FCC SAR Test Report

APPLICANT	:	**Motorola Solutions, Inc.**
EQUIPMENT	:	**NITRO Two-Way Radio**
BRAND NAME	:	**Motorola Solutions**
MODEL NAME	:	**SLN 1000**
FCC ID	:	**AZ489FT7123**
STANDARD	:	**FCC 47 CFR PART 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

The product was received on Apr. 02, 2019 and testing was started from Apr. 05, 2019 and completed on May 10, 2019. We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Mark Qu

Approved by: Mark Qu / Manager

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Sporton International (Shenzhen) Inc.
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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA913001	Rev. 01	Initial issue of report.	May 07, 2019
FA913001	Rev. 02	Retest body-worn SAR for WLAN 5.8GHz.	May 10, 2019

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Motorola Solutions, Inc., NITRO Two-Way Radio, SLN 1000,** are as follows.

Equipment Class	Frequency Band		Highest Standalone SAR Summary Face (Separation 25mm) 1g SAR (W/kg)	Highest Standalone SAR Summary Hotspot (Separation 10mm) 1g SAR (W/kg)	Highest Standalone SAR Summary Body-worn (Separation 0mm) 1g SAR (W/kg)
Licensed	LTE	Band 48	0.10	0.47	**0.47**
DTS	WLAN	2.4GHz WLAN	<0.10	0.32	<0.10
NII	WLAN	5GHz WLAN	**0.20**	**0.67**	0.22
DSS	2.4GHz Band	Bluetooth			<0.10

Highest SAR Summary Highest Simultaneous Transmission 1g SAR (W/kg)		
Face	Licensed + DTS	0.18
	Licensed + NII	0.30
Hotspot	Licensed + DTS	0.62
	Licensed + NII	**0.72**
Body-worn	Licensed + DTS	0.54
	Licensed + NII	0.60
	Licensed + NII + DSS	0.61
Date of Testing:	2019/4/5 ~ 2019/5/10	

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) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications

2. Administration Data

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

Applicant	
Company Name	Motorola Solutions, Inc.
Address	8000 West Sunrise Blvd., Ft Lauderdale, Florida 33322, United States

Manufacturer	
Company Name	Motorola Solutions, Inc.
Address	8000 West Sunrise Blvd., Ft Lauderdale, Florida 33322, United States

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
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	NITRO Two-Way Radio
Brand Name	Motorola Solutions
Model Name	SLN 1000
FCC ID	AZ489FT7123
IMEI Code	004401680684863
Wireless Technology and Frequency Range	LTE Band 48: 3552.5 MHz ~ 3697.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	LTE: QPSK, 16QAM WLAN 2.4GHz : 802.11b/g/n HT20/HT40 WLAN 5GHz : 802.11a/n HT20/HT40 Bluetooth BR/EDR/LE
HW Version	P2
SW Version	KEY_BASE_USR_D05.00.66
EUT Stage	Identical Prototype

Remark:

1. This device has PTT (push-to-talk) function, so perform 25mm in-front-of the face SAR. For the device can't support held-to-ear operating mode, so no need to considering head SAR testing.
2. The device can use with assigned accessory manufacturer offered, so perform 0mm body worn accessory SAR.
3. This device also support hotspot mode, so hotspot SAR has been performed.
4. This device 2.4GHz WLAN support hotspot operation.
5. This device 2.4GHz WLAN/5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.3GHz / 5.5GHz supports WiFi Direct (GC only).

4.2 Specification of Accessory

Specification of Accessory				
US AC Adapter 1 (Micrio USB Charger)	**Brand Name**	Motorola	**Model Name**	PS000150A11
	Power Rating	I/P: 100 - 240Vac, 0.25A, O/P: 5Vdc, 1.5A		
US AC Adapter 2 (SUC)	**Brand Name**	Motorola	**Model Name**	PMLN7109A
	Power Rating	I/P: 100 - 240Vac, 0.25A, O/P: 5Vdc, 1A		
US AC Adapter 3 (MUC)	**Brand Name**	Motorola	**Model Name**	PMLN7101A
	Power Rating	I/P: 100 - 240Vac, 1A, O/P: 5Vdc, 1A		
Battery 1	**Brand Name**	Motorola	**Model Name**	BT110 (PMNN4578A)
	Power Rating	3.7V~4.35Vdc, 2300/2500mAh(min/typ)	Type	Li-ion
Earphone 1	**Brand Name**	Motorola	**Model Name**	PMLN7189A
	Signal Line	1.28meter, non-shielded cable, with w/o ferrite core		
Earphone 2	**Brand Name**	Motorola	**Model Name**	PMLN7156A
	Signal Line	1.18meter, non-shielded cable, with w/o ferrite core		
Earphone 3	**Brand Name**	Motorola	**Model Name**	PMLN7157A
	Signal Line	1.64meter, non-shielded cable, with w/o ferrite core		
Earphone 4	**Brand Name**	Motorola	Model Name	PMLN7158A
	Signal Line	2.11meter, non-shielded cable, with w/o ferrite core		
Earphone 5	**Brand Name**	Motorola	**Model Name**	PMLN7159A
	Signal Line	1.69 meter, non-shielded cable, with w/o ferrite core		
Nylon Wrist Strap	**Brand Name**	Motorola	**Model Name**	PMLN6074A
Heavy Duty Swivel Belt Clip	**Brand Name**	Motorola	**Model Name**	PMLN7128A
Carry Holder/Holster with Swivel Belt Clip	**Brand Name**	Motorola	**Model Name**	PMLN7932A
AINA PTT voice responder	**Brand Name**	Motorola	**Model Name**	PMNN4126A

4.3 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>Equipment Name</td><td>NITRO Two-Way Radio</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 48: 3552.5 MHz ~ 3697.5 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 48: 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>Uplink Modulations used</td><td>QPSK / 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE Release Version</td><td>R10, Cat 4</td></tr>
<tr><td>CA Support</td><td>Not Supported</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr>
</table>
</td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

LTE Band 48								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	55265	3552.5	55290	3555	55315	3557.5	55340	3560
LM	55810	3607	55815	3607.5	55820	3608	55830	3609
HM	56170	3643	55165	3642.5	56160	3642	56150	3641
H	56715	3697.5	56690	3695	56665	3692.5	56640	3690

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:

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

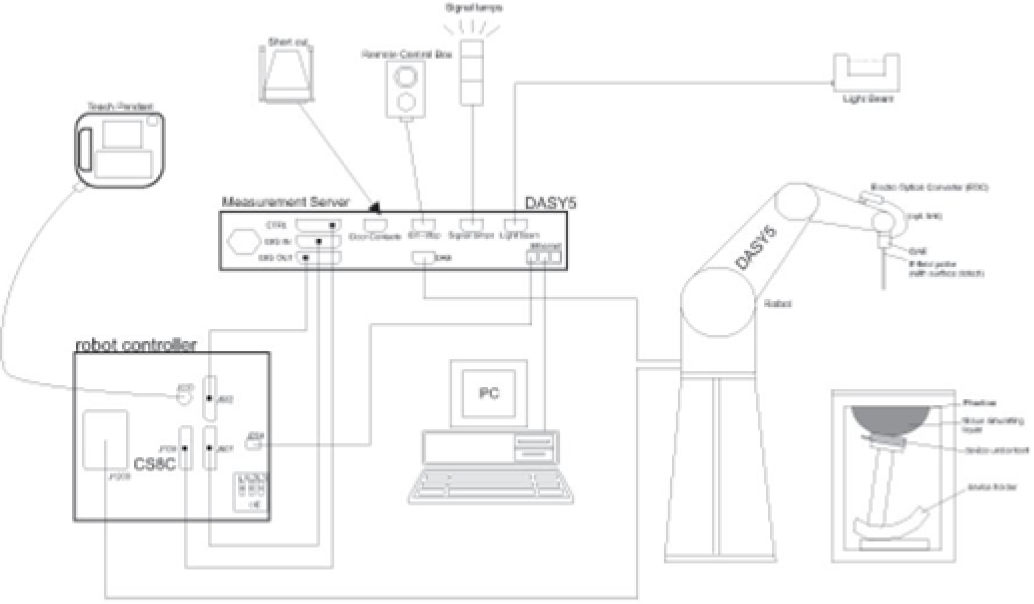
SAR is expressed in units of Watts per kilogram (W/kg)

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

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.

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

8.4 Zoom Scan

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

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

<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	736	2018/8/31	2019/8/30
SPEAG	3500MHz System Validation Kit	D3500V2	1037	2018/11/27	2019/11/26
SPEAG	3700MHz System Validation Kit	D3700V2	1008	2018/11/27	2019/11/26
SPEAG	5000MHz System Validation Kit	D5GHzV2	1167	2018/8/3	2019/8/2
SPEAG	Data Acquisition Electronics	DAE4	1303	2019/1/3	2020/1/2
SPEAG	Dosimetric E-Field Probe	EX3DV4	3819	2019/3/1	2020/2/29
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1670	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201300653	2018/7/18	2019/7/17
Agilent	Wireless Communication Test Set	E5515C	MY50267224	2018/9/11	2019/9/10
Agilent	Network Analyzer	E5071C	MY46523671	2018/10/18	2019/10/17
Speag	Dielectric Assessment KIT	DAK-3.5	1071	2018/11/20	2019/11/19
Agilent	Signal Generator	N5181A	MY50145381	2018/12/22	2019/12/21
Anritsu	Power Senor	MA2411B	1306099	2018/7/30	2019/7/29
Anritsu	Power Meter	ML2495A	1349001	2018/7/26	2019/7/25
Anritsu	Power Sensor	MA2411B	1207253	2018/12/22	2019/12/21
Anritsu	Power Meter	ML2495A	1218010	2018/12/22	2019/12/21
R&S	CBT BLUETOOTH TESTER	CBT	100963	2018/12/22	2019/12/21
R&S	Spectrum Analyzer	FSP7	100818	2018/7/18	2019/7/17
LKM electronic	Hygrometer	DTM3000	3241	2018/8/10	2019/8/9
Anymetre	Thermo-Hygrometer	JR593	2015030903	2018/12/22	2019/12/21
ARRA	Power Divider	A3200-2	N/A	Note	
PASTERNACK	Dual Directional Coupler	PE2214-10	N/A	Note	
Agilent	Dual Directional Coupler	778D	50422	Note	
MCL	Attenuation1	BW-S10W5	N/A	Note	
Weinschel	Attenuation2	3M-20	N/A	Note	
Zhongjilianhe	Attenuation3	MVE2214-03	N/A	Note	
mini-circuits	Amplifier	ZHL-42W+	QA1341002	Note	
mini-circuits	Amplifier	ZVE-3W-83+	599201528	Note	

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

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For 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. 10.1. 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. 10.2.

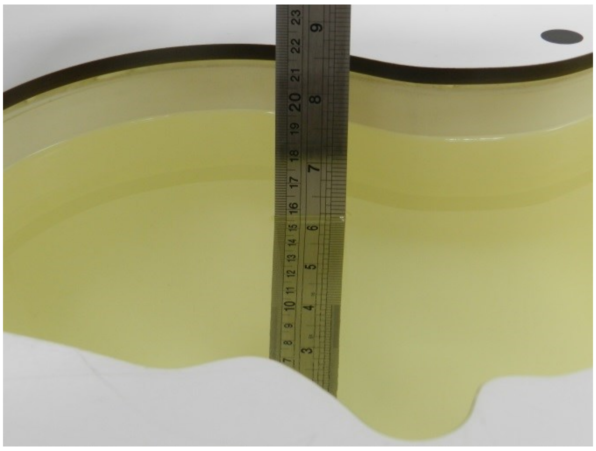


Fig 10.1Photo of Liquid Height for Head SAR

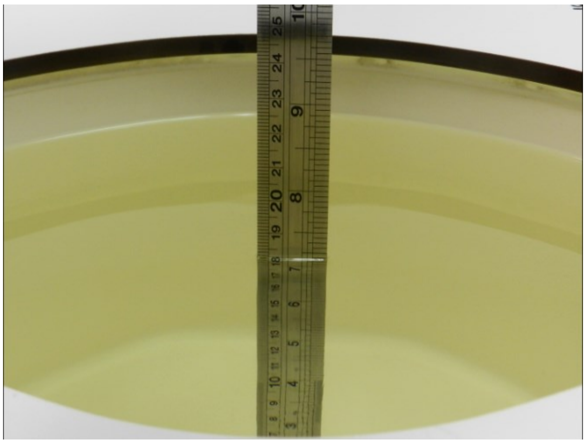


Fig 10.2 Photo of Liquid Height for Body SAR

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
For Body								
2450	68.6	0	0	0	0	31.4	1.95	52.7

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	Head	22.6	1.878	40.464	1.80	39.20	4.33	3.22	±5	2019/4/17
3500	Head	22.4	2.817	39.527	2.91	37.90	-3.20	4.29	±5	2019/4/5
3700	Head	22.4	3.054	38.374	3.12	37.70	-2.12	1.79	±5	2019/4/5
5250	Head	22.8	4.703	36.115	4.71	35.95	-0.15	0.46	±5	2019/4/17
5600	Head	22.4	4.848	35.767	5.07	35.50	-4.38	0.75	±5	2019/4/17
5750	Head	22.5	5.170	35.843	5.22	35.35	-0.96	1.39	±5	2019/4/17
2450	Body	22.5	1.992	52.291	1.95	52.70	2.15	-0.78	±5	2019/4/17
3500	Body	22.7	3.319	51.784	3.31	51.30	0.27	0.94	±5	2019/4/7
3700	Body	22.7	3.524	51.522	3.55	51.00	-0.73	1.02	±5	2019/4/7
5250	Body	22.6	5.276	50.886	5.36	48.95	-1.57	3.96	±5	2019/4/17
5600	Body	22.4	5.825	50.395	5.77	48.50	0.95	3.91	±5	2019/4/17
5750	Body	22.6	6.051	50.049	5.94	48.28	1.87	3.66	±5	2019/4/17
5750	Body	22.9	6.050	50.057	5.94	48.28	1.85	3.68	±5	2019/5/10

10.3 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2019/4/17	2450	Head	250	736	3819	1303	12.10	52.70	48.4	-8.16
2019/4/5	3500	Head	100	1037	3819	1303	6.79	65.30	67.9	3.98
2019/4/5	3700	Head	100	1008	3819	1303	6.16	67.00	61.6	-8.06
2019/4/17	5250	Head	100	1167	3819	1303	7.34	77.00	73.4	-4.68
2019/4/17	5600	Head	100	1167	3819	1303	7.34	80.80	73.4	-9.16
2019/4/17	5750	Head	100	1167	3819	1303	7.07	76.90	70.7	-8.06
2019/4/17	2450	Body	250	736	3819	1303	11.80	51.50	47.2	-8.35
2019/4/7	3500	Body	100	1037	3819	1303	6.51	61.40	65.1	6.03
2019/4/7	3700	Body	100	1008	3819	1303	6.19	63.60	61.9	-2.67
2019/4/17	5250	Body	100	1167	3819	1303	7.19	74.40	71.9	-3.36
2019/4/17	5600	Body	100	1167	3819	1303	8.34	77.10	83.4	8.17
2019/4/17	5750	Body	100	1167	3819	1303	7.62	74.30	76.2	2.56
2019/5/10	5750	Body	100	1167	3819	1303	7.21	74.30	72.1	-2.96

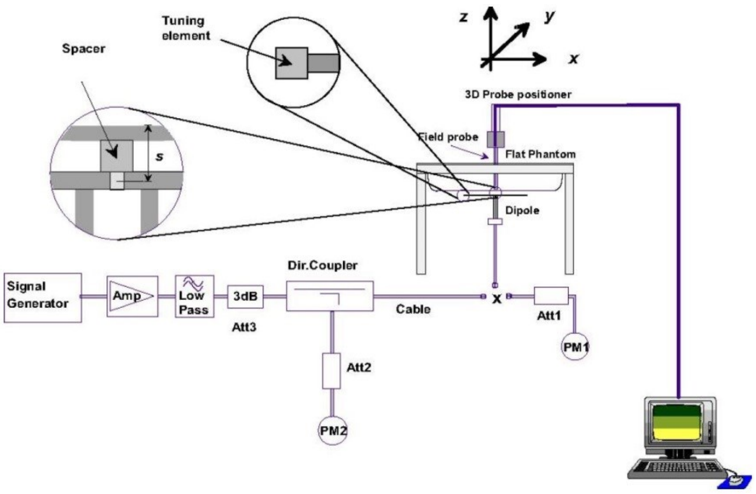


Fig 10.3.1 System Performance Check Setup

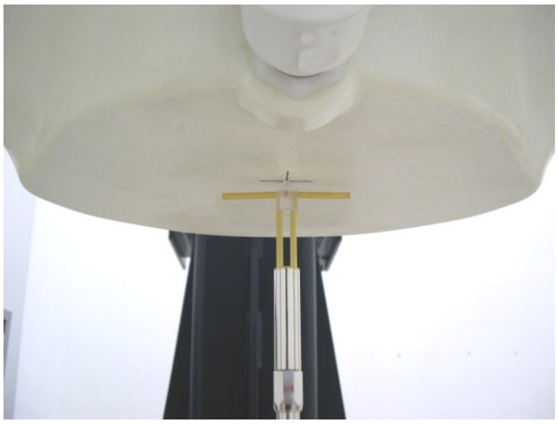


Fig 10.3.2 Setup Photo

11. RF Exposure Positions

11.1 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

12. Conducted RF Output Power (Unit: dBm)

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations

b. “special subframe S” contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS

c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

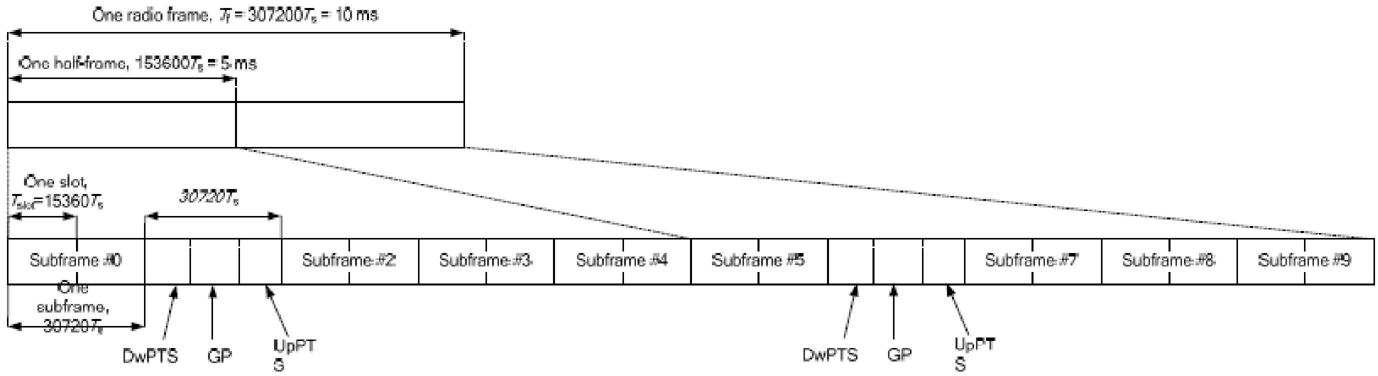


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

<table>
<tr><th rowspan="3">Special subframe configuration</th><th colspan="3">Normal cyclic prefix in downlink</th><th colspan="3">Extended cyclic prefix in downlink</th></tr>
<tr><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th></tr>
<tr><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th></tr>
<tr><td>0</td><td>$6592 \cdot T_s$</td><td rowspan="5">$2192 \cdot T_s$</td><td rowspan="5">$2560 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$2192 \cdot T_s$</td><td rowspan="4">$2560 \cdot T_s$</td></tr>
<tr><td>1</td><td>$19760 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>2</td><td>$21952 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>3</td><td>$24144 \cdot T_s$</td><td>$25600 \cdot T_s$</td></tr>
<tr><td>4</td><td>$26336 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$4384 \cdot T_s$</td><td rowspan="4">$5120 \cdot T_s$</td></tr>
<tr><td>5</td><td>$6592 \cdot T_s$</td><td rowspan="5">$4384 \cdot T_s$</td><td rowspan="5">$5120 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>6</td><td>$19760 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>7</td><td>$21952 \cdot T_s$</td><td>$12800 \cdot T_s$</td></tr>
<tr><td>8</td><td>$24144 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>$13168 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
</table>

Special subframe ($30720 \cdot T_s$): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe($30720 \cdot T_s$): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.
ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink
iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%
iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%
v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

<LTE Band 48>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)				MPR (dB)
Channel				55340	55830	56150	56640	55340	55830	56150	56640	
Frequency (MHz)				3560	3609	3641	3690	3560	3609	3641	3690	
20	QPSK	1	0	**20.89**	20.54	19.88	19.46	22	22	21.5	21	0
20	QPSK	1	49	20.51	20.20	19.57	19.09					
20	QPSK	1	99	20.43	20.09	19.64	19.11					
20	QPSK	50	0	20.71	20.37	19.76	19.33	22	22	21.5	21	≤ 1
20	QPSK	50	24	20.60	20.28	19.69	19.16					
20	QPSK	50	50	20.46	20.07	19.61	19.10					
20	QPSK	100	0	20.55	20.13	19.70	19.21					
20	16QAM	1	0	19.92	19.61	18.99	19.54	21	21	20.5	20	≤ 1
20	16QAM	1	49	19.59	19.29	18.67	18.20					
20	16QAM	1	99	19.53	19.19	18.80	18.27					
20	16QAM	50	0	19.77	19.45	18.82	18.34	21	21	20.5	20	≤ 2
20	16QAM	50	24	19.69	19.34	18.78	18.25					
20	16QAM	50	50	19.53	19.15	18.70	18.19					
20	16QAM	100	0	19.64	19.24	18.78	18.30					
Channel				55315	55820	56160	56665	55315	55820	56160	56665	MPR (dB)
Frequency (MHz)				3557.5	3608	3642	3692.5	3557.5	3608	3642	3692.5	
15	QPSK	1	0	20.85	20.55	19.91	19.45	22	22	21.5	21	0
15	QPSK	1	37	20.64	20.29	19.71	19.19					
15	QPSK	1	74	20.66	20.29	19.77	19.23					
15	QPSK	36	0	20.78	20.41	19.83	19.35	22	22	21.5	21	≤ 1
15	QPSK	36	20	20.70	20.36	19.78	19.26					
15	QPSK	36	39	20.64	20.15	19.69	19.21					
15	QPSK	75	0	20.72	20.23	19.75	19.25					
15	16QAM	1	0	20.08	19.69	19.08	18.57	21	21	20.5	20	≤ 1
15	16QAM	1	37	19.86	19.41	18.62	18.29					
15	16QAM	1	74	19.86	19.31	18.87	18.31					
15	16QAM	36	0	19.92	19.53	18.87	18.36	21	21	20.5	20	≤ 2
15	16QAM	36	20	19.87	19.48	18.82	18.32					
15	16QAM	36	39	19.83	19.23	18.82	18.31					
15	16QAM	75	0	19.90	19.33	18.88	18.38					

Channel				55290	55815	56165	56690	55290	55815	56165	56690	MPR (dB)
Frequency (MHz)				3555	3607.5	3642.5	3695	3555	3607.5	3642.5	3695	
10	QPSK	1	0	20.84	20.46	19.78	19.41	22	22	21.5	21	0
10	QPSK	1	25	20.66	20.31	19.63	19.13					
10	QPSK	1	49	20.65	20.31	19.67	19.16					
10	QPSK	25	0	20.73	20.34	19.68	19.20	22	22	21.5	21	≤ 1
10	QPSK	25	12	20.70	20.37	19.66	19.18					
10	QPSK	25	25	20.64	20.27	19.62	19.10					
10	QPSK	50	0	20.73	20.35	19.67	19.16					
10	16QAM	1	0	19.63	19.30	18.62	18.21	21	21	20.5	20	≤ 1
10	16QAM	1	25	19.47	19.12	18.61	18.12					
10	16QAM	1	49	19.51	19.15	18.59	18.09					
10	16QAM	25	0	19.76	19.42	18.72	18.31	21	21	20.5	20	≤ 2
10	16QAM	25	12	19.73	19.37	18.71	18.28					
10	16QAM	25	25	19.71	19.37	18.66	18.21					
10	16QAM	50	0	19.74	19.42	18.69	18.28					
Channel				55265	55810	56170	56715	55265	55810	56170	56715	MPR (dB)
Frequency (MHz)				3552.5	3607	3643	3697.5	3552.5	3607	3643	3697.5	
5	QPSK	1	0	20.78	20.39	19.81	19.32	22	22	21.5	21	0
5	QPSK	1	12	20.67	20.32	19.73	19.21					
5	QPSK	1	24	20.70	20.35	19.77	19.22					
5	QPSK	12	0	20.73	20.31	19.78	19.24	22	22	21.5	21	≤ 1
5	QPSK	12	7	20.71	20.33	19.76	19.23					
5	QPSK	12	13	20.68	20.31	19.75	19.21					
5	QPSK	25	0	20.65	20.32	19.74	19.22					
5	16QAM	1	0	19.56	19.23	18.67	18.13	21	21	20.5	20	≤ 1
5	16QAM	1	12	19.49	19.15	18.55	18.09					
5	16QAM	1	24	19.50	19.14	18.58	18.05					
5	16QAM	12	0	19.76	19.38	18.82	18.31	21	21	20.5	20	≤ 2
5	16QAM	12	7	19.75	19.35	18.80	18.27					
5	16QAM	12	13	19.69	19.34	18.75	18.24					
5	16QAM	25	0	19.72	19.33	18.79	18.25					

<WLAN Conducted Power>

General Note:

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

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	19.06	21.00	100.00
		6	2437	18.33	20.00	
		11	2462	18.18	20.00	
	802.11g 6Mbps	1	2412	16.19	18.00	94.67
		6	2437	15.41	17.00	
		11	2462	15.40	17.00	
	802.11n-HT20 MCS0	1	2412	15.11	17.00	92.36
		6	2437	14.52	16.50	
		11	2462	14.35	16.00	
	802.11n-HT40 MCS0	3	2422	12.03	14.00	89.12
		6	2437	11.82	13.50	
		9	2452	12.10	14.00	

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	14.80	16.50	94.94
		40	5200	14.93	16.50	
		44	5220	15.89	17.50	
		48	5240	15.83	17.50	
	802.11n-HT20 MCS0	36	5180	13.86	15.50	94.73
		40	5200	13.88	15.50	
		44	5220	13.82	15.50	
		48	5240	13.74	15.50	
	802.11n-HT40 MCS0	38	5190	12.84	14.50	85.25
		46	5230	12.86	14.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	15.87	17.50	94.94
		56	5280	15.64	17.50	
		60	5300	15.57	17.50	
		64	5320	15.50	17.50	
	802.11n-HT20 MCS0	52	5260	14.16	16.00	94.73
		56	5280	14.03	16.00	
		60	5300	13.92	15.50	
		64	5320	13.89	15.50	
	802.11n-HT40 MCS0	54	5270	13.33	15.00	85.25
		62	5310	12.39	14.00	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	15.92	17.50	94.94
		116	5580	16.06	18.00	
		124	5620	**16.30**	18.00	
		132	5660	16.08	18.00	
		140	5700	15.81	17.50	
		144	5720	15.51	17.50	
	802.11n-HT20 MCS0	100	5500	13.82	15.50	94.73
		116	5580	14.08	16.00	
		124	5620	13.75	15.50	
		132	5660	13.69	15.50	
		140	5700	13.39	15.00	
		144	5720	13.22	15.00	
	802.11n-HT40 MCS0	102	5510	12.90	14.50	85.25
		110	5550	13.18	15.00	
		126	5630	12.97	14.50	
		134	5670	12.96	14.50	
		142	5710	12.89	14.50	

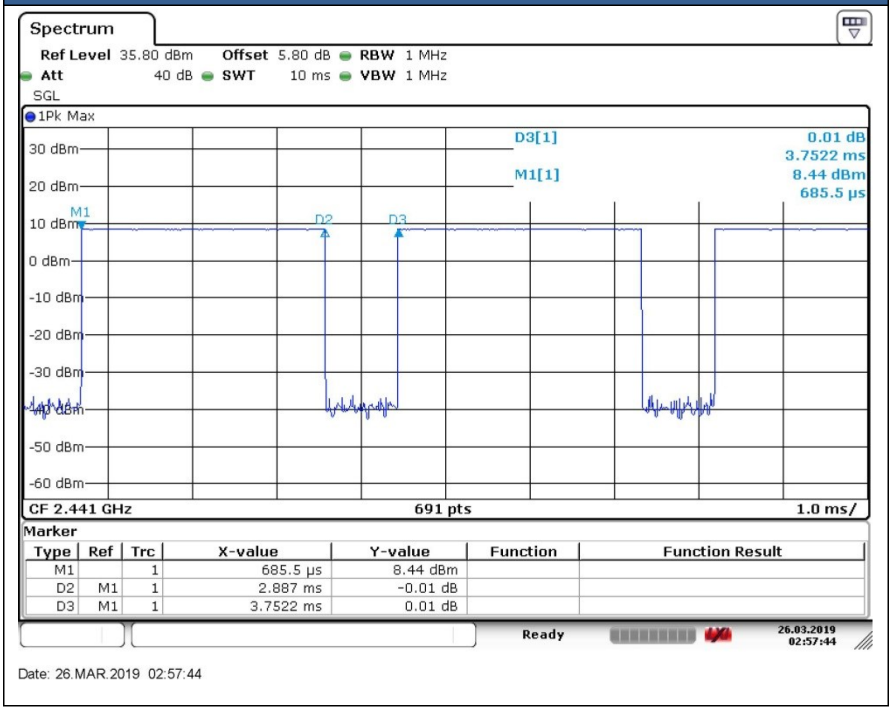
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a MCS0	149	5745	15.61	17.50	94.94
		157	5785	**16.06**	18.00	
		165	5825	15.98	17.50	
	802.11n-HT20 MCS0	149	5745	13.60	15.50	94.73
		157	5785	14.00	16.00	
		165	5825	13.98	15.50	
	802.11n-HT40 MCS0	151	5755	12.92	14.50	85.25
		159	5795	13.18	15.00	

<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 76.94 % 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



Mode	Channel	Frequency (MHz)	Average power (dBm)
			1Mbps
BR/EDR	CH 00	2402	**9.02**
	CH 39	2441	8.50
	CH 78	2480	7.86
Tune-up limit (dBm)			11.00

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
v4.0 LE	CH 00	2402	**0.77**
	CH 19	2440	0.42
	CH 39	2480	0.27
Tune-up limit (dBm)			2.50

13. Antenna Location

Please refer to appendix D for SAR test setup photo.

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 WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   e. For TDD LTE SAR measurement, the duty cycle 1:2.33 (42.9 %) for power class 2 and 1:1.59 (62.9 %) for power class 3 were used perform testing and considering the theoretical duty cycle of 43.3% for power class 2 and 63.3% for power class 3 for extended cyclic prefix in the uplink, and the theoretical duty cycle of 42.9% for power class 2 and 62.9% for power class 3 for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 43.3%/42.9% = 1.009 for power class 2 and 63.3%/62.9% = 1.006 for power class 3 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. This device has PTT (push-to-talk) function, so perform 25mm in-front-of the face SAR.
5. The device can use with assigned accessory manufacturer offered, so perform 0mm body worn accessory SAR.
6. For Swivel Carry Holster, when using body-worn accessory, the device can enclose the holster with front face or back face, so for body-worn SAR testing, evaluated front/back face when enclose to the holster. There is a swivel belt clip adhere to holster, only rotation for using.
7. 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.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing 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. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

14.1 Face SAR

<u><LTE SAR></u>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	LTE Band 48	20M	QPSK	1	0	In front of face	25	55340	3560	20.89	22.00	1.291	62.9	1.006	-0.01	0.074	0.097
	LTE Band 48	20M	QPSK	50	0	In front of face	25	55340	3560	20.71	22.00	1.346	62.9	1.006	0.02	0.071	0.096

<u><WLAN 2.4GHz SAR></u>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
02	WLAN2.4GHz	802.11b 1Mbps	In front of face	25	1	2412	19.06	21.00	1.563	100	1.000	0.02	0.051	0.080

<u><WLAN 5GHz SAR></u>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
03	WLAN5.3GHz	802.11a 6Mbps	In front of face	25	52	5260	15.87	17.50	1.455	94.94	1.053	0.08	0.129	0.198
04	WLAN5.5GHz	802.11a 6Mbps	In front of face	25	124	5620	16.30	18.00	1.479	94.94	1.053	0.05	0.052	0.081
05	WLAN5.8GHz	802.11a 6Mbps	In front of face	25	157	5785	16.06	18.00	1.563	94.94	1.053	0.04	0.065	0.107

14.2 Hotspot SAR

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 48	20M	QPSK	1	0	Front	10	55340	3560	20.89	22.00	1.291	62.9	1.006	0.05	0.224	0.291
	LTE Band 48	20M	QPSK	50	0	Front	10	55340	3560	20.71	22.00	1.346	62.9	1.006	-0.06	0.222	0.301
	LTE Band 48	20M	QPSK	1	0	Back	10	55340	3560	20.89	22.00	1.291	62.9	1.006	0.03	0.245	0.318
	LTE Band 48	20M	QPSK	50	0	Back	10	55340	3560	20.71	22.00	1.346	62.9	1.006	-0.01	0.232	0.314
	LTE Band 48	20M	QPSK	1	0	Right Side	10	55340	3560	20.89	22.00	1.291	62.9	1.006	0.1	0.269	0.349
06	LTE Band 48	20M	QPSK	50	0	Right Side	10	55340	3560	20.71	22.00	1.346	62.9	1.006	0.05	0.349	**0.473**
	LTE Band 48	20M	QPSK	1	0	Top Side	10	55340	3560	20.89	22.00	1.291	62.9	1.006	-0.01	0.073	0.095
	LTE Band 48	20M	QPSK	50	0	Top Side	10	55340	3560	20.71	22.00	1.346	62.9	1.006	0.03	0.081	0.110

<WLAN 2.4GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
07	WLAN2.4GHz	802.11b 1Mbps	Front	10	1	2412	19.06	21.00	1.563	100	1.000	-0.17	0.206	**0.322**
	WLAN2.4GHz	802.11b 1Mbps	Back	10	1	2412	19.06	21.00	1.563	100	1.000	0.1	0.106	0.166
	WLAN2.4GHz	802.11b 1Mbps	Left Side	10	1	2412	19.06	21.00	1.563	100	1.000	0.03	0.076	0.119

<WLAN 5GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.2GHz	802.11a 6Mbps	Front	10	44	5220	15.89	17.50	1.448	94.94	1.053	0.17	0.102	0.156
	WLAN5.2GHz	802.11a 6Mbps	Back	10	44	5220	15.89	17.50	1.448	94.94	1.053	-0.02	0.176	0.268
08	WLAN5.2GHz	802.11a 6Mbps	Left Side	10	44	5220	15.89	17.50	1.448	94.94	1.053	-0.04	0.310	**0.473**
	WLAN5.8GHz	802.11a 6Mbps	Front	10	157	5785	16.06	18.00	1.563	94.94	1.053	0.03	0.194	0.319
	WLAN5.8GHz	802.11a 6Mbps	Back	10	157	5785	16.06	18.00	1.563	94.94	1.053	0.05	0.242	0.398
09	WLAN5.8GHz	802.11a 6Mbps	Left Side	10	157	5785	16.06	18.00	1.563	94.94	1.053	0.11	0.404	**0.665**
	WLAN5.8GHz	802.11a 6Mbps	Left Side	10	165	5825	15.98	17.50	1.419	94.94	1.053	0.05	0.316	0.472

14.3 Body Worn Accessory SAR

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Carry Accessory	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 48	20M	QPSK	1	0	Front Face	Swivel Carry Holster	0	55340	3560	20.89	22.00	1.291	62.9	1.006	0.01	0.359	0.466
10	LTE Band 48	20M	QPSK	50	0	Front Face	Swivel Carry Holster	0	55340	3560	20.71	22.00	1.346	62.9	1.006	-0.06	0.350	**0.474**
	LTE Band 48	20M	QPSK	1	0	Back Face	Swivel Carry Holster	0	55340	3560	20.89	22.00	1.291	62.9	1.006	0.03	0.137	0.178
	LTE Band 48	20M	QPSK	50	0	Back Face	Swivel Carry Holster	0	55340	3560	20.71	22.00	1.346	62.9	1.006	-0.08	0.134	0.181
	LTE Band 48	20M	QPSK	1	0	Back Face	Belt Clip	0	55340	3560	20.89	22.00	1.291	62.9	1.006	0.1	0.246	0.320
	LTE Band 48	20M	QPSK	50	0	Back Face	Belt Clip	0	55340	3560	20.71	22.00	1.346	62.9	1.006	-0.06	0.242	0.328

<WLAN 2.4GHz SAR>

Plot No.	Band	Mode	Test Position	Carry Accessory	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Front Face	Swivel Carry Holster	0	1	2412	19.06	21.00	1.563	100	1.000	0.13	0.044	0.069
	WLAN2.4GHz	802.11b 1Mbps	Back Face	Swivel Carry Holster	0	1	2412	19.06	21.00	1.563	100	1.000	0.05	0.026	0.040
11	WLAN2.4GHz	802.11b 1Mbps	Back Face	Belt Clip	0	1	2412	19.06	21.00	1.563	100	1.000	0.02	0.059	**0.092**

<WLAN 5GHz SAR>

Plot No.	Band	Mode	Test Position	Carry Accessory	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.3GHz	802.11a 6Mbps	Front Face	Swivel Carry Holster	0	52	5260	15.87	17.50	1.455	94.94	1.053	0.03	0.050	0.076
12	WLAN5.3GHz	802.11a 6Mbps	Back Face	Swivel Carry Holster	0	52	5260	15.87	17.50	1.455	94.94	1.053	0.09	0.112	**0.172**
	WLAN5.3GHz	802.11a 6Mbps	Back Face	Belt Clip	0	52	5260	15.87	17.50	1.455	94.94	1.053	0.12	0.074	0.113
	WLAN5.5GHz	802.11a 6Mbps	Front Face	Swivel Carry Holster	0	124	5620	16.30	18.00	1.479	94.94	1.053	-0.07	0.080	0.125
13	WLAN5.5GHz	802.11a 6Mbps	Back Face	Swivel Carry Holster	0	124	5620	16.30	18.00	1.479	94.94	1.053	-0.09	0.141	**0.220**
	WLAN5.5GHz	802.11a 6Mbps	Back Face	Belt Clip	0	124	5620	16.30	18.00	1.479	94.94	1.053	0.05	0.082	0.128
	WLAN5.8GHz	802.11a 6Mbps	Front Face	Swivel Carry Holster	0	157	5785	16.06	18.00	1.563	94.94	1.053	-0.01	0.065	0.107
14	WLAN5.8GHz	802.11a 6Mbps	Back Face	Swivel Carry Holster	0	157	5785	16.06	18.00	1.563	94.94	1.053	-0.07	0.136	**0.224**
	WLAN5.8GHz	802.11a 6Mbps	Back Face	Belt Clip	0	157	5785	16.06	18.00	1.563	94.94	1.053	-0.07	0.088	0.145

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Carry Accessory	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	1Mbps	Front Face	Swivel Carry Holster	0	0	2402	9.02	11	1.578	76.94	1.083	0.01	0.005	0.009
	Bluetooth	1Mbps	Back Face	Swivel Carry Holster	0	0	2402	9.02	11	1.578	76.94	1.083	0.03	0.003	0.004
15	Bluetooth	1Mbps	Back Face	Belt Clip	0	0	2402	9.02	11	1.578	76.94	1.083	-0.05	0.00831	**0.014**

15. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	WAVE TWO-WAY RADIO		
		Face	Hotspot	Body-worn
1.	LTE + WLAN2.4GHz	Yes	Yes	Yes
2.	LTE + WLAN5.2GHz	Yes	Yes	Yes
3.	LTE + WLAN5.3GHz	Yes		Yes
4.	LTE + WLAN5.5GHz	Yes		Yes
5.	LTE + WLAN5.8GHz	Yes	Yes	Yes
6.	LTE + Bluetooth			Yes
7.	LTE + WLAN5.2GHz+ Bluetooth			Yes
8.	LTE + WLAN5.3GHz+ Bluetooth			Yes
9.	LTE + WLAN5.5GHz+ Bluetooth			Yes
10.	LTE + WLAN5.8GHz+ Bluetooth			Yes

General Note:

1. This device 2.4GHz WLAN/ 5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WLAN Direct (GC/GO), and 5.3GHz / 5.5GHz supports WLAN Direct (GC only).
2. WLAN 2.4GHz and Bluetooth share the same antenna so can't transmit simultaneously.
3. According to EUT character, WLAN5GHz can transmit with Bluetooth simultaneously though they share the same antenna.
4. 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.
5. The worst case 5 GHz WLAN SAR for each configuration was used for SAR summation.
6. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

15.1 Head Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
LTE	Band 48	In the front of face at 25mm	0.097	0.080	0.198	0.18	0.30

15.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
LTE	Band 48	Front at 10mm	0.301	0.322	0.319	0.62	0.62
		Back at 10mm	0.318	0.166	0.398	0.48	0.72
		Left side at 10mm		0.119	0.665	0.12	0.67
		Right side at 10mm	0.473			0.47	0.47
		Top side at 10mm	0.110			0.11	0.11

15.3 Body-Worn Accessory Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	4 Bluetooth 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+3+4 Summed 1g SAR (W/kg)
LTE	Band 48	Front Face at 0mm Swivel Carry Holster	0.474	0.069	0.125	0.009	0.54	0.60	0.61
		Back Face at 0mm Swivel Carry Holster	0.181	0.040	0.224	0.004	0.22	0.41	0.41
		Back Face at 0mm Belt Clip	0.328	0.092	0.145	0.014	0.42	0.47	0.49

Test Engineer： Johnny Chen

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. 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. 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.

[10] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[11] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[12] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Head_2450MHz

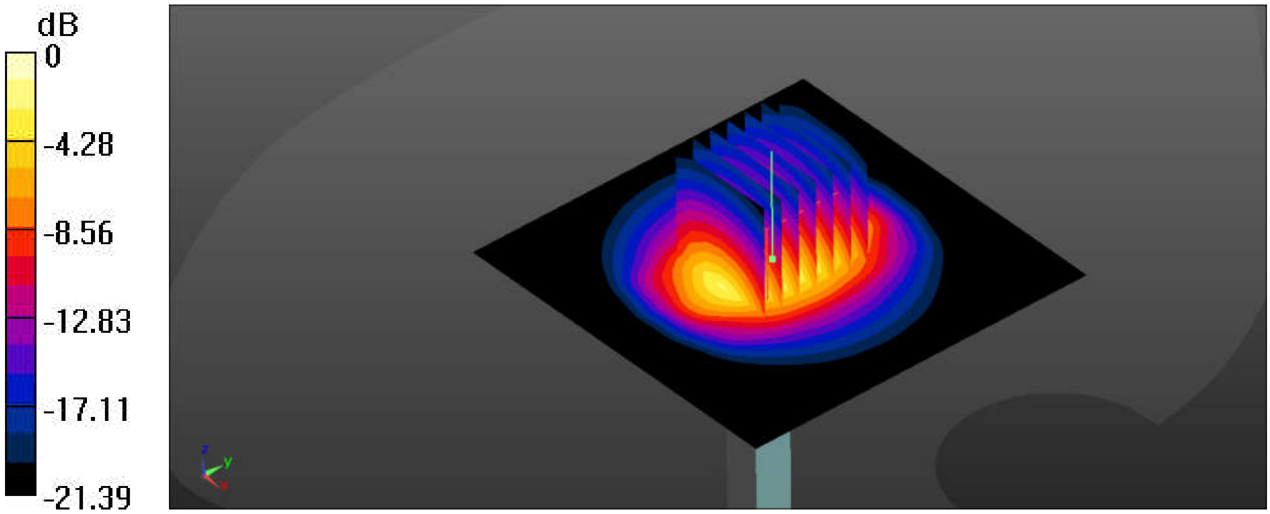
DUT: D2450V2-SN:736

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450_190417 Medium parameters used: f = 2450 MHz; σ = 1.878 S/m; ε_r = 40.464; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.21, 7.21, 7.21); Calibrated: 2019.03.01
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 25.4 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.5 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 33.7 W/kg
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 6.32 W/kg
Maximum value of SAR (measured) = 25.3 W/kg



0 dB = 25.3 W/kg

System Check_Head_3500MHz

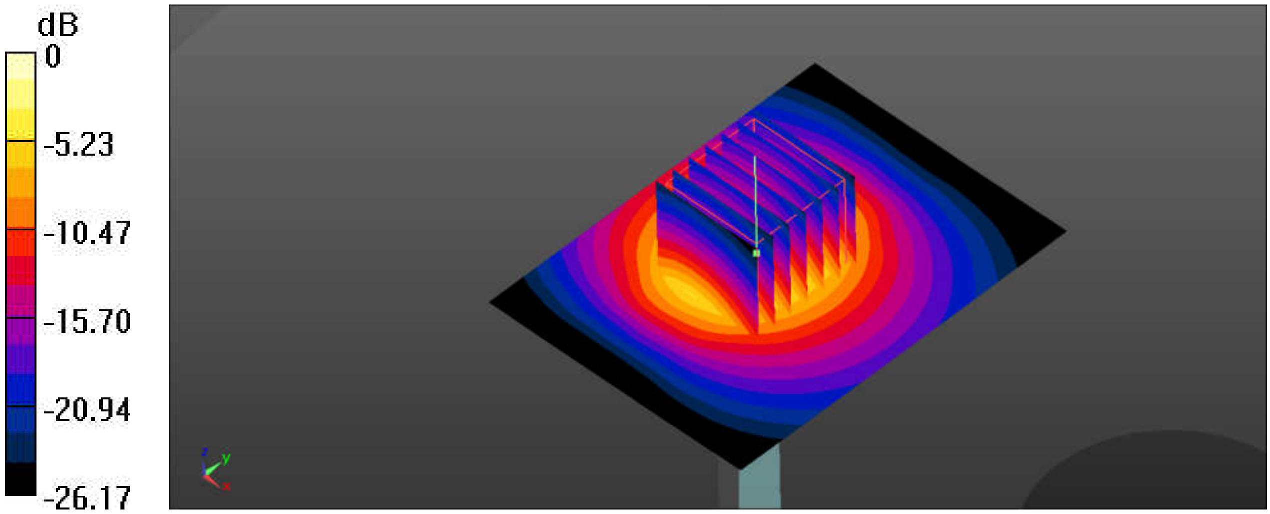
DUT: D3500V2-SN:1037

Communication System: UID 0, CW (0); Frequency: 3500 MHz;Duty Cycle: 1:1
Medium: HSL_3500_190405 Medium parameters used: f = 3500 MHz; σ = 2.817 S/m; ε_r = 39.527; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.89, 6.89, 6.89); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 13.9 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 49.96 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 19.4 W/kg
SAR(1 g) = 6.79 W/kg; SAR(10 g) = 2.45 W/kg
Maximum value of SAR (measured) = 13.6 W/kg



0 dB = 13.6 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.04.05

System Check_Head_3700MHz

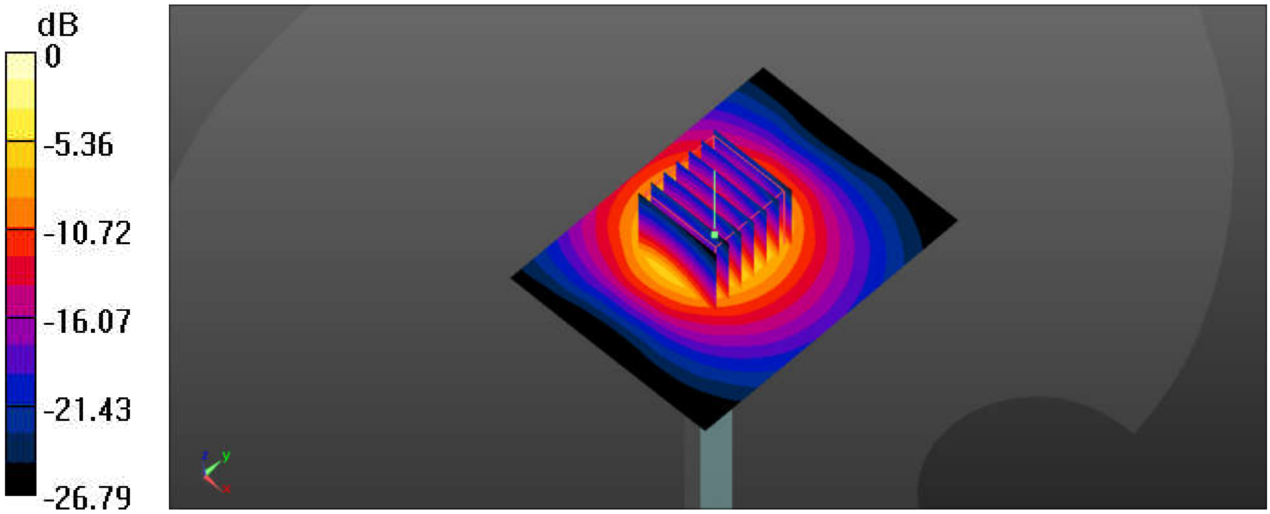
DUT: D3700V2-SN:1008

Communication System: UID 0, CW (0); Frequency: 3700 MHz;Duty Cycle: 1:1
Medium: HSL_3700_190405 Medium parameters used: f = 3700 MHz; σ = 3.054 S/m; ε_r = 38.374; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.67, 6.67, 6.67); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 12.9 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 43.99 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 6.16 W/kg; SAR(10 g) = 2.27 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.9 W/kg

System Check_Head_5250MHz

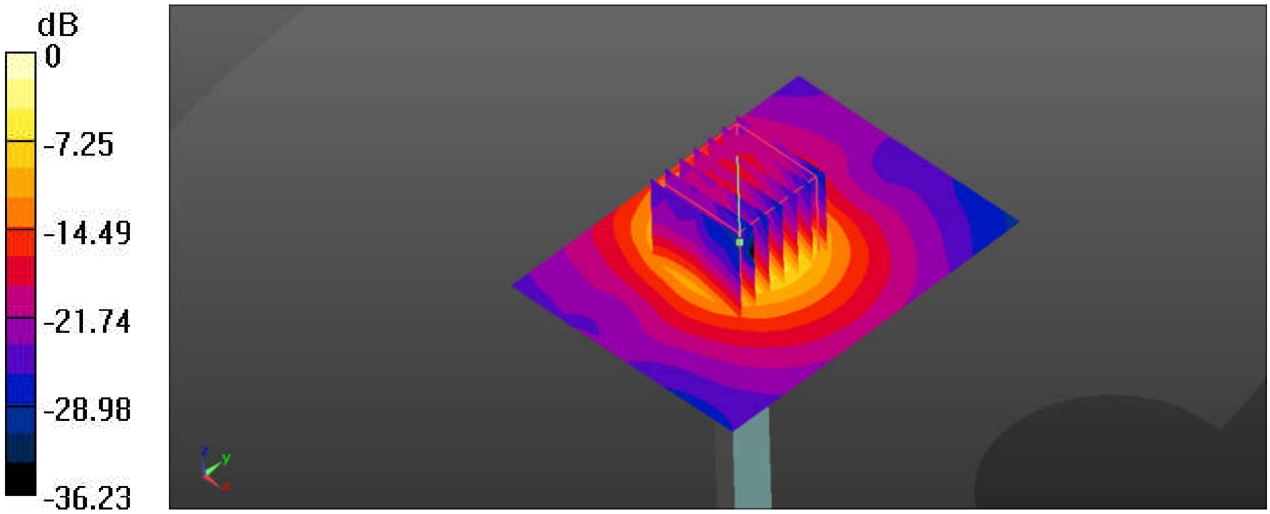
DUT: D5GHzV2-SN:1167

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: HSL_5250_190417 Medium parameters used: f = 5250 MHz; σ = 4.703 S/m; ε_r = 36.115; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(5.07, 5.07, 5.07); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 18.0 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 39.24 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.5 W/kg
SAR(1 g) = 7.34 W/kg; SAR(10 g) = 2.05 W/kg
Maximum value of SAR (measured) = 18.2 W/kg



0 dB = 18.2 W/kg

System Check_Head_5600MHz

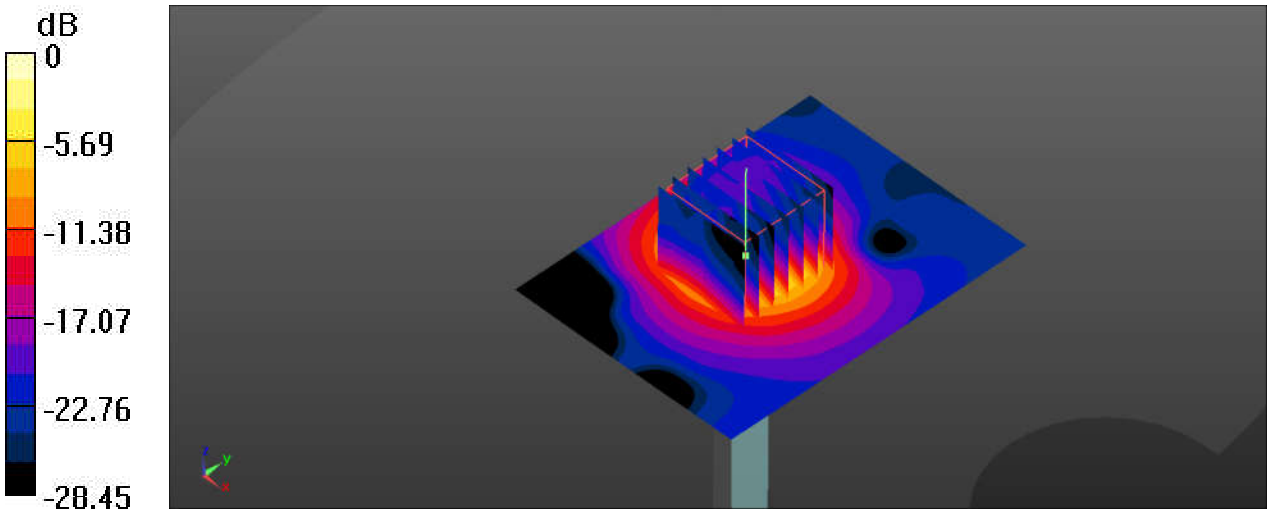
DUT: D5GHzV2-SN:1167

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: HSL_5600_190417 Medium parameters used: f = 5600 MHz; σ = 4.848 S/m; ε_r = 35.767; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.7, 4.7, 4.7); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 18.0 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 39.20 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 31.0 W/kg
SAR(1 g) = 7.34 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.6 W/kg



0 dB = 18.6 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.04.17

System Check_Head_5750MHz

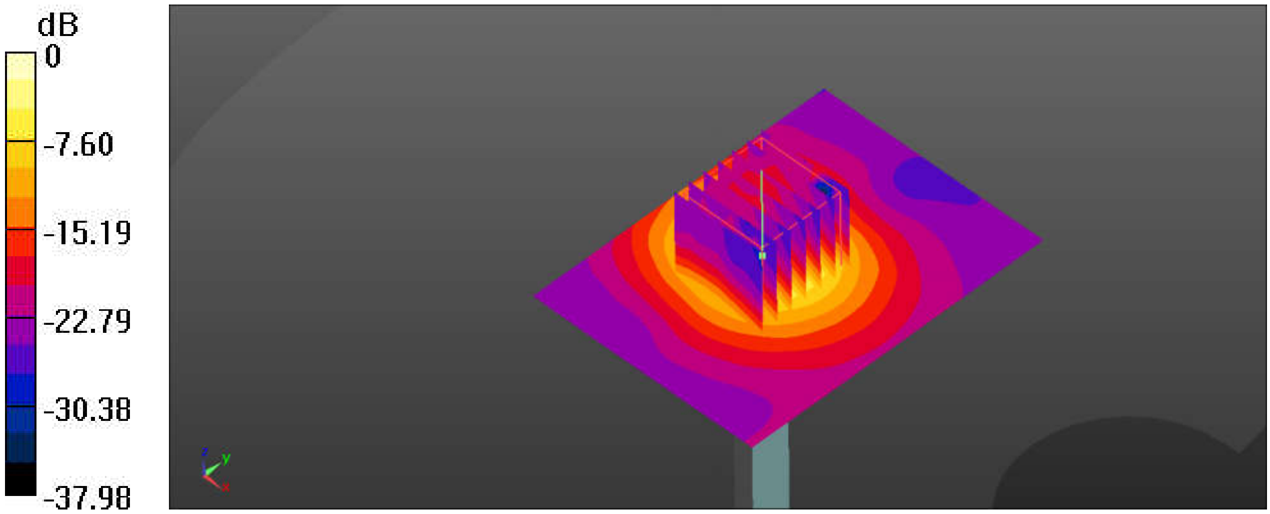
DUT: D5GHzV2-SN:1167

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: HSL_5750_190417 Medium parameters used: f = 5750 MHz; σ = 5.17 S/m; ε_r = 35.843; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.77, 4.77, 4.77); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 18.2 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 36.65 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 31.2 W/kg
SAR(1 g) = 7.07 W/kg; SAR(10 g) = 1.98 W/kg
Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 18.3 W/kg

System Check_Body_2450MHz

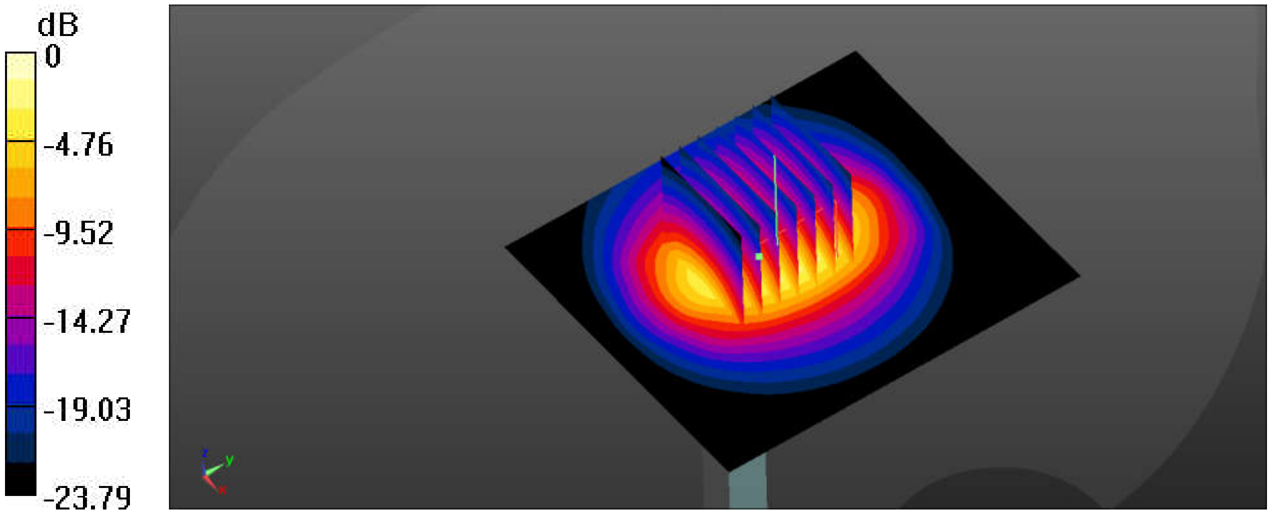
DUT: D2450V2-SN:736

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_190417 Medium parameters used: f = 2450 MHz; σ = 1.992 S/m; ε_r = 52.291; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.32, 7.32, 7.32); Calibrated: 2019.03.01
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=250mW/Area Scan (71x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 34.4 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 111.1 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 59.3 W/kg
SAR(1 g) = 11.8 W/kg; SAR(10 g) = 6.1 W/kg
Maximum value of SAR (measured) = 33.3 W/kg



0 dB = 33.3 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.04.07

System Check_Body_3500MHz

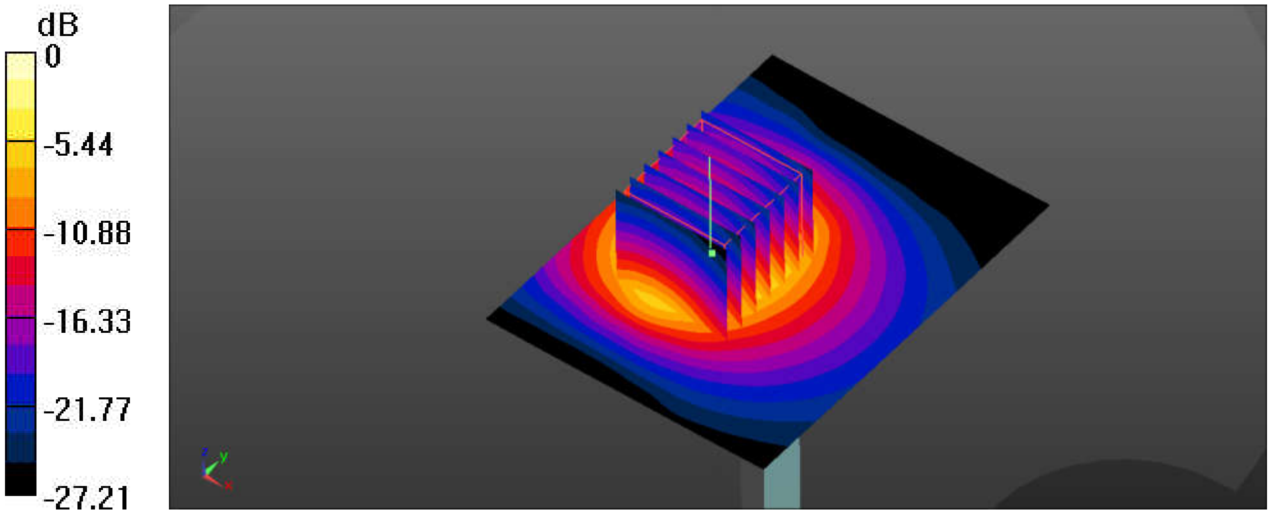
DUT: D3500V2-SN:1037

Communication System: UID 0, CW (0); Frequency: 3500 MHz;Duty Cycle: 1:1
Medium: MSL_3500_190407 Medium parameters used: f = 3500 MHz; σ = 3.319 S/m; ε_r = 51.784; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.57, 6.57, 6.57); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 14.6 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 35.83 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 19.9 W/kg
SAR(1 g) = 6.51 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 14.0 W/kg



0 dB = 14.0 W/kg

System Check_Body_3700MHz

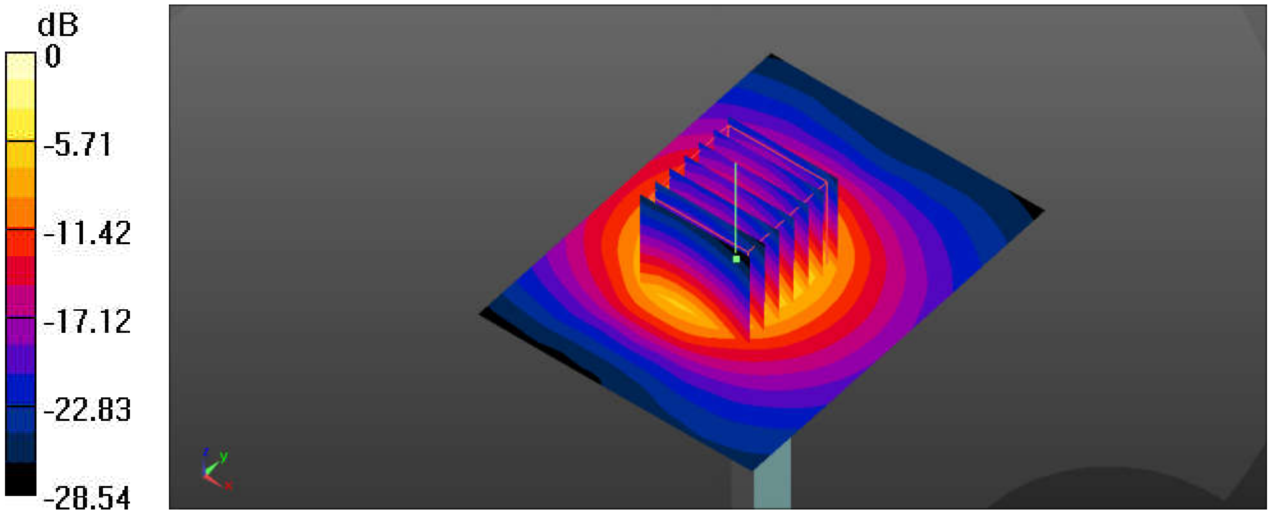
DUT: D3700V2-SN:1008

Communication System: UID 0, CW (0); Frequency: 3700 MHz;Duty Cycle: 1:1
Medium: MSL_3700_190407 Medium parameters used: f = 3700 MHz; σ = 3.524 S/m; ε_r = 51.522; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.37, 6.37, 6.37); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 13.2 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 45.93 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 6.19 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg

System Check_Body_5250MHz

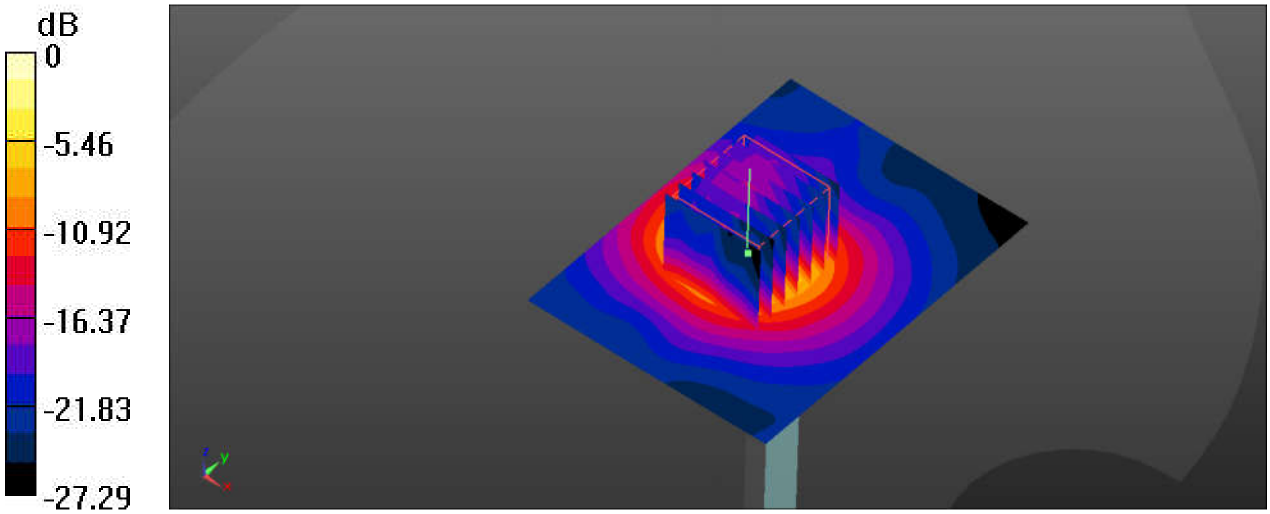
DUT: D5GHzV2-SN1167

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: MSL_5250_190417 Medium parameters used: f = 5250 MHz; σ = 5.276 S/m; ε_r = 50.886; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.46, 4.46, 4.46); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 17.7 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 36.34 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 26.3 W/kg
SAR(1 g) = 7.19 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.3 W/kg



0 dB = 17.3 W/kg

System Check_Body_5600MHz

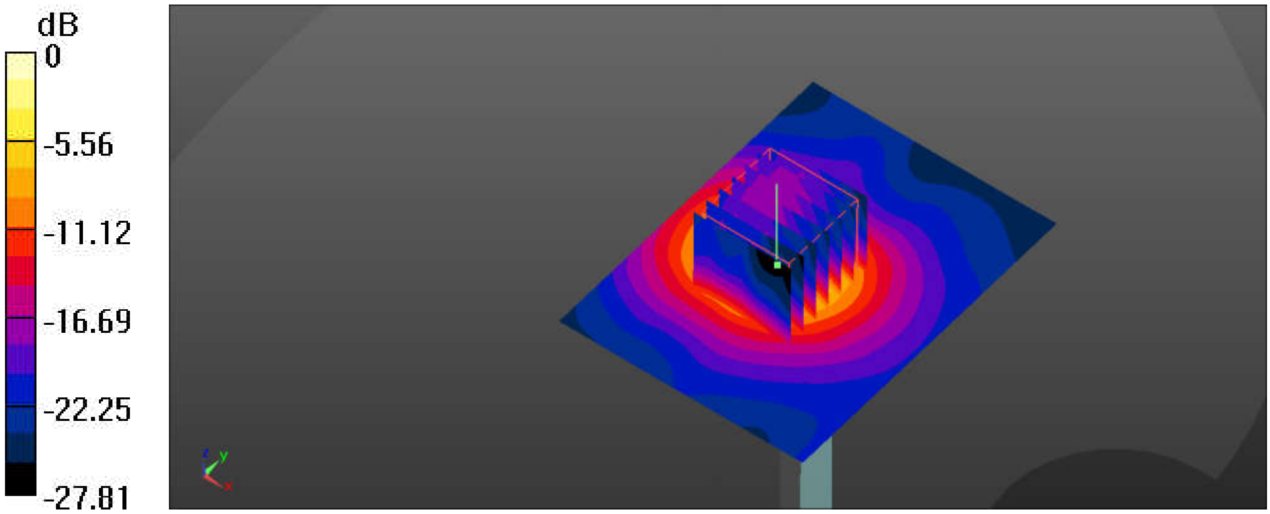
DUT: D5GHzV2-SN:1167

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: MSL_5600_190417 Medium parameters used: f = 5600 MHz; σ = 5.825 S/m; ε_r = 50.395; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(3.92, 3.92, 3.92); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 21.2 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 36.95 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 33.9 W/kg
SAR(1 g) = 8.34 W/kg; SAR(10 g) = 2.27 W/kg
Maximum value of SAR (measured) = 21.0 W/kg



0 dB = 21.0 W/kg

System Check_Body_5750MHz

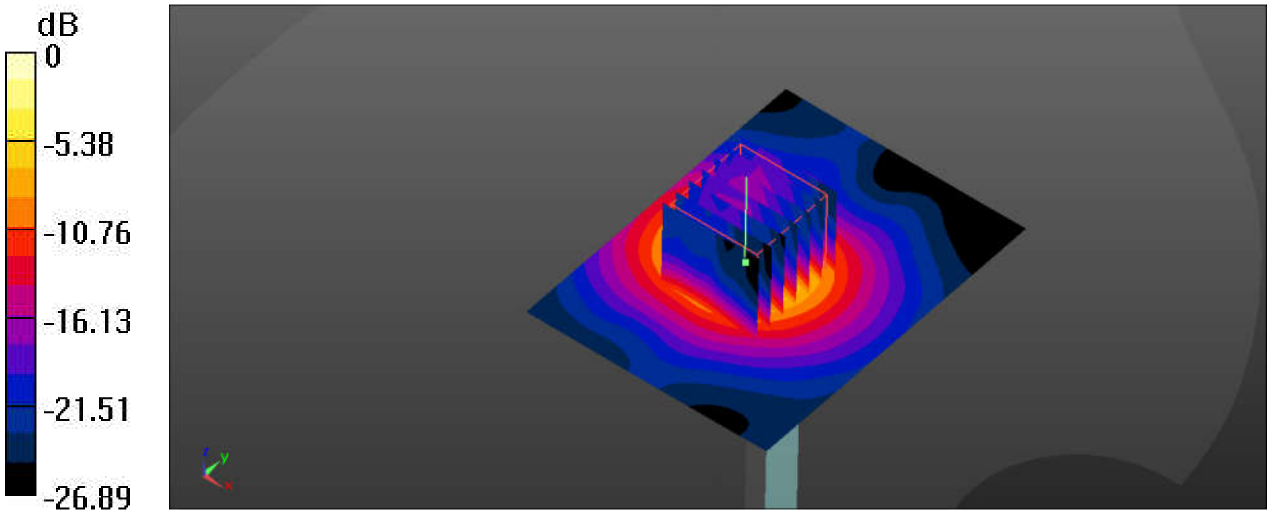
DUT: D5GHzV2-SN:1167

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: MSL_5750_190417 Medium parameters used: f = 5750 MHz; σ = 6.051 S/m; ε_r = 50.049; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.07, 4.07, 4.07); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 19.6 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 35.25 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 7.62 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg

System Check_Body_5750MHz

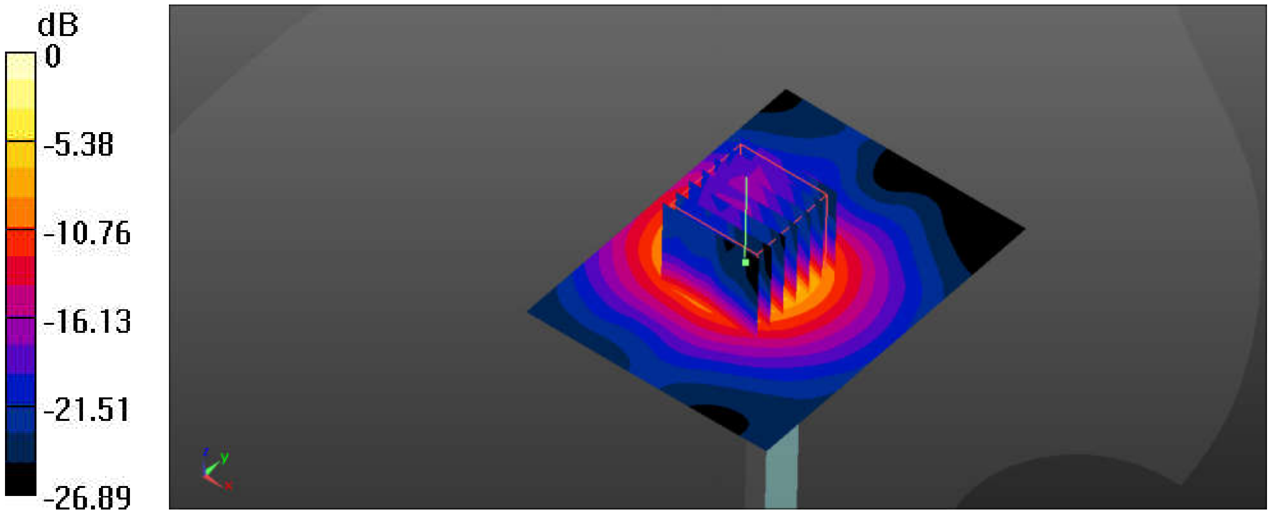
DUT: D5GHzV2-SN:1167

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: MSL_5750_190510 Medium parameters used: f = 5750 MHz; σ = 6.050 S/m; ε_r = 50.057; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.07, 4.07, 4.07); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 19.7 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 35.25 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 7.21 W/kg; SAR(10 g) = 2.05 W/kg
Maximum value of SAR (measured) = 19.1 W/kg



0 dB = 19.1 W/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

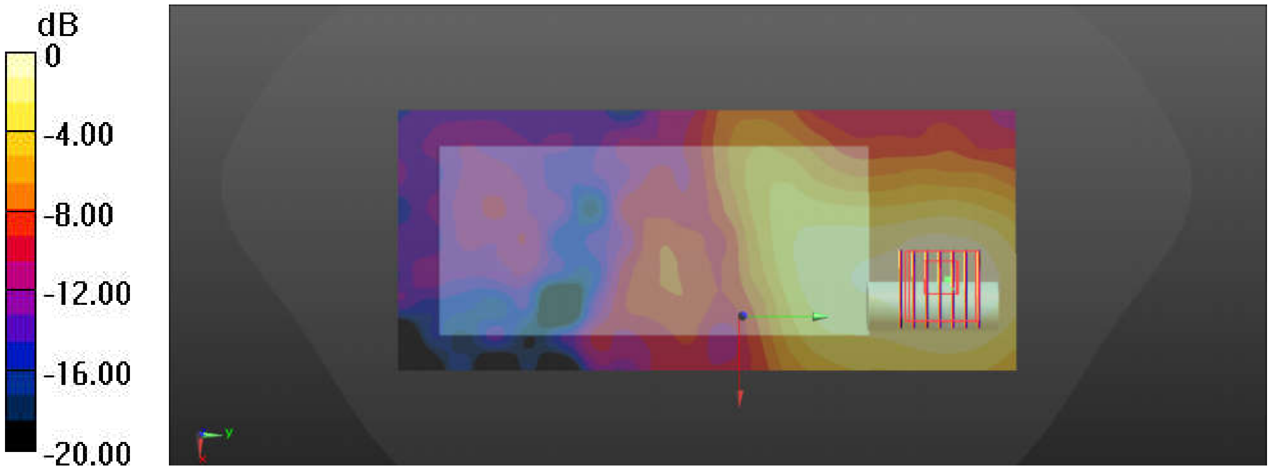
01_LTE Band 48_20M_QPSK_1RB_0Offset_face_25mm_Ch55340

Communication System: UID 0, LTE (0); Frequency: 3560 MHz;Duty Cycle: 1:1.59
Medium: HSL_3500_190405 Medium parameters used: f = 3560 MHz; σ = 2.864 S/m; ε_r = 39.814; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.89, 6.89, 6.89); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.12 (7450)

Ch55340/Area Scan (81x191x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.131 W/kg

Ch55340/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.637 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.179 W/kg
SAR(1 g) = 0.074 W/kg; SAR(10 g) = 0.038 W/kg
Maximum value of SAR (measured) = 0.129 W/kg



0 dB = 0.131 W/kg

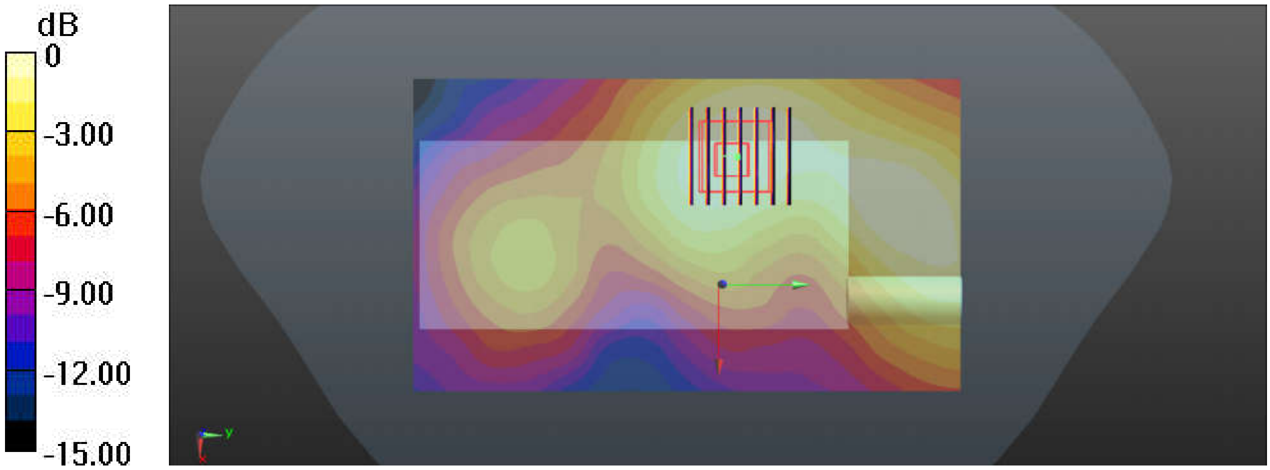
02_WLAN2.4GHz_802.11b 1Mbps_face_25mm_Ch1

Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL_2450_190417 Medium parameters used: f = 2412 MHz; σ = 1.947 S/m; ε_r = 52.455; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.21, 7.21, 7.21); Calibrated: 2019.03.01
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.12 (7450)

Ch1/Area Scan (81x141x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.0624 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.576 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.0960 W/kg
SAR(1 g) = 0.051 W/kg; SAR(10 g) = 0.029 W/kg
Maximum value of SAR (measured) = 0.0627 W/kg



0 dB = 0.0624 W/kg

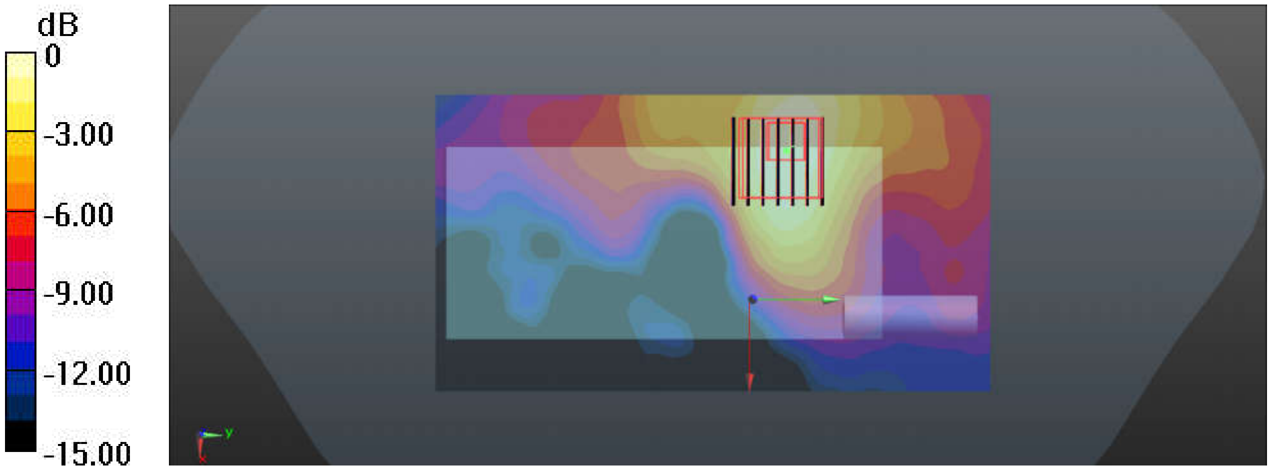
03_WLAN5GHz_802.11a 6Mbps_face_25mm_Ch52

Communication System: UID 0, WIFI (0); Frequency: 5260 MHz;Duty Cycle: 1:1.053
Medium: HSL_5250_190417 Medium parameters used: f = 5260 MHz; σ = 4.718 S/m; ε_r = 36.099; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(5.07, 5.07, 5.07); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.12 (7450)

Ch52/Area Scan (81x151x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.270 W/kg

Ch52/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.114 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.412 W/kg
SAR(1 g) = 0.129 W/kg; SAR(10 g) = 0.053 W/kg
Maximum value of SAR (measured) = 0.270 W/kg



0 dB = 0.270 W/kg

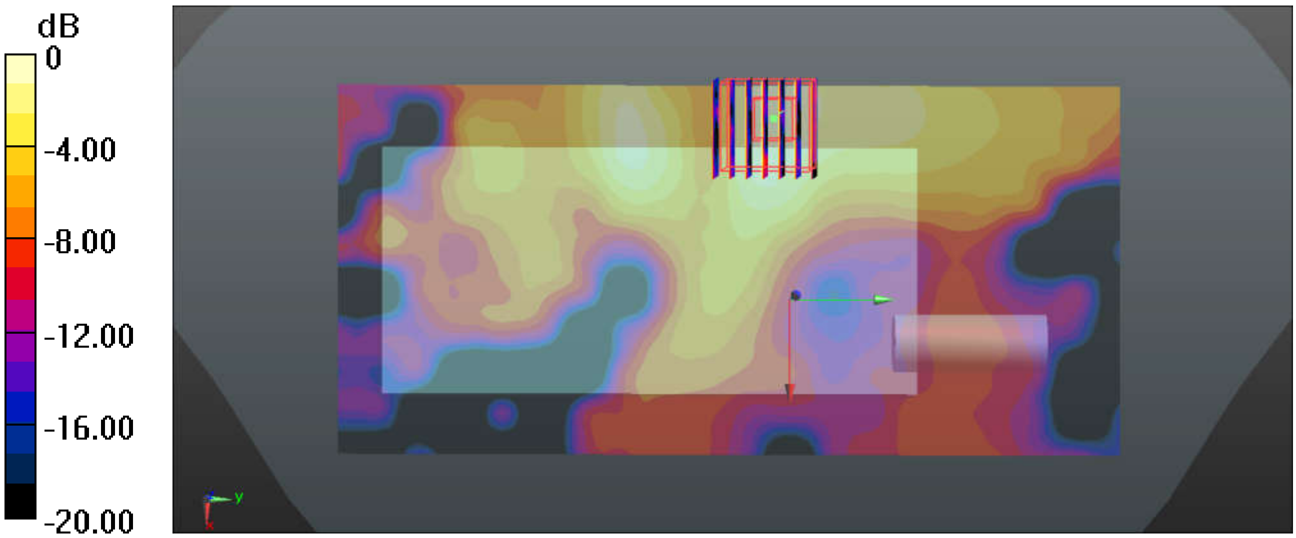
04_WLAN5GHz_802.11a 6Mbps_face_25mm_Ch124

Communication System: UID 0, WIFI (0); Frequency: 5620 MHz;Duty Cycle: 1:1.053
Medium: HSL_5600_190417 Medium parameters used: f = 5620 MHz; σ = 4.867 S/m; ε_r = 35.738; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.7, 4.7, 4.7); Calibrated: 2019.03.01;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch124/Area Scan (91x191x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.135 W/kg

Ch124/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.643 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.201 W/kg
SAR(1 g) = 0.052 W/kg; SAR(10 g) = 0.020 W/kg
Maximum value of SAR (measured) = 0.135 W/kg



0 dB = 0.135 W/kg

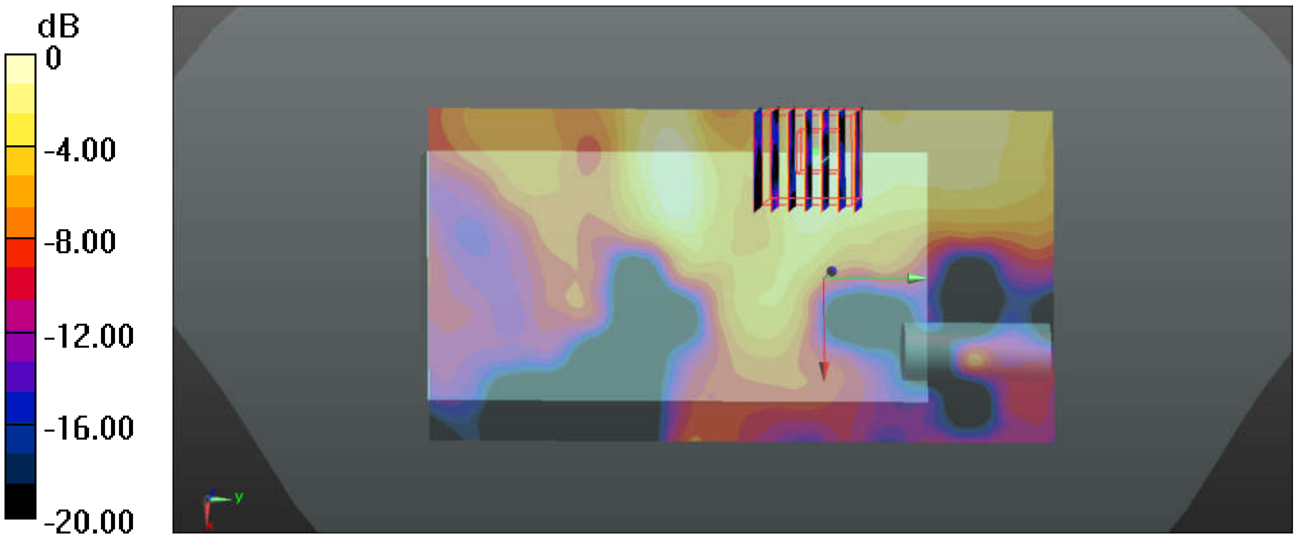
05_WLAN5GHz_802.11a 6Mbps_face_25mm_Ch157

Communication System: UID 0, WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.053
Medium: HSL_5750_190417 Medium parameters used: f = 5785 MHz; σ = 5.348 S/m; ε_r = 35.489; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.77, 4.77, 4.77); Calibrated: 2019.03.01;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch157/Area Scan (81x151x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.164 W/kg

Ch157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.747 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.252 W/kg
SAR(1 g) = 0.065 W/kg; SAR(10 g) = 0.024 W/kg
Maximum value of SAR (measured) = 0.151 W/kg



0 dB = 0.164 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.04.07

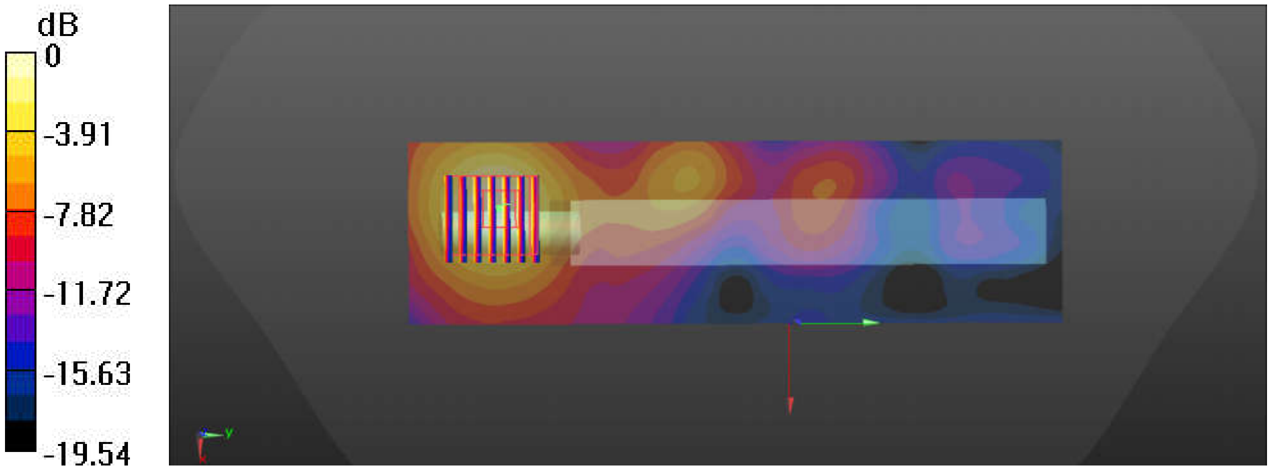
06_LTE Band 48_20M_QPSK_50RB_0Offset_Right Side_10mm_Ch55340

Communication System: UID 0, LTE (0); Frequency: 3560 MHz;Duty Cycle: 1:1.59
Medium: MSL_3500_190407 Medium parameters used: f = 3560 MHz; σ = 3.38 S/m; ε_r = 51.682; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.57, 6.57, 6.57); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch55340/Area Scan (51x181x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.649 W/kg

Ch55340/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 4.698 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.902 W/kg
SAR(1 g) = 0.349 W/kg; SAR(10 g) = 0.149 W/kg
Maximum value of SAR (measured) = 0.638 W/kg



0 dB = 0.649 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.04.17

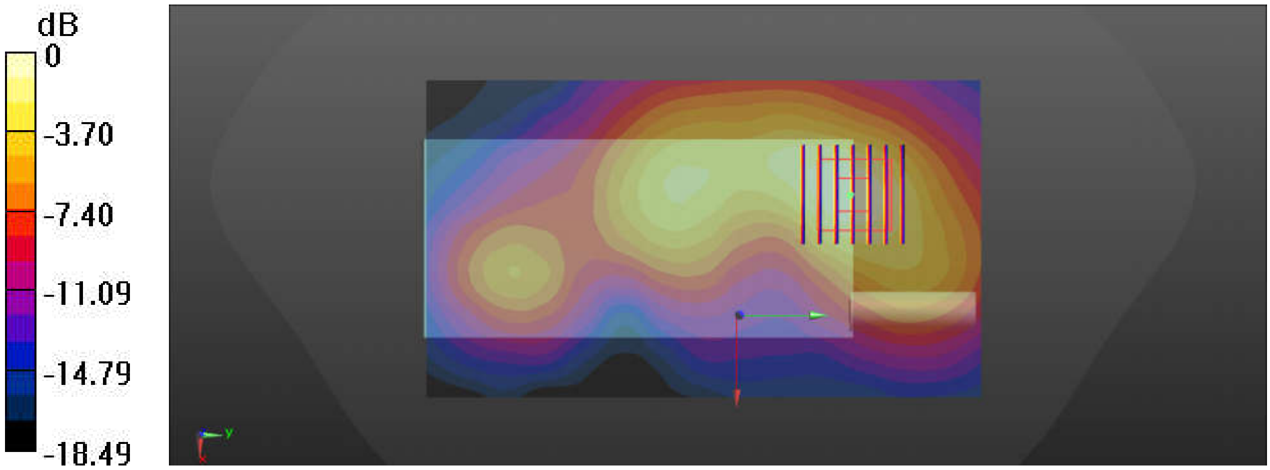
07_WLAN2.4GHz_802.11b 1Mbps_Front_10mm_Ch1

Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL_2450_190417 Medium parameters used: f = 2412 MHz; σ = 1.947 S/m; ε_r = 52.455; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.32, 7.32, 7.32); Calibrated: 2019.03.01
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch1/Area Scan (81x141x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.302 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.545 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 0.392 W/kg
SAR(1 g) = 0.206 W/kg; SAR(10 g) = 0.109 W/kg
Maximum value of SAR (measured) = 0.298 W/kg



0 dB = 0.302 W/kg

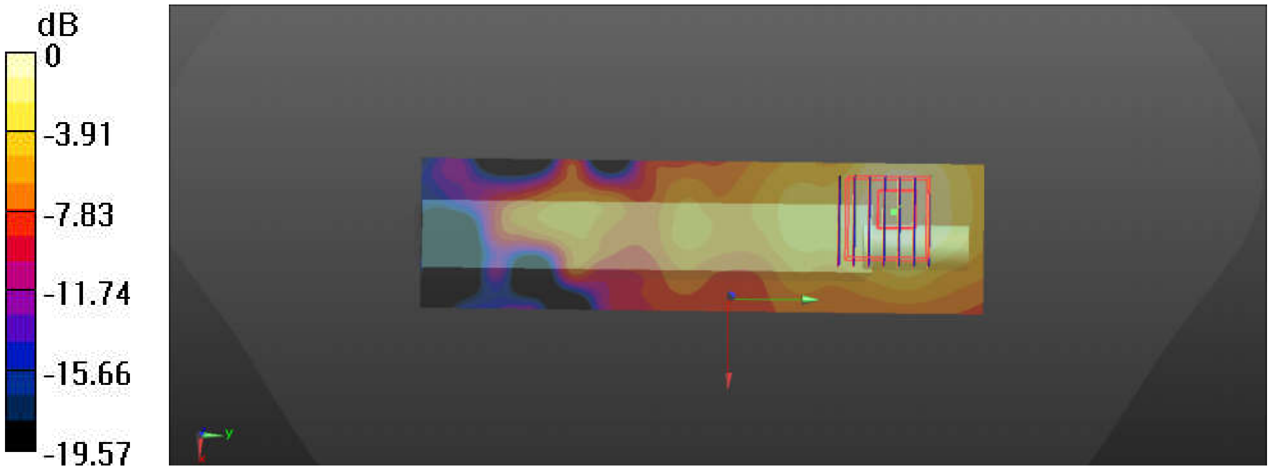
08_WLAN5GHz_802.11a 6Mbps_Left Side_10mm_Ch44

Communication System: UID 0, WIFI (0); Frequency: 5220 MHz;Duty Cycle: 1:1.053
Medium: MSL_5250_190417 Medium parameters used: f = 5220 MHz; σ = 5.228 S/m; ε_r = 50.914; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.46, 4.46, 4.46); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch44/Area Scan (41x151x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.644 W/kg

Ch44/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 7.367 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.01 W/kg
SAR(1 g) = 0.310 W/kg; SAR(10 g) = 0.128 W/kg
Maximum value of SAR (measured) = 0.659 W/kg



0 dB = 0.644 W/kg

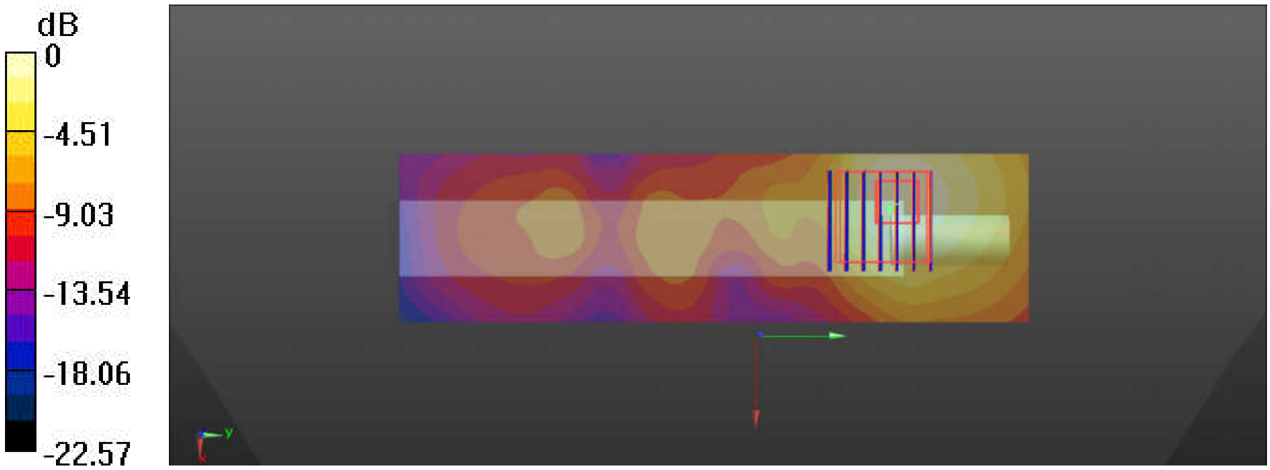
09_WLAN5GHz_802.11a 6Mbps_Left Side_10mm_Ch157

Communication System: UID 0, WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.053
Medium: MSL_5750_190417 Medium parameters used: f = 5785 MHz; σ = 6.097 S/m; ε_r = 49.941; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.07, 4.07, 4.07); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch157/Area Scan (41x151x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.919 W/kg

Ch157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.639 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.59 W/kg
SAR(1 g) = 0.404 W/kg; SAR(10 g) = 0.152 W/kg
Maximum value of SAR (measured) = 0.914 W/kg



0 dB = 0.919 W/kg

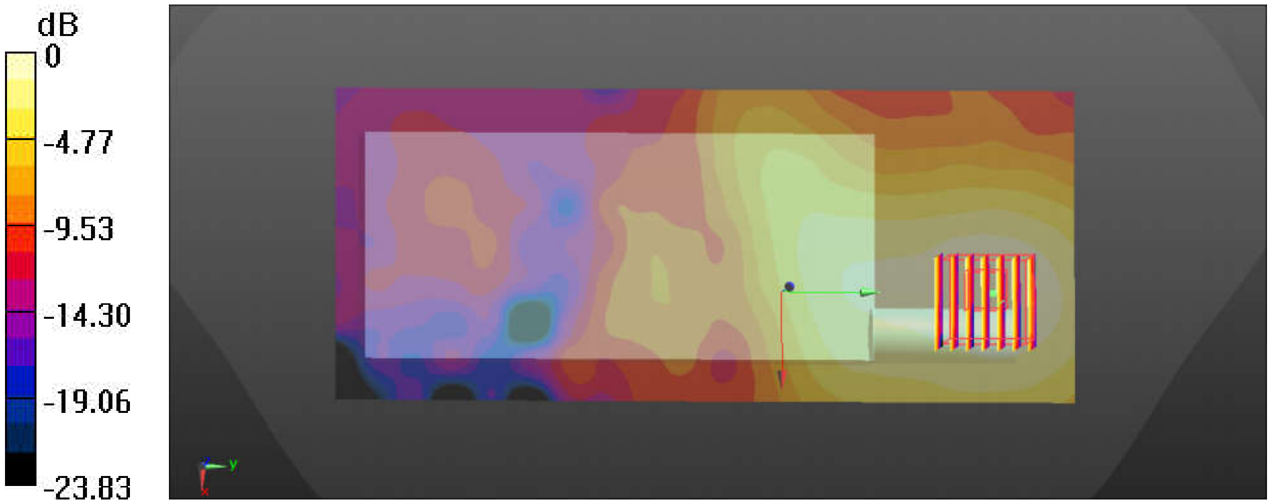
10_LTE Band 48_20M_QPSK_50RB_0Offset_Front_0mm_Ch55340

Communication System: UID 0, LTE (0); Frequency: 3560 MHz;Duty Cycle: 1:1.59
Medium: MSL_3500_190407 Medium parameters used: f = 3560 MHz; σ = 3.38 S/m; ε_r = 51.682; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(6.57, 6.57, 6.57); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch55340/Area Scan (81x191x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.480 W/kg

Ch55340/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.019 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.615 W/kg
SAR(1 g) = 0.35 W/kg; SAR(10 g) = 0.095 W/kg
Maximum value of SAR (measured) = 0.446 W/kg



0 dB = 0.446 W/kg

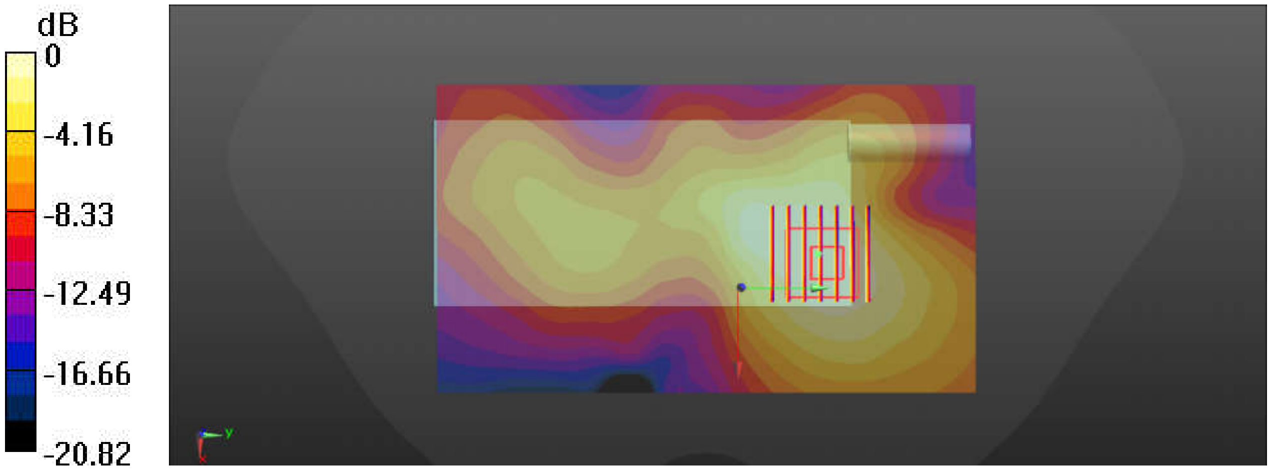
11_WLAN2.4GHz_802.11b 1Mbps_Back_0mm_Ch1

Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL_2450_190417 Medium parameters used: f = 2412 MHz; σ = 1.947 S/m; ε_r = 52.455; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.32, 7.32, 7.32); Calibrated: 2019.03.01
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch1/Area Scan (81x141x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.0820 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.420 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.106 W/kg
SAR(1 g) = 0.059 W/kg; SAR(10 g) = 0.034 W/kg
Maximum value of SAR (measured) = 0.0795 W/kg



0 dB = 0.0820 W/kg

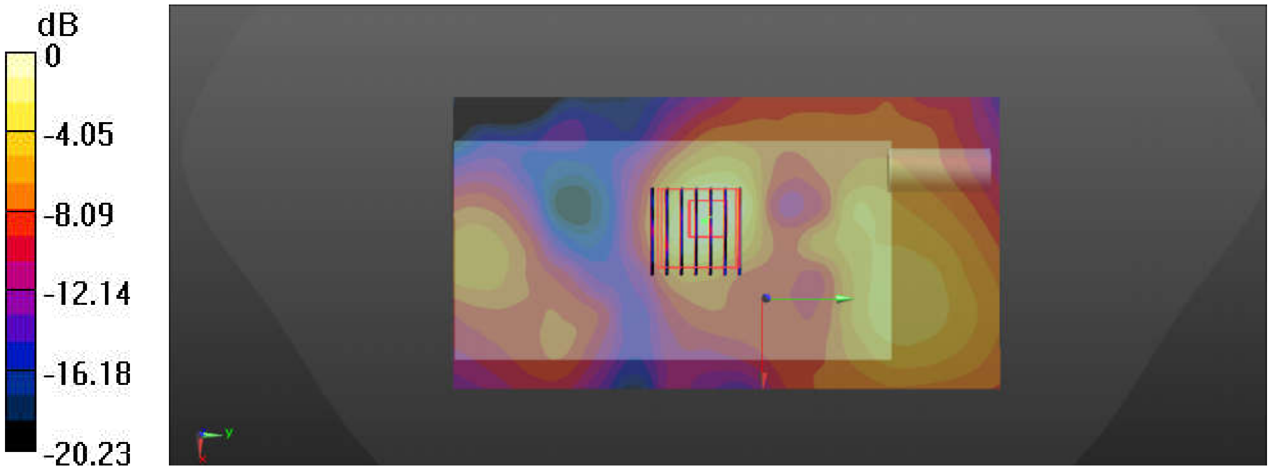
12_WLAN5GHz_802.11a 6Mbps_Back_0mm_Ch52

Communication System: UID 0, WIFI (0); Frequency: 5260 MHz;Duty Cycle: 1:1.053
Medium: MSL_5250_190417 Medium parameters used: f = 5260 MHz; σ = 5.295 S/m; ε_r = 50.88; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.46, 4.46, 4.46); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch52/Area Scan (81x151x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.308 W/kg

Ch52/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.996 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.401 W/kg
SAR(1 g) = 0.112 W/kg; SAR(10 g) = 0.036 W/kg
Maximum value of SAR (measured) = 0.302 W/kg



0 dB = 0.308 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.04.17

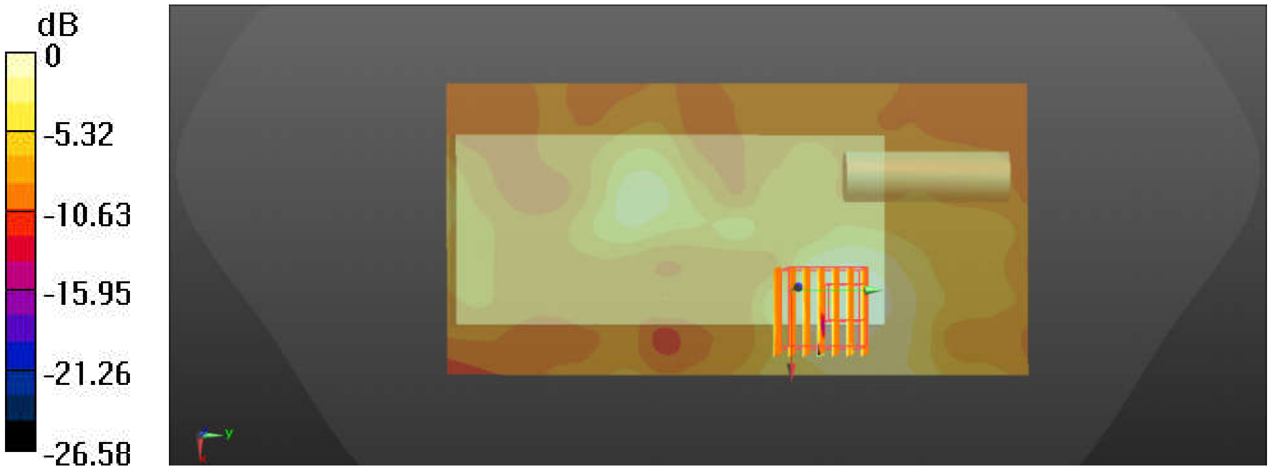
13_WLAN5GHz_802.11a 6Mbps_Back_0mm_Ch124

Communication System: UID 0, WIFI (0); Frequency: 5620 MHz;Duty Cycle: 1:1.053
Medium: MSL_5600_190417 Medium parameters used: f = 5620 MHz; σ = 5.851 S/m; ε_r = 50.371; ρ = 1000 kg/m^3
Ambient Temperature：23.7 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(3.92, 3.92, 3.92); Calibrated: 2019.01.31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch124/Area Scan (81x161x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.303 W/kg

Ch124/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.595 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.141 W/kg; SAR(10 g) = 0.071 W/kg
Maximum value of SAR (measured) = 1.05 W/kg



0 dB = 0.303 W/kg

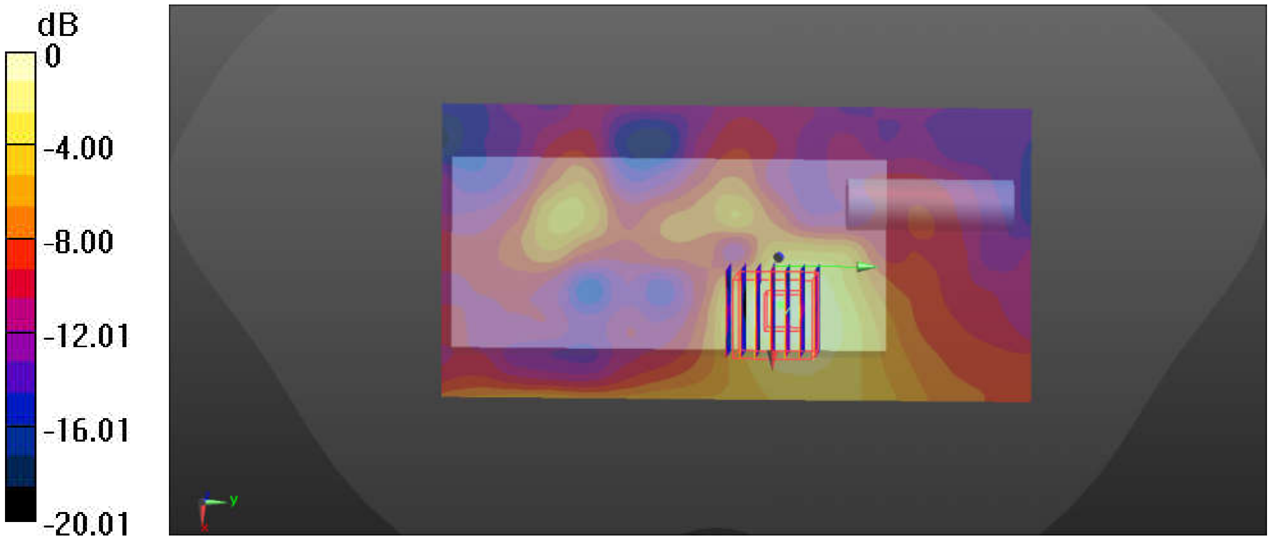
14_WLAN5GHz_802.11a 6Mbps_Back_0mm_Ch157

Communication System: UID 0, WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.053
Medium: MSL_5750_190510 Medium parameters used: f = 5785 MHz; σ = 6.228 S/m; ε_r = 46.763; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(4.07, 4.07, 4.07); Calibrated: 2019.03.01
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: Twin-SAM1(P1aP2a20); Type: QD 000 P40 CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch157/Area Scan (81x161x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.337 W/kg

Ch157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.979 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.557 W/kg
SAR(1 g) = 0.136 W/kg; SAR(10 g) = 0.057 W/kg
Maximum value of SAR (measured) = 0.299 W/kg



0 dB = 0.337 W/kg

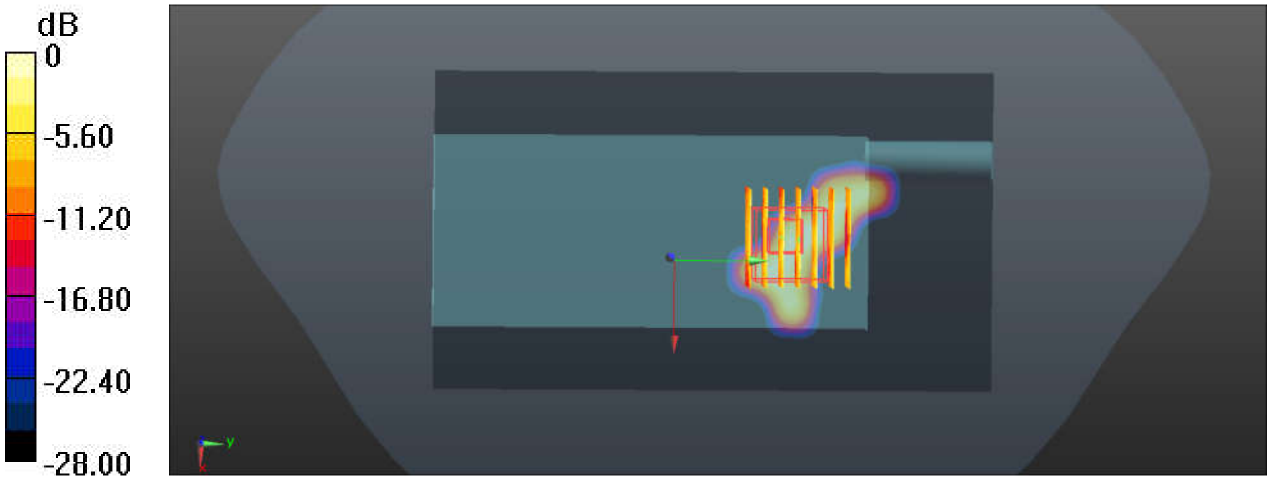
15_Bluetooth_DH5 1Mbps_Back_0mm_Ch0

Communication System: UID 0, Bluetooth (0); Frequency: 2402 MHz;Duty Cycle: 1:1.3
Medium: MSL_2450_190417 Medium parameters used: f = 2402 MHz; σ = 1.937 S/m; ε_r = 52.459; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.32, 7.32, 7.32); Calibrated: 2019.03.01
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2019.01.03
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

Ch0/Area Scan (81x141x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.0169 W/kg

Ch0/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.9040 V/m; Power Drift = -0.35 dB
Peak SAR (extrapolated) = 0.0160 W/kg
SAR(1 g) = 0.00831 W/kg; SAR(10 g) = 0.00537 W/kg
Maximum value of SAR (measured) = 0.0119 W/kg



0 dB = 0.0169 W/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: Z18-60326**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 736
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	August 31, 2018

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 NRVD	102083	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Power sensor NRV-Z5	100542	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Reference Probe EX3DV4	SN 7464	12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Sep-18
DAE4	SN 1524	13-Sep-17(SPEAG,No.DAE4-1524_Sep17)	Sep-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
NetworkAnalyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

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

Issued: September 3, 2018

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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	52.10.1.1476
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	38.8 ± 6 %	1.80 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	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.7 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 mW /g ± 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	52.3 ± 6 %	1.98 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	13.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.5 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.14 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.4 mW /g ± 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	53.9Ω+ 2.56jΩ
Return Loss	- 26.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.0Ω+ 4.22jΩ
Return Loss	- 27.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.022 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: 08.31.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 736

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

Medium parameters used: f = 2450 MHz; σ = 1.802 S/m; ε_r = 38.84; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(7.89, 7.89, 7.89) @ 2450 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

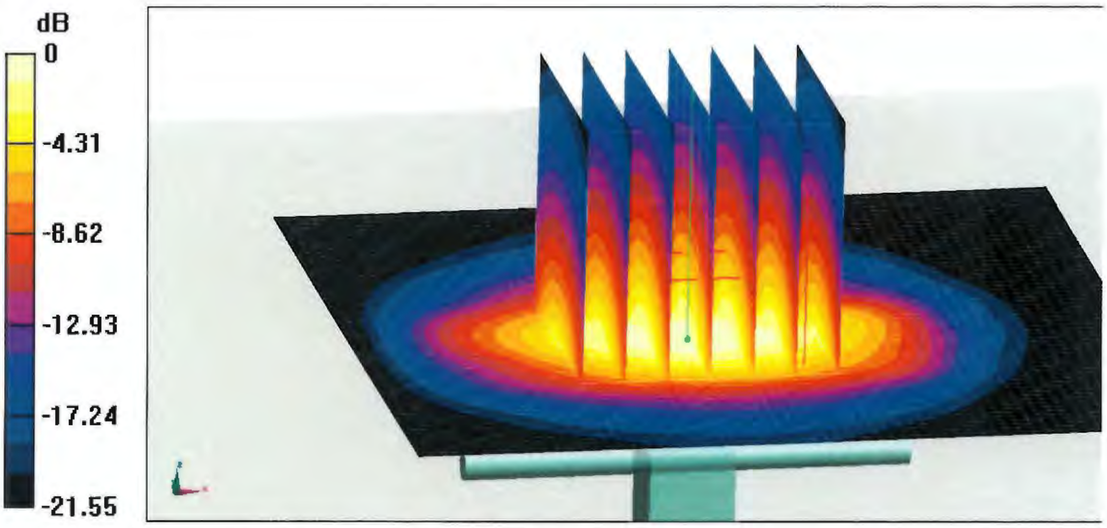
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.2 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.17 W/kg

Maximum value of SAR (measured) = 22.2 W/kg



0 dB = 22.2 W/kg = 13.46 dBW/kg

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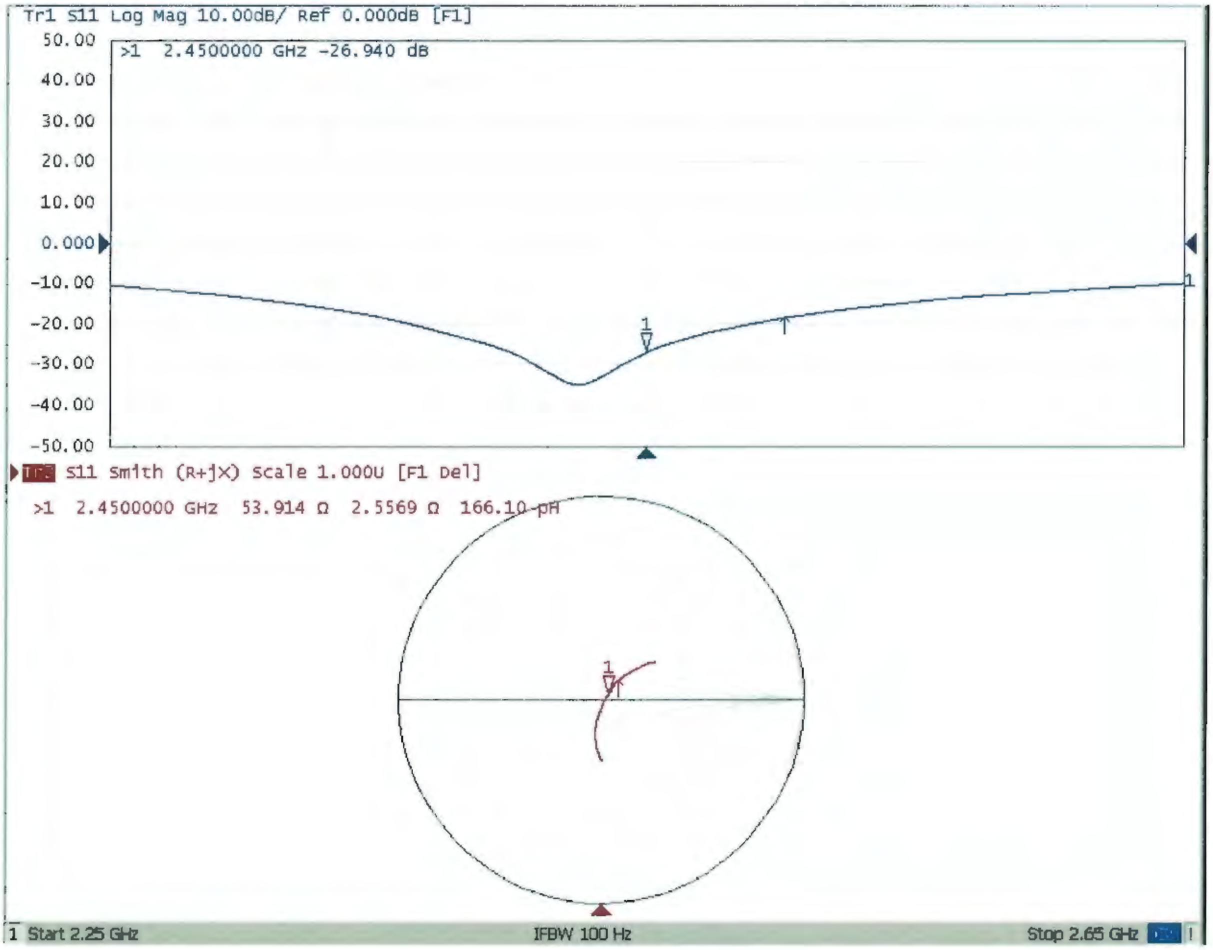
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 08.30.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 736

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

Medium parameters used: f = 2450 MHz; σ = 1.982 S/m; ε_r = 52.34; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.09, 8.09, 8.09) @ 2450 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

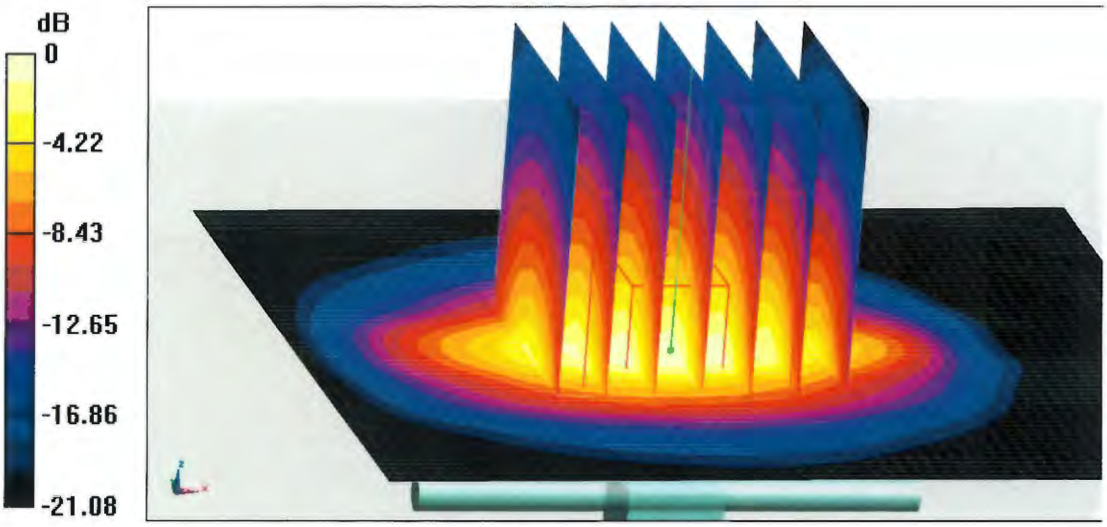
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.71 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.0 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.14 W/kg

Maximum value of SAR (measured) = 21.3 W/kg



0 dB = 21.3 W/kg = 13.28 dBW/kg

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Impedance Measurement Plot for Body TSL