



Report No.: RZA1012-2020SAR01R3



OET 65

TEST REPORT

Product Name 802.11n-BT COMBO CARD

Model AETHEROS

FCC ID PPD-AR5B195

Client Atheros Communications, Inc.

TA Technology (Shanghai) Co., Ltd.



GENERAL SUMMARY

| | | | |
|--------------|---|-------|---------|
| Product Name | 802.11n-BT COMBO CARD | Model | ATHEROS |
| FCC ID | PPD-AR5B195 | | |
| Report No. | RZA1012-2020SAR01R3 | | |
| Client | Atheros Communications, Inc. | | |
| Manufacturer | Atheros Communications, Inc. | | |
| 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 248227 D01 SAR meas for 802 11 a b g v01r02: SAR Measurement Procedures for 802.11a/b/g Transmitters</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: Pass</p> | | |
| Comment | The test result only responds to the measured sample. | | |

Approved by 杨伟中

Yang Weizhong

Revised by 凌敏宝

Ling Minbao

Performed by 杜瑞伟

Du Ruwei



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

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 Mode..... | 8 |
| 1.7. Test Date | 8 |
| 2. Operational Conditions during Test | 9 |
| 2.1. General Description of Test Procedures | 9 |
| 2.2. Position of Module | 10 |
| 3. SAR Measurements System Configuration..... | 11 |
| 3.1. SAR Measurement Set-up | 11 |
| 3.2. DASY5 E-field Probe System | 12 |
| 3.2.1. EX3DV4 Probe Specification | 12 |
| 3.2.2. E-field Probe Calibration..... | 13 |
| 3.3. Other Test Equipment | 13 |
| 3.3.1. Device Holder for Transmitters | 13 |
| 3.3.2. Phantom | 14 |
| 3.4. Scanning Procedure | 14 |
| 3.5. Data Storage and Evaluation | 16 |
| 3.5.1. Data Storage..... | 16 |
| 3.5.2. Data Evaluation by SEMCAD | 16 |
| 3.6. System Check..... | 19 |
| 3.7. Equivalent Tissues | 20 |
| 4. Laboratory Environment..... | 20 |
| 5. Characteristics of the Test..... | 21 |
| 5.1. Applicable Limit Regulations | 21 |
| 5.2. Applicable Measurement Standards | 21 |
| 6. Conducted Output Power Measurement..... | 22 |
| 6.1. Summary | 22 |
| 6.2. Conducted Power Results | 22 |
| 7. Test Results | 25 |
| 7.1. Dielectric Performance..... | 25 |
| 7.2. System Check..... | 25 |
| 7.3. Summary of Measurement Results | 26 |
| 7.3.1. 802.11b..... | 26 |
| 8. Measurement Uncertainty | 27 |
| 9. Main Test Instruments | 28 |
| ANNEX A: Test Layout | 29 |

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

Report No. RZA1012-2020SAR01R3

Page 4 of 67

| | |
|---|----|
| ANNEX B: System Check Results | 30 |
| ANNEX C: Graph Results | 32 |
| ANNEX D: Probe Calibration Certificate | 39 |
| ANNEX E: D2450V2 Dipole Calibration Certificate | 50 |
| ANNEX F: DAE4 Calibration Certificate | 59 |
| ANNEX G: The EUT Appearances | 64 |

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 5 of 67

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.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

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

1.2. Testing Laboratory

Company: TA Technology (Shanghai) Co., Ltd.

Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

City: Shanghai

Post code: 201201

Country: P. R. China

Contact: Yang Weizhong

Telephone: +86-021-50791141/2/3

Fax: +86-021-50791141/2/3-8000

Website: <http://www.ta-shanghai.com>

E-mail: yangweizhong@ta-shanghai.com

TA Technology (Shanghai) Co., Ltd.

Test Report

1.3. Applicant Information

Company: Atheros Communications, Inc.
Address: 1700 Technology Dr San Jose California 95110, United States
City: California
Postal Code: 95110
Country: United States
Telephone: (408) 773-5200
Fax: (408) 773-9940

1.4. Manufacturer Information

Company: Atheros Communications, Inc.
Address: 1700 Technology Dr San Jose California 95110, United States
City: California
Postal Code: 95110
Country: United States
Telephone: (408) 773-5200
Fax: (408) 773-9940

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

1.5. Information of EUT

General Information

| | | |
|--|---|--------------|
| Device Type: | Portable Device | |
| Exposure Category: | Uncontrolled Environment / General Population | |
| Product Name: | 802.11n-BT COMBO CARD | |
| SN: | / | |
| Hardware Version: | / | |
| Software Version: | / | |
| Antenna Type: | Internal Antenna | |
| Device Operating Configurations : | | |
| Supporting Mode(s): | 802.11b; (tested) 802.11g; 802.11n; | |
| Test Channel: (Low - Middle - High) | 1-6-11 (802.11b/g/n20) 3-6-9 (802.11n40) | |
| Operating Frequency Range(s): | Band | Tx (MHz) |
| | 802.11b | 2412~2462MHz |

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 8 of 67

Auxiliary Equipment Details

AE1: Battery

Model: GP-S20-6462B4-0100
Manufacturer: ATL
SN: /

AE2: Battery

Model: A102-2S5000-S1C1
Manufacturer: SMP
SN: /

The EUT is a 802.11n-BT COMBO CARD, under Model name: AETHEROS, the device has an internal antenna for WiFi Tx/Rx. SAR is tested for 802.11b in this report. SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

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 Mode

Body Worn Configuration

| Mode | Channel | Position | SAR _{1g} (W/kg) |
|---------|---------|----------|--------------------------|
| 802.11b | High/11 | Top Side | 1.400 |

The Maximum Power

| Mode | Maximum AV Power (dBm) | Maximum PK Power (dBm) |
|---------|------------------------|------------------------|
| 802.11b | 15.34 | 17.83 |

Note: The detail Power refers to Table 4 (Power Measurement Results).

1.7. Test Date

The test is performed on January 12, 2011 and January 27, 2011

2. Operational Conditions during Test

2.1. General Description of Test Procedures

For the 802.11b/g SAR body tests, a communication link is set up with the test mode software for WIFI mode test. The Absolute Radiofrequency Channel Number (ARFCN) is allocated to 1, 6 and 11 respectively in the case of 2450 MHz. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate.

802.11b/g operating modes are tested independently according to the service requirements in each frequency band. 802.11b/g modes are tested on channels 1, 6, 11; however, if output power reduction is necessary for channels 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels must be tested instead.

SAR is not required for 802.11g channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels. When the maximum average output channel in each frequency band is not included in the “default test channels”, the maximum channel should be tested instead of an adjacent “default test channels”, these are referred to as the “required test channels” and are illustrated in table 1.

Then The Absolute Radiofrequency Channel Number (ARFCN) is firstly allocated to 2437 respectively in the case of 802.11b/g.

Table 1: “Default Test Channels”

| Mode | GHz | Channel | Turbo Channel | “Default Test Channels” | | |
|-----------|-------|-----------------|---------------|-------------------------|---------|------|
| | | | | 15.247 | | UNII |
| | | | | 802.11b | 802.11g | |
| 802.11b/g | 2.412 | 1 [#] | | ✓ | * | |
| | 2.437 | 6 | 6 | ✓ | * | |
| | 2.462 | 11 [#] | | ✓ | * | |

Note: [#]=when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

✓= “default test channels”

* =possible 802.11g channels with maximum average output 0.25dB>=the “default test channels”

2.2. Position of Module

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 G Picture 4)
- Test Position 2: The right side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX G Picture 5)
- Test Position 3: The left side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX G Picture 6)
(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 top side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX G Picture 7)
- Test Position 5: The bottom side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX G Picture 8)
(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)

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.

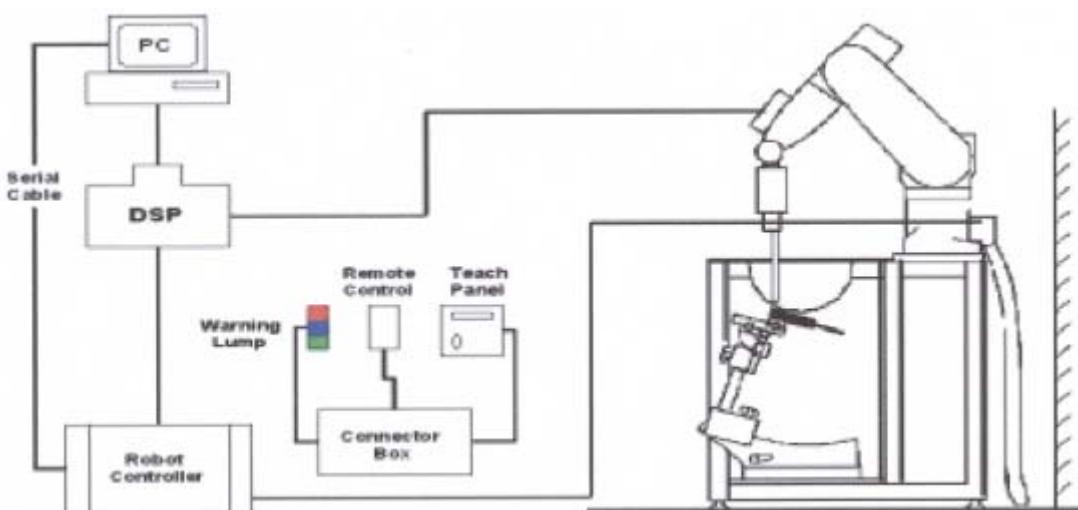


Figure 1 SAR Lab Test Measurement Set-up

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 0.25dB. 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/m³).

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 \pm 0.2 mm

Filling Volume Approx. 30 liters

Dimensions 190×600×400 mm (H×L×W)

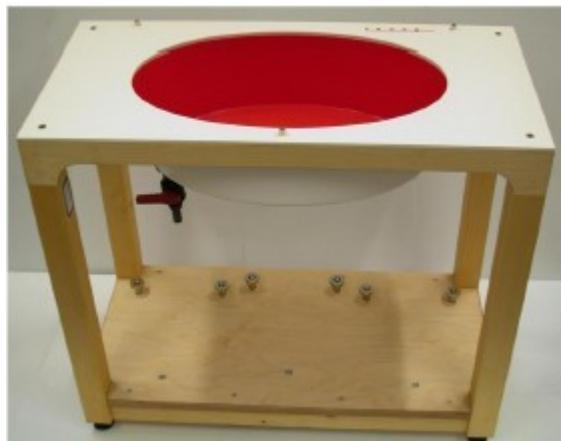


Figure 4.ELI4 Phantom

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 \pm 0.1mm). 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°.)
- 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

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 | Norm _i , a_{i0} , a_{i1} , a_{i2} |
| | - Conversion factor | Conv _{F_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. RZA1012-2020SAR01R3

Page 17 of 67

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)

c_f = crest factor of exciting field (DASY parameter)

$d_c p_i$ = 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.

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

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

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 6.

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.

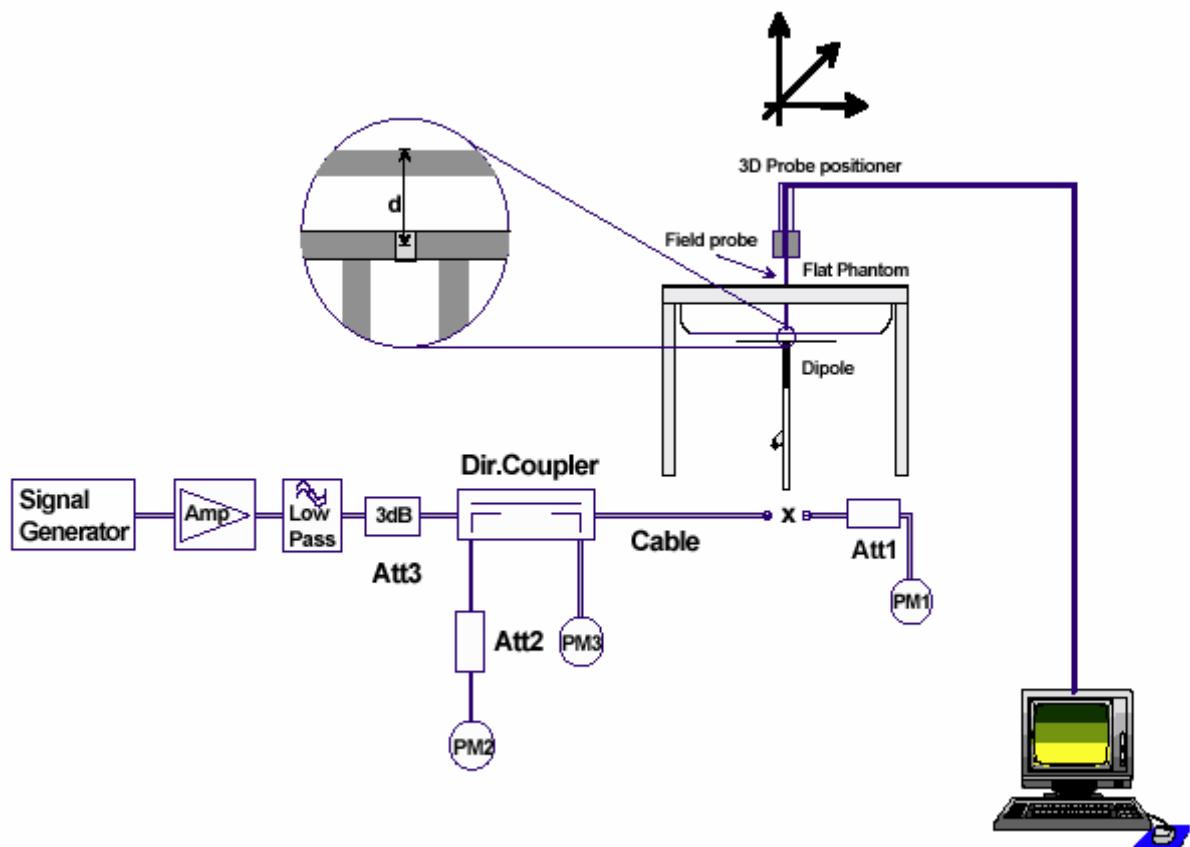


Figure 5 System Check Set-up

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 20 of 67

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 2 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

Table 2: Composition of the Body Tissue Equivalent Matter

| MIXTURE% | FREQUENCY (Body) 2450MHz |
|---------------------------------------|--|
| Water | 73.2 |
| Glycol | 26.7 |
| Salt | 0.1 |
| Dielectric Parameters Target Value | f=2450MHz $\epsilon=52.70$ $\sigma=1.95$ |

4. Laboratory Environment

Table 3: 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 248227 D01 SAR meas for 802 11 a b g V01R02: SAR Measurement Procedures for 802.11a/b/g Transmitters

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

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 22 of 67

6. Conducted Output Power Measurement

6.1. Summary

The following procedures had been used to prepare the EUT for the SAR test. The client provided a special driver and program, which enable engineer to control the frequency and output power of the module.

6.2. Conducted Power Results

Table 4: Conducted Power Measurement Results

| Mode | Channel | Data rate (Mbps) | | AV Power (dBm) | PK Power (dBm) |
|---------|---------|------------------|--------|----------------|----------------|
| 802.11b | 1 | 1 | Before | 14.95 | 17.57 |
| | | | After | 14.94 | 17.55 |
| | | 2 | Before | 15.21 | 17.62 |
| | | | After | 15.20 | 17.60 |
| | | 5.5 | Before | 15.34 | 17.83 |
| | | | After | 15.32 | 17.81 |
| | 6 | 11 | Before | 15.32 | 17.87 |
| | | | After | 15.31 | 17.85 |
| | | 1 | Before | 14.98 | 17.39 |
| | | | After | 14.96 | 17.37 |
| | | 2 | Before | 14.90 | 17.92 |
| | | | After | 14.92 | 17.93 |
| | 11 | 5.5 | Before | 14.96 | 18.13 |
| | | | After | 14.95 | 18.12 |
| | | 11 | Before | 14.92 | 18.02 |
| | | | After | 14.95 | 18.04 |
| | | 1 | Before | 14.61 | 17.13 |
| | | | After | 14.60 | 17.11 |
| | | 2 | Before | 14.87 | 17.38 |
| | | | After | 14.85 | 17.37 |
| | | 5.5 | Before | 14.97 | 17.57 |
| | | | After | 14.95 | 17.56 |
| | | 11 | Before | 14.72 | 17.32 |
| | | | After | 14.71 | 17.31 |
| 802.11g | 1 | 6 | Before | 13.57 | 16.78 |
| | | 9 | Before | 13.47 | 16.62 |
| | | 12 | Before | 13.58 | 16.85 |
| | | 18 | Before | 13.48 | 16.81 |
| | | 24 | Before | 13.58 | 16.96 |
| | | 36 | Before | 13.43 | 16.52 |
| | | 48 | Before | 13.63 | 16.87 |

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

| | | | | | |
|---|----|----|--------|-------|-------|
| | | 54 | Before | 13.43 | 16.69 |
| 6 | 11 | 6 | Before | 12.80 | 16.24 |
| | | 9 | Before | 12.87 | 16.31 |
| | | 12 | Before | 12.85 | 16.19 |
| | | 18 | Before | 12.96 | 16.21 |
| | | 24 | Before | 12.63 | 16.04 |
| | | 36 | Before | 12.53 | 15.89 |
| | | 48 | Before | 12.42 | 15.87 |
| | | 54 | Before | 12.67 | 15.98 |
| | | 6 | Before | 12.67 | 16.16 |

| Mode | Channel | Data rate (Mbps) | | AV Power (dBm) | PK Power (dBm) |
|--------------------|---------|---------------------|--------|-------------------|-------------------|
| 802.11n (20MHz) | 1 | MCS0 | Before | 13.14 | 16.47 |
| | | MCS1 | Before | 13.07 | 16.58 |
| | | MCS2 | Before | 12.97 | 16.39 |
| | | MCS3 | Before | 12.85 | 16.28 |
| | | MCS4 | Before | 13.07 | 16.35 |
| | | MCS5 | Before | 12.98 | 16.31 |
| | | MCS6 | Before | 12.87 | 16.32 |
| | | MCS7 | Before | 12.92 | 16.42 |
| | 6 | MCS0 | Before | 12.34 | 15.95 |
| | | MCS1 | Before | 12.23 | 16.09 |
| | | MCS2 | Before | 12.03 | 15.75 |
| | | MCS3 | Before | 11.85 | 15.41 |
| | | MCS4 | Before | 11.98 | 15.32 |
| | | MCS5 | Before | 11.92 | 15.53 |
| | | MCS6 | Before | 12.21 | 15.52 |
| | | MCS7 | Before | 12.02 | 15.36 |
| | 11 | MCS0 | Before | 12.65 | 16.32 |
| | | MCS1 | Before | 12.58 | 16.23 |
| | | MCS2 | Before | 12.73 | 16.34 |
| | | MCS3 | Before | 12.47 | 16.21 |
| | | MCS4 | Before | 12.56 | 16.35 |
| | | MCS5 | Before | 12.24 | 15.98 |

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

| | | | | | |
|--------------------|---|------|--------|-------|-------|
| 802.11n (40MHz) | 3 | MCS6 | Before | 12.32 | 15.78 |
| | | MCS7 | Before | 12.30 | 15.75 |
| | | MCS0 | Before | 13.35 | 16.82 |
| | | MCS1 | Before | 13.35 | 16.98 |
| | | MCS2 | Before | 13.25 | 16.96 |
| | | MCS3 | Before | 13.15 | 16.72 |
| | | MCS4 | Before | 13.17 | 16.65 |
| | | MCS5 | Before | 13.23 | 16.43 |
| | | MCS6 | Before | 12.98 | 16.43 |
| | | MCS7 | Before | 12.96 | 16.47 |
| | 6 | MCS0 | Before | 12.56 | 15.98 |
| | | MCS1 | Before | 12.63 | 16.03 |
| | | MCS2 | Before | 12.47 | 16.18 |
| | | MCS3 | Before | 12.23 | 16.01 |
| | | MCS4 | Before | 12.23 | 15.92 |
| | | MCS5 | Before | 12.42 | 15.78 |
| | | MCS6 | Before | 12.17 | 15.59 |
| | | MCS7 | Before | 12.10 | 15.55 |
| | 9 | MCS0 | Before | 12.85 | 16.35 |
| | | MCS1 | Before | 12.64 | 16.03 |
| | | MCS2 | Before | 12.45 | 15.96 |
| | | MCS3 | Before | 12.67 | 15.98 |
| | | MCS4 | Before | 12.49 | 16.03 |
| | | MCS5 | Before | 12.20 | 15.75 |
| | | MCS6 | Before | 12.25 | 15.66 |
| | | MCS7 | Before | 12.47 | 15.83 |

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

7. Test Results

7.1. Dielectric Performance

Table 5: Dielectric Performance of Body Tissue Simulating Liquid

| Frequency | Description | Dielectric Parameters | | Temp °C |
|-------------------|-----------------------------------|------------------------|----------------------|------------|
| | | ϵ_r | $\sigma(\text{s/m})$ | |
| 2450MHz (body) | Target value $\pm 10\%$ window | 52.70 50.07 — 55.34 | 1.95 1.85 — 2.05 | / |
| | Measurement value 2011-1-12 | 51.83 | 1.92 | |
| | Measurement value 2011-1-27 | 51.82 | 1.92 | |

7.2. System Check

Table 6: System Check for Body Tissue Simulating Liquid

| Frequency | Description | SAR(W/kg) | | Dielectric Parameters | | Temp °C |
|-----------|--|---------------------|-------------------|--------------------------|----------------------|------------|
| | | 10g | 1g | ϵ_r | $\sigma(\text{s/m})$ | |
| 2450MHz | Recommended value $\pm 10\%$ window | 5.97 5.37 — 6.57 | 13 11.7 — 14.3 | 51.8 | 2.01 | / |
| | Measurement value 2011-1-12 | 6.02 | 13.98 | 51.83 | 1.92 | |
| | Measurement value 2011-1-27 | 6.02 | 13.99 | 51.82 | 1.92 | |

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

7.3. Summary of Measurement Results

7.3.1. 802.11b

Table 7: SAR Values (802.11b)

| 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 with Battery 1(Model: GP-S20-6462B4-0100) | | | | | | |
| Test Position 1 | Middle/6 | 0.033 | 0.066 | 0.050 | Figure 8 | |
| Test Position 2 | Middle/6 | 0.006 | 0.013 | 0.062 | Figure 9 | |
| Test Position 3 | / | / | / | / | / | |
| Test Position 4 | High/11 | 0.534 | 1.400 | 0.043 | Figure 10 | |
| | Middle/6 | 0.381 | 1.010 | 0.075 | Figure 11 | |
| | Low/1 | 0.277 | 0.728 | 0.006 | Figure 12 | |
| Test Position 5 | / | / | / | / | / | |
| Worst Case Position of Battery 1 with Battery 2 (Model:A102-2S5000-S1C1) | | | | | | |
| Test Position 4 | High/11 | 0.487 | 1.34 | 0.170 | Figure 13 | |

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.
4. SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 27 of 67

8. Measurement Uncertainty

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

Report No. RZA1012-2020SAR01R3

Page 28 of 67

| | | | | | | | | |
|--|---|--|-----|---|------------|----------|------|----------|
| 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 8: 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 2450MHz | D2450V2 | 712 | February 19, 2010 | Two years |

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

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

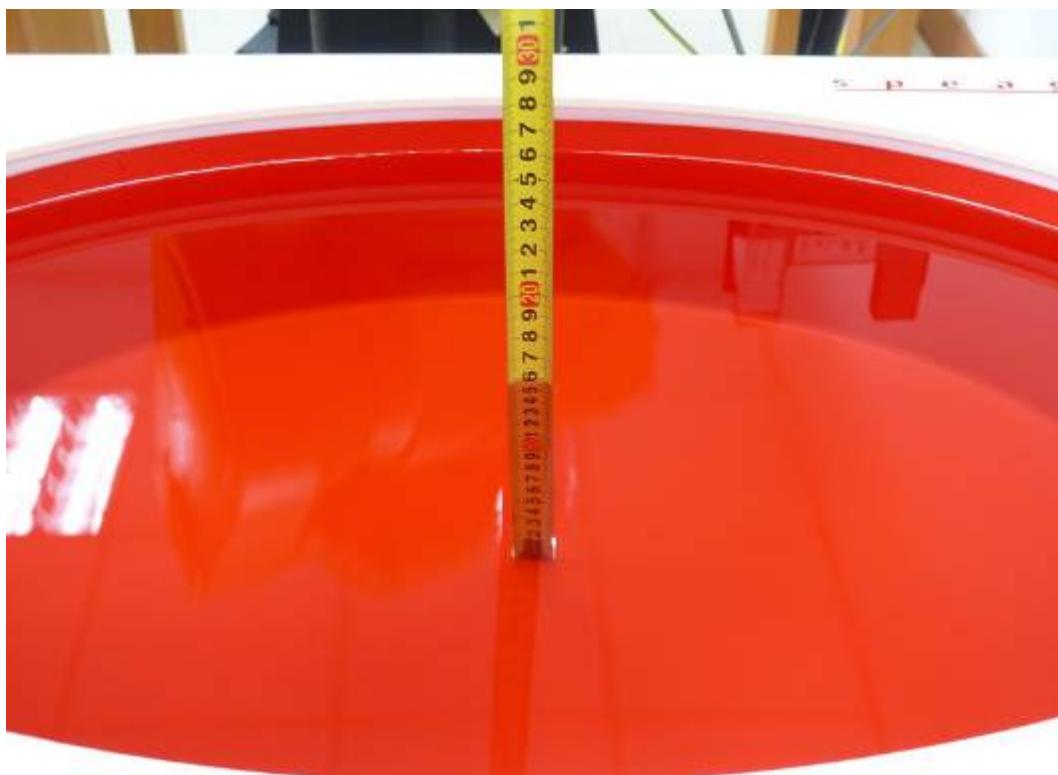
Report No. RZA1012-2020SAR01R3

Page 29 of 67

ANNEX A: Test Layout



Picture 1: Specific Absorption Rate Test Layout



Picture 2: Liquid depth in the flat Phantom (2450 MHz, 15.2cm depth)

ANNEX B: System Check Results

System Performance Check at 2450 MHz

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 712

Date/Time: 1/12/2011 9:00:36 AM

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 51.83$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.9 °C

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 21.5 mW/g

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

Reference Value = 71.0 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 13.98 mW/g; SAR(10 g) = 6.02 mW/g

Maximum value of SAR (measured) = 19.6 mW/g

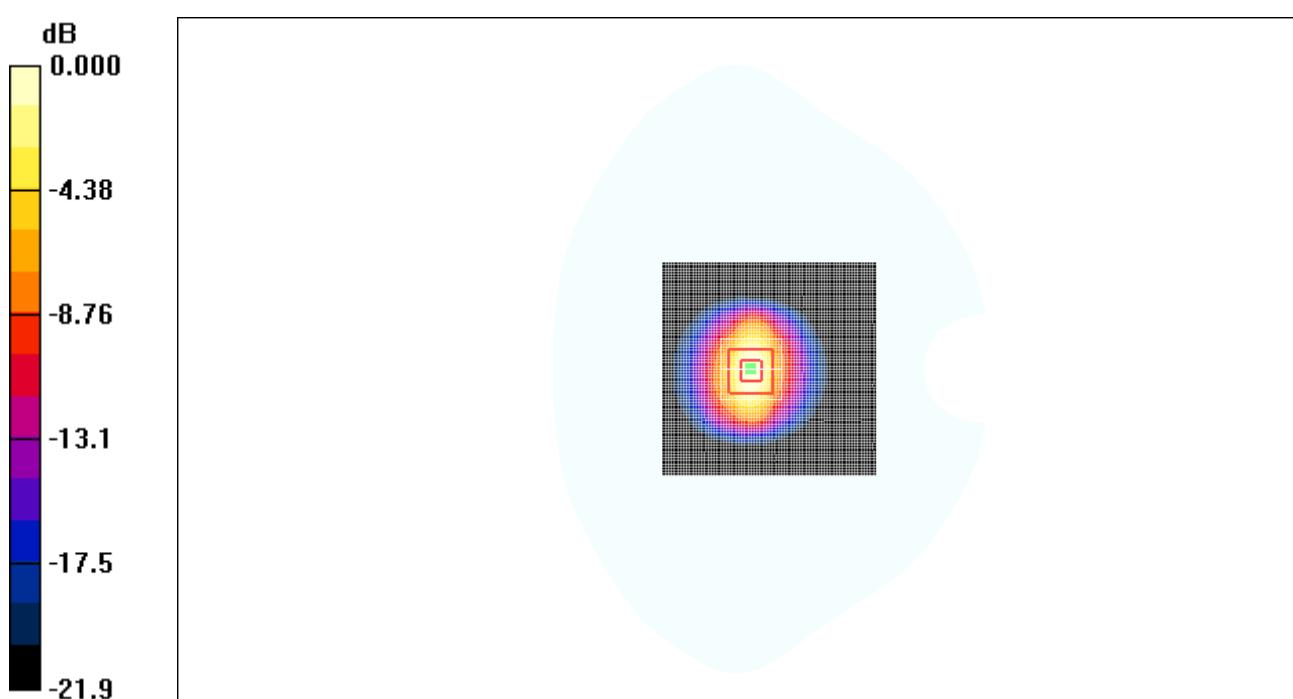


Figure 6 System Performance Check 2450MHz 250mW

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

Report No. RZA1012-2020SAR01R3

Page 31 of 67

System Performance Check at 2450 MHz

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 712

Date/Time: 1/27/2011 9:00:36 AM

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 51.82$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.9 °C

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 21.5 mW/g

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

Reference Value = 71.0 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 13.99 mW/g; SAR(10 g) = 6.02 mW/g

Maximum value of SAR (measured) = 19.6 mW/g

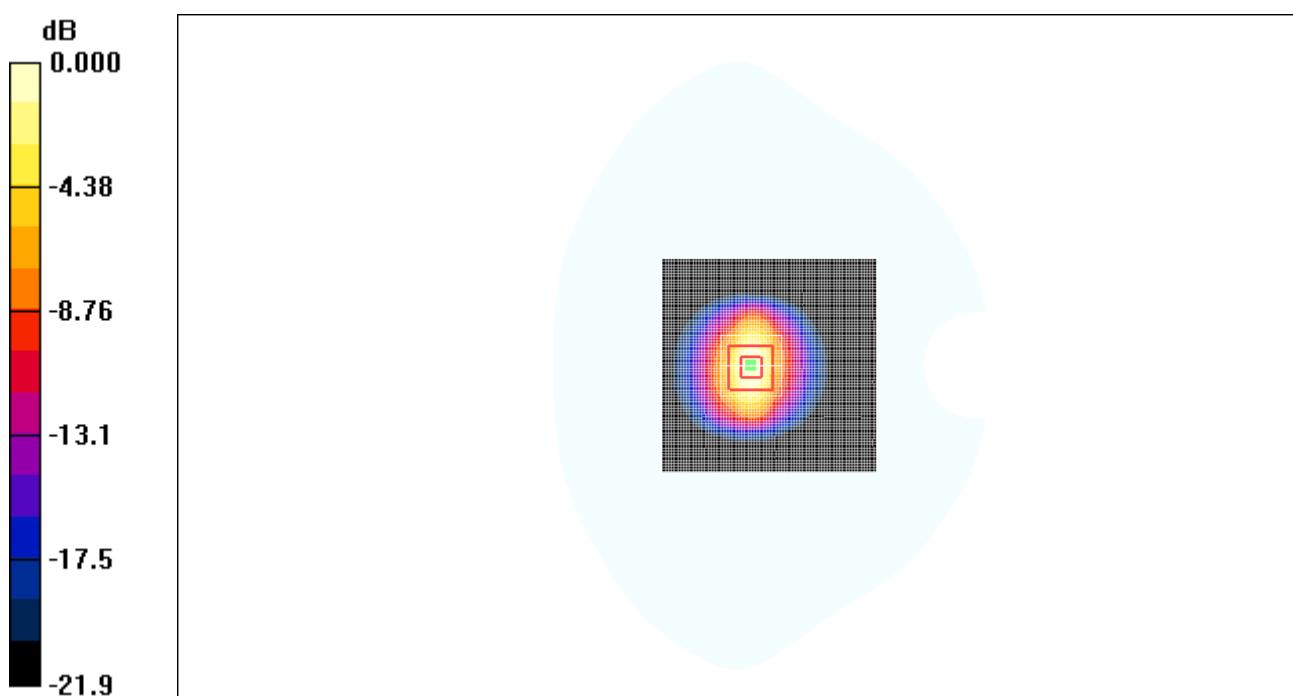


Figure 7 System Performance Check 2450MHz 250mW

ANNEX C: Graph Results

802.11b Test Position 1 Middle

Date/Time: 1/12/2011 11:39:30 AM

Communication System: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

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

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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 (101x161x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.064 mW/g

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

Reference Value = 1.34 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 0.141 W/kg

SAR(1 g) = 0.066 mW/g; SAR(10 g) = 0.033 mW/g

Maximum value of SAR (measured) = 0.072 mW/g

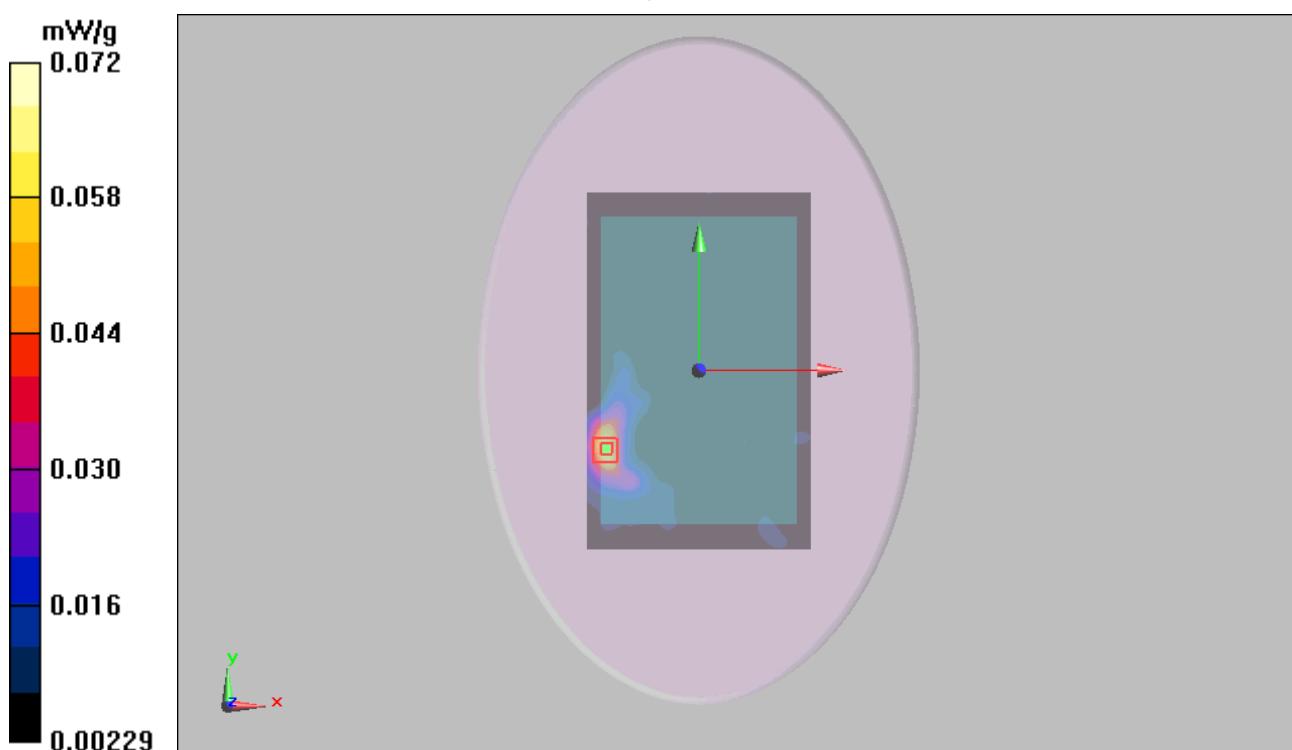


Figure 8 802.11b Test Position 1 Channel 6

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

Report No. RZA1012-2020SAR01R3

Page 33 of 67

802.11b Test Position 2 Middle

Date/Time: 1/12/2011 12:26:44 PM

Communication System: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

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

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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 (31x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.018 mW/g

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

Reference Value = 0.682 V/m; Power Drift = 0.062 dB

Peak SAR (extrapolated) = 0.023 W/kg

SAR(1 g) = 0.013 mW/g; SAR(10 g) = 0.006 mW/g

Maximum value of SAR (measured) = 0.015 mW/g

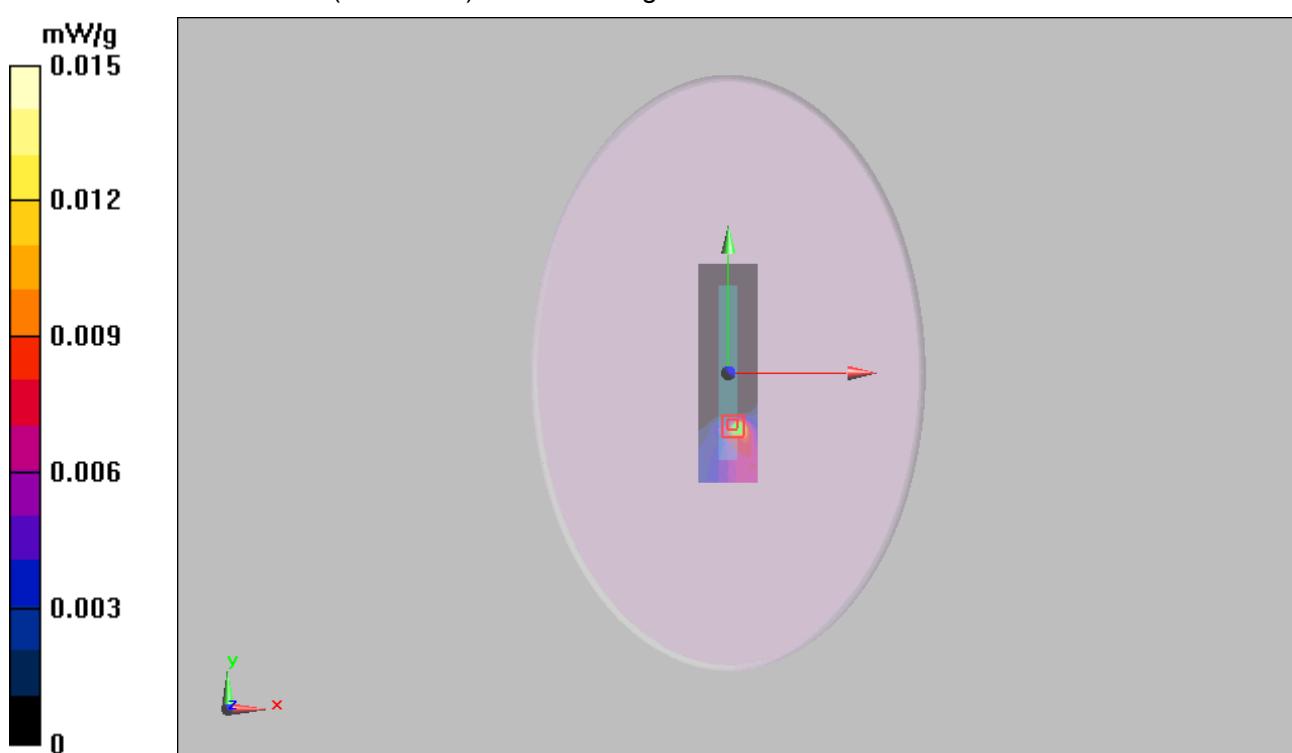


Figure 9 802.11b Test Position 2 Channel 6

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

Report No. RZA1012-2020SAR01R3

Page 34 of 67

802.11b Test Position 4 High

Date/Time: 1/12/2011 10:17:15 AM

Communication System: 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2462$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

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

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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 4 High/Area Scan (31x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.785 mW/g

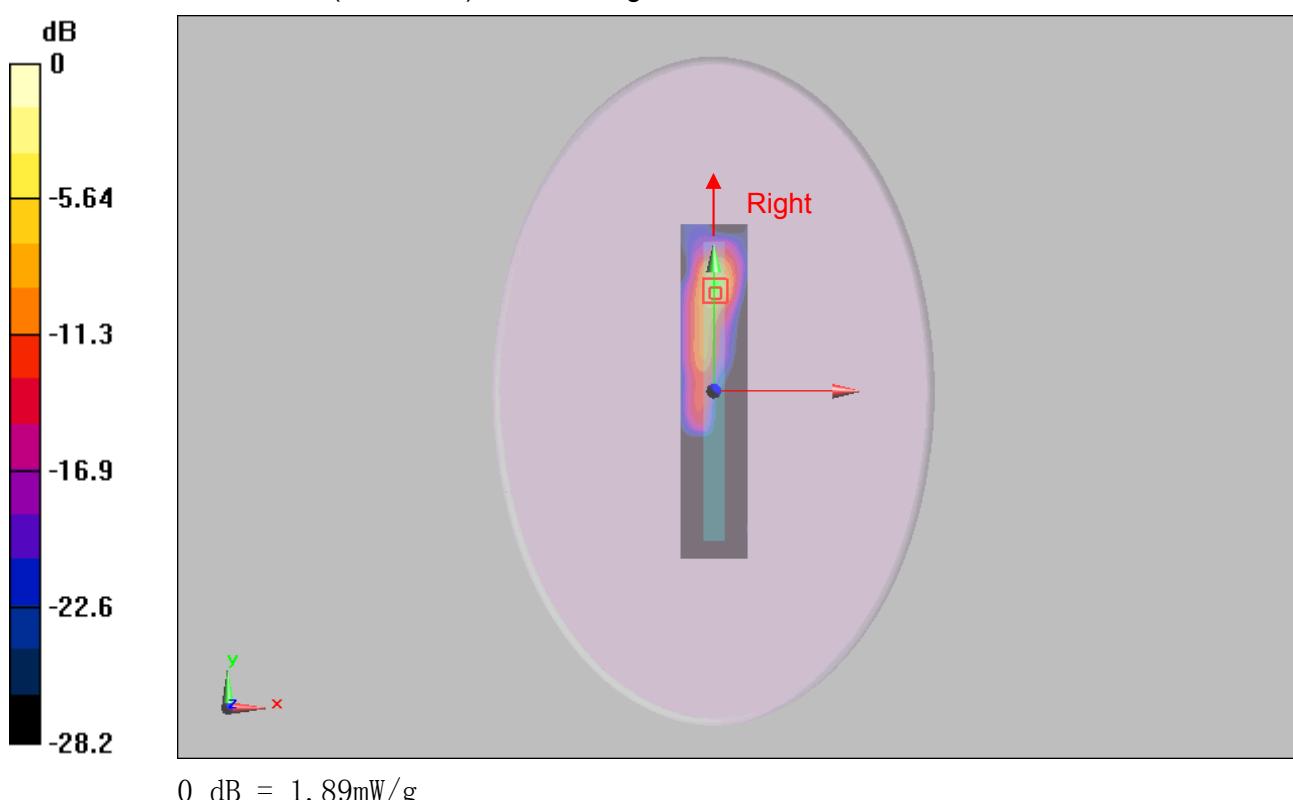
Test Position 4 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.06 V/m; Power Drift = 0.043 dB

Peak SAR (extrapolated) = 3.37 W/kg

SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.534 mW/g

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



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

Report No. RZA1012-2020SAR01R3

Page 35 of 67

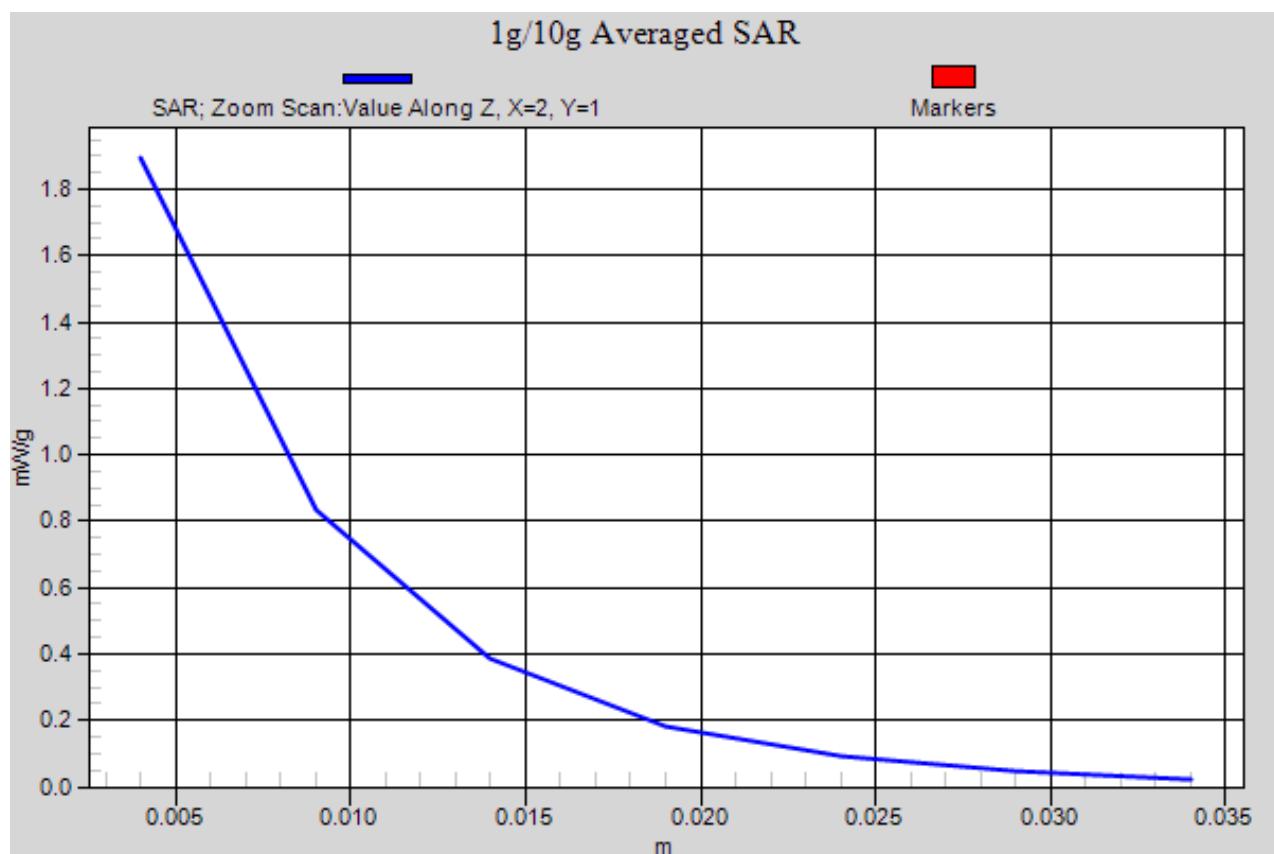


Figure 10 802.11b Test Position 4 Channel 11

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

Report No. RZA1012-2020SAR01R3

Page 36 of 67

802.11b Test Position 4 Middle

Date/Time: 1/12/2011 10:34:23 AM

Communication System: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

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

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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 4 Middle/Area Scan (31x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.615 mW/g

Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.01 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 2.39 W/kg

SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.381 mW/g

Maximum value of SAR (measured) = 1.33 mW/g

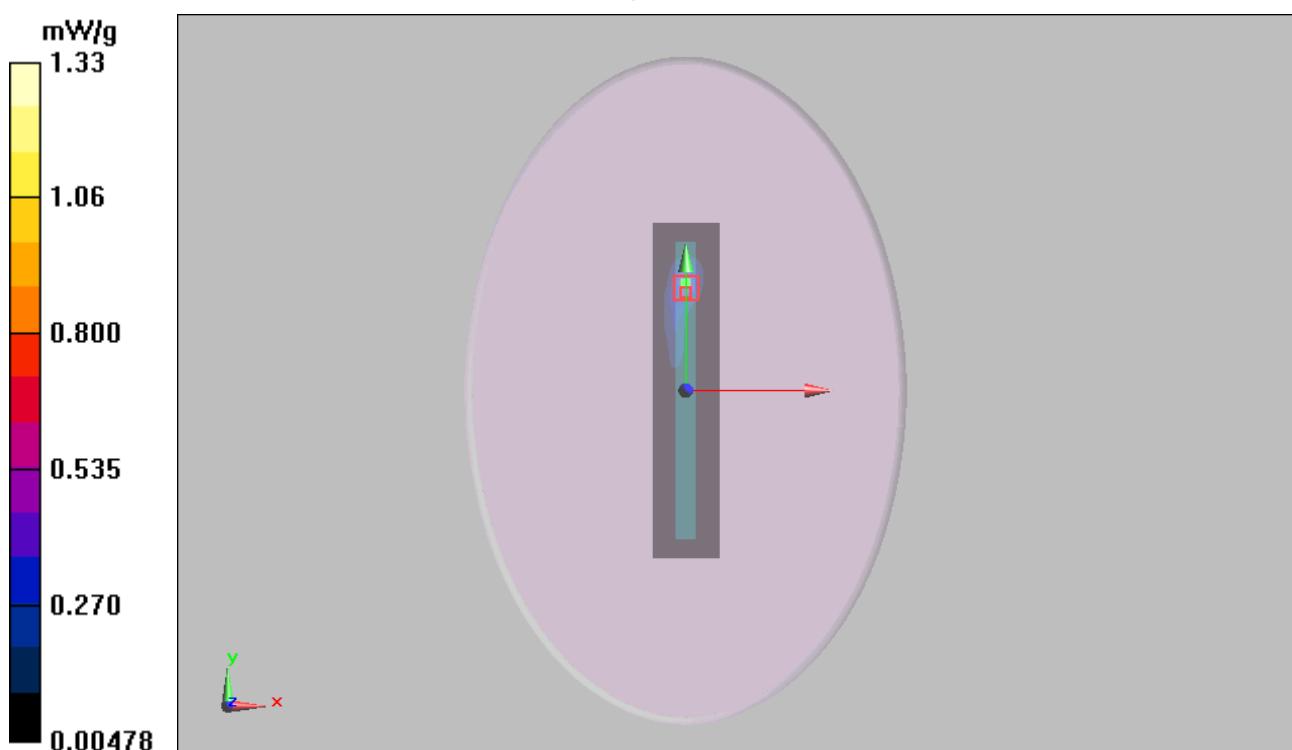


Figure 11 802.11b Test Position 4 Channel 6

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

Report No. RZA1012-2020SAR01R3

Page 37 of 67

802.11b Test Position 4 Low

Date/Time: 1/12/2011 10:50:34 AM

Communication System: 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2412$ MHz; $\sigma = 1.88$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

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

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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 4 Low /Area Scan (31x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.735 mW/g

Test Position 4 Low /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.61 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 1.83 W/kg

SAR(1 g) = 0.728 mW/g; SAR(10 g) = 0.277 mW/g

Maximum value of SAR (measured) = 0.874 mW/g

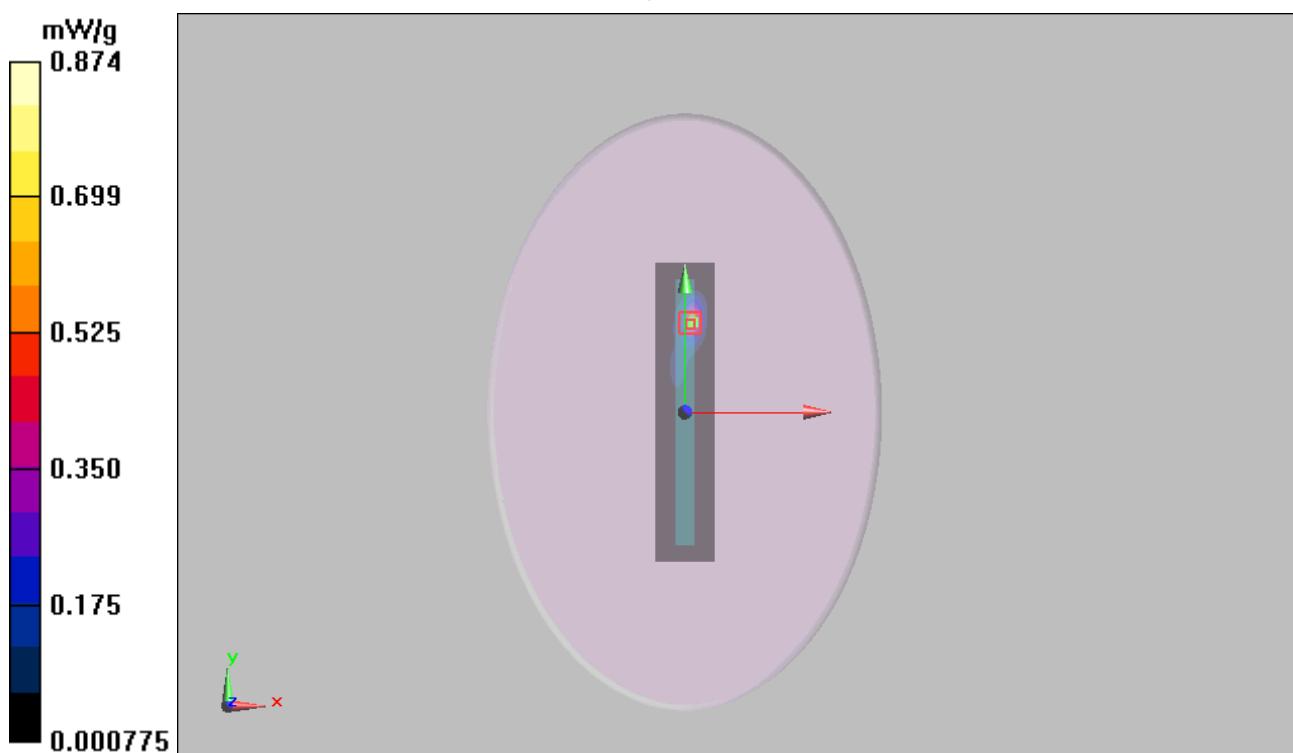


Figure 12 802.11b Test Position 4 Channel 1

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

Report No. RZA1012-2020SAR01R3

Page 38 of 67

802.11b Test Position 4 High

Date/Time: 1/27/2011 11:50:34 AM

Communication System: 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2462$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

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

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.46, 7.46, 7.46); 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 4 High /Area Scan (41x201x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.537 mW/g

Test Position 4 High /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.62 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 3.28 W/kg

SAR(1 g) = 1.34 mW/g; SAR(10 g) = 0.487 mW/g

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

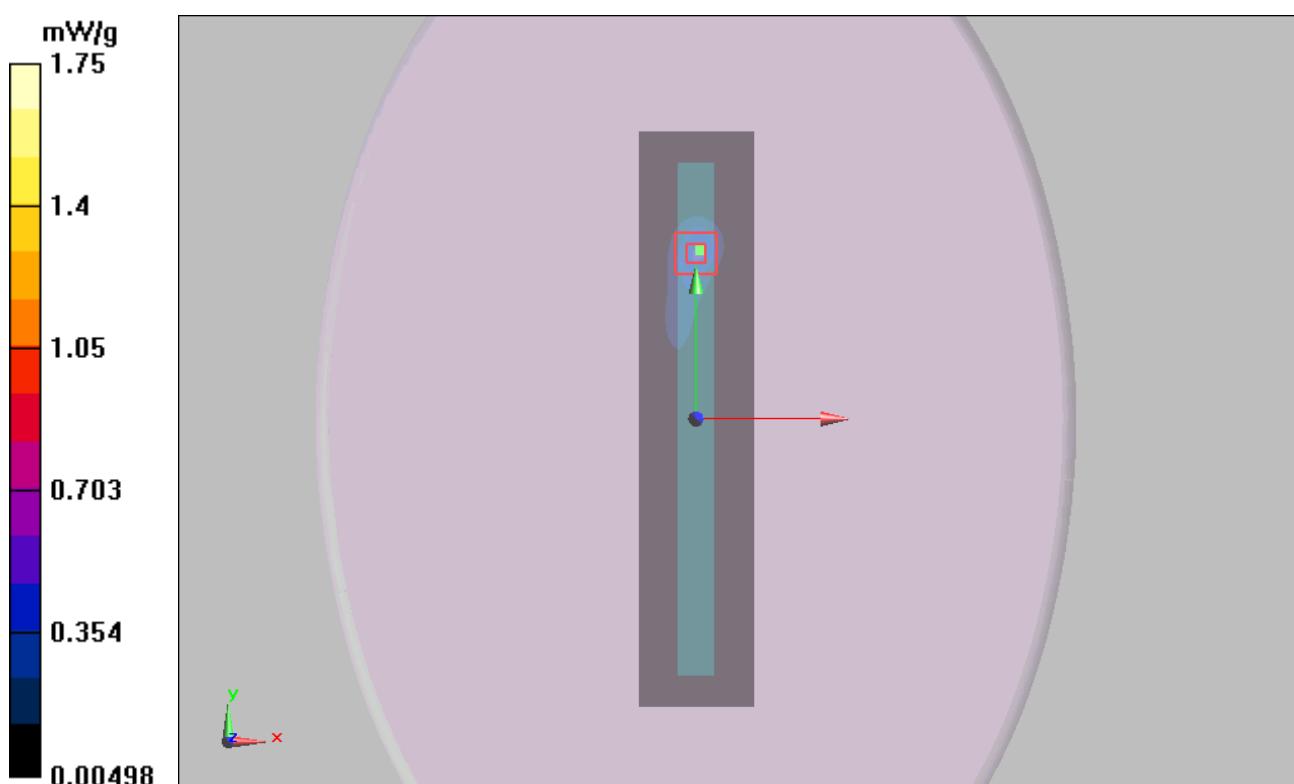


Figure 13 802.11b Test Position 4 Channel 11

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 39 of 67

ANNEX D: Probe 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 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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|----------------------------|-----------------|--------------------------------|-----------------------|
| Power meter 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 |
| DAE4 | SN: 660 | 20-Apr-10 (No. DAE4-660_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: | Name | Function | Signature |
|----------------|---------------|-------------------|-----------|
| | Katja Pokovic | Technical Manager | |

| Approved by: | Name | Function | Signature |
|--------------|--------------|-----------------|-----------|
| | Niels Kuster | Quality Manager | |

Issued: November 25, 2010

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

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 40 of 67

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

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., $\theta = 0$ 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 $\theta = 0$ ($f \leq 900$ 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).
- $NORM(f)x, y, z = NORMx, y, z * frequency_response$ (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.
- DCPx, 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.
- Ax, y, z; Bx, y, z; Cx, y, z, VRx, 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.

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

Report No. RZA1012-2020SAR01R3

Page 41 of 67

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. RZA1012-2020SAR01R3

Page 42 of 67

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 | $\pm 10.1\%$ |
| 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 Y Z | 0.00 0.00 0.00 | 0.00 0.00 0.00 | 1.00 1.00 1.00 | 143.2 140.9 135.8 | $\pm 2.4\%$ |

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 E^2 -field uncertainty inside TSL (see Pages 5 and 8).

^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. RZA1012-2020SAR01R3

Page 43 of 67

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. RZA1012-2020SAR01R3

Page 44 of 67

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.

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

Report No. RZA1012-2020SAR01R3

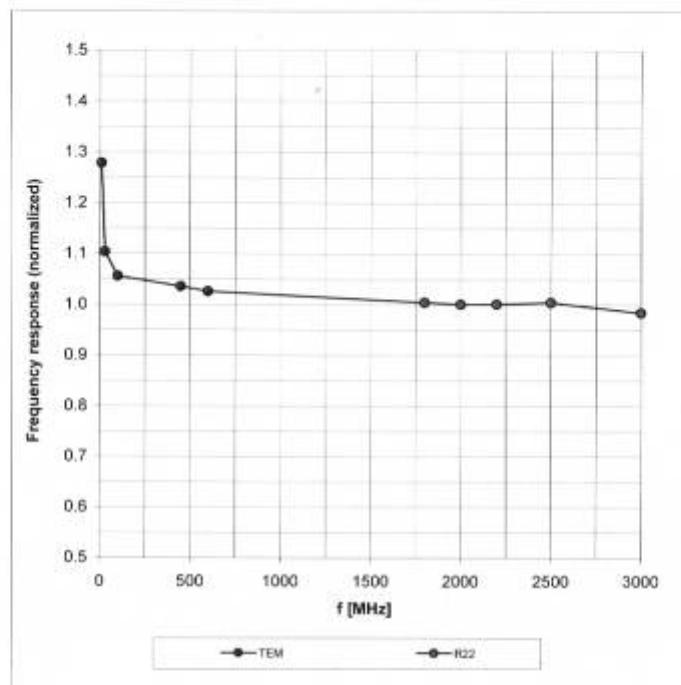
Page 45 of 67

EX3DV4 SN:3677

November 24, 2010

Frequency Response of E-Field

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



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

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

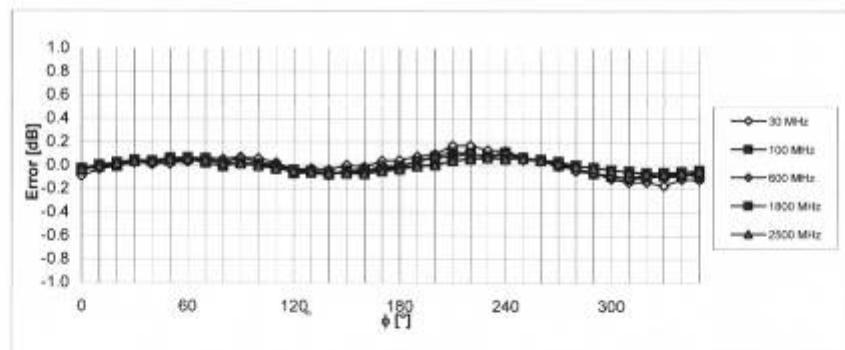
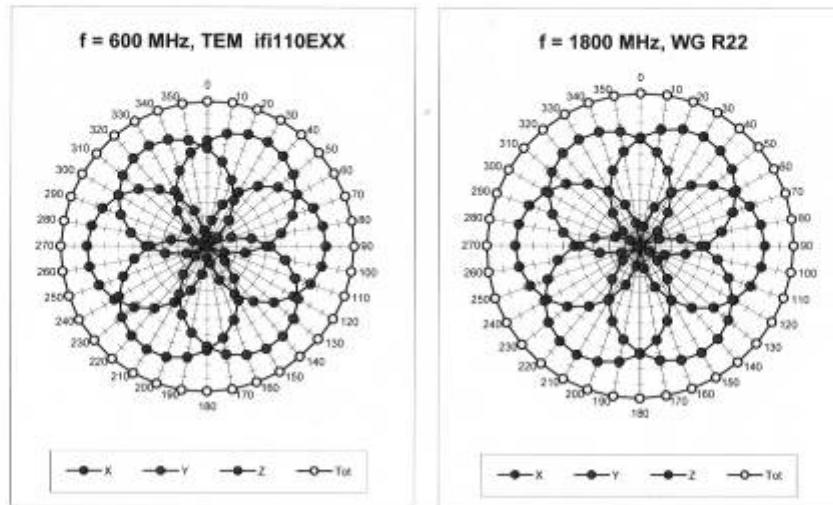
Report No. RZA1012-2020SAR01R3

Page 46 of 67

EX3DV4 SN:3677

November 24, 2010

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



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

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

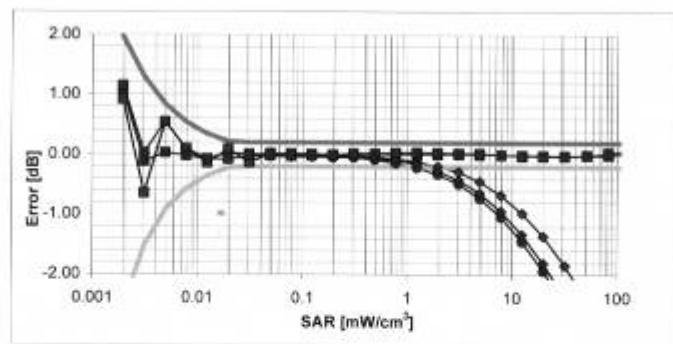
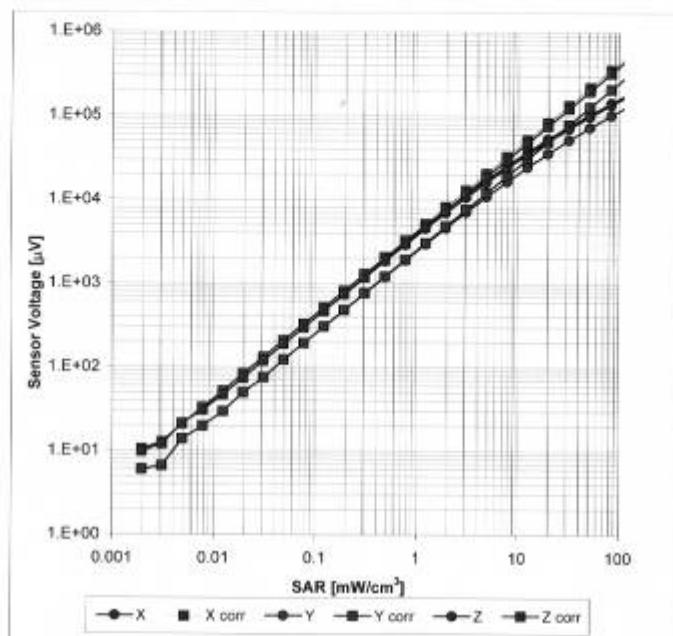
Report No. RZA1012-2020SAR01R3

Page 47 of 67

EX3DV4 SN:3677

November 24, 2010

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



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

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

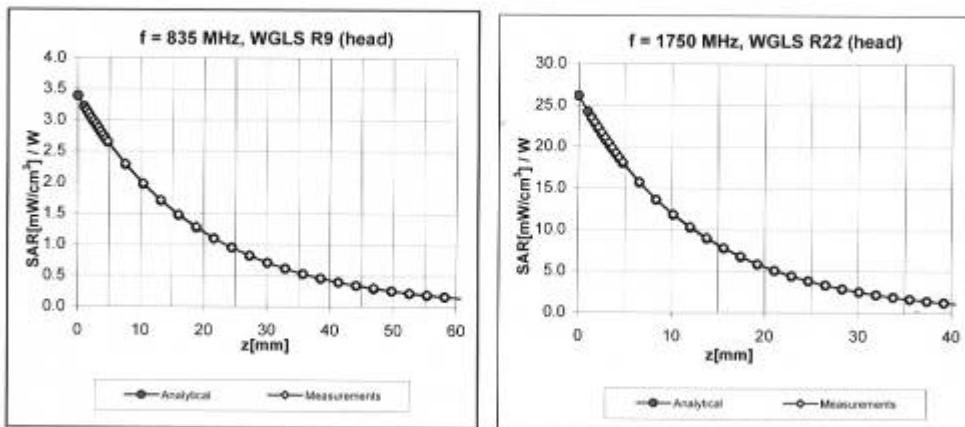
Report No. RZA1012-2020SAR01R3

Page 48 of 67

EX3DV4 SN:3677

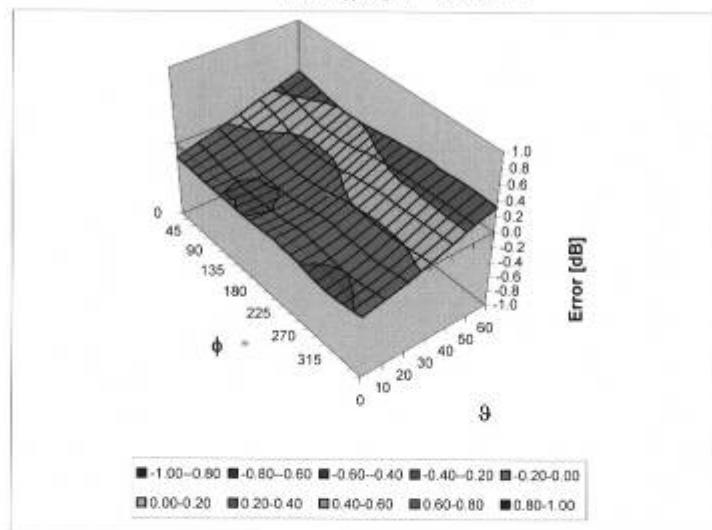
November 24, 2010

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ), $f = 900$ MHz



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

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

Report No. RZA1012-2020SAR01R3

Page 49 of 67

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 |

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 50 of 67

ANNEX E: D2450V2 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 ATL (Auden)

Certificate No.: D2450V2-712_Feb10

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 712

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

Calibration date: February 19, 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) | 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-09 (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 | 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: | Name | Function | Signature |
|----------------|----------------|-----------------------|-----------|
| | Jeton Kastrati | Laboratory Technician | |

| Approved by: | Name | Function | Signature |
|--------------|---------------|-------------------|-----------|
| | Katja Pokovic | Technical Manager | |

Issued: February 19, 2010

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

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 51 of 67

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

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:

- a) 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
- b) 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
- c) 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:

- d) 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. RZA1012-2020SAR01R3

Page 52 of 67

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 | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 2450 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 39.2 | 1.80 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 38.5 ± 6 % | 1.76 mho/m ± 6 % |
| Head TSL temperature during test | (21.0 ± 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 | 13.3 mW / g |
| SAR normalized | normalized to 1W | 53.2 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 53.5 mW / g ± 17.0 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
| SAR measured | 250 mW input power | 6.24 mW / g |
| SAR normalized | normalized to 1W | 25.0 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 25.0 mW / g ± 16.5 % (k=2) |

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 53 of 67

Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 52.7 | 1.95 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 51.7 ± 6 % | 2.00 mho/m ± 6 % |
| Body TSL temperature during test | (21.2 ± 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 | 13.0 mW / g |
| SAR normalized | normalized to 1W | 52.0 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 51.1 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
|---|--------------------|----------------------------|
| SAR measured | 250 mW input power | 5.97 mW / g |
| SAR normalized | normalized to 1W | 23.9 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 23.7 mW / g ± 16.5 % (k=2) |

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 54 of 67

Appendix

Antenna Parameters with Head TSL

| | |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $54.2 \Omega + 1.9 j\Omega$ |
| Return Loss | - 27.1 dB |

Antenna Parameters with Body TSL

| | |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $50.1 \Omega + 5.2 j\Omega$ |
| Return Loss | - 25.7 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1,144 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 | July 05, 2002 |

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

Report No. RZA1012-2020SAR01R3

Page 55 of 67

DASY5 Validation Report for Head TSL

Date/Time: 17.02.2010 13:12:38

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712

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

Medium: HSL U11 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.77$ mho/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

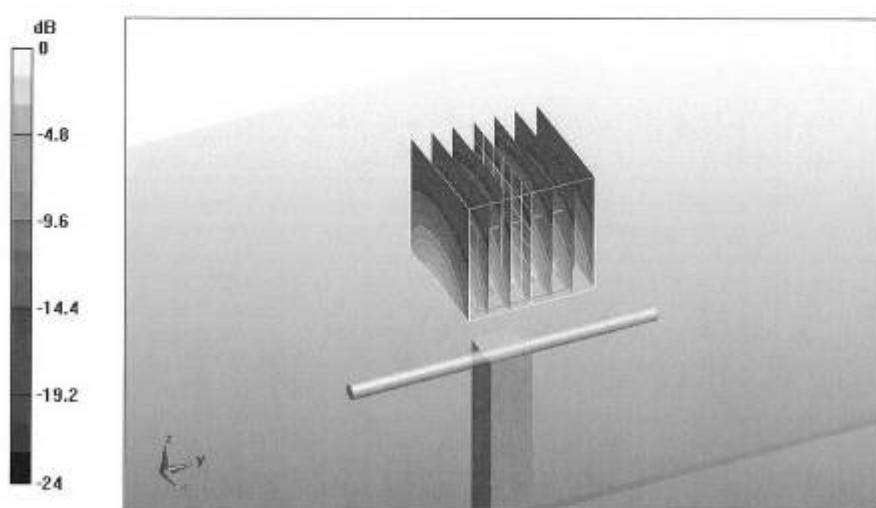
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.1 V/m; Power Drift = 0.032 dB

Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.24 mW/g

Maximum value of SAR (measured) = 17.1 mW/g

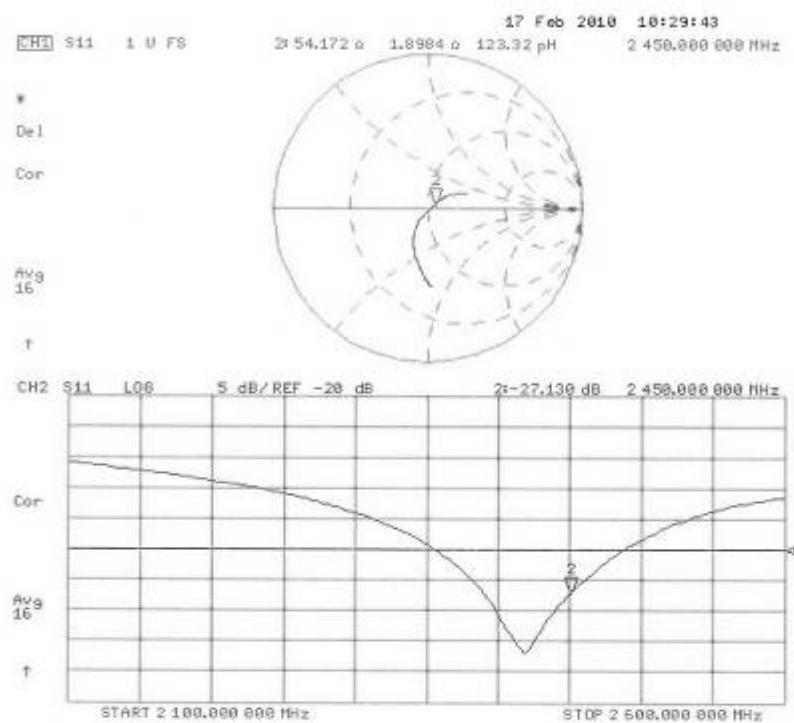


TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2020SAR01R3

Page 56 of 67

Impedance Measurement Plot for Head TSL



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

Report No. RZA1012-2020SAR01R3

Page 57 of 67

DASY5 Validation Report for Body

Date/Time: 19.02.2010 13:05:49

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712

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

Medium: MSL U10 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

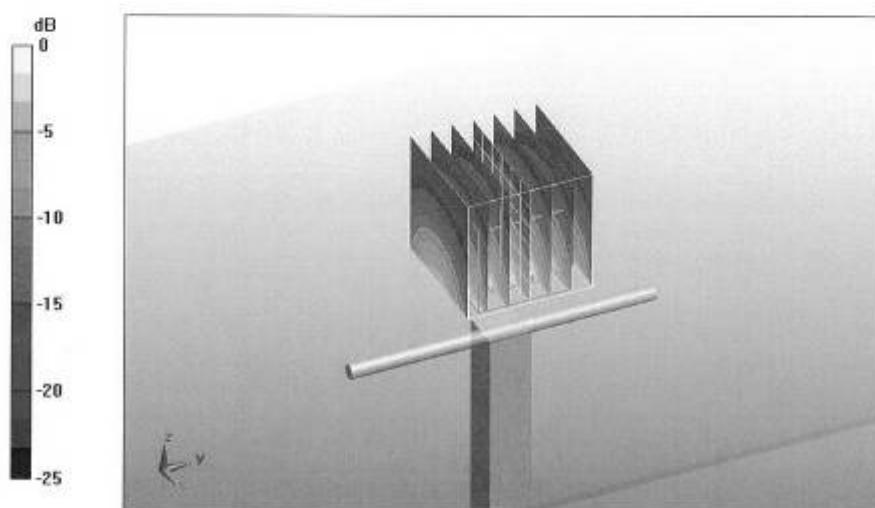
Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.5 V/m; Power Drift = 0.015 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 13 mW/g; SAR(10 g) = 5.97 mW/g

Maximum value of SAR (measured) = 17 mW/g



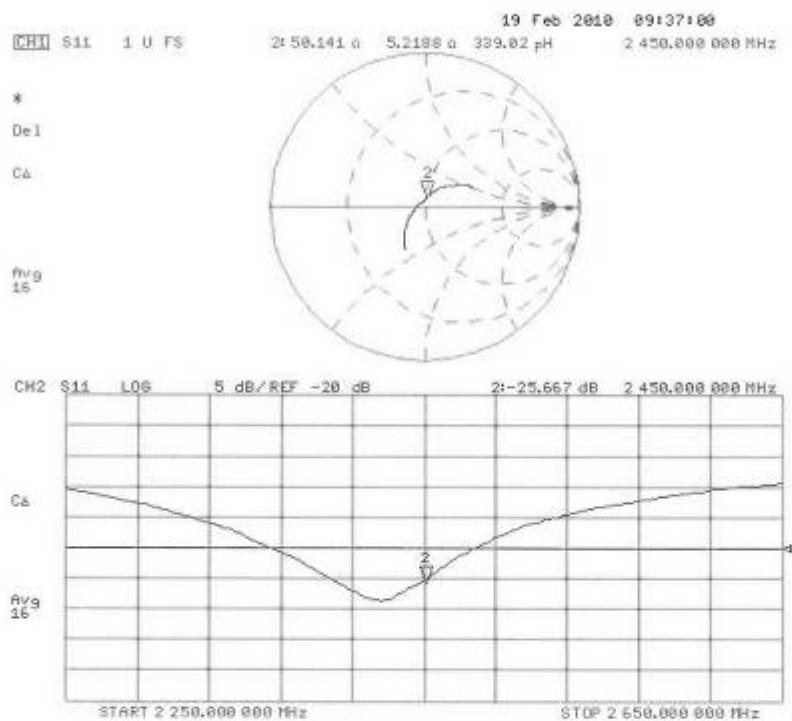
0 dB = 17mW/g

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

Report No. RZA1012-2020SAR01R3

Page 58 of 67

Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 59 of 67

ANNEX F: DAE4 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 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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-------------------------------|--------------------|----------------------------|------------------------|
| 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 Andrea Guntli Function Technician Signature

Approved by: Name Finn Bornholt Function R&D Director Signature

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

Issued: November 18, 2010

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2020SAR01R3

Page 60 of 67

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**

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. RZA1012-2020SAR01R3

Page 61 of 67

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = $6.1\mu\text{V}$, full range = $-100...+300\text{ mV}$

Low Range: 1LSB = 61nV , full range = $-1.....+3\text{mV}$

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

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

Connector Angle

| | |
|---|--------------------------|
| Connector Angle to be used in DASY system | $90.0^\circ \pm 1^\circ$ |
|---|--------------------------|

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

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. RZA1012-2020SAR01R3

Page 63 of 67

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 10MΩ

| | 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 (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| 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 |