

FCC

SAR

TEST REPORT

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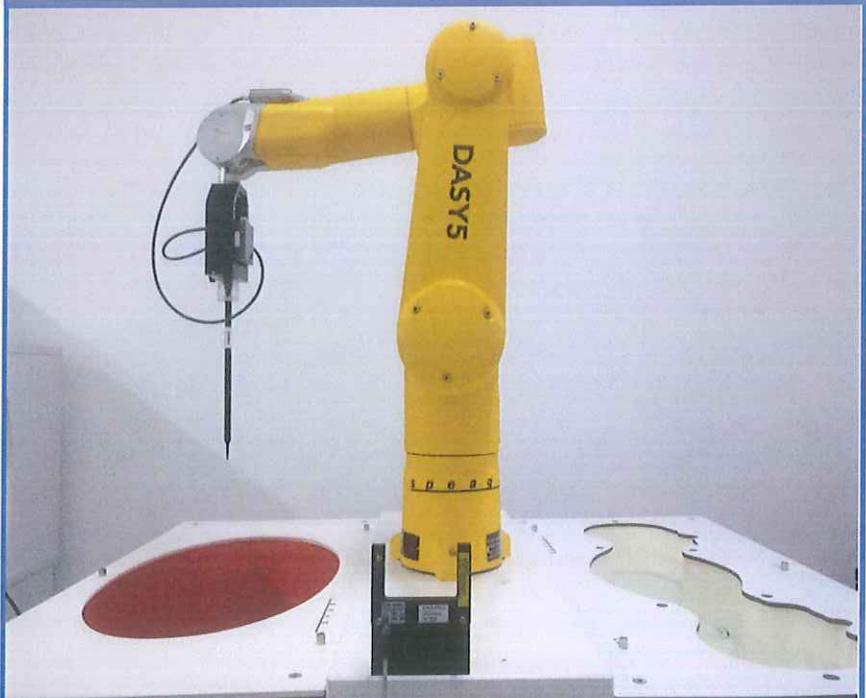
FOR

Single Stream 802.11a/b/g/n/ac + BT 4.1 M.2

Type Card

ISSUED TO  
Qualcomm Atheros, Inc.

1700 Technology Drive, San Jose, CA 95110



Tested by: Zong Liyao

Zong Liyao

(Engineer)

Date: Aug. 16, 2017

Approved by: Wei Yanquan

Wei Yanquan

(Chief Engineer)

Date: Aug. 16, 2017

Report No.: BL-SZ1760285-701

EUT Name: Single Stream 802.11a/b/g/n/ac +  
BT 4.1 M.2 Type Card

Model Name: QCNFA435

Brand Name: Qualcomm Atheros

FCC ID: PPD-QCNFA435

Test Standard: FCC 47 CFR Part 2.1093

ANSI C95.1: 1999, IEEE 1528: 2013

Maximum SAR: Body 2.4GHz (1 g): 1.138 W/kg

Body 5GHz (1 g): 1.182 W/kg

Test Conclusion: Pass

Test Date: Jun. 27, 2017 ~ Jun. 28, 2017

Date of Issue: Aug. 16, 2017

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## Revision History

| Version        | Issue Date           | Revisions Content  |
|----------------|----------------------|--|
| <u>Rev. 01</u> | <u>Jul. 10, 2017</u> | <u>Initial Issue</u>   |
| <u>Rev. 02</u> | <u>Jul. 25, 2017</u> | <u>Added 2.4GHz Maximum SAR Value in Cover page.</u><br><u>Updated Product Description in page 6.</u>  |
| <u>Rev. 03</u> | <u>Jul. 27, 2017</u> | <u>Updated tune up power and recalculated the Scaled SAR Values.</u>   |
| <u>Rev. 04</u> | <u>Aug. 16, 2017</u> | <u>Updated 802.11n (HT20) channel 11 tune up limit in section 8.</u><br><u>Updated 802.11ac (VHT40) channel 54 and 62 tune up limit in section 8.</u><br><u>Updated 802.11 n (HT40) and ac (VHT40) channel 102 tune up limit in section 8.</u> |

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## 1 GENERAL INFORMATION

### 1.1 Identification of the Testing Laboratory

|              |   |
|--------------|---|
| Company Name | Shenzhen BALUN Technology Co.,Ltd.  |
| Address      | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Phone Number | +86 755 6685 0100   |
| Fax Number   | +86 755 6182 4271   |

### 1.2 Identification of the Responsible Testing Location

|                           |  |
|---------------------------|--|
| Test Location             | Shenzhen BALUN Technology Co.,Ltd.   |
| Address                   | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China  |
| Accreditation Certificate | <p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements.</p> <p>The recognition numbers of test site are 832625.</p> <p>The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.</p> |
| Description               | All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055  |

### 1.3 Test Environment Condition

|                           |               |
|---------------------------|---------------|
| Ambient Temperature       | 21 to 23°C    |
| Ambient Relative Humidity | 37 to 48%     |
| Ambient Pressure          | 100 to 102KPa |

## 1.4 Announce

- (1) The test report reference to the report template version v2.2.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

## 2 PRODUCT INFORMATION

### 2.1 Applicant

|           |   |
|-----------|---|
| Applicant | Qualcomm Atheros, Inc.                    |
| Address   | 1700 Technology Drive, San Jose, CA 95110 |

### 2.2 Manufacturer

|              |   |
|--------------|---|
| Manufacturer | Qualcomm Atheros, Inc.                    |
| Address      | 1700 Technology Drive, San Jose, CA 95110 |

### 2.3 Factory Information

|         |     |
|---------|-----|
| Factory | N/A |
| Address | N/A |

### 2.4 General Description for Equipment under Test (EUT)

|   |   |
|---|---|
| EUT Name                                  | Single Stream 802.11a/b/g/n/ac + BT 4.1 M.2 Type Card                                   |
| Model Name Under Test                     | QCNFA435  |
| Series Model Name                         | N/A   |
| Description of Model Name Differentiation | N/A   |
| Hardware Version                          | N/A   |
| Software Version                          | N/A   |
| Dimensions (Approx.)                      | N/A   |
| Weight (Approx.)                          | N/A   |
| Network and Wireless connectivity         | WIFI 802.11a, 802.11b, 802.11g, 802.11n(HT20/40),<br>802.11ac(HT20/40/80);<br>Bluetooth |

#### 2.4.1 Host Information:

|                     |                             |
|---------------------|-----------------------------|
| Product Description | Notebook / Tablet Computer  |
| Model Name          | Lenovo YOGA 720-12IKB, 81B5 |
| brand               | Lenovo                      |

#### 2.4.2 Antenna Information:

| Antenna Port  | Antenna Manufacturer | Antenna Type | Antenna Gain (dBi) |               |                |                 |
|---|----------------------|--------------|--------------------|---------------|----------------|-----------------|
|   |                      |              | 2.4~2.4835 GHz     | 5.15~5.35 GHz | 5.47~5.725 GHz | 5.725~5.850 GHz |
| Main Antenna  | South Star           | PIFA         | 1.22               | 1.31          | 1.25           | 1.29            |
| Auxiliary Antenna   |                      | PIFA         | 0.94               | 0.74          | 1.12           | 0.65            |
| Note: The Main Antenna supports TX/RX function, and the Auxiliary Antenna only support RX function. |                      |              |                    |               |                |                 |

#### 2.5 Ancillary Equipment

|  |                      |               |
|--|----------------------|---------------|
| Ancillary Equipment 1  | Battery1             |               |
|  | Battery Name         | LG CHEM, LTD. |
|  | Brand Name           | Lenovo        |
|  | Model No.            | L17L3P61      |
|  | Serial No.           | N/A           |
|  | Capacitance          | 36Wh          |
|  | Rated Voltage        | 11.58 V       |
|  | Limit Charge Voltage | N/A           |
| Ancillary Equipment 2  | Battery2             |               |
|  | Battery Name         | CELXPERT      |
|  | Brand Name           | Lenovo        |
|  | Model No.            | L17C3P61      |
|  | Serial No.           | N/A           |
|  | Capacitance          | 36Wh          |
|  | Rated Voltage        | 11.52 V       |
|  | Limit Charge Voltage | N/A           |
| Ancillary Equipment 3  | Battery3             |               |
|  | Battery Name         | Simplo        |
|  | Brand Name           | Lenovo        |
|  | Model No.            | L17M3P61      |
|  | Serial No.           | N/A           |
|  | Capacitance          | 36Wh          |
|  | Rated Voltage        | 11.52 V       |
|  | Limit Charge Voltage | N/A           |
| Note: This device has three kinds of batteries, RF exposure chose battery1 to evaluate full SAR test, battery2 and battery3 verified the worse cases of battery 1. |                      |               |

## 2.6 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

|                   |   |  |
|-------------------|---|--|
| Operating Mode    | 2.4G WLAN, 5G WLAN, Bluetooth                       |  |
| Frequency Range   | 802.11b/g/n(HT20/HT40)                              | 2400 MHz ~ 2483.5 MHz                        |
|                   | 802.11a/n(HT20/HT40)                                | 5150 MHz ~ 5250 MHz                          |
|                   | /ac(HT20/HT40/HT80)                                 | 5250 MHz ~ 5350 MHz                          |
|                   |   | 5470 MHz ~ 5725 MHz                          |
|                   |   | 5725 MHz ~ 5850 MHz                          |
| Bluetooth         | 2400 MHz ~ 2483.5 MHz                               |  |
| Antenna Type      | WLAN: PIFA Antenna<br>Bluetooth: PIFA Antenna       |  |
| Hotspot Function  | N/A   |  |
| Power Reduction   | Not Support   |  |
| Exposure Category | General Population/Uncontrolled exposure            |  |
| EUT Stage         | Portable Device                                     |  |
| Product           | Type  |  |
|                   | <input checked="" type="checkbox"/> Production unit | <input type="checkbox"/> Identical prototype |

### 3 SUMMARY OF TEST RESULT

#### 3.1 Test Standards

| No. | Identity                  | Document Title  |
|-----|---------------------------|---|
| 1   | 47 CFR Part 2             | Frequency Allocations and Radio Treaty Matters; General Rules and Regulations   |
| 2   | ANSI/IEEE Std. C95.1-1999 | IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz  |
| 3   | IEEE Std. 1528-2013       | Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques |
| 4   | FCC KDB 447498 D01 v06    | Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies  |
| 5   | FCC KDB 865664 D01 v01r04 | SAR Measurement 100 MHz to 6 GHz  |
| 6   | FCC KDB 865664 D02 v01r02 | RF Exposure Reporting   |
| 7   | KDB 248227 D01 v02r02     | SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters   |
| 8   | KDB 616217 D04v01r02      | SAR for laptop and tablets  |

### 3.2 Device Category and SAR Limit

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user.

Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

Table of Exposure Limits:

| Body Position   | SAR Value (W/Kg)                             |                                      |
|---|--|--------------------------------------|
|   | General Population/<br>Uncontrolled Exposure | Occupational/<br>Controlled Exposure |
| Whole-Body SAR<br>(averaged over the entire body)                                   | 0.08   | 0.4                                  |
| Partial-Body SAR<br>(averaged over any 1 gram of tissue)                            | 1.60   | 8.0                                  |
| SAR for hands, wrists, feet and<br>ankles<br>(averaged over any 10 grams of tissue) | 4.0  | 20.0                                 |

NOTE:

**General Population/Uncontrolled Exposure:** Locations where there is the exposure of individuals who have no knowledge or control of their exposure. 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.

**Occupational/Controlled Exposure:** Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure. 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. This 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.

### 3.3 Test Result Summary

#### 3.3.1 Highest SAR (1 g Value)

| Band         | Antenna      | Maximum Scaled SAR<br>(W/kg) | Maximum Report SAR<br>(W/kg) |  |
|--------------|--------------|------------------------------|------------------------------|--|
|              |              | Body (0mm)                   | Body (0mm)                   |  |
| 2.4G WLAN    | Main Antenna | 1.138                        | 1.182                        |  |
| 5.3G WLAN    | Main Antenna | <b>1.182</b>                 |                              |  |
| 5.6G WLAN    | Main Antenna | 1.094                        |                              |  |
| 5.8G WLAN    | Main Antenna | 1.091                        |                              |  |
| Limit (W/kg) |              | 1.60                         |                              |  |
| Verdict      |              | Pass                         |                              |  |

#### 3.3.2 Highest Simultaneous SAR

| Position | Simultaneous Configuration                          | Simultaneous SAR<br>(W/kg) | Limit<br>(W/kg) | Verdict |
|----------|---|----------------------------|-----------------|---------|
| Body     | 5 WLAN (Main Antenna) +<br>Bluetooth (Main Antenna) | 1.349                      | 1.6             | Pass    |

### 3.4 Test Uncertainty

According to KDB 865664 D01, when the highest measured 1 g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis is not required in SAR reports submitted for equipment approval.

The maximum 1 g SAR for the EUT in this report is 1.182 W/kg, which is lower than 1.5 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.

## 4 MEASUREMENT SYSTEM

### 4.1 Specific Absorption Rate (SAR) Definition

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.

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:

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

SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

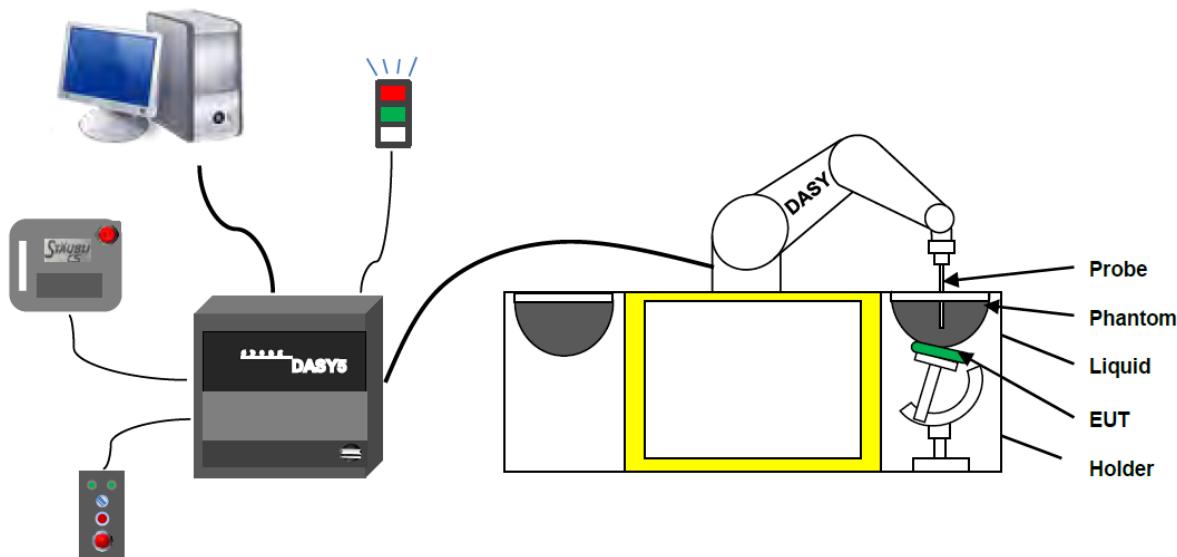
$$\mathbf{SAR} = \frac{\sigma E^2}{\rho}$$

Where:  $\sigma$  is the conductivity of the tissue,

$\rho$  is the mass density of the tissue and  $E$  is the RMS electrical field strength.

## 4.2 DASY SAR System

### 4.2.1 DASY SAR System Diagram



The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

#### 4.2.2 Robot

The Dasy SAR system uses the high precision robots. Symmetrical design with triangular core Built-in optical fiber for surface detection system For the 6-axis controller system, Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents). The robot series have many features that are important for our application:



- High precision  
(repeatability  $\pm 0.02$  mm)
- High reliability  
(industrial design)
- Low maintenance costs  
(virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements  
(brush less synchron motors; no stepper motors)
- Low ELF interference  
(motor control \_elds shielded via the closed metallic construction shields)

#### 4.2.3 E-Field Probe

The probe is specially designed and calibrated for use in liquids with high permittivities for the measurements the Specific Dosimetric E-Field Probe EX3DV4-SN:7340 with following specifications is used.

|               |   |
|---------------|---|
| Construction  | Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycoether) |
| Calibration   | ISO/IEC 17025 calibration service available   |
| Frequency     | 10 MHz to 6 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)  |
| Directivity   | $\pm 0.2$ dB in HSL (rotation around probe axis) ; $\pm 0.4$ dB in HSL (rotation normal to probe axis)  |
| Dynamic range | 5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB  |
| Dimensions    | Overall length: 337 mm (Tip: 9 mm) Tip diameter: 2.5 mm (Body: 10 mm) Distance from probe tip to dipole centers: 1.0 mm   |
| Application   | General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (EX3DV4)  |



#### E-Field Probe Calibration Process

Probe calibration is realized, in compliance with CENELEC EN 62209-1/-2 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 62209-1/2 annexe technique using reference guide at the five frequencies.

#### 4.2.4 Data Acquisition Electronics

The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a 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.



- Input Impedance: 200MOhm
- The Inputs: Symmetrical and Floating
- Common Mode Rejection: Above 80dB

#### 4.2.5 Phantoms

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.



- Left hand
- Right hand
- Flat phantom

**Photo of Phantom SN1857**



| Serial Number      | Material                           | Length | Height |
|--------------------|------------------------------------|--------|--------|
| <b>SN 1857 SAM</b> | Vinylester, glass fiber reinforced | 1000   | 500    |

Phantom 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 the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points.

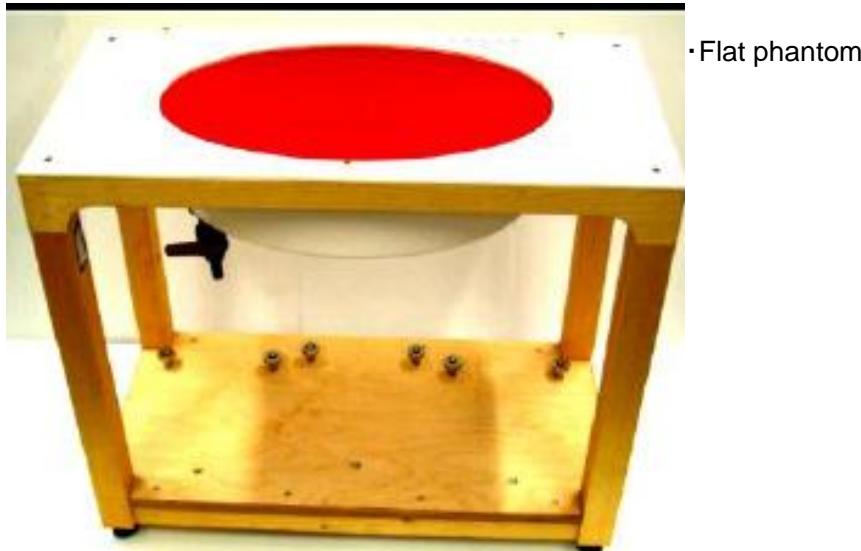


Photo of Phantom SN1012



| Serial Number | Shell Thickness (mm) | Major ellipse axis (mm) | Minor axis ( mm ) |
|---------------|----------------------|-------------------------|-------------------|
| SN 1012 ELI4  | 2.0 ± 0.2            | 600                     | 500               |

#### 4.2.6 Device Holder

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. 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. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used. Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values. Therefore those devices are normally only tested at the flat part of the SAM.



The positioning system allows obtaining cheek and tilting position with a very good accuracy. Incompliance with CENELEC, the tilt angle uncertainty is lower than 1°.

#### 4.2.7 Simulating Liquid

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5%.



The following table gives the recipes for tissue simulating liquid and the theoretical Conductivity/Permittivity.

| Head (Reference IEEE1528)           |           |                    |               |          |                  |          |                             |                         |
|-------------------------------------|-----------|--------------------|---------------|----------|------------------|----------|-----------------------------|-------------------------|
| Frequency (MHz)                     | Water (%) | Sugar (%)          | Cellulose (%) | Salt (%) | Preventol (%)    | DGBE (%) | Conductivity $\sigma$ (S/m) | Permittivity $\epsilon$ |
| 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                    |
| 900                                 | 40.3      | 57.9               | 0.2           | 1.4      | 0.2              | 0        | 0.97                        | 41.5                    |
| 1800, 1900, 2000                    | 55.2      | 0                  | 0             | 0.3      | 0                | 44.5     | 1.4                         | 40.0                    |
| 2450                                | 55.0      | 0                  | 0             | 0.1      | 0                | 44.9     | 1.80                        | 39.2                    |
| 2600                                | 54.9      | 0                  | 0             | 0.1      | 0                | 45.0     | 1.96                        | 39.0                    |
| Frequency (MHz)                     | Water (%) | Hexyl Carbitol (%) |               |          | Triton X-100 (%) |          | Conductivity $\sigma$ (S/m) | Permittivity $\epsilon$ |
| 5200                                | 62.52     | 17.24              |               |          | 17.24            |          | 4.66                        | 36.0                    |
| 5800                                | 62.52     | 17.24              |               |          | 17.24            |          | 5.27                        | 35.3                    |
| Body (From instrument manufacturer) |           |                    |               |          |                  |          |                             |                         |
| Frequency (MHz)                     | Water (%) | Sugar (%)          | Cellulose (%) | Salt (%) | Preventol (%)    | DGBE (%) | Conductivity $\sigma$ (S/m) | Permittivity $\epsilon$ |
| 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                    |
| 900                                 | 50.8      | 48.2               | 0             | 0.9      | 0.1              | 0        | 1.05                        | 55.0                    |
| 1800, 1900, 2000                    | 70.2      | 0                  | 0             | 0.4      | 0                | 29.4     | 1.52                        | 53.3                    |
| 2450                                | 68.6      | 0                  | 0             | 0.1      | 0                | 31.3     | 1.95                        | 52.7                    |
| 2600                                | 68.2      | 0                  | 0             | 0.1      | 0                | 31.7     | 2.16                        | 52.5                    |
| Frequency(MHz)                      | Water     | DGBE (%)           |               |          | Salt (%)         |          | Conductivity $\sigma$ (S/m) | Permittivity $\epsilon$ |
| 5200                                | 78.60     | 21.40              |               |          | /                |          | 5.54                        | 47.86                   |
| 5800                                | 78.50     | 21.40              |               |          | 0.1              |          | 6.0                         | 48.20                   |

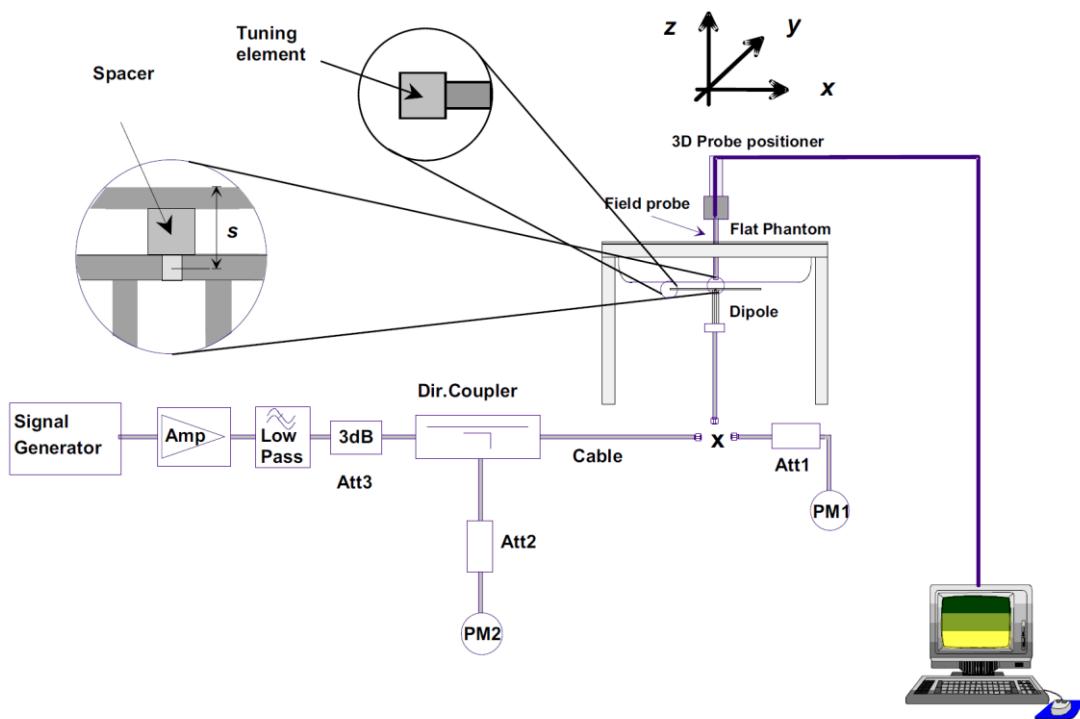
## 5 SYSTEM VERIFICATION

### 5.1 Purpose of System Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

### 5.2 System Check Setup

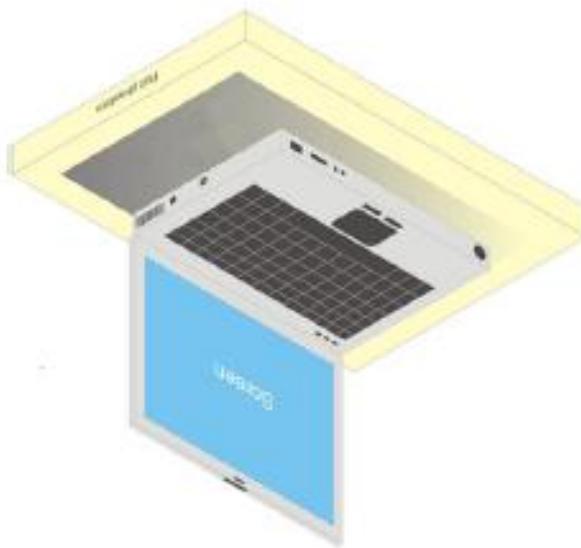
In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



## 6 TEST POSITION CONFIGURATIONS

This DUT was tested in one position which is bottom of laptop touching with phantom 0 mm air gap.

### 6.1 Body Supported Exposure Condition



### 6.2 Tablet Exposure Condition

This DUT was tested in three different positions. They are back side, left edge and top edge in these positions, the surface of DUT is touching with phantom 0mm.

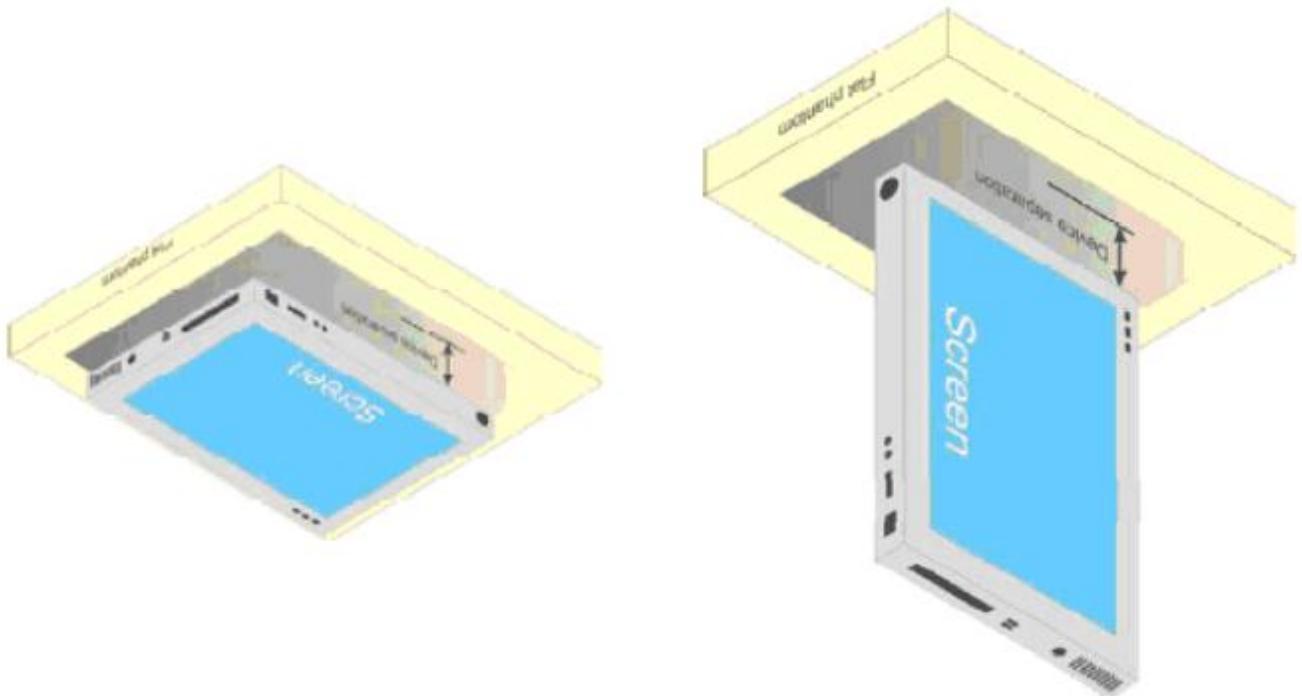
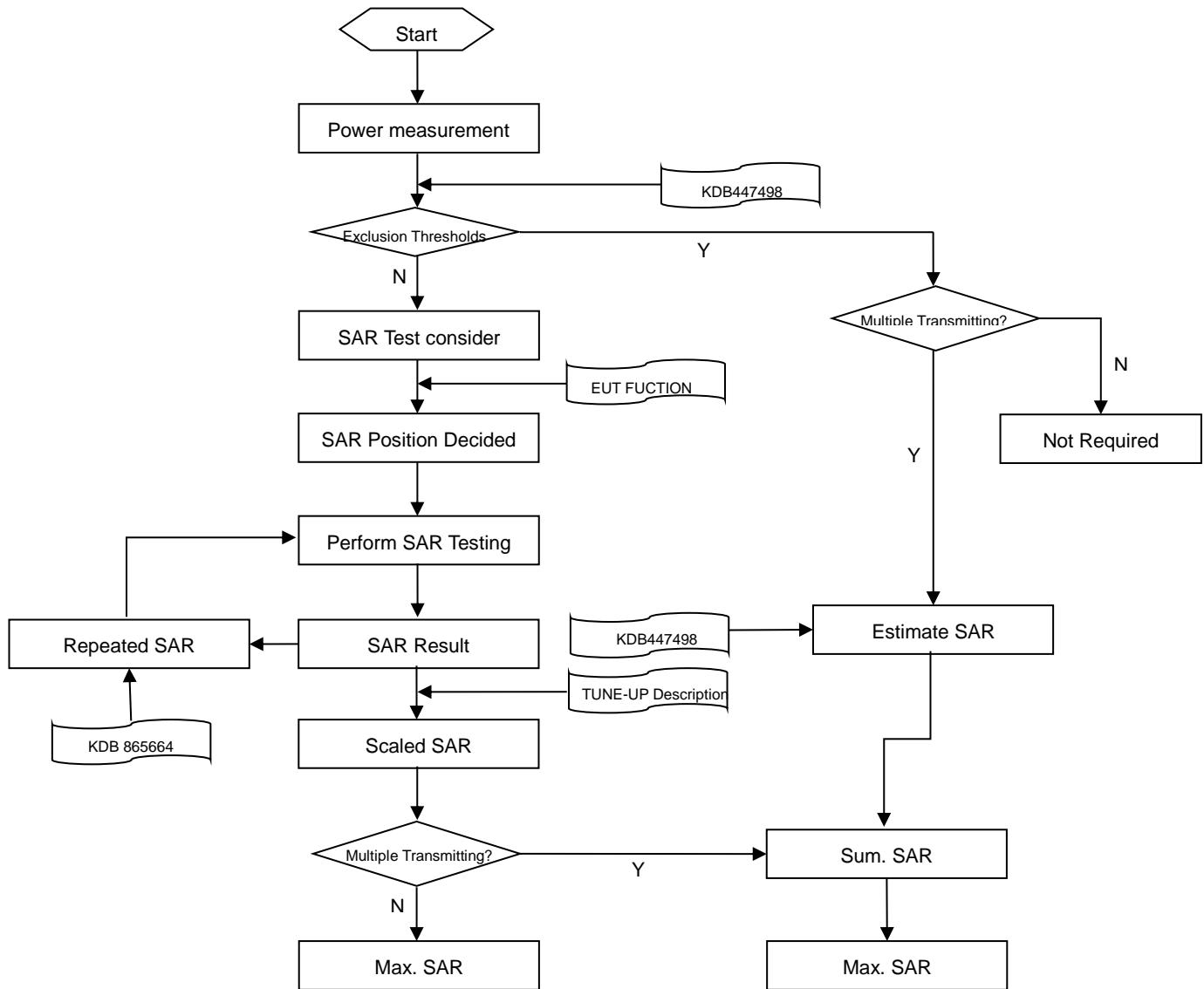


Fig Illustration for Lap-touching Position

## 7 MEASUREMENT PROCEDURE

### 7.1 Measurement Process Diagram



## 7.2 SAR Scan General Requirement

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1 g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013.

|  |  | ≤3GHz   | >3GHz  |  |
|--|--|---|--|--|
| 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  |  | $30^\circ \pm 1^\circ$  | $20^\circ \pm 1^\circ$                             |  |
|  |  | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm  | 3–4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm             |  |
| Maximum area scan spatial resolution: $\Delta x$ Area , $\Delta y$ Area  |  | 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. |  |  |
| Maximum zoom scan spatial resolution: $\Delta x$ Zoom , $\Delta y$ Zoom  |  | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm*   | 3–4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm*             |  |
| Maximum zoom scan spatial resolution, normal to phantom surface  | uniform grid: $\Delta z$ Zoom (n)                | ≤ 5 mm  | 3–4 GHz: ≤ 4 mm                                    |  |
|  |  |   | 4–5 GHz: ≤ 3 mm                                    |  |
|  |  |   | 5–6 GHz: ≤ 2 mm                                    |  |
|  | graded grid                                      | ≤ 4 mm  | 3–4 GHz: ≤ 3 mm                                    |  |
|  |  |   | 4–5 GHz: ≤ 2.5 mm                                  |  |
|  |  |   | 5–6 GHz: ≤ 2 mm                                    |  |
|  | $\Delta z$ Zoom (n>1): between subsequent points | ≤ 1.5 · $\Delta z$ Zoom (n-1)   |  |  |
| Minimum zoom scan volume   | x, y, z  | ≥30 mm  | 3–4 GHz: ≥ 28 mm                                   |  |
|  |  |   | 4–5 GHz: ≥ 25 mm                                   |  |
|  |  |   | 5–6 GHz: ≥ 22 mm                                   |  |
| <p><b>Note:</b></p> <ol style="list-style-type: none"> <li>1. <math>\delta</math> is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.</li> <li>2. * When zoom scan is required and the reported SAR from the area scan based 1 g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</li> </ol> |  |   |  |  |

## 7.3 Measurement Procedure

The following steps are used for each test position

- a. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface
- b. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- c. Measurement of the SAR distribution with a grid of 8 to 16mm \* 8 to 16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
- d. Around this point, a cube of 30 \* 30 \* 30 mm or 32 \* 32 \* 32 mm is assessed by measuring 5 or 8 \* 5 or 8 \* 4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

## 7.4 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.

When the 1 g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

## 8 CONDUCTED RF OUTPUT POWER

The Main Antenna supports TX/RX function, and the Auxiliary Antenna only supports RX function. So all frequency bands and modulations test chain main in this report.

### 8.1 WIFI

#### 8.1.1 2.4G WIFI

| Band (GHz)          | Mode          | Channel | Freq. (MHz) | Avg. Power (dBm) | Tune-up Power Limit (dBm) | SAR Test Require. |
|---------------------|---------------|---------|-------------|------------------|---------------------------|-------------------|
| 2.4<br>(2.4~2.4835) | 802.11b       | 1       | 2412        | 19.70            | 20.00                     | Yes               |
|                     |               | 6       | 2437        | <b>19.85</b>     |                           | Yes               |
|                     |               | 11      | 2462        | 19.22            |                           | Yes               |
|                     | 802.11g       | 1       | 2412        | 16.49            | 17.50                     | No                |
|                     |               | 6       | 2437        | 19.33            | 19.50                     | No                |
|                     |               | 11      | 2462        | 15.62            | 18.00                     | No                |
|                     | 802.11n(HT20) | 1       | 2412        | 16.11            | 17.50                     | No                |
|                     |               | 6       | 2437        | 19.31            | 19.50                     | No                |
|                     |               | 11      | 2462        | 15.40            | 16.00                     | No                |
|                     | 802.11n(HT40) | 3       | 2422        | 15.25            | 16.50                     | No                |
|                     |               | 6       | 2437        | 18.28            | 18.50                     | No                |
|                     |               | 9       | 2452        | 13.14            | 15.00                     | No                |

### 8.1.2 5G WIFI

| Band (GHz)          | Mode            | Channel | Freq. (MHz) | Avg. Power (dBm) | Tune-up Power Limit (dBm) | SAR Test Require. |
|---------------------|-----------------|---------|-------------|------------------|---------------------------|-------------------|
| 5.2<br>(5.15~5.25)  | 802.11a         | 36      | 5180        | 12.73            | 13.00                     | No                |
|                     |                 | 40      | 5200        | 12.86            |                           | No                |
|                     |                 | 48      | 5240        | 13.05            | 13.50                     | No                |
|                     | 802.11n(HT20)   | 36      | 5180        | 13.01            | 13.50                     | No                |
|                     |                 | 40      | 5200        | 13.05            |                           | No                |
|                     |                 | 48      | 5240        | 12.83            |                           | No                |
|                     | 802.11n(HT40)   | 38      | 5190        | 12.63            | 13.00                     | No                |
|                     |                 | 46      | 5230        | 12.52            |                           | No                |
|                     | 802.11ac(VHT20) | 36      | 5180        | 12.38            | 13.00                     | No                |
|                     |                 | 40      | 5200        | 12.97            |                           | No                |
|                     |                 | 48      | 5240        | 13.03            | 13.50                     | No                |
|                     | 802.11ac(VHT40) | 38      | 5190        | 12.73            | 13.00                     | No                |
|                     |                 | 46      | 5230        | 12.68            |                           | No                |
|                     | 802.11ac(VHT80) | 42      | 5210        | 13.16            | 13.50                     | No                |
| 5.3<br>(5.25~5.35)  | 802.11a         | 52      | 5260        | 13.16            | 13.50                     | Yes               |
|                     |                 | 60      | 5300        | <b>13.18</b>     |                           | Yes               |
|                     |                 | 64      | 5320        | 12.70            | 13.00                     | Yes               |
|                     | 802.11n(HT20)   | 52      | 5260        | 13.01            | 13.50                     | No                |
|                     |                 | 60      | 5300        | 13.03            |                           | No                |
|                     |                 | 64      | 5320        | 12.93            |                           | No                |
|                     | 802.11n(HT40)   | 54      | 5270        | 12.47            | 13.00                     | No                |
|                     |                 | 62      | 5310        | 12.79            |                           | No                |
|                     | 802.11ac(VHT20) | 52      | 5260        | 12.62            | 13.00                     | No                |
|                     |                 | 60      | 5300        | 13.13            | 13.50                     | No                |
|                     |                 | 64      | 5320        | 13.09            |                           | No                |
|                     | 802.11ac(VHT40) | 54      | 5270        | 12.34            | 13.00                     | No                |
|                     |                 | 62      | 5310        | 12.50            |                           | No                |
|                     | 802.11ac(VHT80) | 58      | 5290        | 11.01            | 12.00                     | No                |
| 5.6<br>(5.47~5.725) | 802.11a         | 100     | 5500        | 10.61            | 12.00                     | Yes               |
|                     |                 | 116     | 5580        | <b>12.56</b>     | 13.00                     | Yes               |
|                     |                 | 140     | 5700        | 12.46            |                           | Yes               |
|                     | 802.11n(HT20)   | 100     | 5500        | 11.25            | 12.00                     | No                |
|                     |                 | 116     | 5580        | 11.16            |                           | No                |
|                     |                 | 140     | 5700        | 11.74            |                           | No                |
|                     | 802.11n(HT40)   | 102     | 5510        | 10.48            | 11.00                     | No                |
|                     |                 | 134     | 5670        | 12.37            | 12.50                     | No                |
|                     | 802.11ac(VHT20) | 100     | 5500        | 10.14            | 12.00                     | No                |
|                     |                 | 116     | 5580        | 10.97            |                           | No                |
|                     |                 | 140     | 5700        | 11.75            |                           | No                |
|                     | 802.11ac(VHT40) | 102     | 5510        | 10.41            | 11.00                     | No                |
|                     |                 | 134     | 5670        | 12.27            | 12.50                     | No                |
|                     | 802.11ac(VHT80) | 106     | 5530        | 10.17            | 11.50                     | No                |

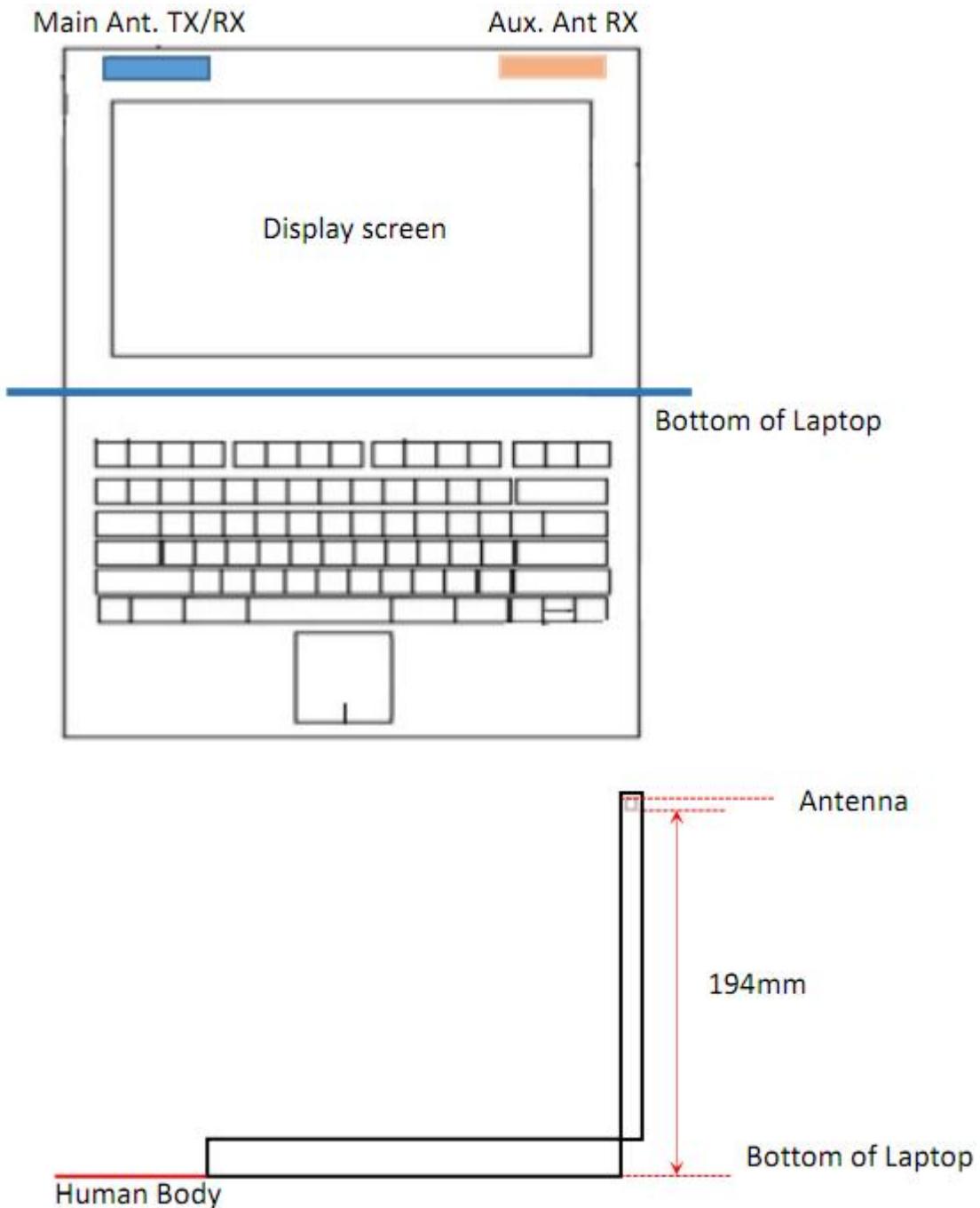
|                      |                 |     |      |              |              |     |
|----------------------|-----------------|-----|------|--------------|--------------|-----|
| 5.8<br>(5.725~5.850) | 802.11a         | 149 | 5745 | 12.60        | 13.00        | No  |
|                      |                 | 157 | 5785 | 12.06        | 12.50        | No  |
|                      |                 | 165 | 5825 | 11.40        |              | No  |
|                      | 802.11n(HT20)   | 149 | 5745 | 12.19        | 13.00        | No  |
|                      |                 | 157 | 5785 | 12.78        |              | No  |
|                      |                 | 165 | 5825 | 11.72        |              | No  |
|                      | 802.11n(HT40)   | 151 | 5755 | 12.23        | 13.00        | No  |
|                      |                 | 159 | 5795 | 12.54        |              | No  |
|                      | 802.11ac(VHT20) | 149 | 5745 | 12.34        | 13.00        | No  |
|                      |                 | 157 | 5785 | 12.84        |              | No  |
|                      |                 | 165 | 5825 | 11.56        | 12.00        | No  |
|                      | 802.11ac(VHT40) | 151 | 5755 | 12.23        | 12.50        | No  |
|                      |                 | 159 | 5795 | 12.38        |              | No  |
|                      | 802.11ac(VHT80) | 155 | 5775 | <b>12.96</b> | <b>13.00</b> | Yes |

## 8.2 Bluetooth

| Mode                      | GFSK   |             |      | $\pi/4$ -DQPSK |       |       |
|---------------------------|--------|-------------|------|----------------|-------|-------|
| Channel                   | 0      | 39          | 78   | 0              | 39    | 78    |
| Frequency (MHz)           | 2402   | 2441        | 2480 | 2402           | 2441  | 2480  |
| Avg. Power (dBm)          | 2.54   | <b>3.28</b> | 2.75 | 1.67           | 2.34  | 2.28  |
| Tune-up Power Limit (dBm) | 6.0    |             |      | 6.0            |       |       |
| Mode                      | 8-DPSK |             |      | BLE            |       |       |
| Channel                   | 0      | 39          | 78   | 0              | 19    | 39    |
| Frequency (MHz)           | 2402   | 2441        | 2480 | 2402           | 2440  | 2480  |
| Avg. Power (dBm)          | 0.67   | 1.21        | 1.41 | -1.93          | -1.41 | -1.13 |
| Tune-up Power Limit (dBm) | 6.0    |             |      | 6.0            |       |       |

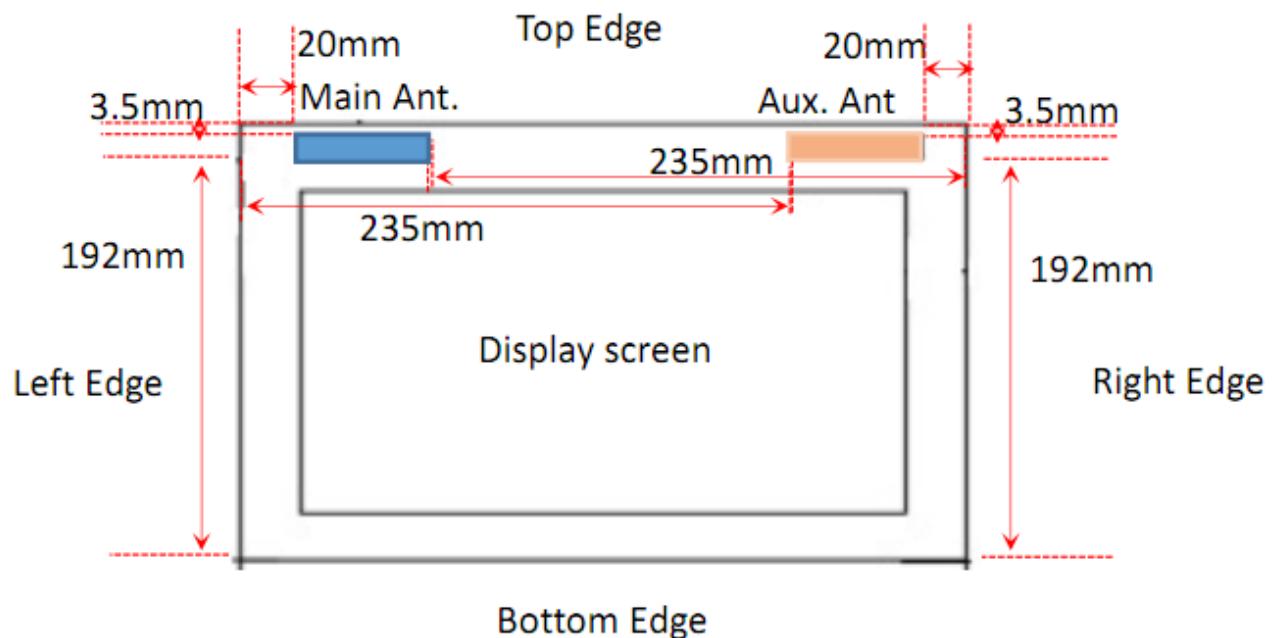
## 9 TEST EXCLUSION CONSIDERATION

### 9.1 NB Mode antenna location sketch:

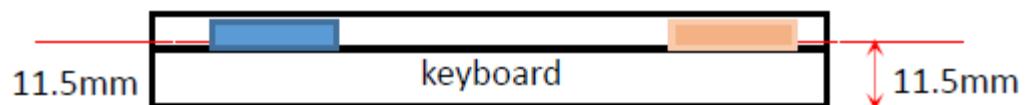


## 9.2 Tablet Mode antenna location sketch:

EUT Front View:



EUT Side View:



Aux. Antenna RX



Main Antenna TX/RX

## 9.3 SAR Test Exclusion Consideration Table

According with FCC KDB 447498 D01, Appendix A, <SAR Test Exclusion Thresholds for 100 MHz - 6 GHz and  $\leq 50$  mm> Table, this Device SAR test configurations consider as following :

### 9.3.1 NB mode SAR Test Exclusion Consideration

| Test Position Configurations | Mode                     | Bluetooth | WLAN 2.4GHz | WLAN 5.2&5.3GHz | WLAN 5.6GHz | WLAN 5.8GHz |
|------------------------------|--------------------------|-----------|-------------|-----------------|-------------|-------------|
| <b>Main Antenna</b>          |                          |           |             |                 |             |             |
| Bottom of Laptop             | Distance to User (mm)    |           | 194         |                 |             |             |
|                              | Max. Peak Power (dBm)    |           | 6.00        | 20.00           | 13.50       | 13.00       |
|                              | Max. Peak Power (mW)     |           | 3.98        | 100.00          | 22.39       | 19.95       |
|                              | Exclusion Threshold (mW) |           | 1535.0      | 1536.0          | 1502.0      | 1502.0      |
|                              | SAR Test Required        |           | No          | No              | No          | No          |

### 9.3.2 Tablet mode SAR Test Exclusion Consideration

| Band                  | Mode                | Max. Peak Power |        | Test Position Configurations |                   |            |          |             |  |
|-----------------------|---------------------|-----------------|--------|------------------------------|-------------------|------------|----------|-------------|--|
|                       |                     | dBm             | mW     | Back Side (with keyboard)    | Left Edge         | Right Edge | Top Edge | Bottom Edge |  |
| Distance to User (mm) |                     |                 |        | 11.5                         | 20.0              | 235.0      | <5.0     | 192.0       |  |
| WLAN 2.4 G            | <b>Main Antenna</b> |                 |        |                              | SAR Test Required |            |          |             |  |
|                       | Exclusion Threshold |                 |        | 13.6                         | 7.9               | 1946.0     | 31.4     | 1516.0      |  |
|                       | 802.11b             | 20.00           | 100.00 | Yes                          | Yes               | No         | Yes      | No          |  |
|                       | 802.11g             | 19.50           | 89.13  | No                           | No                | No         | No       | No          |  |
|                       | 802.11n(HT20)       | 19.50           | 89.13  | No                           | No                | No         | No       | No          |  |
|                       | 802.11n(HT40)       | 18.50           | 70.79  | No                           | No                | No         | No       | No          |  |
| WLAN 5.2 G&5.3G       | Exclusion Threshold |                 |        | 4.6                          | 2.7               | 1912       | 10.6     | 1482.0      |  |
|                       | 802.11a             | 13.50           | 22.39  | Yes                          | Yes               | No         | Yes      | No          |  |
|                       | 802.11n(HT20)       | 13.50           | 22.39  | No                           | No                | No         | No       | No          |  |
|                       | 802.11n(HT40)       | 13.00           | 19.95  | No                           | No                | No         | No       | No          |  |
|                       | 802.11ac(VHT20)     | 13.50           | 22.39  | No                           | No                | No         | No       | No          |  |
|                       | 802.11ac(VHT40)     | 13.00           | 19.95  | No                           | No                | No         | No       | No          |  |
|                       | 802.11ac(VHT80)     | 12.00           | 15.85  | No                           | No                | No         | No       | No          |  |
| WLAN 5.6 G            | Exclusion Threshold |                 |        | 4.2                          | 2.4               | 1912.0     | 9.7      | 1482.0      |  |
|                       | 802.11a             | 13.00           | 19.95  | Yes                          | Yes               | No         | Yes      | No          |  |
|                       | 802.11n(HT20)       | 12.00           | 15.85  | No                           | No                | No         | No       | No          |  |
|                       | 802.11n(HT40)       | 12.50           | 17.78  | No                           | No                | No         | No       | No          |  |
|                       | 802.11ac(VHT20)     | 12.00           | 15.85  | No                           | No                | No         | No       | No          |  |
|                       | 802.11ac(VHT40)     | 12.50           | 17.78  | No                           | No                | No         | No       | No          |  |
|                       | 802.11ac(VHT80)     | 10.50           | 11.22  | No                           | No                | No         | No       | No          |  |
| WLAN 5.8 G            | Exclusion Threshold |                 |        | 4.2                          | 2.4               | 1912       | 9.7      | 1482.0      |  |
|                       | 802.11a             | 13.00           | 19.95  | No                           | No                | No         | No       | No          |  |
|                       | 802.11n(HT20)       | 13.00           | 19.95  | No                           | No                | No         | No       | No          |  |

|           |                     |       |       |     |        |     |        |    |
|-----------|---------------------|-------|-------|-----|--------|-----|--------|----|
|           | 802.11n(HT40)       | 13.00 | 19.95 | No  | No     | No  | No     | No |
|           | 802.11ac(VHT20)     | 13.00 | 19.95 | No  | No     | No  | No     | No |
|           | 802.11ac(VHT40)     | 12.50 | 17.78 | No  | No     | No  | No     | No |
|           | 802.11ac(VHT80)     | 13.00 | 19.95 | Yes | Yes    | No  | Yes    | No |
| Bluetooth | Exclusion Threshold |       | 0.6   | 0.3 | 1945.0 | 1.3 | 1515.0 |    |
|           | BR/EDR              | 6.00  | 3.98  | No  | No     | No  | No     | No |
|           | BLE                 | 6.00  | 3.98  | No  | No     | No  | No     | No |

Note:

1. Maximum power is the source-based time-average power and represents the maximum RF output power including tune-up tolerance among production units
2. Per KDB 447498 D01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. Per KDB 447498 D01, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
4. Per KDB 447498 D01, 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:  

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR}$$
  - a.  $f(\text{GHz})$  is the RF channel transmit frequency in GHz
  - b. Power and distance are rounded to the nearest mW and mm before calculation
  - c. The result is rounded to one decimal place for comparison
  - d. For < 50 mm distance, we just calculate mW of the exclusion threshold value (3.0) to do compare.

This formula is  $[3.0] / [\sqrt{f(\text{GHz})}] \cdot [(\text{min. test separation distance, mm})] = \text{exclusion threshold of mW.}$

5. Per KDB 447498 D01, 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.  $[\text{Threshold at 50 mm in step 1}] + (\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150) \text{ mW, at 100 MHz to 1500 MHz}$
  - b.  $[\text{Threshold at 50 mm in step 1}] + (\text{test separation distance} - 50 \text{ mm}) \cdot 10 \text{ mW at } > 1500 \text{ MHz and } \leq 6 \text{ GHz}$
6. Per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA /HSUPA /DC-HSDPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.
7. Per KDB 248227 D01, choose the highest output power channel to test SAR and determine further SAR exclusion. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate
8. Per KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions.
  - a. When KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.
  - b. 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.
9. Per KDB 248227 D01 SAR is not required for the following U-NII-1 and U-NII-2A bands conditions.
  - a. When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.
  - b. When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is

not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.

## 10 TEST RESULT

### 10.1 WIFI 2.4GHz

| Mode                    | Antenna | Test Mode | Position  | Dist.<br>(mm) | Ch. | Freq.<br>(MHz) | Power<br>Drift<br>(dB) | 1 g Meas.<br>SAR<br>(W/Kg) | Meas.<br>Power<br>(dBm) | Max. tune-<br>up Power<br>(dBm) | Scaling<br>Factor | Duty<br>Cycle<br>(%) | Duty Cycle<br>Scaling<br>Factor | 1 g<br>Scaled SAR<br>(W/Kg) | Meas.<br>No. |
|-------------------------|---------|-----------|-----------|---------------|-----|----------------|------------------------|----------------------------|-------------------------|---------------------------------|-------------------|----------------------|---------------------------------|-----------------------------|--------------|
| <b>Body (Battery 1)</b> |         |           |           |               |     |                |                        |                            |                         |                                 |                   |                      |                                 |                             |              |
| 802.11 b                | Main    | Tablet    | Back Side | 0             | 6   | 2437           | 0.01                   | 0.052                      | 19.85                   | 20.00                           | 1.04              | 100                  | 1.000                           | 0.054                       | /            |
|                         |         |           | Left Edge | 0             | 6   | 2437           | 0.00                   | 0.411                      | 19.85                   | 20.00                           | 1.04              | 100                  | 1.000                           | 0.425                       | /            |
|                         |         |           | Top Edge  | 0             | 6   | 2437           | -0.06                  | 1.000                      | 19.85                   | 20.00                           | 1.04              | 100                  | 1.000                           | 1.035                       | /            |
|                         |         |           |           | 0             | 1   | 2412           | -0.02                  | 0.965                      | 19.70                   | 20.00                           | 1.07              | 100                  | 1.000                           | 1.034                       | /            |
|                         |         |           |           | 0             | 11  | 2462           | 0.07                   | 0.951                      | 19.22                   | 20.00                           | 1.20              | 100                  | 1.000                           | <b>1.138</b>                | 1#           |

### 10.2 WIFI 2.4GHz (worst case with Battery)

| Mode                    | Antenna | Test Mode | Position | Dist.<br>(mm) | Ch. | Freq.<br>(MHz) | Power<br>Drift<br>(dB) | 1 g Meas.<br>SAR<br>(W/Kg) | Meas.<br>Power<br>(dBm) | Max. tune-<br>up Power<br>(dBm) | Scaling<br>Factor | Duty<br>Cycle<br>(%) | Duty Cycle<br>Scaling<br>Factor | 1 g<br>Scaled SAR<br>(W/Kg) | Meas.<br>No. |
|-------------------------|---------|-----------|----------|---------------|-----|----------------|------------------------|----------------------------|-------------------------|---------------------------------|-------------------|----------------------|---------------------------------|-----------------------------|--------------|
| <b>Body (Battery 2)</b> |         |           |          |               |     |                |                        |                            |                         |                                 |                   |                      |                                 |                             |              |
| 802.11 b                | Main    | Tablet    | Top Edge | 0             | 11  | 2462           | 0.15                   | 0.939                      | 19.22                   | 20.00                           | 1.20              | 100                  | 1.000                           | 1.124                       | /            |
| <b>Body (Battery 3)</b> |         |           |          |               |     |                |                        |                            |                         |                                 |                   |                      |                                 |                             |              |
| 802.11 b                | Main    | Tablet    | Top Edge | 0             | 11  | 2462           | -0.09                  | 0.928                      | 19.22                   | 20.00                           | 1.20              | 100                  | 1.000                           | 1.111                       | /            |

## 10.3WIFI 5GHz

| Fre. Band               | Mode          | Antenn a | Test Mode | Position  | Dist. (mm) | Ch. | Freq. (MHz) | Power Drift (%) | 1 g Meas. SAR (W/Kg) | Meas. Power (dBm) | Max. tune-Up Power (dBm) | Scaling Factor | Duty Cycle (%) | Duty Cycle Scaling Factor | 1 g Scaled SAR (W/Kg) | Meas. No. |
|-------------------------|---------------|----------|-----------|-----------|------------|-----|-------------|-----------------|----------------------|-------------------|--------------------------|----------------|----------------|---------------------------|-----------------------|-----------|
| <b>Body (Battery 1)</b> |               |          |           |           |            |     |             |                 |                      |                   |                          |                |                |                           |                       |           |
| 5.3G                    | 802.11a       | Main     | Tablet    | Back Side | 0          | 60  | 5300        | 0.07            | 0.064                | 13.18             | 13.50                    | 1.08           | 99.5           | 1.005                     | 0.069                 | /         |
|                         |               |          |           | Left Edge | 0          | 60  | 5300        | 0.08            | 0.071                | 13.18             | 13.50                    | 1.08           | 99.5           | 1.005                     | 0.077                 | /         |
|                         |               |          |           | Top Edge  | 0          | 60  | 5300        | 0.01            | 0.928                | 13.18             | 13.50                    | 1.08           | 99.5           | 1.005                     | 1.004                 | /         |
|                         |               |          |           |           | 0          | 52  | 5260        | 0.03            | 1.090                | 13.16             | 13.50                    | 1.08           | 99.5           | 1.005                     | <b>1.182</b>          | 2#        |
|                         |               |          |           |           | 0          | 64  | 5320        | -0.04           | 0.789                | 12.70             | 13.00                    | 1.07           | 99.5           | 1.005                     | 0.850                 | /         |
| 5.6G                    | 802.11 a      | Main     | Tablet    | Back Side | 0          | 116 | 5580        | 0.05            | 0.083                | 12.56             | 13.00                    | 1.11           | 99.5           | 1.005                     | 0.092                 | /         |
|                         |               |          |           | Left Edge | 0          | 116 | 5580        | 0.03            | 0.094                | 12.56             | 13.00                    | 1.11           | 99.5           | 1.005                     | 0.105                 | /         |
|                         |               |          |           | Top Edge  | 0          | 116 | 5580        | 0.01            | 0.984                | 12.56             | 13.00                    | 1.11           | 99.5           | 1.005                     | <b>1.094</b>          | 3#        |
|                         |               |          |           |           | 0          | 100 | 5500        | 0.10            | 0.598                | 10.61             | 12.00                    | 1.38           | 99.5           | 1.005                     | 0.828                 | /         |
|                         |               |          |           |           | 0          | 140 | 5700        | 0.01            | 0.802                | 12.46             | 13.00                    | 1.13           | 99.5           | 1.005                     | 0.913                 | /         |
| 5.8G                    | 802.11 (HT80) | Main     | Tablet    | Back Side | 0          | 155 | 5775        | -0.05           | 0.061                | 12.96             | 13.00                    | 1.01           | 98.0           | 1.020                     | 0.063                 | /         |
|                         |               |          |           | Left Edge | 0          | 155 | 5775        | -0.02           | 0.070                | 12.96             | 13.00                    | 1.01           | 98.0           | 1.020                     | 0.072                 | /         |
|                         |               |          |           | Top Edge  | 0          | 155 | 5775        | 0.06            | 1.060                | 12.96             | 13.00                    | 1.01           | 98.0           | 1.020                     | <b>1.091</b>          | 4#        |

## 10.4WIFI 5GHz (worst case with other Battery)

| Fre. Band               | Mode    | Antenn a | Test Mode | Position | Dist. (mm) | Ch. | Freq. (MHz) | Power Drift (%) | 1 g Meas. SAR (W/Kg) | Meas. Power (dBm) | Max. tune-Up Power (dBm) | Scaling Factor | Duty Cycle (%) | Duty Cycle Scaling Factor | 1 g Scaled SAR (W/Kg) | Meas. No. |
|-------------------------|---------|----------|-----------|----------|------------|-----|-------------|-----------------|----------------------|-------------------|--------------------------|----------------|----------------|---------------------------|-----------------------|-----------|
| <b>Body (Battery 2)</b> |         |          |           |          |            |     |             |                 |                      |                   |                          |                |                |                           |                       |           |
| 5.3G                    | 802.11a | Main     | Tablet    | Top Edge | 0          | 52  | 5260        | 0.08            | 1.035                | 13.16             | 13.50                    | 1.08           | 99.5           | 1.005                     | 1.125                 | /         |
| <b>Body (Battery 3)</b> |         |          |           |          |            |     |             |                 |                      |                   |                          |                |                |                           |                       |           |
| 5.3G                    | 802.11a | Main     | Tablet    | Top Edge | 0          | 52  | 5260        | 0.02            | 1.033                | 13.16             | 13.50                    | 1.08           | 99.5           | 1.005                     | 1.122                 | /         |

## 11 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are  $\leq 1.45$  W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is  $\leq 1.10$ , the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is  $< 0.80$  W/kg, repeated measurement is not required.
2. When the highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
3. If the ratio of largest to smallest SAR for the original and first repeated measurements is  $> 1.20$ , or when the original or repeated measurement is  $\geq 1.45$  W/kg, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ , and the original, first or second repeated measurement is  $\geq 1.5$  W/kg, perform a third repeated measurement.

| Frequency Band (MHz)   | Wireless Band         | Antenna      | RF Exposure Conditions |          | Test Position | Highest Measured SAR (W/kg) | Repeated SAR (Yes/No) | Highest Measured SAR (W/kg) | Largest to Smallest SAR Ratio |
|--|-----------------------|--------------|------------------------|----------|---------------|-----------------------------|-----------------------|-----------------------------|-------------------------------|
| 2400   | WIFI 802.11 b         | Main Antenna | Body                   | Top Edge | 1.000         | Yes                         | 0.977                 | 1.02                        |                               |
| 5300   | WIFI 802.11 a         | Main Antenna | Body                   | Top Edge | 1.090         | Yes                         | 1.035                 | 1.05                        |                               |
| 5600   | WIFI 802.11 a         | Main Antenna | Body                   | Top Edge | 0.984         | Yes                         | 0.956                 | 1.03                        |                               |
| 5800   | WIFI 802.11 ac (HT80) | Main Antenna | Body                   | Top Edge | 1.060         | Yes                         | 0.998                 | 1.06                        |                               |
| Note: The ratio of largest to smallest SAR for the original and first repeated measurements is $< 1.20$ , the second repeated measurement is not required. |                       |              |                        |          |               |                             |                       |                             |                               |

## 12 SIMULTANEOUS TRANSMISSION

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR 1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR 1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR 1g is greater than the SAR limit (SAR 1g 1.6 W/kg), SAR test exclusion is determined by the SAR to Peak Location Ratio (SPLSR).

According KDB 447498 D01v06, simultaneous transmission:

- a) SPLSR =  $(\text{SAR1} + \text{SAR2})^{1.5} / R_i$  (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.  
SAR1 is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition.  
SAR2 is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition as the first.
- b) If  $\text{SPLSR} \leq 0.04$ , simultaneously transmission SAR measurement is not necessary.
- c) Simultaneously transmission SAR measurement, and the reported multi-band SAR  $< 1.6\text{W/kg}$ .

### 12.1 Simultaneous Transmission Mode Consider

| NO.   | Mode                    | 2.4G WLAN & 5G WLAN & 2.4G Bluetooth |
|---|-------------------------|--------------------------------------|
|   |                         | Body                                 |
| 1   | 5 G WLAN (Main Antenna) | +Bluetooth (Main Antenna)            |
| Note:   |                         |                                      |
| 1. The Main Antenna supports TX/RX function, and the Auxiliary Antenna only supports RX function.<br>2. 2.4G WLAN and 5G WLAN does not support transmission together, only WLAN 5GHz and Bluetooth will be transmitting from the main antenna at same time. |                         |                                      |

### 12.2 Estimated SAR Calculation

According to KDB 447498 D01, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR was estimated according to following formula to result in substantially conservative SAR values of  $\leq 0.4$  W/kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max.Tune Up Power(mw)}}{\text{Min Test Separation Distance}} * \frac{\sqrt{f_{GHz}}}{x} \quad (\text{where } x = 7.5 \text{ for 1-g SAR})$$

If the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is used for estimated SAR calculation. When the test separation distance is  $> 50$  mm, the 0.4 W/kg is used for SAR-1g.

| Band      | Mode | Position  | Antenna To user (mm) | SAR Testing | Max. Tune-up Power (dBm) | Max. Tune-up Power (mW) | Frequency (GHz) | Calculation Distance/Gap (mm) | Estimated SAR (W/kg) |
|-----------|------|-----------|----------------------|-------------|--------------------------|-------------------------|-----------------|-------------------------------|----------------------|
| Bluetooth | GFSK | Back Side | 11.5                 | NO          | 6.00                     | 4.00                    | 2.441           | 5                             | 0.167                |
|           |      | Left Edge | 20.0                 | NO          | 6.00                     | 4.00                    | 2.441           | 5                             | 0.167                |

|   |  |          |     |    |      |      |       |   |       |
|---|--|----------|-----|----|------|------|-------|---|-------|
|   |  | Top Edge | 3.5 | NO | 6.00 | 4.00 | 2.441 | 5 | 0.167 |
| Note: For conservativeness, 5mm is used to calculate the estimated SAR. |  |          |     |    |      |      |       |   |       |

## 12.3 Sum SAR of Simultaneous Transmission

### 12.3.1 Highest Sum Body SAR of Simultaneous Transmission

| Test Mode              | Position  | Mode                     | Max. 1g SAR (W/kg) | 1g Sum SAR (W/kg) | SPLSR (Yes/No) |
|------------------------|-----------|--------------------------|--------------------|-------------------|----------------|
| Body (Separation 0 mm) |           |                          |                    |                   |                |
| Tablet                 | Back Side | Bluetooth (Main Antenna) | 0.167              | 0.259             | No             |
|                        |           | 5G WLAN (Main Antenna)   | 0.092              |                   |                |
|                        | Left Edge | Bluetooth (Main Antenna) | 0.167              | 0.272             | No             |
|                        |           | 5G WLAN (Main Antenna)   | 0.105              |                   |                |
|                        | Top Edge  | Bluetooth (Main Antenna) | 0.167              | 1.349             | No             |
|                        |           | 5G WLAN (Main Antenna)   | 1.182              |                   |                |

## 13 TEST EQUIPMENTS LIST

| Description                  | Manufacturer | Model     | Serial No.      | Cal. Date  | Cal. Due   |
|------------------------------|--------------|-----------|-----------------|------------|------------|
| PC                           | Dell         | N/A       | N/A             | N/A        | N/A        |
| E-Field Probe                | Speag        | EX3DV4    | SN: 7340        | 2016/12/27 | 2017/12/26 |
| 2450MHz Validation Dipole    | Speag        | D2450V2   | SN: 952         | 2014/11/27 | 2017/11/26 |
| 5GHz Validation Dipole       | Speag        | D5GHzV2   | SN: 1200        | 2014/12/04 | 2017/12/03 |
| Data Acquisition Electronics | Speag        | DAE4      | SN: 1454        | 2016/12/19 | 2017/12/18 |
| Signal Generator             | R&S          | SMBV100A  | 260592          | 2017/06/12 | 2018/06/11 |
| Power Meter                  | Agilent      | E4419B    | GB40201833      | 2016/11/25 | 2017/11/24 |
| Power Sensor                 | Agilent      | E9300A    | MY41498012      | 2016/11/25 | 2017/11/24 |
| Power Sensor                 | Agilent      | E9300A    | MY41499891      | 2016/11/25 | 2017/11/24 |
| Power Amplifier              | SATIMO       | 6552B     | 22374           | 2017/06/12 | 2018/06/11 |
| Network Analyzer             | Agilent      | 5071B     | MY42404001      | 2017/06/12 | 2018/06/11 |
| Thermometer                  | Elitech      | RC-4HC    | N/A             | 2017/02/18 | 2018/02/17 |
| Dielectric Probe Kit         | SATIMO       | SCLMP     | SN 25/13 OCPG56 | N/A        | N/A        |
| Phantom1                     | Speag        | SAM       | SN: 1859        | N/A        | N/A        |
| Phantom2                     | Speag        | ELI4      | SN: 1012        | N/A        | N/A        |
| Attenuator                   | COM-MW       | ZA-S1-31  | 1305003187      | N/A        | N/A        |
| Directional coupler          | AA-MCS       | AAMCS-UDC | 000272          | N/A        | N/A        |

**Note:**  
Per KDB 865664 D01, Dipole SAR Validation Verification, BALUN LAB has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:  
1. There is no physical damage on the dipole;  
2. System validation with specific dipole is within 10% of calibrated value;  
1. 3. Return-loss is within 20% of calibrated measurement.

## ANNEX A SIMULATING LIQUID VERIFICATION RESULT

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SCLMP Dielectric Probe Kit.

| Date       | Liquid Type | Fre. (MHz) | Temp. (°C) | Meas. Conductivity ( $\sigma$ ) (S/m) | Meas. Permittivity ( $\epsilon$ ) | Target Conductivity ( $\sigma$ ) (S/m) | Target Permittivity ( $\epsilon$ ) | Conductivity Tolerance (%) | Permittivity Tolerance (%) |
|------------|-------------|------------|------------|---------------------------------------|-----------------------------------|--|------------------------------------|----------------------------|----------------------------|
| 2017.06.28 | Body        | 2450       | 21.2       | 2.02                                  | 50.75                             | 1.95                                   | 52.70                              | 3.59                       | -3.70                      |
| 2017.06.28 | Body        | 5200       | 21.2       | 5.32                                  | 48.40                             | 5.30                                   | 49.01                              | 0.38                       | -1.22                      |
| 2017.06.27 | Body        | 5600       | 21.4       | 5.83                                  | 46.73                             | 5.77                                   | 48.47                              | 1.11                       | -3.59                      |
| 2017.06.27 | Body        | 5800       | 21.4       | 6.01                                  | 46.24                             | 6.00                                   | 48.20                              | 0.17                       | -4.07                      |

Note: The tolerance limit of Conductivity and Permittivity is  $\pm 5\%$ .

## ANNEX B SYSTEM CHECK RESULT

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 % (for 1 g).

| Date       | Liquid Type | Freq. (MHz) | Power (mW) | Measured SAR (W/kg) | Normalized SAR (W/kg) | Dipole SAR (W/kg) | Tolerance (%) | Targeted SAR(W/kg) | Tolerance (%) |
|------------|-------------|-------------|------------|---------------------|-----------------------|-------------------|---------------|--------------------|---------------|
| 2017.06.28 | Body        | 2450        | 100        | 5.08                | 50.8                  | 50.60             | 0.40          | 52.40              | -3.05         |
| 2017.06.28 | Body        | 5200        | 100        | 7.10                | 70.1                  | 75.30             | -6.91         | 76.50              | -8.37         |
| 2017.06.27 | Body        | 5600        | 100        | 8.26                | 82.6                  | 80.50             | 2.61          | 83.30              | -0.84         |
| 2017.06.27 | Body        | 5800        | 100        | 7.61                | 76.1                  | 74.70             | 1.87          | 78.00              | -2.44         |

Note: The tolerance limit of System validation  $\pm 10\%$ .

# System Performance Check Data (2450MHz Body)

Date: 2017.06.28

Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.02$  S/m;  $\epsilon_r = 50.75$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.0 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(7.71, 7.71, 7.71); Calibrated: 2016.12.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**CW2450 100mw/Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 5.85 W/kg

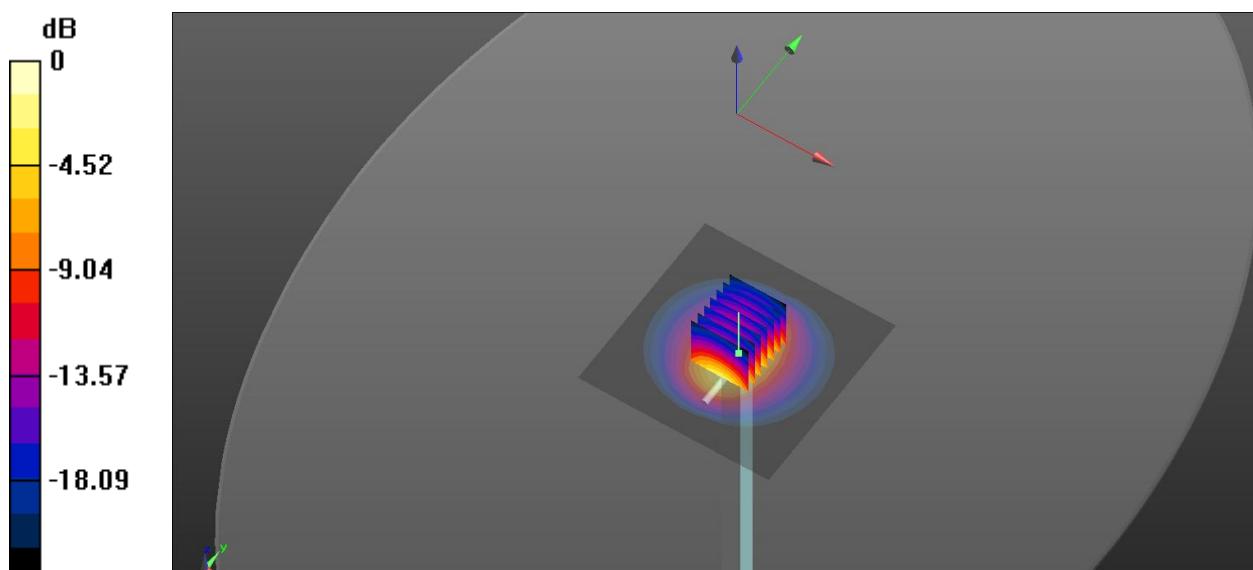
**CW2450 100mw/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.73 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 10.6 W/kg

**SAR(1 g) = 5.08 W/kg; SAR(10 g) = 2.31 W/kg**

Maximum value of SAR (measured) = 5.85 W/kg



# System Performance Check Data (5200MHz Body)

Date: 2017.06.28

Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.32$  S/m;  $\epsilon_r = 48.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.0 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.82, 4.82, 4.82); Calibrated: 2016.12.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**CW 5200 100mw/Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 8.06 W/kg

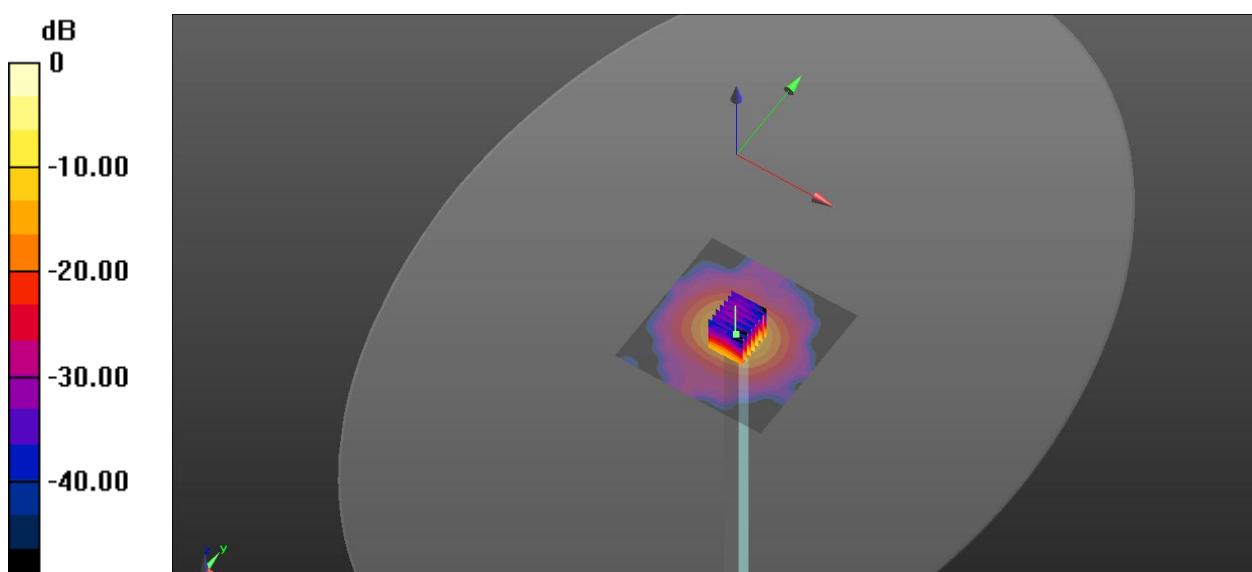
**CW 5200 100mw/Zoom Scan (7x7x21)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 40.31 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 28.8 W/kg

**SAR(1 g) = 7.10 W/kg; SAR(10 g) = 1.96 W/kg**

Maximum value of SAR (measured) = 17.3 W/kg



0 dB = 17.3 W/kg

# System Performance Check Data (5600MHz Body)

Date: 2017.06.27

Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5600$  MHz;  $\sigma = 5.83$  S/m;  $\epsilon_r = 46.73$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.2 Liquid Temperature: 21.4

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.12, 4.12, 4.12); Calibrated: 2016.12.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**CW 5600 100mw/Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 9.38 W/kg

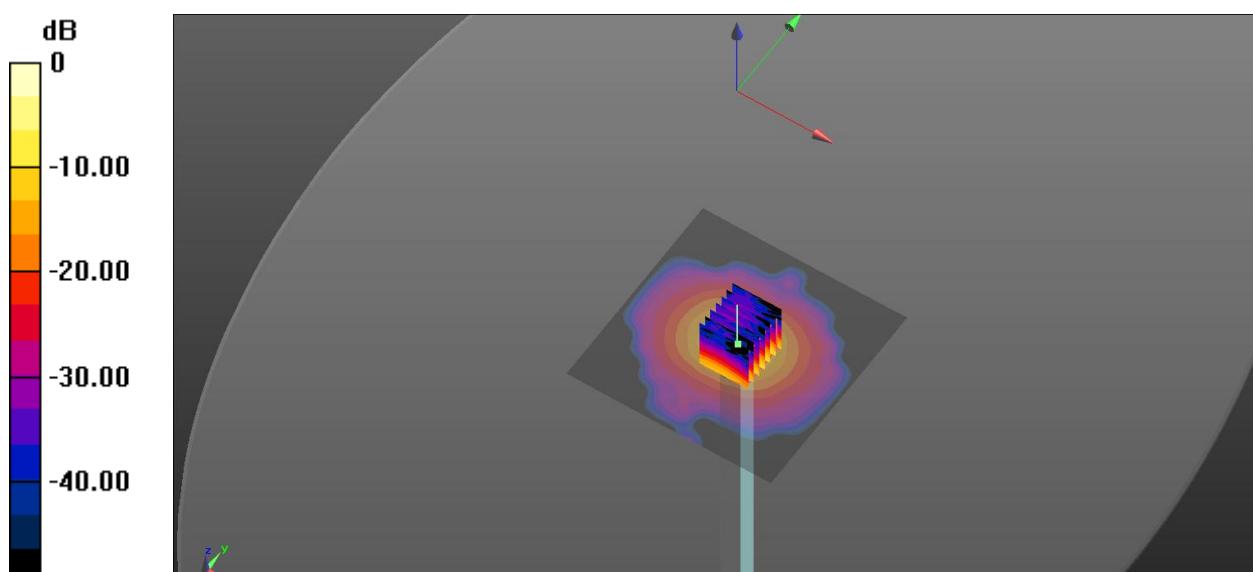
**CW 5600 100mw/Zoom Scan (7x7x21)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 41.39 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 36.1 W/kg

**SAR(1 g) = 8.26 W/kg; SAR(10 g) = 2.21 W/kg**

Maximum value of SAR (measured) = 20.7 W/kg



0 dB = 20.7 W/kg

# System Performance Check Data (5800MHz Body)

Date: 2017.06.27

Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.01$  S/m;  $\epsilon_r = 46.24$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.2 Liquid Temperature: 21.4

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.56, 4.56, 4.56); Calibrated: 2016.12.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**CW 5800/Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 7.88 W/kg

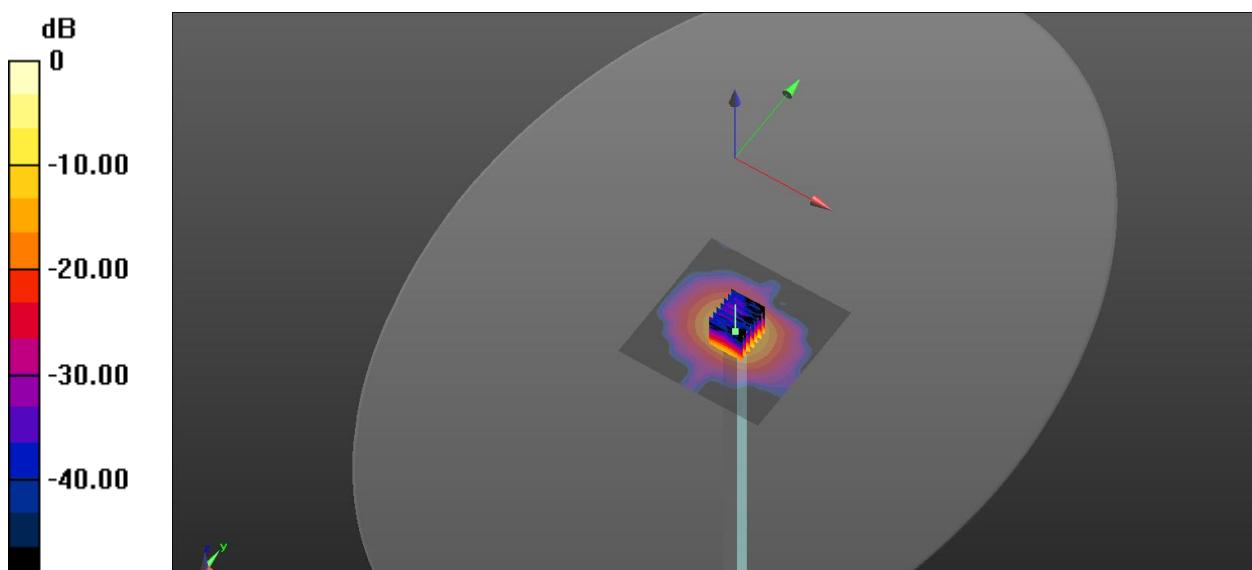
**CW 5800/Zoom Scan (7x7x21)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 46.77 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 35.9 W/kg

**SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.09 W/kg**

Maximum value of SAR (measured) = 17.8 W/kg



## ANNEX C TEST DATA

### MEAS. 1 Body Plane with Top Edge 0 mm on Channel 11 in IEEE 802.b mode with Main Ant.

Date: 2017.06.28

Communication System Band: WLAN(b); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 2.048$  S/m;  $\epsilon_r = 50.622$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.0 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(7.71, 7.71, 7.71); Calibrated: 2016.12.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch11/Area Scan (51x121x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.983 W/kg

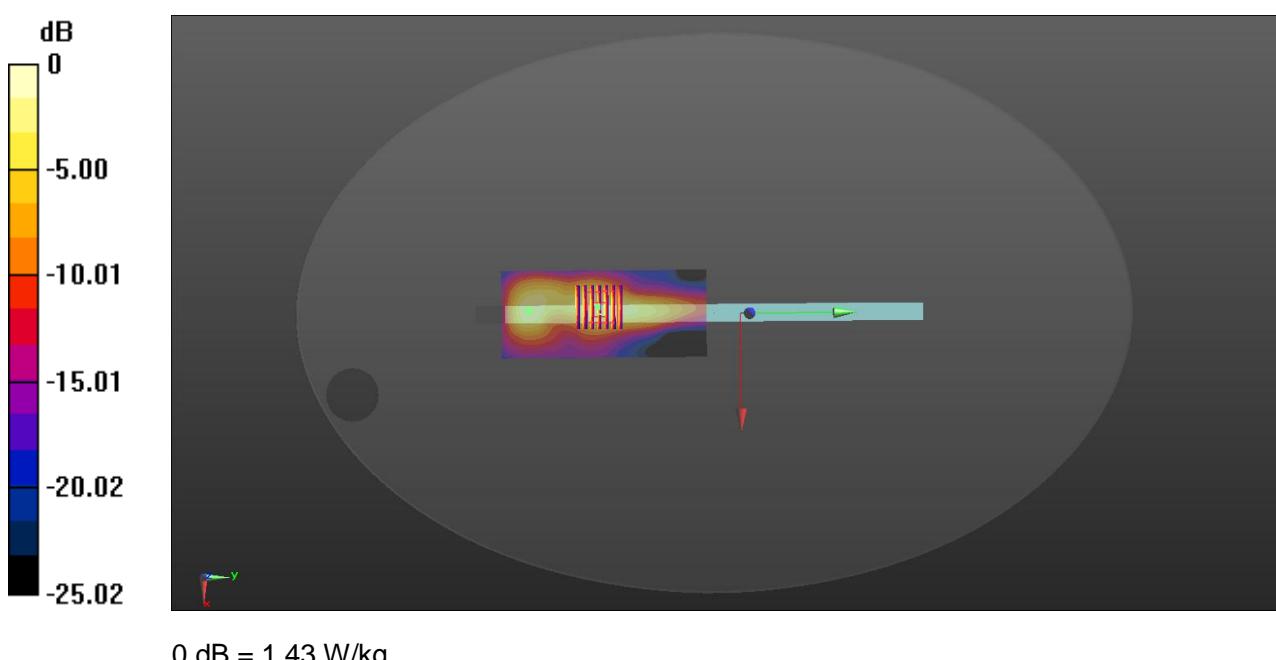
**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.082 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 2.22 W/kg

**SAR(1 g) = 0.951 W/kg; SAR(10 g) = 0.449 W/kg**

Maximum value of SAR (measured) = 1.43 W/kg



**MEAS. 2 Body Plane with Top Edge 0 mm on Channel 52 in IEEE 802.a mode with Main Ant.**

Date: 2017.06.28

Communication System Band: WLAN(a); Frequency: 5260 MHz; Duty Cycle: 1:1.005

Medium parameters used (interpolated):  $f = 5260$  MHz;  $\sigma = 5.368$  S/m;  $\epsilon_r = 47.76$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.0 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.82, 4.82, 4.82); Calibrated: 2016.12.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch52/Area Scan (71x141x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.58 W/kg

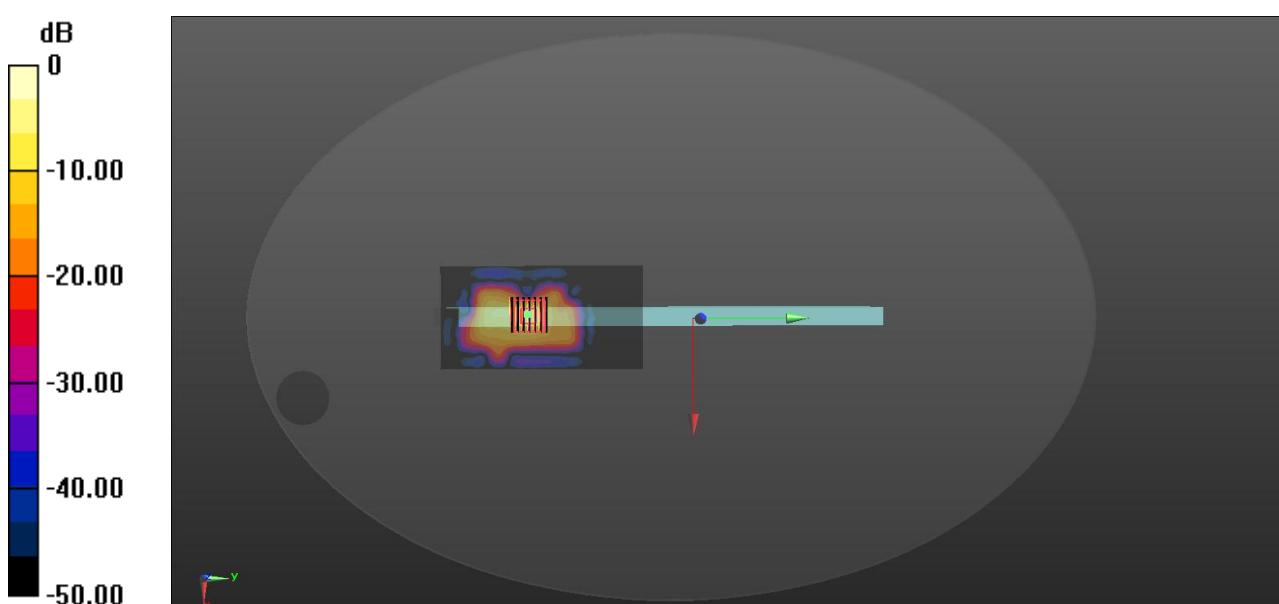
**Ch52/Zoom Scan (7x7x15)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.658 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 5.73 W/kg

**SAR(1 g) = 1.09 W/kg; SAR(10 g) = 0.258 W/kg**

Maximum value of SAR (measured) = 2.77 W/kg



**MEAS. 3 Body Plane with Top Edge 0 mm on Channel 116 in IEEE 802.a mode with Main Ant.**

Date: 2017.06.27

Communication System Band: WLAN(a); Frequency: 5580 MHz; Duty Cycle: 1:1.005

Medium parameters used:  $f = 5580$  MHz;  $\sigma = 5.82$  S/m;  $\epsilon_r = 46.75$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.2 Liquid Temperature: 21.4

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.12, 4.12, 4.12); Calibrated: 2016.12.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch116/Area Scan (71x141x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.08 W/kg

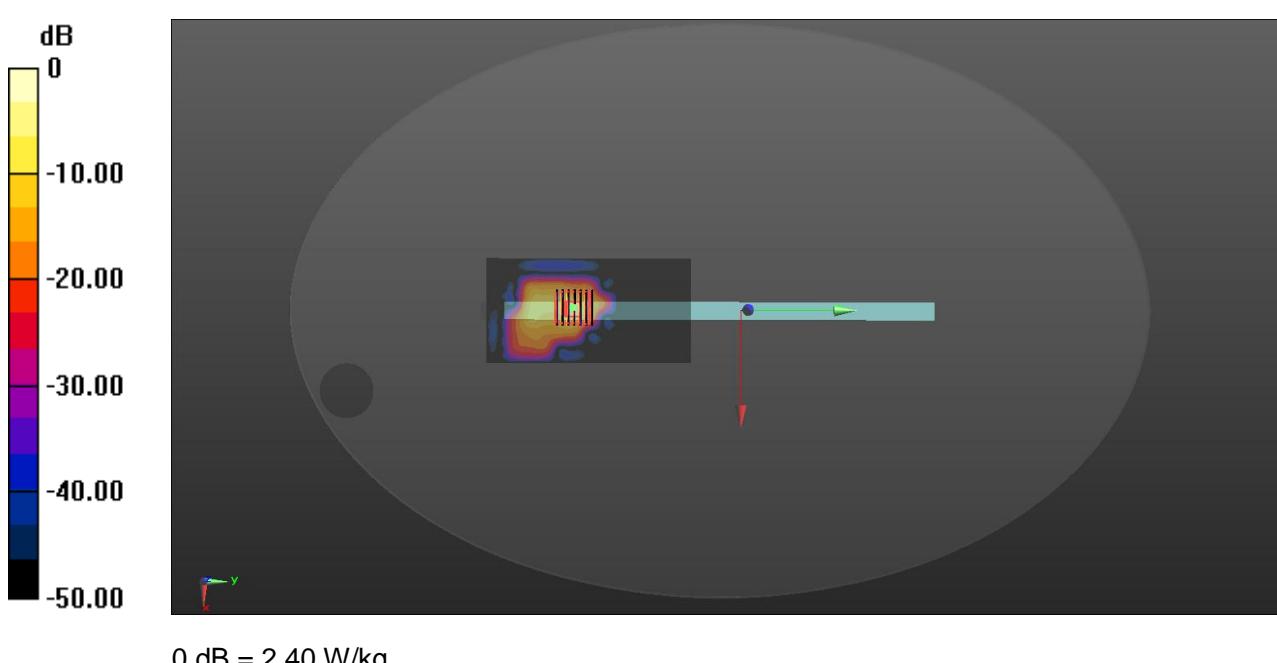
**Ch116/Zoom Scan (7x7x15)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.215 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 5.15 W/kg

**SAR(1 g) = 0.984 W/kg; SAR(10 g) = 0.222 W/kg**

Maximum value of SAR (measured) = 2.40 W/kg



**MEAS. 4 Body Plane with Top Edge 0 mm on Channel 155 in IEEE 802.ac(HT80) mode with****Main Ant.**

Date: 2017.06.27

Communication System Band: WLAN(ac) 80Mhz; Frequency: 5775 MHz; Duty Cycle: 1:1.020

Medium parameters used:  $f = 5775$  MHz;  $\sigma = 5.98$  S/m;  $\epsilon_r = 46.46$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temperature: 22.2 Liquid Temperature: 21.4

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.56, 4.56, 4.56); Calibrated: 2016.12.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454; Calibrated: 2016.12.19
- Phantom: ELI v4.0 (30deg probe tilt); Type: QDOVA001BB; Serial: TP:1012
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch155/Area Scan (71x141x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.24 W/kg

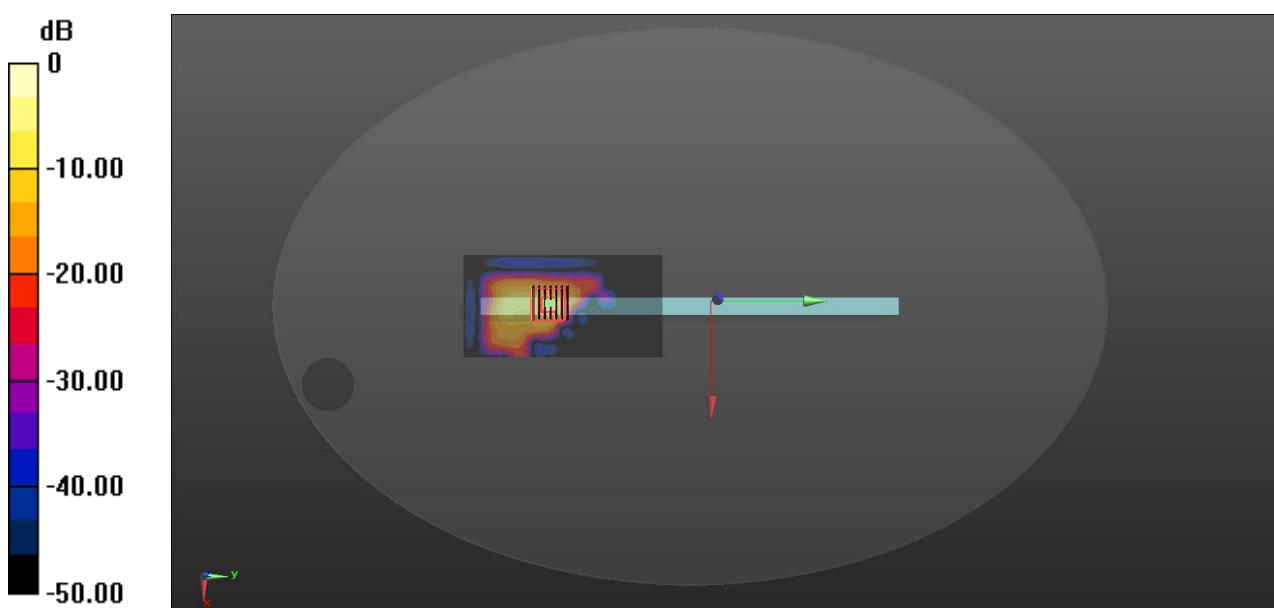
**Ch155/Zoom Scan (7x7x15)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.598 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 5.90 W/kg

**SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.255 W/kg**

Maximum value of SAR (measured) = 2.71 W/kg



## ANNEX D EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ1760285-AW.pdf”.

## ANNEX E SAR TEST SETUP PHOTOS

Please refer the document “BL-SZ1760285-AS.pdf”.

## ANNEX F CALIBRATION REPORT

Please refer the document “CALIBRATION REPORT.pdf”.

--END OF REPORT--