FCC SAR Test Report

APPLICANT	:	**Honeywell International Inc.**
EQUIPMENT	:	**Dolphin CT60**
BRAND NAME	:	**Honeywell**
MODEL NAME	:	**CT60L0N**
FCC ID	:	**HD5-CT60L0N**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

The product was received on Apr. 24, 2020 and testing was started from May 24, 2020 and completed on May 26, 2020. We, Sporton International (Kunshan) 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 (Kunshan) Inc., the test report shall not be reproduced except in full.

Rose Wang

Reviewed by: Rose Wang / Supervisor

Kat Yin

Approved by: Kat Yin / Manager

ilac-MRA ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA042406	Rev. 01	Initial issue of report	Jun. 11, 2020

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Honeywell International Inc., Dolphin CT60, CT60L0N,** are as follows.

Highest SAR Summary							
Equipment Class	Frequency Band		Head (Separation 0mm)	Body-worn (Separation 10mm)	Body-worn Holster 1 Tested at 0 mm	Body-worn Holster 2 Tested at 0 mm	Extremely (Separation 10mm)
			1g SAR (W/kg)				10g SAR (W/kg)
DTS	WLAN	2.4GHz WLAN	**0.52**	**0.28**	**0.14**	<0.10	**0.69**
NII		5GHz WLAN	0.18	0.16	0.12	**0.10**	0.19
DSS	Bluetooth	2.4GHz Bluetooth	<0.10	<0.10	<0.10	<0.10	<0.10
Date of Testing:		2020/5/24~2020/5/26					
Remark: 0mm body-worn SAR testing is performed for device with holster.							

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Extremely 10g SAR) 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

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory		
Test Firm	Sporton International (Kunshan) Inc.	
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958	
Test Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CN1257	314309

Applicant	
Company Name	Honeywell International Inc.
Address	9680 Old Bailes Road, Fort Mill, SC 29707 USA

Manufacturer	
Company Name	Honeywell International Inc.
Address	9680 Old Bailes Road, Fort Mill, SC 29707 USA

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 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Dolphin CT60
Brand Name	Honeywell
Model Name	CT60L0N
FCC ID	HD5-CT60L0N
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 NFC : 13.56 MHz
Mode	WLAN 2.4GHz 802.11b/g/n/ac HT20/ HT40/VHT20/VHT40 WLAN 5GHz : 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
HW Version	V1.0
HW P/N	DVT
SW Version	OS.03.003-HON.02.001
SW P/N	88.00.00-DEBUG(0579)
EUT Stage	Identical Prototype
Remark: This is a variant report for CT60L0N. For change note, please refer the product equality declaration exhibit separately. According to the change, WLAN/Bluetooth full SAR testing and performed WLAN new measured power from the original report which can refer to Bureau Veritas Report with Original FCC ID: HD5-CT60L0N, Model: CT60L0N.	

Variant for Maximum Target Conducted Power

Mode	Band	Original	Variant
WLAN	802.11b	19.5	19.0

Note：Above table show variant power level and other bands are the same as the original application.

Original and Variant product are list in the following table:

Object	Original	Variant	Remark
Carrier Board	Scanner N6703 imager	Scanner change to N6803 imager	–

CT60L0N have the following new parts:

RF Module	Under fill Modified
RF Module	LPDDR4x Layout Optimization
RF Module	Wi-Fi Layout Optimization
RF Module	SOM PAD Mask Optimization
RF Module	Change DC regulator and WLAN amplifier DC power
RF Module	BOM Change for Optimization **
RF Module	Add New power inductor in BOM
RF Module	Remove un-used CLK trace WCN_CLK
Carrier Board	Add 1F/2.7V supercap
Carrier Board	Add MAX38888 DC/DC for supercap charge/ change discharge circuit
Carrier Board	Add low battery protection circuit
Carrier Board	Change speaker and add a connector for it
Carrier Board	Change ADS1014 to ADS1015 to add supercap voltage detection
Carrier Board	AUX antenna tuner circuit change placement location
Carrier Board	Upgrade the SOM to SOM4
Carrier Board	Add new model battery
Carrier Board	Add WIFI-AUX layout, RF WIFI AUX Matching
Carrier Board	Modify two n-PTH to PTH to reduce RSE issue.
Carrier Board	Upgrade to gen 8 scanner, adjust 2 spring contacts' location.
Carrier Board	Add a high-G sensor.
WIFI 11b	Power reduction from 18+/-1.5 dB to 17.5+/-1.5 dB

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:

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

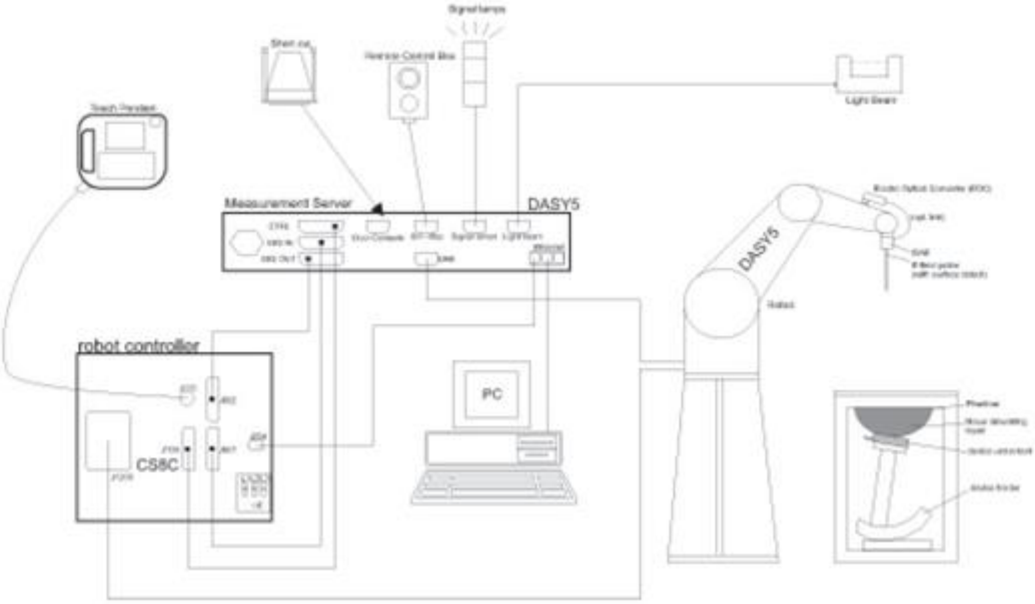
SAR is expressed in units of Watts per kilogram (W/kg)

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

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)

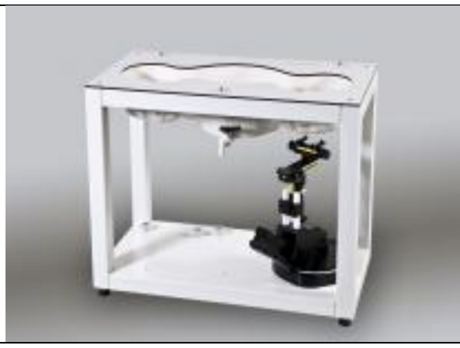
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

Photo of DAE

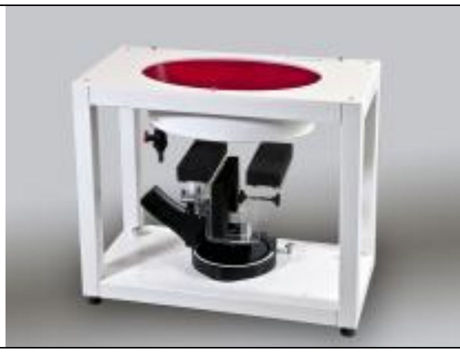
7.3 Phantom

<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 WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) 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
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, 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.

<table>
<tr><th></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

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.

<table>
<tr><th colspan="3"></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">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 <u>reported</u> 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.</td></tr>
</table>

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	908	2019/3/25	2022/3/24
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2019/9/24	2020/9/23
SPEAG	Data Acquisition Electronics	DAE4	1210	2019/7/23	2020/7/22
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	2019/5/27	2020/5/26
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1503	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2020/4/16	2021/4/15
SPEAG	Dielectric Probe Kit	DAK-3.5	1071	2019/10/28	2020/10/27
Anritsu	Vector Signal Generator	MG3710A	6201682672	2020/1/8	2021/1/7
Rohde & Schwarz	Power Meter	NRVD	102081	2019/8/15	2020/8/14
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2019/8/14	2020/8/13
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2019/8/14	2020/8/13
R&S	CBT BLUETOOTH TESTER	CBT	101641	2020/1/8	2021/1/7
EXA	Spectrum Analyzer	FSV7	101631	2020/1/8	2021/1/7
Testo	Hygrometer	608-H1	1241332088	2020/1/8	2021/1/7
FLUKE	DIGITAC THERMOMETER	51II	97240029	2019/8/15	2020/8/14
ARRA	Power Divider	A3200-2	N/A	Note 1	
MCL	Attenuation1	BW-S10W5+	N/A	Note 1	
MCL	Attenuation2	BW-S10W5+	N/A	Note 1	
MCL	Attenuation3	BW-S10W5+	N/A	Note 1	
Agilent	Dual Directional Coupler	778D	20500	Note 1	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note 1	
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note 1	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note 1	

Note:

1. 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
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

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 head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.2.

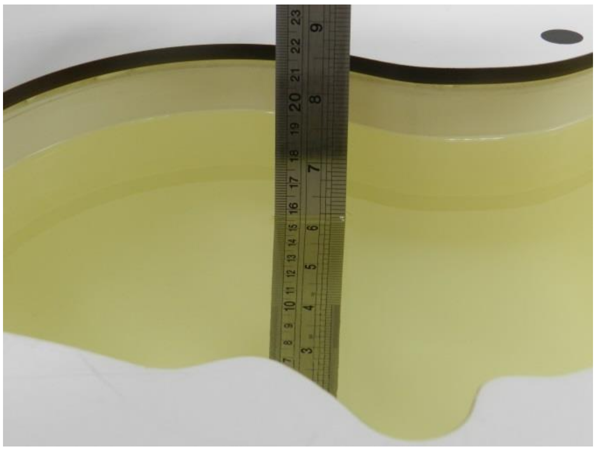


Fig 11.1 Photo of Liquid Height for Head SAR

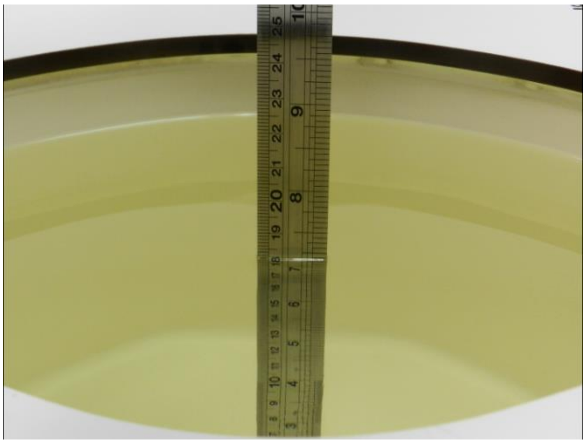


Fig 11.2 Photo of Liquid Height for Body SAR

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 Head								
2450	55.0	0	0	0	0	45.0	1.80	39.2

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	Head	22.6	1.844	38.183	1.800	39.200	2.44	-2.59	±5	2020/5/24
5250	Head	22.8	4.601	36.381	4.710	35.900	-2.31	1.34	±5	2020/5/25
5600	Head	22.8	4.990	35.802	5.070	35.500	-1.58	0.85	±5	2020/5/25
5750	Head	22.7	5.167	35.547	5.220	35.400	-1.02	0.42	±5	2020/5/26

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.

<1g SAR>

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 (%)
2020/5/24	2450	Head	250	908	3857	1210	12.60	52.80	50.40	-4.55
2020/5/25	5250	Head	100	1113	3857	1210	8.54	80.50	85.40	6.09
2020/5/25	5600	Head	100	1113	3857	1210	8.94	83.40	89.40	7.19
2020/5/26	5750	Head	100	1113	3857	1210	8.49	80.00	84.90	6.13

<10g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2020/5/24	2450	Head	250	908	3857	1210	5.71	24.20	22.84	-5.62
2020/5/25	5250	Head	100	1113	3857	1210	2.49	23.10	24.90	7.79
2020/5/25	5600	Head	100	1113	3857	1210	2.59	23.80	25.90	8.82
2020/5/26	5750	Head	100	1113	3857	1210	2.45	22.80	24.50	7.46

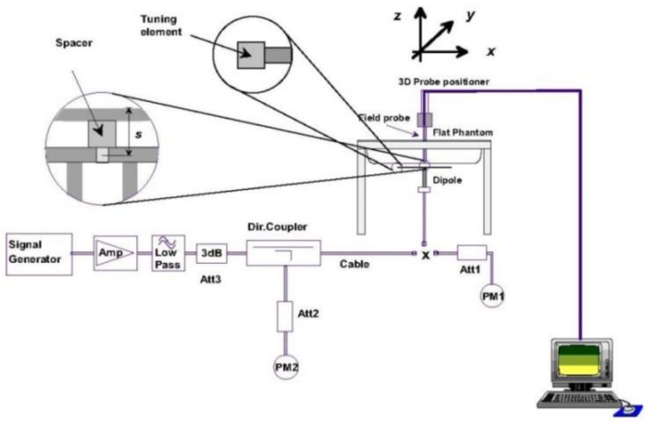


Fig 11.3.1 System Performance Check Setup

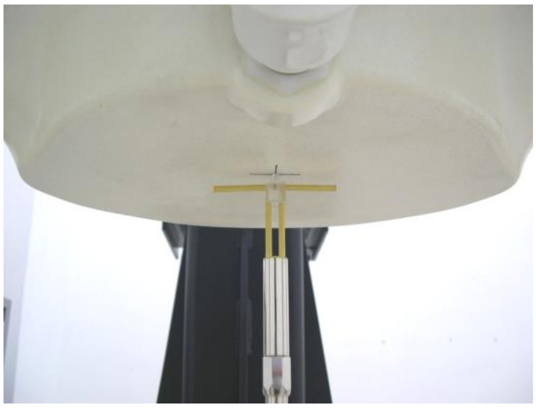


Fig 11.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 12.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M,” the left ear reference point (ERP) is marked “LE,” and the right ERP is marked “RE.” Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 12.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 12.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 12.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

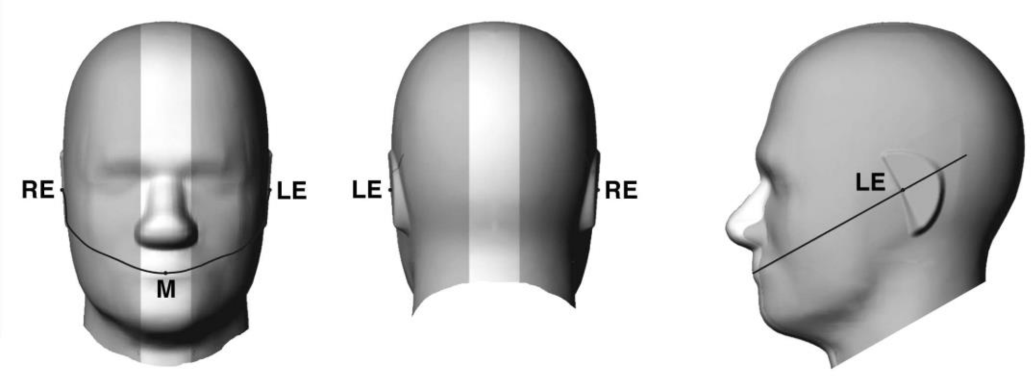


Fig 12.1.1 Front, back, and side views of SAM twin phantom

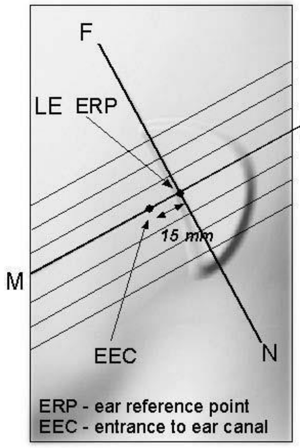


Fig 12.1.2 Close-up side view of phantom showing the ear region.

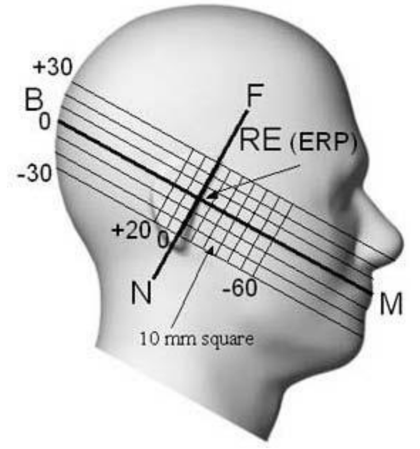


Fig 12.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width wt of the handset at the level of the acoustic output (point A in Figure 12.2.1 and Figure 12.2.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 12.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 12.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 12.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 12.2.3. The actual rotation angles should be documented in the test report.

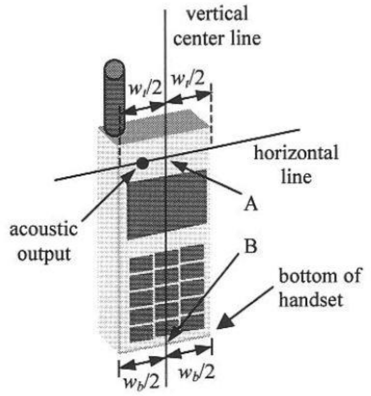


Fig 12.2.1 Handset vertical and horizontal reference lines—"fixed case

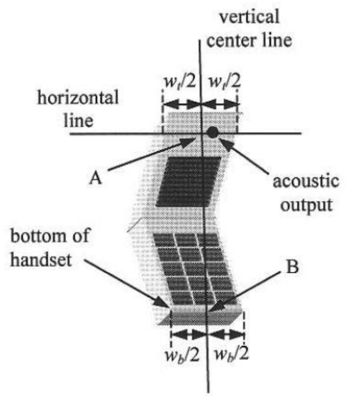


Fig 12.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

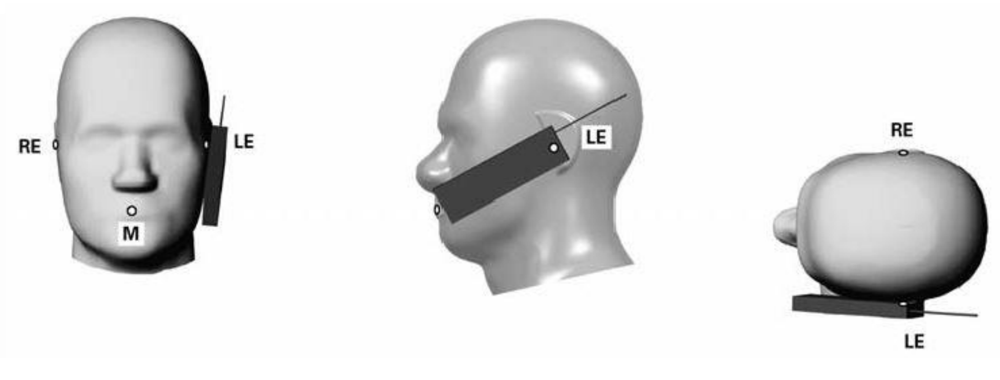


Fig 12.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 12.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

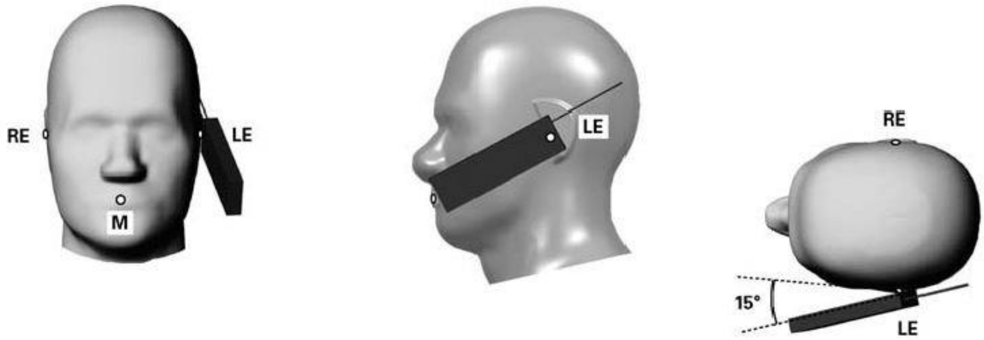
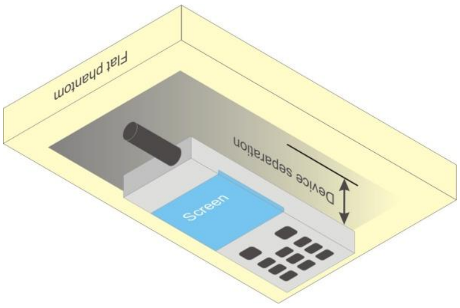


Fig 12.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 12.4). Per KDB648474 D04v01r03, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.



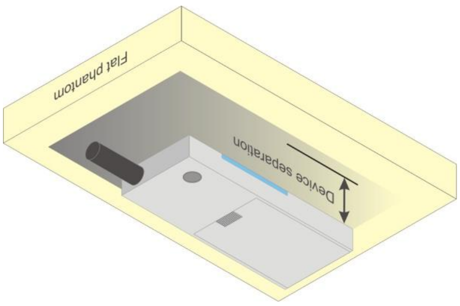


Fig 12.4 Body Worn Position

11.5 Product Specific 10g SAR Exposure

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.

2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.6 The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

12. Conducted RF Output Power (Unit: dBm)

The detailed conducted power table can refer to Appendix E.

<WLAN Conducted Power>

General Note:

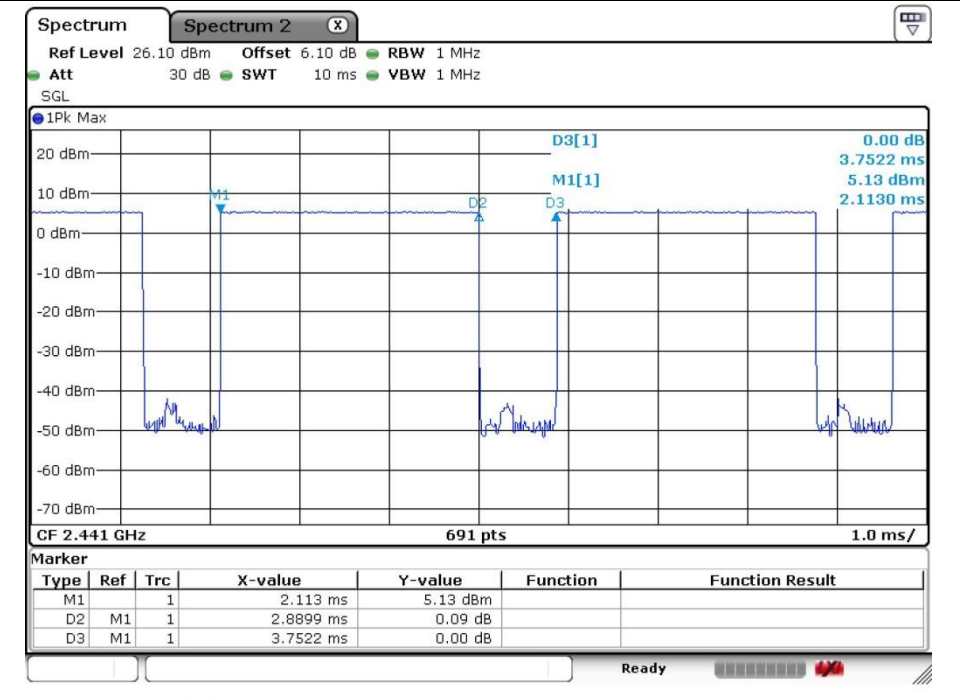
1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. 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.

<u><2.4GHz Bluetooth></u>

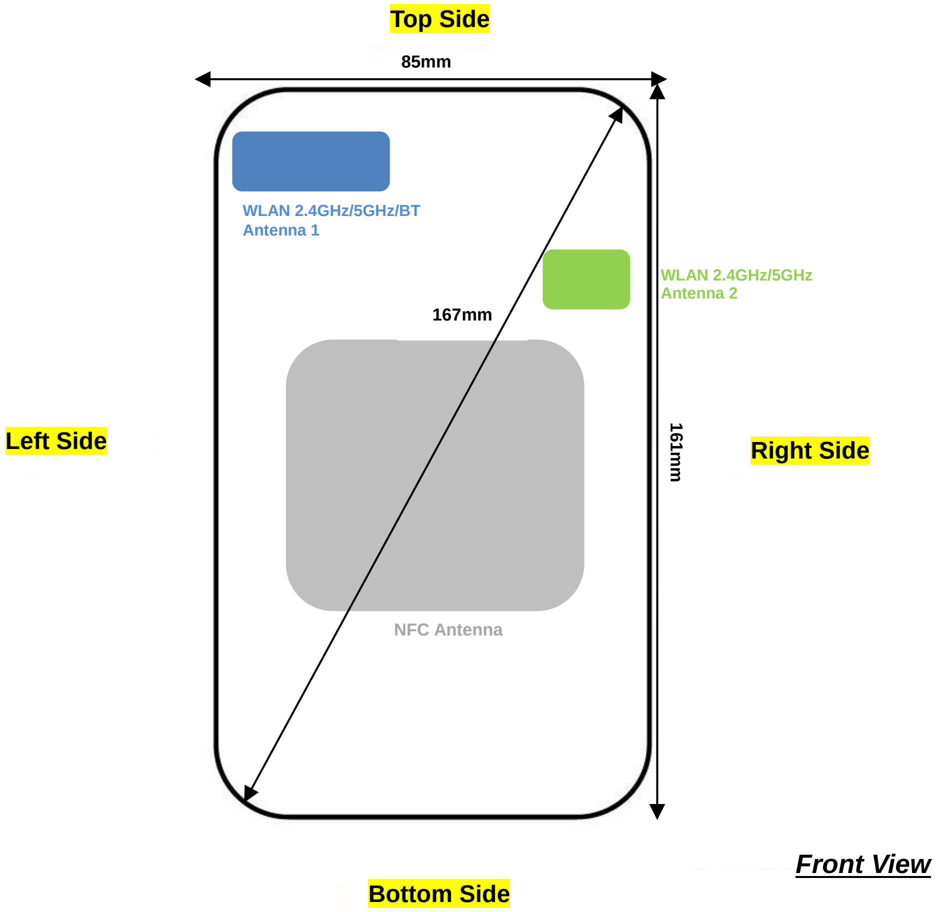
General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 77.02 % as following figure, according to 2016 Oct. TCB workshop for Bluetooth SAR scaling need further consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation

Bluetooth time-domain plot



13. Antenna Location



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. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. 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)"
   c. For BT/WLAN: 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 when the measured SAR is ≥ 0.8W/kg. Per KDB 865664 D01v01r04, if the extremity repeated SAR is necessary, the same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.

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. For WLAN SAR testing was performed on dual antenna, due to the single antenna RF power in MIMO mode is larger than the single antenna RF power in SISO mode.
6. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

14.1 Head SAR

<WLAN2.4G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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	WLAN 2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	-0.01	0.453	0.52
	WLAN 2.4GHz	802.11b 1Mbps	Right Tilted	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.01	0.111	0.13
	WLAN 2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.03	0.152	0.17
	WLAN 2.4GHz	802.11b 1Mbps	Left Tilted	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.05	0.120	0.14
	WLAN 2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 1+2	6	2437	18.24	19.00	1.191	100	1.000	0.01	0.347	0.41
	WLAN 2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 1+2	1	2412	18.26	19.00	1.186	100	1.000	0.05	0.347	0.41

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)
	Bluetooth	1Mbps	Right Cheek	0mm	Ant 1	0	2402	6.65	7.00	1.084	77.02	1.082	0.06	0.016	0.02
	Bluetooth	1Mbps	Right Tilted	0mm	Ant 1	0	2402	6.65	7.00	1.084	77.02	1.082	0.01	0.015	0.02
	Bluetooth	1Mbps	Left Cheek	0mm	Ant 1	0	2402	6.65	7.00	1.084	77.02	1.082	0.05	0.014	0.02
	Bluetooth	1Mbps	Left Tilted	0mm	Ant 1	0	2402	6.65	7.00	1.084	77.02	1.082	0.03	0.012	0.01
02	Bluetooth	1Mbps	Right Cheek	0mm	Ant 1	39	2441	6.03	7.00	1.250	77.02	1.082	-0.07	0.020	0.03
	Bluetooth	1Mbps	Right Cheek	0mm	Ant 1	78	2480	6.39	7.00	1.151	77.02	1.082	0.04	0.017	0.02

<WLAN5G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)
	WLAN 5.3GHz	802.11n-HT40 MCS0	Right Cheek	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.05	0.060	0.08
	WLAN 5.3GHz	802.11n-HT40 MCS0	Right Tilted	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.01	0.048	0.06
03	WLAN 5.3GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.08	0.079	0.10
	WLAN 5.3GHz	802.11n-HT40 MCS0	Left Tilted	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.03	0.062	0.08
	WLAN 5.3GHz	802.11n-HT40 MCS0	Left Cheek	0mm	Ant 1+2	62	5310	13.75	15.00	1.334	96.24	1.039	0.01	0.062	0.09
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.03	0.108	0.16
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Right Tilted	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.01	0.050	0.07
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.02	0.110	0.16
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.06	0.074	0.11
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 1+2	106	5530	15.21	16.50	1.346	93.19	1.073	0.02	0.113	0.16
04	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 1+2	122	5610	15.12	16.50	1.374	93.19	1.073	-0.07	0.125	0.18
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.01	0.111	0.16
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Right Tilted	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.03	0.052	0.08
05	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.01	0.124	0.18
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.03	0.047	0.07

14.2 Body Worn Accessory SAR

<WLAN2.4G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)	Note
	WLAN 2.4GHz	802.11b 1Mbps	Front Face	10mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.01	0.098	0.11	
06	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	10mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	-0.01	0.245	**0.28**	
	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	10mm	Ant 1+2	6	2437	18.24	19.00	1.191	100	1.000	-0.01	0.175	0.21	
	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	10mm	Ant 1+2	1	2412	18.26	19.00	1.186	100	1.000	-0.01	0.165	0.20	
	WLAN 2.4GHz	802.11b 1Mbps	Front Face	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.04	0.067	0.08	Holster 1
	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	-0.01	0.124	0.14	Holster 1
	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	0mm	Ant 1+2	6	2437	18.24	19.00	1.191	100	1.000	0.09	0.115	0.14	Holster 1
	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	0mm	Ant 1+2	1	2412	18.26	19.00	1.186	100	1.000	-0.03	0.098	0.12	Holster 1
	WLAN 2.4GHz	802.11b 1Mbps	Front Face	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	-0.01	0.075	0.09	Holster 2
	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.02	0.061	0.07	Holster 2
	WLAN 2.4GHz	802.11b 1Mbps	Front Face	0mm	Ant 1+2	6	2437	18.24	19.00	1.191	100	1.000	0.03	0.073	0.09	Holster 2
	WLAN 2.4GHz	802.11b 1Mbps	Front Face	0mm	Ant 1+2	1	2412	18.26	19.00	1.186	100	1.000	0.01	0.050	0.06	Holster 2

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)	Note
	Bluetooth	1Mbps	Rear Face	10mm	Ant 1	78	2480	6.39	7.00	1.151	77.02	1.082	0.01	0.002	0.00	
	Bluetooth	1Mbps	Rear Face	10mm	Ant 1	0	2402	6.65	7.00	1.084	77.02	1.082	0.07	0.001	0.00	
07	Bluetooth	1Mbps	Rear Face	10mm	Ant 1	39	2441	6.03	7.00	1.250	77.02	1.082	-0.05	0.00431	**0.01**	
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	78	2480	6.39	7.00	1.151	77.02	1.082	-0.01	0.002	0.00	Holster 1
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	0	2402	6.65	7.00	1.084	77.02	1.082	0.06	0.001	0.00	Holster 1
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	39	2441	6.03	7.00	1.250	77.02	1.082	0.02	0.002	0.00	Holster 1
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	78	2480	6.39	7.00	1.151	77.02	1.082	0.01	0.002	0.00	Holster 2
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	0	2402	6.65	7.00	1.084	77.02	1.082	0.06	0.001	0.00	Holster 2
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	39	2441	6.03	7.00	1.250	77.02	1.082	0.06	0.000	0.00	Holster 2

<WLAN5G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)	Note
	WLAN 5.3GHz	802.11n-HT40 MCS0	Front Face	10mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.01	0.046	0.06	
	WLAN 5.3GHz	802.11n-HT40 MCS0	Rear Face	10mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.03	0.105	0.14	
08	WLAN 5.3GHz	802.11n-HT40 MCS0	Rear Face	10mm	Ant 1+2	62	5310	13.75	15.00	1.334	96.24	1.039	-0.02	0.107	**0.15**	
	WLAN 5.3GHz	802.11n-HT40 MCS0	Front Face	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.01	0.082	0.11	Holster 1
	WLAN 5.3GHz	802.11n-HT40 MCS0	Rear Face	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.06	0.088	0.12	Holster 1
	WLAN 5.3GHz	802.11n-HT40 MCS0	Rear Face	0mm	Ant 1+2	62	5310	13.75	15.00	1.334	96.24	1.039	0.01	0.056	0.08	Holster 1
	WLAN 5.3GHz	802.11n-HT40 MCS0	Front Face	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.06	0.069	0.09	Holster 2
	WLAN 5.3GHz	802.11n-HT40 MCS0	Rear Face	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.01	0.036	0.05	Holster 2
	WLAN 5.3GHz	802.11n-HT40 MCS0	Front Face	0mm	Ant 1+2	62	5310	13.75	15.00	1.334	96.24	1.039	0.05	0.033	0.05	Holster 2
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	10mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.01	0.065	0.09	
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Rear Face	10mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.03	0.079	0.11	
09	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Rear Face	10mm	Ant 1+2	106	5530	15.21	16.50	1.346	93.19	1.073	-0.07	0.113	**0.16**	
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Rear Face	10mm	Ant 1+2	122	5610	15.12	16.50	1.374	93.19	1.073	0.01	0.107	0.16	
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	-0.01	0.060	0.09	Holster 1
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Rear Face	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.06	0.053	0.08	Holster 1
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	106	5530	15.21	16.50	1.346	93.19	1.073	0.04	0.075	0.11	Holster 1
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	122	5610	15.12	16.50	1.374	93.19	1.073	0.08	0.068	0.10	Holster 1
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.01	0.056	0.08	Holster 2
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Rear Face	0mm	Ant 1+2	138	5690	15.24	16.50	1.337	93.19	1.073	0.06	0.046	0.07	Holster 2
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	106	5530	15.21	16.50	1.346	93.19	1.073	0.05	0.072	0.10	Holster 2
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	122	5610	15.12	16.50	1.374	93.19	1.073	0.01	0.035	0.05	Holster 2
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Front Face	10mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.01	0.038	0.06	
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Rear Face	10mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	-0.06	0.058	0.09	
10	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.01	0.078	**0.11**	Holster 1
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Rear Face	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.00	0.060	0.09	Holster 1
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.01	0.049	0.07	Holster 2
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Rear Face	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.03	0.047	0.07	Holster 2

14.3 Extremely SAR

<WLAN2.4G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	WLAN 2.4GHz	802.11b 1Mbps	Front Face	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.02	0.235	0.27
	WLAN 2.4GHz	802.11b 1Mbps	Rear Face	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.03	0.296	0.34
	WLAN 2.4GHz	802.11b 1Mbps	Left Side	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.01	0.134	0.15
11	WLAN 2.4GHz	802.11b 1Mbps	Right Side	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	0.05	0.604	0.69
	WLAN 2.4GHz	802.11b 1Mbps	Top Side	0mm	Ant 1+2	11	2462	18.42	19.00	1.143	100	1.000	-0.05	0.156	0.18
	WLAN 2.4GHz	802.11b 1Mbps	Right Side	0mm	Ant 1+2	6	2437	18.24	19.00	1.191	100	1.000	0.06	0.424	0.51
	WLAN 2.4GHz	802.11b 1Mbps	Right Side	0mm	Ant 1+2	1	2412	18.26	19.00	1.186	100	1.000	-0.02	0.406	0.48

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	Bluetooth	1Mbps	Front Face	0mm	Ant 1	78	2480	6.65	7.00	1.084	77.02	1.082	0.01	0.011	0.01
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	78	2480	6.65	7.00	1.084	77.02	1.082	-0.03	0.012	0.01
	Bluetooth	1Mbps	Left Side	0mm	Ant 1	78	2480	6.65	7.00	1.084	77.02	1.082	-0.05	0.011	0.01
	Bluetooth	1Mbps	Right Side	0mm	Ant 1	78	2480	6.65	7.00	1.084	77.02	1.082	0.02	0.001	0.00
	Bluetooth	1Mbps	Top Side	0mm	Ant 1	78	2480	6.65	7.00	1.084	77.02	1.082	0.08	0.011	0.01
12	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	0	2402	6.03	7.00	1.250	77.02	1.082	0.05	0.013	0.02
	Bluetooth	1Mbps	Rear Face	0mm	Ant 1	39	2441	6.39	7.00	1.151	77.02	1.082	0.03	0.010	0.01

<WLAN5G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	WLAN 5.3GHz	802.11n-HT40 MCS0	Front Face	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.05	0.066	0.09
	WLAN 5.3GHz	802.11n-HT40 MCS0	Rear Face	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.06	0.126	0.17
	WLAN 5.3GHz	802.11n-HT40 MCS0	Left Side	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.01	0.106	0.14
13	WLAN 5.3GHz	802.11n-HT40 MCS0	Right Side	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.07	0.138	0.18
	WLAN 5.3GHz	802.11n-HT40 MCS0	Top Side	0mm	Ant 1+2	54	5270	15.48	16.50	1.265	96.24	1.039	0.06	0.077	0.10
	WLAN 5.3GHz	802.11n-HT40 MCS0	Right Side	0mm	Ant 1+2	62	5310	13.75	15.00	1.332	96.24	1.039	0.01	0.108	0.15
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	138	5690	15.24	16.50	1.338	93.19	1.073	0.06	0.085	0.12
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Rear Face	0mm	Ant 1+2	138	5690	15.24	16.50	1.338	93.19	1.073	0.00	0.095	0.14
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Left Side	0mm	Ant 1+2	138	5690	15.24	16.50	1.338	93.19	1.073	0.05	0.116	0.17
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 1+2	138	5690	15.24	16.50	1.338	93.19	1.073	0.08	0.118	0.17
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 1+2	138	5690	15.24	16.50	1.338	93.19	1.073	0.01	0.084	0.12
	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 1+2	106	5530	15.21	16.50	1.346	93.19	1.073	0.03	0.120	0.17
14	WLAN 5.5GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 1+2	122	5610	15.12	16.50	1.374	93.19	1.073	-0.08	0.123	0.18
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Front Face	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.05	0.070	0.10
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Rear Face	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	-0.02	0.088	0.13
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Left Side	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.01	0.097	0.14
15	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Right Side	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	0.08	0.127	0.19
	WLAN 5.8GHz	802.11ac-VHT80 MCS0	Top Side	0mm	Ant 1+2	155	5775	15.14	16.50	1.368	93.19	1.073	-0.06	0.020	0.03

15. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations
1.	None

Note:

1. 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.
2. According to the EUT character, WLAN 5GHz and Bluetooth can't transmit simultaneously.
3. WLAN and Bluetooth share the same antenna 1, and they can't transmit simultaneously each other.

Test Engineer : Nick Hu, Yuan Zhao, Jiaxing Chang, Yuankai Kong

16. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

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 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

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

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

[8] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.

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

------THE END------

Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Head_2450MHz

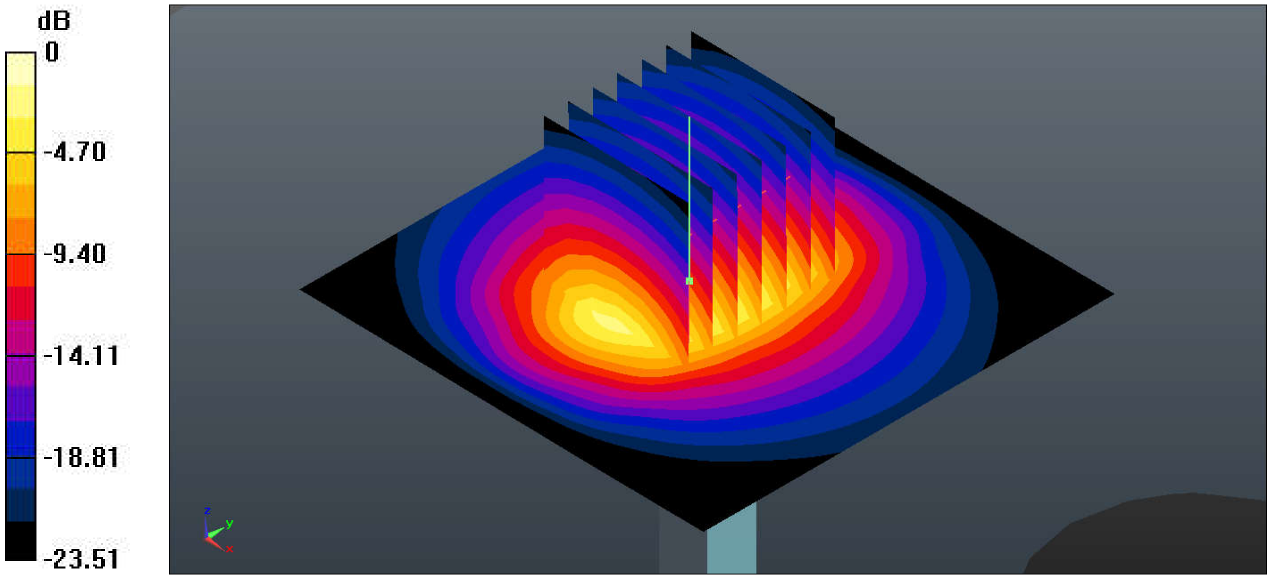
DUT: D2450V2 - SN:908

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2450 MHz; σ = 1.844 S/m; ε_r = 38.183; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 20.7 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.94 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.71 W/kg
Maximum value of SAR (measured) = 19.8 W/kg



0 dB = 19.8 W/kg = 12.97 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.25

System Check_Head_5250MHz

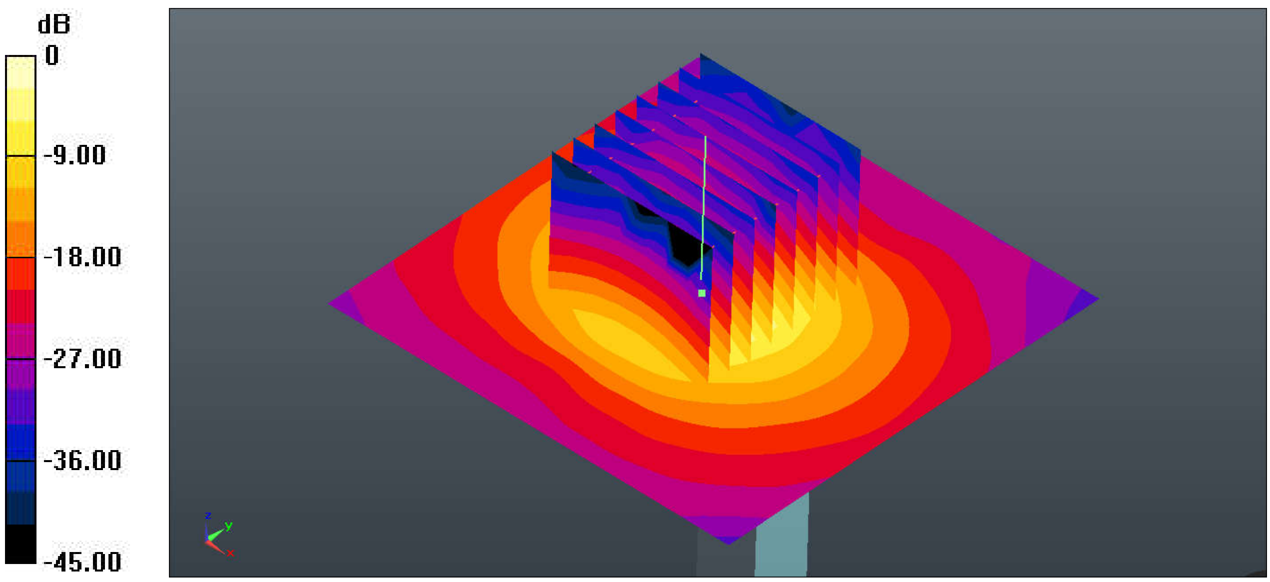
DUT: D5GHzV2 - SN:1113

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5250 MHz; σ = 4.601 S/m; ε_r = 36.381; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.1 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 46.21 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.49 W/kg
Maximum value of SAR (measured) = 19.1 W/kg



0 dB = 19.1 W/kg = 12.81 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.25

System Check_Head_5600MHz

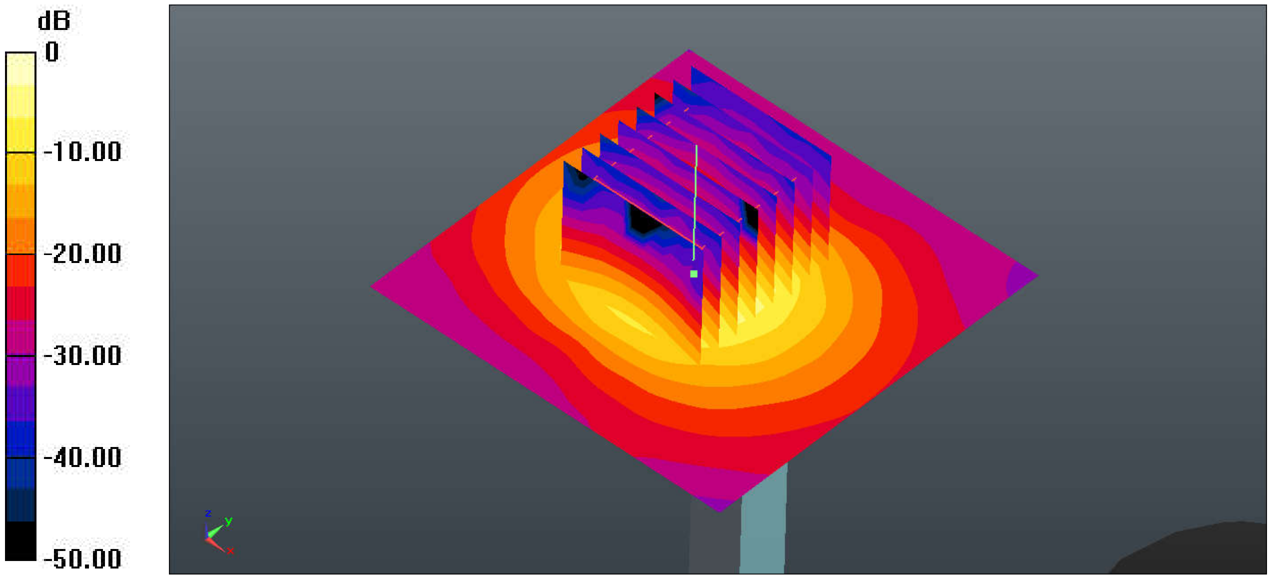
DUT: D5GHzV2 - SN:1113

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5600 MHz; σ = 4.99 S/m; ε_r = 35.802; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 21.9 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 44.91 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.8 W/kg
SAR(1 g) = 8.94 W/kg; SAR(10 g) = 2.59 W/kg
Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 20.5 W/kg = 13.12 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.26

System Check_Head_5750MHz

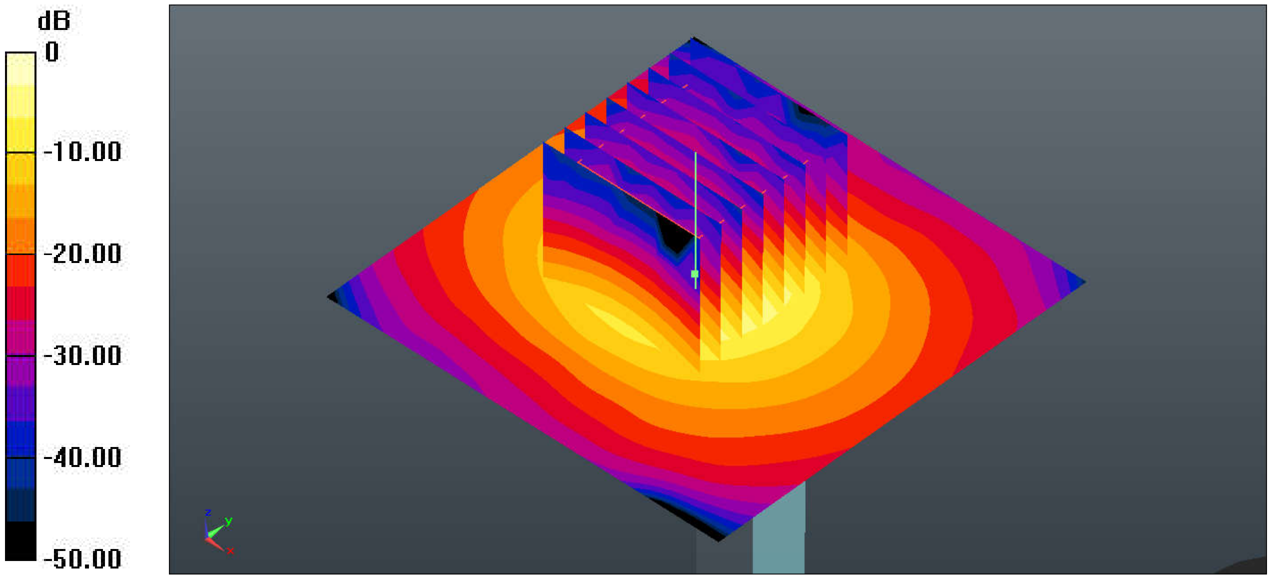
DUT: D5GHzV2 - SN:1113

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5750 MHz; σ = 5.167 S/m; ε_r = 35.547; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.3 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 42.01 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 8.49 W/kg; SAR(10 g) = 2.45 W/kg
Maximum value of SAR (measured) = 19.9 W/kg



0 dB = 19.9 W/kg = 12.99 dBW/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

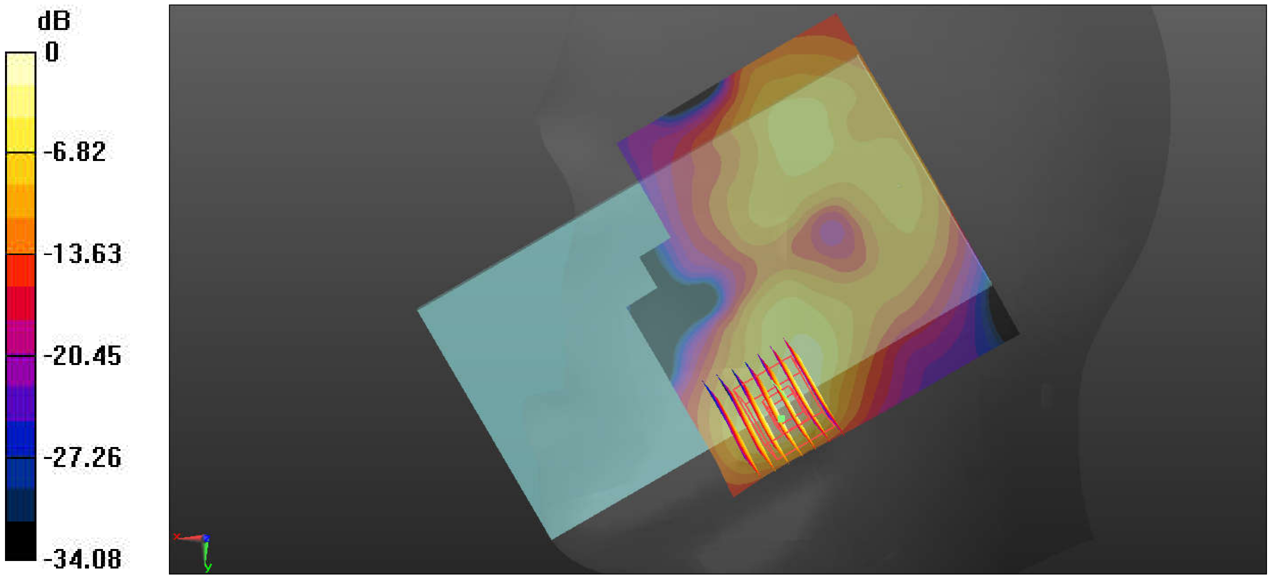
01_WLAN 2.4GHz _802.11b 1Mbps_Right Cheek_0mm_Ch11_Ant1+2

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2462 MHz; σ = 1.858 S/m; ε_r = 38.139; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (101x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.648 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.574 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.968 W/kg
SAR(1 g) = 0.453 W/kg; SAR(10 g) = 0.182 W/kg
Maximum value of SAR (measured) = 0.735 W/kg



0 dB = 0.735 W/kg = -1.34 dBW/kg

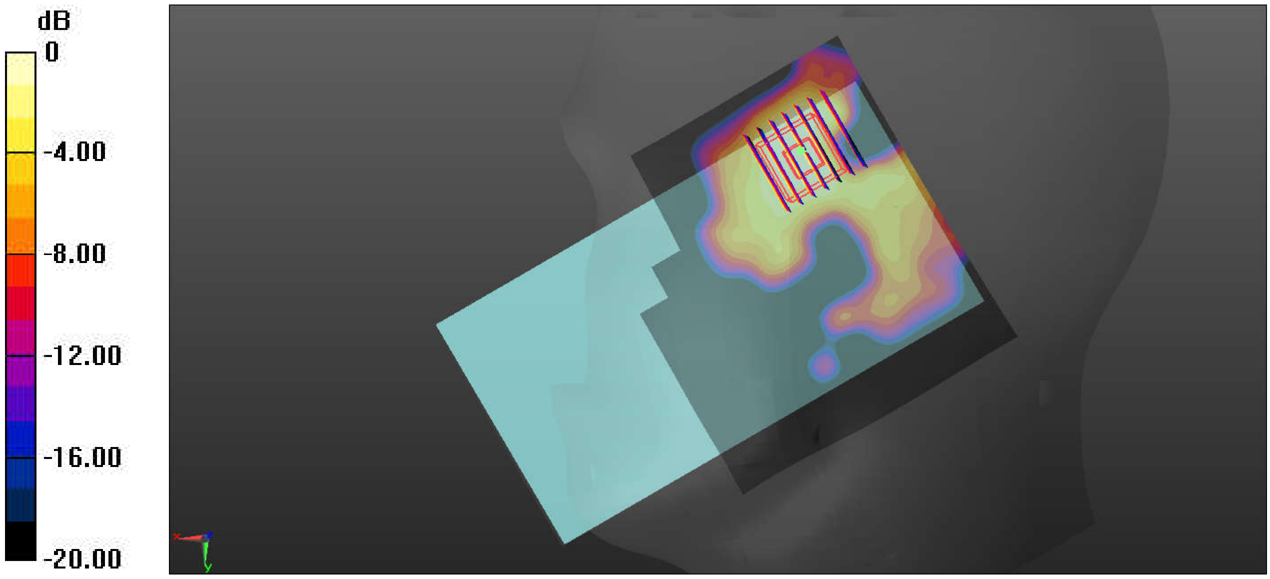
02_Bluetooth _1Mbps_Right Cheek_0mm_Ch39

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.298
Medium: HSL_2450 Medium parameters used: f = 2441 MHz; σ = 1.834 S/m; ε_r = 38.221; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (101x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0419 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.829 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.0930 W/kg
SAR(1 g) = 0.020 W/kg; SAR(10 g) = 0.00932 W/kg
Maximum value of SAR (measured) = 0.0319 W/kg



0 dB = 0.0319 W/kg = -14.96 dBW/kg

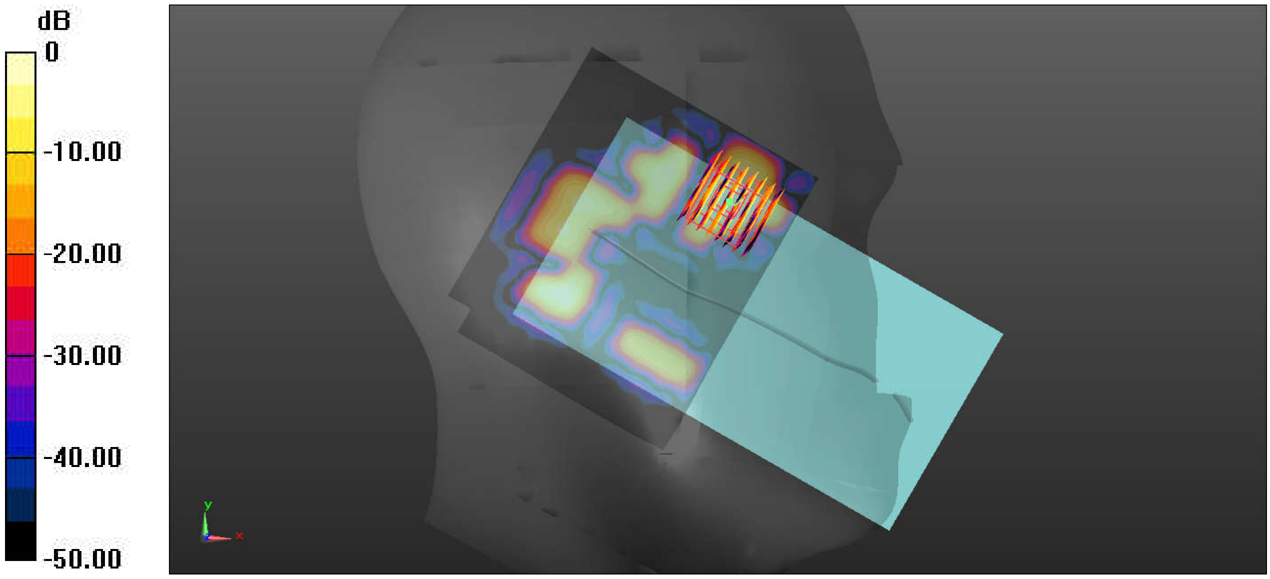
03_WLAN5GHz_802.11n-HT40 MCS0_Left Cheek_0mm_Ch54_Ant1+2

Communication System: UID 0, 802.11n (0); Frequency: 5270 MHz;Duty Cycle: 1:1.039
Medium: HSL_5000 Medium parameters used: f = 5270 MHz; $\sigma = 4.628$ S/m; $\varepsilon_r = 36.373$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (121x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.650 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.080 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.369 W/kg
SAR(1 g) = 0.079 W/kg; SAR(10 g) = 0.025 W/kg
Maximum value of SAR (measured) = 0.198 W/kg



0 dB = 0.198 W/kg = -7.03 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.25

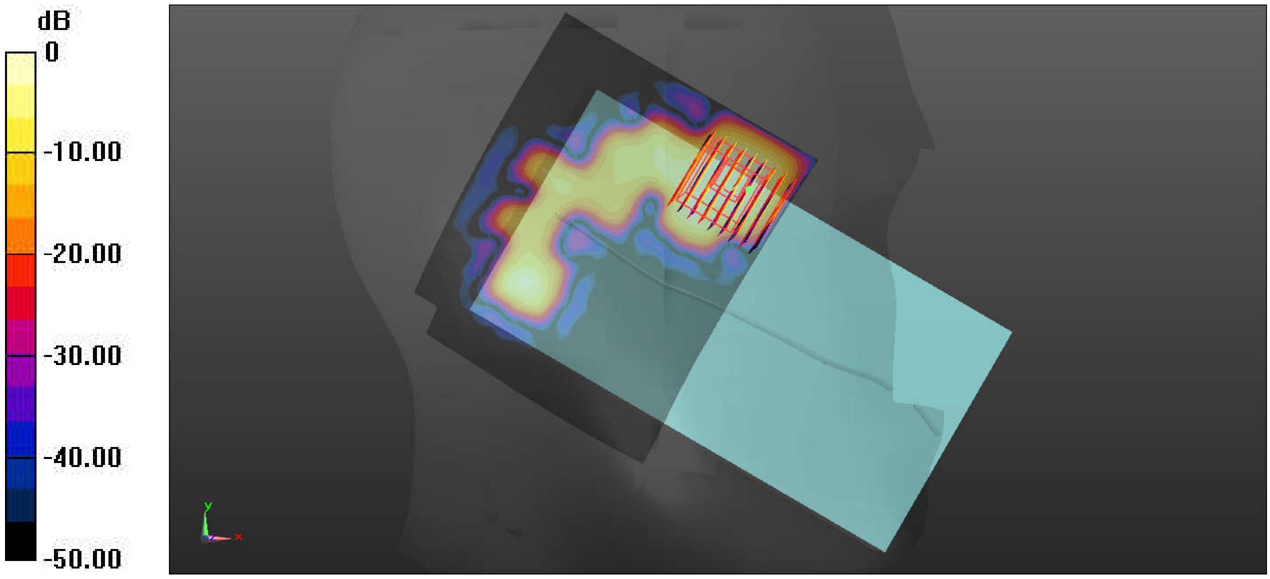
04_WLAN5GHz_802.11ac-VHT80 MCS0_Left Cheek_0mm_Ch122_Ant1+2

Communication System: UID 0, 802.11ac (0); Frequency: 5610 MHz;Duty Cycle: 1:1.073
Medium: HSL_5000 Medium parameters used: f = 5610 MHz; σ = 5.005 S/m; ε_r = 35.784; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (121x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.483 W/kg

Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.958 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.598 W/kg
SAR(1 g) = 0.125 W/kg; SAR(10 g) = 0.041 W/kg
Maximum value of SAR (measured) = 0.356 W/kg



0 dB = 0.356 W/kg = -4.49 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2020.5.26

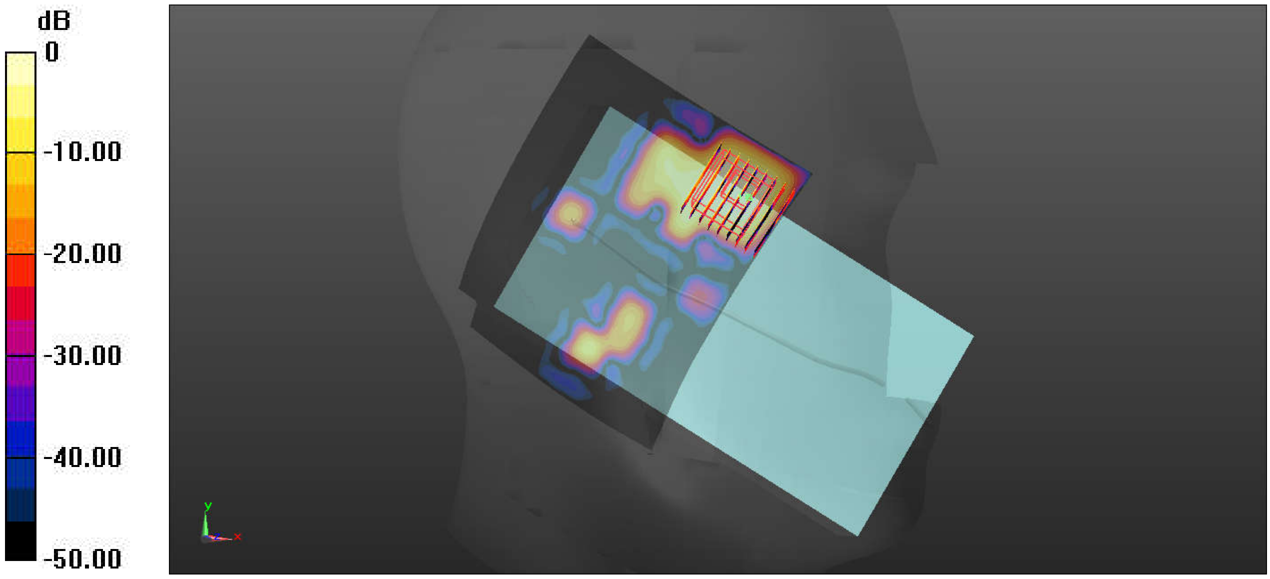
05_WLAN5GHz_802.11ac-VHT80 MCS0_Left Cheek_0mm_Ch155_Ant1+2

Communication System: UID 0, 802.11ac (0); Frequency: 5775 MHz;Duty Cycle: 1:1.073
Medium: HSL_5000 Medium parameters used: f = 5775 MHz; σ = 5.201 S/m; ε_r = 35.54; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (121x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.544 W/kg

Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0.9870 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.582 W/kg
SAR(1 g) = 0.124 W/kg; SAR(10 g) = 0.040 W/kg
Maximum value of SAR (measured) = 0.361 W/kg



0 dB = 0.361 W/kg = -4.42 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.24

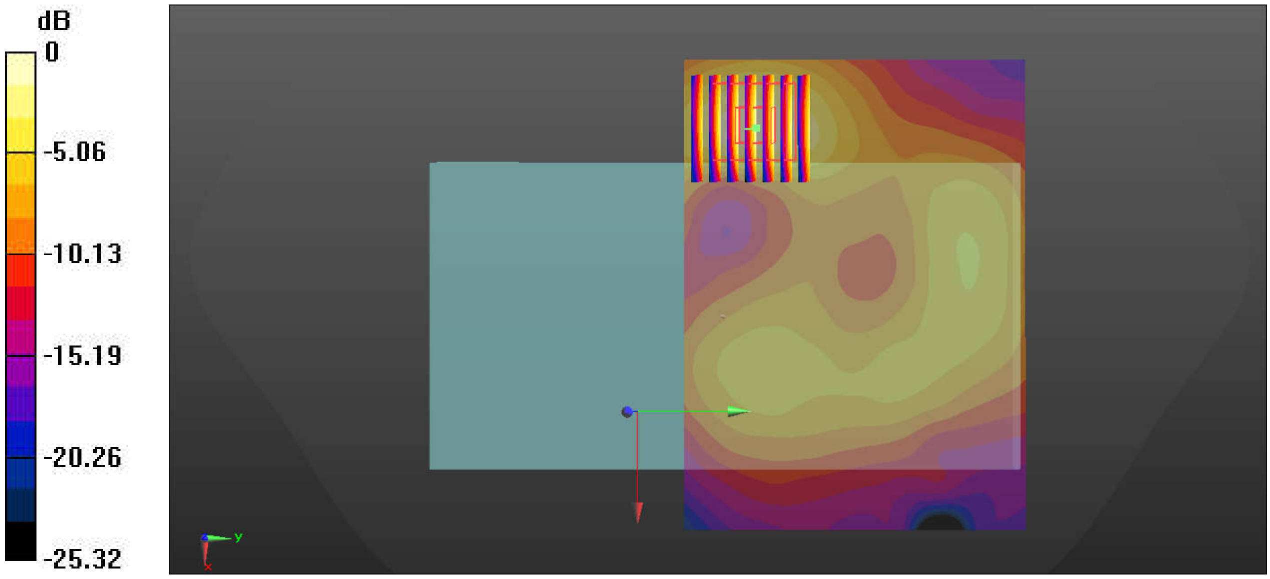
06_WLAN 2.4GHz _802.11b 1Mbps_Rear Face_10mm_Ch11_Ant1+2

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2462 MHz; σ = 1.858 S/m; ε_r = 38.139; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (111x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.404 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.485 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.487 W/kg
SAR(1 g) = 0.245 W/kg; SAR(10 g) = 0.116 W/kg
Maximum value of SAR (measured) = 0.398 W/kg



0 dB = 0.398 W/kg = -4.00 dBW/kg

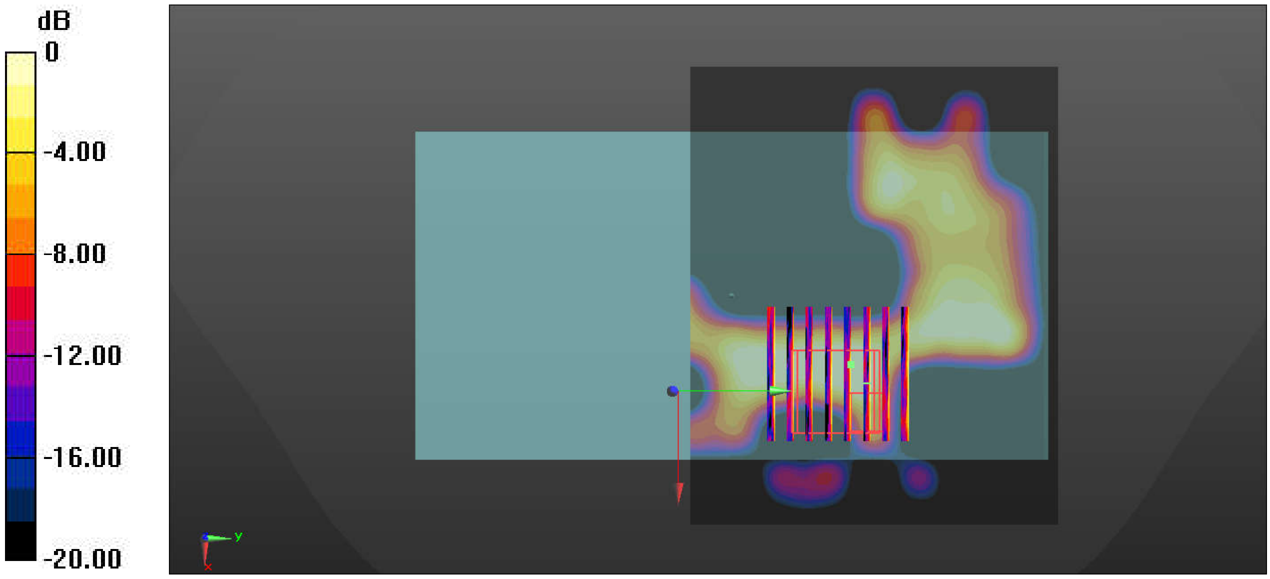
07_Bluetooth _1Mbps_Rear Face_10mm_Ch39_Ant1

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.298
Medium: HSL_2450 Medium parameters used: f = 2441 MHz; σ = 1.834 S/m; ε_r = 38.221; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (101x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0290 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.352 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.0260 W/kg
SAR(1 g) = 0.00431 W/kg; SAR(10 g) = 0.00178 W/kg
Maximum value of SAR (measured) = 0.0130 W/kg



0 dB = 0.0130 W/kg = -18.86 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.25

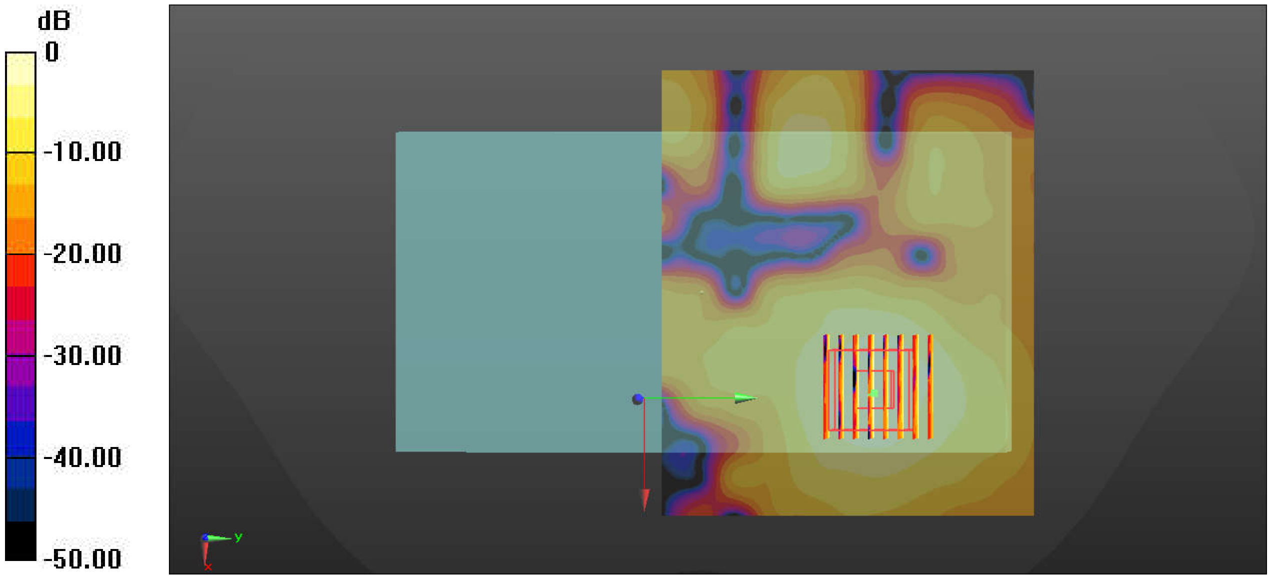
08_WLAN5GHz_802.11n-HT40 MCS0_Rear Face_10mm_Ch62_Ant1+2

Communication System: UID 0, 802.11n (0); Frequency: 5310 MHz;Duty Cycle: 1:1.039
Medium: HSL_5000 Medium parameters used: f = 5310 MHz; σ = 4.667 S/m; ε_r = 36.286; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (121x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.250 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.565 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.414 W/kg
SAR(1 g) = 0.107 W/kg; SAR(10 g) = 0.039 W/kg
Maximum value of SAR (measured) = 0.327 W/kg



0 dB = 0.327 W/kg = -4.85 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2020.5.25

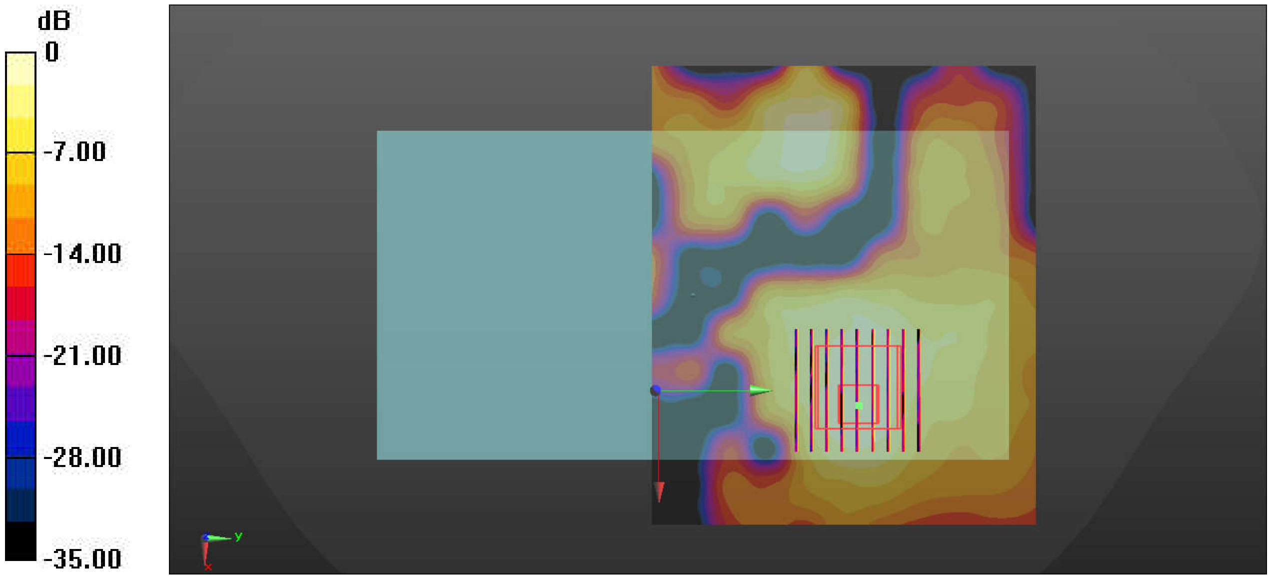
09_WLAN5GHz_802.11ac-VHT80 MCS0_Rear Face_10mm_Ch106_Ant1+2

Communication System: UID 0, 802.11ac (0); Frequency: 5530 MHz;Duty Cycle: 1:1.073
Medium: HSL_5000 Medium parameters used: f = 5530 MHz; σ = 4.91 S/m; ε_r = 35.93; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (121x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.281 W/kg

Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.991 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.472 W/kg
SAR(1 g) = 0.113 W/kg; SAR(10 g) = 0.042 W/kg
Maximum value of SAR (measured) = 0.281 W/kg



0 dB = 0.281 W/kg = -5.51 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.26

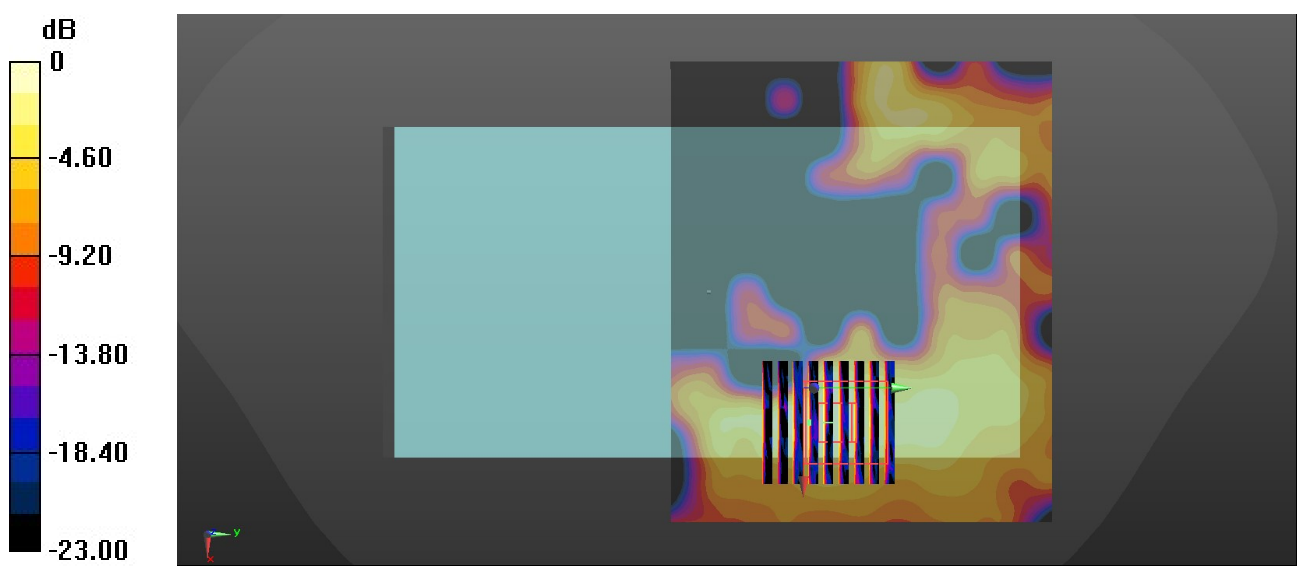
10_WLAN5GHz_802.11ac-VHT80 MCS0_Front_0mm_Ch155_Ant1+2_Holster 1

Communication System: UID 0, 802.11ac (0); Frequency: 5775 MHz;Duty Cycle: 1:1.073
Medium: HSL_5000 Medium parameters used: f = 5775 MHz; σ = 5.201 S/m; ε_r = 35.54; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1697
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (121x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.236 W/kg

Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0.3960 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.377 W/kg
SAR(1 g) = 0.078 W/kg; SAR(10 g) = 0.026 W/kg
Maximum value of SAR (measured) = 0.207 W/kg



0 dB = 0.236 W/kg = -6.27 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2020.5.24

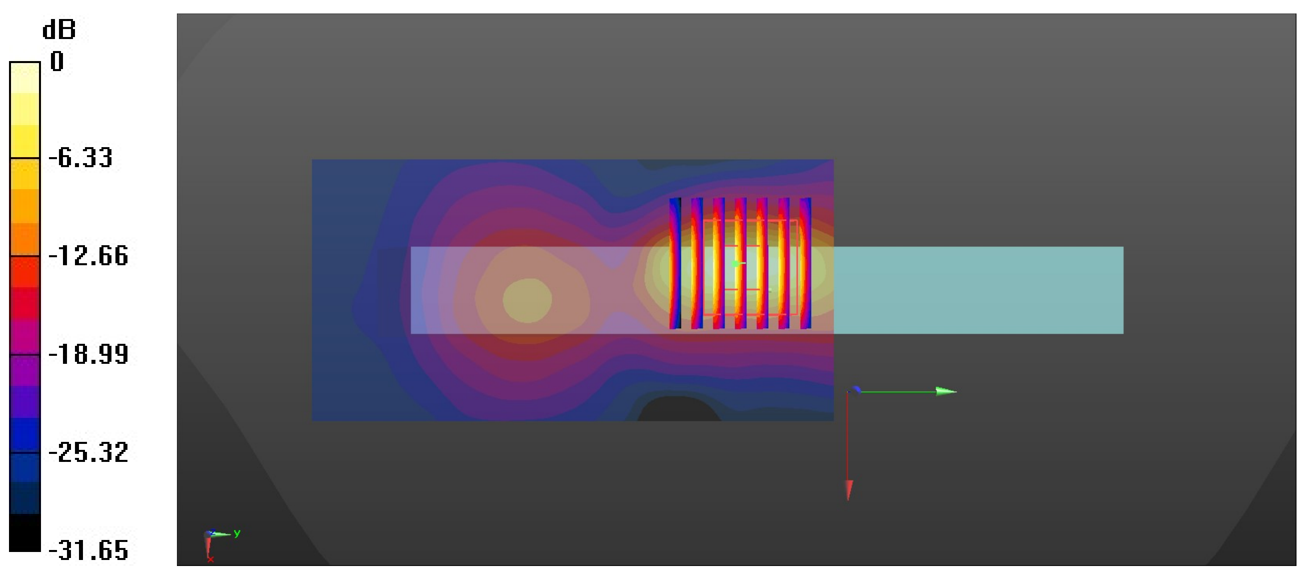
11_WLAN2.4GHz_802.11b 1Mbps_Right Side_0mm_Ch11_Ant1+2

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2462 MHz; σ = 1.858 S/m; ε_r = 38.139; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (51x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 3.44 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.19 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 4.70 W/kg
SAR(1 g) = 1.76 W/kg; SAR(10 g) = 0.604 W/kg
Maximum value of SAR (measured) = 3.43 W/kg



0 dB = 3.43 W/kg = 5.35 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.24

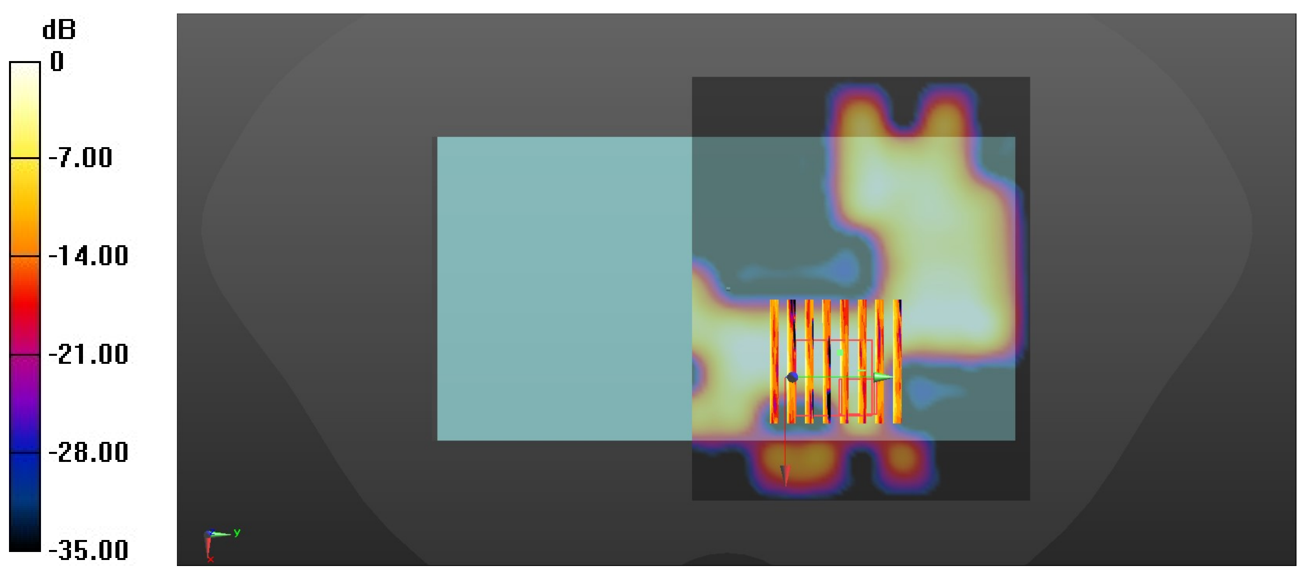
12_Bluetooth_1Mbps_Back_0mm_Ch0_Ant1

Communication System: UID 0, Bluetooth (0); Frequency: 2402 MHz;Duty Cycle: 1:1.298
Medium: HSL_2450 Medium parameters used: f = 2402 MHz; σ = 1.787 S/m; ε_r = 38.364; ρ = 1000 kg/m^3
Ambient Temperature：23.1 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (101x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0737 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.343 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.112 W/kg
SAR(1 g) = 0.025 W/kg; SAR(10 g) = 0.013 W/kg
Maximum value of SAR (measured) = 0.0412 W/kg



0 dB = 0.0412 W/kg = -13.85 dBW/kg

13_WLAN5GHz_802.11n-HT40 MCS0_Right Side_0mm_Ch54_Ant1+2

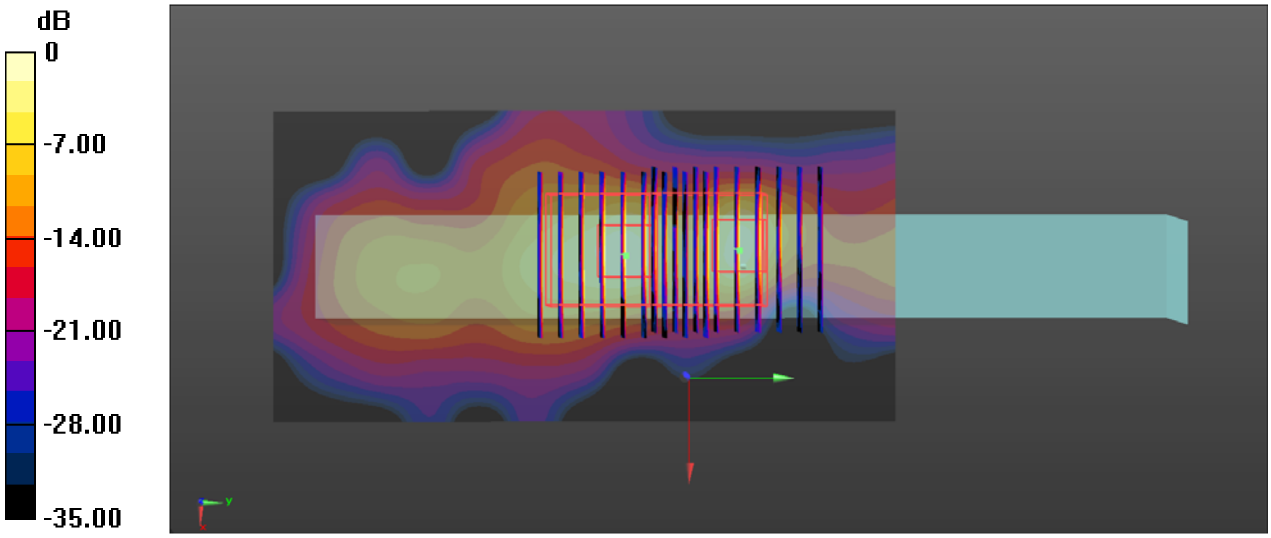
Communication System: UID 0, 802.11n (0); Frequency: 5270 MHz;Duty Cycle: 1:1.039
Medium: HSL_5000 Medium parameters used: f = 5270 MHz; σ = 4.628 S/m; ε_r = 36.373; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.42 W/kg

Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 14.96 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.67 W/kg
SAR(1 g) = 0.575 W/kg; SAR(10 g) = 0.138 W/kg
Maximum value of SAR (measured) = 1.58 W/kg

Zoom Scan (9x9x7)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 14.96 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.69 W/kg
SAR(1 g) = 0.544 W/kg; SAR(10 g) = 0.107 W/kg
Maximum value of SAR (measured) = 1.55 W/kg



0 dB = 1.55 W/kg = 1.90 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.25

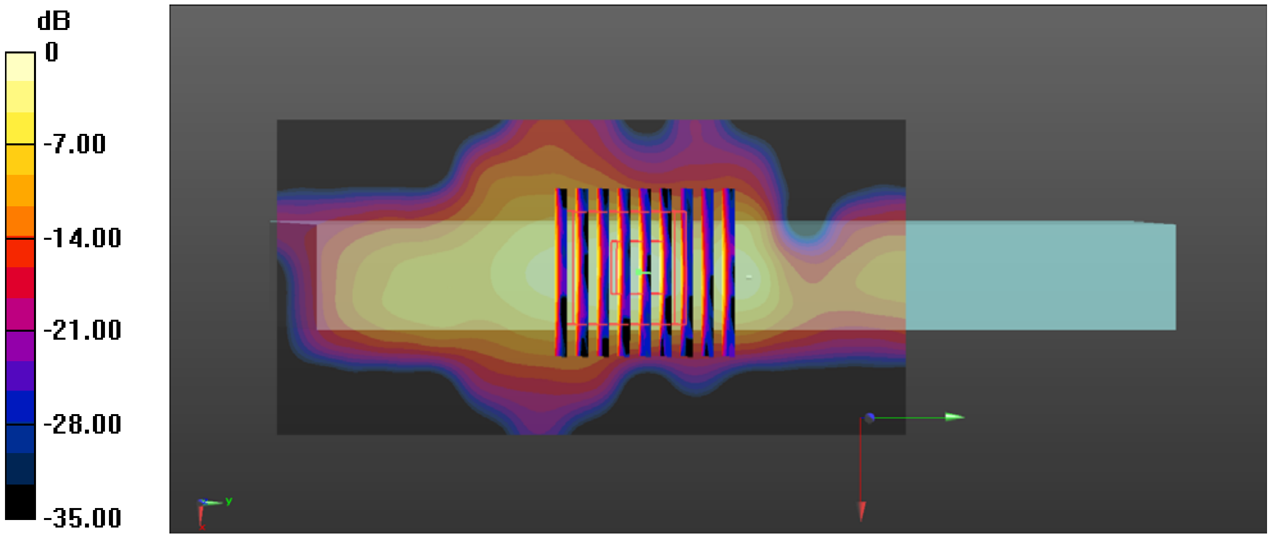
14_WLAN5GHz_802.11ac-VHT80 MCS0_Right Side_0mm_Ch122_Ant1+2

Communication System: UID 0, 802.11ac (0); Frequency: 5610 MHz;Duty Cycle: 1:1.073
Medium: HSL_5000 Medium parameters used: f = 5610 MHz; σ = 5.005 S/m; ε_r = 35.784; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.34 W/kg

Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 12.78 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.20 W/kg
SAR(1 g) = 0.454 W/kg; SAR(10 g) = 0.123 W/kg
Maximum value of SAR (measured) = 1.33 W/kg



0 dB = 1.33 W/kg = 1.24 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.5.26

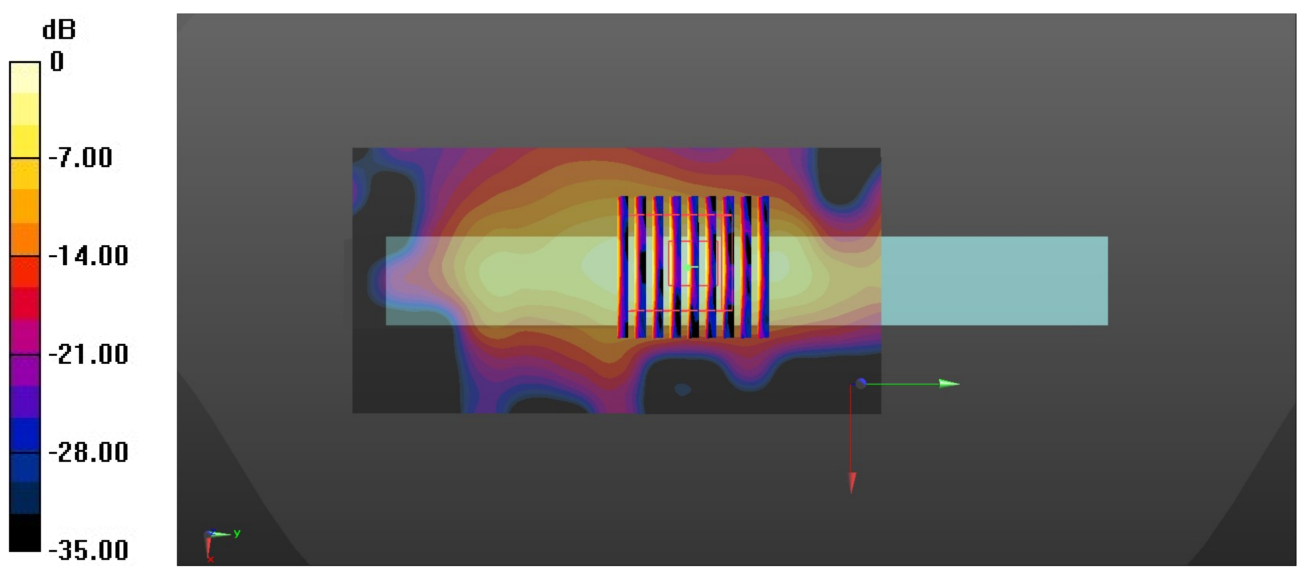
15_WLAN5GHz_802.11ac-VHT80 MCS0_Right Side_0mm_Ch155_Ant1+2

Communication System: UID 0, 802.11ac (0); Frequency: 5775 MHz;Duty Cycle: 1:1.073
Medium: HSL_5000 Medium parameters used: f = 5775 MHz; σ = 5.201 S/m; ε_r = 35.54; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2019.7.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.13 W/kg

Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 9.353 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 3.40 W/kg
SAR(1 g) = 0.471 W/kg; SAR(10 g) = 0.127 W/kg
Maximum value of SAR (measured) = 1.29 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows

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中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client **Sporton** **Certificate No: Z19-60087**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 908
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 25, 2019

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	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG,No.DAE4-1331_Feb19)	Feb-20
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: March 28, 2019

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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, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

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%.

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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
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	39.6 ± 6 %	1.84 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	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.8 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 18.7 % (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	53.8 ± 6 %	2.00 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	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.8 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.3Ω+ 5.18 jΩ
Return Loss	- 21.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.6Ω+ 5.81 jΩ
Return Loss	- 24.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.020 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

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DASY5 Validation Report for Head TSL Date: 03.25.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 908

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

Medium parameters used: f = 2450 MHz; σ = 1.841 S/m; ε_r = 39.63; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.62, 7.62, 7.62) @ 2450 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

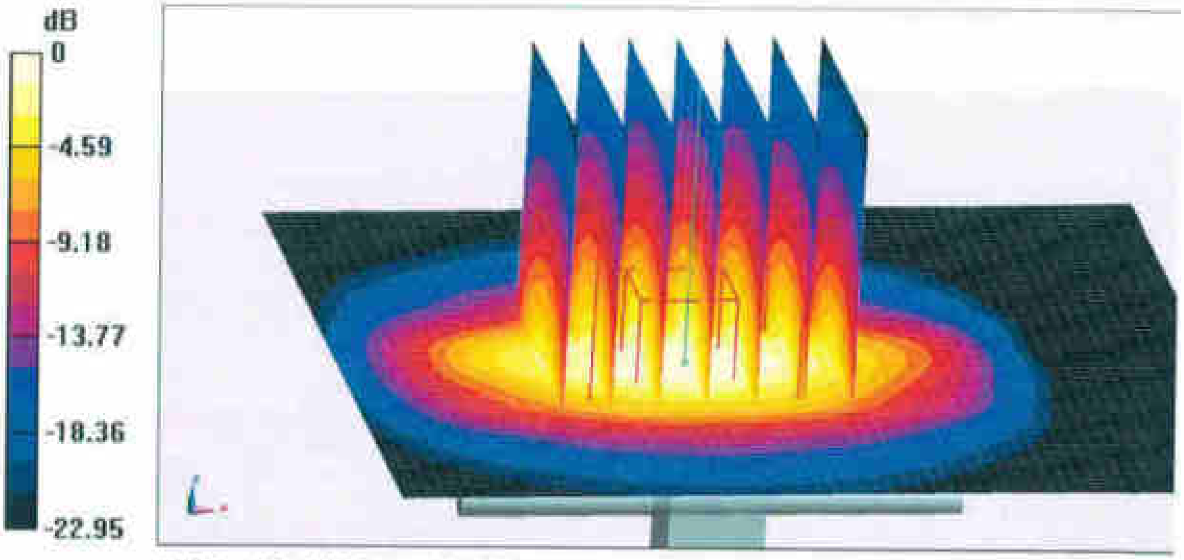
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.04 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 28.3 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.07 W/kg

Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 22.4 W/kg = 13.50 dBW/kg

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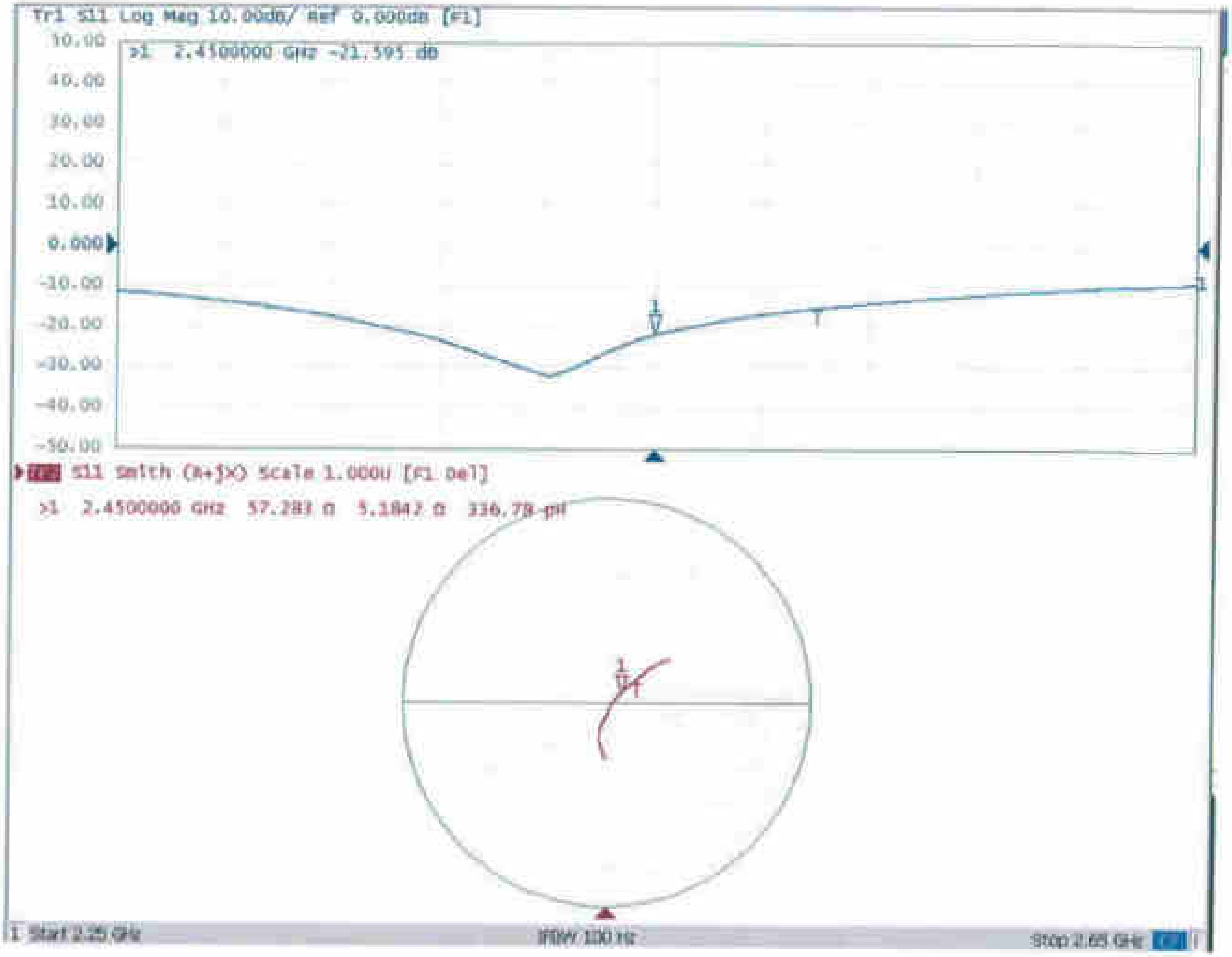
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 03.25.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 908

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

Medium parameters used: f = 2450 MHz; σ = 2.003 S/m; ε_r = 53.78; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.79, 7.79, 7.79) @ 2450 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

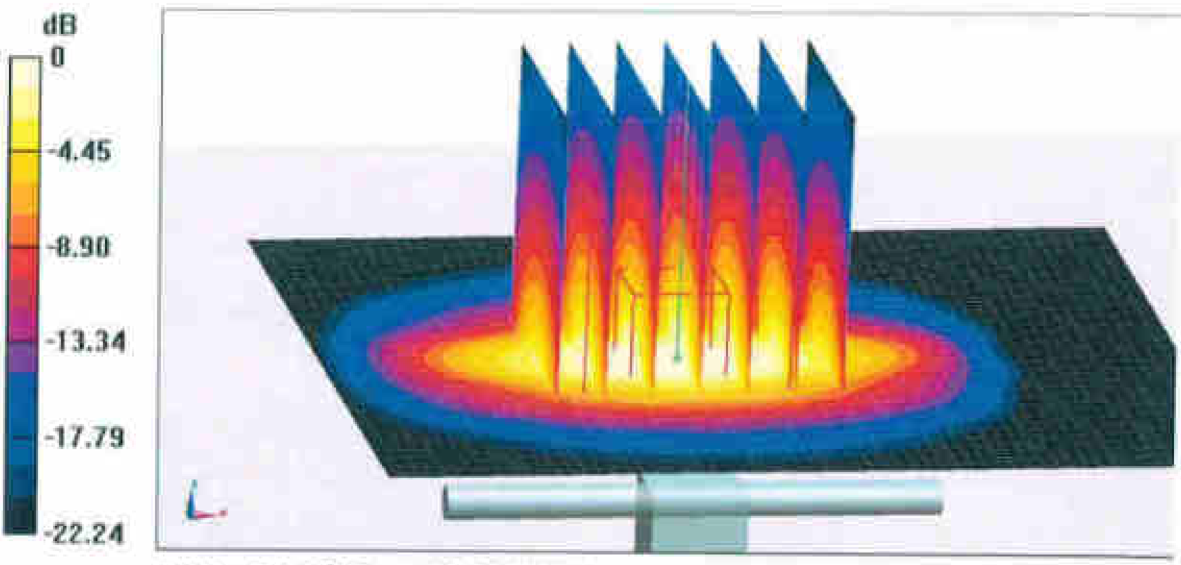
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.51 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 27.1 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.91 W/kg

Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

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Impedance Measurement Plot for Body TSL