FCC SAR Test Report

APPLICANT	:	ZTE CORPORATION
EQUIPMENT	:	Mobile Broadband Internet Device
BRAND NAME	:	ZTE
MODEL NAME	:	K83V
FCC ID	:	SRQ-K83V
STANDARD	:	FCC 47 CFR PART 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

The product was received on Apr. 10, 2019 and testing was started from May 14, 2019 and completed on May 21, 2019. We, Sporton International (Kunshan) 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 (Kunshan) Inc., the test report shall not be reproduced except in full.

Rose Wang

Reviewed by: Rose Wang / Supervisor

Kat Yin

Approved by: Kat Yin / Manager

ilac-MRA

A2LA ACCREDITED Cert #5145.02

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

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA941004	Rev. 01	Initial issue of report	Jun. 11, 2019

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION, Mobile Broadband Internet Device, K83V**, are as follows.

<table>
<tr><th colspan="5">Highest Standalone 1g SAR Summary</th></tr>
<tr><th rowspan="2">Equipment Class</th><th rowspan="2" colspan="2">Frequency Band</th><th>Body</th><th rowspan="2">Highest Simultaneous Transmission 1g SAR (W/kg)</th></tr>
<tr><th>1g SAR (W/kg)</th></tr>
<tr><td rowspan="4">Licensed</td><td rowspan="4">LTE</td><td>Band 13</td><td>1.18</td><td rowspan="4">1.58</td></tr>
<tr><td>Band 5</td><td>1.10</td></tr>
<tr><td>Band 2</td><td>1.01</td></tr>
<tr><td>Band 4</td><td>1.12</td></tr>
<tr><td>DTS</td><td rowspan="2">WLAN</td><td>2.4GHz WLAN</td><td>1.15</td><td>1.58</td></tr>
<tr><td>NII</td><td>5GHz WLAN</td><td>1.12</td><td>1.24</td></tr>
<tr><td>DSS</td><td>Bluetooth</td><td>Bluetooth</td><td>0.54</td><td>1.40</td></tr>
<tr><td colspan="2">Date of Testing:</td><td colspan="3">2019/5/14~2019/5/21</td></tr>
</table>

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

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

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

Applicant	
Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

3. Guidance Applied

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Mobile Broadband Internet Device
Brand Name	ZTE
Model Name	K83V
FCC ID	SRQ-K83V
IMEI Code	867598040004280
Wireless Technology and Frequency Range	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 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 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE/HS
HW Version	K83VHW1.0
SW Version	K83VSBLV1.0.0B03
EUT Stage	Identical Prototype

Remark:

1. The device employs proximity sensor that detect the presence of the user's body also a finger or hand at the bottom face, edge 3 or edge 4 faces of the device. When bottom face, edge 3 or edge 4 of body condition or when the device is in handheld state is detected, all WWAN bands reduced power will be active.
2. For WLAN, when proximity sensor detect user's body also a finger or hand at the bottom face or edge 1 face of the device, WLAN2.4GHz/WLAN5.8GHz reduced power will be active.
3. The device supports voice function, but limited to speakerphone mode.

4.2 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>FCC ID</td><td>SRQ-K83V</td></tr>
<tr><td>Equipment Name</td><td>Mobile Broadband Internet Device</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850.7 MHz ~ 1909.3 MHz
LTE Band 4: 1710.7 MHz ~ 1754.3 MHz
LTE Band 5: 824.7 MHz ~ 848.3 MHz
LTE Band 13: 779.5 MHz ~ 784.5 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 13: 5MHz, 10MHz</td></tr>
<tr><td>Uplink Modulations used</td><td>QPSK / 16QAM</td></tr>
<tr><td>LTE Release Version</td><td>R15, Cat 13</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>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, Proximity Sensor. Power reduction will be active at all WWAN bands.</td></tr>
</table>

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

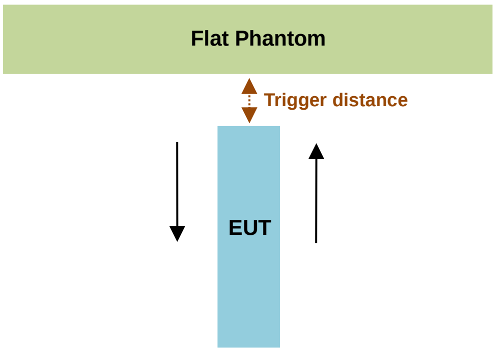
LTE Band 13

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5		
M	23230	782	23230	782
H	23255	784.5		

5. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

1. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed and the tissue-equivalent medium for highest frequency (WWAN 1900MHz) and lowest (WWAN 780MHz) frequency was used for proximity sensor triggering testing.
2. Capacitive proximity sensor placed coincident with WWAN antenna elements at the Bottom Face and Edge 3/4 of the device are utilized to determine when the device comes in proximity of the user's body at the Bottom Face or Edge 3 or Edge 4 side of the device.
3. Capacitive proximity sensor placed coincident with WLAN antenna elements at the Bottom Face and Edge 1 of the device are utilized to determine when the device comes in proximity of the user's body at the Bottom Face or Edge 1 side of the device.
4. There is no need to do sensor coverage testing for the proximity sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the proximity sensor entirely covers the antenna.
5. When the sensor is active, LTE Band 2/4/5/13 and WLAN2.4GHz/WLAN5.8GHz reduced power will be active.
6. The sensors used to detect the proximity of the user's body and device use a detection threshold distance. The data shown in the sections below shows the distance(s).



<WWAN Frequency Bands>

Proximity Sensor Triggering Distance (mm)						
Position	Bottom Face		Edge 3		Edge 4	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	15	15	18	18	5	5

<WLAN Frequency Bands>

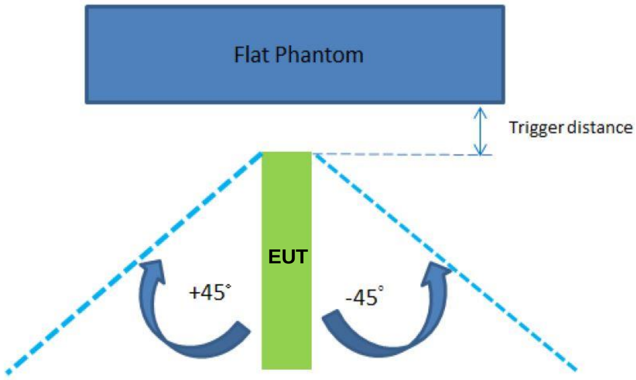
Proximity Sensor Triggering Distance (mm)				
Position	Bottom Face		Edge 1	
	Moving towards	Moving away	Moving towards	Moving away
Minimum	10	10	9	9

<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.
Illustrated in the internal photo exhibit, although the senor is spatially offset, there is no trigger condition where the antenna is next to the user but the sensor is laterally further away, therefore proximity sensor coverage testing is not required.
This procedure is not required because antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

<Tablet Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at 18 mm & 5mm separation for WWAN bands edge 3 & edge 4 and 9mm for WLAN edge 1.
Rotating the tablet around the edge next to the phantom in ≤ 10° increments until the tablet is ± 45° from the vertical position at 0°, and the maximum output power remains in the reduced mode.



<WWAN Frequency Bands>

The Sensor Trigger Distance (mm)		
Position	Edge 3	Edge 4
Minimum	18	5

<WLAN Frequency Bands>

The Sensor Trigger Distance (mm)	
Position	Edge 1
Minimum	9

Proximity sensor power reduction for WWAN Bands

Exposure Position / wireless mode	Bottom Face(1)	Edge 1	Edge 2	Edge 3(1)	Edge 4(1)
LTE Band 2	8.5 dB	0 dB	0 dB	8.5 dB	8.5 dB
LTE Band 4	7.5 dB	0 dB	0 dB	7.5 dB	7.5 dB
LTE Band 5	2.0 dB	0 dB	0 dB	2.0 dB	2.0 dB
LTE Band 13	3.5 dB	0 dB	0 dB	3.5 dB	3.5 dB

Remark:
1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit "P-Sensor operational description
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
   - Bottom Face: 10 mm for WWAN Frequency Bands(manufacturer declared test distance)
   - Edge 3: 9 mm for WWAN Frequency Bands(manufacturer declared test distance)
   - Edge 4: 2 mm for WWAN Frequency Bands(manufacturer declared test distance)

Proximity sensor power reduction for WLAN Bands

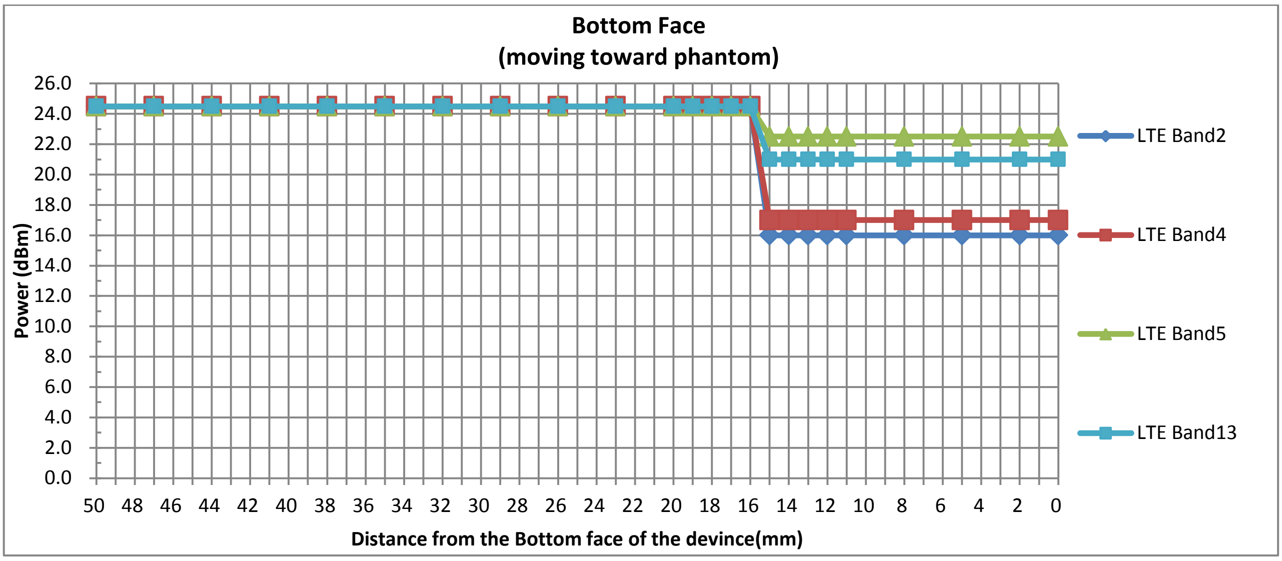
Exposure Position / wireless mode	Bottom Face(1)	Edge 1(1)	Edge 2	Edge 3	Edge 4
WLAN 2.4GHz	6.0 dB	6.0 dB	0 dB	0 dB	0 dB
WLAN 5.8GHz	1.5 dB	1.5 dB	0 dB	0 dB	0 dB

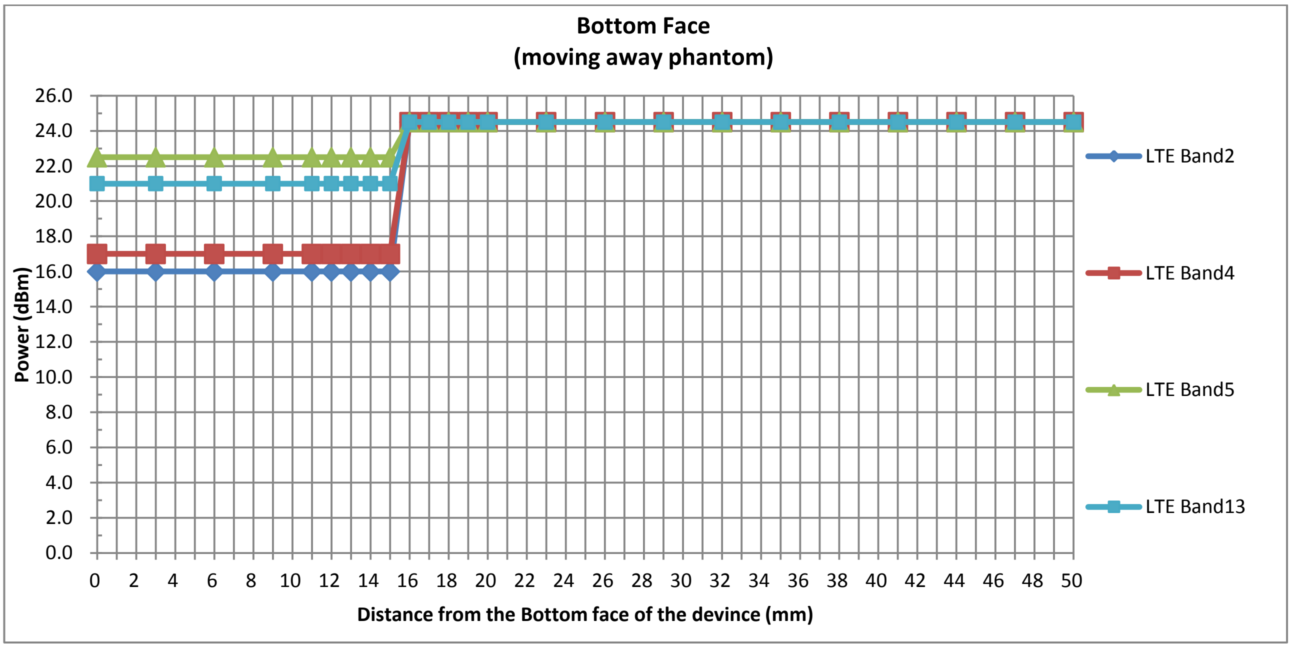
Remark:
1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit "P-Sensor operational description
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
   - Bottom Face: 9 mm for WLAN Frequency Bands
   - Edge 1: 8 mm for WLAN Frequency Bands

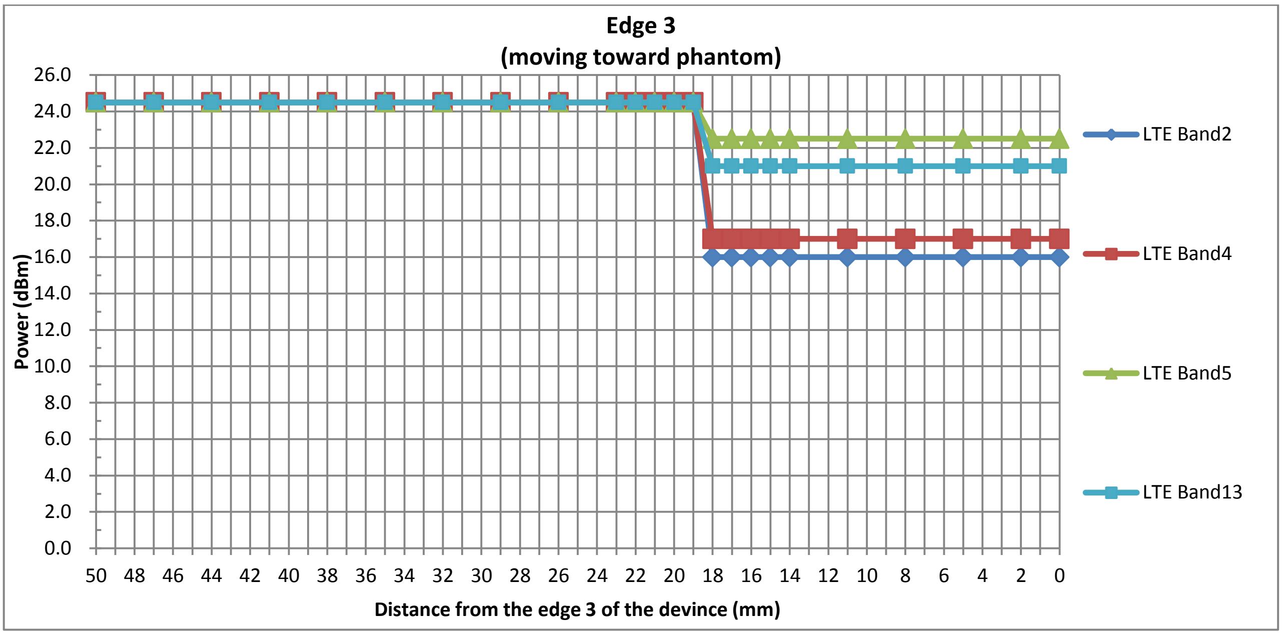
Power Measurement during Sensor Trigger distance testing

Band/Mode	Ch #	Measured power reduction (dBm)		Reduction Levels
		w/o power back-off	w/ power back-off	(dB)
LTE Band 2	18900	23.17	15.40	7.77
LTE Band 4	20175	22.97	16.85	6.12
LTE Band 5	20525	23.89	22.49	1.40
LTE Band 13	23230	23.72	20.41	3.31
WLAN 2.4GHz b 1Mbps	6	17.28	11.09	6.19
WLAN 5.8GHz a 6Mbps	157	11.97	11.29	0.68

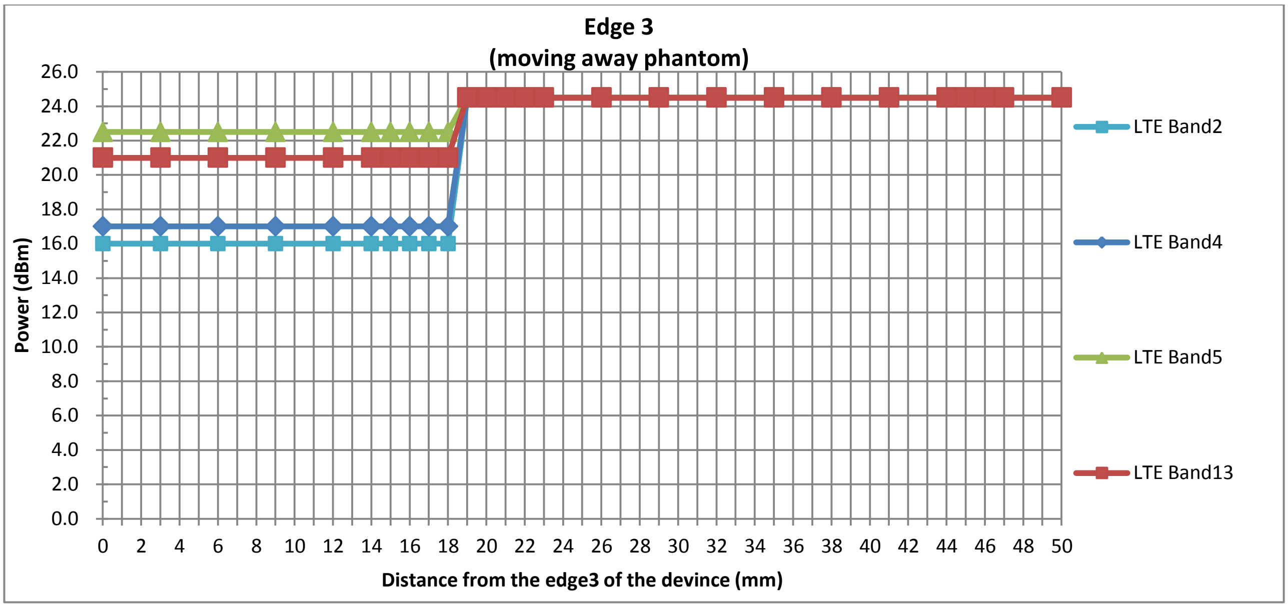
<WWAN>


Bottom Face
(moving toward phantom)
Power (dBm)
Distance from the Bottom face of the devince(mm)
LTE Band2
LTE Band4
LTE Band5
LTE Band13

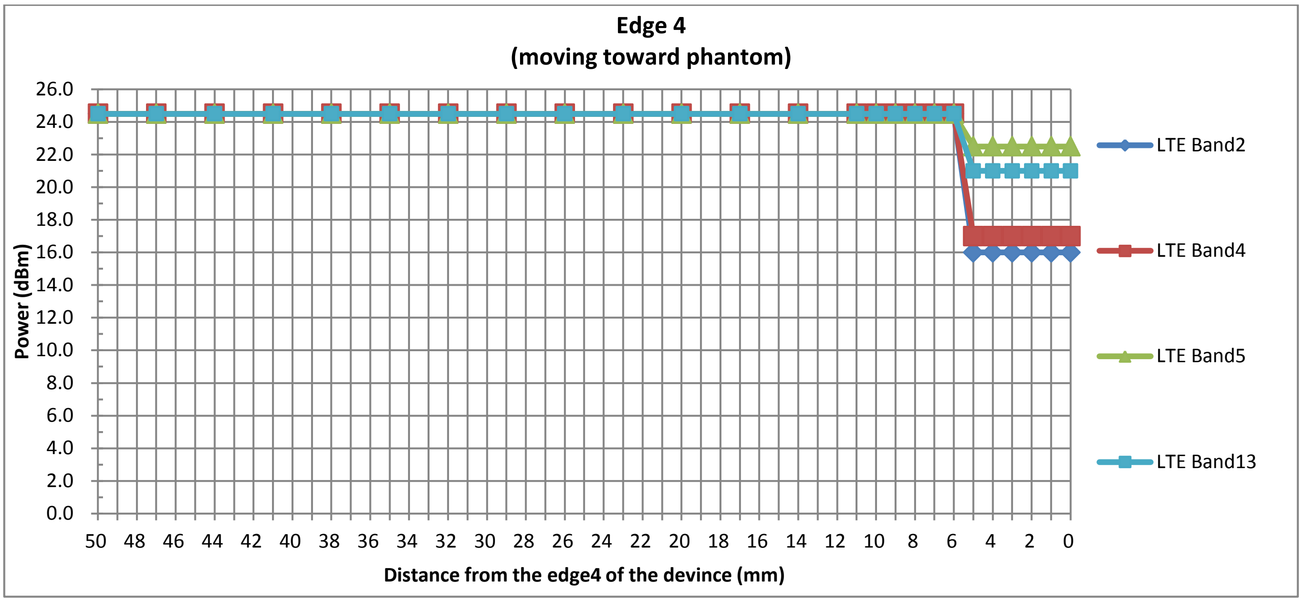

Bottom Face
(moving away phantom)
Power (dBm)
Distance from the Bottom face of the device (mm)
LTE Band2
LTE Band4
LTE Band5
LTE Band13

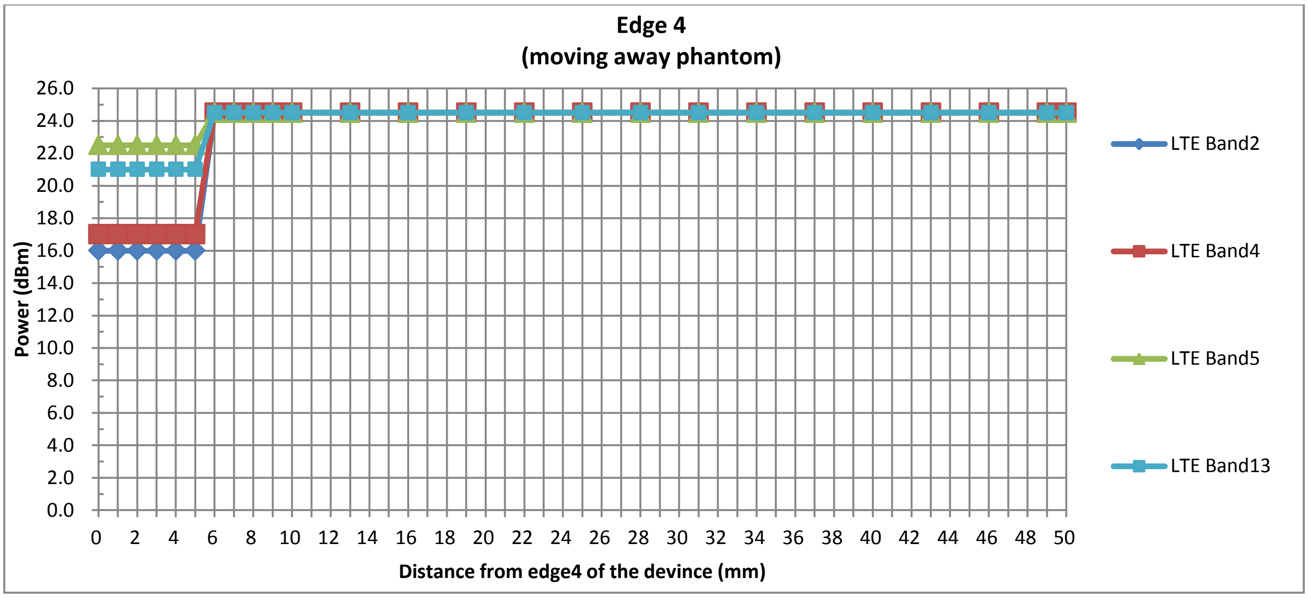


Edge 3
(moving toward phantom)
Power (dBm)
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
Distance from the edge 3 of the devince (mm)
LTE Band2
LTE Band4
LTE Band5
LTE Band13

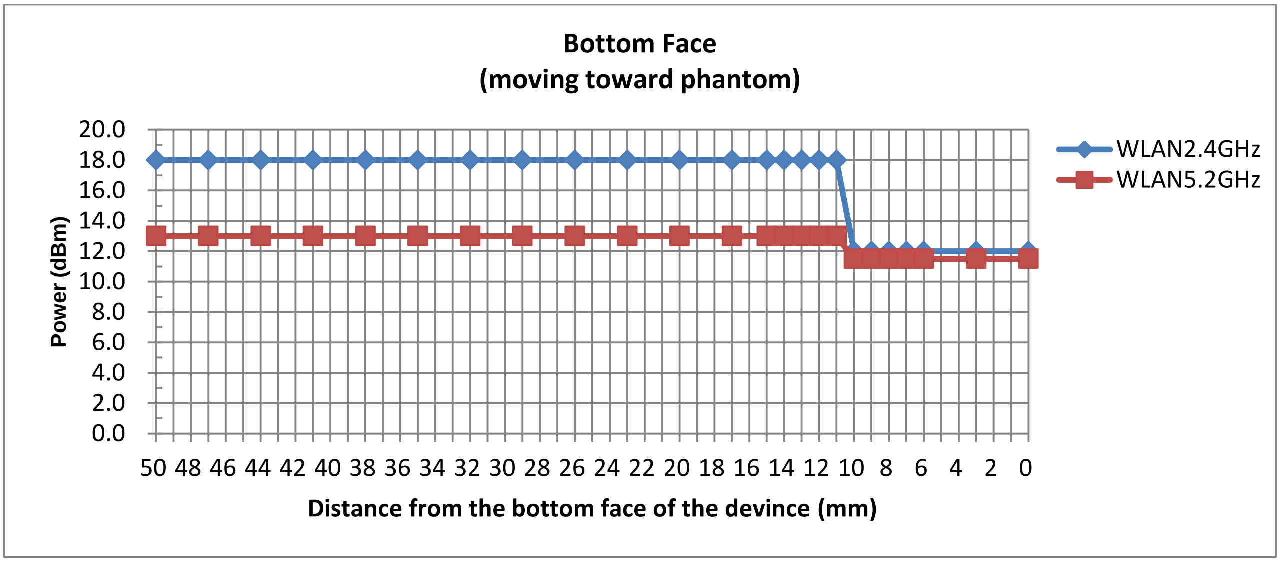


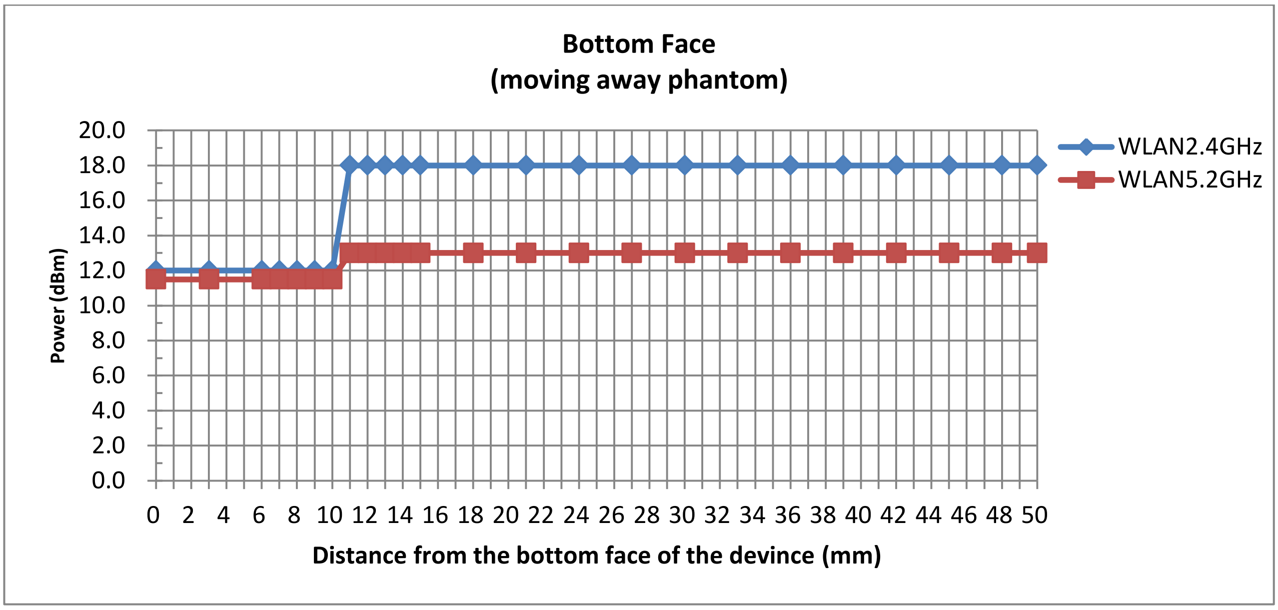
Edge 3
(moving away phantom)
Power (dBm)
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
Distance from the edge3 of the devince (mm)
LTE Band2
LTE Band4
LTE Band5
LTE Band13

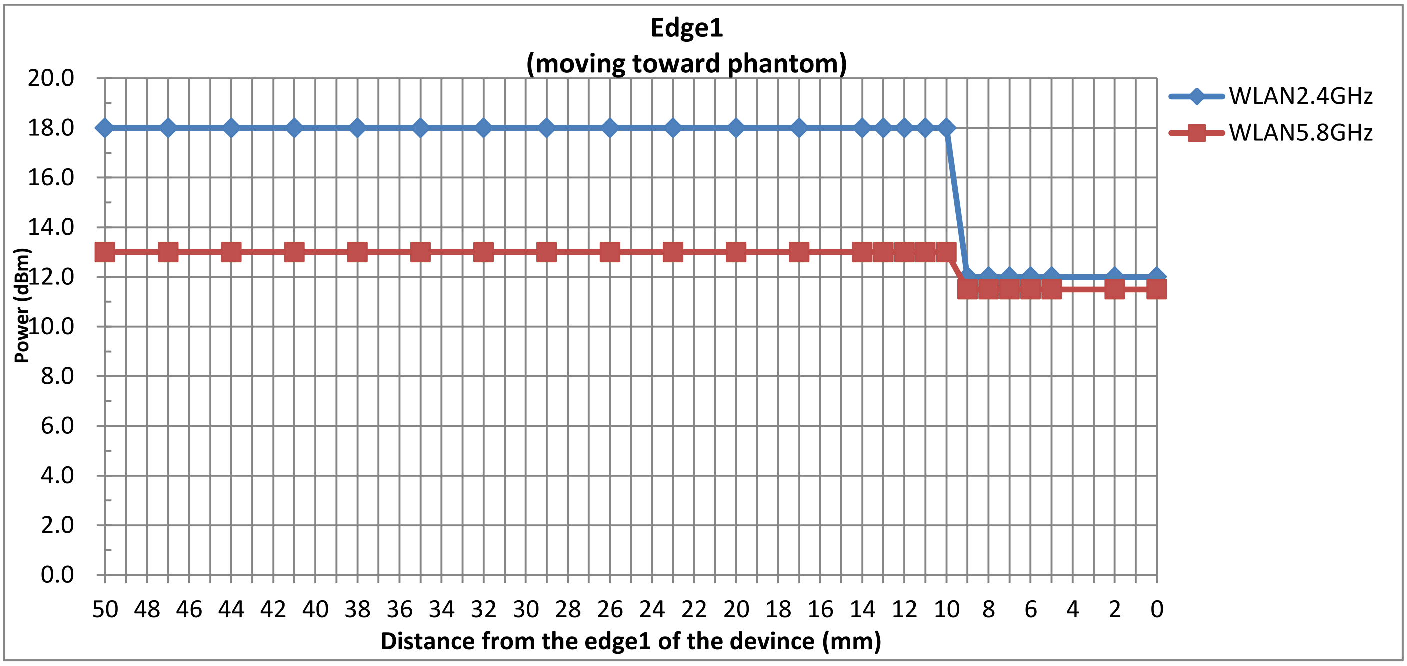

Edge 4
(moving toward phantom)
Power (dBm)
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
Distance from the edge4 of the devince (mm)
LTE Band2
LTE Band4
LTE Band5
LTE Band13

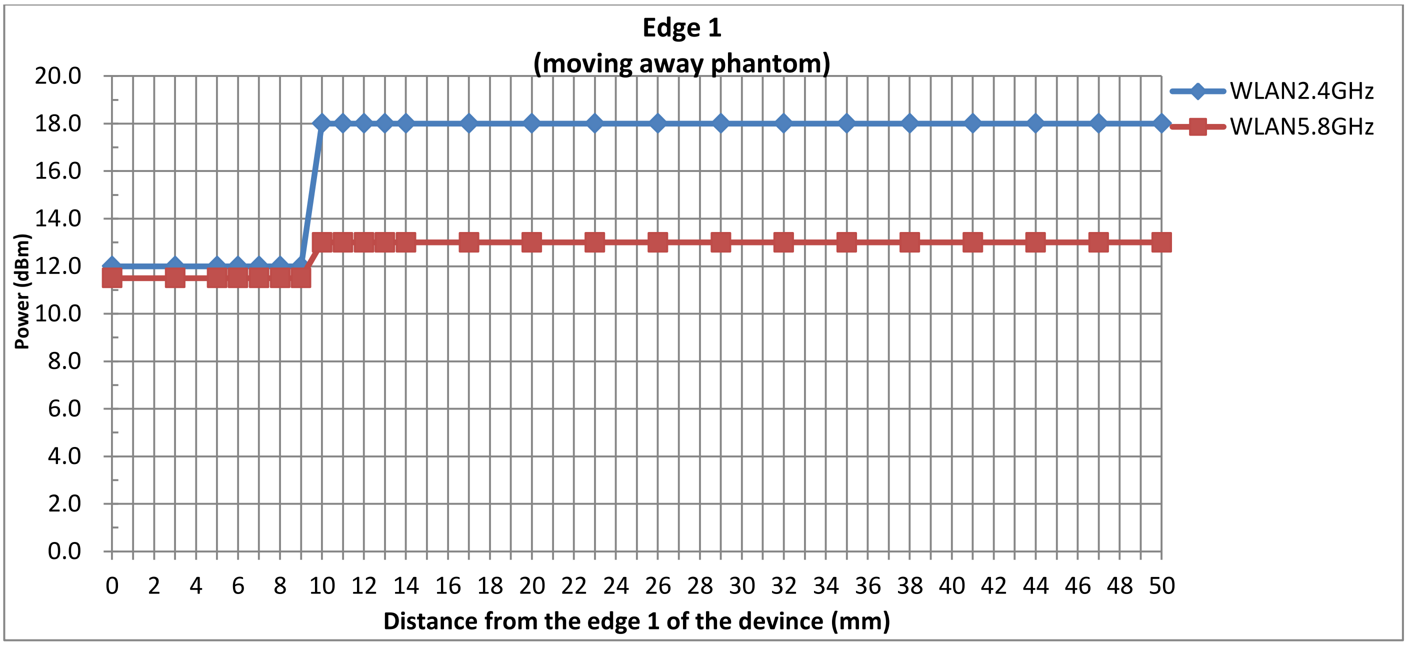

Edge 4
(moving away phantom)
Power (dBm)
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
Distance from edge4 of the devince (mm)
LTE Band2
LTE Band4
LTE Band5
LTE Band13

<WLAN>


Bottom Face
(moving toward phantom)
Power (dBm)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
Distance from the bottom face of the devince (mm)
WLAN2.4GHz
WLAN5.2GHz


Bottom Face
(moving away phantom)
Power (dBm)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
Distance from the bottom face of the devince (mm)
WLAN2.4GHz
WLAN5.2GHz


Edge1
(moving toward phantom)
Power (dBm)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
Distance from the edge1 of the devince (mm)
WLAN2.4GHz
WLAN5.8GHz


Edge 1
(moving away phantom)
Power (dBm)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
Distance from the edge 1 of the devince (mm)
WLAN2.4GHz
WLAN5.8GHz

6. RF Exposure Limits

6.1 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.

6.2 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.

7. Specific Absorption Rate (SAR)

7.1 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.

7.2 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:

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

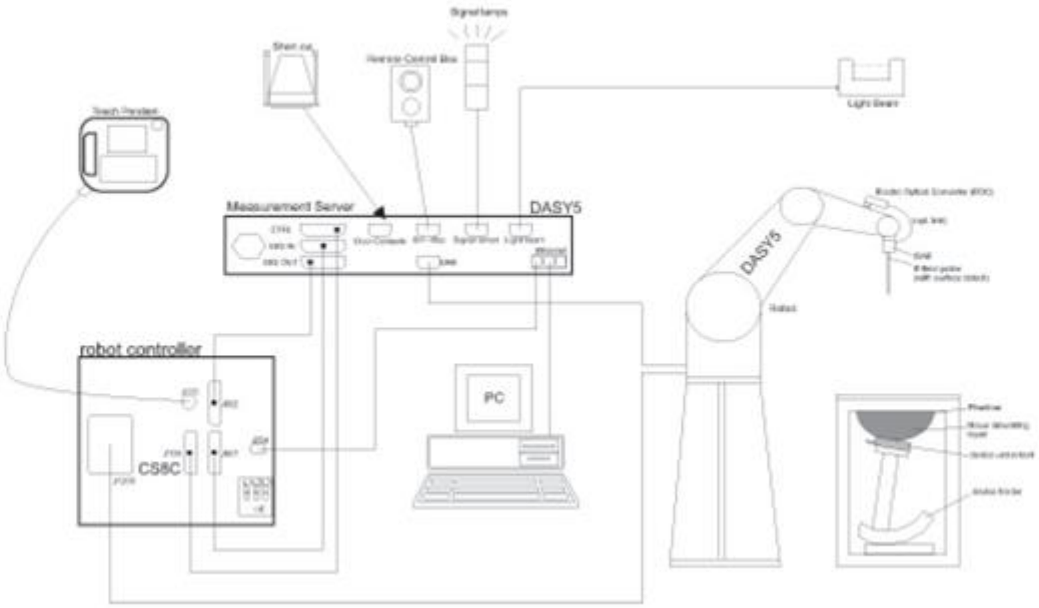
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

8. 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.

8.1 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	

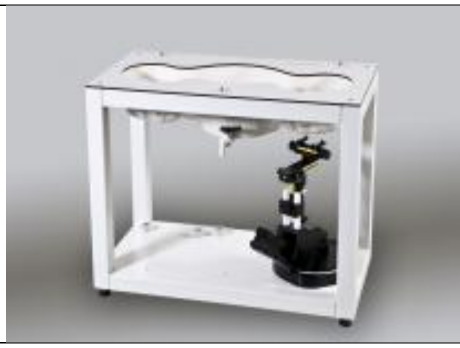
8.2 Data Acquisition Electronics (DAE)

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

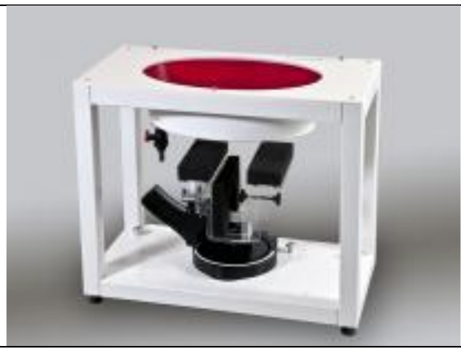
8.3 Phantom

<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.

8.4 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

9. 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

9.1 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

9.2 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.

9.3 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.	

9.4 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.

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

9.5 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.

9.6 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.

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1087	2019/3/27	2020/3/26
SPEAG	835MHz System Validation Kit	D835V2	4d151	2019/3/27	2020/3/26
SPEAG	1750MHz System Validation Kit	D1750V2	1090	2019/3/27	2020/3/26
SPEAG	1900MHz System Validation Kit	D1900V2	5d170	2019/3/26	2020/3/25
SPEAG	2450MHz System Validation Kit	D2450V2	908	2019/3/25	2020/3/24
SPEAG	5000MHz System Validation Kit	D5GHzV2	1006	2018/9/27	2019/9/26
SPEAG	Data Acquisition Electronics	DAE4	690	2019/1/23	2020/1/22
SPEAG	Data Acquisition Electronics	DAE4	1279	2018/10/22	2019/10/21
SPEAG	Dosimetric E-Field Probe	EX3DV4	3911	2019/1/22	2020/1/21
SPEAG	Dosimetric E-Field Probe	EX3DV4	3843	2018/9/27	2019/9/26
SPEAG	ELI4 Phantom	QD 0VA 001 BB	TP-1201	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio Communication Analyzer	MT8821C	6201432831	2019/4/17	2020/4/16
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2019/4/17	2020/4/16
SPEAG	Dielectric Probe Kit	DAK-3.5	1138	2018/11/20	2019/11/19
Anritsu	Vector Signal Generator	MG3710A	6201682672	2019/1/14	2020/1/13
Rohde & Schwarz	Power Meter	NRVD	102081	2018/8/20	2019/8/19
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2018/8/20	2019/8/19
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2018/8/20	2019/8/19
FLUKE	DIGITAC THERMOMETER	51II	97240029	2018/8/8	2019/8/7
R&S	CBT BLUETOOTH TESTER	CBT	101641	2019/1/14	2020/1/13
EXA	Spectrum Analyzer	FSV7	101631	2019/1/14	2020/1/13
ARRA	Power Divider	A3200-2	N/A	Note	
MCL	Attenuation1	BW-S10W5+	N/A	Note	
MCL	Attenuation2	BW-S10W5+	N/A	Note	
MCL	Attenuation3	BW-S10W5+	N/A	Note	
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note	
Agilent	Dual Directional Coupler	778D	20500	Note	
Agilent	Dual Directional Coupler	11691D	MY48151020	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.

11. System Verification

11.1 Tissue Simulating Liquids

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

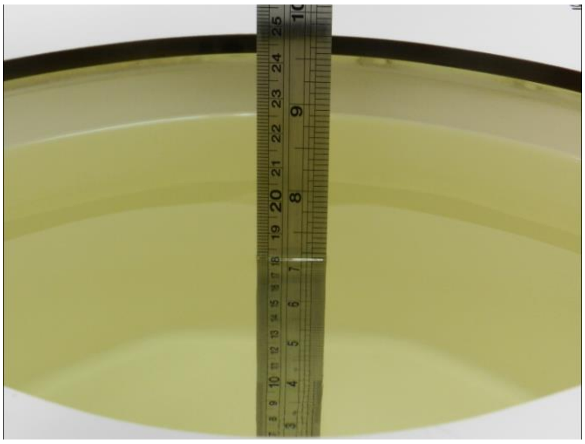


Fig 10.1 Photo of Liquid Height for Body SAR

11.2 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
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
750	Head	22.6	0.903	42.105	0.89	41.90	1.46	0.49	±5	2019/5/14
835	Head	22.8	0.945	42.762	0.90	41.50	5.00	3.04	±5	2019/5/14
1750	Head	22.7	1.397	39.621	1.37	40.10	1.97	-1.19	±5	2019/5/15
1900	Head	22.9	1.405	39.193	1.40	40.00	0.36	-2.02	±5	2019/5/15
2450	Head	22.7	1.845	38.195	1.80	39.20	2.50	-2.56	±5	2019/5/17
5250	Head	22.6	4.603	36.734	4.71	35.90	-2.27	2.32	±5	2019/5/21
5750	Head	22.9	5.185	35.617	5.22	35.40	-0.67	0.61	±5	2019/5/21

11.3 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 (%)
2019/5/14	750	Head	250	1087	3843	1279	2.12	8.36	8.48	1.44
2019/5/14	835	Head	250	4d151	3843	1279	2.39	9.30	9.56	2.80
2019/5/15	1750	Head	250	1090	3843	1279	9.70	36.40	38.80	6.59
2019/5/15	1900	Head	250	5d170	3843	1279	10.10	39.00	40.40	3.59
2019/5/17	2450	Head	250	908	3843	1279	12.90	52.80	51.60	-2.27
2019/5/21	5250	Head	100	1006	3911	690	7.87	80.70	78.70	-2.48
2019/5/21	5750	Head	100	1006	3911	690	7.47	80.40	74.70	-7.09

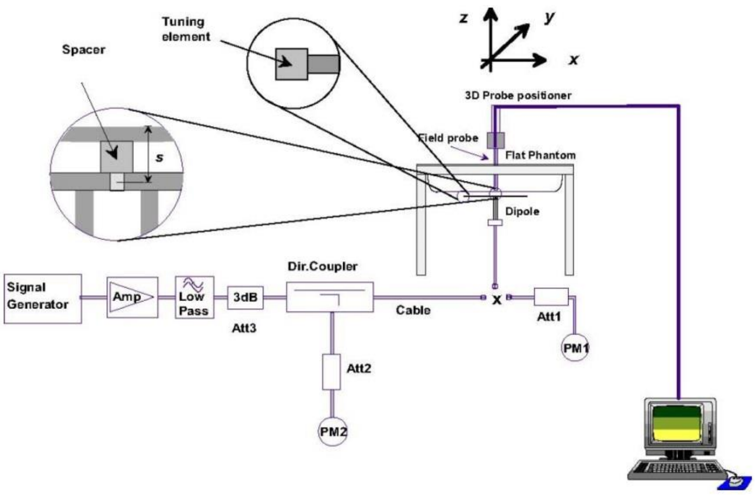


Fig 10.3.1 System Performance Check Setup

Fig 10.3.2 Setup Photo

12. RF Exposure Positions

12.1 SAR Testing for Tablet

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

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

13. 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.
8. For LTE 4 / B5 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

<Full Power Mode>

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	22.98	22.93	23.04	24.5	0
20	QPSK	1	49	23.23	23.17	23.13		
20	QPSK	1	99	22.91	22.73	22.89		
20	QPSK	50	0	22.14	22.14	22.12	23.5	1
20	QPSK	50	24	22.18	22.16	22.18		
20	QPSK	50	50	21.99	22.02	22.06		
20	QPSK	100	0	22.13	22.10	22.05		
20	16QAM	1	0	21.89	21.67	21.97	23.5	1
20	16QAM	1	49	21.71	21.60	21.79		
20	16QAM	1	99	21.80	21.74	22.00		
20	16QAM	50	0	21.19	21.22	21.20	22.5	2
20	16QAM	50	24	21.27	21.19	21.24		
20	16QAM	50	50	21.11	21.02	21.17		
20	16QAM	100	0	21.06	21.12	21.22		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	23.10	23.08	23.14	24.5	0
15	QPSK	1	37	23.16	23.21	23.11		
15	QPSK	1	74	22.93	22.80	23.19		
15	QPSK	36	0	22.10	22.16	22.08	23.5	1
15	QPSK	36	20	21.95	22.08	22.06		
15	QPSK	36	39	22.04	21.99	22.04		
15	QPSK	75	0	22.00	22.05	22.15		
15	16QAM	1	0	21.56	21.70	21.68	23.5	1
15	16QAM	1	37	21.84	22.00	21.86		
15	16QAM	1	74	21.67	21.76	21.58		
15	16QAM	36	0	21.09	21.09	21.07	22.5	2
15	16QAM	36	20	21.05	21.20	21.17		
15	16QAM	36	39	21.04	21.11	21.06		
15	16QAM	75	0	20.98	21.07	21.25		

Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	22.68	22.78	22.93	24.5	0
10	QPSK	1	25	22.91	22.89	23.02		
10	QPSK	1	49	22.66	22.92	22.91		
10	QPSK	25	0	21.89	21.99	21.91	23.5	1
10	QPSK	25	12	21.90	21.93	21.94		
10	QPSK	25	25	21.81	21.91	21.91		
10	QPSK	50	0	21.91	22.01	21.96		
10	16QAM	1	0	21.72	21.80	21.85	23.5	1
10	16QAM	1	25	21.70	21.67	22.00		
10	16QAM	1	49	22.00	22.00	21.60		
10	16QAM	25	0	20.99	21.09	21.01	22.5	2
10	16QAM	25	12	21.01	21.06	21.04		
10	16QAM	25	25	20.96	20.91	21.00		
10	16QAM	50	0	20.86	21.02	21.06		
Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	22.74	22.82	23.07	24.5	0
5	QPSK	1	12	22.96	22.81	23.03		
5	QPSK	1	24	22.72	22.70	22.78		
5	QPSK	12	0	21.81	21.91	21.92	23.5	1
5	QPSK	12	7	21.87	21.88	21.87		
5	QPSK	12	13	21.73	21.89	21.84		
5	QPSK	25	0	21.82	21.84	21.91		
5	16QAM	1	0	21.51	21.56	21.52	23.5	1
5	16QAM	1	12	21.52	21.50	21.56		
5	16QAM	1	24	21.53	21.54	21.59		
5	16QAM	12	0	20.70	20.81	20.77	22.5	2
5	16QAM	12	7	20.78	20.75	20.78		
5	16QAM	12	13	20.65	20.90	20.76		
5	16QAM	25	0	20.81	20.86	20.91		

Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.65	22.87	23.06	24.5	0
3	QPSK	1	8	22.79	22.86	22.98		
3	QPSK	1	14	22.69	22.83	23.01		
3	QPSK	8	0	21.64	21.81	21.88	23.5	1
3	QPSK	8	4	21.68	21.90	21.89		
3	QPSK	8	7	21.64	21.83	21.87		
3	QPSK	15	0	21.71	21.76	21.85		
3	16QAM	1	0	21.99	21.56	21.65	23.5	1
3	16QAM	1	8	21.60	21.57	21.54		
3	16QAM	1	14	21.50	21.67	21.60		
3	16QAM	8	0	20.78	20.61	20.73	22.5	2
3	16QAM	8	4	20.55	20.69	20.65		
3	16QAM	8	7	20.82	20.88	21.01		
3	16QAM	15	0	20.78	20.88	20.90		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.68	22.76	22.86	24.5	0
1.4	QPSK	1	3	22.75	22.89	22.90		
1.4	QPSK	1	5	22.68	22.81	22.76		
1.4	QPSK	3	0	22.66	22.83	22.88		
1.4	QPSK	3	1	22.78	22.87	22.87		
1.4	QPSK	3	3	22.76	22.91	23.11		
1.4	QPSK	6	0	21.73	21.65	21.79	23.5	1
1.4	16QAM	1	0	21.84	21.65	21.97	23.5	1
1.4	16QAM	1	3	21.65	21.66	21.84		
1.4	16QAM	1	5	21.66	21.63	21.95		
1.4	16QAM	3	0	21.56	21.76	21.74		
1.4	16QAM	3	1	21.74	21.70	21.67		
1.4	16QAM	3	3	21.67	21.63	21.68		
1.4	16QAM	6	0	20.55	20.64	20.67	22.5	2

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.92	22.97	23.37	24.5	0
20	QPSK	1	49	22.94	23.19	23.13		
20	QPSK	1	99	23.00	22.88	22.89		
20	QPSK	50	0	21.84	22.01	22.00	23.5	1
20	QPSK	50	24	21.83	22.06	22.07		
20	QPSK	50	50	21.73	22.01	21.91		
20	QPSK	100	0	21.85	21.96	22.03		
20	16QAM	1	0	21.72	21.62	21.73	23.5	1
20	16QAM	1	49	21.62	21.59	21.70		
20	16QAM	1	99	21.60	21.60	21.61		
20	16QAM	50	0	20.82	21.09	21.00	22.5	2
20	16QAM	50	24	20.86	21.25	21.13		
20	16QAM	50	50	20.77	21.09	20.98		
20	16QAM	100	0	20.80	21.05	21.09		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.75	22.65	23.00	24.5	0
15	QPSK	1	37	22.99	22.92	22.91		
15	QPSK	1	74	22.61	22.81	22.81		
15	QPSK	36	0	21.74	21.73	21.94	23.5	1
15	QPSK	36	20	21.77	21.94	21.80		
15	QPSK	36	39	21.73	21.90	21.72		
15	QPSK	75	0	21.71	21.84	21.85		
15	16QAM	1	0	21.57	21.60	21.58	23.5	1
15	16QAM	1	37	21.61	21.51	21.82		
15	16QAM	1	74	21.60	21.83	21.60		
15	16QAM	36	0	20.80	20.73	20.88	22.5	2
15	16QAM	36	20	20.83	20.91	20.74		
15	16QAM	36	39	20.59	20.77	20.68		
15	16QAM	75	0	20.76	20.83	20.73		

Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.51	22.71	22.70	24.5	0
10	QPSK	1	25	22.66	22.80	22.87		
10	QPSK	1	49	22.57	22.69	22.69		
10	QPSK	25	0	21.93	21.91	21.85	23.5	1
10	QPSK	25	12	21.78	21.99	21.86		
10	QPSK	25	25	21.72	21.94	21.79		
10	QPSK	50	0	21.80	21.88	21.74		
10	16QAM	1	0	21.50	21.52	21.61	23.5	1
10	16QAM	1	25	21.51	21.59	21.85		
10	16QAM	1	49	21.52	21.51	21.53		
10	16QAM	25	0	21.03	20.83	20.92	22.5	2
10	16QAM	25	12	20.88	21.02	20.83		
10	16QAM	25	25	20.60	20.83	20.65		
10	16QAM	50	0	20.72	21.00	20.82		
Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.61	22.90	22.95	24.5	0
5	QPSK	1	12	22.89	22.80	22.94		
5	QPSK	1	24	22.52	22.87	22.61		
5	QPSK	12	0	21.83	21.84	21.83	23.5	1
5	QPSK	12	7	21.96	22.00	21.73		
5	QPSK	12	13	21.87	21.90	21.69		
5	QPSK	25	0	21.90	21.95	21.77		
5	16QAM	1	0	21.60	21.91	21.65	23.5	1
5	16QAM	1	12	22.04	22.00	21.61		
5	16QAM	1	24	21.61	21.76	21.60		
5	16QAM	12	0	20.80	20.83	20.60	22.5	2
5	16QAM	12	7	20.70	21.10	20.62		
5	16QAM	12	13	20.82	21.00	20.71		
5	16QAM	25	0	20.99	21.06	20.76		

Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	23.09	23.12	22.91	24.5	0
3	QPSK	1	8	23.30	23.16	23.00		
3	QPSK	1	14	23.15	23.24	23.00		
3	QPSK	8	0	22.14	22.23	21.99	23.5	1
3	QPSK	8	4	22.14	22.30	22.04		
3	QPSK	8	7	22.10	22.25	22.11		
3	QPSK	15	0	22.10	22.18	21.98		
3	16QAM	1	0	21.60	21.69	21.51	23.5	1
3	16QAM	1	8	21.79	21.77	21.63		
3	16QAM	1	14	21.64	21.73	21.50		
3	16QAM	8	0	21.03	21.05	20.89	22.5	2
3	16QAM	8	4	21.20	21.12	20.87		
3	16QAM	8	7	21.20	21.27	21.05		
3	16QAM	15	0	21.07	21.30	20.87		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.68	23.09	23.16	24.5	0
1.4	QPSK	1	3	22.75	23.10	23.08		
1.4	QPSK	1	5	22.73	23.10	22.95		
1.4	QPSK	3	0	23.12	23.35	23.01		
1.4	QPSK	3	1	23.20	23.30	23.05		
1.4	QPSK	3	3	23.10	23.33	23.10		
1.4	QPSK	6	0	21.94	22.15	21.83	23.5	1
1.4	16QAM	1	0	21.60	21.50	21.56	23.5	1
1.4	16QAM	1	3	21.80	21.78	21.75		
1.4	16QAM	1	5	21.50	21.65	21.50		
1.4	16QAM	3	0	21.82	21.78	21.50		
1.4	16QAM	3	1	21.87	21.99	21.51		
1.4	16QAM	3	3	21.97	21.90	21.76		
1.4	16QAM	6	0	20.69	21.11	20.70	22.5	2

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	23.65	23.45	23.71	24.5	0
10	QPSK	1	25	23.77	23.89	23.87		
10	QPSK	1	49	23.70	23.56	23.60		
10	QPSK	25	0	22.64	22.64	22.73	23.5	1
10	QPSK	25	12	22.56	22.68	22.55		
10	QPSK	25	25	22.48	22.68	22.72		
10	QPSK	50	0	22.63	22.70	22.76		
10	16QAM	1	0	22.25	22.44	22.49	23.5	1
10	16QAM	1	25	22.41	22.39	22.43		
10	16QAM	1	49	22.40	22.20	22.60		
10	16QAM	25	0	21.55	21.95	21.72	22.5	2
10	16QAM	25	12	21.83	21.79	21.65		
10	16QAM	25	25	21.78	21.69	21.70		
10	16QAM	50	0	21.71	21.71	21.69		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	23.26	23.53	23.57	24.5	0
5	QPSK	1	12	23.53	23.72	23.70		
5	QPSK	1	24	23.27	23.35	23.67		
5	QPSK	12	0	22.48	22.53	22.74	23.5	1
5	QPSK	12	7	22.63	22.58	22.57		
5	QPSK	12	13	22.40	22.51	22.69		
5	QPSK	25	0	22.55	22.49	22.71		
5	16QAM	1	0	22.14	22.23	22.12	23.5	1
5	16QAM	1	12	22.22	22.12	22.40		
5	16QAM	1	24	22.34	22.43	22.60		
5	16QAM	12	0	21.58	21.45	21.47	22.5	2
5	16QAM	12	7	21.71	21.50	21.39		
5	16QAM	12	13	21.70	21.46	21.42		
5	16QAM	25	0	21.73	21.60	21.79		

Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	23.48	23.56	23.49	24.5	0
3	QPSK	1	8	23.40	23.52	23.54		
3	QPSK	1	14	23.45	23.38	23.53		
3	QPSK	8	0	22.52	22.51	22.60	23.5	1
3	QPSK	8	4	22.39	22.52	22.61		
3	QPSK	8	7	22.55	22.43	22.59		
3	QPSK	15	0	22.68	22.46	22.68		
3	16QAM	1	0	22.18	22.20	22.21	23.5	1
3	16QAM	1	8	22.40	22.21	22.23		
3	16QAM	1	14	22.13	22.00	22.01		
3	16QAM	8	0	21.61	21.48	21.70	22.5	2
3	16QAM	8	4	21.54	21.55	21.73		
3	16QAM	8	7	21.69	21.54	21.69		
3	16QAM	15	0	21.61	21.56	21.31		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	23.61	23.69	23.69	24.5	0
1.4	QPSK	1	3	23.73	23.67	23.78		
1.4	QPSK	1	5	23.54	23.65	23.70		
1.4	QPSK	3	0	23.54	23.82	23.68		
1.4	QPSK	3	1	23.66	23.76	23.73		
1.4	QPSK	3	3	23.78	23.74	23.82		
1.4	QPSK	6	0	22.58	22.73	22.70	23.5	1
1.4	16QAM	1	0	22.50	22.89	22.65	23.5	1
1.4	16QAM	1	3	22.54	22.90	22.60		
1.4	16QAM	1	5	22.54	22.78	22.61		
1.4	16QAM	3	0	22.54	22.71	22.69		
1.4	16QAM	3	1	22.49	22.75	22.66		
1.4	16QAM	3	3	22.97	22.62	22.70		
1.4	16QAM	6	0	21.43	21.60	21.46	22.5	2

<LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel					23230			
Frequency (MHz)					782			
10	QPSK	1	0		23.29		24.5	0
10	QPSK	1	25		23.72			
10	QPSK	1	49		23.64			
10	QPSK	25	0		22.45		23.5	1
10	QPSK	25	12		22.41			
10	QPSK	25	25		22.57			
10	QPSK	50	0		22.38			
10	16QAM	1	0		22.05		23.5	1
10	16QAM	1	25		22.49			
10	16QAM	1	49		22.02			
10	16QAM	25	0		21.44		22.5	2
10	16QAM	25	12		21.66			
10	16QAM	25	25		21.59			
10	16QAM	50	0		21.39			
Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	23.37	23.50	23.45	24.5	0
5	QPSK	1	12	23.65	23.68	23.33		
5	QPSK	1	24	23.47	23.24	23.32		
5	QPSK	12	0	22.51	22.53	22.63	23.5	1
5	QPSK	12	7	22.38	22.54	22.55		
5	QPSK	12	13	22.48	22.47	22.67		
5	QPSK	25	0	22.42	22.52	22.55		
5	16QAM	1	0	22.30	22.50	22.65	23.5	1
5	16QAM	1	12	22.52	22.37	22.72		
5	16QAM	1	24	22.40	22.40	22.65		
5	16QAM	12	0	21.45	21.61	21.70	22.5	2
5	16QAM	12	7	21.54	21.62	21.72		
5	16QAM	12	13	21.55	21.45	21.74		
5	16QAM	25	0	21.46	21.60	21.62		

<Reduced Power Mode for P-Sensor On>

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	15.35	15.40	15.45	16	0
20	QPSK	1	49	15.75	15.40	15.70		
20	QPSK	1	99	15.50	15.50	15.40		
20	QPSK	50	0	15.59	15.56	15.54	16	0
20	QPSK	50	24	15.41	15.52	15.54		
20	QPSK	50	50	15.36	15.39	15.45		
20	QPSK	100	0	15.55	15.53	15.40		
20	16QAM	1	0	15.13	15.22	15.11	16	0
20	16QAM	1	49	15.02	15.21	15.20		
20	16QAM	1	99	15.11	15.12	15.06		
20	16QAM	50	0	15.53	15.51	15.47	16	0
20	16QAM	50	24	15.39	15.48	15.64		
20	16QAM	50	50	15.57	15.34	15.56		
20	16QAM	100	0	15.47	15.49	15.57		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	15.56	15.63	15.51	16	0
15	QPSK	1	37	15.66	15.72	15.74		
15	QPSK	1	74	15.34	15.31	15.41		
15	QPSK	36	0	15.56	15.60	15.65	16	0
15	QPSK	36	20	15.58	15.55	15.63		
15	QPSK	36	39	15.48	15.37	15.47		
15	QPSK	75	0	15.55	15.50	15.61		
15	16QAM	1	0	15.33	15.25	15.12	16	0
15	16QAM	1	37	15.30	15.30	15.30		
15	16QAM	1	74	15.47	15.02	15.10		
15	16QAM	36	0	15.63	15.55	15.54	16	0
15	16QAM	36	20	15.58	15.59	15.64		
15	16QAM	36	39	15.39	15.51	15.61		
15	16QAM	75	0	15.63	15.45	15.54		

Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	15.24	15.55	15.41	16	0
10	QPSK	1	25	15.44	15.60	15.48		
10	QPSK	1	49	15.46	15.43	15.20		
10	QPSK	25	0	15.50	15.57	15.56	16	0
10	QPSK	25	12	15.61	15.52	15.53		
10	QPSK	25	25	15.49	15.40	15.47		
10	QPSK	50	0	15.51	15.50	15.57		
10	16QAM	1	0	15.32	15.10	15.31	16	0
10	16QAM	1	25	15.03	15.05	15.00		
10	16QAM	1	49	15.03	15.08	15.21		
10	16QAM	25	0	15.54	15.58	15.60	16	0
10	16QAM	25	12	15.62	15.62	15.65		
10	16QAM	25	25	15.49	15.36	15.73		
10	16QAM	50	0	15.51	15.45	15.70		
Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	15.50	15.50	15.24	16	0
5	QPSK	1	12	15.60	15.38	15.65		
5	QPSK	1	24	15.59	15.16	15.37		
5	QPSK	12	0	15.47	15.43	15.47	16	0
5	QPSK	12	7	15.43	15.43	15.49		
5	QPSK	12	13	15.42	15.34	15.50		
5	QPSK	25	0	15.38	15.37	15.53		
5	16QAM	1	0	15.23	15.23	15.53	16	0
5	16QAM	1	12	15.53	15.63	15.65		
5	16QAM	1	24	15.46	15.48	15.29		
5	16QAM	12	0	15.39	15.60	15.52	16	0
5	16QAM	12	7	15.36	15.49	15.40		
5	16QAM	12	13	15.48	15.50	15.23		
5	16QAM	25	0	15.40	15.44	15.45		

Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	15.43	15.45	15.53	16	0
3	QPSK	1	8	15.44	15.47	15.49		
3	QPSK	1	14	15.37	15.36	15.25		
3	QPSK	8	0	15.55	15.47	15.66	16	0
3	QPSK	8	4	15.49	15.48	15.59		
3	QPSK	8	7	15.47	15.42	15.57		
3	QPSK	15	0	15.43	15.42	15.54		
3	16QAM	1	0	15.23	15.08	15.50	16	0
3	16QAM	1	8	15.20	15.30	15.50		
3	16QAM	1	14	15.37	15.30	15.28		
3	16QAM	8	0	15.27	15.42	15.61	16	0
3	16QAM	8	4	15.61	15.33	15.71		
3	16QAM	8	7	15.50	15.36	15.63		
3	16QAM	15	0	15.60	15.34	15.57		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	15.33	15.39	15.51	16	0
1.4	QPSK	1	3	15.38	15.37	15.66		
1.4	QPSK	1	5	15.31	15.21	15.52		
1.4	QPSK	3	0	15.40	15.42	15.64		
1.4	QPSK	3	1	15.53	15.45	15.66		
1.4	QPSK	3	3	15.60	15.51	15.56		
1.4	QPSK	6	0	15.38	15.41	15.59	16	0
1.4	16QAM	1	0	15.50	15.55	15.67	16	0
1.4	16QAM	1	3	15.60	15.66	15.60		
1.4	16QAM	1	5	15.63	15.50	15.65		
1.4	16QAM	3	0	15.59	15.27	15.63		
1.4	16QAM	3	1	15.64	15.57	15.60		
1.4	16QAM	3	3	15.68	15.67	15.48		
1.4	16QAM	6	0	15.35	15.51	15.37	16	0

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	16.82	16.85	16.99	17	0
20	QPSK	1	49	16.78	16.95	16.83		
20	QPSK	1	99	16.80	16.80	16.80		
20	QPSK	50	0	16.96	16.92	16.98	17	0
20	QPSK	50	24	16.86	16.90	16.98		
20	QPSK	50	50	16.84	16.86	16.92		
20	QPSK	100	0	16.91	16.92	16.91		
20	16QAM	1	0	16.64	16.63	16.96	17	0
20	16QAM	1	49	16.80	16.40	16.80		
20	16QAM	1	99	16.33	16.40	16.60		
20	16QAM	50	0	16.65	16.93	16.90	17	0
20	16QAM	50	24	16.71	16.91	16.80		
20	16QAM	50	50	16.83	16.73	16.81		
20	16QAM	100	0	16.73	16.78	16.80		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	16.72	16.78	16.96	17	0
15	QPSK	1	37	16.97	16.98	16.96		
15	QPSK	1	74	16.75	16.75	16.82		
15	QPSK	36	0	16.76	16.97	16.91	17	0
15	QPSK	36	20	16.83	16.89	16.98		
15	QPSK	36	39	16.85	16.82	16.88		
15	QPSK	75	0	16.79	16.83	16.87		
15	16QAM	1	0	16.48	16.46	16.53	17	0
15	16QAM	1	37	16.47	16.65	16.46		
15	16QAM	1	74	16.58	16.36	16.40		
15	16QAM	36	0	16.83	16.89	16.93	17	0
15	16QAM	36	20	16.89	16.97	16.98		
15	16QAM	36	39	16.80	16.79	16.84		
15	16QAM	75	0	16.80	16.71	16.96		

Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	16.60	16.73	16.84	17	0
10	QPSK	1	25	16.60	16.92	16.90		
10	QPSK	1	49	16.67	16.54	16.76		
10	QPSK	25	0	16.80	16.86	16.91	17	0
10	QPSK	25	12	16.79	16.89	16.97		
10	QPSK	25	25	16.77	16.70	16.83		
10	QPSK	50	0	16.85	16.79	16.93		
10	16QAM	1	0	16.53	16.50	16.57	17	0
10	16QAM	1	25	16.92	16.96	16.46		
10	16QAM	1	49	16.93	16.51	16.81		
10	16QAM	25	0	16.78	16.78	16.80	17	0
10	16QAM	25	12	16.94	16.80	16.95		
10	16QAM	25	25	16.88	16.78	16.77		
10	16QAM	50	0	16.83	16.88	16.81		
Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	16.69	16.72	16.61	17	0
5	QPSK	1	12	16.87	16.83	16.71		
5	QPSK	1	24	16.50	16.64	16.71		
5	QPSK	12	0	16.73	16.76	16.79	17	0
5	QPSK	12	7	16.74	16.78	16.85		
5	QPSK	12	13	16.67	16.66	16.87		
5	QPSK	25	0	16.70	16.84	16.78		
5	16QAM	1	0	16.52	16.20	16.68	17	0
5	16QAM	1	12	16.74	16.60	16.74		
5	16QAM	1	24	16.19	16.21	16.36		
5	16QAM	12	0	16.69	16.72	16.67	17	0
5	16QAM	12	7	16.78	16.73	16.91		
5	16QAM	12	13	16.82	16.61	16.92		
5	16QAM	25	0	16.76	16.74	16.93		

Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	16.78	16.82	16.66	17	0
3	QPSK	1	8	16.77	16.85	16.69		
3	QPSK	1	14	16.68	16.78	16.54		
3	QPSK	8	0	16.85	16.81	16.65	17	0
3	QPSK	8	4	16.90	16.86	16.70		
3	QPSK	8	7	16.82	16.79	16.77		
3	QPSK	15	0	16.73	16.82	16.65		
3	16QAM	1	0	16.32	16.26	16.26	17	0
3	16QAM	1	8	16.53	16.31	16.30		
3	16QAM	1	14	16.58	16.77	16.41		
3	16QAM	8	0	16.78	16.79	16.60	17	0
3	16QAM	8	4	16.61	16.83	16.51		
3	16QAM	8	7	16.63	16.64	16.69		
3	16QAM	15	0	16.62	16.74	16.72		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	16.69	16.73	16.75	17	0
1.4	QPSK	1	3	16.89	16.74	16.70		
1.4	QPSK	1	5	16.86	16.65	16.75		
1.4	QPSK	3	0	16.93	16.72	16.93		
1.4	QPSK	3	1	16.86	16.84	16.98		
1.4	QPSK	3	3	16.85	16.85	16.85		
1.4	QPSK	6	0	16.81	16.80	16.85	17	0
1.4	16QAM	1	0	16.54	16.49	16.34	17	0
1.4	16QAM	1	3	16.75	16.85	16.58		
1.4	16QAM	1	5	16.75	16.57	16.49		
1.4	16QAM	3	0	16.56	16.67	16.63		
1.4	16QAM	3	1	16.72	16.68	16.67		
1.4	16QAM	3	3	16.61	16.68	16.70		
1.4	16QAM	6	0	16.54	16.57	16.77	17	0

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.17	22.04	22.13	22.5	0
10	QPSK	1	25	22.16	22.49	22.45		
10	QPSK	1	49	22.07	22.48	22.38		
10	QPSK	25	0	22.26	22.33	22.45	22.5	0
10	QPSK	25	12	22.26	22.34	22.40		
10	QPSK	25	25	22.30	22.26	22.39		
10	QPSK	50	0	22.24	22.30	22.33		
10	16QAM	1	0	22.03	21.89	21.82	22.5	0
10	16QAM	1	25	22.12	22.18	21.91		
10	16QAM	1	49	21.88	21.99	21.74		
10	16QAM	25	0	22.32	22.39	22.40	22.5	0
10	16QAM	25	12	22.40	22.39	22.42		
10	16QAM	25	25	22.31	22.38	22.35		
10	16QAM	50	0	22.38	22.44	22.40		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.10	22.18	22.46	22.5	0
5	QPSK	1	12	22.33	22.44	22.45		
5	QPSK	1	24	22.11	22.23	22.21		
5	QPSK	12	0	22.21	22.23	22.37	22.5	0
5	QPSK	12	7	22.27	22.28	22.31		
5	QPSK	12	13	22.17	22.24	22.27		
5	QPSK	25	0	22.20	22.29	22.32		
5	16QAM	1	0	21.65	21.66	21.87	22.5	0
5	16QAM	1	12	22.00	22.00	22.05		
5	16QAM	1	24	21.96	21.70	21.61		
5	16QAM	12	0	22.29	22.23	22.26	22.5	0
5	16QAM	12	7	22.43	22.30	22.39		
5	16QAM	12	13	22.32	22.37	22.45		
5	16QAM	25	0	22.35	22.34	22.39		

Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.16	22.20	22.33	22.5	0
3	QPSK	1	8	22.27	22.19	22.13		
3	QPSK	1	14	22.18	22.17	22.17		
3	QPSK	8	0	22.33	22.37	22.24	22.5	0
3	QPSK	8	4	22.28	22.38	22.34		
3	QPSK	8	7	22.28	22.29	22.30		
3	QPSK	15	0	22.25	22.32	22.32		
3	16QAM	1	0	22.36	22.10	22.43	22.5	0
3	16QAM	1	8	22.35	22.01	22.46		
3	16QAM	1	14	22.29	22.03	22.44		
3	16QAM	8	0	22.23	22.42	22.36	22.5	0
3	16QAM	8	4	22.25	22.47	22.46		
3	16QAM	8	7	22.31	22.43	22.33		
3	16QAM	15	0	22.33	22.36	22.46		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.19	22.15	22.26	22.5	0
1.4	QPSK	1	3	22.24	22.19	22.35		
1.4	QPSK	1	5	22.26	22.06	22.29		
1.4	QPSK	3	0	22.30	22.25	22.34		
1.4	QPSK	3	1	22.34	22.38	22.40		
1.4	QPSK	3	3	22.29	22.29	22.38		
1.4	QPSK	6	0	22.30	22.24	22.28	22.5	0
1.4	16QAM	1	0	22.01	21.91	21.75	22.5	0
1.4	16QAM	1	3	22.11	21.87	22.00		
1.4	16QAM	1	5	22.00	21.77	21.91		
1.4	16QAM	3	0	22.45	22.42	22.18		
1.4	16QAM	3	1	22.20	22.45	22.36		
1.4	16QAM	3	3	22.24	22.35	22.47		
1.4	16QAM	6	0	22.23	22.01	22.33	22.5	0

<LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel					23230			
Frequency (MHz)					782			
10	QPSK	1	0		20.26		21	0
10	QPSK	1	25		20.41			
10	QPSK	1	49		20.35			
10	QPSK	25	0		20.20		21	0
10	QPSK	25	12		20.29			
10	QPSK	25	25		20.30			
10	QPSK	50	0		20.36			
10	16QAM	1	0		20.00		21	0
10	16QAM	1	25		20.40			
10	16QAM	1	49		19.94			
10	16QAM	25	0		20.25		21	0
10	16QAM	25	12		20.26			
10	16QAM	25	25		20.20			
10	16QAM	50	0		20.10			
Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	20.08	19.87	20.01	21	0
5	QPSK	1	12	20.31	19.98	20.13		
5	QPSK	1	24	19.98	20.00	20.03		
5	QPSK	12	0	20.02	20.00	20.08	21	0
5	QPSK	12	7	20.12	20.07	20.03		
5	QPSK	12	13	20.09	20.02	20.03		
5	QPSK	25	0	20.10	20.02	19.96		
5	16QAM	1	0	19.65	19.78	20.00	21	0
5	16QAM	1	12	20.00	19.72	19.90		
5	16QAM	1	24	20.00	19.71	20.13		
5	16QAM	12	0	19.92	20.19	19.89	21	0
5	16QAM	12	7	20.23	20.20	20.10		
5	16QAM	12	13	19.73	19.74	19.80		
5	16QAM	25	0	20.20	20.17	20.15		

<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.

<Full Power Mode>

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	16.77	18.00	97.59
		6	2437	17.28	18.00	
		11	2462	16.67	18.00	
	802.11g 6Mbps	1	2412	13.88	15.00	87.04
		6	2437	14.08	15.00	
		11	2462	13.71	15.00	
	802.11n-HT20 MCS0	1	2412	12.93	14.00	86.70
		6	2437	13.14	14.00	
		11	2462	12.77	14.00	
	802.11n-HT40 MCS0	3	2422	12.74	14.00	85.87
		6	2437	12.61	14.00	
		9	2452	12.88	14.00	

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	11.79	13.00	87.04
		40	5200	11.98	13.00	
		44	5220	11.88	13.00	
		48	5240	11.97	13.00	
	802.11n-HT20 MCS0	36	5180	11.51	13.00	86.70
		40	5200	11.67	13.00	
		44	5220	11.83	13.00	
		48	5240	11.89	13.00	
	802.11n-HT40 MCS0	38	5190	12.08	13.00	85.96
		46	5230	12.10	13.00	
	802.11ac-VHT20 MCS0	36	5180	10.72	12.50	83.33
		40	5200	10.95	12.50	
		44	5220	11.16	12.50	
		48	5240	11.18	12.50	
	802.11ac-VHT40 MCS0	38	5190	10.93	12.50	82.72
		46	5230	11.13	12.50	
	802.11ac-VHT80 MCS0	42	5210	11.06	12.50	55.63

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	12.26	13.00	87.04
		157	5785	11.97	13.00	
		165	5825	12.02	13.00	
	802.11n-HT20 MCS0	149	5745	12.18	12.50	86.70
		157	5785	12.14	12.50	
		165	5825	10.40	12.50	
	802.11n-HT40 MCS0	151	5755	12.43	12.50	85.96
		159	5795	12.21	12.50	
	802.11ac-VHT20 MCS0	149	5745	10.75	12.00	83.33
		157	5785	10.54	12.00	
		165	5825	10.65	12.00	
	802.11ac-VHT40 MCS0	151	5755	10.86	12.00	82.72
		159	5795	10.58	12.00	
	802.11ac-VHT80 MCS0	155	5775	11.13	12.00	55.63

<Reduced Power for P-Sensor On>

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	11.07	12.00	97.59
		6	2437	11.09	12.00	
		11	2462	11.02	12.00	
	802.11g 6Mbps	1	2412	11.00	12.00	87.04
		6	2437	11.06	12.00	
		11	2462	10.85	12.00	
	802.11n-HT20 MCS0	1	2412	10.51	12.00	86.70
		6	2437	10.68	12.00	
		11	2462	10.50	12.00	
	802.11n-HT40 MCS0	3	2422	10.52	12.00	85.87
		6	2437	10.50	12.00	
		9	2452	10.88	12.00	

<5GHz WLAN>

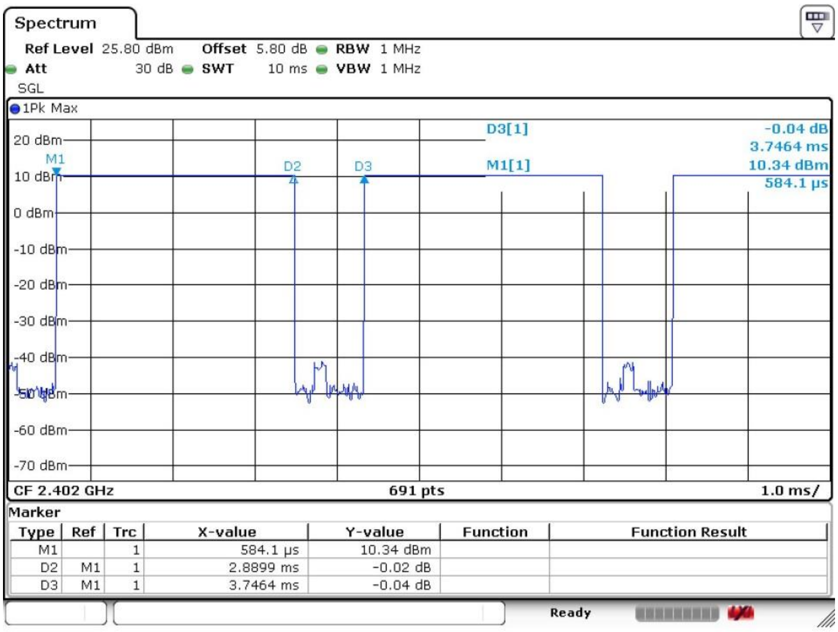
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	11.42	11.50	87.04
		157	5785	11.29	11.50	
		165	5825	11.35	11.50	
	802.11n-HT20 MCS0	149	5745	11.20	11.50	86.70
		157	5785	11.10	11.50	
		165	5825	11.00	11.50	
	802.11n-HT40 MCS0	151	5755	10.98	11.00	85.96
		159	5795	10.88	11.00	
	802.11ac-VHT20 MCS0	149	5745	10.75	11.50	83.33
		157	5785	10.54	11.50	
		165	5825	10.65	11.50	
	802.11ac-VHT40 MCS0	151	5755	10.86	11.00	82.72
		159	5795	10.58	11.00	
	802.11ac-VHT80 MCS0	155	5775	10.70	11.00	55.63

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 77.14 % 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.

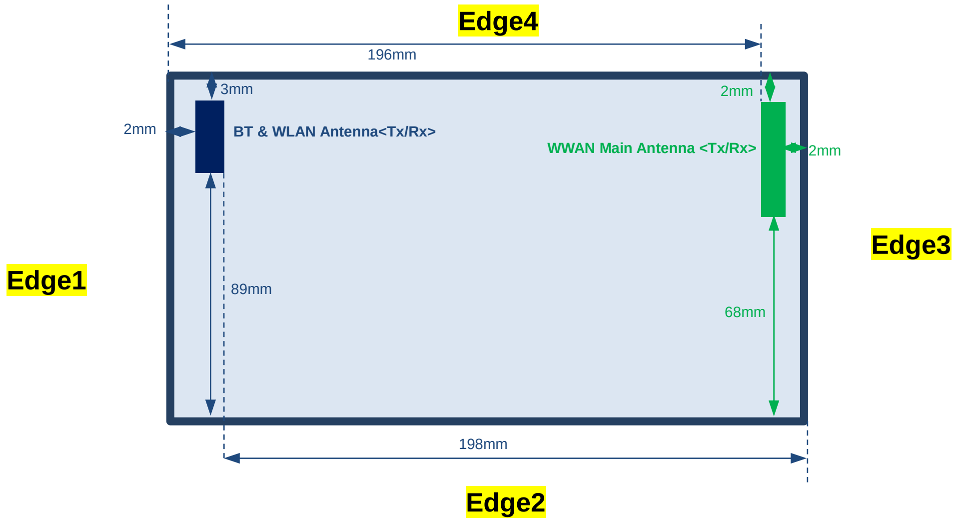
Bluetooth time-domain plot



Mode	Channel	Frequency (MHz)	Average power (dBm)
			1Mbps
BR/EDR	CH 00	2402	12.00
	CH 39	2441	11.44
	CH 78	2480	**12.08**
Tune-up limit (dBm)			14.00

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	**3.09**
	CH 19	2440	2.63
	CH 39	2480	2.83
Tune-up limit (dBm)			5.00

14. Antenna Location



Length: 210mm
Width: 125mm

Back View

<SAR test exclusion table>

General Note:

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

Exposure Position	Wireless Interface	LTE Band 13	LTE Band 5	LTE Band 4	LTE Band 2	BT	2.4GHz WLAN	5GHz WLAN
	Calculated Frequency	784MHz	848MHz	1754MHz	1909MHz	2480MHz	2462MHz	5825MHz
	Maximum power (dBm)	24.5	24.5	24.5	24.5	14	18	13
	Maximum rated power(mW)	282.0	282.0	282.0	282.0	25.0	63.0	20.0
Bottom Face	Separation distance(mm)	5.0				5.0	5.0	5.0
	exclusion threshold	49.9	51.9	74.7	77.9	7.9	19.8	9.7
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Edge 1	Separation distance(mm)	196.0				5.0	5.0	5.0
	exclusion threshold	933.0	988.0	1573.0	1569.0	7.9	19.8	9.7
	Testing required?	No	No	No	No	Yes	Yes	Yes
Edge 2	Separation distance(mm)	68.0				89.0	89.0	89.0
	exclusion threshold	263.0	265.0	293.0	289.0	485.0	486.0	452.0
	Testing required?	Yes	Yes	No	No	No	No	No
Edge 3	Separation distance(mm)	5.0				198.0	198.0	198.0
	exclusion threshold	49.9	51.9	74.7	77.9	1575.0	1576.0	1542.0
	Testing required?	Yes	Yes	Yes	Yes	No	No	No
Edge 4	Separation distance(mm)	5.0				5.0	5.0	5.0
	exclusion threshold	49.9	51.9	74.7	77.9	7.9	19.8	9.7
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

15. 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
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. The device employs proximity sensor that detect the presence of the user’s body also a finger or hand at the bottom face, edge 3 or edge 4 faces of the device. When bottom face, edge 3 or edge 4 of body condition or when the device is in handheld state is detected, all WWAN bands reduced power will be active.
5. For WLAN, when proximity sensor detect user’s body also a finger or hand at the bottom face or edge 1 face of the device, WLAN2.4GHz/WLAN5.8GHz reduced power will be active.
6. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 10mm for bottom face, 9mm for edge 3 and 2mm for edge 4 for WWAN frequency bands; 9mm for bottom face and 8mm for edge 1 for WLAN frequency bands.
7. For co-located analysis between WWAN and WLAN, WWAN 9mm bottom SAR testing and WLAN 10mm bottom SAR testing are evaluated additional to correspondent simultaneously SAR.
8. WLAN5.2GHz and Bluetooth distance SAR performed for co-located with WWAN analysis.

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.
6. For LTE B4 / B5 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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. 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.
3. 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.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

15.1 Body SAR

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 13	10M	QPSK	1	25	Bottom Face	0	On	23230	782	20.41	21.00	1.146	0.01	1.000	1.146
	LTE Band 13	10M	QPSK	25	25	Bottom Face	0	On	23230	782	20.30	21.00	1.175	-0.18	0.963	1.131
01	LTE Band 13	10M	QPSK	50	0	Bottom Face	0	On	23230	782	20.36	21.00	1.159	-0.11	1.020	**1.182**
	LTE Band 13	10M	QPSK	1	25	Edge 2	0	Off	23230	782	23.72	24.50	1.197	0.13	0.090	0.108
	LTE Band 13	10M	QPSK	25	25	Edge 2	0	Off	23230	782	22.57	23.50	1.239	-0.09	0.066	0.081
	LTE Band 13	10M	QPSK	1	25	Edge 3	0	On	23230	782	20.41	21.00	1.146	0.05	0.521	0.597
	LTE Band 13	10M	QPSK	25	25	Edge 3	0	On	23230	782	20.30	21.00	1.175	0.09	0.494	0.580
	LTE Band 13	10M	QPSK	1	25	Edge 4	0	On	23230	782	20.41	21.00	1.146	0.01	0.196	0.225
	LTE Band 13	10M	QPSK	25	25	Edge 4	0	On	23230	782	20.30	21.00	1.175	-0.06	0.199	0.234
	LTE Band 13	10M	QPSK	1	25	Bottom Face	10	Off	23230	782	23.72	24.50	1.197	0.11	0.946	1.132
	LTE Band 13	10M	QPSK	25	25	Bottom Face	10	Off	23230	782	22.57	23.50	1.239	0.01	0.757	0.938
	LTE Band 13	10M	QPSK	50	0	Bottom Face	10	Off	23230	782	22.38	23.50	1.294	-0.05	0.696	0.901
	LTE Band 13	10M	QPSK	1	25	Bottom Face	9	On	23230	782	20.41	21.00	1.146	0.01	0.338	0.387
	LTE Band 13	10M	QPSK	25	25	Bottom Face	9	On	23230	782	20.30	21.00	1.175	0.06	0.321	0.377
	LTE Band 13	10M	QPSK	1	25	Edge 3	9	Off	23230	782	23.72	24.50	1.197	0.01	0.638	0.764
	LTE Band 13	10M	QPSK	25	25	Edge 3	9	Off	23230	782	22.57	23.50	1.239	0.06	0.502	0.622
	LTE Band 13	10M	QPSK	1	25	Edge 4	2	Off	23230	782	23.72	24.50	1.197	-0.02	0.289	0.346
	LTE Band 13	10M	QPSK	25	25	Edge 4	2	Off	23230	782	22.57	23.50	1.239	0.06	0.234	0.290
	LTE Band 5	10M	QPSK	1	25	Bottom Face	0	On	20525	836.5	22.49	22.50	1.002	0.15	1.030	1.032
02	LTE Band 5	10M	QPSK	25	0	Bottom Face	0	On	20525	836.5	22.33	22.50	1.040	-0.09	1.060	**1.102**
	LTE Band 5	10M	QPSK	50	0	Bottom Face	0	On	20525	836.5	22.30	22.50	1.047	0.04	1.050	1.099
	LTE Band 5	10M	QPSK	1	25	Edge 2	0	Off	20525	836.5	23.89	24.50	1.151	0.01	0.098	0.113
	LTE Band 5	10M	QPSK	25	0	Edge 2	0	Off	20525	836.5	22.64	23.50	1.219	0.02	0.078	0.095
	LTE Band 5	10M	QPSK	1	25	Edge 3	0	On	20525	836.5	22.49	22.50	1.002	-0.01	0.589	0.590
	LTE Band 5	10M	QPSK	25	0	Edge 3	0	On	20525	836.5	22.33	22.50	1.040	0.05	0.584	0.607
	LTE Band 5	10M	QPSK	1	25	Edge 4	0	On	20525	836.5	22.49	22.50	1.002	0.02	0.381	0.382
	LTE Band 5	10M	QPSK	25	0	Edge 4	0	On	20525	836.5	22.33	22.50	1.040	0.09	0.392	0.408
	LTE Band 5	10M	QPSK	1	25	Bottom Face	10	Off	20525	836.5	23.89	24.50	1.151	-0.03	0.864	0.994
	LTE Band 5	10M	QPSK	25	0	Bottom Face	10	Off	20525	836.5	22.64	23.50	1.219	-0.05	0.692	0.844
	LTE Band 5	10M	QPSK	50	0	Bottom Face	10	Off	20525	836.5	22.70	23.50	1.202	-0.01	0.675	0.812
	LTE Band 5	10M	QPSK	1	25	Bottom Face	9	On	20525	836.5	22.49	22.50	1.002	0.06	0.380	0.381
	LTE Band 5	10M	QPSK	25	0	Bottom Face	9	On	20525	836.5	22.33	22.50	1.040	-0.01	0.350	0.364
	LTE Band 5	10M	QPSK	1	25	Edge 3	9	Off	20525	836.5	23.89	24.50	1.151	0.03	0.515	0.593
	LTE Band 5	10M	QPSK	25	0	Edge 3	9	Off	20525	836.5	22.64	23.50	1.219	0.02	0.408	0.497
	LTE Band 5	10M	QPSK	1	25	Edge 4	2	Off	20525	836.5	23.89	24.50	1.151	-0.03	0.304	0.350
	LTE Band 5	10M	QPSK	25	0	Edge 4	2	Off	20525	836.5	22.64	23.50	1.219	0.06	0.263	0.321

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20M	QPSK	1	49	Bottom Face	0	On	18700	1860	15.75	16.00	1.059	-0.16	0.743	0.787
	LTE Band 2	20M	QPSK	50	0	Bottom Face	0	On	18700	1860	15.59	16.00	1.099	0.02	0.735	0.808
	LTE Band 2	20M	QPSK	50	0	Bottom Face	0	On	18900	1880	15.56	16.00	1.107	0.03	0.762	0.843
	LTE Band 2	20M	QPSK	50	0	Bottom Face	0	On	19100	1900	15.54	16.00	1.112	-0.05	0.773	0.859
	LTE Band 2	20M	QPSK	100	0	Bottom Face	0	On	18700	1860	15.55	16.00	1.109	0.05	0.659	0.731
	LTE Band 2	20M	QPSK	1	49	Edge 3	0	On	18700	1860	15.75	16.00	1.059	0.01	0.854	0.905
	LTE Band 2	20M	QPSK	1	49	Edge 3	0	On	18900	1880	15.40	16.00	1.148	0.01	0.809	0.929
	LTE Band 2	20M	QPSK	1	49	Edge 3	0	On	19100	1900	15.70	16.00	1.072	0.03	0.826	0.885
	LTE Band 2	20M	QPSK	50	0	Edge 3	0	On	18700	1860	15.59	16.00	1.099	-0.08	0.876	0.963
	LTE Band 2	20M	QPSK	50	0	Edge 3	0	On	18900	1880	15.56	16.00	1.107	0.02	0.850	0.941
	LTE Band 2	20M	QPSK	50	0	Edge 3	0	On	19100	1900	15.54	16.00	1.112	0.03	0.826	0.918
	LTE Band 2	20M	QPSK	100	0	Edge 3	0	On	18700	1860	15.55	16.00	1.109	-0.01	0.832	0.923
	LTE Band 2	20M	QPSK	1	49	Edge 4	0	On	18700	1860	15.75	16.00	1.059	0.01	0.127	0.135
	LTE Band 2	20M	QPSK	50	0	Edge 4	0	On	18700	1860	15.59	16.00	1.099	0.03	0.128	0.141
03	LTE Band 2	20M	QPSK	1	49	Bottom Face	10	Off	18700	1860	23.23	24.50	1.340	-0.05	0.757	**1.014**
	LTE Band 2	20M	QPSK	1	49	Bottom Face	10	Off	18900	1880	23.17	24.50	1.358	-0.02	0.723	0.982
	LTE Band 2	20M	QPSK	1	49	Bottom Face	10	Off	19100	1900	23.13	24.50	1.371	0.01	0.692	0.949
	LTE Band 2	20M	QPSK	50	24	Bottom Face	10	Off	18700	1860	22.18	23.50	1.355	0.01	0.614	0.832
	LTE Band 2	20M	QPSK	50	24	Bottom Face	10	Off	18900	1880	22.16	23.50	1.361	0.01	0.569	0.775
	LTE Band 2	20M	QPSK	50	24	Bottom Face	10	Off	19100	1900	22.18	23.50	1.355	-0.03	0.538	0.729
	LTE Band 2	20M	QPSK	100	0	Bottom Face	10	Off	18700	1860	22.13	23.50	1.371	0.03	0.593	0.813
	LTE Band 2	20M	QPSK	1	49	Bottom Face	9	On	18700	1860	15.75	16.00	1.059	0.06	0.291	0.308
	LTE Band 2	20M	QPSK	50	0	Bottom Face	9	On	18700	1860	15.59	16.00	1.099	-0.03	0.283	0.311
	LTE Band 2	20M	QPSK	1	49	Edge 3	9	Off	18700	1860	23.23	24.50	1.340	0.03	0.742	0.994
	LTE Band 2	20M	QPSK	1	49	Edge 3	9	Off	18900	1880	23.17	24.50	1.358	0.01	0.639	0.868
	LTE Band 2	20M	QPSK	1	49	Edge 3	9	Off	19100	1900	23.13	24.50	1.371	-0.02	0.661	0.906
	LTE Band 2	20M	QPSK	50	24	Edge 3	9	Off	18700	1860	22.18	23.50	1.355	-0.08	0.516	0.699
	LTE Band 2	20M	QPSK	100	0	Edge 3	9	Off	18700	1860	22.13	23.50	1.371	0.03	0.512	0.702
	LTE Band 2	20M	QPSK	1	49	Edge 4	2	Off	18700	1860	23.23	24.50	1.340	0.01	0.558	0.748
	LTE Band 2	20M	QPSK	50	24	Edge 4	2	Off	18700	1860	22.18	23.50	1.355	0.02	0.474	0.642
	LTE Band 4	20M	QPSK	1	0	Bottom Face	0	On	20175	1732.5	16.85	17.00	1.035	0.03	0.809	0.837
	LTE Band 4	20M	QPSK	50	0	Bottom Face	0	On	20175	1732.5	16.92	17.00	1.019	0.06	0.796	0.811
	LTE Band 4	20M	QPSK	100	0	Bottom Face	0	On	20175	1732.5	16.92	17.00	1.019	0.03	0.801	0.816
	LTE Band 4	20M	QPSK	1	0	Edge 3	0	On	20175	1732.5	16.85	17.00	1.035	0.01	0.641	0.664
	LTE Band 4	20M	QPSK	50	0	Edge 3	0	On	20175	1732.5	16.92	17.00	1.019	0.05	0.646	0.658
	LTE Band 4	20M	QPSK	1	0	Edge 4	0	On	20175	1732.5	16.85	17.00	1.035	0.03	0.246	0.255
	LTE Band 4	20M	QPSK	50	24	Edge 4	0	On	20175	1732.5	16.92	17.00	1.019	0.02	0.262	0.267
04	LTE Band 4	20M	QPSK	1	0	Bottom Face	10	Off	20175	1732.5	22.97	24.50	1.422	-0.04	0.788	**1.121**
	LTE Band 4	20M	QPSK	50	24	Bottom Face	10	Off	20175	1732.5	22.06	23.50	1.393	-0.02	0.611	0.851
	LTE Band 4	20M	QPSK	100	0	Bottom Face	10	Off	20175	1732.5	21.96	23.50	1.426	0.03	0.615	0.877
	LTE Band 4	20M	QPSK	1	0	Bottom Face	9	On	20175	1732.5	16.85	17.00	1.035	-0.06	0.272	0.282
	LTE Band 4	20M	QPSK	50	0	Bottom Face	9	On	20175	1732.5	16.92	17.00	1.019	0.05	0.265	0.270
	LTE Band 4	20M	QPSK	1	0	Edge 3	9	Off	20175	1732.5	22.97	24.50	1.422	0.07	0.717	1.020
	LTE Band 4	20M	QPSK	50	24	Edge 3	9	Off	20175	1732.5	22.06	23.50	1.393	0.06	0.555	0.773
	LTE Band 4	20M	QPSK	100	0	Edge 3	9	Off	20175	1732.5	21.96	23.50	1.426	-0.06	0.552	0.787
	LTE Band 4	20M	QPSK	1	0	Edge 4	2	Off	20175	1732.5	22.97	24.50	1.422	0.06	0.756	1.075
	LTE Band 4	20M	QPSK	50	24	Edge 4	2	Off	20175	1732.5	22.06	23.50	1.393	0.06	0.637	0.887
	LTE Band 4	20M	QPSK	100	0	Edge 4	2	Off	20175	1732.5	21.96	23.50	1.426	0.01	0.652	0.929

<WLAN 2.4GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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)
05	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0	On	6	2437	11.09	12.00	1.233	97.59	1.025	0.02	0.910	1.150
	WLAN 2.4GHz	802.11b 1Mbps	Bottom Face	0	On	1	2412	11.07	12.00	1.239	97.59	1.025	0.02	0.873	1.109
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0	On	6	2437	11.09	12.00	1.233	97.59	1.025	0.04	0.320	0.404
	WLAN2.4GHz	802.11b 1Mbps	Edge 4	0	Off	6	2437	17.28	18.00	1.180	97.59	1.025	0.01	0.418	0.506
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	10	Off	6	2437	17.28	18.00	1.180	97.59	1.025	0.03	0.737	0.892
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	10	Off	1	2412	16.77	18.00	1.327	97.59	1.025	0.03	0.705	0.959
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	9	Off	6	2437	17.28	18.00	1.180	97.59	1.025	-0.03	0.950	1.149
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	9	Off	1	2412	16.77	18.00	1.327	97.59	1.025	0.06	0.825	1.122
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	8	Off	6	2437	17.28	18.00	1.180	97.59	1.025	0.01	0.737	0.892
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	8	Off	1	2412	16.77	18.00	1.327	97.59	1.025	0.01	0.655	0.891

<WLAN5G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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	802.11n-HT40 MCS0	Bottom Face	0	Off	46	5230	12.10	13.00	1.230	85.96	1.163	0.01	0.418	0.598
06	WLAN5.2GHz	802.11n-HT40 MCS0	Edge 1	0	Off	46	5230	12.10	13.00	1.230	85.96	1.163	-0.03	0.444	0.635
	WLAN5.2GHz	802.11n-HT40 MCS0	Edge 4	0	Off	46	5230	12.10	13.00	1.230	85.96	1.163	0.04	0.056	0.080
	WLAN5.2GHz	802.11n-HT40 MCS0	Bottom Face	10	Off	46	5230	12.10	13.00	1.230	85.96	1.163	-0.03	0.019	0.027
	WLAN5.2GHz	802.11n-HT40 MCS0	Bottom Face	9	Off	46	5230	12.10	13.00	1.230	85.96	1.163	0.08	0.076	0.109
	WLAN5.2GHz	802.11n-HT40 MCS0	Edge 1	8	Off	46	5230	12.10	13.00	1.230	85.96	1.163	0.04	0.055	0.079
	WLAN5.8GHz	802.11a 6Mbps	Bottom Face	0	On	149	5745	11.42	11.50	1.019	87.04	1.149	0.01	0.689	0.806
	WLAN5.8GHz	802.11a 6Mbps	Bottom Face	0	On	165	5825	11.35	11.50	1.035	87.04	1.149	-0.03	0.696	0.828
	WLAN5.8GHz	802.11a 6Mbps	Edge 1	0	On	149	5745	11.42	11.50	1.019	87.04	1.149	0.02	0.938	1.098
07	WLAN5.8GHz	802.11a 6Mbps	Edge 1	0	On	165	5825	11.35	11.50	1.035	87.04	1.149	0.01	0.944	1.123
	WLAN5.8GHz	802.11a 6Mbps	Edge 4	0	Off	149	5745	12.26	13.00	1.186	87.04	1.149	0.01	0.120	0.163
	WLAN5.8GHz	802.11a 6Mbps	Bottom Face	10	Off	149	5745	12.26	13.00	1.186	87.04	1.149	0.02	0.069	0.094
	WLAN5.8GHz	802.11a 6Mbps	Bottom Face	9	Off	149	5745	12.26	13.00	1.186	87.04	1.149	0.06	0.070	0.096
	WLAN5.8GHz	802.11a 6Mbps	Edge 1	8	Off	149	5745	12.26	13.00	1.186	87.04	1.149	0.01	0.099	0.135

<Bluetooth 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)
08	Bluetooth	1Mbps	Bottom Face	0	78	2480	12.08	14.00	1.556	77.14	1.080	0.03	0.319	0.536
	Bluetooth	1Mbps	Bottom Face	9	78	2480	12.08	14.00	1.556	77.14	1.080	0.06	0.080	0.134
	Bluetooth	1Mbps	Bottom Face	10	78	2480	12.08	14.00	1.556	77.14	1.080	-0.06	0.070	0.118
	Bluetooth	1Mbps	Edge 1	0	78	2480	12.08	14.00	1.556	77.14	1.080	0.01	0.127	0.213
	Bluetooth	1Mbps	Edge 4	0	78	2480	12.08	14.00	1.556	77.14	1.080	0.05	0.051	0.086

15.2 Repeated SAR Measurement

No.	Band	Mode	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	LTE Band 13	-	10M	QPSK	50	0	Bottom Face	0	on	23230	782	20.36	21.00	1.159	-	-	-0.11	1.020	1	1.182
2nd	LTE Band 13	-	10M	QPSK	50	0	Bottom Face	0	on	23230	782	20.36	21.00	1.159	-	-	0.03	1.000	1.020	1.159
1st	LTE Band 5	-	10M	QPSK	25	0	Bottom Face	0	on	20525	836.5	22.33	22.50	1.040	-	-	-0.09	1.060	1	1.102
2nd	LTE Band 5	-	10M	QPSK	25	0	Bottom Face	0	on	20525	836.5	22.33	22.50	1.040	-	-	0.06	1.050	1.010	1.092
1st	LTE Band 2	-	20M	QPSK	50	0	Edge 3	0	on	18700	1860	15.59	16.00	1.099	-	-	-0.08	0.876	1	0.963
2nd	LTE Band 2	-	20M	QPSK	50	0	Edge 3	0	on	18700	1860	15.59	16.00	1.099	-	-	0.03	0.869	1.008	0.955
1st	LTE Band 4	-	20M	QPSK	1	0	Bottom Face	0	on	20175	1732.5	16.85	17.00	1.035	-	-	0.03	0.809	1	0.837
2nd	LTE Band 4	-	20M	QPSK	1	0	Bottom Face	0	on	20175	1732.5	16.85	17.00	1.035	-	-	-0.06	0.806	1.004	0.834
1st	WLAN2.4GHz	802.11b 1Mbps	-	-	-	-	Bottom Face	9	off	6	2437	17.28	18.00	1.180	97.59	1.025	-0.03	0.950	1	1.149
2nd	WLAN2.4GHz	802.11b 1Mbps	-	-	-	-	Bottom Face	9	off	6	2437	17.28	18.00	1.180	97.59	1.025	0.06	0.948	1.002	1.147
1st	WLAN5.8GHz	802.11a 6Mbps	-	-	-	-	Edge 1	0	on	165	5825	11.35	11.50	1.035	87.04	1.149	0.01	0.944	1	1.123
2nd	WLAN5.8GHz	802.11a 6Mbps	-	-	-	-	Edge 1	0	on	165	5825	11.35	11.50	1.035	87.04	1.149	-0.06	0.939	1.005	1.117

General Note:

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

16. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Body
1.	LTE + 2.4GHz WLAN	Yes
2.	LTE + 5GHz WLAN	Yes
3.	LTE + Bluetooth	Yes

General Note:

1. WLAN 2.4GHz and Bluetooth share the same antenna so can't transmit simultaneously.
2. The reported SAR summation is calculated based on the same configuration and test position.
3. All licensed modes share the same antenna part and cannot transmit simultaneously.
4. 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.
   v) The SPLSR calculated results please refer to section 16.2.

16.1 Body Exposure Conditions

WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	Case No	SPLSR	1+3 Summed 1g SAR (W/kg)	Case No	SPLSR	1+4 Summed 1g SAR (W/kg)	Case No	SPLSR
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth									
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)									
LTE	Band 13	Bottom Face at 10 mm	1.132	0.959	0.094	0.118	**2.09**	**#01**	**0.01**	1.23			1.25		
		Edge 3 at 9 mm	0.764				0.76			0.76			0.76		
		Edge 1 at 8 mm		0.892	0.135	0.213	0.89			0.14			0.21		
		Bottom Face at 0mm	1.182	1.150	0.828	0.536	**2.33**	**#02**	**0.02**	**2.01**	**#09**	**0.01**	**1.72**	**#13**	**0.01**
		Edge 1 at 0mm		0.404	1.123	0.213	0.40			1.12			0.21		
		Edge 2 at 0mm	0.108				0.11			0.11			0.11		
		Edge 3 at 0mm	0.597				0.60			0.60			0.60		
		Edge 4 at 0mm	0.234	0.506	0.163	0.086	0.74			0.40			0.32		
		Edge 4 at 2 mm	0.346	0.506	0.163	0.086	0.85			0.51			0.43		
		Bottom Face at 9 mm	0.387	1.149	0.109	0.134	1.54			0.50			0.52		
	Band 5	Bottom Face at 10 mm	0.994	0.959	0.094	0.118	**1.95**	**#03**	**0.01**	1.09			1.11		
		Edge 3 at 9 mm	0.593				0.59			0.59			0.59		
		Edge 1 at 8 mm		0.892	0.135	0.213	0.89			0.14			0.21		
		Bottom Face at 0mm	1.102	1.150	0.828	0.536	**2.25**	**#04**	**0.02**	**1.93**	**#10**	**0.01**	**1.64**	**#14**	**0.01**
		Edge 1 at 0mm		0.404	1.123	0.213	0.40			1.12			0.21		
		Edge 2 at 0mm	0.113				0.11			0.11			0.11		
		Edge 3 at 0mm	0.607				0.61			0.61			0.61		
		Edge 4 at 0mm	0.408	0.506	0.163	0.086	0.91			0.57			0.49		
		Edge 4 at 2 mm	0.350	0.506	0.163	0.086	0.86			0.51			0.44		
		Bottom Face at 9 mm	0.381	1.149	0.109	0.134	1.53			0.49			0.52		

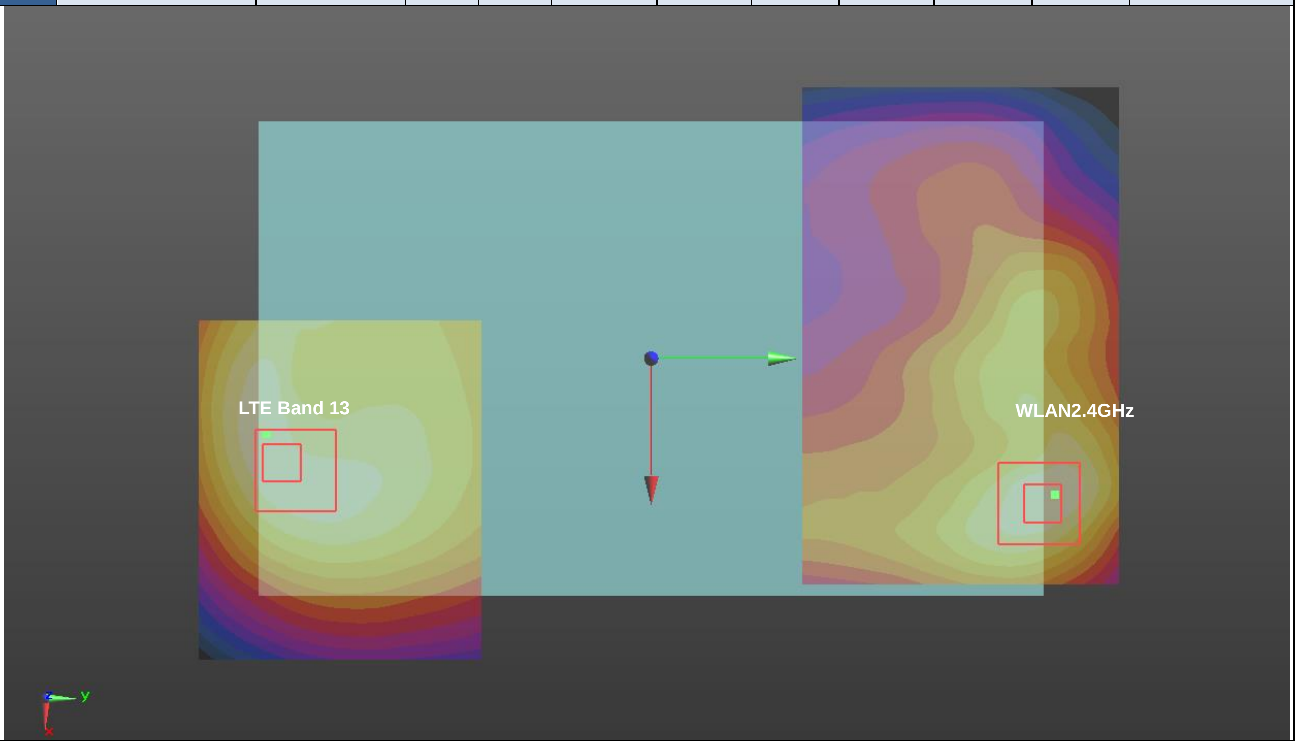
WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	Case No	SPLSR	1+3 Summed 1g SAR (W/kg)	Case No	SPLSR	1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth							
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)							
LTE	Band 2	Bottom Face at 10 mm	1.014	0.959	0.094	0.118	**1.97**	**#05**	**0.01**	1.11			1.13
		Edge 3 at 9 mm	0.994				0.99			0.99			0.99
		Edge 1 at 8 mm		0.892	0.135	0.213	0.89			0.14			0.21
		Bottom Face at 0mm	0.859	1.150	0.828	0.536	**2.01**	**#06**	**0.03**	**1.69**	**#11**	**0.02**	**1.40**
		Edge 1 at 0mm		0.404	1.123	0.213	0.40			1.12			0.21
		Edge 3 at 0mm	0.963				0.96			0.96			0.96
		Edge 4 at 0mm	0.141	0.506	0.163	0.086	0.65			0.30			0.23
		Edge 4 at 2 mm	0.748	0.506	0.163	0.086	1.25			0.91			0.83
		Bottom Face at 9 mm	0.311	1.149	0.109	0.134	1.46			0.42			0.45
	Band 4	Bottom Face at 10 mm	1.121	0.959	0.094	0.118	**2.08**	**#07**	**0.02**	1.22			1.24
		Edge 3 at 9 mm	1.020				1.02			1.02			1.02
		Edge 1 at 8 mm		0.892	0.135	0.213	0.89			0.14			0.21
		Bottom Face at 0mm	0.837	1.150	0.828	0.536	**1.99**	**#08**	**0.01**	**1.67**	**#12**	**0.01**	1.37
		Edge 1 at 0mm		0.404	1.123	0.213	0.40			1.12			0.21
		Edge 3 at 0mm	0.664				0.66			0.66			0.66
		Edge 4 at 0mm	0.267	0.506	0.163	0.086	0.77			0.43			0.35
		Edge 4 at 2 mm	1.075	0.506	0.163	0.086	**1.58**			**1.24**			1.16
		Bottom Face at 9 mm	0.282	1.149	0.109	0.134	1.43			0.39			0.42

16.2 SPLSR Evaluation and Analysis

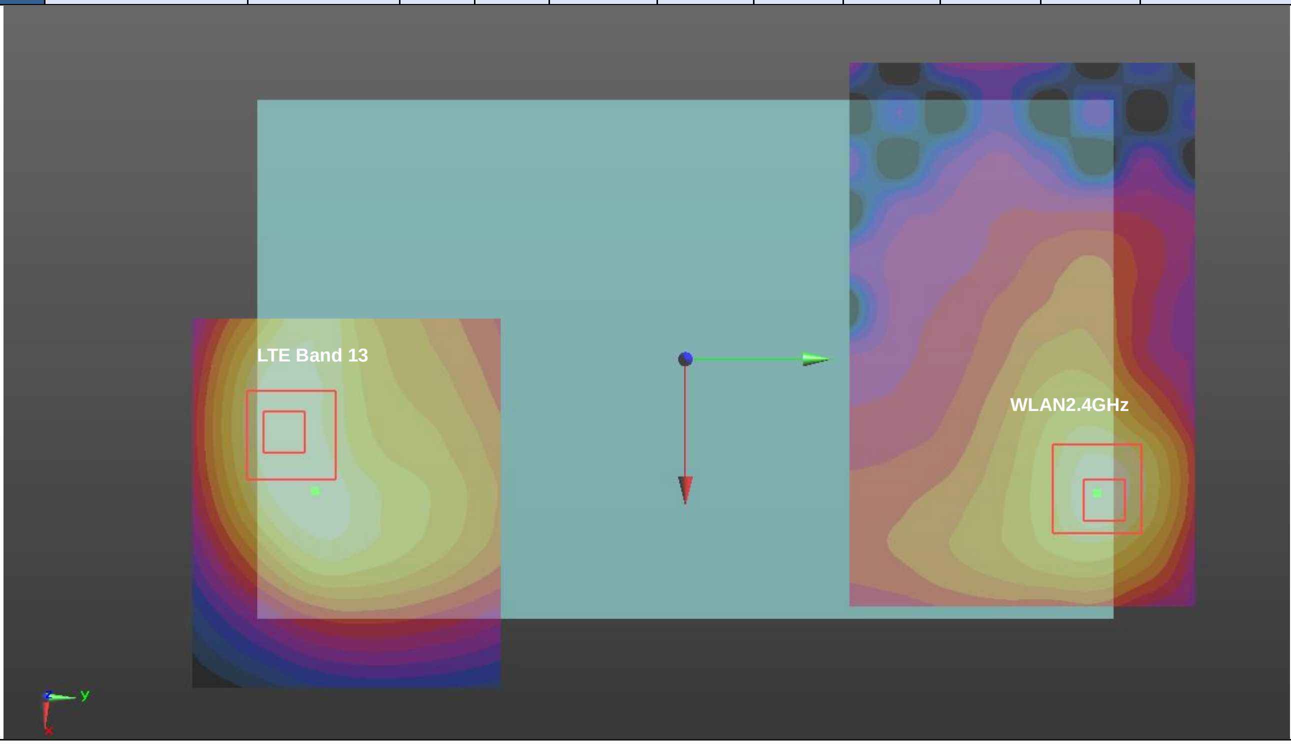
General Note:

1. When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of [(x1−x2)2 + (y1−y2)2 + (z1−z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
2. SPLSR = (SAR1 + SAR2)1.5 / (min. separation distance, mm). If SPLSR ≤ 0.04 for 1g SAR, simultaneously transmission SAR measurement is not necessary.

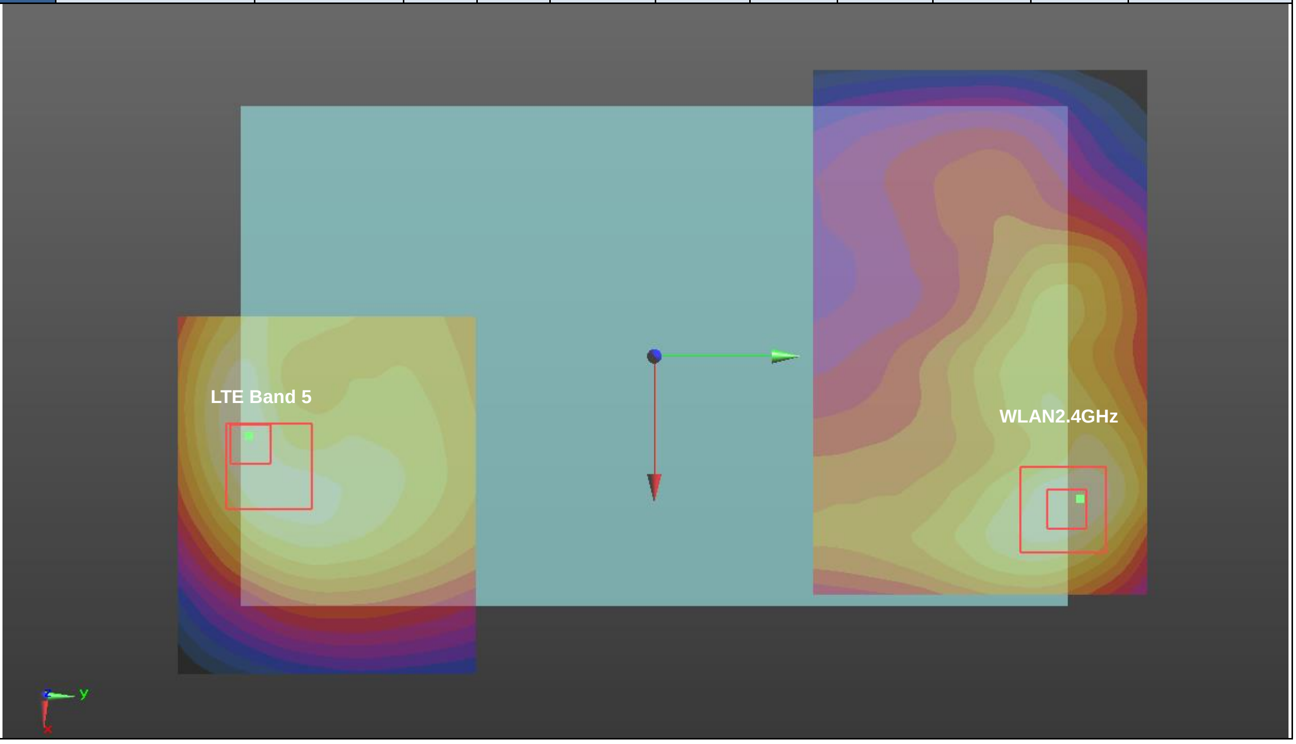
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#01	LTE Band 13	Bottom Face	1.132	10mm	21.6	-102	-1.08	206.9	2.09	0.01	Not required
	WIFI 2.4GHz		0.959	10mm	38	104.2	0.12				



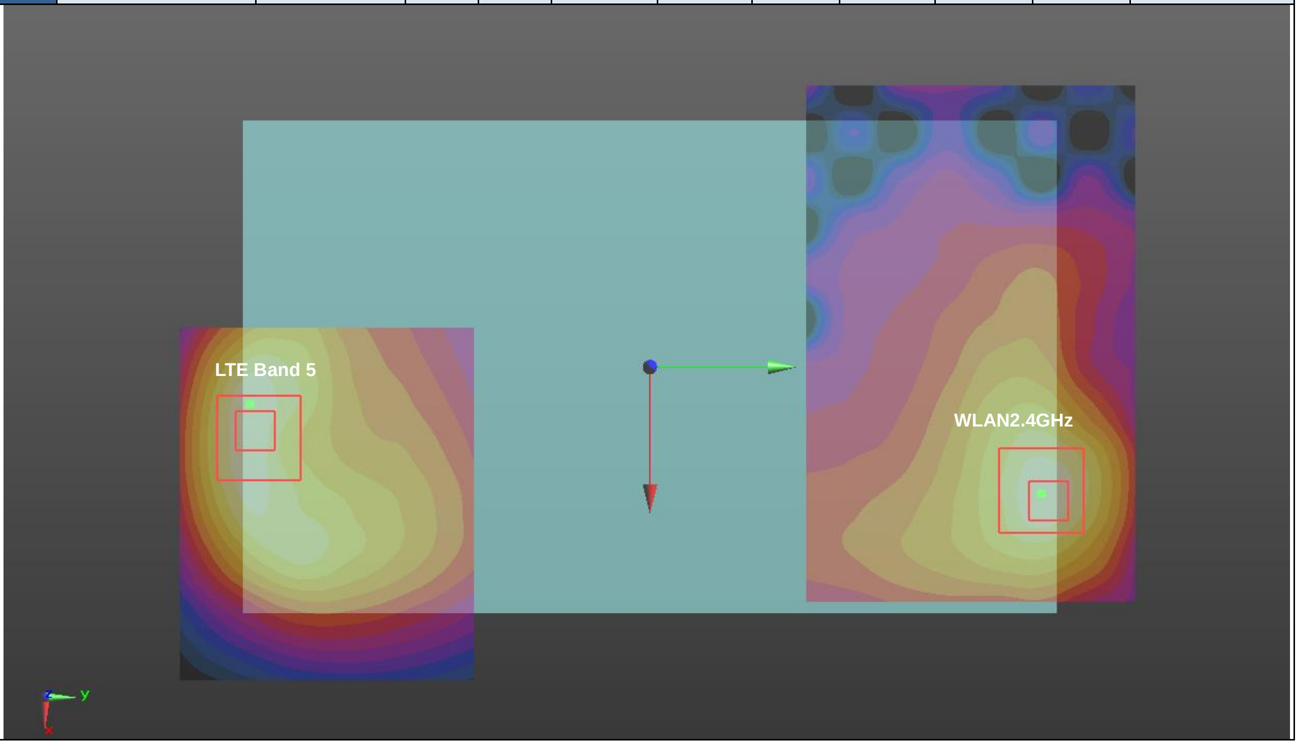
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case #02	LTE Band 13	Bottom Face	1.182	0mm	16	-98	-0.17	200.9	2.33	0.02	Not required
	WIFI 2.4GHz		1.15	0mm	35.4	102	1.27				



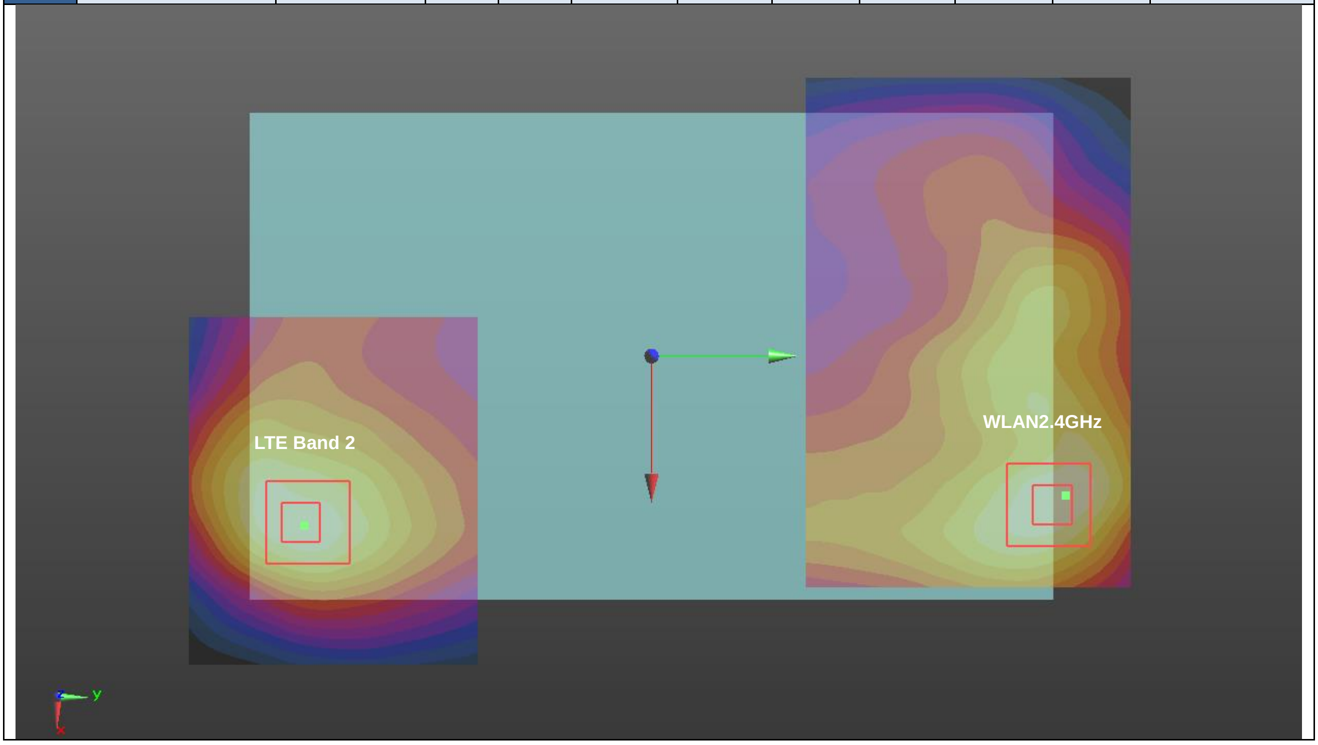
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case #03	LTE Band 5	Bottom Face	0.994	10mm	20	-102	-1.16	207.0	1.95	0.01	Not required
	WIFI 2.4GHz		0.959	10mm	38	104.2	0.12				



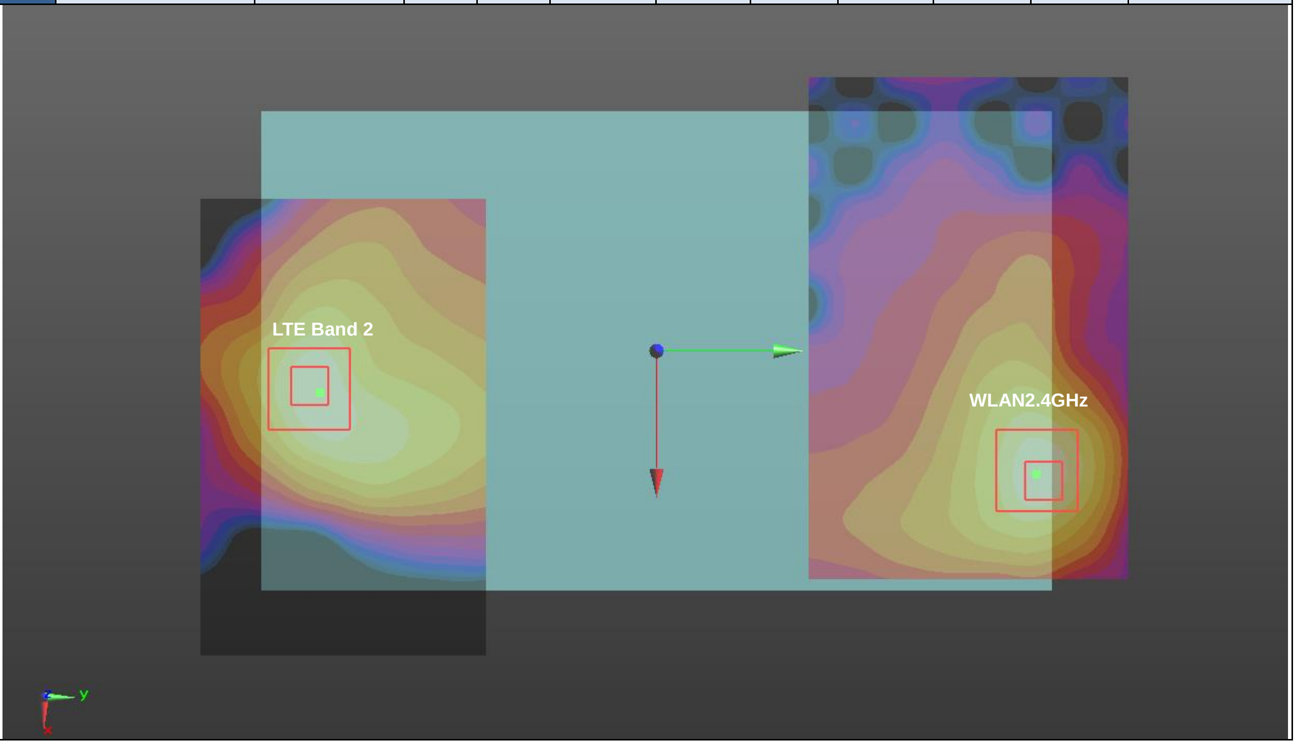
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#04	LTE Band 5	Bottom Face	1.102	0mm	9.5	-100.4	0.03	204.1	2.25	0.02	Not required
	WIFI 2.4GHz		1.15	0mm	35.4	102	1.27				



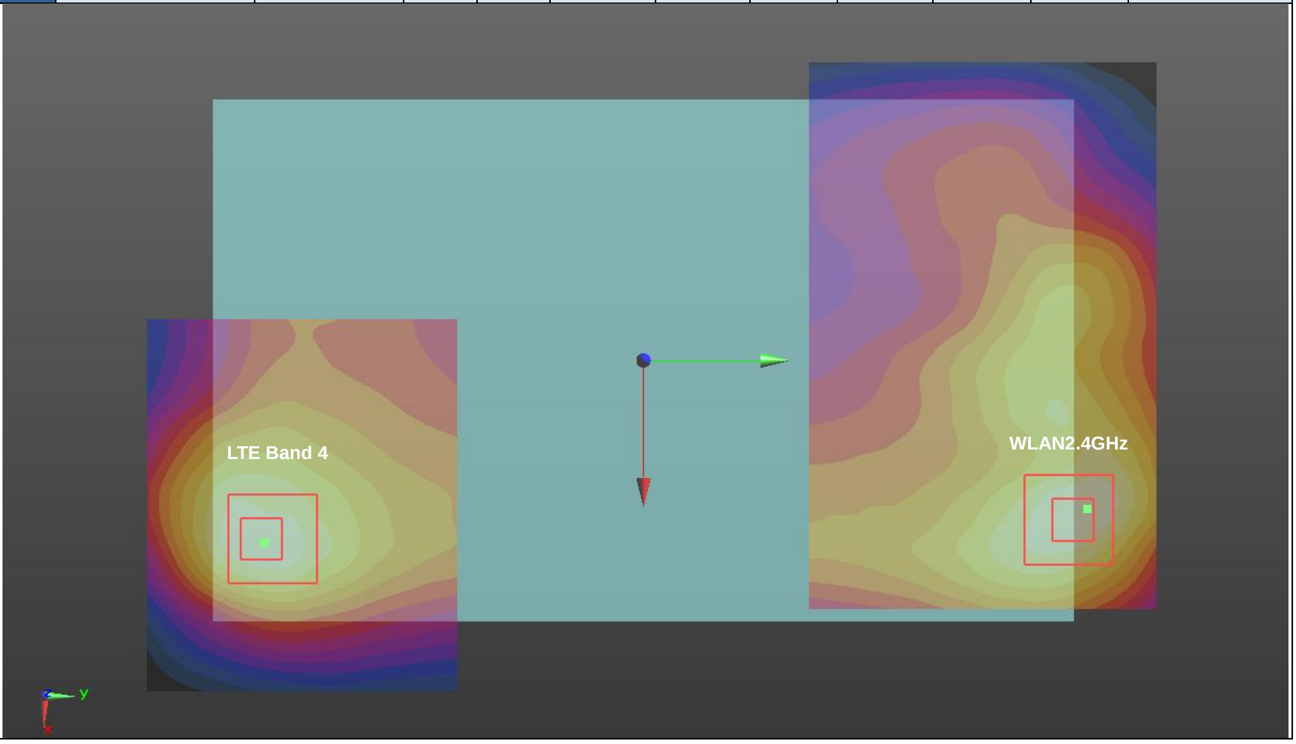
<table>
<tr><th rowspan="2">Case #05</th><th rowspan="2">Band</th><th rowspan="2">Position</th><th rowspan="2">SAR (W/kg)</th><th>Gap</th><th colspan="3">SAR peak location (mm)</th><th rowspan="2">3D distance (mm)</th><th rowspan="2">Summed SAR (W/kg)</th><th rowspan="2">SPLSR Results</th><th rowspan="2">Simultaneous SAR</th></tr>
<tr><th>(mm)</th><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td rowspan="2"></td><td>LTE Band 2</td><td rowspan="2">Bottom Face</td><td>1.014</td><td>10mm</td><td>42.4</td><td>-93.2</td><td>0.02</td><td rowspan="2">197.4</td><td rowspan="2">1.97</td><td rowspan="2">0.01</td><td rowspan="2">Not required</td></tr>
<tr><td>WIFI 2.4GHz</td><td>0.959</td><td>10mm</td><td>38</td><td>104.2</td><td>0.12</td></tr>
</table>



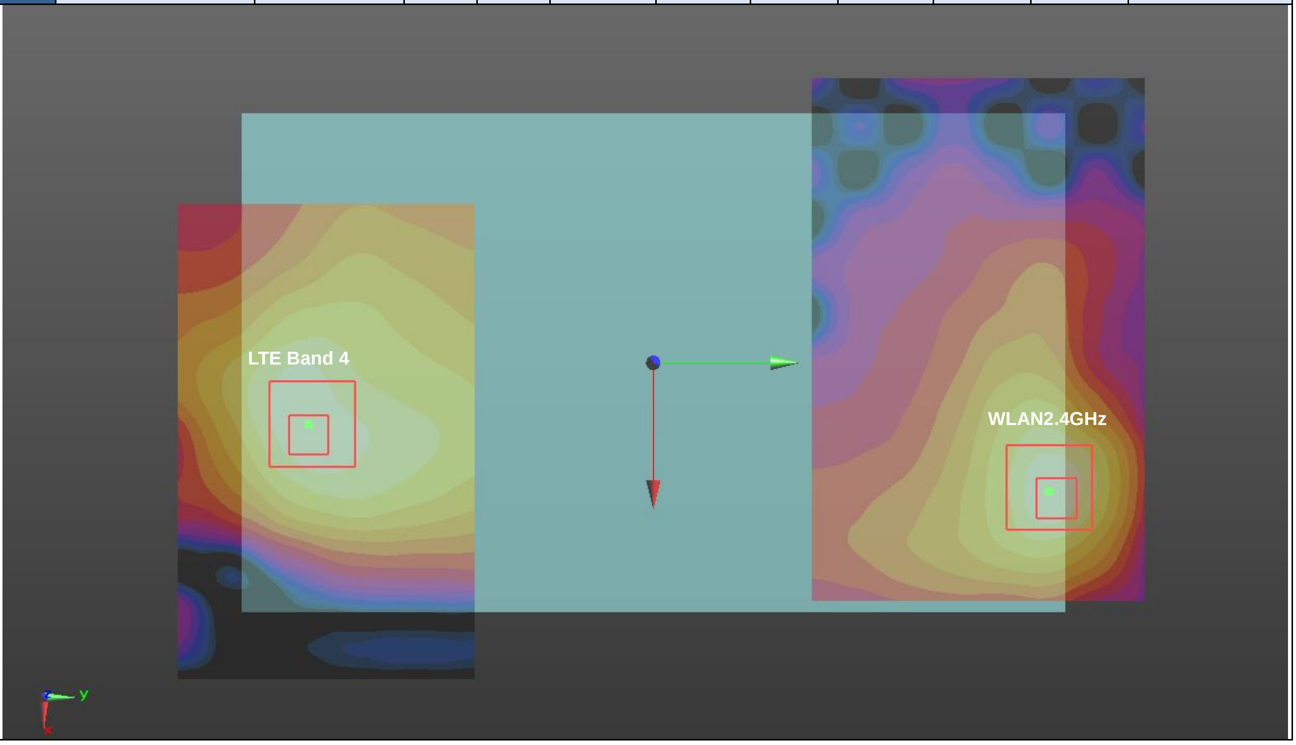
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case #06	LTE Band 2	Bottom Face	0.859	0mm	55	-2	3.7	105.9	2.01	0.03	Not required
	WIFI 2.4GHz		1.15	0mm	35.4	102	1.27				



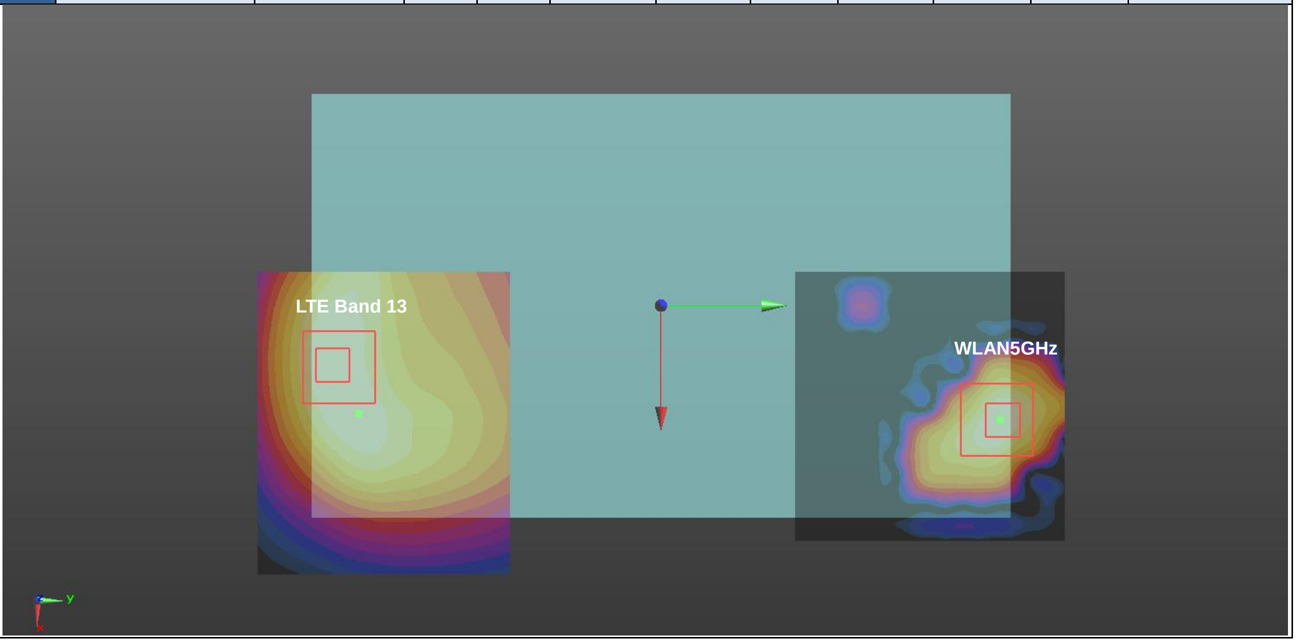
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#07	LTE Band 4	Bottom Face	1.121	10mm	42.4	-94.7	-0.09	198.9	2.08	0.02	Not required
	WIFI 2.4GHz		0.959	10mm	38	104.2	0.12				



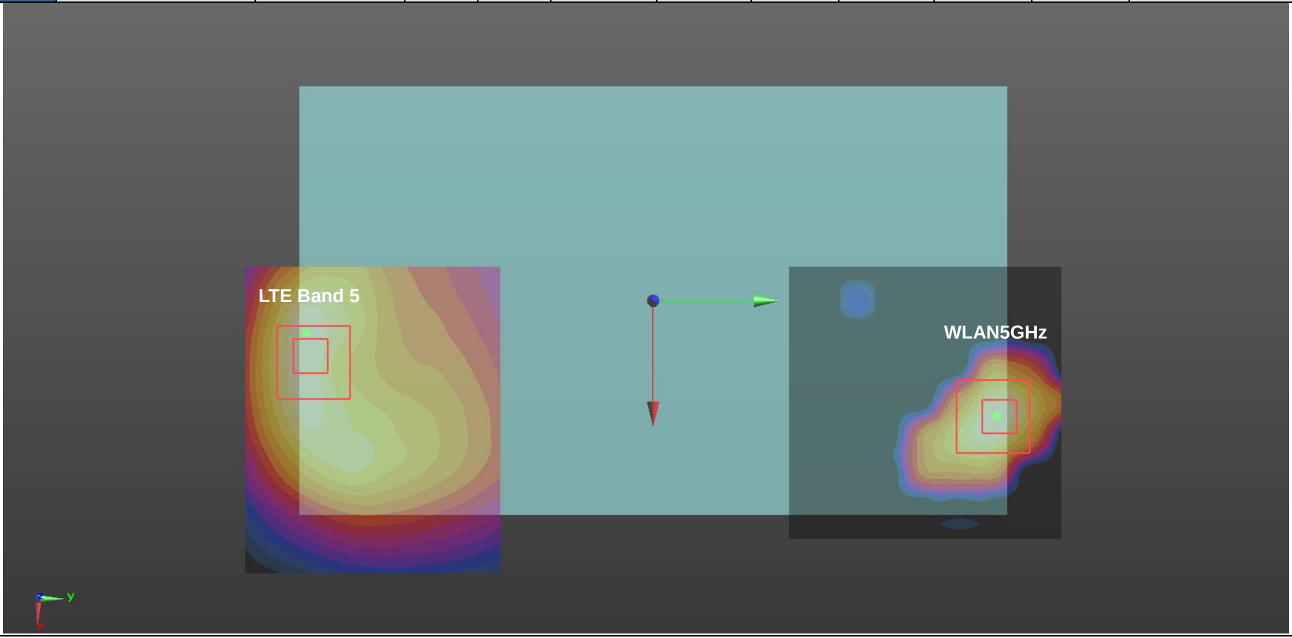
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case #08	LTE Band 4	Bottom Face	0.837	0mm	20.3	-87	-2.14	189.6	1.99	0.01	Not required
	WIFI 2.4GHz		1.15	0mm	35.4	102	1.27				



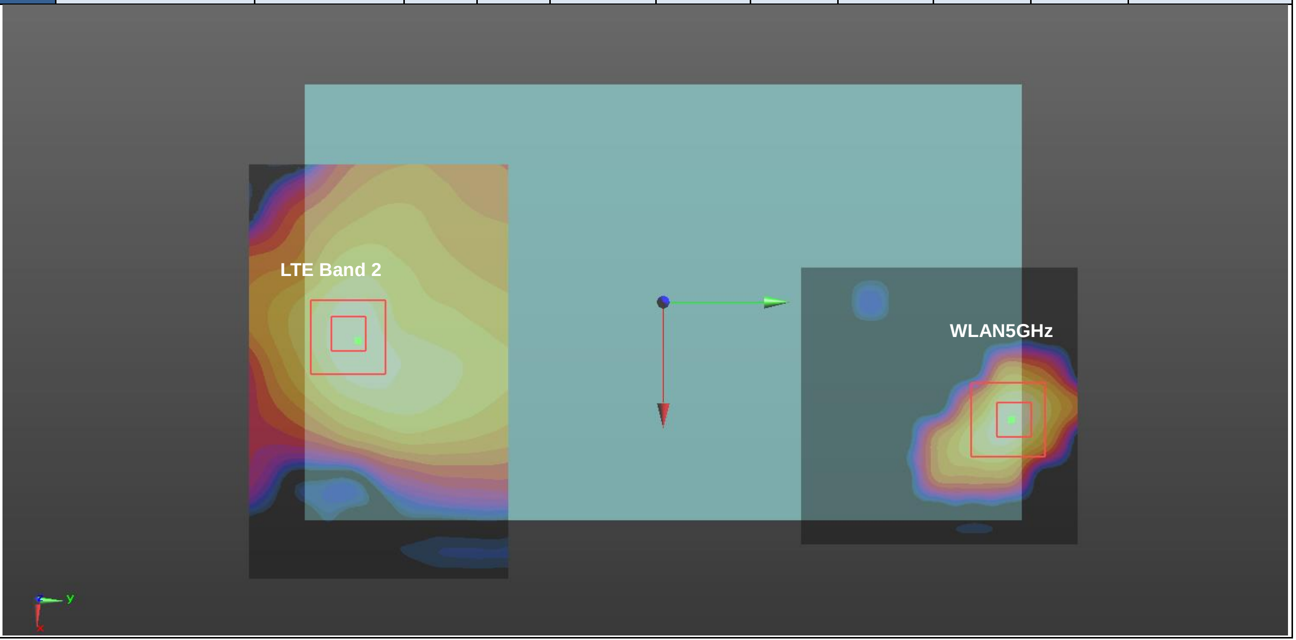
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#09	LTE Band 13	Bottom Face	1.182	0mm	16	-98	-0.17	200.5	2.01	0.01	Not required
	WLAN5GHz		0.828	0mm	32.4	101.8	1.1				



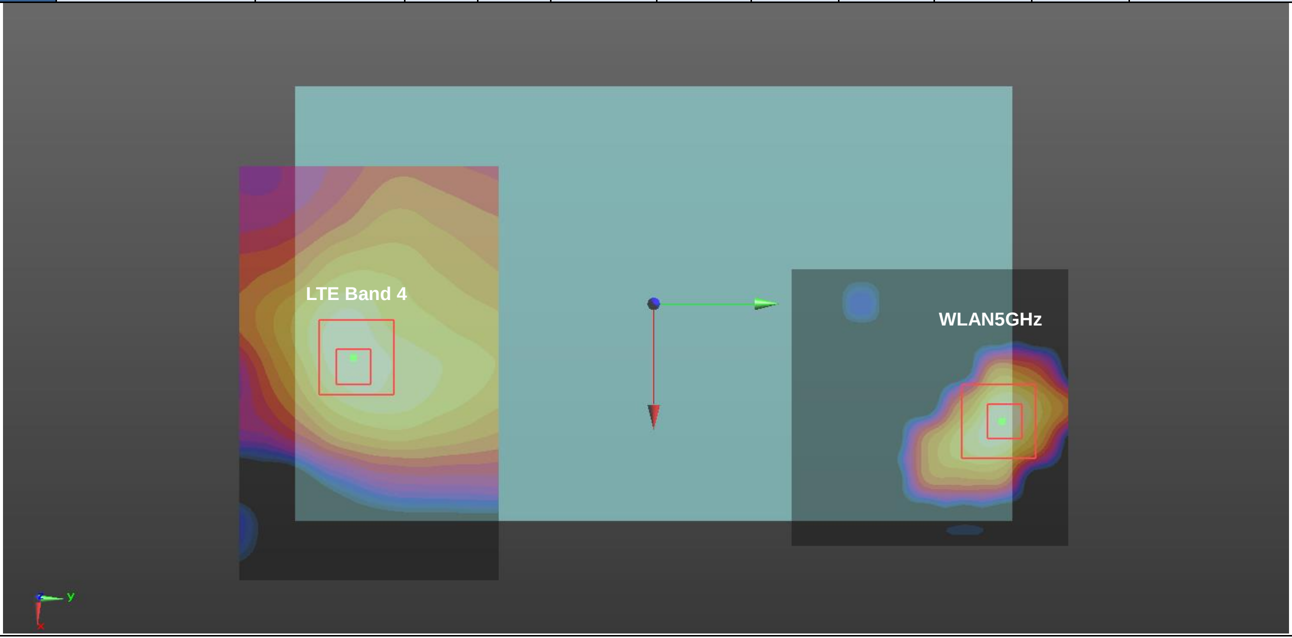
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#10	LTE Band 5	Bottom Face	1.102	0mm	9.5	-100.4	0.03	203.5	1.93	0.01	Not required
	WLAN5GHz		0.828	0mm	32.4	101.8	1.1				



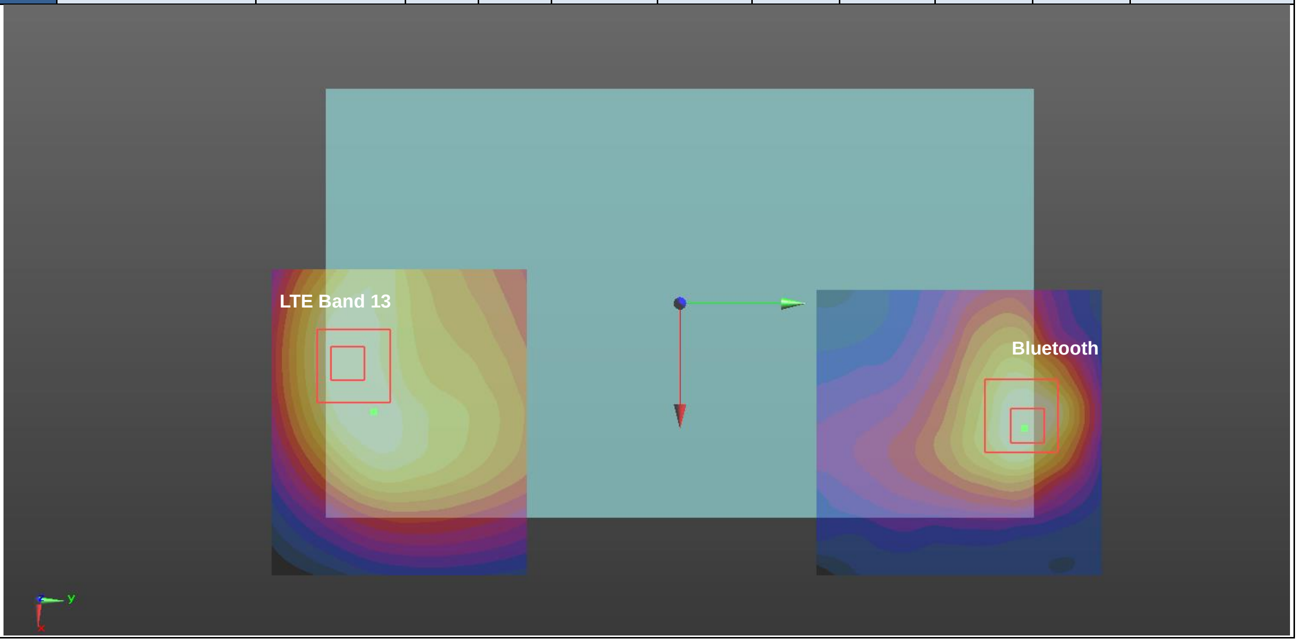
Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#11	LTE Band 2	Bottom Face	0.859	0mm	55	-2	3.7	106.3	1.69	0.02	Not required
	WLAN5GHz		0.828	0mm	32.4	101.8	1.1				



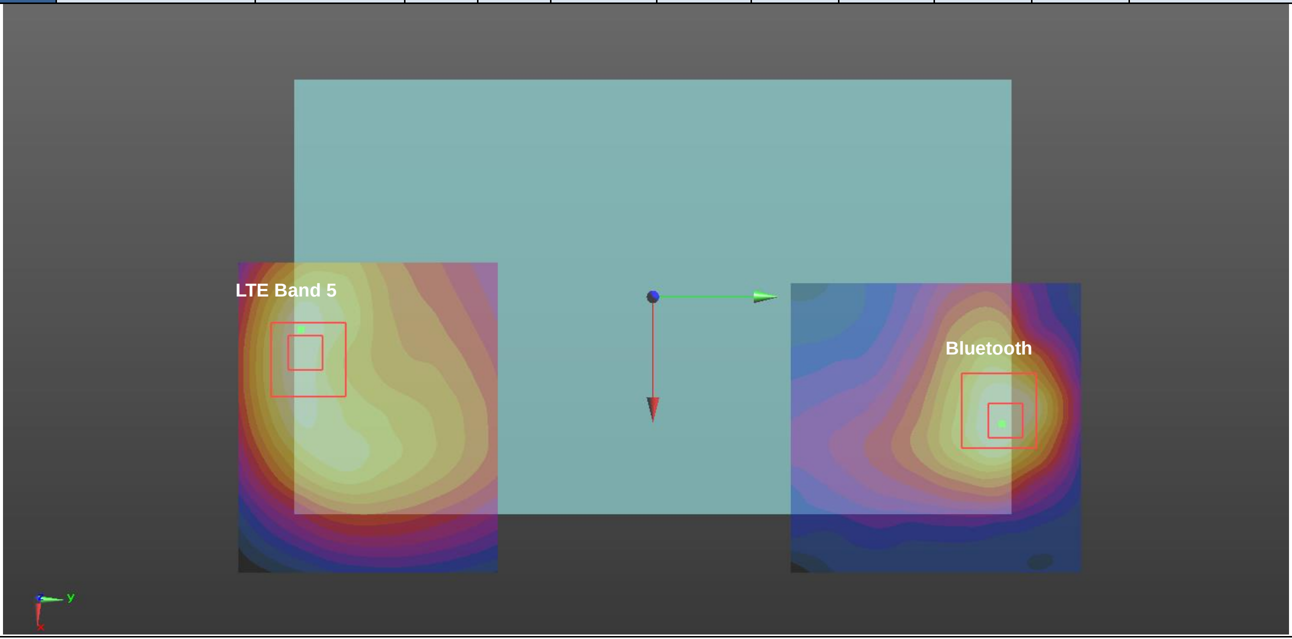
Case	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
#12	LTE Band 4	Bottom Face	0.837	0mm	20.3	-87	-2.14	189.2	1.67	0.01	Not required
	WLAN5GHz		0.828	0mm	32.4	101.8	1.1				



Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#13	LTE Band 13	Bottom Face	1.182	0mm	16	-98	-0.17	201.3	1.72	0.01	Not required
	Bluetooth		0.536	0mm	36.8	102.2	0.77				



Case	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
#14	LTE Band 5	Bottom Face	1.102	0mm	9.5	-100.4	0.03	204.4	1.64	0.01	Not required
	Bluetooth		0.536	0mm	36.8	102.2	0.77				



Test Engineer： Nick Hu

17. Uncertainty Assessment

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

18. 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 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.
[9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, 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

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.5.14

System Check_Head_750MHz

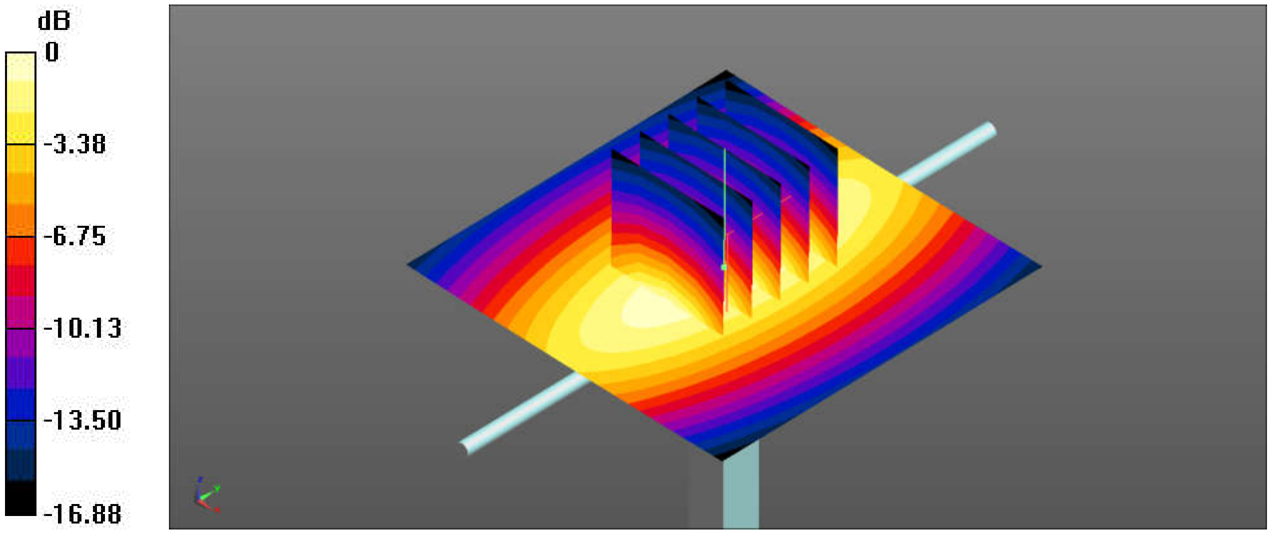
DUT: D750V3- SN:1087

Communication System: UID 0, CW (0); Frequency: 750 MHz;Duty Cycle: 1:1
Medium: HSL_750 Medium parameters used: f = 750 MHz; σ = 0.903 S/m; ε_r = 42.105; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(9.27, 9.27, 9.27); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.46 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.13 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 4.06 W/kg
SAR(1 g) = 2.12 W/kg; SAR(10 g) = 1.39 W/kg
Maximum value of SAR (measured) = 3.45 W/kg



0 dB = 3.46 W/kg = 5.39 dBW/kg

System Check_Head_835MHz

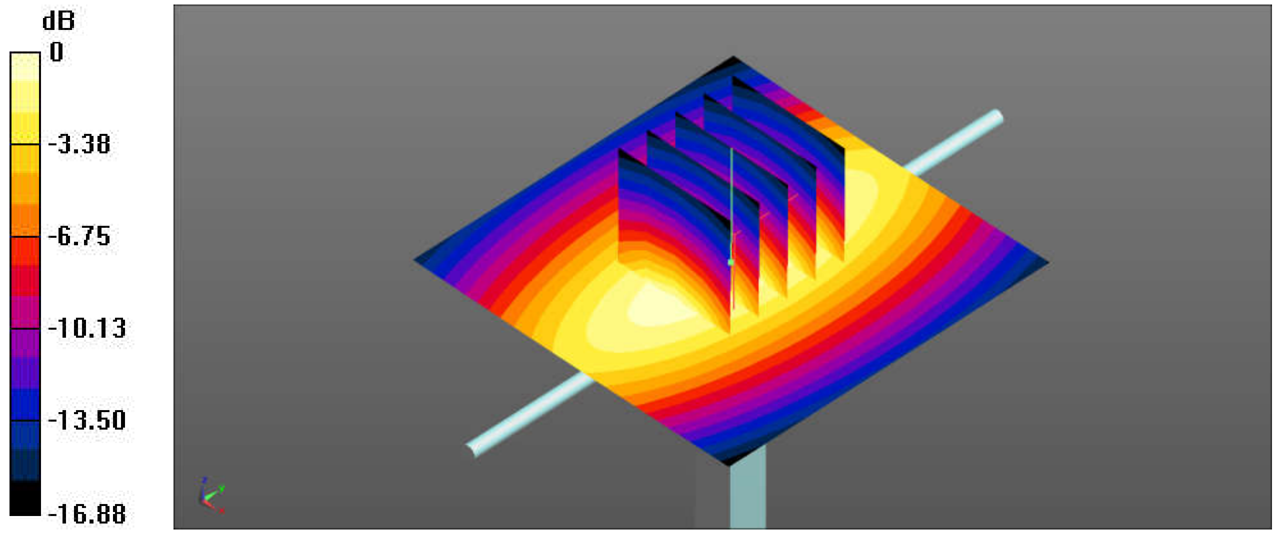
DUT: D835V2 - SN:4d151

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL_835 Medium parameters used: f = 835 MHz; σ = 0.945 S/m; ε_r = 42.762; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(9.01, 9.01, 9.01); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.72 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.95 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 4.36 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 3.71 W/kg



0 dB = 3.72 W/kg = 5.71 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.5.15

System Check_Head_1750MHz

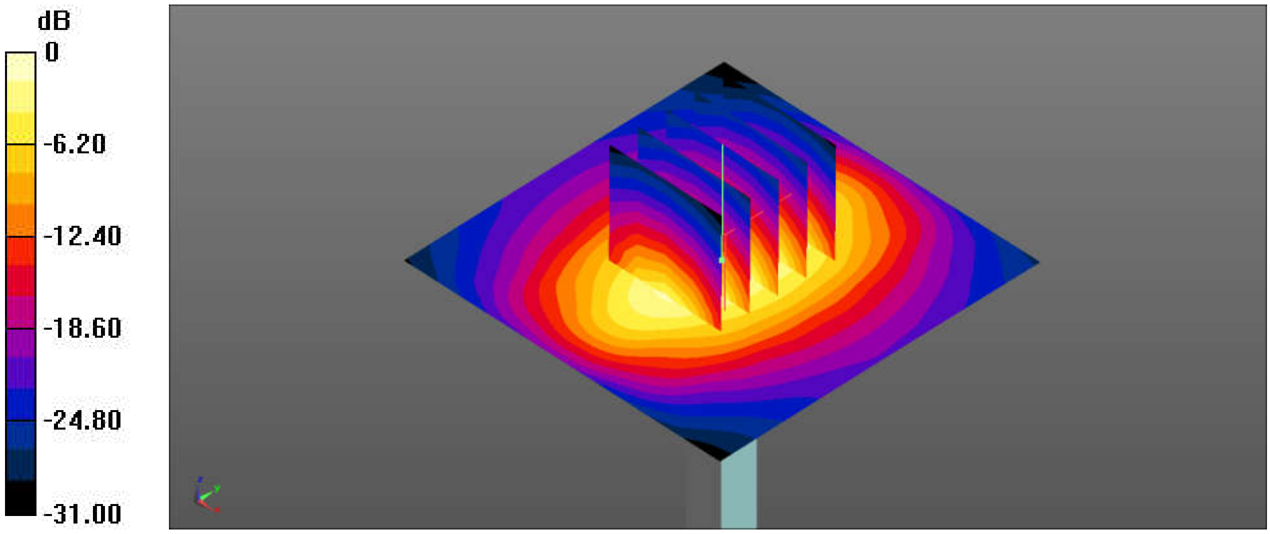
DUT: D1750V2 - SN:1090

Communication System: UID 0, CW (0); Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1750 MHz; σ = 1.397 S/m; ε_r = 39.621; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.79, 7.79, 7.79); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 15.2 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 93.23 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 18.9 W/kg
SAR(1 g) = 9.7 W/kg; SAR(10 g) = 5.02 W/kg
Maximum value of SAR (measured) = 15.2 W/kg



0 dB = 15.2 W/kg = 11.82 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.5.15

System Check_Head_1900MHz

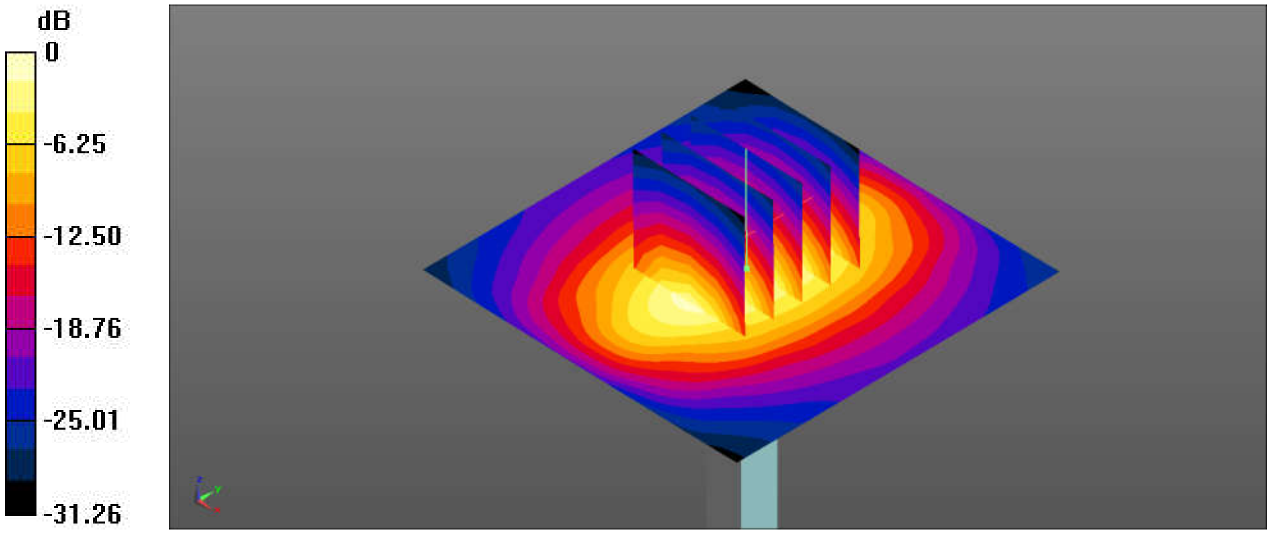
DUT: D1900V2 - SN:5d170

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1900 MHz; σ = 1.405 S/m; ε_r = 39.193; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.4, 7.4, 7.4); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 17.6 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 98.76 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 22.5 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.2 W/kg
Maximum value of SAR (measured) = 17.6 W/kg



0 dB = 17.6 W/kg = 12.46 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.5.17

System Check_Head_2450MHz

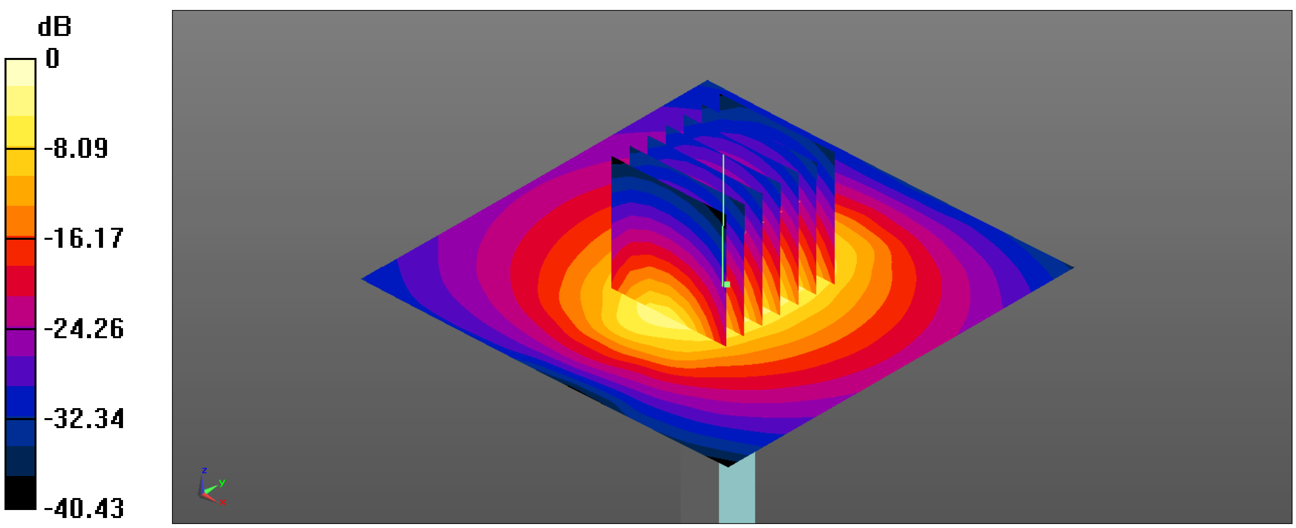
DUT: D2450V2 - SN:908

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2450 MHz; σ = 1.854 S/m; ε_r = 38.195; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.08, 7.08, 7.08); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 24.8 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.47 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 35.0 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.81 W/kg
Maximum value of SAR (measured) = 25.1 W/kg



0 dB = 24.8 W/kg = 13.94 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.5.21

System Check_Head_5250MHz

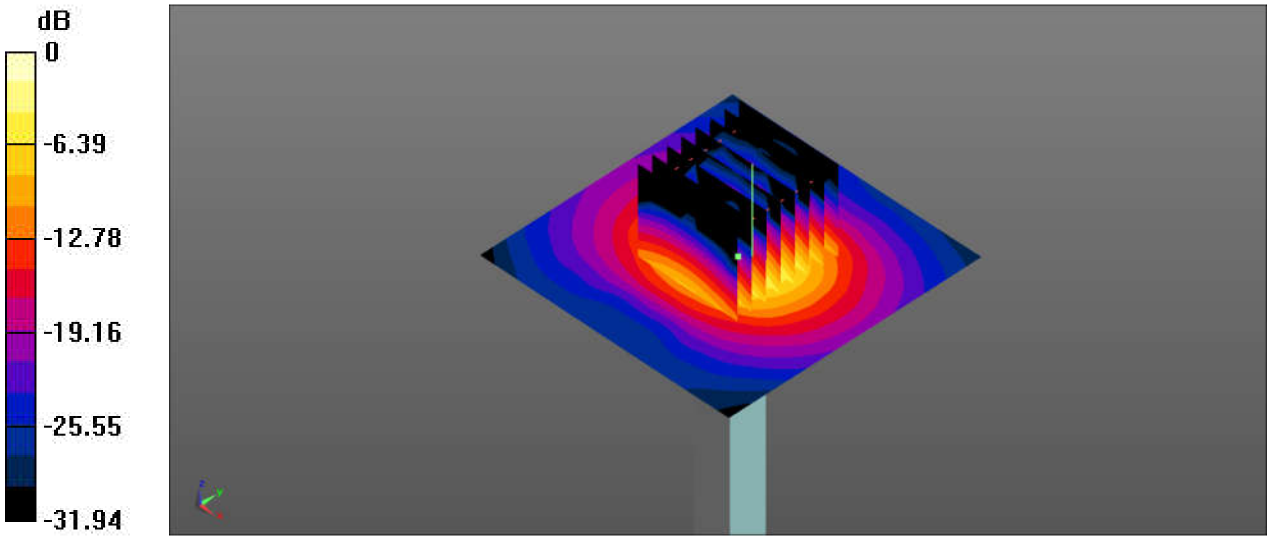
DUT: D5GHzV2 - SN:1006

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5250 MHz; σ = 4.603 S/m; ε_r = 36.734; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(5.23, 5.23, 5.23); Calibrated: 2019.1.22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.1 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 44.61 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 31.0 W/kg
SAR(1 g) = 7.87 W/kg; SAR(10 g) = 2.24 W/kg
Maximum value of SAR (measured) = 18.4 W/kg



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

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.5.21

System Check_Head_5750MHz

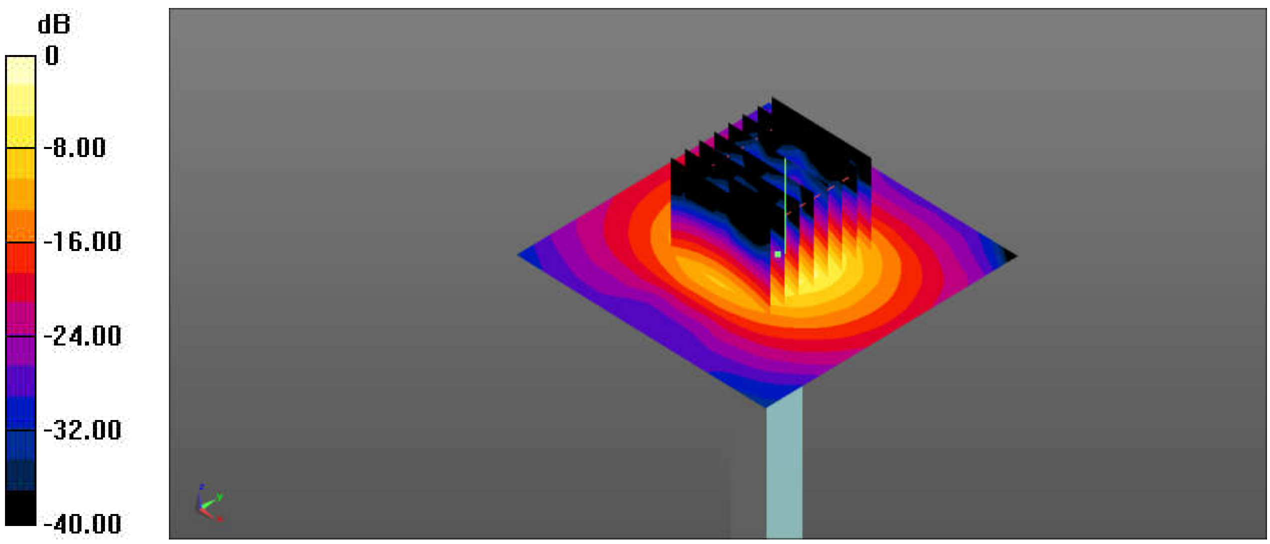
DUT: D5GHzV2 - SN:1006

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5750 MHz; σ = 5.185 S/m; ε_r = 35.617; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(4.76, 4.76, 4.76); Calibrated: 2019.1.22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.8 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 40.20 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 7.47 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 17.8 W/kg = 12.50 dBW/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

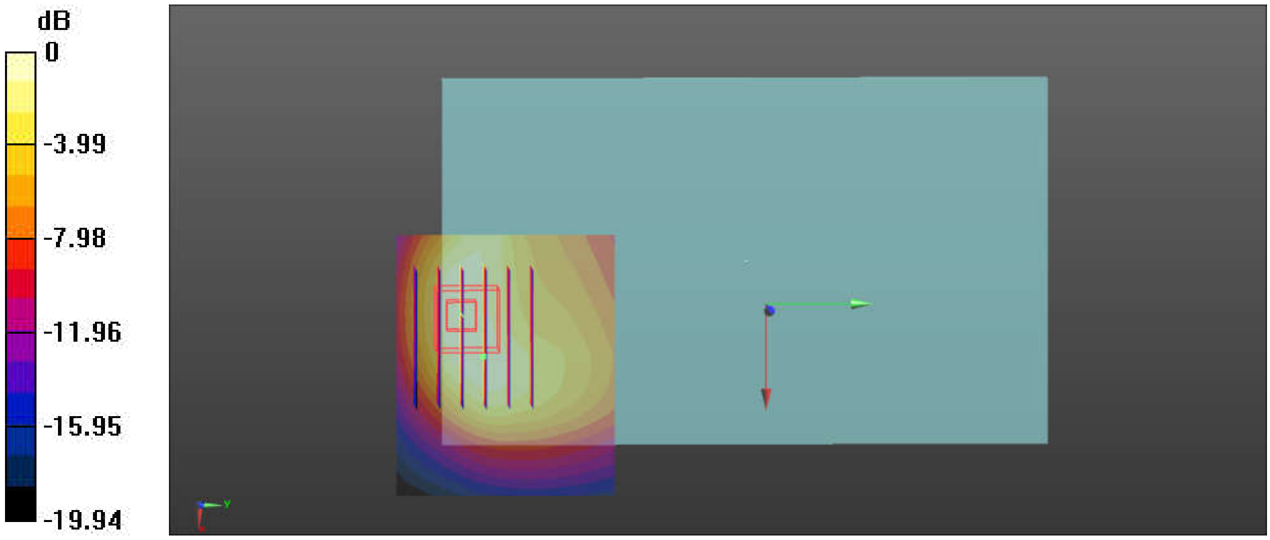
01_LTE Band 13_10M_QPSK_50RB_0Offset_Bottom Face_0mm_Ch23230

Communication System: UID 0, LTE-FDD (0); Frequency: 782 MHz;Duty Cycle: 1:1
Medium: HSL_750 Medium parameters used: f = 782 MHz; σ = 0.935 S/m; ε_r = 41.682; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(9.27, 9.27, 9.27); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch23230/Area Scan (61x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.946 W/kg

Ch23230/Zoom Scan (7x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.917 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 2.45 W/kg
SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.492 W/kg
Maximum value of SAR (measured) = 1.50 W/kg



0 dB = 0.946 W/kg = -0.24 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.5.14

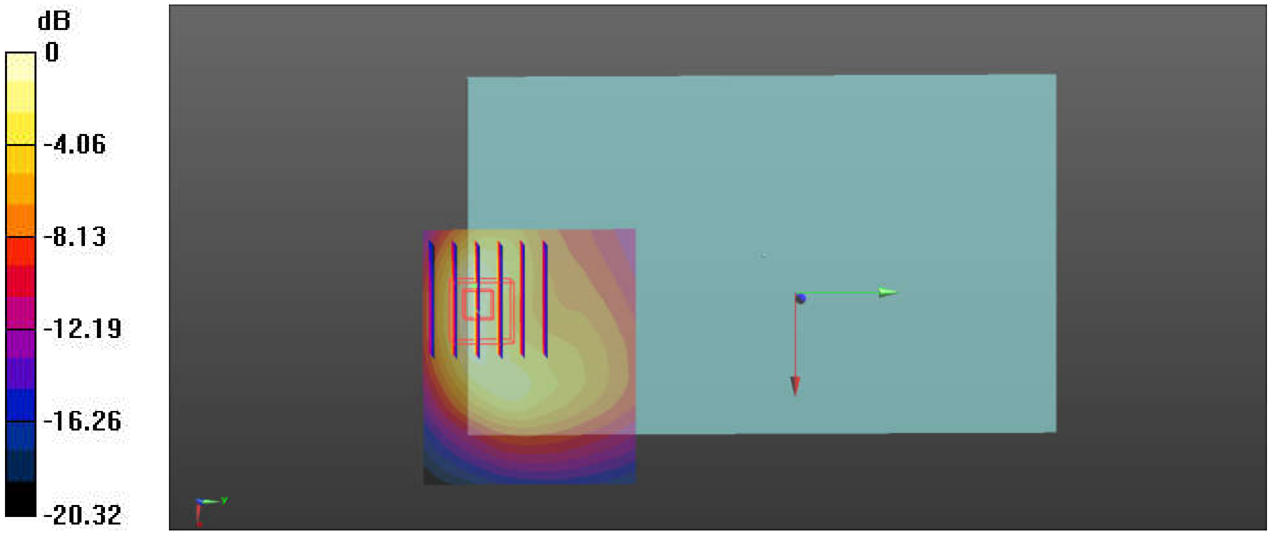
02_LTE Band 5_10M_QPSK_25RB_0Offset_Bottom Face_0mm_Ch20525

Communication System: UID 0, LTE-FDD (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: HSL_835 Medium parameters used: f = 836.5 MHz; σ = 0.947 S/m; ε_r = 42.743; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(9.01, 9.01, 9.01); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch20525/Area Scan (61x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.15 W/kg

Ch20525/Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.171 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 2.62 W/kg
SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.514 W/kg
Maximum value of SAR (measured) = 1.46 W/kg



0 dB = 1.15 W/kg = 0.61 dBW/kg

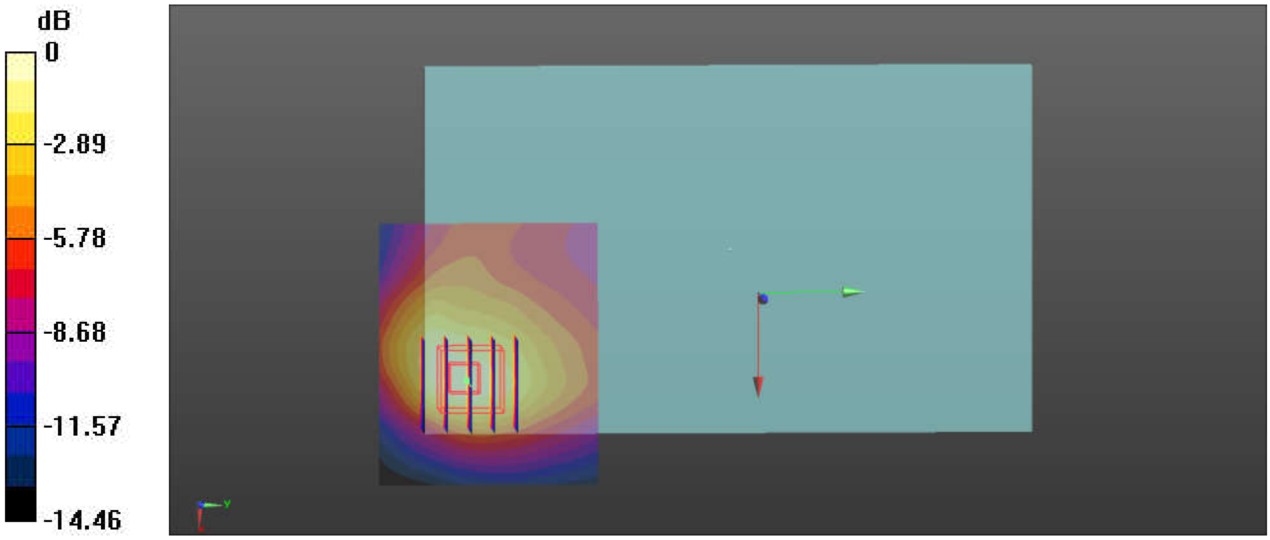
03_LTE Band 2_20M_QPSK_1RB_49Offset_Bottom Face_10mm_Ch18700

Communication System: UID 0, LTE-FDD (0); Frequency: 1860 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1860 MHz; σ = 1.364 S/m; ε_r = 39.378; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.4, 7.4, 7.4); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch18700/Area Scan (61x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.921 W/kg

Ch18700/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.437 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.757 W/kg; SAR(10 g) = 0.433 W/kg
Maximum value of SAR (measured) = 0.934 W/kg



0 dB = 0.921 W/kg = -0.36 dBW/kg

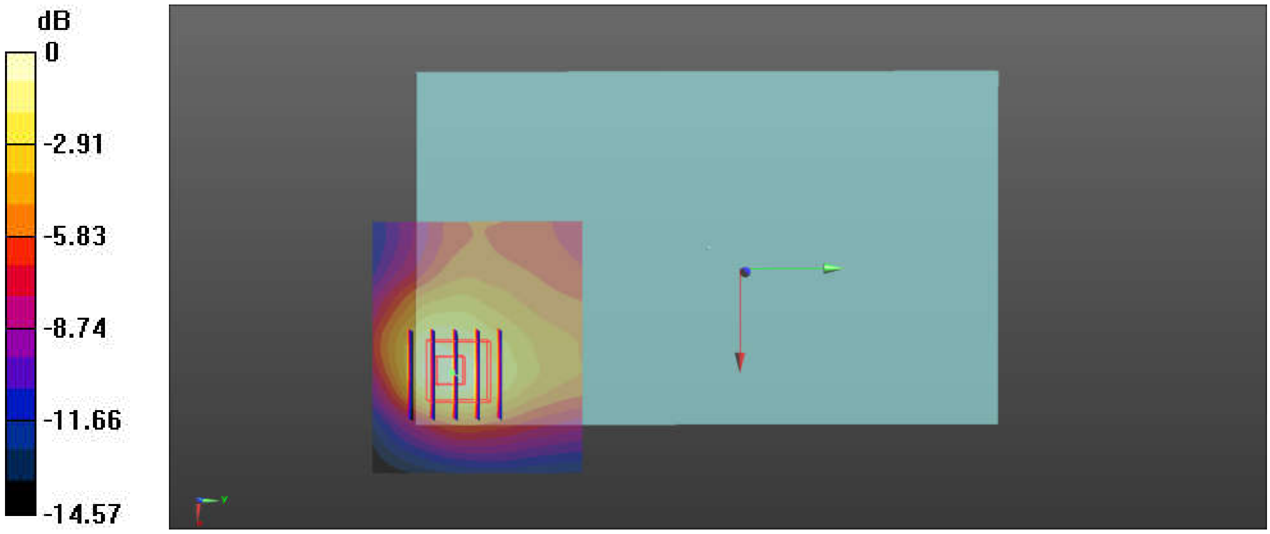
04_LTE Band 4_20M_QPSK_1RB_0Offset_Bottom Face_10mm_Ch20175

Communication System: UID 0, LTE-FDD (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1732.5 MHz; σ = 1.379 S/m; ε_r = 39.695; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.79, 7.79, 7.79); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch20175/Area Scan (61x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.988 W/kg

Ch20175/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.965 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.788 W/kg; SAR(10 g) = 0.451 W/kg
Maximum value of SAR (measured) = 0.964 W/kg



0 dB = 0.988 W/kg = -0.05 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.5.17

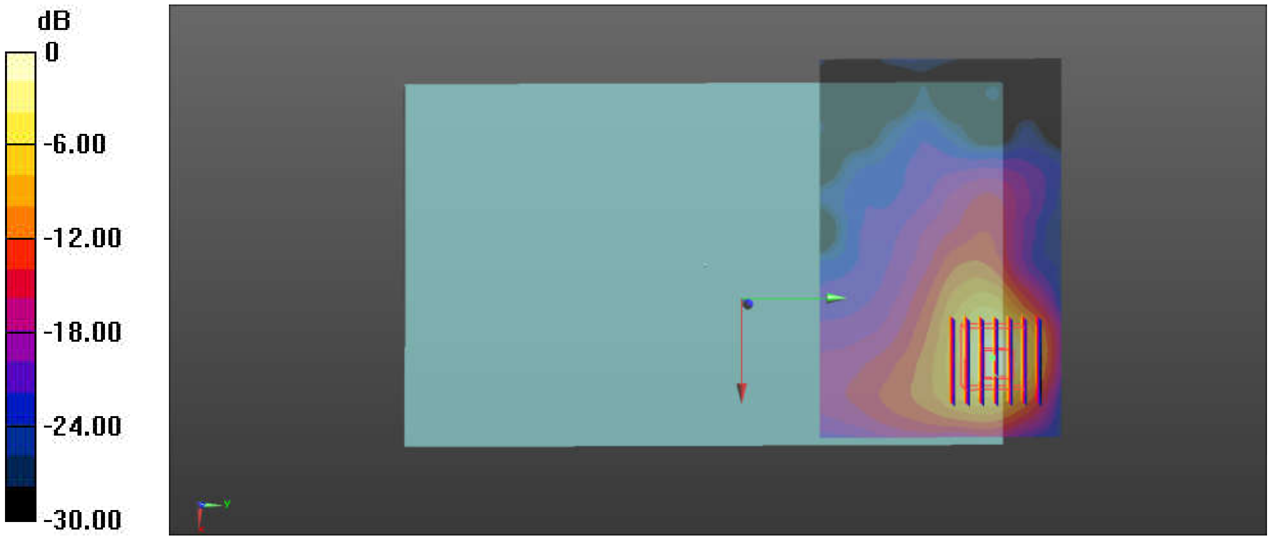
05_WALN2.4GHz_802.11b_1Mbps_Bottom Face_0mm_Ch6

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz;Duty Cycle: 1:1.025
Medium: HSL_2450 Medium parameters used: f = 2437 MHz; σ = 1.83 S/m; ε_r = 38.25; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.08, 7.08, 7.08); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch6/Area Scan (111x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.53 W/kg

Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.020 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 0.910 W/kg; SAR(10 g) = 0.337 W/kg
Maximum value of SAR (measured) = 1.33 W/kg



0 dB = 1.53 W/kg = 1.85 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.5.21

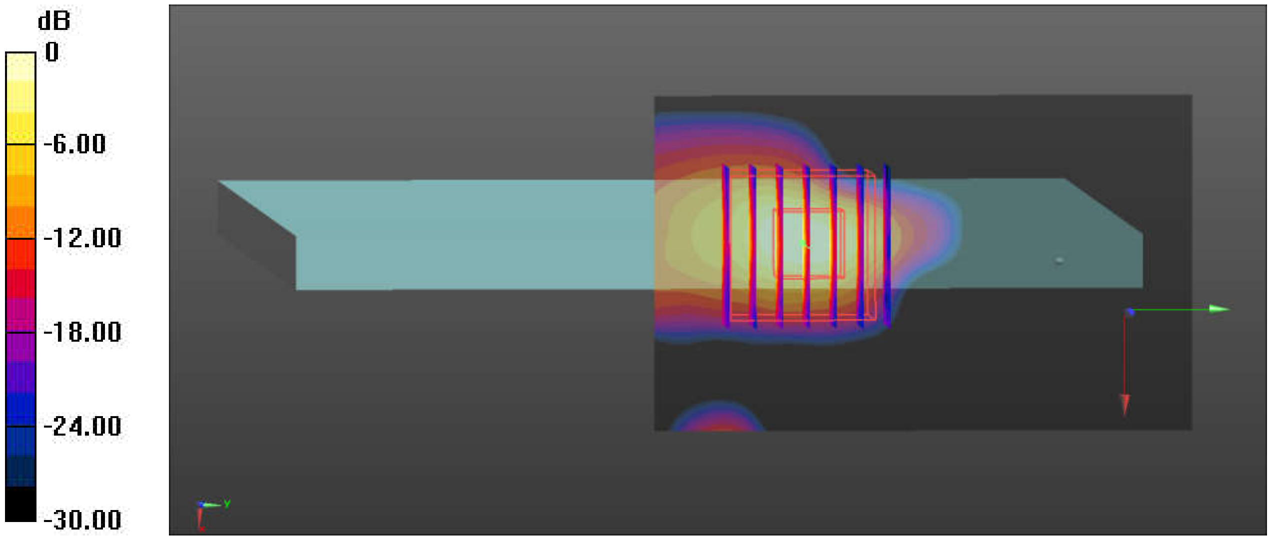
06_WLAN5.2GHz_802.11n-HT40 MCS0_Edge 1_0mm_Ch46

Communication System: UID 0, 802.11n (0); Frequency: 5230 MHz;Duty Cycle: 1:1.163
Medium: HSL_5000 Medium parameters used: f = 5230 MHz; σ = 4.575 S/m; ε_r = 36.757; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(5.23, 5.23, 5.23); Calibrated: 2019.1.22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch46/Area Scan (51x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.747 W/kg

Ch46/Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.334 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.99 W/kg
SAR(1 g) = 0.444 W/kg; SAR(10 g) = 0.092 W/kg
Maximum value of SAR (measured) = 0.881 W/kg



0 dB = 0.747 W/kg = -1.27 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.5.21

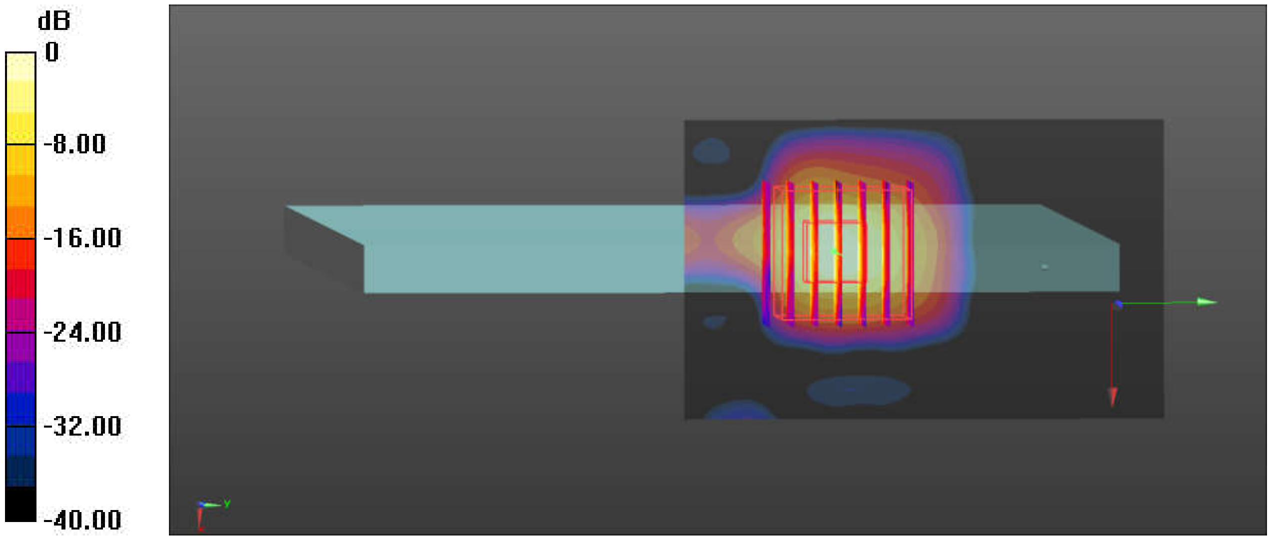
07_WLAN5.8GHz_802.11a 6Mbps_Edge 1_0mm_Ch165

Communication System: UID 0, 802.11a (0); Frequency: 5825 MHz;Duty Cycle: 1:1.149
Medium: HSL_5000 Medium parameters used: f = 5825 MHz; σ = 5.273 S/m; ε_r = 35.475; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(4.76, 4.76, 4.76); Calibrated: 2019.1.22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch165/Area Scan (51x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.95 W/kg

Ch165/Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0.8040 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 4.38 W/kg
SAR(1 g) = 0.944 W/kg; SAR(10 g) = 0.195 W/kg
Maximum value of SAR (measured) = 1.84 W/kg



0 dB = 1.95 W/kg = 2.90 dBW/kg

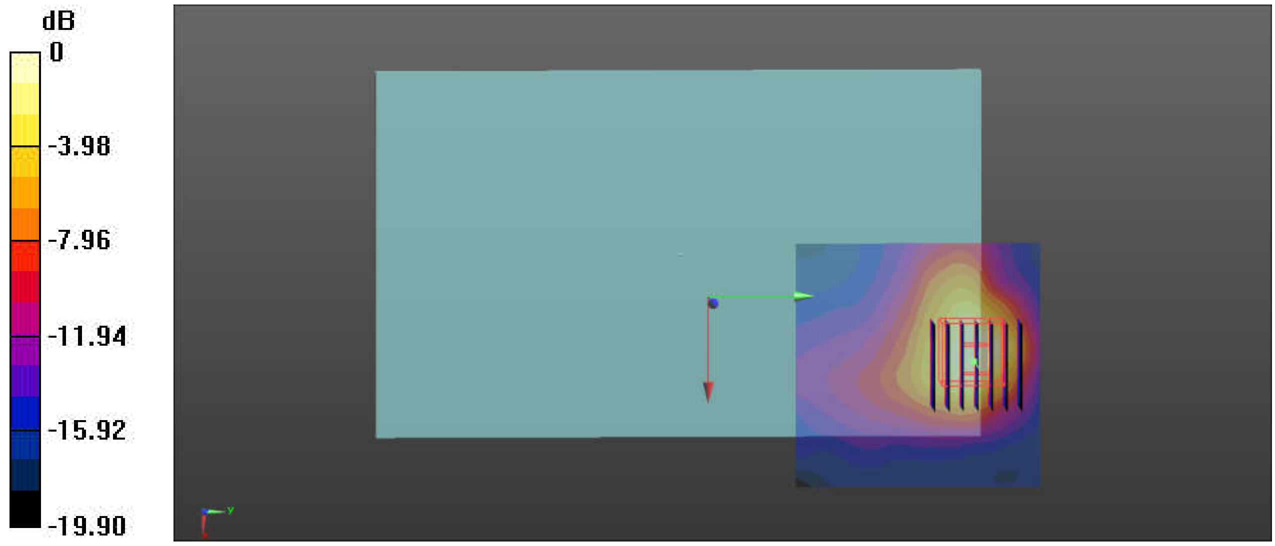
08_Bluetooth_1Mbps_Bottom Face_0mm_Ch78

Communication System: UID 0, Bluetooth (0); Frequency: 2480 MHz;Duty Cycle: 1:1.296
Medium: HSL_2450 Medium parameters used: f = 2480 MHz; σ = 1.879 S/m; ε_r = 38.087; ρ = 1000kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.08, 7.08, 7.08); Calibrated: 2018.9.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2018.10.22
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch78/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.340 W/kg

Ch78/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.832 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.319 W/kg; SAR(10 g) = 0.128 W/kg
Maximum value of SAR (measured) = 0.473 W/kg



0 dB = 0.340 W/kg = -4.69 dBW/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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校准
CALIBRATION
CNAS L0570

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E-mail: cttl@chinattl.com http://www.chinattl.cn

Client **Sporton** **Certificate No: Z19-60081**

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1087
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 27, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG,No.DAE4-1331_Feb19)	Feb-20
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

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

Issued: March 29, 2019

In Collaboration with
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CALIBRATION LABORATORY

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	43.0 ± 6 %	0.90 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	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.36 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.65 W/kg ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.9 ± 6 %	0.94 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	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.58 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.75 W/kg ±18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.4Ω- 2.59jΩ
Return Loss	- 29.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.6Ω- 3.86jΩ
Return Loss	- 27.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	0.898 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 03.26.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1087

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 750 MHz; σ = 0.903 S/m; ε_r = 43.01; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.03, 10.03, 10.03) @ 750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

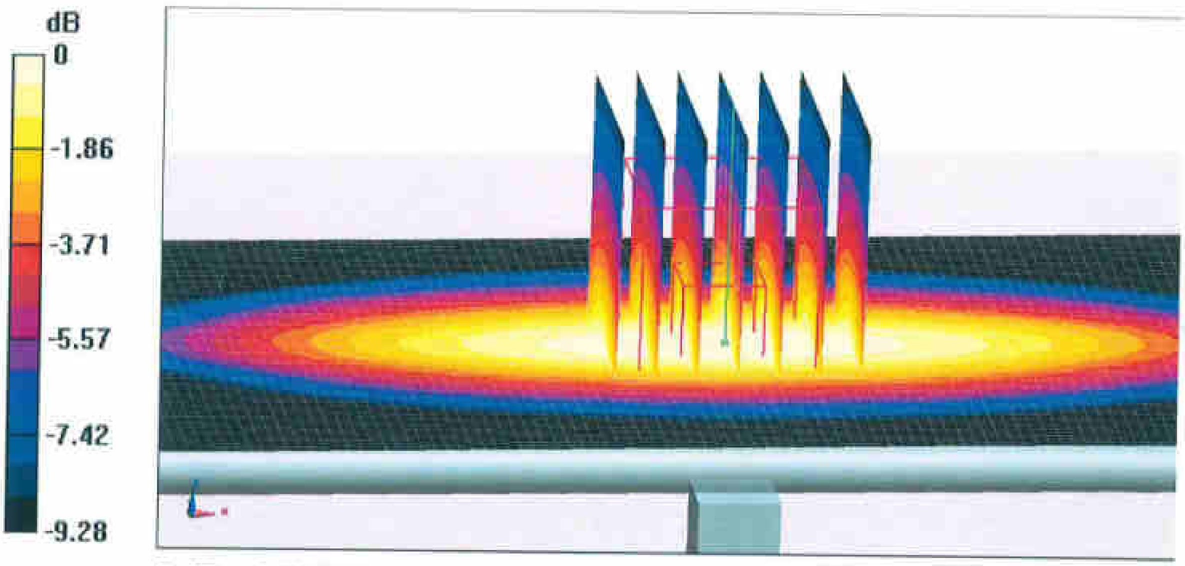
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.05 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.00 W/kg

SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.42 W/kg

Maximum value of SAR (measured) = 2.72 W/kg



0 dB = 2.72 W/kg = 4.35 dBW/kg

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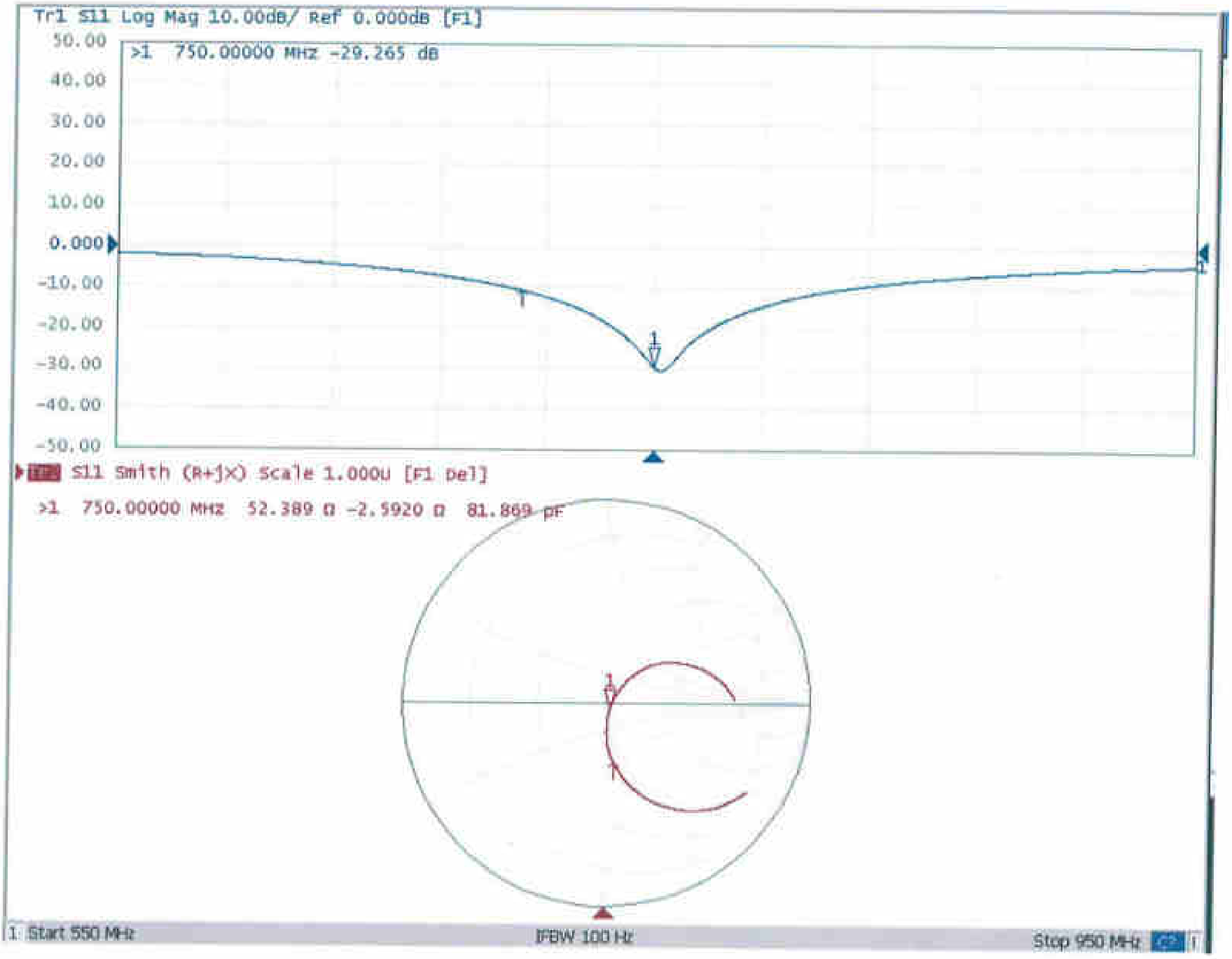
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 03.26.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1087

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 750 MHz; σ = 0.935 S/m; ε_r = 56.85; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.85, 9.85, 9.85) @ 750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

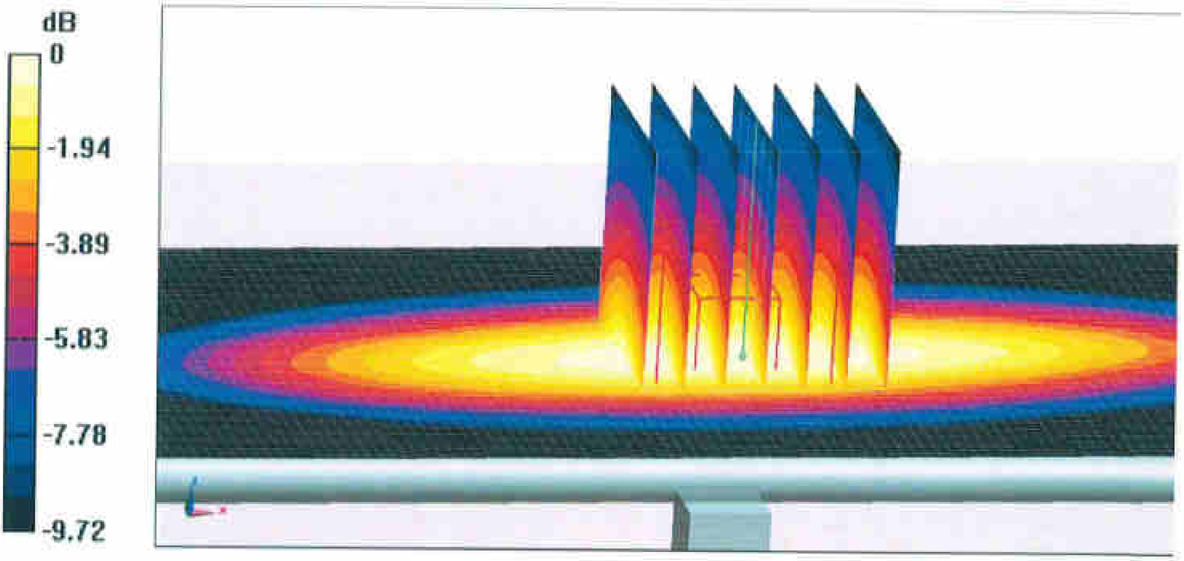
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.71 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.08 W/kg

SAR(1 g) = 2.09 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (measured) = 2.75 W/kg



0 dB = 2.75 W/kg = 4.39 dBW/kg

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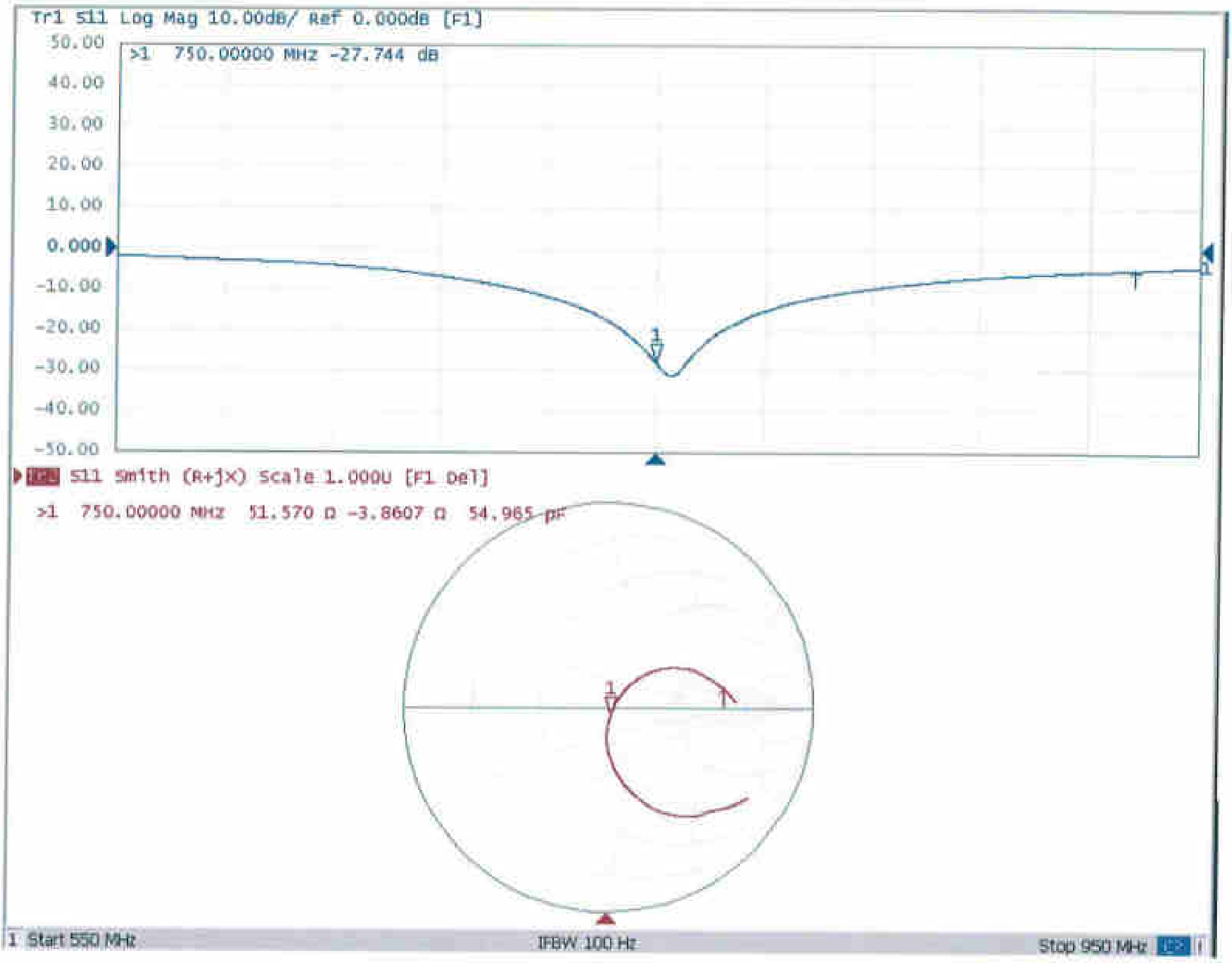
Impedance Measurement Plot for Body TSL



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CALIBRATION
CNAS L0570

Client **Sporton** **Certificate No: Z19-60082**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d151
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 27, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG,No.DAE4-1331_Feb19)	Feb-20
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

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

Issued: March 30, 2019

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

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

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.7 ± 6 %	0.93 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	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.30 W/kg ± 18.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.16 W/kg ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.7 ± 6 %	0.94 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	2.32 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.53 W /kg ± 18.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.52 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.20 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.8Ω- 3.28jΩ
Return Loss	- 29.5dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7Ω- 3.98jΩ
Return Loss	- 25.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.253 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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DASY5 Validation Report for Head TSL Date: 03.26.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d151

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.925 S/m; ε_r = 42.68; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.75, 9.75, 9.75) @ 835 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

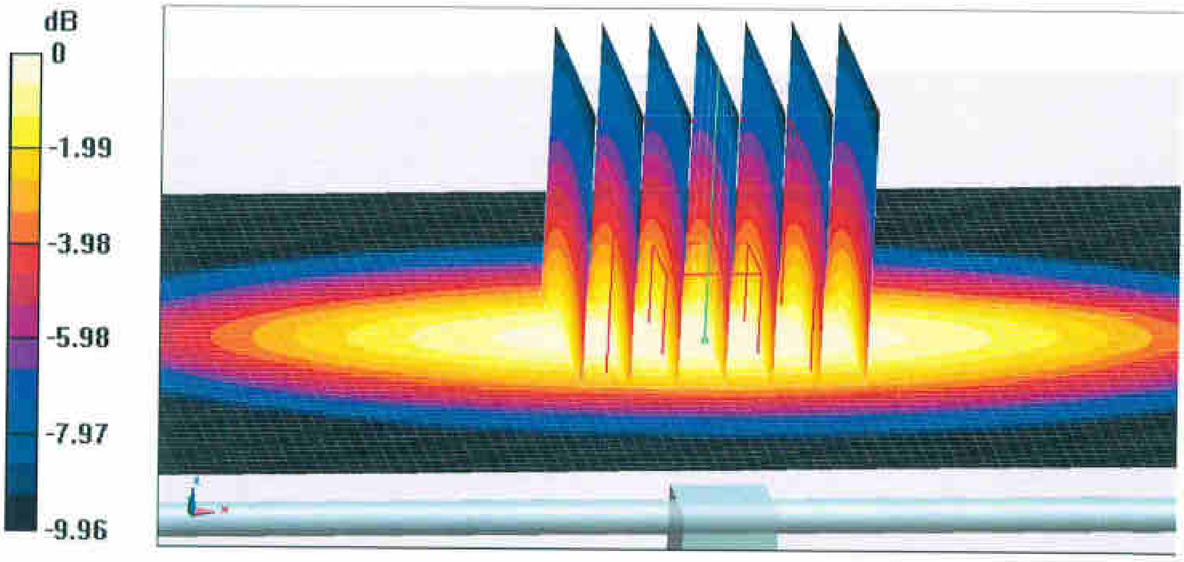
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.34 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.55 W/kg

SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.56 W/kg

Maximum value of SAR (measured) = 3.14 W/kg



0 dB = 3.14 W/kg = 4.97 dBW/kg

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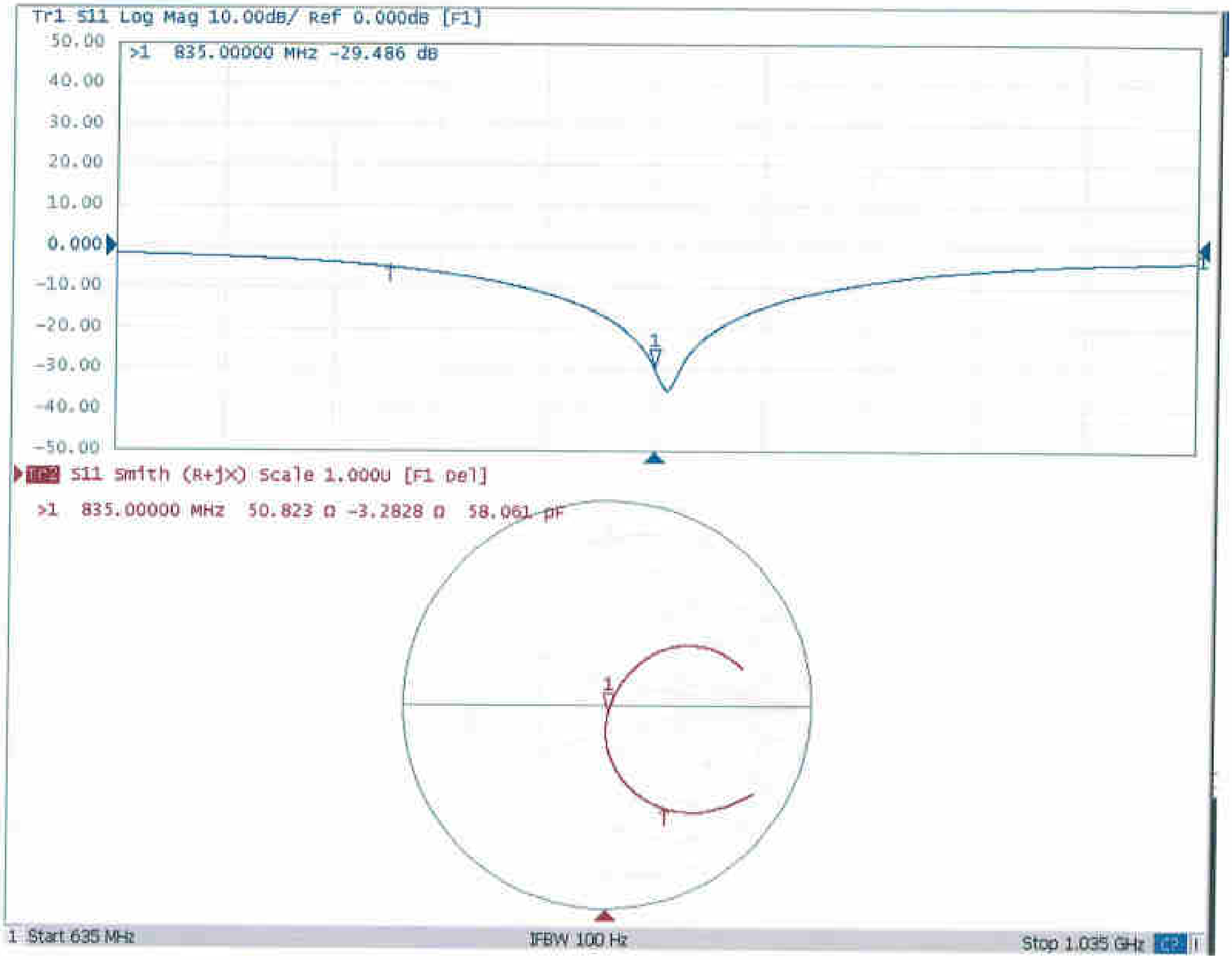
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 03.26.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d151

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.944 S/m; ε_r = 56.66; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.61, 9.61, 9.61) @ 835 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

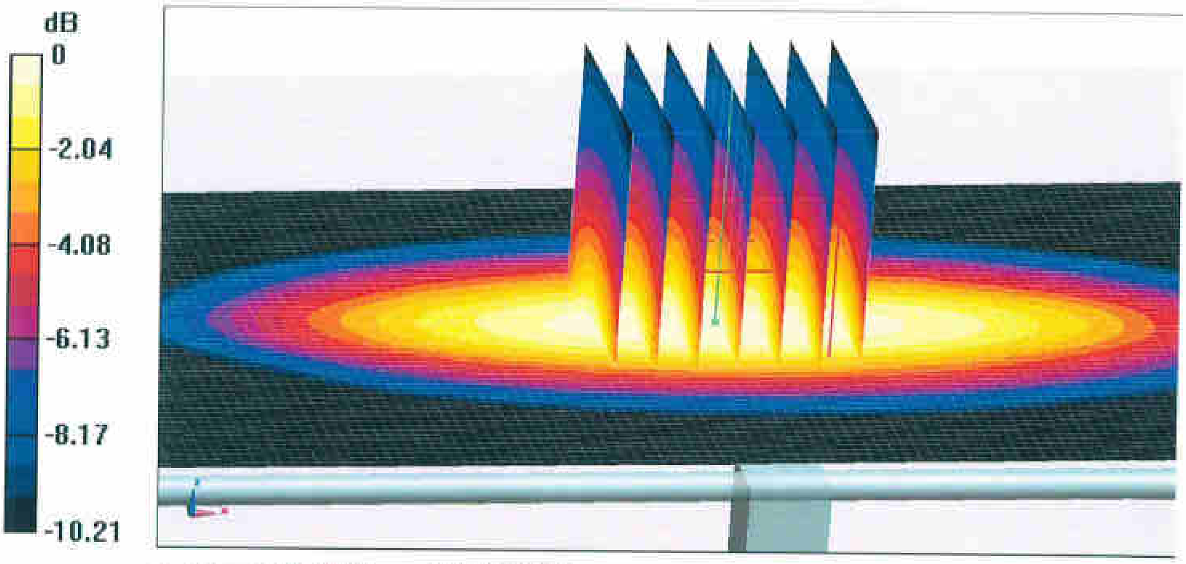
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.03 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 3.53 W/kg

SAR(1 g) = 2.32 W/kg; SAR(10 g) = 1.52 W/kg

Maximum value of SAR (measured) = 3.12 W/kg



0 dB = 3.12 W/kg = 4.94 dBW/kg

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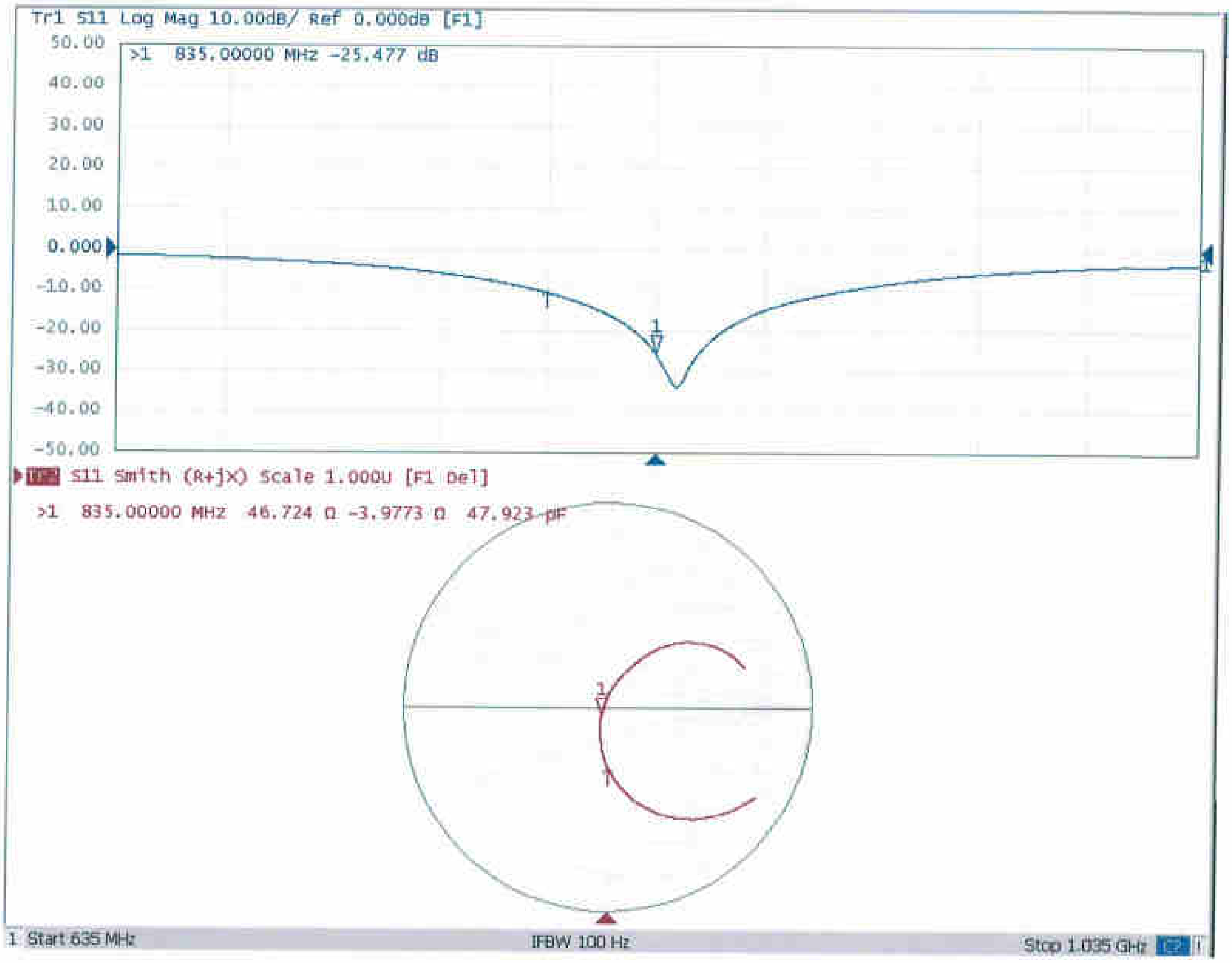
Impedance Measurement Plot for Body TSL



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CNAS L0570

Client **Sporton** **Certificate No: Z19-60084**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1090
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 27, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG,No.DAE4-1331_Feb19)	Feb-20
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

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

Issued: March 29, 2019

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

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

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	1.37 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	9.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.79 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 W/kg ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.0 ± 6 %	1.45 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	9.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.7 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	4.89 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.9 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.5Ω- 2.34 jΩ
Return Loss	- 29.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.9Ω- 2.19 jΩ
Return Loss	- 23.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.085 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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