

# FCC SAR Test Report

APPLICANT : ZTE CORPORATION  
EQUIPMENT : Ufi  
BRAND NAME : ZTE  
MODEL NAME : Z291DL  
FCC ID : SRQ-Z291DL  
STANDARD : FCC 47 CFR Part 2 (2.1093)  
ANSI/IEEE C95.1-1992  
IEEE 1528-2013

We, SPORTON INTERNATIONAL (XI'AN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (XI'AN) INC., the test report shall not be reproduced except in full.



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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for ZTE CORPORATION, Ufi, Z291DL are as follows.

Equipment Class	Frequency Band		Highest 1g SAR Summary		Highest Simultaneous Transmission 1g SAR (W/kg)
			Body (Separation 10mm)		
			1g SAR (W/kg)		
Licensed	LTE	Band 12	1.01		1.53
		Band 13	1.18		
		Band 5	0.60		
		Band 4	1.39		
		Band 2	1.41		
DTS	WLAN	2.4GHz WLAN	0.13		1.53
Date of Testing:			2016/01/29 ~ 2016/02/03		

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



## 2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (XI'AN) INC.
Test Site Location	1F, Building A3, No. 39 Chuangye Rd., Xi'an Hi-tech Zone, Shanxi Province, P. R. China TEL: +86-029-8860-8767 FAX: +86-029-8860-8791

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

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

## 3. Guidance Standard

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 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01



4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Ufi
Brand Name	ZTE
Model Name	Z291DL
FCC ID	SRQ-Z291DL
IMEI Code	869232020015615
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 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz
Mode	· LTE: QPSK, 16QAM · 802.11b/g/n HT20
HW Version	Z291DLHWV1.0
SW Version	TF_US_Z291DLV1.0.0B05
EUT Stage	Identical Prototype
<b>Remark:</b>	
<ol style="list-style-type: none"> <li>The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.</li> <li>This device 2.4GHz supports hotspot operation and 802.11n-HT40 is not supported in 2.4GHz WLAN.</li> <li>This device has no voice function.</li> </ol>	

**4.2 General LTE SAR Test and Reporting Considerations**

Summarized necessary items addressed in KDB 941225 D05 v02r05																																							
FCC ID	SRQ-Z291DL																																						
Equipment Name	Ufi																																						
Operating Frequency Range of each LTE transmission band	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 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz																																						
Channel Bandwidth	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 12: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz																																						
uplink modulations used	QPSK, and 16QAM																																						
LTE Voice / Data requirements	Data only																																						
LTE Release Version	R9																																						
LTE MPR permanently built-in by design	<p align="center"><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (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> </thead> <tbody> <tr> <td>QPSK</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 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>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 2</td> </tr> </tbody> </table>	Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																
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16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																
LTE A-MPR	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)																																						
Spectrum plots for RB configuration	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.																																						



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)	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 12												
	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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704				
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5				
H	23173	715.3	23165	714.5	23155	713.5	23130	711				
LTE Band 13												
	Bandwidth 5 MHz				Bandwidth 10 MHz							
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)					
L	23205		779.5		23230		782					
M	23230		782									
H	23255		784.5									

**5. RF Exposure Limits**

**5.1 Uncontrolled Environment**

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

**5.2 Controlled Environment**

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

**Limits for Occupational/Controlled Exposure (W/kg)**

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

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

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

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

## **6. Specific Absorption Rate (SAR)**

### **6.1 Introduction**

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

### **6.2 SAR Definition**

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

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

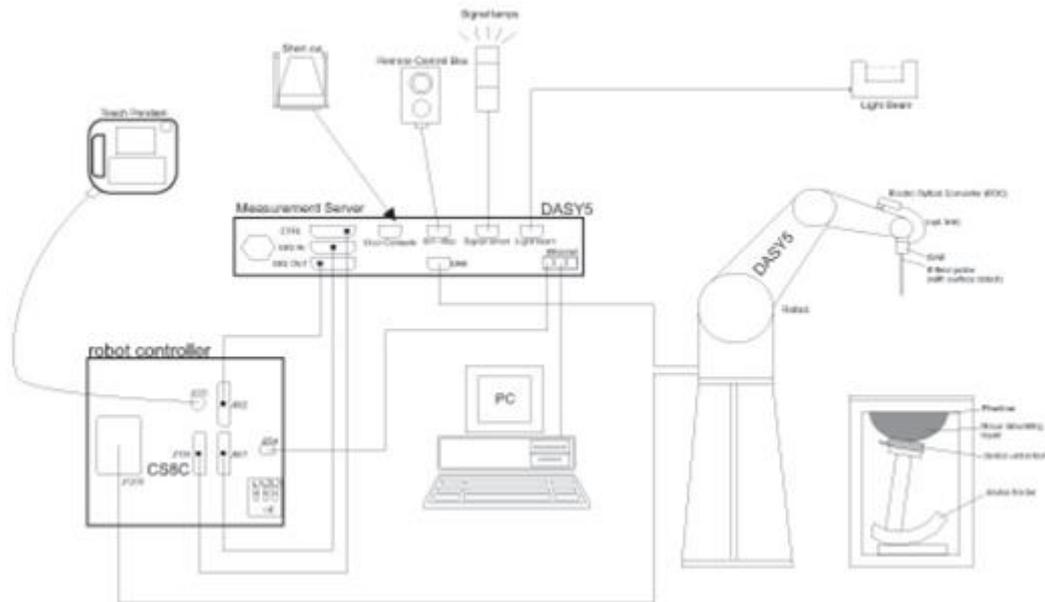
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  is the mass density of the tissue and E is the RMS electrical field strength.

## 7. System Description and Setup

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



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

**7.1 E-Field Probe**

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

**<EX3DV4 Probe>**

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



**7.2 Data Acquisition Electronics (DAE)**

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

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



**Fig 5.1 Photo of DAE**

**7.3 Phantom**

**<SAM Twin Phantom>**

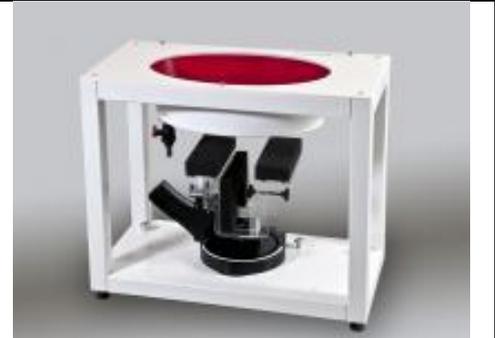
<b>Shell Thickness</b>	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
<b>Filling Volume</b>	Approx. 25 liters
<b>Dimensions</b>	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
<b>Measurement Areas</b>	Left Hand, Right Hand, Flat Phantom



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>**

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



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

### **7.4 Device Holder**

#### **<Mounting Device for Hand-Held Transmitter>**

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



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

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

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



Mounting Device for Laptops

## **8. Measurement Procedures**

The measurement procedures are as follows:

### <Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN power measurement, use engineering software to configure EUT WLAN 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 output power

### <SAR measurement>

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

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

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

### **8.1 Spatial Peak SAR Evaluation**

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

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

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

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

**8.2 Power Reference Measurement**

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

**8.3 Area Scan**

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

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

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

### 8.4 Zoom Scan

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

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

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		$\leq 2$ 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 1 <sup>st</sup> 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: $\delta$ 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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> 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.				

### 8.5 Volume Scan Procedures

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

### 8.6 Power Drift Monitoring

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



**9. Test Equipment List**

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1087	Mar. 20, 2015	Mar. 19, 2016
SPEAG	835MHz System Validation Kit	D835V2	4d151	Mar. 20, 2015	Mar. 19, 2016
SPEAG	1750MHz System Validation Kit	D1750V2	1090	Mar. 24, 2015	Mar. 23, 2016
SPEAG	1900MHz System Validation Kit	D1900V2	5d170	Mar. 24, 2015	Mar. 23, 2016
SPEAG	2450MHz System Validation Kit	D2450V2	908	Mar. 20, 2015	Mar. 19, 2016
SPEAG	Data Acquisition Electronics	DAE4	1358	Aug. 27, 2015	Aug. 26, 2016
SPEAG	Dosimetric E-Field Probe	EX3DV4	3911	Oct. 01, 2015	Sep. 30, 2016
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1753	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1754	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201074235	Oct. 15, 2015	Oct. 14, 2016
Agilent	ENA Series Network Analyzer	E5071C	MY46317418	Dec. 08, 2015	Dec. 07, 2016
Agilent	Dielectric Probe Kit	85070E	MY44300751	NCR	NCR
Anritsu	Power Sensor	MA2411B	0917070	Jan. 20, 2016	Jan. 19, 2017
Anritsu	Power Meter	ML2495A	1005002	Jan. 20, 2016	Jan. 19, 2017
Anritsu	Power Sensor	MA2411B	1339206	Jan. 20, 2016	Jan. 19, 2017
Anritsu	Power Meter	ML2495A	1438004	Jan. 20, 2016	Jan. 19, 2017
ARRA	Power Divider	A3200-2	NA	NA	NA
R&S	Signal Generator	SMBV100A	258305	Jan. 20, 2016	Jan. 19, 2017
R&S	Spectrum Analyzer	FSP7	101045	Dec. 08, 2015	Dec. 07, 2016
AR	Amplifier	5S1G4	342137	Note1	
Agilent	Dual Directional Coupler	778D	50422	Note1	
PASTERNAK	Dual Directional Coupler	PE2214-10	N/A	Note1	
Woken	Attenuation1	WK0602-XX	N/A	Note1	
PE	Attenuation2	PE7005-10	N/A	Note1	
PE	Attenuation3	PE7005-3	N/A	Note1	

**General Note:**

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

## 10. System Verification

### 10.1 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 ( $\sigma$ )	Permittivity ( $\epsilon_r$ )
<b>For Head</b>								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
<b>For Body</b>								
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

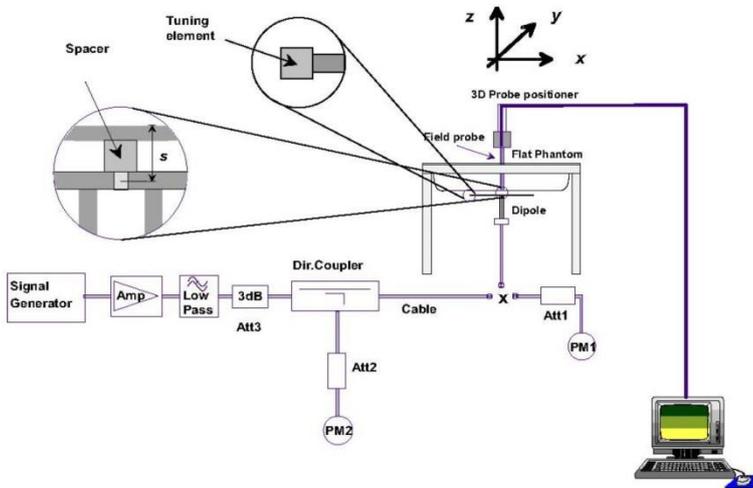
### <Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity ( $\sigma$ )	Permittivity ( $\epsilon_r$ )	Conductivity Target ( $\sigma$ )	Permittivity Target ( $\epsilon_r$ )	Delta ( $\sigma$ ) (%)	Delta ( $\epsilon_r$ ) (%)	Limit (%)	Date
750	Body	22.3	0.954	55.690	0.96	55.50	-0.63	0.34	±5	2016/01/29
835	Body	22.2	0.989	53.169	0.97	55.20	1.96	-3.68	±5	2016/01/29
1750	Body	22.5	1.515	51.952	1.49	53.40	1.68	-2.71	±5	2016/01/29
1900	Body	22.1	1.588	51.586	1.52	53.30	4.47	-3.22	±5	2016/01/29
2450	Body	22.3	1.983	51.159	1.95	52.70	1.69	-2.92	±5	2016/02/03

**10.2 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 (%)
2016/01/29	750	Body	250	1087	3911	1358	2.15	8.57	8.6	0.35
2016/01/29	835	Body	250	4d151	3911	1358	2.52	9.45	10.08	6.67
2016/01/29	1750	Body	250	1090	3911	1358	9.26	37.20	37.04	-0.43
2016/01/29	1900	Body	250	5d170	3911	1358	10.60	39.90	42.4	6.27
2016/02/03	2450	Body	250	908	3911	1358	13.10	50.30	52.4	4.17



**Fig 8.3.1 System Performance Check Setup**



**Fig 8.3.2 Setup Photo**



## **11. RF Exposure Positions**

### **11.1 Body Position**

- (a) To position the device parallel to the phantom surface with all sides and either keypad up or down.
- (b) To adjust the device parallel to the flat phantom.
- (c) To adjust the distance between the device and the flat phantom to 10 mm.

#### **<EUT Setup Photos>**

Please refer to Appendix D for the test setup photos.

### **11.2 Wireless Router**

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

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



## **12. Conducted RF Output Power (Unit: dBm)**

### **<LTE Conducted Power>**

#### **General Note:**

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are  $\leq 0.8$  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  $\frac{1}{2}$  dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is  $\leq 1.45$  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  $\frac{1}{2}$  dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is  $\leq 1.45$  W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B12 / B5 / B4 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.



<LTE Band 12>

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				23060	23095	23130	24.00	0
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	22.82	22.74	22.79		
10	QPSK	1	25	22.79	22.81	22.72	23.00	0-1
10	QPSK	1	49	22.88	22.84	22.90		
10	QPSK	25	0	21.83	21.84	21.82		
10	QPSK	25	12	21.87	21.83	21.79	23.00	0-1
10	QPSK	25	25	21.86	21.88	21.89		
10	QPSK	50	0	21.90	21.85	21.83		
10	16QAM	1	0	21.86	21.73	21.78	23.00	0-1
10	16QAM	1	25	21.77	21.79	21.74		
10	16QAM	1	49	21.84	21.81	21.86		
10	16QAM	25	0	21.09	21.01	20.83	22.00	0-2
10	16QAM	25	12	21.00	20.84	20.82		
10	16QAM	25	25	20.89	20.91	20.90		
10	16QAM	50	0	20.80	20.86	20.84		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	22.83	22.81	22.78	24.00	0
5	QPSK	1	12	22.72	22.82	22.74		
5	QPSK	1	24	22.85	22.80	22.86		
5	QPSK	12	0	21.94	21.84	21.78	23.00	0-1
5	QPSK	12	7	21.82	21.88	21.84		
5	QPSK	12	13	21.91	21.93	21.90		
5	QPSK	25	0	21.87	21.85	21.80		
5	16QAM	1	0	21.81	21.80	21.69	23.00	0-1
5	16QAM	1	12	21.74	21.77	21.72		
5	16QAM	1	24	21.75	21.76	21.87		
5	16QAM	12	0	20.92	20.93	20.81	22.00	0-2
5	16QAM	12	7	20.85	20.91	20.84		
5	16QAM	12	13	20.90	20.92	20.87		
5	16QAM	25	0	20.82	20.84	20.91		



Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	22.85	22.79	22.78	24.00	0
3	QPSK	1	8	22.89	22.83	22.81		
3	QPSK	1	14	22.83	22.85	22.84		
3	QPSK	8	0	21.94	21.86	21.84	23.00	0-1
3	QPSK	8	4	21.91	21.82	21.89		
3	QPSK	8	7	21.97	21.88	21.86		
3	QPSK	15	0	21.90	21.91	21.87		
3	16QAM	1	0	21.81	21.76	21.73	23.00	0-1
3	16QAM	1	8	21.83	21.77	21.78		
3	16QAM	1	14	21.80	21.82	21.86		
3	16QAM	8	0	20.92	20.91	20.80	22.00	0-2
3	16QAM	8	4	20.93	20.89	20.85		
3	16QAM	8	7	20.94	20.87	20.91		
3	16QAM	15	0	20.91	20.85	20.82		
Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	22.92	22.85	22.88	24.00	0
1.4	QPSK	1	3	22.91	22.82	22.81		
1.4	QPSK	1	5	22.94	22.88	22.87		
1.4	QPSK	3	0	22.90	22.87	22.86		
1.4	QPSK	3	1	22.95	22.89	22.84		
1.4	QPSK	3	3	22.93	22.83	22.89	23.00	0-1
1.4	QPSK	6	0	21.95	21.92	21.90	23.00	0-1
1.4	16QAM	1	0	21.88	21.85	21.81		
1.4	16QAM	1	3	21.85	21.86	21.82		
1.4	16QAM	1	5	21.90	21.91	21.79		
1.4	16QAM	3	0	21.91	21.90	21.84		
1.4	16QAM	3	1	21.89	21.88	21.83		
1.4	16QAM	3	3	21.93	21.87	21.85		
1.4	16QAM	6	0	20.83	20.73	20.72	22.00	0-2



<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			24.00	0
Frequency (MHz)				782				
10	QPSK	1	0		22.58			
10	QPSK	1	25		22.60		23.00	0-1
10	QPSK	1	49		22.61			
10	QPSK	25	0		21.67			
10	QPSK	25	12		21.66		23.00	0-1
10	QPSK	25	25		21.62			
10	QPSK	50	0		21.59			
10	16QAM	1	0		21.53		23.00	0-1
10	16QAM	1	25		21.59			
10	16QAM	1	49		21.56			
10	16QAM	25	0		20.69		22.00	0-2
10	16QAM	25	12		20.68			
10	16QAM	25	25		20.67			
10	16QAM	50	0		20.64			
Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	22.56	22.74	22.66	24.00	0
5	QPSK	1	12	22.70	22.57	22.61		
5	QPSK	1	24	22.64	22.71	22.64		
5	QPSK	12	0	21.66	21.67	21.68	23.00	0-1
5	QPSK	12	7	21.63	21.65	21.66		
5	QPSK	12	13	21.64	21.68	21.63		
5	QPSK	25	0	21.65	21.62	21.67	23.00	0-1
5	16QAM	1	0	21.56	21.68	21.56		
5	16QAM	1	12	21.65	21.52	21.57		
5	16QAM	1	24	21.59	21.69	21.52	22.00	0-2
5	16QAM	12	0	20.67	20.74	20.69		
5	16QAM	12	7	20.70	20.67	20.66		
5	16QAM	12	13	20.71	20.72	20.68		
5	16QAM	25	0	20.65	20.71	20.67		



<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	22.59	22.53	22.61		
10	QPSK	1	25	22.54	22.56	22.58	24.00	0
10	QPSK	1	49	22.67	22.60	22.70		
10	QPSK	25	0	21.57	21.63	21.65		
10	QPSK	25	12	21.60	21.59	21.62	23.00	0-1
10	QPSK	25	25	21.56	21.64	21.63		
10	QPSK	50	0	21.55	21.66	21.67		
10	16QAM	1	0	21.52	21.50	21.56	23.00	0-1
10	16QAM	1	25	21.49	21.52	21.51		
10	16QAM	1	49	21.60	21.56	21.70		
10	16QAM	25	0	20.57	20.62	20.66	22.00	0-2
10	16QAM	25	12	20.61	20.66	20.62		
10	16QAM	25	25	20.59	20.64	20.71		
10	16QAM	50	0	20.56	20.60	20.70		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.54	22.63	22.59	24.00	0
5	QPSK	1	12	22.51	22.61	22.68		
5	QPSK	1	24	22.61	22.58	22.69		
5	QPSK	12	0	21.59	21.65	21.66	23.00	0-1
5	QPSK	12	7	21.56	21.66	21.72		
5	QPSK	12	13	21.62	21.68	21.75		
5	QPSK	25	0	21.57	21.62	21.71		
5	16QAM	1	0	21.54	21.62	21.73	23.00	0-1
5	16QAM	1	12	21.52	21.56	21.63		
5	16QAM	1	24	21.50	21.54	21.62		
5	16QAM	12	0	20.60	20.68	20.65	22.00	0-2
5	16QAM	12	7	20.62	20.66	20.72		
5	16QAM	12	13	20.61	20.67	20.75		
5	16QAM	25	0	20.58	20.63	20.64		



Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.56	22.63	22.73	24.00	0
3	QPSK	1	8	22.49	22.58	22.72		
3	QPSK	1	14	22.53	22.59	22.71		
3	QPSK	8	0	21.61	21.64	21.81	23.00	0-1
3	QPSK	8	4	21.59	21.60	21.76		
3	QPSK	8	7	21.62	21.66	21.78		
3	QPSK	15	0	21.60	21.67	21.79		
3	16QAM	1	0	21.56	21.66	21.68	23.00	0-1
3	16QAM	1	8	21.53	21.55	21.61		
3	16QAM	1	14	21.51	21.61	21.63		
3	16QAM	8	0	20.71	20.72	20.77	22.00	0-2
3	16QAM	8	4	20.64	20.68	20.72		
3	16QAM	8	7	20.65	20.69	20.73		
3	16QAM	15	0	20.60	20.64	20.72		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.58	22.66	22.71	24.00	0
1.4	QPSK	1	3	22.57	22.65	22.70		
1.4	QPSK	1	5	22.61	22.64	22.74		
1.4	QPSK	3	0	22.59	22.67	22.75		
1.4	QPSK	3	1	22.55	22.62	22.77		
1.4	QPSK	3	3	22.63	22.68	22.79	23.00	0-1
1.4	QPSK	6	0	21.62	21.67	21.81	23.00	0-1
1.4	16QAM	1	0	21.55	21.56	21.70		
1.4	16QAM	1	3	21.51	21.59	21.67		
1.4	16QAM	1	5	21.50	21.61	21.72		
1.4	16QAM	3	0	21.61	21.66	21.69		
1.4	16QAM	3	1	21.56	21.60	21.73		
1.4	16QAM	3	3	21.57	21.63	21.71		
1.4	16QAM	6	0	20.52	20.54	20.61	22.00	0-2



<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	22.71	22.82	22.81	23.50	0
20	QPSK	1	49	22.67	22.81	22.59		
20	QPSK	1	99	22.78	22.64	22.50		
20	QPSK	50	0	21.72	21.74	21.70	22.50	0-1
20	QPSK	50	24	21.73	21.72	21.62		
20	QPSK	50	50	21.70	21.66	21.50		
20	16QAM	1	0	21.63	21.74	21.71	22.50	0-1
20	16QAM	1	49	21.60	21.70	21.56		
20	16QAM	1	99	21.67	21.50	21.44		
20	16QAM	50	0	20.69	20.72	20.80	21.50	0-2
20	16QAM	50	24	20.71	20.81	20.62		
20	16QAM	50	50	20.81	20.70	20.51		
20	16QAM	100	0	20.78	20.86	20.63		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.70	22.85	22.77		
15	QPSK	1	37	22.63	22.79	22.65		
15	QPSK	1	74	22.72	22.66	22.57		
15	QPSK	36	0	21.69	21.72	21.59	22.50	0-1
15	QPSK	36	20	21.60	21.73	21.58		
15	QPSK	36	39	21.71	21.70	21.56		
15	QPSK	75	0	21.65	21.77	21.64	22.50	0-1
15	16QAM	1	0	21.77	21.76	21.64		
15	16QAM	1	37	21.55	21.72	21.56		
15	16QAM	1	74	21.64	21.57	21.49	21.50	0-2
15	16QAM	36	0	20.81	20.71	20.59		
15	16QAM	36	20	20.70	20.72	20.61		
15	16QAM	36	39	20.69	20.81	20.49		
15	16QAM	75	0	20.75	20.85	20.60		



Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.71	22.83	22.70	23.50	0
10	QPSK	1	25	22.64	22.75	22.69		
10	QPSK	1	49	22.69	22.72	22.60		
10	QPSK	25	0	21.72	21.69	21.66	22.50	0-1
10	QPSK	25	12	21.62	21.72	21.52		
10	QPSK	25	25	21.66	21.77	21.56		
10	QPSK	50	0	21.60	21.75	21.58	22.50	0-1
10	16QAM	1	0	21.65	21.78	21.71		
10	16QAM	1	25	21.55	21.68	21.60		
10	16QAM	1	49	21.61	21.63	21.45	21.50	0-2
10	16QAM	25	0	20.76	20.81	20.70		
10	16QAM	25	12	20.65	20.83	20.55		
10	16QAM	25	25	20.68	20.86	20.59	21.50	0-2
10	16QAM	50	0	20.62	20.84	20.50		
Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.65	22.77	22.70	23.50	0
5	QPSK	1	12	22.67	22.76	22.58		
5	QPSK	1	24	22.59	22.82	22.65		
5	QPSK	12	0	21.67	21.81	21.53	22.50	0-1
5	QPSK	12	7	21.72	21.78	21.59		
5	QPSK	12	13	21.71	21.77	21.57		
5	QPSK	25	0	21.69	21.72	21.55	22.50	0-1
5	16QAM	1	0	21.59	21.73	21.61		
5	16QAM	1	12	21.63	21.71	21.52		
5	16QAM	1	24	21.51	21.74	21.50	21.50	0-2
5	16QAM	12	0	20.77	20.81	20.58		
5	16QAM	12	7	20.80	20.84	20.56		
5	16QAM	12	13	20.78	20.87	20.60	21.50	0-2
5	16QAM	25	0	20.71	20.80	20.57		



Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.65	22.80	22.61	23.50	0
3	QPSK	1	8	22.62	22.75	22.55		
3	QPSK	1	14	22.68	22.81	22.62		
3	QPSK	8	0	21.65	21.79	21.57	22.50	0-1
3	QPSK	8	4	21.62	21.72	21.55		
3	QPSK	8	7	21.70	21.81	21.56		
3	QPSK	15	0	21.69	21.78	21.61	22.50	0-1
3	16QAM	1	0	21.58	21.72	21.54		
3	16QAM	1	8	21.55	21.68	21.50		
3	16QAM	1	14	21.59	21.70	21.48	21.50	0-2
3	16QAM	8	0	20.73	20.83	20.63		
3	16QAM	8	4	20.70	20.88	20.62		
3	16QAM	8	7	20.72	20.84	20.65	21.50	0-2
3	16QAM	15	0	20.67	20.80	20.55		
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	22.83	22.66	23.50	0
1.4	QPSK	1	3	22.66	22.84	22.61		
1.4	QPSK	1	5	22.77	22.86	22.62		
1.4	QPSK	3	0	22.69	22.83	22.71		
1.4	QPSK	3	1	22.71	22.81	22.69		
1.4	QPSK	3	3	22.73	22.82	22.65	22.50	0-1
1.4	QPSK	6	0	21.67	21.75	21.63		
1.4	16QAM	1	0	21.63	21.79	21.59	22.50	0-1
1.4	16QAM	1	3	21.64	21.77	21.56		
1.4	16QAM	1	5	21.66	21.72	21.55		
1.4	16QAM	3	0	21.60	21.73	21.61		
1.4	16QAM	3	1	21.58	21.75	21.62		
1.4	16QAM	3	3	21.68	21.78	21.53	21.50	0-2
1.4	16QAM	6	0	20.63	20.74	20.52		



<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	22.31	22.40	22.32	23.80	0
20	QPSK	1	49	22.25	22.37	22.24		
20	QPSK	1	99	22.30	22.39	22.26		
20	QPSK	50	0	21.08	21.11	21.10	22.80	0-1
20	QPSK	50	24	21.09	21.01	21.08		
20	QPSK	50	50	20.99	21.09	21.07		
20	QPSK	100	0	21.01	21.05	21.02	22.80	0-1
20	16QAM	1	0	21.06	21.10	21.08		
20	16QAM	1	49	20.95	20.99	21.09		
20	16QAM	1	99	21.01	20.93	21.04	21.80	0-2
20	16QAM	50	0	20.15	20.13	20.18		
20	16QAM	50	24	20.10	20.06	20.14		
20	16QAM	50	50	20.08	20.18	20.15	21.80	0-2
20	16QAM	100	0	20.11	20.14	20.20		
Channel				18675	18900	19125		
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	22.29	22.35	22.33	23.80	0
15	QPSK	1	37	22.31	22.33	22.36		
15	QPSK	1	74	22.35	22.36	22.37		
15	QPSK	36	0	21.16	20.99	21.06	22.80	0-1
15	QPSK	36	20	21.13	20.96	21.04		
15	QPSK	36	39	21.12	21.03	21.07		
15	QPSK	75	0	21.11	21.10	21.14	22.80	0-1
15	16QAM	1	0	21.14	21.12	21.08		
15	16QAM	1	37	21.07	20.99	21.07		
15	16QAM	1	74	20.96	21.00	21.04	21.80	0-2
15	16QAM	36	0	20.13	20.06	20.18		
15	16QAM	36	20	20.12	20.14	20.13		
15	16QAM	36	39	20.11	20.10	20.15	21.80	0-2
15	16QAM	75	0	20.09	20.19	20.22		



Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	22.32	22.37	22.35	23.80	0
10	QPSK	1	25	22.31	22.30	22.34		
10	QPSK	1	49	22.35	22.32	22.38		
10	QPSK	25	0	21.09	21.04	21.07	22.80	0-1
10	QPSK	25	12	21.15	21.02	21.05		
10	QPSK	25	25	21.18	21.12	21.10		
10	QPSK	50	0	21.14	21.09	21.11	22.80	0-1
10	16QAM	1	0	21.08	21.10	21.12		
10	16QAM	1	25	21.07	21.01	21.08		
10	16QAM	1	49	21.02	20.92	21.06	21.80	0-2
10	16QAM	25	0	20.18	20.17	20.20		
10	16QAM	25	12	20.15	20.20	20.16		
10	16QAM	25	25	20.19	20.21	20.22	21.80	0-2
10	16QAM	50	0	20.14	20.09	20.18		
Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	22.30	22.31	22.29	23.80	0
5	QPSK	1	12	22.27	22.30	22.31		
5	QPSK	1	24	22.37	22.34	22.34		
5	QPSK	12	0	21.14	20.99	21.04	22.80	0-1
5	QPSK	12	7	21.09	21.07	21.09		
5	QPSK	12	13	21.11	21.10	21.13		
5	QPSK	25	0	21.09	20.99	21.07	22.80	0-1
5	16QAM	1	0	21.05	21.02	21.03		
5	16QAM	1	12	21.04	20.98	21.01		
5	16QAM	1	24	21.06	21.00	21.02	21.80	0-2
5	16QAM	12	0	20.19	20.22	20.20		
5	16QAM	12	7	20.18	20.16	20.17		
5	16QAM	12	13	20.21	20.18	20.24	21.80	0-2
5	16QAM	25	0	20.17	20.11	20.16		



Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.26	22.30	22.29	23.80	0
3	QPSK	1	8	22.27	22.25	22.28		
3	QPSK	1	14	22.29	22.32	22.34		
3	QPSK	8	0	21.10	20.99	21.09	22.80	0-1
3	QPSK	8	4	21.15	21.02	21.11		
3	QPSK	8	7	21.10	21.04	21.07		
3	QPSK	15	0	21.08	21.05	21.08	22.80	0-1
3	16QAM	1	0	20.99	21.00	20.98		
3	16QAM	1	8	21.10	20.94	21.00		
3	16QAM	1	14	21.02	20.97	21.08	21.80	0-2
3	16QAM	8	0	20.13	20.11	20.16		
3	16QAM	8	4	20.18	20.14	20.20		
3	16QAM	8	7	20.15	20.20	20.19	21.80	0-2
3	16QAM	15	0	20.17	20.12	20.14		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.21	22.19	22.17	23.80	0
1.4	QPSK	1	3	22.11	22.12	22.15		
1.4	QPSK	1	5	22.19	22.15	22.20		
1.4	QPSK	3	0	22.14	22.14	22.18		
1.4	QPSK	3	1	22.17	22.13	22.16		
1.4	QPSK	3	3	22.16	22.11	22.19	22.80	0-1
1.4	QPSK	6	0	21.17	21.11	21.13	22.80	0-1
1.4	16QAM	1	0	21.10	21.03	21.08		
1.4	16QAM	1	3	21.06	21.05	21.14		
1.4	16QAM	1	5	21.12	21.07	21.12		
1.4	16QAM	3	0	21.19	21.08	21.04		
1.4	16QAM	3	1	21.09	21.01	21.09		
1.4	16QAM	3	3	21.15	21.04	21.03	21.80	0-2
1.4	16QAM	6	0	20.09	20.08	20.06		

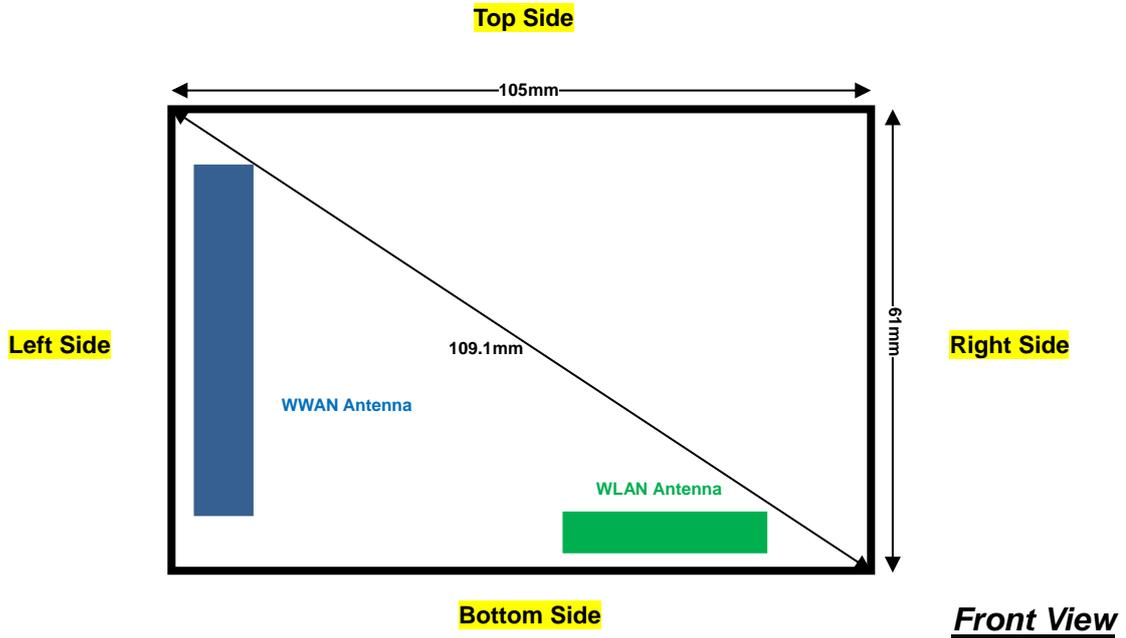
**<WLAN Conducted Power>****General Note:**

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  $\leq 0.4$  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  $\leq 0.8$  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  $\leq 1.2$  W/kg or all required channels are tested.

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b	CH 1	2412	1Mbps	12.95	13.50	100.00
		CH 6	2437		14.82	15.00	
		CH 11	2462		15.19	15.50	
	802.11g	CH 1	2412	6Mbps	10.34	11.00	98.10
		CH 6	2437		12.22	12.50	
		CH 11	2462		12.79	13.00	
	802.11n-HT20	CH 1	2412	MCS0	8.16	9.00	98.27
		CH 6	2437		10.21	11.00	
		CH 11	2462		10.74	11.00	

### 13. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	≤ 25mm	≤ 25mm	94mm	≤ 25mm
WLAN	≤ 25mm	≤ 25mm	52.5mm	≤ 25mm	≤ 25mm	62mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	Yes	Yes	Yes	Yes	No	Yes
WLAN	Yes	Yes	No	Yes	Yes	No

**General Note:**

Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm\*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge



## **14. SAR Test Results**

### **General Note:**

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
  - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
  - b. Reported SAR(W/kg)= Measured SAR(W/kg)\*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:
  - $\leq 0.8$  W/kg or  $2.0$  W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
  - $\leq 0.6$  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
  - $\leq 0.4$  W/kg or  $1.0$  W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

### **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  $\leq 0.8$  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  $\frac{1}{2}$  dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is  $\leq 1.45$  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  $\frac{1}{2}$  dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is  $\leq 1.45$  W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B12 / B5 / B4 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  $\leq 1.2$  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  $\leq 0.8$  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  $\leq 1.2$  W/kg or all required channels are tested.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.



14.1 Body SAR

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)	
01	LTE Band 12	10M	QPSK	1RB	49offset	Front	10	23095	707.5	22.84	24.00	1.306	0.02	0.772	1.008	
	LTE Band 12	10M	QPSK	1RB	49offset	Back	10	23095	707.5	22.84	24.00	1.306	0.03	0.666	0.862	
	LTE Band 12	10M	QPSK	1RB	49offset	Left side	10	23095	707.5	22.84	24.00	1.306	-0.04	0.068	0.089	
	LTE Band 12	10M	QPSK	1RB	49offset	Top side	10	23095	707.5	22.84	24.00	1.306	-0.02	0.248	0.324	
	LTE Band 12	10M	QPSK	1RB	49offset	Bottom side	10	23095	707.5	22.84	24.00	1.306	0.04	0.447	0.584	
	LTE Band 12	10M	QPSK	25RB	25offset	Front	10	23095	707.5	21.88	23.00	1.294	0.1	0.633	0.819	
	LTE Band 12	10M	QPSK	25RB	25offset	Back	10	23095	707.5	21.88	23.00	1.294	-0.02	0.588	0.761	
	LTE Band 12	10M	QPSK	25RB	25offset	Left side	10	23095	707.5	21.88	23.00	1.294	-0.16	0.056	0.072	
	LTE Band 12	10M	QPSK	25RB	25offset	Top side	10	23095	707.5	21.88	23.00	1.294	0.01	0.215	0.278	
	LTE Band 12	10M	QPSK	25RB	25offset	Bottom side	10	23095	707.5	21.88	23.00	1.294	0.05	0.345	0.446	
	LTE Band 12	10M	QPSK	50RB	0offset	Front	10	23095	707.5	21.85	23.00	1.303	0.02	0.630	0.821	
	LTE Band 12	10M	QPSK	50RB	0offset	Back	10	23095	707.5	21.85	23.00	1.303	0.06	0.624	0.813	
	02	LTE Band 13	10M	QPSK	1RB	49offset	Front	10	23230	782	22.61	24.00	1.377	0.02	0.856	1.179
		LTE Band 13	10M	QPSK	1RB	49offset	Back	10	23230	782	22.61	24.00	1.377	0.04	0.690	0.950
LTE Band 13		10M	QPSK	1RB	49offset	Left side	10	23230	782	22.61	24.00	1.377	0.06	0.095	0.131	
LTE Band 13		10M	QPSK	1RB	49offset	Top side	10	23230	782	22.61	24.00	1.377	-0.02	0.460	0.634	
LTE Band 13		10M	QPSK	1RB	49offset	Bottom side	10	23230	782	22.61	24.00	1.377	0.06	0.554	0.763	
LTE Band 13		10M	QPSK	25RB	0offset	Front	10	23230	782	21.67	23.00	1.358	0.06	0.832	1.130	
LTE Band 13		10M	QPSK	25RB	0offset	Back	10	23230	782	21.67	23.00	1.358	0.05	0.643	0.873	
LTE Band 13		10M	QPSK	25RB	0offset	Left side	10	23230	782	21.67	23.00	1.358	-0.03	0.057	0.077	
LTE Band 13		10M	QPSK	25RB	0offset	Top side	10	23230	782	21.67	23.00	1.358	-0.01	0.485	0.659	
LTE Band 13		10M	QPSK	25RB	0offset	Bottom side	10	23230	782	21.67	23.00	1.358	0.07	0.517	0.702	
LTE Band 13		10M	QPSK	50RB	0offset	Front	10	23230	782	21.59	23.00	1.384	0.01	0.786	1.087	
LTE Band 13	10M	QPSK	50RB	0offset	Back	10	23230	782	21.59	23.00	1.384	0.04	0.612	0.847		
03	LTE Band 5	10M	QPSK	1RB	49offset	Front	10	20525	836.5	22.60	24.00	1.380	0.01	0.431	0.595	
	LTE Band 5	10M	QPSK	1RB	49offset	Back	10	20525	836.5	22.60	24.00	1.380	-0.08	0.370	0.511	
	LTE Band 5	10M	QPSK	1RB	49offset	Left side	10	20525	836.5	22.60	24.00	1.380	-0.06	0.096	0.133	
	LTE Band 5	10M	QPSK	1RB	49offset	Top side	10	20525	836.5	22.60	24.00	1.380	0.06	0.218	0.301	
	LTE Band 5	10M	QPSK	1RB	49offset	Bottom side	10	20525	836.5	22.60	24.00	1.380	0.07	0.240	0.331	
	LTE Band 5	10M	QPSK	25RB	0offset	Front	10	20525	836.5	21.63	23.00	1.371	0.04	0.387	0.531	
	LTE Band 5	10M	QPSK	25RB	0offset	Back	10	20525	836.5	21.63	23.00	1.371	0.02	0.329	0.451	
	LTE Band 5	10M	QPSK	25RB	0offset	Left side	10	20525	836.5	21.63	23.00	1.371	-0.04	0.083	0.114	
	LTE Band 5	10M	QPSK	25RB	0offset	Top side	10	20525	836.5	21.63	23.00	1.371	-0.04	0.195	0.267	
	LTE Band 5	10M	QPSK	25RB	0offset	Bottom side	10	20525	836.5	21.63	23.00	1.371	0.02	0.208	0.285	



Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
04	LTE Band 4	20M	QPSK	1RB	0offset	Front	10	20175	1732.5	22.82	23.50	1.169	-0.1	1.190	1.392
	LTE Band 4	20M	QPSK	1RB	0offset	Back	10	20175	1732.5	22.82	23.50	1.169	-0.03	0.933	1.091
	LTE Band 4	20M	QPSK	1RB	0offset	Left side	10	20175	1732.5	22.82	23.50	1.169	-0.17	0.697	0.815
	LTE Band 4	20M	QPSK	1RB	0offset	Top side	10	20175	1732.5	22.82	23.50	1.169	-0.05	0.459	0.537
	LTE Band 4	20M	QPSK	1RB	0offset	Bottom side	10	20175	1732.5	22.82	23.50	1.169	0.03	0.703	0.822
	LTE Band 4	20M	QPSK	50RB	0offset	Front	10	20175	1732.5	21.74	22.50	1.191	-0.11	0.948	1.129
	LTE Band 4	20M	QPSK	50RB	0offset	Back	10	20175	1732.5	21.74	22.50	1.191	0.07	0.698	0.831
	LTE Band 4	20M	QPSK	50RB	0offset	Left side	10	20175	1732.5	21.74	22.50	1.191	-0.19	0.548	0.653
	LTE Band 4	20M	QPSK	50RB	0offset	Top side	10	20175	1732.5	21.74	22.50	1.191	-0.03	0.368	0.438
	LTE Band 4	20M	QPSK	50RB	0offset	Bottom side	10	20175	1732.5	21.74	22.50	1.191	0.04	0.559	0.666
	LTE Band 4	20M	QPSK	100RB	0offset	Front	10	20175	1732.5	21.78	22.50	1.180	-0.11	0.973	1.148
	LTE Band 4	20M	QPSK	100RB	0offset	Back	10	20175	1732.5	21.78	22.50	1.180	0.03	0.690	0.814
	LTE Band 4	20M	QPSK	100RB	0offset	Left side	10	20175	1732.5	21.78	22.50	1.180	-0.17	0.567	0.669
	LTE Band 4	20M	QPSK	100RB	0offset	Bottom side	10	20175	1732.5	21.78	22.50	1.180	0.01	0.561	0.662
	LTE Band 2	20M	QPSK	1RB	0offset	Front	10	18900	1880	22.40	23.80	1.380	-0.03	0.850	1.173
	LTE Band 2	20M	QPSK	1RB	0offset	Back	10	18900	1880	22.40	23.80	1.380	-0.1	0.557	0.769
	LTE Band 2	20M	QPSK	1RB	0offset	Left side	10	18900	1880	22.40	23.80	1.380	-0.05	0.594	0.820
	LTE Band 2	20M	QPSK	1RB	0offset	Top side	10	18900	1880	22.40	23.80	1.380	-0.05	0.363	0.501
	LTE Band 2	20M	QPSK	1RB	0offset	Bottom side	10	18900	1880	22.40	23.80	1.380	0.04	0.310	0.428
05	LTE Band 2	20M	QPSK	1RB	0offset	Front	10	18700	1860	22.31	23.80	1.409	-0.12	1.000	1.409
	LTE Band 2	20M	QPSK	1RB	0offset	Front	10	19100	1900	22.32	23.80	1.406	-0.05	0.745	1.048
	LTE Band 2	20M	QPSK	1RB	0offset	Left side	10	18700	1860	22.31	23.80	1.409	-0.05	0.635	0.895
	LTE Band 2	20M	QPSK	1RB	0offset	Left side	10	19100	1900	22.32	23.80	1.406	-0.09	0.563	0.792
	LTE Band 2	20M	QPSK	50RB	0offset	Front	10	18900	1880	21.11	22.80	1.476	-0.06	0.632	0.933
	LTE Band 2	20M	QPSK	50RB	0offset	Back	10	18900	1880	21.11	22.80	1.476	-0.04	0.411	0.607
	LTE Band 2	20M	QPSK	50RB	0offset	Left side	10	18900	1880	21.11	22.80	1.476	0.03	0.457	0.674
	LTE Band 2	20M	QPSK	50RB	0offset	Top side	10	18900	1880	21.11	22.80	1.476	0.02	0.266	0.393
	LTE Band 2	20M	QPSK	50RB	0offset	Bottom side	10	18900	1880	21.11	22.80	1.476	-0.01	0.226	0.334
	LTE Band 2	20M	QPSK	50RB	0offset	Front	10	18700	1860	21.08	22.80	1.486	-0.11	0.786	1.168
	LTE Band 2	20M	QPSK	50RB	0offset	Front	10	19100	1900	21.10	22.80	1.479	-0.08	0.627	0.927
	LTE Band 2	20M	QPSK	100RB	0offset	Front	10	18900	1880	21.05	22.80	1.496	-0.04	0.609	0.911
	LTE Band 2	20M	QPSK	100RB	0offset	Left side	10	18900	1880	21.05	22.80	1.496	-0.01	0.456	0.682

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	MAX Area Scan SAR 1g SAR (W/kg)	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Front	10	11	2462	15.19	15.50	1.074	0.138			
	WLAN2.4GHz	802.11b 1Mbps	Back	10	11	2462	15.19	15.50	1.074	0.138			
06	WLAN2.4GHz	802.11b 1Mbps	Right side	10	11	2462	15.19	15.50	1.074	0.193	0.04	0.116	0.125
	WLAN2.4GHz	802.11b 1Mbps	Bottom side	10	11	2462	15.19	15.50	1.074	0.00998			



14.2 Repeated SAR Measurement

No.	Band	BW (MHz)	RB Size	RB Offset	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	LTE Band 13	10M	1	49	QPSK	Front	10	23230	782	22.61	24.00	1.377	0.02	0.856	1	1.179
2nd	LTE Band 13	10M	1	49	QPSK	Front	10	23230	782	22.61	24.00	1.377	0.06	0.852	1.005	1.173
1st	LTE Band 4	20M	1	0	QPSK	Front	10	20175	1732.5	22.82	23.50	1.169	-0.1	1.190	1	1.392
2nd	LTE Band 4	20M	1	0	QPSK	Front	10	20175	1732.5	22.82	23.50	1.169	-0.03	1.160	1.026	1.357
1st	LTE Band 2	20M	1	0	QPSK	Front	10	18700	1860	22.31	23.80	1.409	-0.12	1.000	1	1.409
2nd	LTE Band 2	20M	1	0	QPSK	Front	10	18700	1860	22.31	23.80	1.409	-0.02	0.998	1.002	1.406

General Note:

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

**15. Simultaneous Transmission Analysis**

NO.	Simultaneous Transmission Configurations	Body	Note
1.	LTE + WLAN2.4GHz	Yes	Hotspot

**General Note:**

1. This device has no voice function.
2. This device 2.4GHz WLAN supports hotspot operation.
3. For body, WLAN 2.4GHz, chose the worse position zoom scan SAR for co-located with WWAN.
4. The Scaled SAR summation is calculated based on the same configuration and test position.
5. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
  - i) Scalar SAR summation < 1.6W/kg.
  - ii)  $SPLSR = (SAR_1 + SAR_2)^{1.5} / (\text{min. separation distance, mm})$ , and the peak separation distance is determined from the square root of  $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$ , where  $(x_1, y_1, z_1)$  and  $(x_2, y_2, z_2)$  are the coordinates of the extrapolated peak SAR locations in the zoom scan.
  - iii) If  $SPLSR \leq 0.04$ , simultaneously transmission SAR measurement is not necessary.
  - iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.



**15.1 Body Exposure Conditions**

WWAN Band		Exposure Position	WWAN	2.4GHz WLAN	Summed 1g SAR (W/kg)
			1g SAR (W/kg)	1g SAR (W/kg)	
LTE	Band 12	Front	1.008	0.125	1.13
		Back	0.862	0.125	0.99
		Left side	0.089		0.09
		Right side		0.125	0.13
		Top side	0.324		0.32
		Bottom side	0.584	0.125	0.71
	Band 13	Front	1.179	0.125	1.30
		Back	0.950	0.125	1.08
		Left side	0.131		0.13
		Right side		0.125	0.13
		Top side	0.659		0.66
		Bottom side	0.763	0.125	0.89
	Band 5	Front	0.595	0.125	0.72
		Back	0.511	0.125	0.64
		Left side	0.133		0.13
		Right side		0.125	0.13
		Top side	0.301		0.30
		Bottom side	0.331	0.125	0.46
	Band 4	Front	1.392	0.125	1.52
		Back	1.091	0.125	1.22
		Left side	0.815		0.82
		Right side		0.125	0.13
		Top side	0.537		0.54
		Bottom side	0.822	0.125	0.95
Band 2	Front	1.409	0.125	<b>1.53</b>	
	Back	0.769	0.125	0.89	
	Left side	0.895		0.90	
	Right side		0.125	0.13	
	Top side	0.501		0.50	
	Bottom side	0.428	0.125	0.55	

Test Engineer : Kat Yin

## 16. Uncertainty Assessment

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

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

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

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor <sup>(a)</sup>	1/k <sup>(b)</sup>	1/√3	1/√6	1/√2

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

(b)  $\kappa$  is the coverage factor

**Table 16.1. Standard Uncertainty for Assumed Distribution**

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

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

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

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

## **17. References**

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v02r02, "SAR Guidance for IEEE 802.11 (WiFi) Transmitters", Oct 2015.
- [6] FCC KDB 447498 D01 v06, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Oct 2015
- [7] FCC KDB 941225 D05 v02r05, "SAR Evaluation Considerations for LTE Devices", Dec 2015
- [8] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.
- [9] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [10] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.



## **Appendix A. Plots of System Performance Check**

The plots are shown as follows.

### System Check\_Body\_750MHz\_20160129

**DUT: D750V3-SN:1087**

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

Medium: MSL\_750\_2016/01/29 Medium parameters used:  $f = 750$  MHz;  $\sigma = 0.954$  S/m;  $\epsilon_r = 55.69$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(10.08, 10.08, 10.08); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.70 W/kg

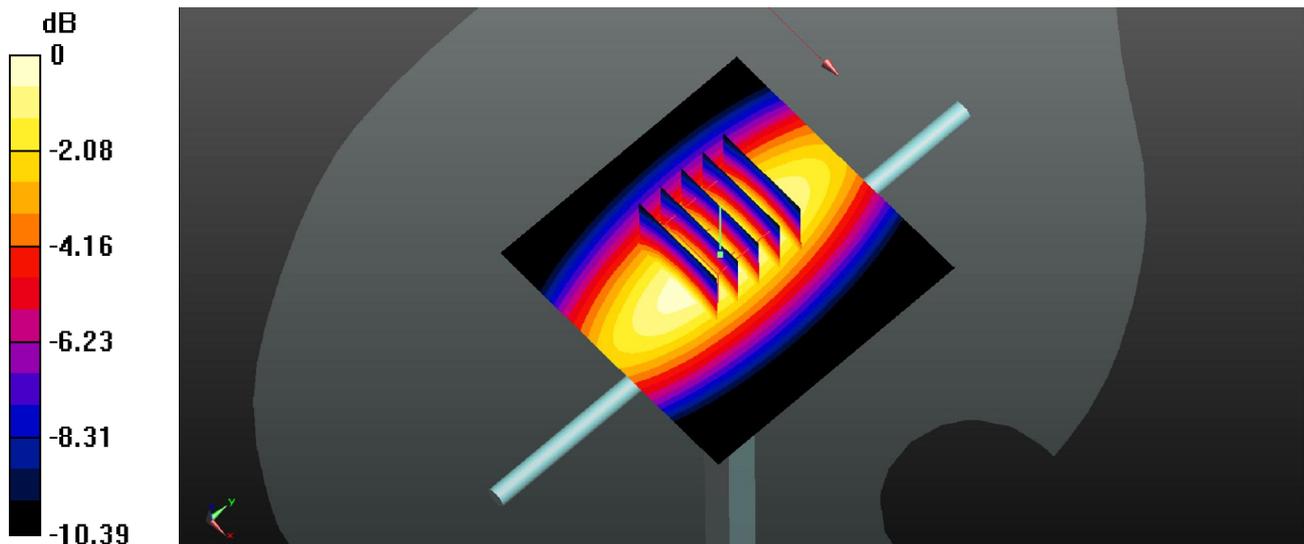
**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 48.80 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 3.18 W/kg

**SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.42 W/kg**

Maximum value of SAR (measured) = 2.70 W/kg



### System Check\_Body\_835MHz\_20160129

**DUT: D835V2-SN:4d151**

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

Medium: MSL\_835\_2016/01/29 Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.989 \text{ S/m}$ ;  $\epsilon_r = 53.169$ ;

$\rho = 1000 \text{ kg/m}^3$

Ambient Temperature :  $23.5 \text{ }^\circ\text{C}$ ; Liquid Temperature :  $22.2 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(9.8, 9.8, 9.8); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) =  $3.18 \text{ W/kg}$

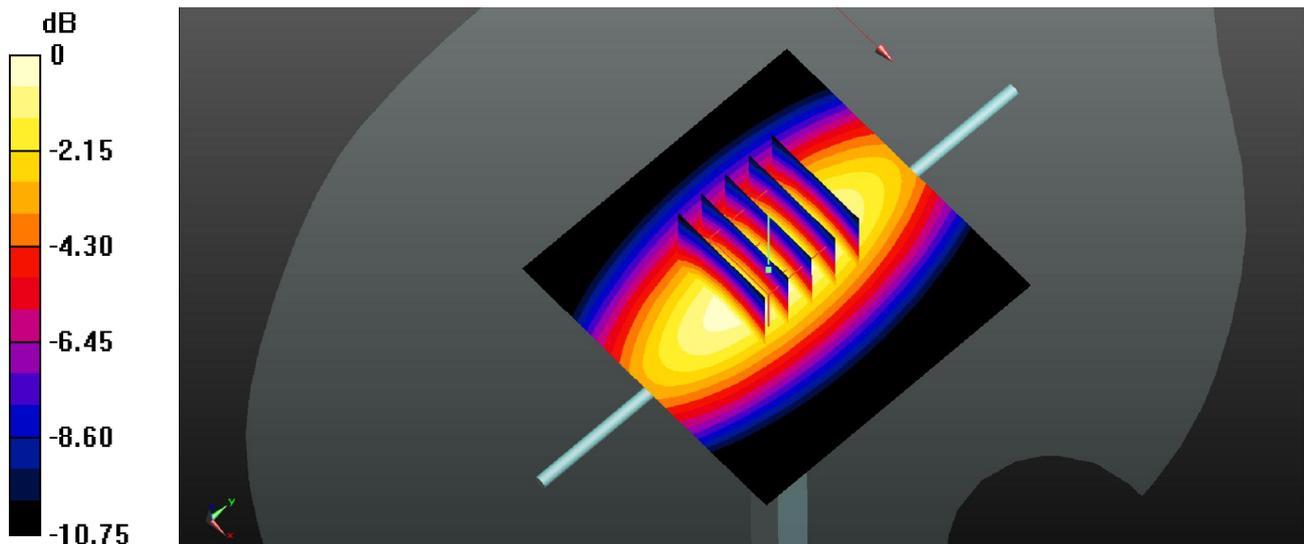
**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $52.23 \text{ V/m}$ ; Power Drift =  $0.03 \text{ dB}$

Peak SAR (extrapolated) =  $3.75 \text{ W/kg}$

**SAR(1 g) =  $2.52 \text{ W/kg}$ ; SAR(10 g) =  $1.65 \text{ W/kg}$**

Maximum value of SAR (measured) =  $3.17 \text{ W/kg}$



0 dB =  $3.17 \text{ W/kg}$

### System Check\_Body\_1750MHz\_20160129

**DUT: D1750V2-SN:1090**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: MSL\_1750\_2016/01/29 Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.515$  S/m;  $\epsilon_r = 51.952$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(8.01, 8.01, 8.01); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 13.2 W/kg

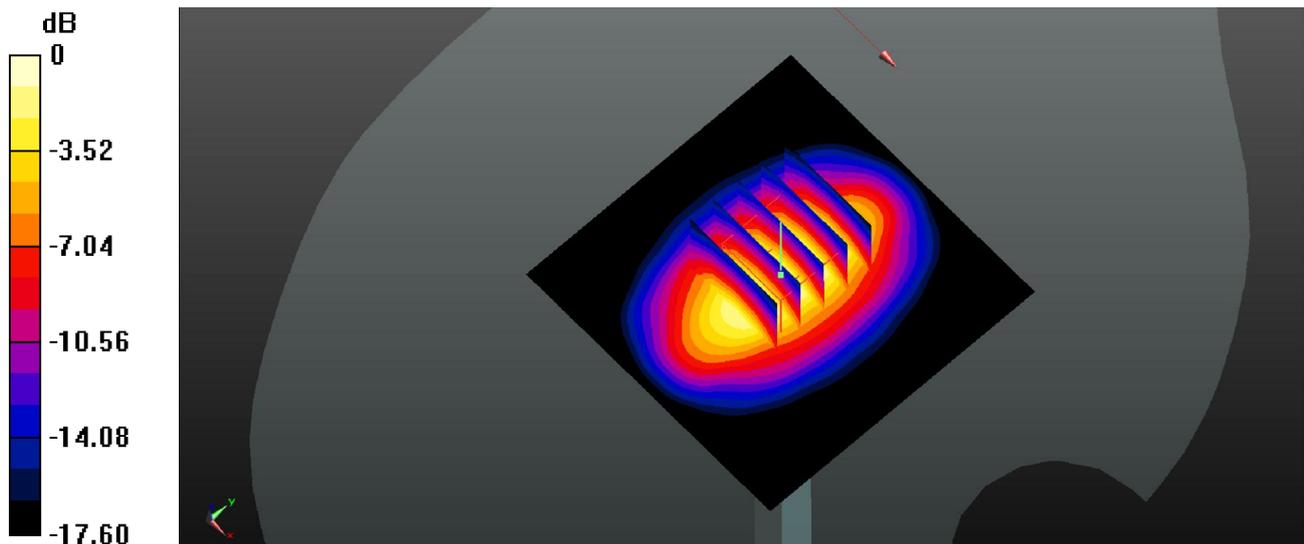
**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 94.95 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 16.6 W/kg

**SAR(1 g) = 9.26 W/kg; SAR(10 g) = 4.86 W/kg**

Maximum value of SAR (measured) = 13.0 W/kg



0 dB = 13.0 W/kg

**System Check\_Body\_1900MHz\_20160129**

**DUT: D1900V2-SN:5d170**

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL\_1900\_2016/01/29 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.588$  S/m;  $\epsilon_r = 51.586$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(7.75, 7.75, 7.75); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 15.2 W/kg

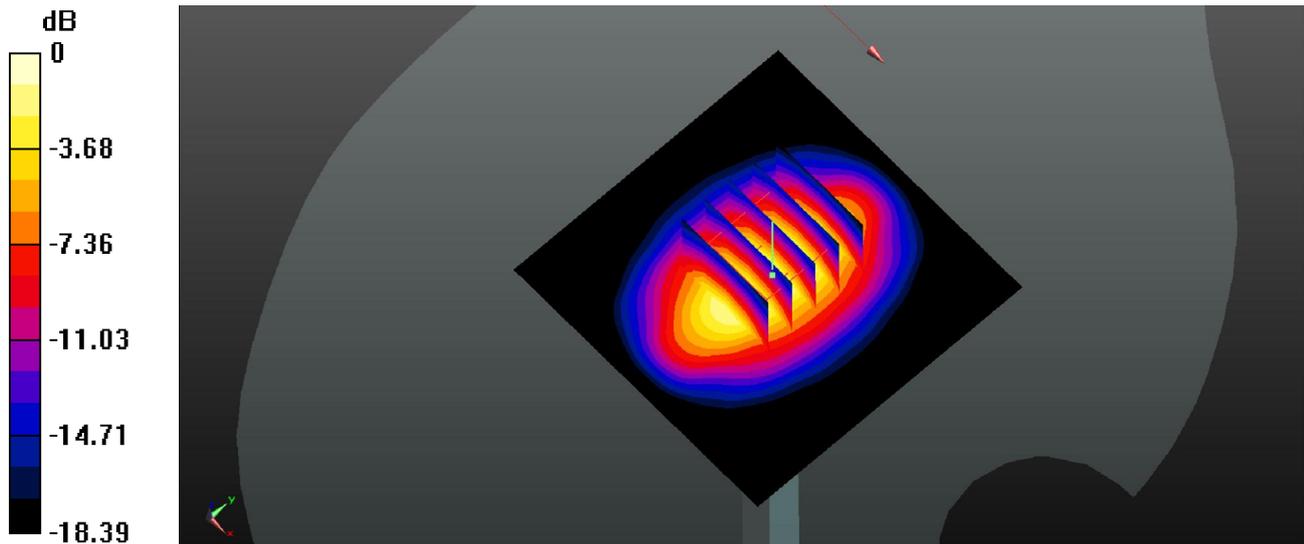
**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 87.12 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 19.3 W/kg

**SAR(1 g) = 10.6 W/kg; SAR(10 g) = 5.43 W/kg**

Maximum value of SAR (measured) = 15.2 W/kg



0 dB = 15.2 W/kg

### System Check\_Body\_2450MHz\_20160203

#### DUT: D2450V2-SN:908

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

Medium: MSL\_2450\_2016/02/03 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.983$  S/m;  $\epsilon_r = 51.159$ ;

$\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.3 °C ; Liquid Temperature : 22.3 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(7.34, 7.34, 7.34); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 20.0 W/kg

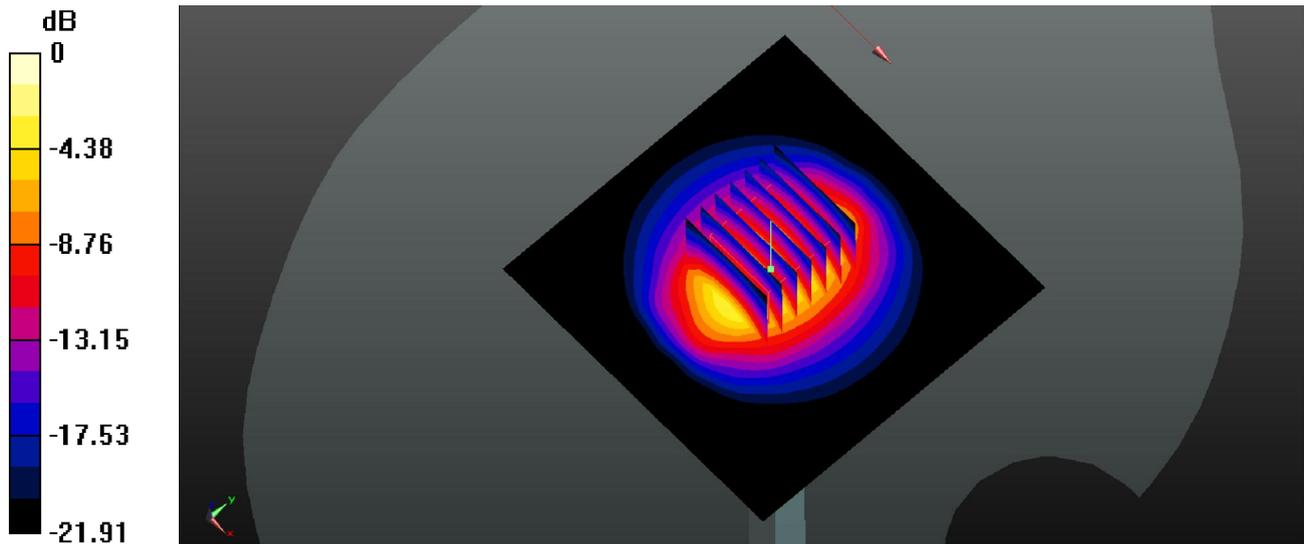
**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 85.15 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 26.8 W/kg

**SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.02 W/kg**

Maximum value of SAR (measured) = 20.1 W/kg



0 dB = 20.1 W/kg



**Appendix B. Plots of High SAR Measurement**

The plots are shown as follows.

**01\_LTE Band 12\_10M\_QPSK\_1RB\_49offset\_Front\_10mm\_Ch23095**

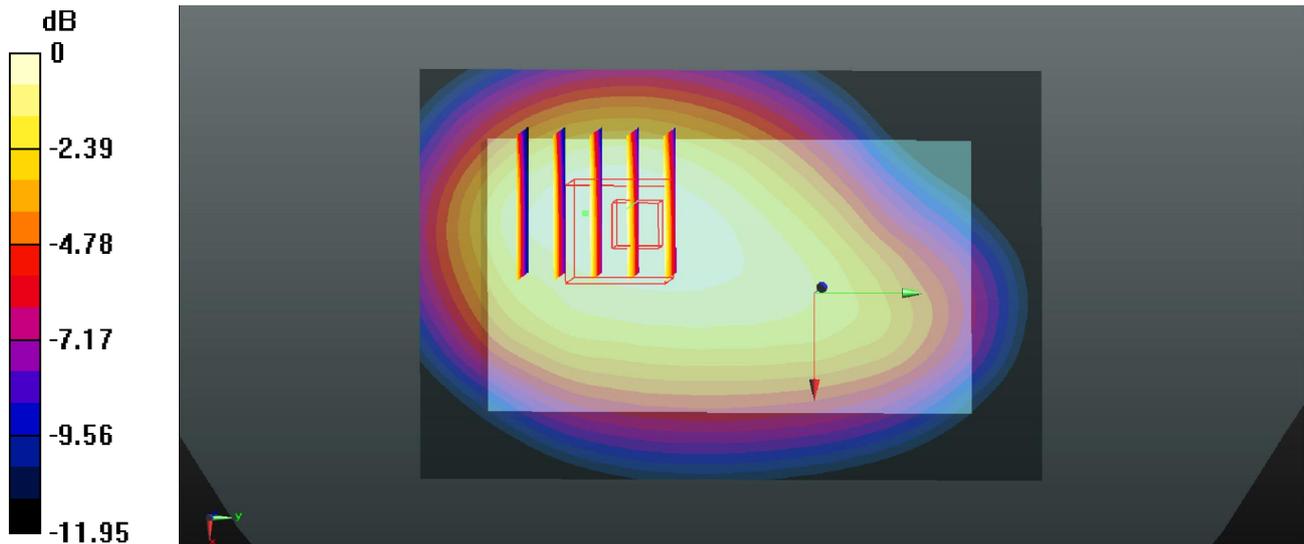
Communication System: UID 0, FDD-LTE (0); Frequency: 707.5 MHz; Duty Cycle: 1:1  
 Medium: MSL\_750\_2016/01/29 Medium parameters used:  $f = 707.5 \text{ MHz}$ ;  $\sigma = 0.918 \text{ S/m}$ ;  $\epsilon_r = 56.004$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Ambient Temperature :  $23.4 \text{ }^\circ\text{C}$ ; Liquid Temperature :  $22.3 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(10.08, 10.08, 10.08); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch23095/Area Scan (61x91x1):** Interpolated grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) =  $0.934 \text{ W/kg}$

**Ch23095/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value =  $27.83 \text{ V/m}$ ; Power Drift =  $0.02 \text{ dB}$   
 Peak SAR (extrapolated) =  $1.07 \text{ W/kg}$   
**SAR(1 g) =  $0.772 \text{ W/kg}$ ; SAR(10 g) =  $0.550 \text{ W/kg}$**   
 Maximum value of SAR (measured) =  $0.924 \text{ W/kg}$



0 dB =  $0.924 \text{ W/kg}$

### 02\_LTE Band 13\_10M\_QPSK\_1RB\_49offset\_Front\_10mm\_Ch23230

Communication System: UID 0, FDD-LTE (0); Frequency: 782 MHz; Duty Cycle: 1:1

Medium: MSL\_750\_2016/01/29 Medium parameters used:  $f = 782 \text{ MHz}$ ;  $\sigma = 0.982 \text{ S/m}$ ;  $\epsilon_r = 55.281$ ;

$\rho = 1000 \text{ kg/m}^3$

Ambient Temperature :  $23.4 \text{ }^\circ\text{C}$ ; Liquid Temperature :  $22.3 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(10.08, 10.08, 10.08); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch23230/Area Scan (61x91x1):** Interpolated grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) =  $1.03 \text{ W/kg}$

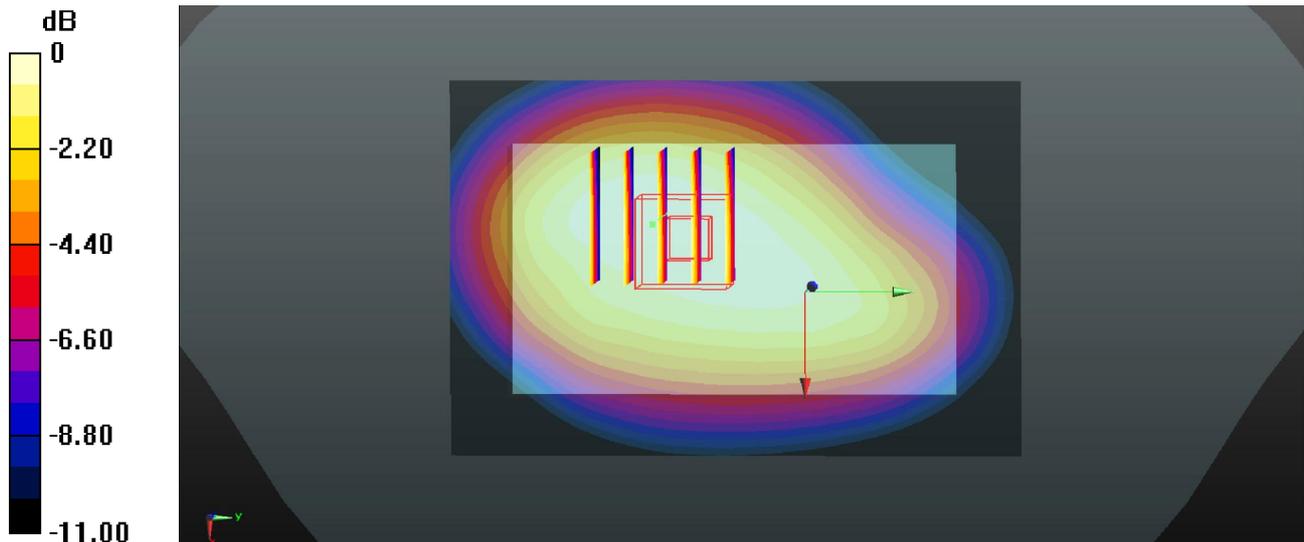
**Ch23230/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $29.73 \text{ V/m}$ ; Power Drift =  $0.02 \text{ dB}$

Peak SAR (extrapolated) =  $1.14 \text{ W/kg}$

**SAR(1 g) =  $0.856 \text{ W/kg}$ ; SAR(10 g) =  $0.628 \text{ W/kg}$**

Maximum value of SAR (measured) =  $1.01 \text{ W/kg}$



0 dB =  $1.01 \text{ W/kg}$

### 03\_LTE Band 5\_10M\_QPSK\_1RB\_49offset\_Front\_10mm\_Ch20525

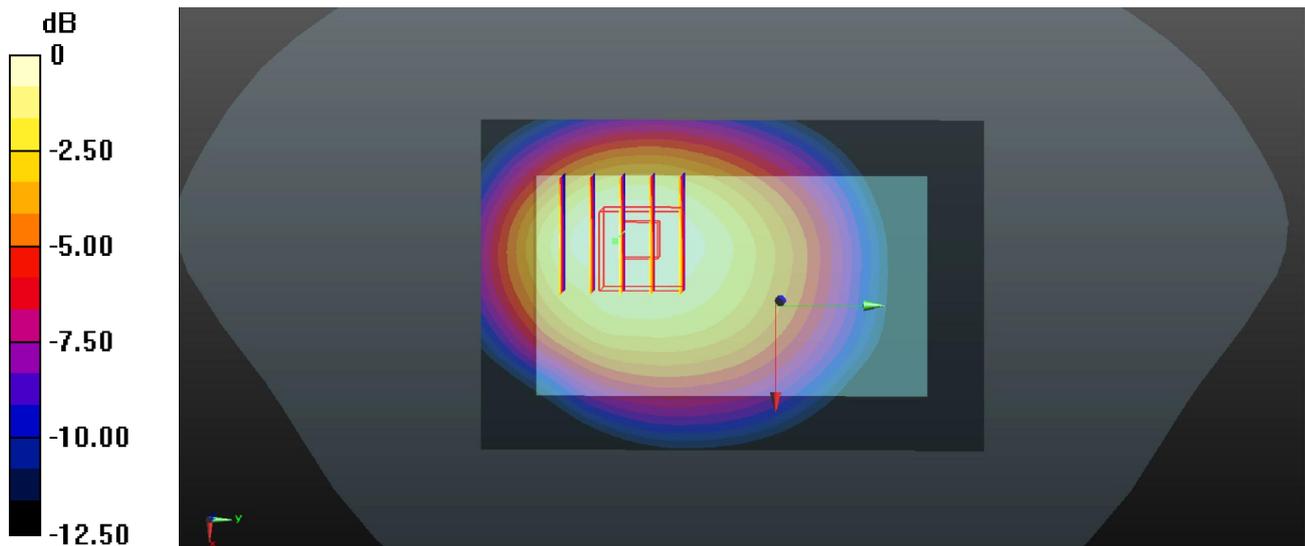
Communication System: UID 0, FDD-LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1  
Medium: MSL\_835\_2016/01/29 Medium parameters used:  $f = 836.5$  MHz;  $\sigma = 0.99$  S/m;  $\epsilon_r = 53.161$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.2 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(9.8, 9.8, 9.8); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20525/Area Scan (61x91x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.549 W/kg

**Ch20525/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 17.30 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 0.624 W/kg  
**SAR(1 g) = 0.431 W/kg; SAR(10 g) = 0.301 W/kg**  
Maximum value of SAR (measured) = 0.529 W/kg



0 dB = 0.529 W/kg

**04\_LTE Band 4\_20M\_QPSK\_1RB\_0offset\_Front\_10mm\_Ch20175**

Communication System: UID 0, FDD-LTE (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1  
 Medium: MSL\_1750\_2016/01/29 Medium parameters used:  $f = 1732.5$  MHz;  $\sigma = 1.497$  S/m;  $\epsilon_r = 52.018$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

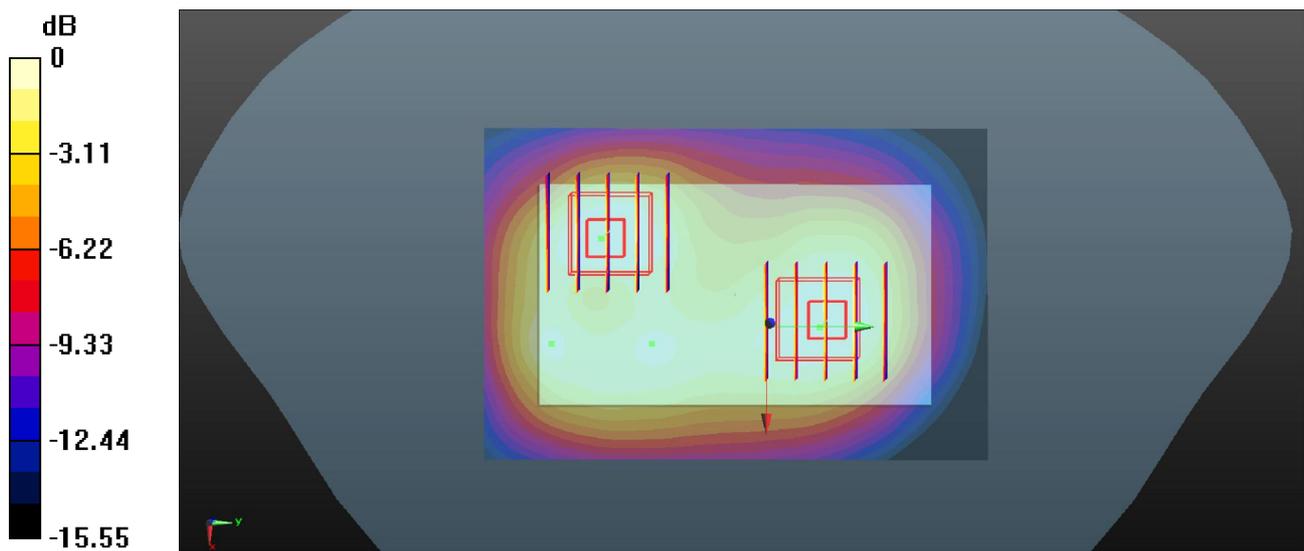
DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(8.01, 8.01, 8.01); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20175/Area Scan (61x91x1):** Interpolated grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 1.63 W/kg

**Ch20175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 19.74 V/m; Power Drift = -0.10 dB  
 Peak SAR (extrapolated) = 2.04 W/kg  
**SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.654 W/kg**  
 Maximum value of SAR (measured) = 1.64 W/kg

**Ch20175/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 19.74 V/m; Power Drift = -0.10 dB  
 Peak SAR (extrapolated) = 1.46 W/kg  
**SAR(1 g) = 0.988 W/kg; SAR(10 g) = 0.628 W/kg**  
 Maximum value of SAR (measured) = 1.25 W/kg



0 dB = 1.25 W/kg

**05\_LTE Band 2\_20M\_QPSK\_1RB\_0offset\_Front\_10mm\_Ch18700**

Communication System: UID 0, FDD-LTE (0); Frequency: 1860 MHz; Duty Cycle: 1:1  
 Medium: MSL\_1900\_2016/01/29 Medium parameters used:  $f = 1860 \text{ MHz}$ ;  $\sigma = 1.537 \text{ S/m}$ ;  $\epsilon_r = 51.71$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Ambient Temperature :  $23.5 \text{ }^\circ\text{C}$ ; Liquid Temperature :  $22.1 \text{ }^\circ\text{C}$

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3911; ConvF(7.75, 7.75, 7.75); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch18700/Area Scan (61x91x1):** Interpolated grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) =  $1.33 \text{ W/kg}$

**Ch18700/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $11.50 \text{ V/m}$ ; Power Drift =  $-0.12 \text{ dB}$

Peak SAR (extrapolated) =  $1.66 \text{ W/kg}$

**SAR(1 g) =  $1 \text{ W/kg}$ ; SAR(10 g) =  $0.581 \text{ W/kg}$**

Maximum value of SAR (measured) =  $1.32 \text{ W/kg}$

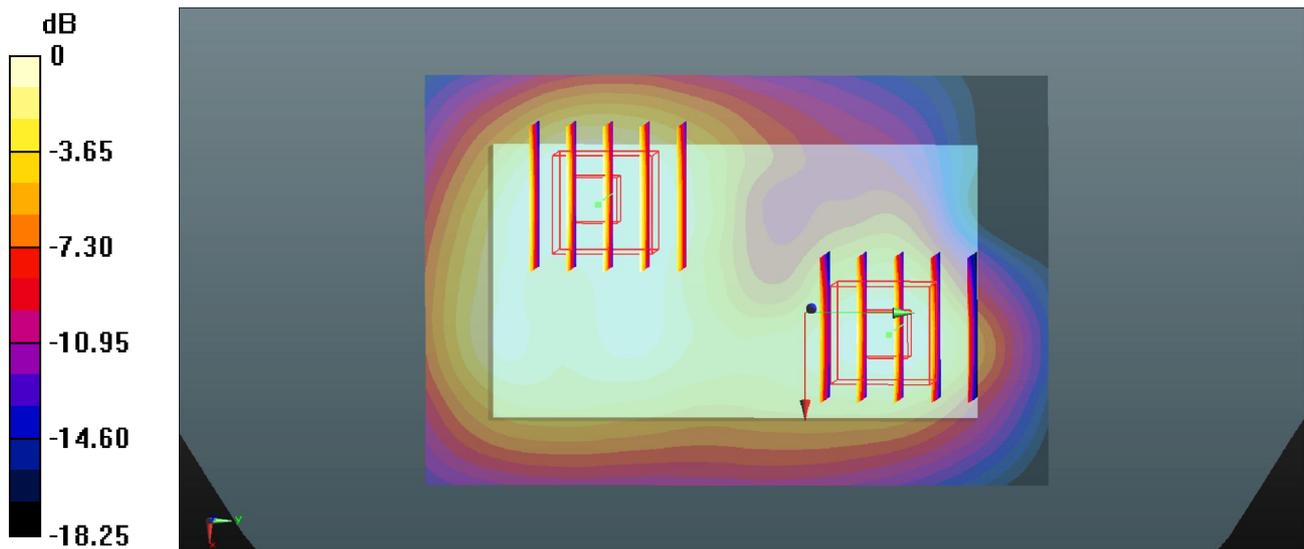
**Ch18700/Zoom Scan (5x5x7)/Cube 1:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $11.50 \text{ V/m}$ ; Power Drift =  $-0.12 \text{ dB}$

Peak SAR (extrapolated) =  $1.16 \text{ W/kg}$

**SAR(1 g) =  $0.705 \text{ W/kg}$ ; SAR(10 g) =  $0.392 \text{ W/kg}$**

Maximum value of SAR (measured) =  $0.951 \text{ W/kg}$



0 dB =  $0.951 \text{ W/kg}$

### 06\_WLAN2.4GHz\_802.11b 1Mbps\_Right side\_10mm\_Ch11

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: MSL\_2450\_2016/02/03 Medium parameters used:  $f = 2462$  MHz;  $\sigma = 2$  S/m;  $\epsilon_r = 51.115$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.3 °C ; Liquid Temperature : 22.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(7.34, 7.34, 7.34); Calibrated: 2015/10/1;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1358; Calibrated: 2015/8/27
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch11/Area Scan (31x71x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.193 W/kg

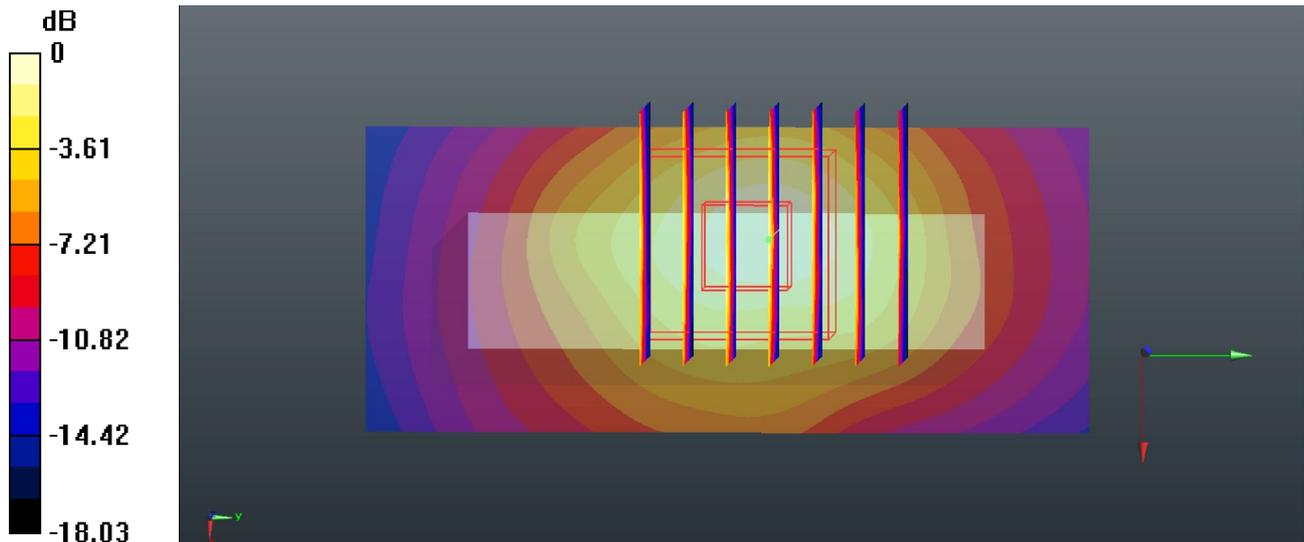
**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.845 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.246 W/kg

**SAR(1 g) = 0.116 W/kg; SAR(10 g) = 0.058 W/kg**

Maximum value of SAR (measured) = 0.194 W/kg



0 dB = 0.194 W/kg



**Appendix C. DASYS Calibration Certificate**

The DASYS calibration certificates are shown as follows.