FCC SAR Test Report

APPLICANT	:	Acer Incorporated
EQUIPMENT	:	Tablet Computer
BRAND NAME	:	acer
MODEL NAME	:	A7003
FCC ID	:	HLZA7003
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.

Mark Qu

Approved by: Mark Qu / Manager

TESTING
NVLAP LAB CODE 600156-0

Sporton International (Shenzhen) Inc.
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China

Table of Contents

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA772802	Rev. 01	Initial issue of report	Sep. 04, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Acer Incorporated, Tablet Computer, A7003**, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary Body 1g SAR (W/kg) (0mm Gap)
DTS	WLAN 2.4GHz Band	0.84
NII	WLAN 5GHz Band	**1.18**
Date of Testing:		2017/8/3 ~ 2017/8/4

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Testing Laboratory	
Test Site	Sporton International (Shenzhen) Inc.
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	Acer Incorporated
Address	8F, 88, Sec.1 Xintai 5th Rd. Xizhi, New Taipei City 221, Taiwan, R.O.C

Manufacturer	
Company Name	Acer Incorporated
Address	8F, 88, Sec.1 Xintai 5th Rd. Xizhi, New Taipei City 221, Taiwan, R.O.C

3. Guidance Applied

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Tablet Computer
Brand Name	acer
Model Name	A7003
FCC ID	HLZA7003
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth v3.0+EDR, Bluetooth v4.0 LE, Bluetooth v4.1 LE
HW Version	A10H2_MB_V1.2
SW Version	Acer_AV0N0_A3-A50_RV01RA01_WW_GEN1
EUT Stage	Production Unit
Remark: 1. This device has no voice function. 2. There are two different types of EUT. Based on the differences between them, we chose sample 1 full test and sample 2 only verified the worst case of Sample 1.	

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

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

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

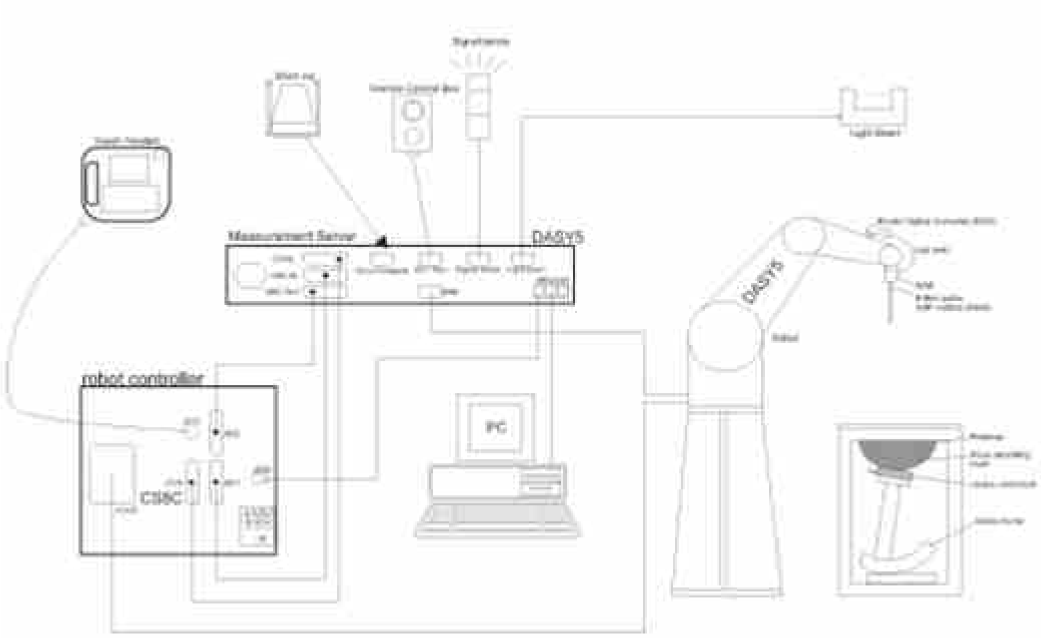
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 E-Field Probe

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

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 μW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

7.2 Data Acquisition Electronics (DAE)

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

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

Fig 5.1 Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

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

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

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm

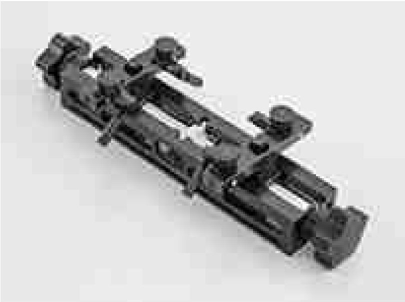
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

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

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(b) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Engineering software to configure EUT WLAN/BT continuously transmissions, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

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

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

8.1 Spatial Peak SAR Evaluation

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

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

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

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

8.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	924	Mar. 21, 2017	Mar. 20, 2018
SPEAG	5000MHz System Validation Kit	D5GHzV2	1203	Dec. 16, 2016	Dec. 15, 2017
SPEAG	Data Acquisition Electronics	DAE4	1338	Nov. 22, 2016	Nov. 21, 2017
SPEAG	Dosimetric E-Field Probe	EX3DV4	3911	Sep. 29, 2016	Sep. 28, 2017
SPEAG	ELI4 Phantom	ELI5.0	1225	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Network Analyzer	E5071C	MY46523671	Oct. 11, 2016	Oct. 10, 2017
Speag	Dielectric Assessment KIT	DAK-3.5	1071	Nov. 23, 2016	Nov. 22, 2017
R&S	CBT BLUETOOTH TESTER	CBT	100963	Jan. 03, 2017	Jan. 02, 2018
Agilent	Signal Generator	N5181A	MY50145381	Jan. 03, 2017	Jan. 02, 2018
Anritsu	Power Senor	MA2411B	1306099	Jul. 19, 2017	Jul. 18, 2018
Anritsu	Power Meter	ML2495A	1349001	Jul. 19, 2017	Jul. 18, 2018
Anritsu	Power Sensor	MA2411B	1207253	Jan. 03, 2017	Jan. 02, 2018
Anritsu	Power Meter	ML2495A	1218010	Jan. 03, 2017	Jan. 02, 2018
Anymetre	Hygrometer	JR593	2015030903	Jan. 06, 2017	Jan. 05, 2018
LKM electronic	Hygrometer	DTM3000	3241	Jul. 15, 2017	Jul. 14, 2018
R&S	Spectrum Analyzer	FSP7	100818	Jul. 19, 2017	Jul. 18, 2018
ARRA	Power Divider	A3200-2	N/A	Note	
PASTERNACK	Dual Directional Coupler	PE2214-10	N/A	Note	
Agilent	Dual Directional Coupler	778D	50422	Note	
MCL	Attenuation1	BW-S10W5	N/A	Note	
Weinschel	Attenuation2	3M-20	N/A	Note	
Zhongjilianhe	Attenuation3	MVE2214-03	N/A	Note	
mini-circuits	Amplifier	ZHL-42W+	QA1341002	Note	
mini-circuits	Amplifier	ZVE-3W-83+	599201528	Note	

Note:
Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1.

Fig 10.1 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Body								
2450	68.6	0	0	0	0	31.4	1.95	52.7

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	Body	22.5	1.992	52.302	1.95	52.70	2.15	-0.76	±5	2017/8/4
5300	Body	22.8	5.390	50.964	5.42	48.90	-0.55	4.22	±5	2017/8/3
5600	Body	22.6	5.909	50.389	5.77	48.50	2.41	3.89	±5	2017/8/3
5800	Body	22.9	6.192	46.798	6.00	48.20	3.20	-2.91	±5	2017/8/3

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2017/8/4	2450	Body	250	924	3911	1338	12.60	50.50	50.4	-0.20
2017/8/3	5300	Body	100	1203	3911	1338	7.89	76.40	78.9	3.27
2017/8/3	5600	Body	100	1203	3911	1338	7.66	77.40	76.6	-1.03
2017/8/3	5800	Body	100	1203	3911	1338	7.21	74.10	72.1	-2.70

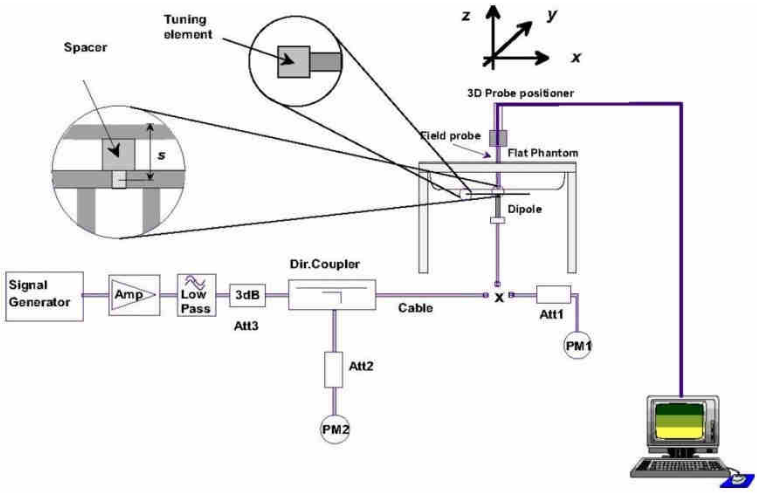


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

12. Conducted RF Output Power (Unit: dBm)

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	13.34	14.00	100.00
		6	2437	13.53	14.00	
		11	2462	**13.65**	14.00	
	802.11g 6Mbps	1	2412	12.15	13.00	97.46
		6	2437	12.45	13.00	
		11	2462	12.52	13.00	
	802.11n-HT20 MCS0	1	2412	10.23	11.00	97.28
		6	2437	10.51	11.00	
		11	2462	10.63	11.00	
	802.11n-HT40 MCS0	3	2422	6.43	7.00	95.32
		6	2437	6.64	7.00	
		9	2452	6.75	7.00	

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	12.65	13.00	97.56
		40	5200	12.61	13.00	
		44	5220	12.39	13.00	
		48	5240	12.35	13.00	
	802.11n-HT20 MCS0	36	5180	11.46	12.00	97.40
		40	5200	11.45	12.00	
		44	5220	11.17	12.00	
		48	5240	11.19	12.00	
	802.11n-HT40 MCS0	38	5190	11.66	12.00	94.90
		46	5230	11.44	12.00	
	802.11ac-VHT20 MCS0	36	5180	8.88	9.50	97.42
		40	5200	8.86	9.50	
		44	5220	8.88	9.50	
		48	5240	8.79	9.50	
	802.11ac-VHT40 MCS0	38	5190	9.03	9.50	94.92
		46	5230	9.16	9.50	
	802.11ac-VHT80 MCS0	42	5210	8.97	9.50	90.30

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	12.66	13.00	97.56
		56	5280	12.74	13.00	
		60	5300	12.73	13.00	
		64	5320	12.64	13.00	
	802.11n-HT20 MCS0	52	5260	11.45	12.00	97.40
		56	5280	11.58	12.00	
		60	5300	11.46	12.00	
		64	5320	11.47	12.00	
	802.11n-HT40 MCS0	54	5270	11.74	12.00	94.90
		62	5310	11.72	12.00	
	802.11ac-VHT20 MCS0	52	5260	8.90	9.50	97.42
		56	5280	8.85	9.50	
		60	5300	8.89	9.50	
		64	5320	8.91	9.50	
	802.11ac-VHT40 MCS0	54	5270	9.29	9.50	94.92
		62	5310	9.31	9.50	
	802.11ac-VHT80 MCS0	58	5290	9.04	9.50	90.30

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	11.08	11.50	97.56
		116	5580	11.17	11.50	
		124	5620	11.05	11.50	
		132	5660	11.56	12.00	
		140	5700	10.90	11.50	
		144	5720	10.93	11.50	
	802.11n-HT20 MCS0	100	5500	9.92	10.50	97.40
		116	5580	10.07	10.50	
		124	5620	9.88	10.50	
		132	5660	10.45	11.00	
		140	5700	9.74	10.50	
		144	5720	9.79	10.50	
	802.11n-HT40 MCS0	102	5510	10.19	10.50	94.90
		110	5550	10.30	10.50	
		126	5630	10.13	10.50	
		134	5670	10.47	11.00	
		142	5710	9.97	10.50	
	802.11ac-VHT20 MCS0	100	5500	8.67	9.00	97.42
		116	5580	8.51	9.00	
		124	5620	8.46	9.00	
		132	5660	8.65	9.00	
		140	5700	8.52	9.00	
		144	5720	8.26	9.00	
	802.11ac-VHT40 MCS0	102	5510	8.98	9.50	94.92
		110	5550	8.97	9.50	
		126	5630	8.64	9.00	
		134	5670	8.80	9.50	
		142	5710	8.56	9.00	
	802.11ac-VHT80 MCS0	106	5530	8.75	9.50	90.30
		122	5610	8.62	9.00	
		138	5690	8.42	9.00	

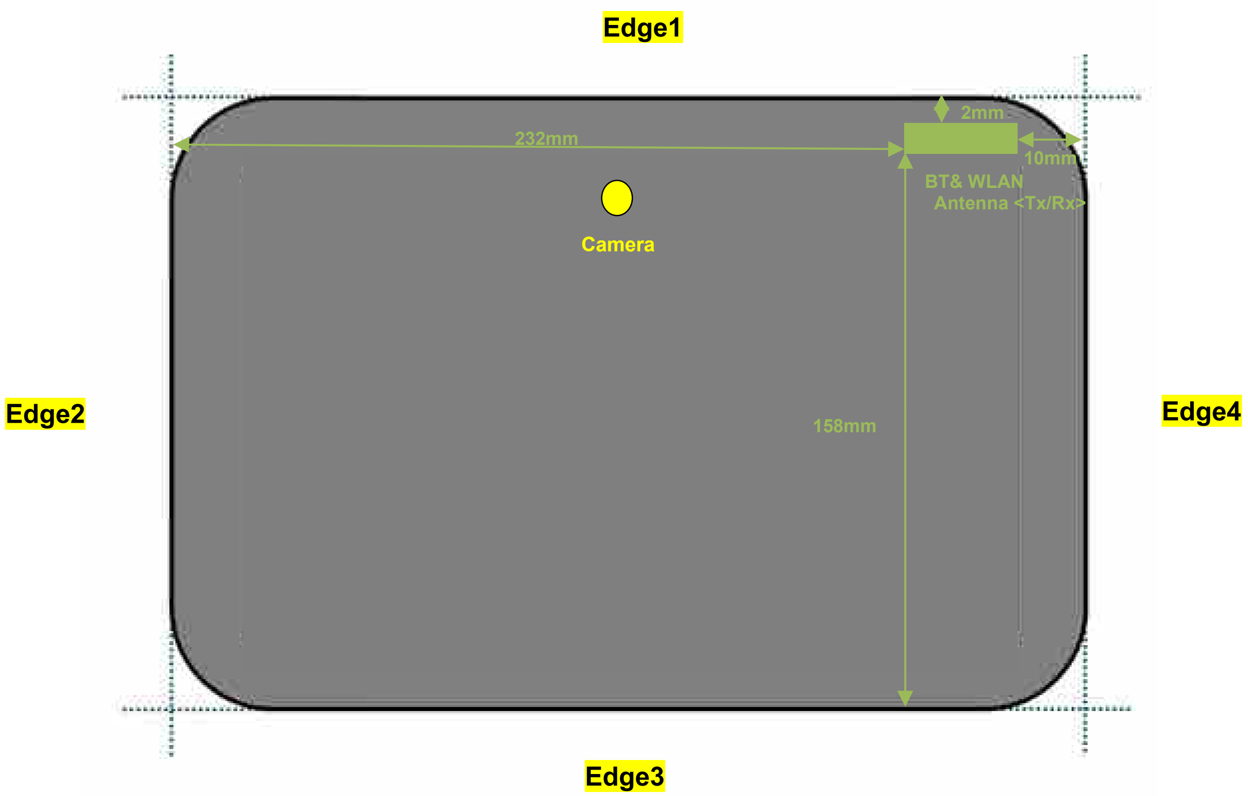
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	**10.19**	10.50	97.56
		157	5785	10.07	10.50	
		165	5825	10.03	10.50	
	802.11n-HT20 MCS0	149	5745	9.85	10.50	97.40
		157	5785	9.92	10.50	
		165	5825	9.64	10.50	
	802.11n-HT40 MCS0	151	5755	9.30	9.50	94.90
		159	5795	9.08	9.50	
	802.11ac-VHT20 MCS0	149	5745	8.04	8.50	97.42
		157	5785	7.99	8.50	
		165	5825	7.86	8.50	
	802.11ac-VHT40 MCS0	151	5755	8.32	8.50	94.92
		159	5795	8.15	8.50	
	802.11ac-VHT80 MCS0	155	5775	8.16	8.50	90.30

<2.4GHz Bluetooth>

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
Bluetooth v3.0+EDR	CH 00	2402	1.58
	CH 39	2441	**2.48**
	CH 78	2480	1.94
Tune-up Limit			3.00

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
Bluetooth v4.0/41 LE	CH 00	2402	1.49
	CH 19	2440	**2.37**
	CH 39	2480	1.67
Tune-up Limit			3.00

13. Antenna Location



Back View

Diagonal Dimension: 310mm

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

Exposure Position	Wireless Interface	Bluetooth	2.4GHz WLAN	5GHz WLAN
	Calculated Frequency	2480MHz	2462MHz	5825MHz
	Maximum power (dBm)	3	14	13
	Maximum rated power(mW)	1.0	25.0	20.0
Bottom Face	Separation distance(mm)	0		
	exclusion threshold	0.3	7.9	9.7
	Testing required?	**No**	**Yes**	**Yes**
Edge 1	Separation distance(mm)	2		
	exclusion threshold	0.3	7.9	9.7
	Testing required?	**No**	**Yes**	**Yes**
Edge 2	Separation distance(mm)	232.0		
	exclusion threshold	1915.0	1916.0	1882.0
	Testing required?	**No**	**No**	**No**
Edge 3	Separation distance(mm)	158		
	exclusion threshold	1175.0	1176.0	1142.0
	Testing required?	**No**	**No**	**No**
Edge 4	Separation distance(mm)	10		
	exclusion threshold	0.2	3.9	4.8
	Testing required?	**No**	**Yes**	**Yes**

14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   b. Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

Tablet Note:

1. Considering the curvature transition from bottom face to the edge, SAR testing at the curvature was performed. The SAR test setup is included in test setup photo exhibit, and the details of the curvature are included in operation description exhibit.
2. Per KDB 616217 D04v01r02, the additional separation introduced by the contour against a flat phantom is < 5 mm on this device and reported SAR is < 1.2 W/kg, a curved or contoured back surface or edge SAR is not required, more detail information please refer to the setup photo.
3. For SAR testing of the curved region of the device, the device was placed directly against the phantom at the point where the distance between the antenna and device exterior is a minimum.
4. When the minimum distance between antenna and device edge along the curve is less than bottom face and surface edge, the curved SAR is necessary, more detail information which can be referred to setup photo.
5. According to the setup photo radius dimension, for X>Z and Y>Z, that complied curved test condition. Per KDB 616217 D04v01r02, SAR at the curved surface is necessary.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

14.1 Body SAR

<WLAN2.4GHz SAR>

Plot No.	Band	Mode	Test Position	Sample	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#01	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	1	0	11	2462	13.65	14	1.084	100	1.000	0.04	0.776	0.841
	WLAN2.4GHz	802.11b 1Mbps	Curved surface of Edge1	1	0	11	2462	13.65	14	1.084	100	1.000	0.07	0.581	0.630
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	1	0	11	2462	13.65	14	1.084	100	1.000	-0.08	0.226	0.245
	WLAN2.4GHz	802.11b 1Mbps	Edge 4	1	0	11	2462	13.65	14	1.084	100	1.000	-0.04	0.249	0.270
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	1	0	1	2412	13.34	14	1.164	100	1.000	0.02	0.651	0.758
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	1	0	6	2437	13.53	14	1.114	100	1.000	0.07	0.716	0.798
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	2	0	11	2462	13.65	14	1.084	100	1.000	0.03	0.654	0.709
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	2	0	1	2412	13.34	14	1.164	100	1.000	0.06	0.533	0.620
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	2	0	6	2437	13.53	14	1.114	100	1.000	0.08	0.611	0.681

<WLAN5GHz SAR>

Plot No.	Band	Mode	Test Position	Sample	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.3GHz	802.11a 6Mbps	Bottom Face	1	0	56	5280	12.74	13	1.062	97.56	1.025	0.07	0.899	0.978
	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	56	5280	12.74	13	1.062	97.56	1.025	0.05	1.020	1.110
	WLAN5.3GHz	802.11a 6Mbps	Edge 1	1	0	56	5280	12.74	13	1.062	97.56	1.025	0.02	0.870	0.947
	WLAN5.3GHz	802.11a 6Mbps	Edge 4	1	0	56	5280	12.74	13	1.062	97.56	1.025	0.03	0.071	0.077
	WLAN5.3GHz	802.11a 6Mbps	Bottom Face	1	0	52	5260	12.66	13	1.082	97.56	1.025	0.09	0.853	0.946
	WLAN5.3GHz	802.11a 6Mbps	Bottom Face	1	0	60	5300	12.73	13	1.065	97.56	1.025	0.08	0.873	0.953
	WLAN5.3GHz	802.11a 6Mbps	Bottom Face	1	0	64	5320	12.64	13	1.087	97.56	1.025	0.07	0.998	1.112
	WLAN5.3GHz	802.11a 6Mbps	Edge 1	1	0	52	5260	12.66	13	1.082	97.56	1.025	0.03	0.813	0.902
	WLAN5.3GHz	802.11a 6Mbps	Edge 1	1	0	60	5300	12.73	13	1.065	97.56	1.025	0.02	0.911	0.994
	WLAN5.3GHz	802.11a 6Mbps	Edge 1	1	0	64	5320	12.64	13	1.087	97.56	1.025	0.06	0.931	1.037
	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	52	5260	12.66	13	1.082	97.56	1.025	0.07	0.945	1.048
	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	60	5300	12.73	13	1.065	97.56	1.025	0.08	1.030	1.124
#02	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	64	5320	12.64	13	1.087	97.56	1.025	0.07	1.060	1.181
	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	64	5320	12.64	13	1.087	97.56	1.025	0.03	1.050	1.170
	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	52	5260	12.66	13	1.082	97.56	1.025	0.07	0.884	0.981
	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	56	5280	12.74	13	1.062	97.56	1.025	0.12	0.909	0.989
	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	60	5300	12.73	13	1.065	97.56	1.025	0.04	0.906	0.989

Plot No.	Band	Mode	Test Position	Sample	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.5GHz	802.11a 6Mbps	Bottom Face	1	0	132	5660	11.56	12	1.107	97.56	1.025	0.05	0.808	0.917
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	132	5660	11.56	12	1.107	97.56	1.025	0.04	0.954	1.082
	WLAN5.5GHz	802.11a 6Mbps	Edge 1	1	0	132	5660	11.56	12	1.107	97.56	1.025	0.01	0.532	0.603
	WLAN5.5GHz	802.11a 6Mbps	Edge 4	1	0	132	5660	11.56	12	1.107	97.56	1.025	0.08	0.048	0.054
	WLAN5.5GHz	802.11a 6Mbps	Bottom Face	1	0	100	5500	11.08	11.5	1.102	97.56	1.025	0.08	0.839	0.948
	WLAN5.5GHz	802.11a 6Mbps	Bottom Face	1	0	116	5580	11.17	11.5	1.080	97.56	1.025	0.08	0.798	0.883
	WLAN5.5GHz	802.11a 6Mbps	Bottom Face	1	0	140	5700	10.90	11.5	1.149	97.56	1.025	0.08	0.751	0.884
	WLAN5.5GHz	802.11a 6Mbps	Bottom Face	1	0	144	5720	10.93	11.5	1.141	97.56	1.025	0.03	0.751	0.878
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	100	5500	11.08	11.5	1.102	97.56	1.025	0.05	0.940	1.062
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	116	5580	11.17	11.5	1.080	97.56	1.025	0.02	0.901	0.997
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	140	5700	10.90	11.5	1.149	97.56	1.025	0.04	0.927	1.092
#03	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	144	5720	10.93	11.5	1.141	97.56	1.025	0.07	0.936	**1.095**
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	144	5720	10.93	11.5	1.141	97.56	1.025	0.03	0.829	0.970
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	100	5500	11.08	11.5	1.102	97.56	1.025	0.08	0.776	0.877
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	116	5580	11.17	11.5	1.080	97.56	1.025	0.07	0.707	0.782
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	132	5660	11.56	12	1.107	97.56	1.025	0.11	0.831	0.943
	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	140	5700	10.90	11.5	1.149	97.56	1.025	0.06	0.810	0.954
	WLAN5.8GHz	802.11a 6Mbps	Bottom Face	1	0	149	5745	10.19	10.5	1.075	97.56	1.025	0.08	0.652	0.718
	WLAN5.8GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	149	5745	10.19	10.5	1.075	97.56	1.025	0.03	0.727	0.801
	WLAN5.8GHz	802.11a 6Mbps	Edge 1	1	0	149	5745	10.19	10.5	1.075	97.56	1.025	0.07	0.458	0.505
	WLAN5.8GHz	802.11a 6Mbps	Edge 4	1	0	149	5745	10.19	10.5	1.075	97.56	1.025	0.02	0.037	0.041
#04	WLAN5.8GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	157	5785	10.07	10.5	1.105	97.56	1.025	0.07	0.765	**0.866**
	WLAN5.8GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	165	5825	10.03	10.5	1.115	97.56	1.025	0.05	0.696	0.795
	WLAN5.8GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	157	5785	10.07	10.5	1.105	97.56	1.025	0.13	0.669	0.758
	WLAN5.8GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	149	5745	10.19	10.5	1.075	97.56	1.025	0.07	0.744	0.820
	WLAN5.8GHz	802.11a 6Mbps	Curved surface of Edge1	2	0	165	5825	10.03	10.5	1.115	97.56	1.025	0.03	0.713	0.815

14.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Sample	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	64	5320	12.64	13	1.087	97.56	1.025	0.07	1.060	1	1.181
2nd	WLAN5.3GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	64	5320	12.64	13	1.087	97.56	1.025	0.05	1.040	1.019	1.159
1st	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	132	5660	11.56	12	1.107	97.56	1.025	0.04	0.954	1	1.082
2nd	WLAN5.5GHz	802.11a 6Mbps	Curved surface of Edge1	1	0	132	5660	11.56	12	1.107	97.56	1.025	0.09	0.951	1.003	1.079

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

15. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations
1.	None

Note:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
3. According to the EUT character, WLAN 5GHz and Bluetooth can't transmit simultaneously.

Test Engineer: Weilong Chen

16. Uncertainty Assessment

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

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

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

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	$1/k^{(b)}$	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

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

(b) κ is the coverage factor

Table 16.1. Standard Uncertainty for Assumed Distribution

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

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

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Table 16.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.6	R	1.732	1	1	3.8	3.8
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.5%	12.5%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.1%	25.0%

Table 16.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

17. References

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

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[8] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[9] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.08.04

System Check_Body_2450MHz_170804

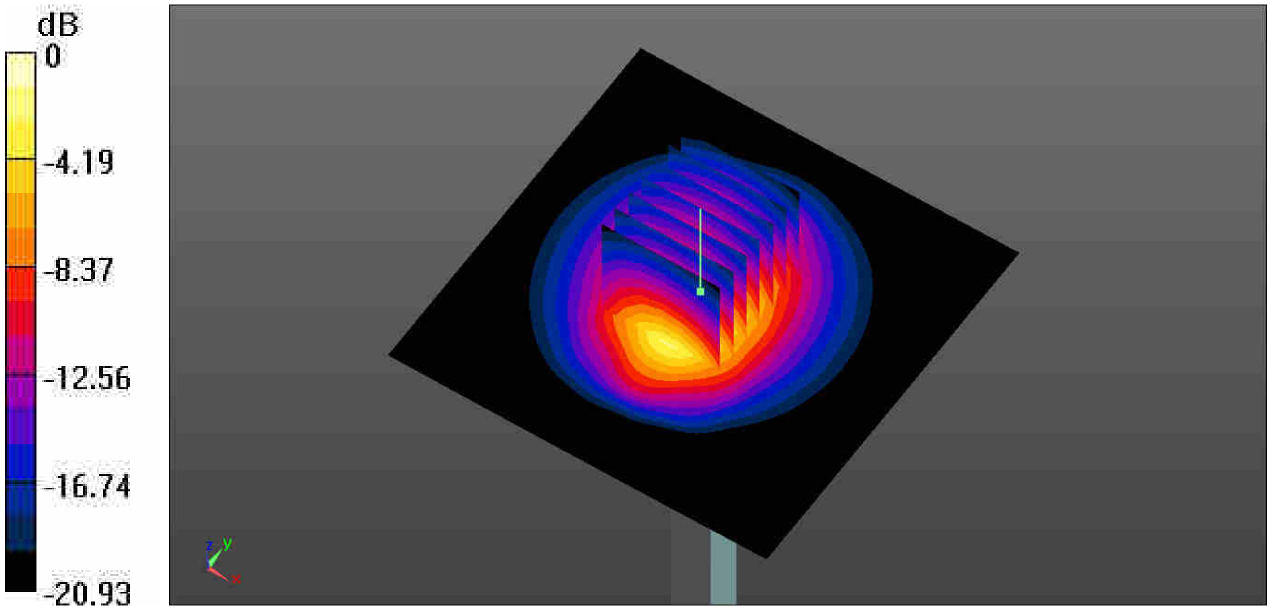
DUT: D2450V2-SN:924

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_170804 Medium parameters used: f = 2450 MHz; σ = 1.992 S/m; ε_r = 52.302; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.66, 7.66, 7.66); Calibrated: 2016.09.29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 18.8 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 82.54 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 25.1 W/kg
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 6.15 W/kg
Maximum value of SAR (measured) = 19 W/kg



0 dB = 18.8 W/kg

System Check_Body_5300MHz_170803

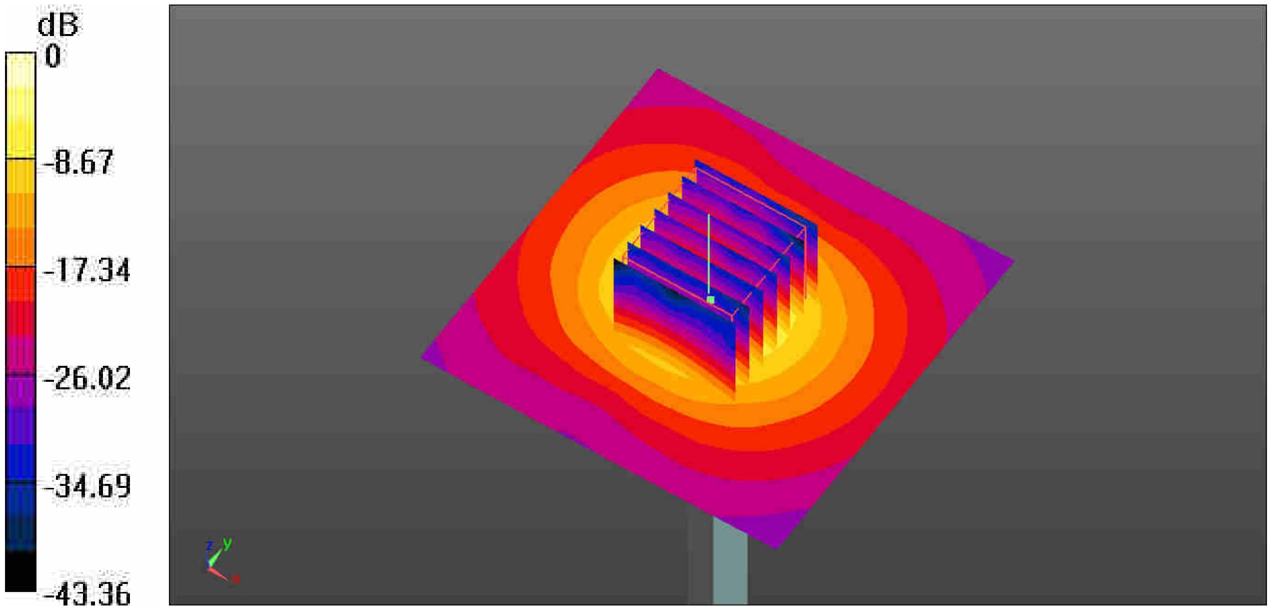
DUT: D5GHzV2-SN:1203

Communication System: UID 0, CW (0); Frequency: 5300 MHz;Duty Cycle: 1:1
Medium: MSL_5300_170803 Medium parameters used: f = 5300 MHz; σ = 5.39 S/m; ε_r = 50.964; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(4.62, 4.62, 4.62); Calibrated: 2016.09.29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 22.0 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 52.16 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 37.0 W/kg
SAR(1 g) = 7.89 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 22.9 W/kg



0 dB = 22.9 W/kg

System Check_Body_5600MHz_170803

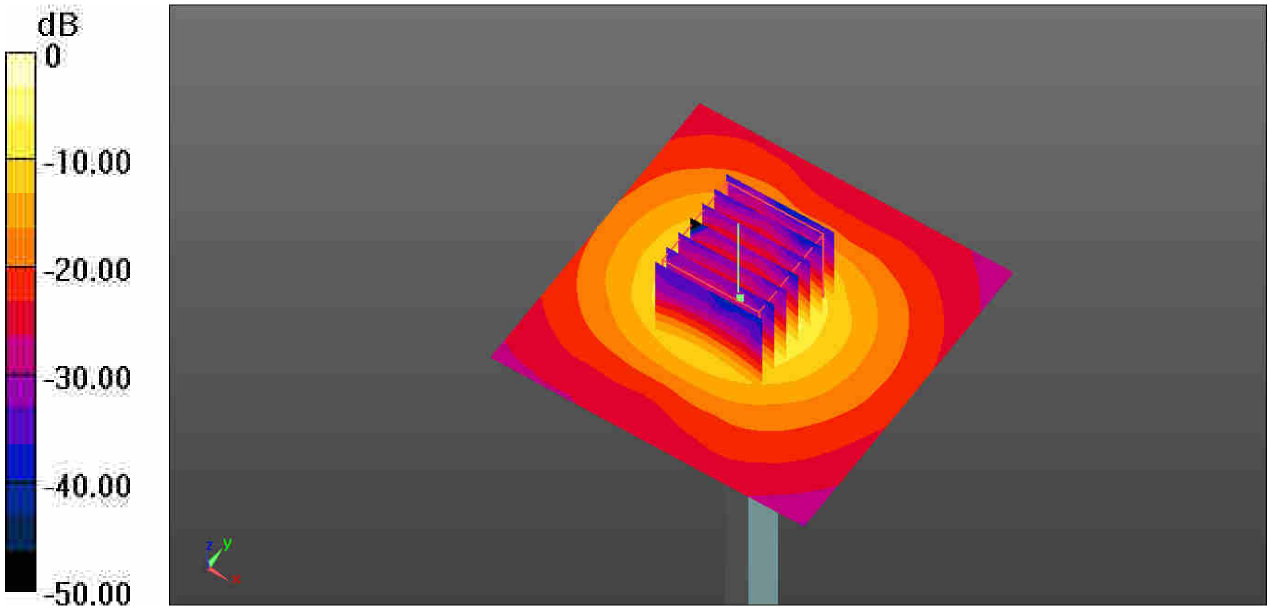
DUT: D5GHzV2-SN:1203

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: MSL_5600_170803 Medium parameters used: f = 5600 MHz; σ = 5.909 S/m; ε_r = 50.389; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(3.78, 3.78, 3.78); Calibrated: 2016.09.29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 21.5 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 49.31 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 7.66 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 21.1 W/kg



0 dB = 21.5 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2017.08.03

System Check_Body_5800MHz_170803

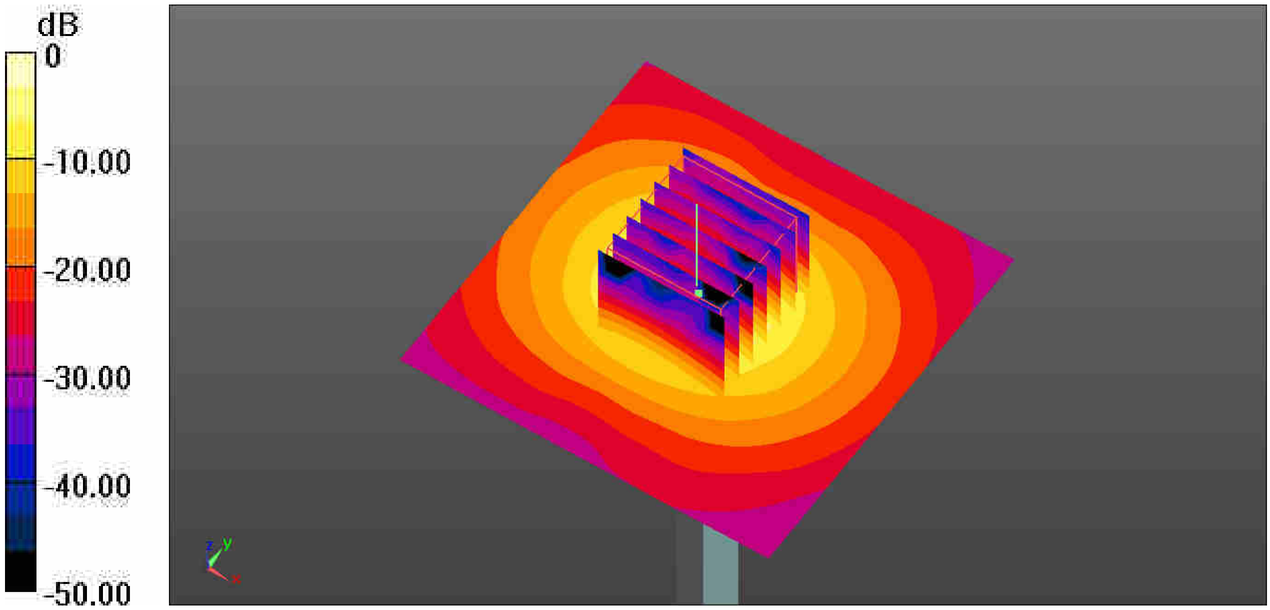
DUT: D5GHzV2-SN:1203

Communication System: UID 0, CW (0); Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: MSL_5800_170803 Medium parameters used: f = 5800 MHz; σ = 6.192 S/m; ε_r = 46.798; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(3.95, 3.95, 3.95); Calibrated: 2016.09.29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 20.4 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 50.67 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 30.3 W/kg
SAR(1 g) = 7.21 W/kg; SAR(10 g) = 2.01 W/kg
Maximum value of SAR (measured) = 20.6 W/kg



0 dB = 20.6 W/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

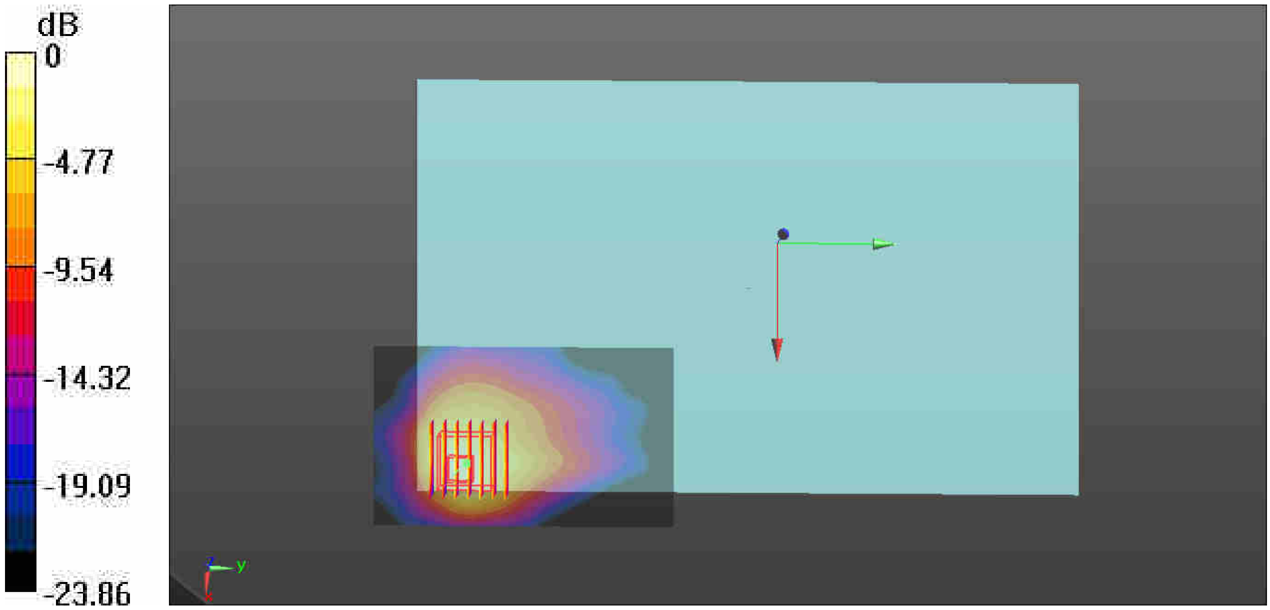
#01_WLAN2.4GHz_802.11b 1Mbps_Bottom Face_0mm_Ch11_Sample 1

Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL_2450_170804 Medium parameters used: f = 2462 MHz; σ = 2.012 S/m; ε_r = 52.233; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.66, 7.66, 7.66); Calibrated: 2016.09.29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch11/Area Scan (61x101x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.20 W/kg

Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.71 W/kg
SAR(1 g) = 0.776 W/kg; SAR(10 g) = 0.385 W/kg
Maximum value of SAR (measured) = 1.17 W/kg



0 dB = 1.17 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.08.03

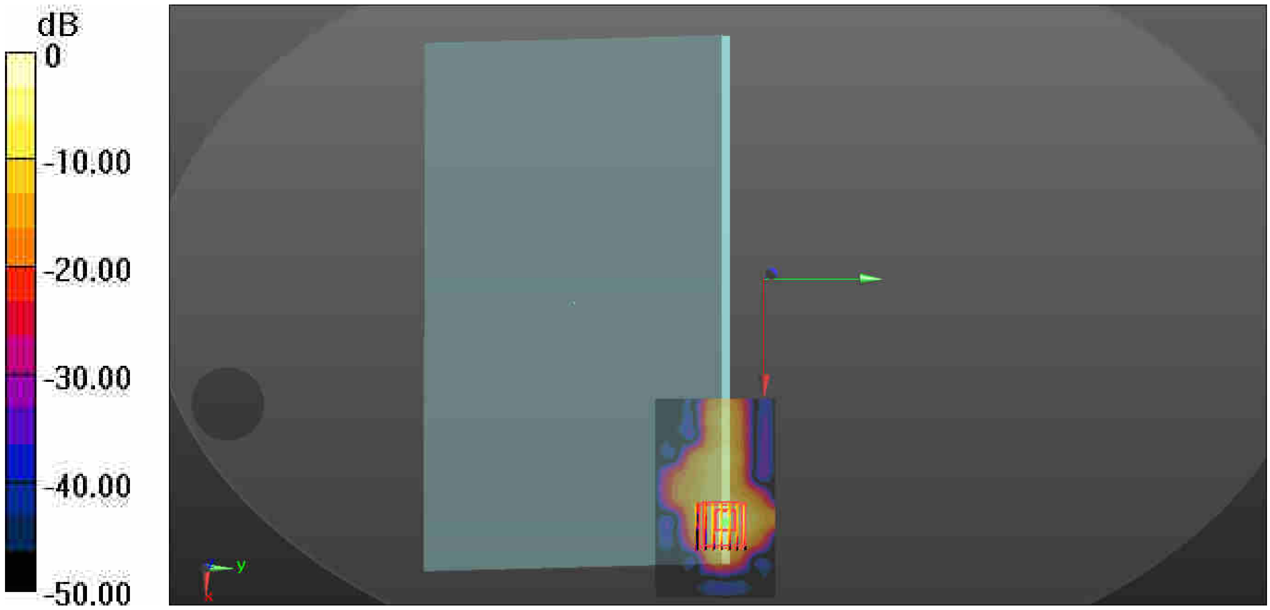
#02_WLAN5.3GHz_802.11a 6Mbps_Curved surface of Edge1_0mm_Ch64_Sample 1

Communication System: UID 0, WIFI (0); Frequency: 5320 MHz;Duty Cycle: 1:1.025
Medium: MSL_5300_170803 Medium parameters used: f = 5320 MHz; σ = 5.426 S/m; ε_r = 50.918; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(4.62, 4.62, 4.62); Calibrated: 2016.09.29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch64/Area Scan (101x61x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.43 W/kg

Ch64/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 1.060 W/kg; SAR(10 g) = 0.306 W/kg
Maximum value of SAR (measured) = 2.31 W/kg



0 dB = 2.43 W/kg

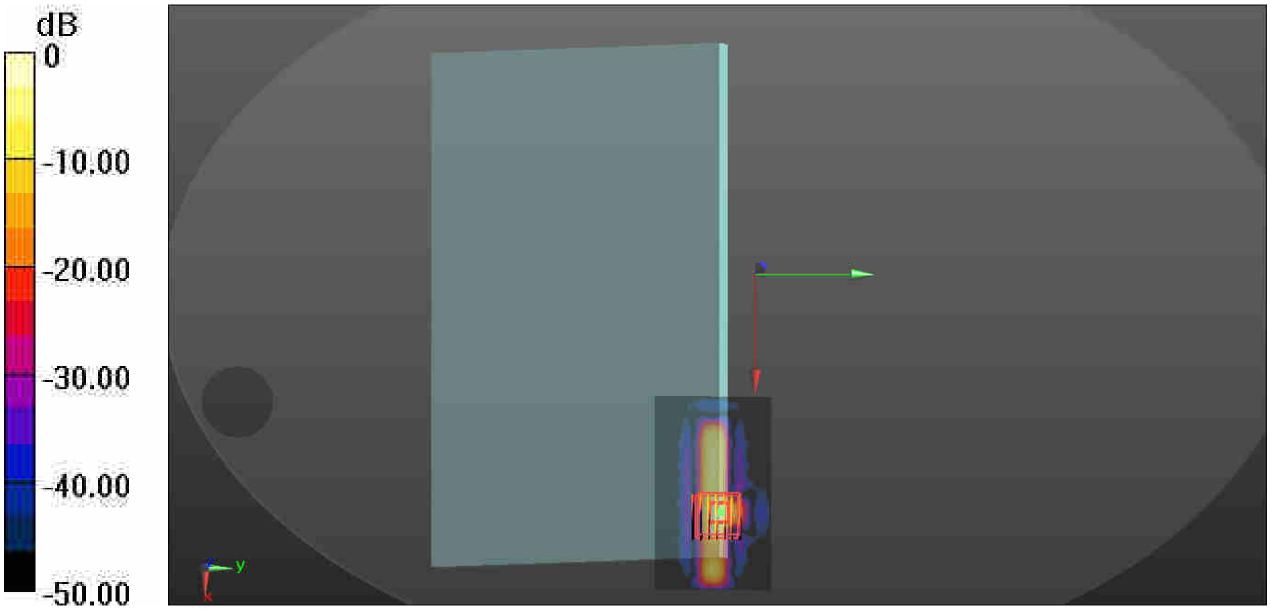
#03_WLAN5.5GHz_802.11a 6Mbps_Curved surface of Edge1_0mm_Ch144_Sample 1

Communication System: UID 0, WIFI (0); Frequency: 5720 MHz;Duty Cycle: 1:1.025
Medium: MSL_5600_170803 Medium parameters used: f = 5720 MHz; σ = 6.018 S/m; ε_r = 48.523; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(3.78, 3.78, 3.78); Calibrated: 2016.09.29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch144/Area Scan (101x61x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.89 W/kg

Ch144/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.00 W/kg
SAR(1 g) = 0.936 W/kg; SAR(10 g) = 0.253 W/kg
Maximum value of SAR (measured) = 2.09 W/kg



0 dB = 2.89 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.08.03

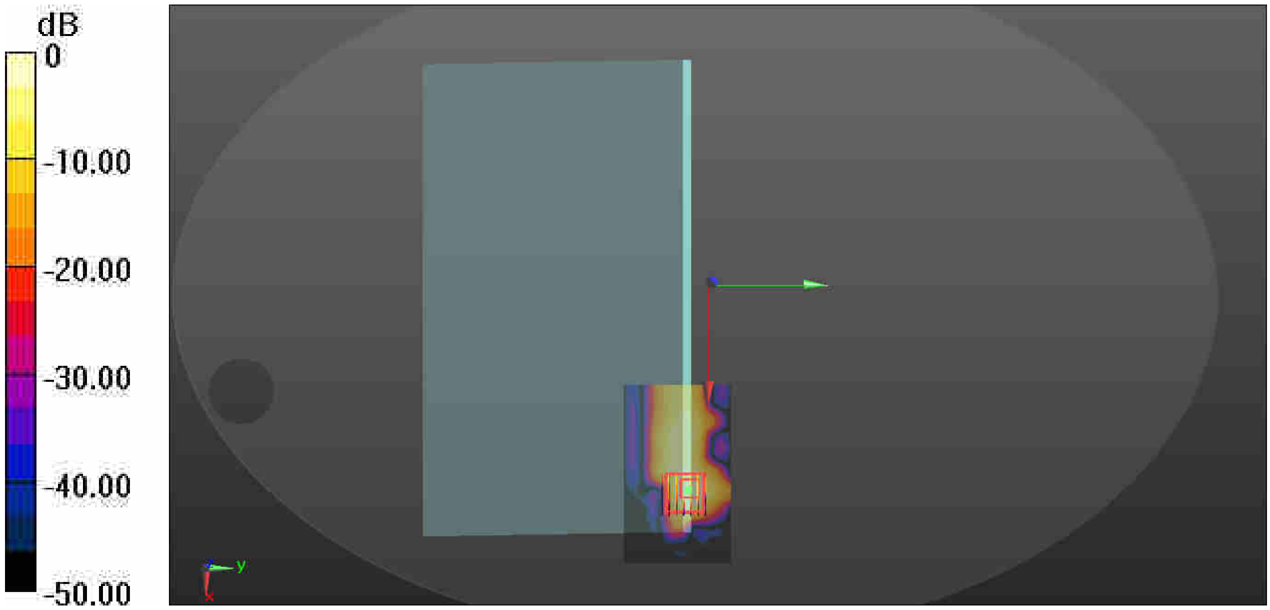
#04_WLAN5.8GHz_802.11a 6Mbps_Curved surface of Edge1_0mm_Ch157_Sample 1

Communication System: UID 0, WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.025
Medium: MSL_5800_170803 Medium parameters used: f = 5785 MHz; σ = 6.172 S/m; ε_r = 46.831; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(3.95, 3.95, 3.95); Calibrated: 2016.09.29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2016.11.22
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch157/Area Scan (101x61x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.98 W/kg

Ch157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.41 W/kg
SAR(1 g) = 0.765 W/kg; SAR(10 g) = 0.201 W/kg
Maximum value of SAR (measured) = 1.74 W/kg



0 dB = 1.74 W/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client: Sporton_SZ

Certificate No: Z17-97044

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 924
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 21, 2017

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 777	22-Aug-16(CTTL-SPEAG,No.Z16-97138)	Aug-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	赵靖
Reviewed by:	Qi Dianyuan	SAR Project Leader	[signature]
Approved by:	Lu Bingsong	Deputy Director of the laboratory	[signature]

Issued: March 25, 2017

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

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 300MHz to 3GHz)", February 2005

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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.

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%.

In Collaboration with
speag
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	39.0 ± 6 %	1.77 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.4 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.04 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.3 mW /g ± 20.4 % (k=2)**

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	52.3 ± 6 %	1.93 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**50.5 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.86 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.5 mW /g ± 20.4 % (k=2)**

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9Ω+ 3.77jΩ
Return Loss	- 28.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3Ω+ 4.18jΩ
Return Loss	- 26.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.260 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
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

In Collaboration with
speag
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 03.21.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.768 S/m; εr = 39.02; ρ = 1000 kg/m3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.74, 7.74, 7.74); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 8/22/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

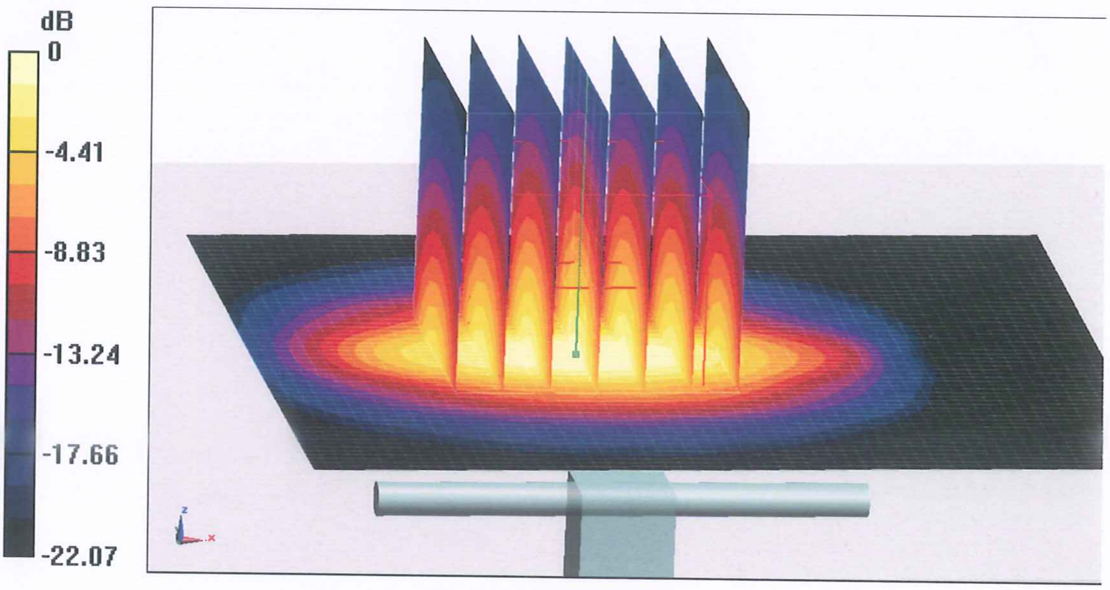
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.8 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 27.0 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.04 W/kg

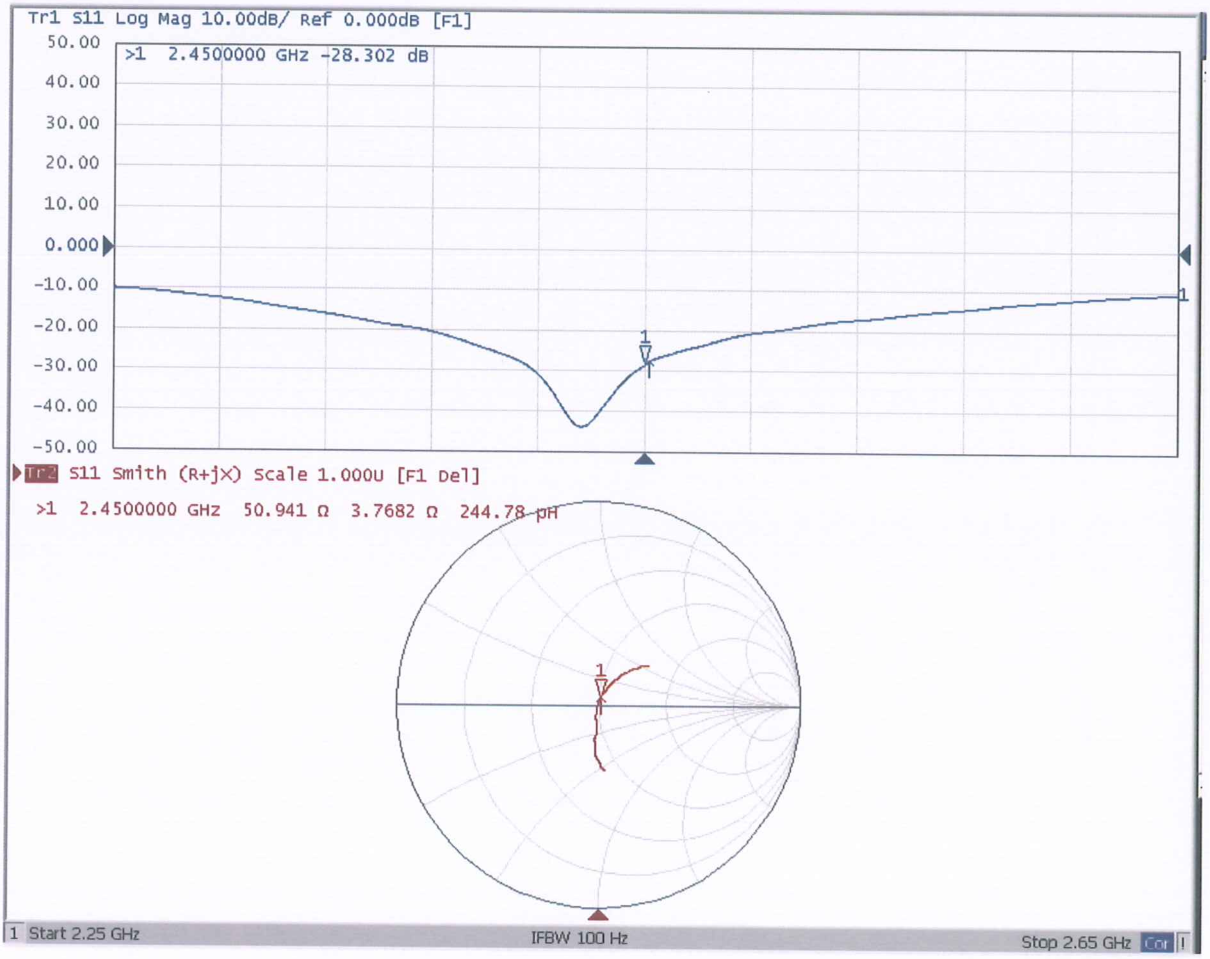
Maximum value of SAR (measured) = 21.7 W/kg



0 dB = 21.7 W/kg = 13.36 dBW/kg

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL

Date: 03.21.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.931 S/m; ε_r = 52.27; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.8, 7.8, 7.8); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 8/22/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

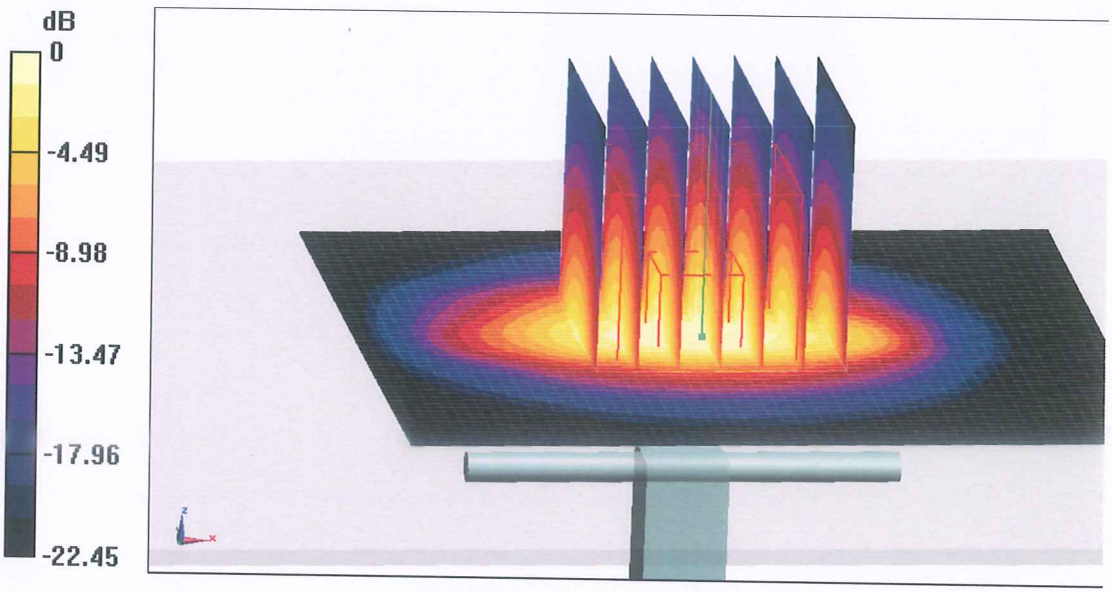
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.48 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 26.4 W/kg

SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.86 W/kg

Maximum value of SAR (measured) = 20.9 W/kg

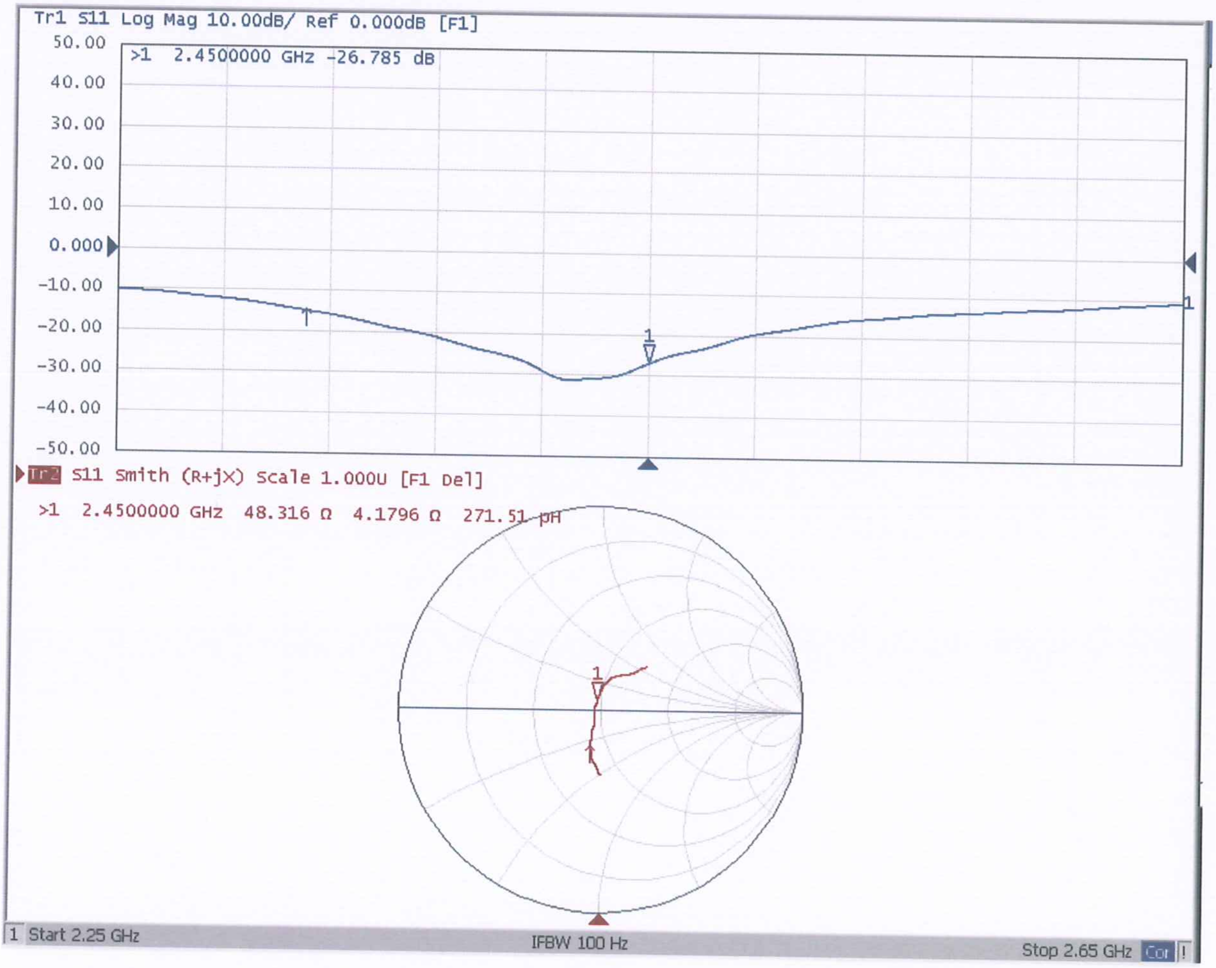


0 dB = 20.9 W/kg = 13.20 dBW/kg

In Collaboration with
speag
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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 0108

Client **Auden**

Certificate No: **D5GHzV2-1203_Dec16**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN:1203
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	December 16, 2016

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 NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 3503	30-Jun-16 (No. EX3-3503_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 16, 2016