

# FCC SAR Test Report

Report No. : SA140611C22

Applicant : ASUSTeK COMPUTER INC.

Address : 4F, No. 150, LI-TE Rd., PEITOU, TAIPEI 112, TAIWAN

Product : Tablet

FCC ID : ZQ6-AP6234A

Brand : ASUS

Model No. : TX201LA-P


Standards : FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1992 / IEEE 1528:2003  
IEEE 1528a-2005 / KDB 865664 D01 v01r03 / KDB 248227 D01 v01r02  
KDB 447498 D01 v05r02 / KDB 616217 D04 v01r01

Sample Received Date : Jun. 11, 2014

Date of Testing : Jun. 26, 2014 ~ Jul. 04, 2014

**CERTIFICATION:** The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch – Lin Kou Laboratories**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

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## Release Control Record

| Report No.  | Reason for Change | Date Issued   |
|-------------|-------------------|---------------|
| SA140611C22 | Initial release   | Jul. 08, 2014 |
|             |                   |               |
|             |                   |               |
|             |                   |               |

## 1. Summary of Maximum SAR Value

| Equipment Class | Mode      | Highest Reported Body SAR <sub>1g</sub> (W/kg) |
|-----------------|-----------|--|
| DTS             | 2.4G WLAN | 0.38   |
|                 | 5.8G WLAN | 0.28   |
| NII             | 5.2G WLAN | 0.43   |
|                 | 5.3G WLAN | 0.42   |
|                 | 5.6G WLAN | 0.52   |
| DSS             | Bluetooth | N/A  |

### Note:

- The SAR limit (**SAR<sub>1g</sub> 1.6 W/kg**) for general population / uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992.

## 2. Description of Equipment Under Test

|  |   |
|--|---|
| <b>EUT Type</b>  | Tablet  |
| <b>FCC ID</b>  | ZQ6-AP6234A   |
| <b>Brand Name</b>                                      | ASUS  |
| <b>Model Name</b>                                      | TX201LA-P   |
| <b>Tx Frequency Bands<br/>(Unit: MHz)</b>              | WLAN : 2412 ~ 2462, 5180 ~ 5240, 5260 ~ 5320, 5500 ~ 5700, 5745 ~ 5825<br>Bluetooth : 2402 ~ 2480                   |
| <b>Uplink Modulations</b>                              | 802.11b : DSSS<br>802.11a/g/n : OFDM<br>Bluetooth : GFSK  |
| <b>Maximum Tune-up Conducted Power<br/>(Unit: dBm)</b> | WLAN 2.4G : 16.5<br>WLAN 5.2G : 13.5<br>WLAN 5.3G : 13.5<br>WLAN 5.6G : 13.5<br>WLAN 5.8G : 13.5<br>Bluetooth : 6.0 |
| <b>Antenna Type</b>                                    | Fixed Internal Antenna  |
| <b>EUT Stage</b>                                       | Identical Prototype   |

**Note:**

- The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

**List of Accessory:**

|                             |                     |               |
|-----------------------------|---------------------|---------------|
| <b>Battery</b>              | <b>Brand Name</b>   | ASUS          |
|                             | <b>Model Name</b>   | C12N1343      |
|                             | <b>Power Rating</b> | 3.85Vdc, 31Wh |
|                             | <b>Type</b>         | Li-ion        |
| <b>WLAN + BT<br/>Module</b> | <b>Brand Name</b>   | AMPAK         |
|                             | <b>Model Name</b>   | AP6234A       |
| <b>PC Station</b>           | <b>Brand Name</b>   | ASUS          |
|                             | <b>Model Name</b>   | TX201LA-B     |

### 3. SAR Measurement System

#### 3.1 Definition of Specific Absorption Rate (SAR)

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:

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

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

SAR measurement can be related to the electrical field in the tissue by

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

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

#### 3.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY4/5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC.

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**Fig-3.1 DASY System Setup**

### 3.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability  $\pm 0.035$  mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



**Fig-3.2 DASY4**





**Fig-3.3 DASY5**

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### 3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

|                      |  |   |
|----------------------|--|---|
| <b>Model</b>         | EX3DV4   |  |
| <b>Construction</b>  | Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE). |   |
| <b>Frequency</b>     | 10 MHz to 6 GHz<br>Linearity: $\pm 0.2$ dB   |   |
| <b>Directivity</b>   | $\pm 0.3$ dB in HSL (rotation around probe axis)<br>$\pm 0.5$ dB in tissue material (rotation normal to probe axis)                                      |   |
| <b>Dynamic Range</b> | 10 $\mu$ W/g to 100 mW/g<br>Linearity: $\pm 0.2$ dB (noise: typically $< 1$ $\mu$ W/g)   |   |
| <b>Dimensions</b>    | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm                     |   |

|                      |   |  |
|----------------------|---|--|
| <b>Model</b>         | ES3DV3  |  |
| <b>Construction</b>  | Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE). |  |
| <b>Frequency</b>     | 10 MHz to 4 GHz<br>Linearity: $\pm 0.2$ dB  |  |
| <b>Directivity</b>   | $\pm 0.2$ dB in HSL (rotation around probe axis)<br>$\pm 0.3$ dB in tissue material (rotation normal to probe axis)   |  |
| <b>Dynamic Range</b> | 5 $\mu$ W/g to 100 mW/g<br>Linearity: $\pm 0.2$ dB  |  |
| <b>Dimensions</b>    | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 3.9 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.0 mm  |  |


### 3.2.3 Data Acquisition Electronics (DAE)


|                             |   |   |
|-----------------------------|---|---|
| <b>Model</b>                | DAE3, DAE4  |  |
| <b>Construction</b>         | Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop. |   |
| <b>Measurement Range</b>    | -100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)  |   |
| <b>Input Offset Voltage</b> | $< 5\mu$ V (with auto zero)   |   |
| <b>Input Bias Current</b>   | $< 50$ fA   |   |
| <b>Dimensions</b>           | 60 x 60 x 68 mm   |   |




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### 3.2.4 Phantoms

|                        |   |   |
|------------------------|---|---|
| <b>Model</b>           | Twin SAM  |  |
| <b>Construction</b>    | The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. |   |
| <b>Material</b>        | Vinylester, glass fiber reinforced (VE-GF)  |   |
| <b>Shell Thickness</b> | $2 \pm 0.2$ mm ( $6 \pm 0.2$ mm at ear point)   |   |
| <b>Dimensions</b>      | Length: 1000 mm<br>Width: 500 mm<br>Height: adjustable feet   |   |
| <b>Filling Volume</b>  | approx. 25 liters   |   |


|                        |   |  |
|------------------------|---|--|
| <b>Model</b>           | ELI   |  |
| <b>Construction</b>    | Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI 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. The phantom is compatible with all SPEAG dosimetric probes and dipoles. |  |
| <b>Material</b>        | Vinylester, glass fiber reinforced (VE-GF)  |  |
| <b>Shell Thickness</b> | $2.0 \pm 0.2$ mm (bottom plate)   |  |
| <b>Dimensions</b>      | Major axis: 600 mm<br>Minor axis: 400 mm  |  |
| <b>Filling Volume</b>  | approx. 30 liters   |  |

## 3.2.5 Device Holder

|                     |   |   |
|---------------------|---|---|
| <b>Model</b>        | Mounting Device   |  |
| <b>Construction</b> | In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). |   |
| <b>Material</b>     | POM   |   |

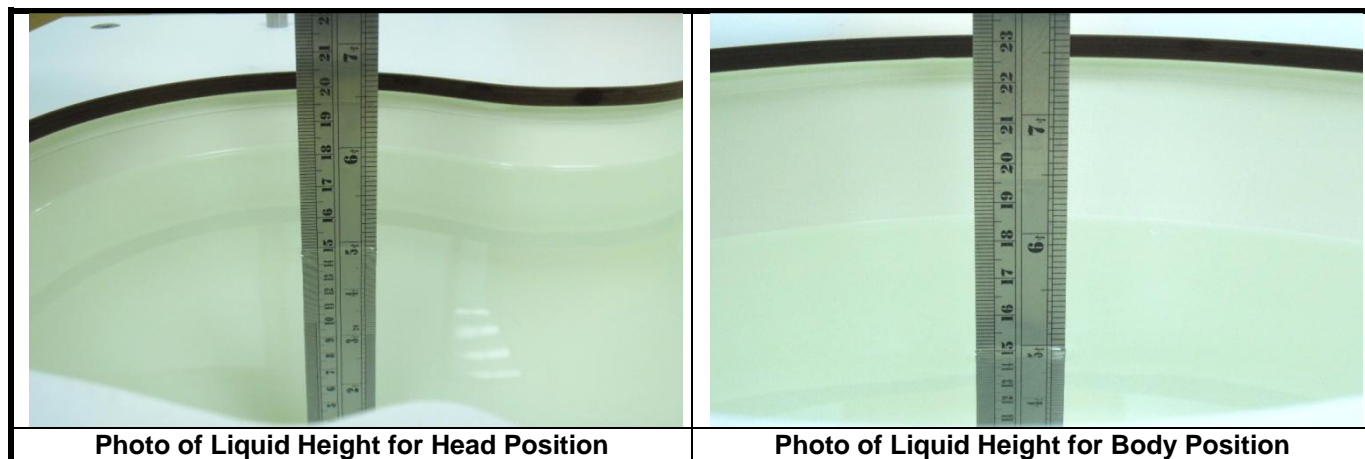
|                     |   |   |
|---------------------|---|---|
| <b>Model</b>        | Laptop Extensions Kit   |  |
| <b>Construction</b> | Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. |   |
| <b>Material</b>     | POM, Acrylic glass, Foam  |   |

## 3.2.6 System Validation Dipoles

|                         |  |   |
|-------------------------|--|---|
| <b>Model</b>            | D-Serial   |  |
| <b>Construction</b>     | Symmetrical dipole with 1/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions. |   |
| <b>Frequency</b>        | 750 MHz to 5800 MHz  |   |
| <b>Return Loss</b>      | > 20 dB  |   |
| <b>Power Capability</b> | > 100 W (f < 1GHz), > 40 W (f > 1GHz)  |   |

## 3.2.7 Tissue Simulating Liquids

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% are listed in Table-3.1.



The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528, and KDB 865664 D01 Appendix A. For the body tissue simulating liquids, the dielectric properties are defined in KDB 865664 D01 Appendix A. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

**Table-3.1 Targets of Tissue Simulating Liquid**

| Frequency (MHz) | Target Permittivity | Range of $\pm 5\%$ | Target Conductivity | Range of $\pm 5\%$ |
|-----------------|---------------------|--------------------|---------------------|--------------------|
| <b>For Head</b> |                     |                    |                     |                    |
| 750             | 41.9                | 39.8 ~ 44.0        | 0.89                | 0.85 ~ 0.93        |
| 835             | 41.5                | 39.4 ~ 43.6        | 0.90                | 0.86 ~ 0.95        |
| 900             | 41.5                | 39.4 ~ 43.6        | 0.97                | 0.92 ~ 1.02        |
| 1450            | 40.5                | 38.5 ~ 42.5        | 1.20                | 1.14 ~ 1.26        |
| 1640            | 40.3                | 38.3 ~ 42.3        | 1.29                | 1.23 ~ 1.35        |
| 1750            | 40.1                | 38.1 ~ 42.1        | 1.37                | 1.30 ~ 1.44        |
| 1800            | 40.0                | 38.0 ~ 42.0        | 1.40                | 1.33 ~ 1.47        |
| 1900            | 40.0                | 38.0 ~ 42.0        | 1.40                | 1.33 ~ 1.47        |
| 2000            | 40.0                | 38.0 ~ 42.0        | 1.40                | 1.33 ~ 1.47        |
| 2300            | 39.5                | 37.5 ~ 41.5        | 1.67                | 1.59 ~ 1.75        |
| 2450            | 39.2                | 37.2 ~ 41.2        | 1.80                | 1.71 ~ 1.89        |
| 2600            | 39.0                | 37.1 ~ 41.0        | 1.96                | 1.86 ~ 2.06        |
| 3500            | 37.9                | 36.0 ~ 39.8        | 2.91                | 2.76 ~ 3.06        |
| 5200            | 36.0                | 34.2 ~ 37.8        | 4.66                | 4.43 ~ 4.89        |
| 5300            | 35.9                | 34.1 ~ 37.7        | 4.76                | 4.52 ~ 5.00        |
| 5500            | 35.6                | 33.8 ~ 37.4        | 4.96                | 4.71 ~ 5.21        |
| 5600            | 35.5                | 33.7 ~ 37.3        | 5.07                | 4.82 ~ 5.32        |
| 5800            | 35.3                | 33.5 ~ 37.1        | 5.27                | 5.01 ~ 5.53        |
| <b>For Body</b> |                     |                    |                     |                    |
| 750             | 55.5                | 52.7 ~ 58.3        | 0.96                | 0.91 ~ 1.01        |
| 835             | 55.2                | 52.4 ~ 58.0        | 0.97                | 0.92 ~ 1.02        |
| 900             | 55.0                | 52.3 ~ 57.8        | 1.05                | 1.00 ~ 1.10        |
| 1450            | 54.0                | 51.3 ~ 56.7        | 1.30                | 1.24 ~ 1.37        |
| 1640            | 53.8                | 51.1 ~ 56.5        | 1.40                | 1.33 ~ 1.47        |
| 1750            | 53.4                | 50.7 ~ 56.1        | 1.49                | 1.42 ~ 1.56        |
| 1800            | 53.3                | 50.6 ~ 56.0        | 1.52                | 1.44 ~ 1.60        |
| 1900            | 53.3                | 50.6 ~ 56.0        | 1.52                | 1.44 ~ 1.60        |
| 2000            | 53.3                | 50.6 ~ 56.0        | 1.52                | 1.44 ~ 1.60        |
| 2300            | 52.9                | 50.3 ~ 55.5        | 1.81                | 1.72 ~ 1.90        |
| 2450            | 52.7                | 50.1 ~ 55.3        | 1.95                | 1.85 ~ 2.05        |
| 2600            | 52.5                | 49.9 ~ 55.1        | 2.16                | 2.05 ~ 2.27        |
| 3500            | 51.3                | 48.7 ~ 53.9        | 3.31                | 3.14 ~ 3.48        |
| 5200            | 49.0                | 46.6 ~ 51.5        | 5.30                | 5.04 ~ 5.57        |
| 5300            | 48.9                | 46.5 ~ 51.3        | 5.42                | 5.15 ~ 5.69        |
| 5500            | 48.6                | 46.2 ~ 51.0        | 5.65                | 5.37 ~ 5.93        |
| 5600            | 48.5                | 46.1 ~ 50.9        | 5.77                | 5.48 ~ 6.06        |
| 5800            | 48.2                | 45.8 ~ 50.6        | 6.00                | 5.70 ~ 6.30        |

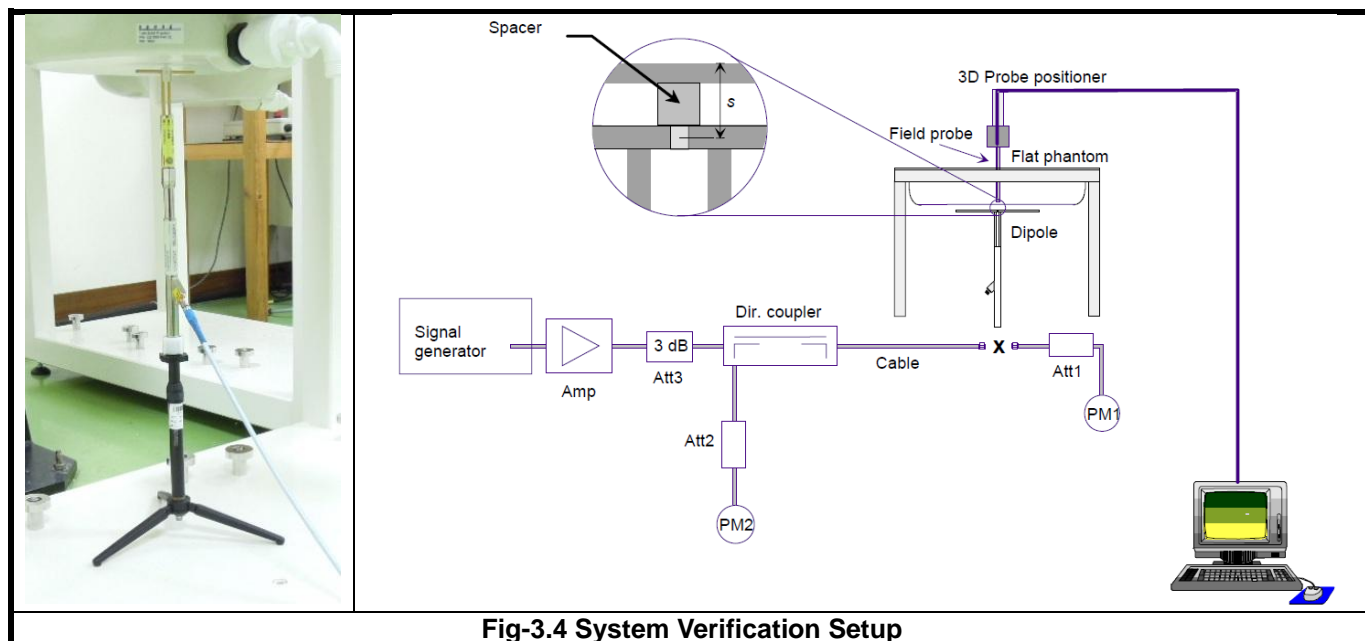
The following table gives the recipes for tissue simulating liquids.

**Table-3.2 Recipes of Tissue Simulating Liquid**

| Tissue Type | Bactericide | DGBE | HEC | NaCl | Sucrose | Triton X-100 | Water | Diethylene Glycol Mono-hexylether |
|-------------|-------------|------|-----|------|---------|--------------|-------|-----------------------------------|
| H750        | 0.2         | -    | 0.2 | 1.5  | 56.0    | -            | 42.1  | -                                 |
| H835        | 0.2         | -    | 0.2 | 1.5  | 57.0    | -            | 41.1  | -                                 |
| H900        | 0.2         | -    | 0.2 | 1.4  | 58.0    | -            | 40.2  | -                                 |
| H1450       | -           | 43.3 | -   | 0.6  | -       | -            | 56.1  | -                                 |
| H1640       | -           | 45.8 | -   | 0.5  | -       | -            | 53.7  | -                                 |
| H1750       | -           | 47.0 | -   | 0.4  | -       | -            | 52.6  | -                                 |
| H1800       | -           | 44.5 | -   | 0.3  | -       | -            | 55.2  | -                                 |
| H1900       | -           | 44.5 | -   | 0.2  | -       | -            | 55.3  | -                                 |
| H2000       | -           | 44.5 | -   | 0.1  | -       | -            | 55.4  | -                                 |
| H2300       | -           | 44.9 | -   | 0.1  | -       | -            | 55.0  | -                                 |
| H2450       | -           | 45.0 | -   | 0.1  | -       | -            | 54.9  | -                                 |
| H2600       | -           | 45.1 | -   | 0.1  | -       | -            | 54.8  | -                                 |
| H3500       | -           | 8.0  | -   | 0.2  | -       | 20.0         | 71.8  | -                                 |
| H5G         | -           | -    | -   | -    | -       | 17.2         | 65.5  | 17.3                              |
| B750        | 0.2         | -    | 0.2 | 0.8  | 48.8    | -            | 50.0  | -                                 |
| B835        | 0.2         | -    | 0.2 | 0.9  | 48.5    | -            | 50.2  | -                                 |
| B900        | 0.2         | -    | 0.2 | 0.9  | 48.2    | -            | 50.5  | -                                 |
| B1450       | -           | 34.0 | -   | 0.3  | -       | -            | 65.7  | -                                 |
| B1640       | -           | 32.5 | -   | 0.3  | -       | -            | 67.2  | -                                 |
| B1750       | -           | 31.0 | -   | 0.2  | -       | -            | 68.8  | -                                 |
| B1800       | -           | 29.5 | -   | 0.4  | -       | -            | 70.1  | -                                 |
| B1900       | -           | 29.5 | -   | 0.3  | -       | -            | 70.2  | -                                 |
| B2000       | -           | 30.0 | -   | 0.2  | -       | -            | 69.8  | -                                 |
| B2300       | -           | 31.0 | -   | 0.1  | -       | -            | 68.9  | -                                 |
| B2450       | -           | 31.4 | -   | 0.1  | -       | -            | 68.5  | -                                 |
| B2600       | -           | 31.8 | -   | 0.1  | -       | -            | 68.1  | -                                 |
| B3500       | -           | 28.8 | -   | 0.1  | -       | -            | 71.1  | -                                 |
| B5G         | -           | -    | -   | -    | -       | 10.7         | 78.6  | 10.7                              |

## 3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.



The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

### 3.4 SAR Measurement Procedure

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

- Power reference measurement
- Area scan
- Zoom scan
- Power drift measurement

The SAR measurement procedures for each of test conditions are as follows:

- Make EUT to transmit maximum output power
- Measure conducted output power through RF cable
- Place the EUT in the specific position of phantom
- Perform SAR testing steps on the DASY system
- Record the SAR value

#### 3.4.1 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. According to KDB 865664 D01, the resolution for Area and Zoom scan is specified in the table below.

| Items                                 | <= 2 GHz | 2-3 GHz  | 3-4 GHz  | 4-5 GHz  | 5-6 GHz  |
|---------------------------------------|----------|----------|----------|----------|----------|
| Area Scan<br>( $\Delta x, \Delta y$ ) | <= 15 mm | <= 12 mm | <= 12 mm | <= 10 mm | <= 10 mm |
| Zoom Scan<br>( $\Delta x, \Delta y$ ) | <= 8 mm  | <= 5 mm  | <= 5 mm  | <= 4 mm  | <= 4 mm  |
| Zoom Scan<br>( $\Delta z$ )           | <= 5 mm  | <= 5 mm  | <= 4 mm  | <= 3 mm  | <= 2 mm  |
| Zoom Scan<br>Volume                   | >= 30 mm | >= 30 mm | >= 28 mm | >= 25 mm | >= 22 mm |

**Note:**

When zoom scan is required and report SAR is <= 1.4 W/kg, the zoom scan resolution of  $\Delta x / \Delta y$  (2-3GHz: <= 8 mm, 3-4GHz: <= 7 mm, 4-6GHz: <= 5 mm) may be applied.

#### 3.4.2 Volume Scan Procedure

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

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### 3.4.3 Power Drift Monitoring

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

### 3.4.4 Spatial Peak SAR Evaluation

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

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

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

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

### 3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.



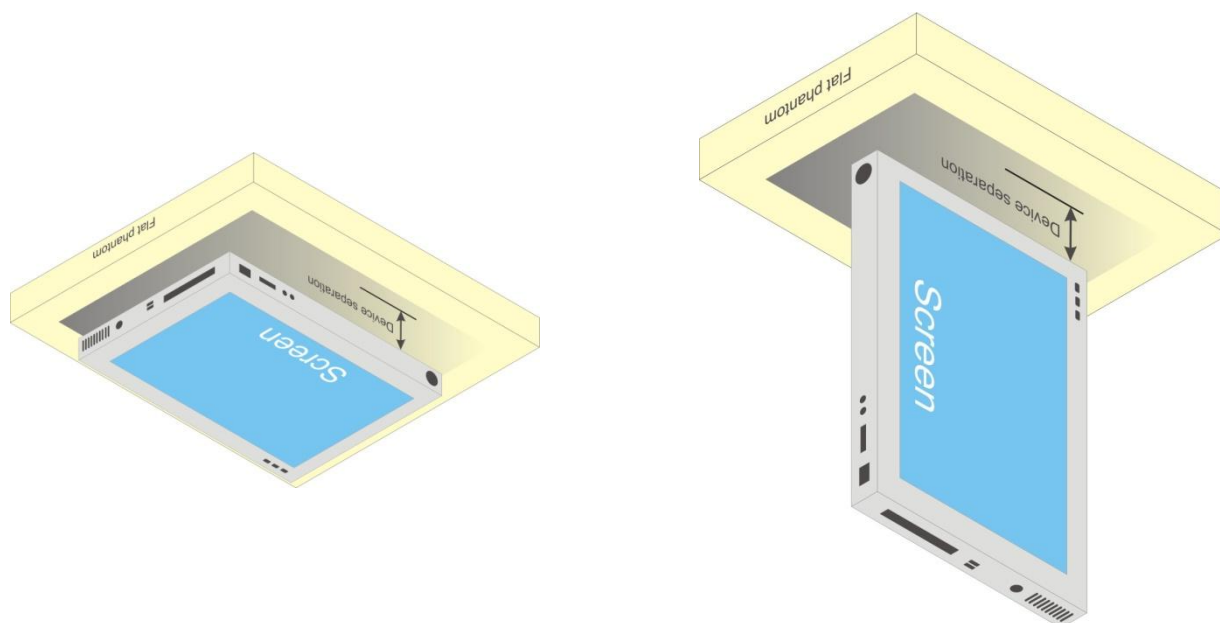
## 4. SAR Measurement Evaluation

### 4.1 EUT Configuration and Setting

For WLAN SAR testing, the EUT has installed WLAN engineering testing software which can provide continuous transmitting RF signal. According to KDB 248227 D01, WLAN SAR should be tested at the lowest data rate, and testing at higher data rate is not required when the maximum average output power is less than 1/4 dB higher than those measured at the lowest data rate. Since the WLAN power at lowest data rate has the highest output power, WLAN SAR for this device was performed at the lowest data rate.

### 4.2 EUT Testing Position

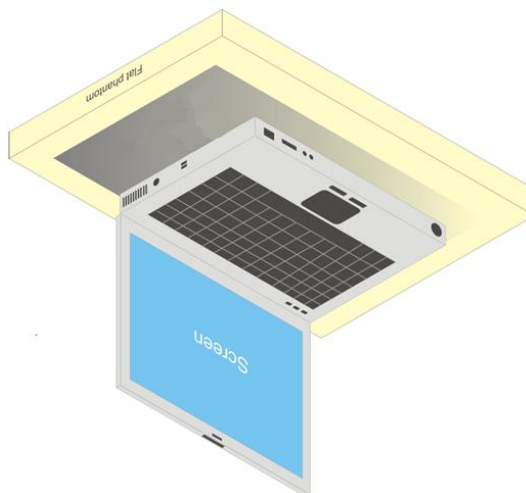
For tablet PC mode, according to KDB 616217 D04, SAR evaluation is required for the back surface and edges of the device. The back surface and edges of the tablet are tested with the tablet touching the phantom. Exposures from antennas through the front surface of the display section of a tablet are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens is generally not necessary. When voice mode is supported on a tablet and it is limited to speaker mode or headset operations only, additional SAR testing for this type of voice use is not required.



**Fig-4.1 Illustration for Tablet Setup**

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For laptop PC mode, according to KDB 616217 D04, SAR testing for laptop PC is required for bottom surface.



**Fig-4.2 Illustration for Laptop Setup**

According to KDB 447498 D01, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following formula.

- For the test separation distance  $\leq 50$  mm

$$\frac{\text{Max. Tune up Power}_{(\text{mW})}}{\text{Min. Test Separation Distance}_{(\text{mm})}} \times \sqrt{f_{(\text{GHz})}} \leq 3.0$$

When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

- For the test separation distance  $> 50$  mm, and the frequency at 100 MHz to 1500 MHz

$$\left[ (\text{Threshold at 50 mm in Step 1}) + (\text{Test Separation Distance} - 50 \text{ mm}) \times \left( \frac{f_{(\text{MHz})}}{150} \right) \right]_{(\text{mW})}$$

- For the test separation distance  $> 50$  mm, and the frequency at  $> 1500$  MHz to 6 GHz

$$[(\text{Threshold at 50 mm in Step 1}) + (\text{Test Separation Distance} - 50 \text{ mm}) \times 10]_{(\text{mW})}$$

### <For Tablet PC Mode>

| Mode      | Max. Tune-up Power (dBm) | Max. Tune-up Power (mW) | Rear Face            |                   |                      | Top Side             |                   |                      | Bottom Side          |                   |                      | Left Side            |                   |                      | Right Side           |                   |                      |
|-----------|--------------------------|-------------------------|----------------------|-------------------|----------------------|----------------------|-------------------|----------------------|----------------------|-------------------|----------------------|----------------------|-------------------|----------------------|----------------------|-------------------|----------------------|
|           |                          |                         | Ant. to Surface (mm) | Calculated Result | Require SAR Testing? | Ant. to Surface (mm) | Calculated Result | Require SAR Testing? | Ant. to Surface (mm) | Calculated Result | Require SAR Testing? | Ant. to Surface (mm) | Calculated Result | Require SAR Testing? | Ant. to Surface (mm) | Calculated Result | Require SAR Testing? |
| WLAN 2.4G | 16.5                     | 45                      | 5                    | 14.1              | Yes                  | 57                   | 166 mW            | No                   | 105                  | 646 mW            | No                   | 288                  | 2476 mW           | No                   | 9.5                  | 7.4               | Yes                  |
| WLAN 5.2G | 13.5                     | 22                      | 5                    | 10.1              | Yes                  | 57                   | 136 mW            | No                   | 105                  | 616 mW            | No                   | 288                  | 2446 mW           | No                   | 9.5                  | 5.3               | Yes                  |
| WLAN 5.3G | 13.5                     | 22                      | 5                    | 10.1              | Yes                  | 57                   | 135 mW            | No                   | 105                  | 615 mW            | No                   | 288                  | 2445 mW           | No                   | 9.5                  | 5.3               | Yes                  |
| WLAN 5.6G | 13.5                     | 22                      | 5                    | 10.5              | Yes                  | 57                   | 133 mW            | No                   | 105                  | 613 mW            | No                   | 288                  | 2443 mW           | No                   | 9.5                  | 5.5               | Yes                  |
| WLAN 5.8G | 13.5                     | 22                      | 5                    | 10.6              | Yes                  | 57                   | 132 mW            | No                   | 105                  | 612 mW            | No                   | 288                  | 2442 mW           | No                   | 9.5                  | 5.6               | Yes                  |
| BT        | 6.0                      | 4                       | 5                    | 1.3               | No                   | 57                   | 165 mW            | No                   | 105                  | 645 mW            | No                   | 288                  | 2475 mW           | No                   | 9.5                  | 0.7               | No                   |

## <For Laptop PC Mode>

| Mode      | Max. Tune-up Power (dBm) | Max. Tune-up Power (mW) | Bottom Surface       |                   |                      |
|-----------|--------------------------|-------------------------|----------------------|-------------------|----------------------|
|           |                          |                         | Ant. to Surface (mm) | Calculated Result | Require SAR Testing? |
| WLAN 2.4G | 16.5                     | 45                      | 113                  | 726 mW            | No                   |
| WLAN 5.2G | 13.5                     | 22                      | 113                  | 696 mW            | No                   |
| WLAN 5.3G | 13.5                     | 22                      | 113                  | 695 mW            | No                   |
| WLAN 5.6G | 13.5                     | 22                      | 113                  | 693 mW            | No                   |
| WLAN 5.8G | 13.5                     | 22                      | 113                  | 692 mW            | No                   |
| BT        | 6.0                      | 4                       | 113                  | 725 mW            | No                   |

## 4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

| Test Date     | Tissue Type | Frequency (MHz) | Liquid Temp. (°C) | Measured Conductivity ( $\sigma$ ) | Measured Permittivity ( $\epsilon_r$ ) | Target Conductivity ( $\sigma$ ) | Target Permittivity ( $\epsilon_r$ ) | Conductivity Deviation (%) | Permittivity Deviation (%) |
|---------------|-------------|-----------------|-------------------|------------------------------------|--|----------------------------------|--------------------------------------|----------------------------|----------------------------|
| Jun. 27, 2014 | Body        | 2450            | 21.8              | 1.967                              | 54.087                                 | 1.95                             | 52.7                                 | 0.87                       | 2.63                       |
| Jun. 26, 2014 | Body        | 5200            | 21.6              | 5.217                              | 48.703                                 | 5.30                             | 49.0                                 | -1.57                      | -0.61                      |
| Jun. 27, 2014 | Body        | 5300            | 21.3              | 5.496                              | 47.512                                 | 5.42                             | 48.9                                 | 1.40                       | -2.84                      |
| Jun. 30, 2014 | Body        | 5600            | 21.3              | 5.936                              | 46.737                                 | 5.77                             | 48.5                                 | 2.88                       | -3.64                      |
| Jul. 04, 2014 | Body        | 5800            | 21.3              | 5.952                              | 47.421                                 | 6.00                             | 48.2                                 | -0.80                      | -1.62                      |

### Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within  $\pm 5\%$  of the target values. Liquid temperature during the SAR testing must be within  $\pm 2^\circ\text{C}$ .

## 4.4 System Validation

The SAR measurement system was validated according to procedures in KDB 865664 D01. The validation status in tabulated summary is as below.

| Test Date     | Probe S/N | Calibration Point |      | Measured Conductivity ( $\sigma$ ) | Measured Permittivity ( $\epsilon_r$ ) | Validation for CW |                 |                | Validation for Modulation |             |      |
|---------------|-----------|-------------------|------|------------------------------------|--|-------------------|-----------------|----------------|---------------------------|-------------|------|
|               |           |                   |      |                                    |  | Sensitivity Range | Probe Linearity | Probe Isotropy | Modulation Type           | Duty Factor | PAR  |
| Jun. 27, 2014 | 3590      | Body              | 2450 | 1.967                              | 54.087                                 | Pass              | Pass            | Pass           | OFDM                      | N/A         | Pass |
| Jun. 26, 2014 | 3820      | Body              | 5200 | 5.217                              | 48.703                                 | Pass              | Pass            | Pass           | OFDM                      | N/A         | Pass |
| Jun. 27, 2014 | 3590      | Body              | 5300 | 5.496                              | 47.512                                 | Pass              | Pass            | Pass           | OFDM                      | N/A         | Pass |
| Jun. 30, 2014 | 3590      | Body              | 5600 | 5.936                              | 46.737                                 | Pass              | Pass            | Pass           | OFDM                      | N/A         | Pass |
| Jul. 04, 2014 | 3590      | Body              | 5800 | 5.952                              | 47.421                                 | Pass              | Pass            | Pass           | OFDM                      | N/A         | Pass |

## 4.5 System Verification

The measuring result for system verification is tabulated as below.

| Test Date     | Mode | Frequency (MHz) | 1W Target SAR-1g (W/kg) | Measured SAR-1g (W/kg) | Normalized to 1W SAR-1g (W/kg) | Deviation (%) | Dipole S/N | Probe S/N | DAE S/N |
|---------------|------|-----------------|-------------------------|------------------------|--------------------------------|---------------|------------|-----------|---------|
| Jun. 27, 2014 | Body | 2450            | 50.0                    | 13.1                   | 52.40                          | 4.80          | 716        | 3590      | 579     |
| Jun. 26, 2014 | Body | 5200            | 74.9                    | 7.09                   | 70.90                          | -5.34         | 1018       | 3820      | 1431    |
| Jun. 27, 2014 | Body | 5300            | 75.7                    | 7.34                   | 73.40                          | -3.04         | 1018       | 3590      | 579     |
| Jun. 30, 2014 | Body | 5600            | 80.4                    | 7.57                   | 75.70                          | -5.85         | 1018       | 3590      | 579     |
| Jul. 04, 2014 | Body | 5800            | 74.9                    | 6.95                   | 69.50                          | -7.21         | 1018       | 3590      | 579     |

### Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

## 4.6 Maximum Output Power

### 4.6.1 Maximum Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance is shown as below.

| Mode         | 2.4G WLAN | 5.2G WLAN | 5.3G WLAN | 5.6G WLAN | 5.8G WLAN |
|--------------|-----------|-----------|-----------|-----------|-----------|
| 802.11b      | 16.5      | N/A       | N/A       | N/A       | N/A       |
| 802.11g      | 14.5      | N/A       | N/A       | N/A       | N/A       |
| 802.11a      | N/A       | 13.5      | 13.5      | 13.5      | 13.5      |
| 802.11n HT20 | 13.5      | 12.5      | 12.5      | 13.0      | 12.5      |
| 802.11n HT40 | 13.5      | 12.5      | 12.5      | 13.0      | 12.5      |

| Mode | Bluetooth |
|------|-----------|
| All  | 6.0       |

### 4.6.2 Measured Conducted Power Result

The measuring conducted average power (Unit: dBm) is shown as below.

#### <WLAN 2.4G>

| Mode                      | 802.11b        |          |           |
|---------------------------|----------------|----------|-----------|
| Channel / Frequency (MHz) | 1 (2412)       | 6 (2437) | 11 (2462) |
| Average Power             | 15.66          | 15.93    | 16.12     |
| Mode                      | 802.11g        |          |           |
| Channel / Frequency (MHz) | 1 (2412)       | 6 (2437) | 11 (2462) |
| Average Power             | 13.94          | 14.25    | 14.41     |
| Mode                      | 802.11n (HT20) |          |           |
| Channel / Frequency (MHz) | 1 (2412)       | 6 (2437) | 11 (2462) |
| Average Power             | 12.96          | 13.33    | 13.37     |
| Mode                      | 802.11n (HT40) |          |           |
| Channel / Frequency (MHz) | 3 (2422)       | 6 (2437) | 9 (2452)  |
| Average Power             | 13.01          | 13.21    | 13.29     |

## <WLAN 5.2G>

| Mode                      | 802.11a        |           |           |           |
|---------------------------|----------------|-----------|-----------|-----------|
| Channel / Frequency (MHz) | 36 (5180)      | 40 (5200) | 44 (5220) | 48 (5240) |
| Average Power             | 13.04          | 12.91     | 13.39     | 13.33     |
| Mode                      | 802.11n (HT20) |           |           |           |
| Channel / Frequency (MHz) | 36 (5180)      | 40 (5200) | 44 (5220) | 48 (5240) |
| Average Power             | 12.05          | 12.04     | 12.14     | 12.08     |
| Mode                      | 802.11n (HT40) |           |           |           |
| Channel / Frequency (MHz) | 38 (5190)      |           | 46 (5230) |           |
| Average Power             | 10.68          |           | 11.42     |           |

## <WLAN 5.3G>

| Mode                      | 802.11a        |           |           |           |
|---------------------------|----------------|-----------|-----------|-----------|
| Channel / Frequency (MHz) | 52 (5260)      | 56 (5280) | 60 (5300) | 64 (5320) |
| Average Power             | 13.41          | 12.83     | 12.97     | 12.93     |
| Mode                      | 802.11n (HT20) |           |           |           |
| Channel / Frequency (MHz) | 52 (5260)      | 56 (5280) | 60 (5300) | 64 (5320) |
| Average Power             | 12.17          | 12.01     | 11.88     | 11.83     |
| Mode                      | 802.11n (HT40) |           |           |           |
| Channel / Frequency (MHz) | 54 (5270)      |           | 62 (5310) |           |
| Average Power             | 11.49          |           | 11.42     |           |

## <WLAN 5.6G>

| Mode                      | 802.11a        |            |            |            |            |            |            |            |
|---------------------------|----------------|------------|------------|------------|------------|------------|------------|------------|
| Channel / Frequency (MHz) | 100 (5500)     | 104 (5520) | 108 (5540) | 112 (5560) | 116 (5580) | 132 (5660) | 136 (5680) | 140 (5700) |
| Average Power             | 13.34          | 13.22      | 12.85      | 12.61      | 13.49      | 12.58      | 12.65      | 13.32      |
| Mode                      | 802.11n (HT20) |            |            |            |            |            |            |            |
| Channel / Frequency (MHz) | 100 (5500)     | 104 (5520) | 108 (5540) | 112 (5560) | 116 (5580) | 132 (5660) | 136 (5680) | 140 (5700) |
| Average Power             | 11.79          | 11.92      | 11.89      | 12.78      | 12.42      | 12.41      | 12.32      | 12.38      |
| Mode                      | 802.11n (HT40) |            |            |            |            |            |            |            |
| Channel / Frequency (MHz) | 102 (5510)     |            |            |            | 134 (5670) |            |            |            |
| Average Power             | 11.01          |            |            |            | 10.68      |            |            |            |

## <WLAN 5.8G>

| Mode                      | 802.11a        |            |            |            |            |
|---------------------------|----------------|------------|------------|------------|------------|
| Channel / Frequency (MHz) | 149 (5745)     | 153 (5765) | 157 (5785) | 161 (5805) | 165 (5825) |
| Average Power             | 13.04          | 13.18      | 13.28      | 13.04      | 12.74      |
| Mode                      | 802.11n (HT20) |            |            |            |            |
| Channel / Frequency (MHz) | 149 (5745)     | 153 (5765) | 157 (5785) | 161 (5805) | 165 (5825) |
| Average Power             | 12.15          | 12.33      | 11.75      | 12.12      | 11.61      |
| Mode                      | 802.11n (HT40) |            |            |            |            |
| Channel / Frequency (MHz) | 151 (5755)     |            | 159 (5795) |            |            |
| Average Power             | 11.47          |            | 11.38      |            |            |

## 4.7 SAR Testing Results

### 4.7.1 SAR Results for Body (Separation Distance is 0 cm Gap)

| Plot No. | Band    | Test Position | Ch. | EUT Type | Max. Tune-up Power (dBm) | Measured Conducted Power (dBm) | Scaling Factor | Power Drift (dB) | Measured SAR-1g (W/kg) | Scaled SAR-1g (W/kg) |
|----------|---------|---------------|-----|----------|--------------------------|--------------------------------|----------------|------------------|------------------------|----------------------|
|          | 802.11b | Rear Face     | 11  | Tablet   | 16.5                     | 16.12                          | 1.09           | 0.00             | 0.047                  | 0.05                 |
| 01       | 802.11b | Right Side    | 11  | Tablet   | 16.5                     | 16.12                          | 1.09           | 0.01             | 0.344                  | 0.38                 |
|          | 802.11a | Rear Face     | 44  | Tablet   | 13.5                     | 13.39                          | 1.03           | 0.19             | 0.014                  | 0.01                 |
| 02       | 802.11a | Right Side    | 44  | Tablet   | 13.5                     | 13.39                          | 1.03           | -0.01            | 0.419                  | 0.43                 |
|          | 802.11a | Rear Face     | 52  | Tablet   | 13.5                     | 13.41                          | 1.02           | -0.09            | 0.0155                 | 0.02                 |
| 03       | 802.11a | Right Side    | 52  | Tablet   | 13.5                     | 13.41                          | 1.02           | 0.01             | 0.409                  | 0.42                 |
|          | 802.11a | Rear Face     | 116 | Tablet   | 13.5                     | 13.49                          | 1.00           | 0.00             | 0.014                  | 0.01                 |
|          | 802.11a | Right Side    | 116 | Tablet   | 13.5                     | 13.49                          | 1.00           | -0.06            | 0.487                  | 0.49                 |
| 04       | 802.11a | Right Side    | 100 | Tablet   | 13.5                     | 13.34                          | 1.04           | -0.06            | 0.497                  | 0.52                 |
|          | 802.11a | Right Side    | 140 | Tablet   | 13.5                     | 13.32                          | 1.04           | -0.01            | 0.353                  | 0.37                 |
|          | 802.11a | Rear Face     | 157 | Tablet   | 13.5                     | 13.28                          | 1.05           | 0.01             | 0.000                  | 0.00                 |
| 05       | 802.11a | Right Side    | 157 | Tablet   | 13.5                     | 13.28                          | 1.05           | 0.01             | 0.267                  | 0.28                 |

#### Note:

- According to KDB 248227, when the extrapolated maximum peak SAR for the maximum output power channel is  $\leq 1.6$  W/kg and the 1g averaged SAR is  $\leq 0.8$  W/kg, WLAN SAR testing for other channels is not required.
- SAR testing for 802.11g/n is not required when its maximum power is less than 1/4 dB higher than 802.11b.
- SAR testing for 802.11n is not required when its maximum power is less than 1/4 dB higher than 802.11a.

### 4.7.2 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.

Since all the measured SAR are less than 0.8 W/kg, the repeated measurement is not required.

**Test Engineer :** Mars Chang, and Enzo Chang

## 5. Calibration of Test Equipment

| Equipment                    | Manufacturer | Model   | SN         | Cal. Date     | Cal. Interval |
|------------------------------|--------------|---------|------------|---------------|---------------|
| System Validation Dipole     | SPEAG        | D2450V2 | 716        | Jul. 31, 2013 | 2 Years       |
| System Validation Dipole     | SPEAG        | D5GHzV2 | 1018       | Jul. 24, 2013 | 2 Years       |
| Dosimetric E-Field Probe     | SPEAG        | EX3DV4  | 3590       | Mar. 04, 2014 | 1 Year        |
| Dosimetric E-Field Probe     | SPEAG        | EX3DV4  | 3820       | May 15, 2014  | 1 Year        |
| Data Acquisition Electronics | SPEAG        | DAE3    | 579        | Apr. 23, 2014 | 1 Year        |
| Data Acquisition Electronics | SPEAG        | DAE4    | 1431       | Mar. 24, 2014 | 1 Year        |
| ENA Series Network Analyzer  | Agilent      | E5071C  | MY46214281 | Jun. 13, 2014 | 1 Year        |
| Spectrum Analyzer            | Agilent      | N9010A  | MY53400225 | Sep. 18, 2013 | 1 Year        |
| MXG Analog Signal Generator  | Agilent      | N5182B  | MY53050430 | Nov. 19, 2013 | 1 Year        |
| Power Meter                  | Anritsu      | ML2495A | 1232002    | Aug. 23, 2013 | 1 Year        |
| Power Sensor                 | Anritsu      | MA2411B | 1207325    | Aug. 23, 2013 | 1 Year        |
| Thermometer                  | YFE          | YF-160A | 110600361  | Feb. 27, 2014 | 1 Year        |

## 6. Measurement Uncertainty

| Error Description                    | Uncertainty Value (±%) | Probability Distribution | Divisor | Ci (1g) | Standard Uncertainty (1g) | Vi |
|--------------------------------------|------------------------|--------------------------|---------|---------|---------------------------|----|
| <b>Measurement System</b>            |                        |                          |         |         |                           |    |
| Probe Calibration                    | 6.0                    | Normal                   | 1       | 1       | ± 6.0 %                   | ∞  |
| Axial Isotropy                       | 4.7                    | Rectangular              | √3      | 0.7     | ± 1.9 %                   | ∞  |
| Hemispherical Isotropy               | 9.6                    | Rectangular              | √3      | 0.7     | ± 3.9 %                   | ∞  |
| Boundary Effects                     | 1.0                    | Rectangular              | √3      | 1       | ± 0.6 %                   | ∞  |
| Linearity                            | 4.7                    | Rectangular              | √3      | 1       | ± 2.7 %                   | ∞  |
| System Detection Limits              | 1.0                    | Rectangular              | √3      | 1       | ± 0.6 %                   | ∞  |
| Readout Electronics                  | 0.6                    | Normal                   | 1       | 1       | ± 0.6 %                   | ∞  |
| Response Time                        | 0.0                    | Rectangular              | √3      | 1       | ± 0.0 %                   | ∞  |
| Integration Time                     | 1.7                    | Rectangular              | √3      | 1       | ± 1.0 %                   | ∞  |
| RF Ambient Noise                     | 3.0                    | Rectangular              | √3      | 1       | ± 1.7 %                   | ∞  |
| RF Ambient Reflections               | 3.0                    | Rectangular              | √3      | 1       | ± 1.7 %                   | ∞  |
| Probe Positioner                     | 0.5                    | Rectangular              | √3      | 1       | ± 0.3 %                   | ∞  |
| Probe Positioning                    | 2.9                    | Rectangular              | √3      | 1       | ± 1.7 %                   | ∞  |
| Max. SAR Eval.                       | 2.3                    | Rectangular              | √3      | 1       | ± 1.3 %                   | ∞  |
| <b>Test Sample Related</b>           |                        |                          |         |         |                           |    |
| Device Positioning                   | 3.9                    | Normal                   | 1       | 1       | ± 3.9 %                   | 31 |
| Device Holder                        | 2.7                    | Normal                   | 1       | 1       | ± 2.7 %                   | 19 |
| Power Drift                          | 5.0                    | Rectangular              | √3      | 1       | ± 2.9 %                   | ∞  |
| <b>Phantom and Setup</b>             |                        |                          |         |         |                           |    |
| Phantom Uncertainty                  | 4.0                    | Rectangular              | √3      | 1       | ± 2.3 %                   | ∞  |
| Liquid Conductivity (Target)         | 5.0                    | Rectangular              | √3      | 0.64    | ± 1.8 %                   | ∞  |
| Liquid Conductivity (Meas.)          | 5.0                    | Normal                   | 1       | 0.64    | ± 3.2 %                   | 29 |
| Liquid Permittivity (Target)         | 5.0                    | Rectangular              | √3      | 0.6     | ± 1.7 %                   | ∞  |
| Liquid Permittivity (Meas.)          | 5.0                    | Normal                   | 1       | 0.6     | ± 3.0 %                   | 29 |
| <b>Combined Standard Uncertainty</b> |                        |                          |         |         | ± 11.7 %                  |    |
| <b>Expanded Uncertainty (K=2)</b>    |                        |                          |         |         | ± 23.4 %                  |    |

Uncertainty budget for frequency range 300 MHz to 3 GHz



# FCC SAR Test Report

A D T

| Error Description                    | Uncertainty Value (±%) | Probability Distribution | Divisor | Ci (1g) | Standard Uncertainty (1g) | Vi |
|--------------------------------------|------------------------|--------------------------|---------|---------|---------------------------|----|
| <b>Measurement System</b>            |                        |                          |         |         |                           |    |
| Probe Calibration                    | 6.55                   | Normal                   | 1       | 1       | ± 6.55 %                  | ∞  |
| Axial Isotropy                       | 4.7                    | Rectangular              | √3      | 0.7     | ± 1.9 %                   | ∞  |
| Hemispherical Isotropy               | 9.6                    | Rectangular              | √3      | 0.7     | ± 3.9 %                   | ∞  |
| Boundary Effects                     | 2.0                    | Rectangular              | √3      | 1       | ± 1.2 %                   | ∞  |
| Linearity                            | 4.7                    | Rectangular              | √3      | 1       | ± 2.7 %                   | ∞  |
| System Detection Limits              | 1.0                    | Rectangular              | √3      | 1       | ± 0.6 %                   | ∞  |
| Readout Electronics                  | 0.3                    | Normal                   | 1       | 1       | ± 0.3 %                   | ∞  |
| Response Time                        | 0.8                    | Rectangular              | √3      | 1       | ± 0.5 %                   | ∞  |
| Integration Time                     | 2.6                    | Rectangular              | √3      | 1       | ± 1.5 %                   | ∞  |
| RF Ambient Noise                     | 3.0                    | Rectangular              | √3      | 1       | ± 1.7 %                   | ∞  |
| RF Ambient Reflections               | 3.0                    | Rectangular              | √3      | 1       | ± 1.7 %                   | ∞  |
| Probe Positioner                     | 0.8                    | Rectangular              | √3      | 1       | ± 0.5 %                   | ∞  |
| Probe Positioning                    | 9.9                    | Rectangular              | √3      | 1       | ± 5.7 %                   | ∞  |
| Max. SAR Eval.                       | 4.0                    | Rectangular              | √3      | 1       | ± 2.3 %                   | ∞  |
| <b>Test Sample Related</b>           |                        |                          |         |         |                           |    |
| Device Positioning                   | 3.9                    | Normal                   | 1       | 1       | ± 3.9 %                   | 31 |
| Device Holder                        | 2.7                    | Normal                   | 1       | 1       | ± 2.7 %                   | 19 |
| Power Drift                          | 5.0                    | Rectangular              | √3      | 1       | ± 2.9 %                   | ∞  |
| <b>Phantom and Setup</b>             |                        |                          |         |         |                           |    |
| Phantom Uncertainty                  | 4.0                    | Rectangular              | √3      | 1       | ± 2.3 %                   | ∞  |
| Liquid Conductivity (Target)         | 5.0                    | Rectangular              | √3      | 0.64    | ± 1.8 %                   | ∞  |
| Liquid Conductivity (Meas.)          | 5.0                    | Normal                   | 1       | 0.64    | ± 3.2 %                   | 30 |
| Liquid Permittivity (Target)         | 5.0                    | Rectangular              | √3      | 0.6     | ± 1.7 %                   | ∞  |
| Liquid Permittivity (Meas.)          | 5.0                    | Normal                   | 1       | 0.6     | ± 3.0 %                   | 30 |
| <b>Combined Standard Uncertainty</b> |                        |                          |         |         | ± 13.4 %                  |    |
| <b>Expanded Uncertainty (K=2)</b>    |                        |                          |         |         | ± 26.8 %                  |    |

Uncertainty budget for frequency range 3 GHz to 6 GHz

## FCC SAR Test Report

### 7. Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

The road map of all our labs can be found in our web site also.

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## **Appendix A. SAR Plots of System Verification**

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

**System Check\_B2450\_140627****DUT: Dipole 2450 MHz; Type: D2450V2; SN: 716**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: B24T25N1\_0627 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.967$  S/m;  $\epsilon_r = 54.087$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 22.3°C; Liquid Temperature : 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.72, 7.72, 7.72); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 20.3 W/kg

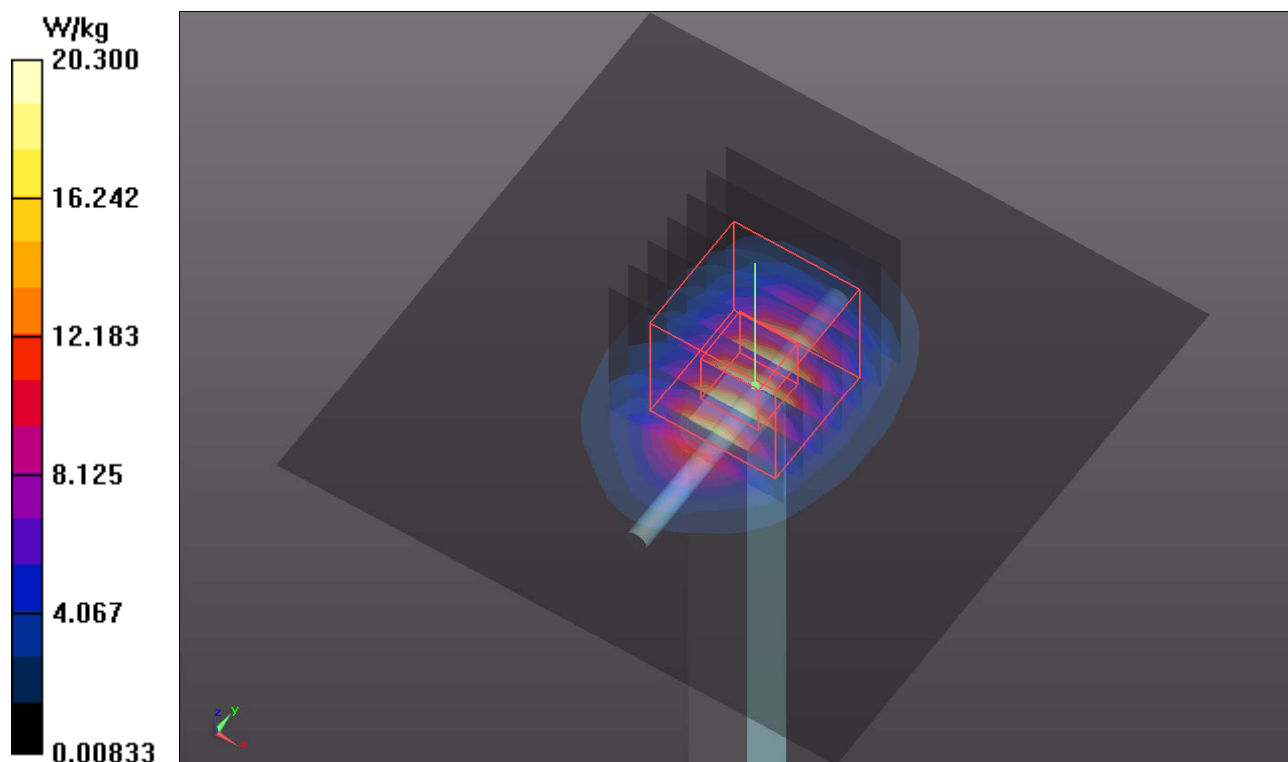
**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.2 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 28.2 W/kg

**SAR(1 g) = 13.1 W/kg; SAR(10 g) = 5.96 W/kg**

Maximum value of SAR (measured) = 20.5 W/kg



## System Check\_B5200\_140626

**DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1018**

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: B50T60N2\_0626 Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.217$  S/m;  $\epsilon_r = 48.703$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 22.3 °C ; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.44, 4.44, 4.44); Calibrated: 2014/05/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1431; Calibrated: 2014/03/24
- Phantom: Flat Phantom ELI 5.0\_Front; Type: QDOVA001BB; Serial: SN:1204
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=100mW/Area Scan (91x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 14.8 W/kg

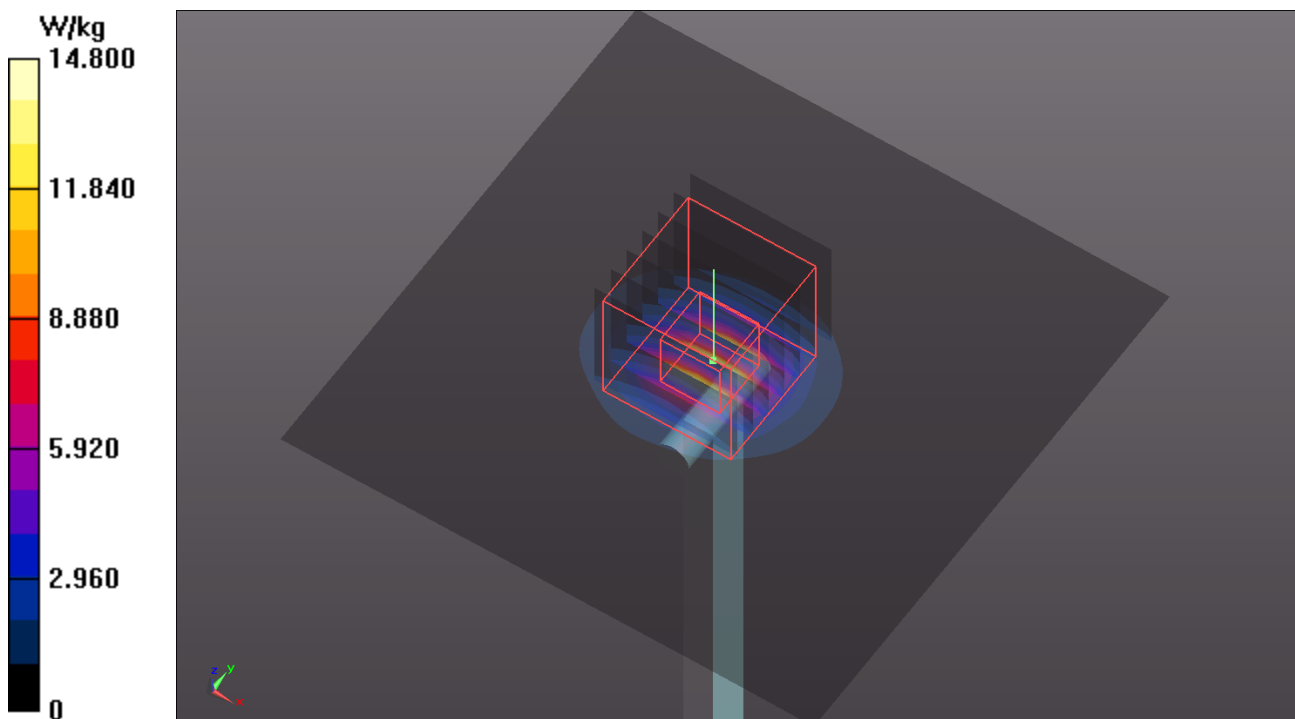
**Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 55.14 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 28.9 W/kg

**SAR(1 g) = 7.09 W/kg; SAR(10 g) = 2.01 W/kg**

Maximum value of SAR (measured) = 14.8 W/kg



**System Check\_B5300\_140627****DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1018**

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B50T60N2\_0627 Medium parameters used:  $f = 5300$  MHz;  $\sigma = 5.496$  S/m;  $\epsilon_r = 47.512$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 21.9°C; Liquid Temperature : 21.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.92, 4.92, 4.92); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=100mW/Area Scan (91x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 14.6 W/kg

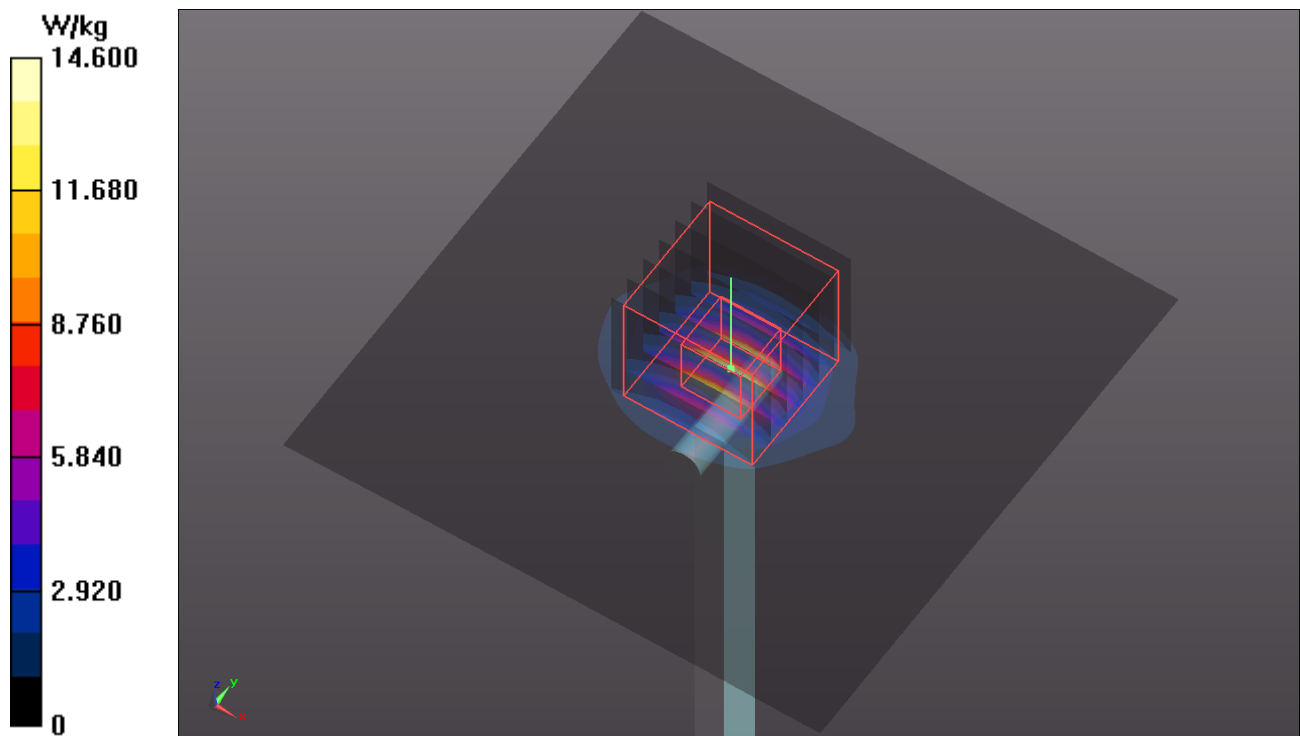
**Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 57.20 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 31.2 W/kg

**SAR(1 g) = 7.34 W/kg; SAR(10 g) = 2.04 W/kg**

Maximum value of SAR (measured) = 15.7 W/kg



**System Check\_B5600\_140630****DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1018**

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: B50T60N2\_0630 Medium parameters used:  $f = 5600$  MHz;  $\sigma = 5.936$  S/m;  $\epsilon_r = 46.737$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 22.2°C; Liquid Temperature : 21.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.62, 4.62, 4.62); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=100mW/Area Scan (91x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 15.8 W/kg

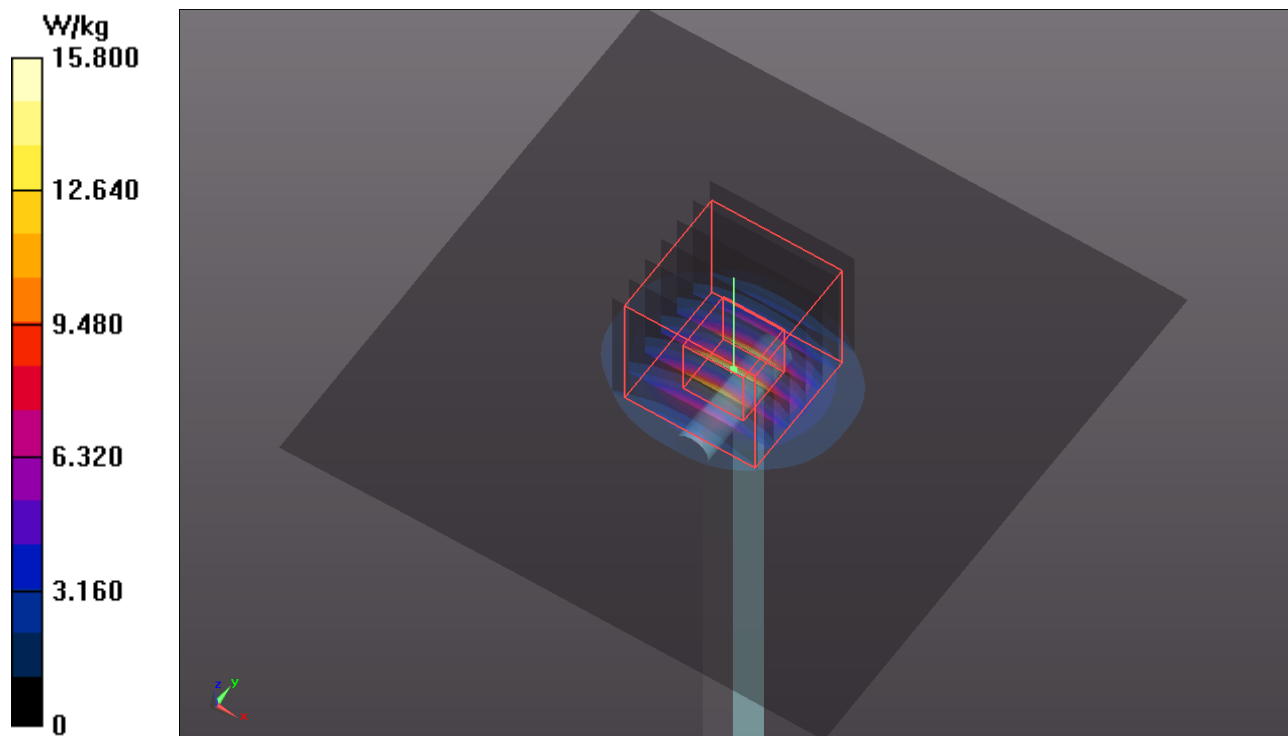
**Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 56.10 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 34.9 W/kg

**SAR(1 g) = 7.57 W/kg; SAR(10 g) = 2.1 W/kg**

Maximum value of SAR (measured) = 16.2 W/kg



**System Check\_B5800\_140704****DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1018**

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: B50T60N1\_0704 Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.952$  S/m;  $\epsilon_r = 47.421$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 21.7°C; Liquid Temperature : 21.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.74, 4.74, 4.74); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=100mW/Area Scan (91x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 14.8 W/kg

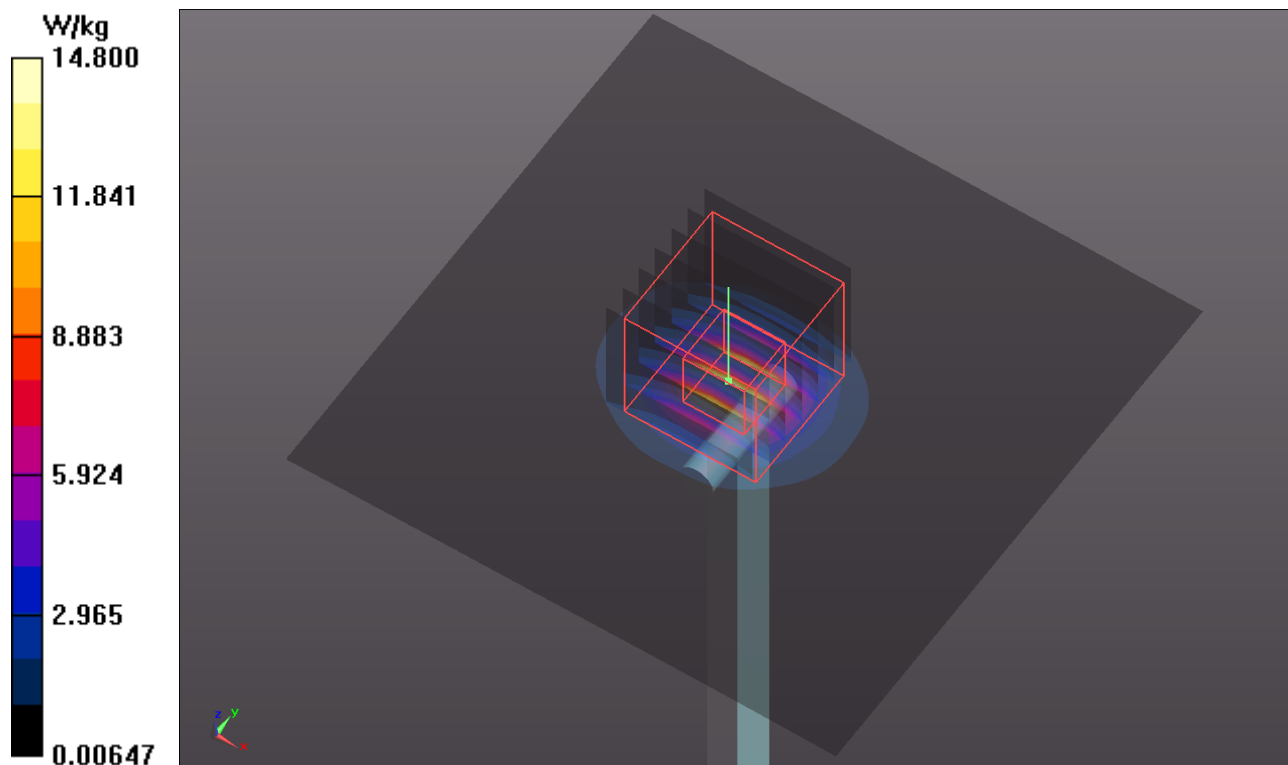
**Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 54.16 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 30.0 W/kg

**SAR(1 g) = 6.95 W/kg; SAR(10 g) = 1.98 W/kg**

Maximum value of SAR (measured) = 14.6 W/kg







### Appendix B. SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

**P01 802.11b\_Right Side\_0cm\_Ch11\_Tablet Mode****DUT: 140611C22**

Communication System: WLAN\_2.4G; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: B24T25N1\_0627 Medium parameters used:  $f = 2462$  MHz;  $\sigma = 1.982$  S/m;  $\epsilon_r = 54.048$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 22.3°C; Liquid Temperature : 21.8°C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3590; ConvF(7.72, 7.72, 7.72); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**- Area Scan (71x191x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.509 W/kg

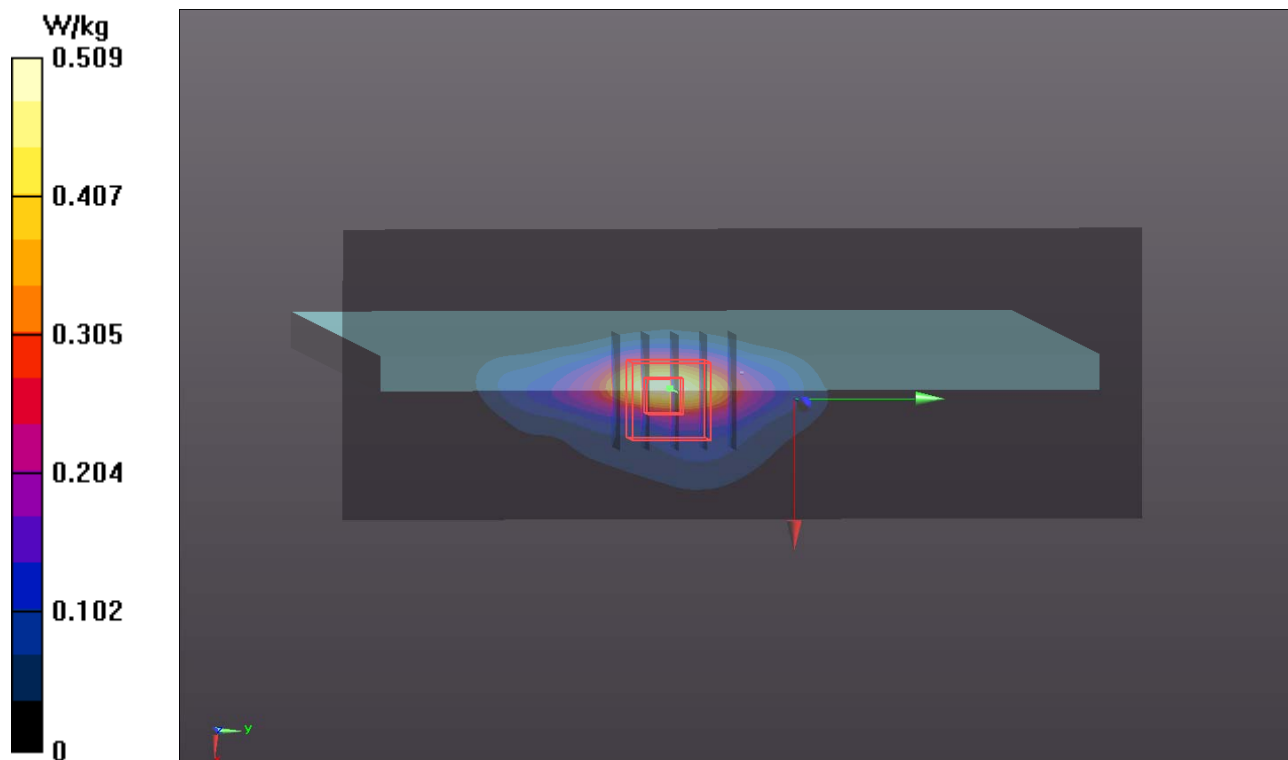
**- Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.00 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.745 W/kg

**SAR(1 g) = 0.344 W/kg; SAR(10 g) = 0.148 W/kg**

Maximum value of SAR (measured) = 0.556 W/kg



**P02 802.11a\_Right Side\_0cm\_Ch44\_Tablet Mode****DUT: 140611C22**

Communication System: WLAN\_5G; Frequency: 5220 MHz; Duty Cycle: 1:1.21

Medium: B50T60N2\_0626 Medium parameters used:  $f = 5220$  MHz;  $\sigma = 5.232$  S/m;  $\epsilon_r = 48.554$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 22.3 °C ; Liquid Temperature : 21.6 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3820; ConvF(4.44, 4.44, 4.44); Calibrated: 2014/05/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1431; Calibrated: 2014/03/24
- Phantom: Flat Phantom ELI 5.0\_Front; Type: QDOVA001BB; Serial: SN:1204
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

- **Area Scan (61x221x1):** Interpolated grid:  $dx=1.000$  mm,  $dy=1.000$  mm

Maximum value of SAR (interpolated) = 0.577 W/kg

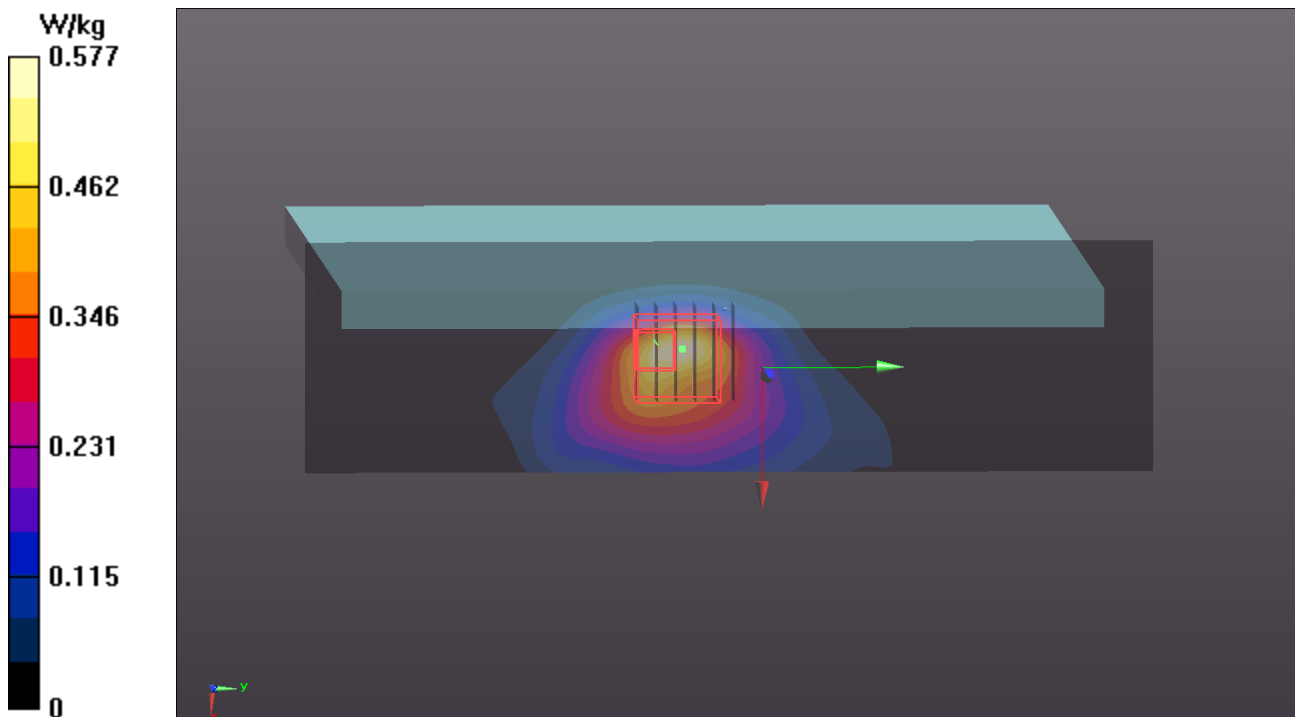
- **Zoom Scan (6x6x12)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=2$ mm

Reference Value = 5.931 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.99 W/kg

**SAR(1 g) = 0.419 W/kg; SAR(10 g) = 0.145 W/kg**

Maximum value of SAR (measured) = 0.784 W/kg



**P03 802.11a\_Right Side\_0cm\_Ch52\_Tablet Mode****DUT: 140611C22**

Communication System: WLAN\_5G; Frequency: 5260 MHz; Duty Cycle: 1:1.2

Medium: B50T60N2\_0627 Medium parameters used:  $f = 5260$  MHz;  $\sigma = 5.425$  S/m;  $\epsilon_r = 47.593$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 21.9°C; Liquid Temperature : 21.3°C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3590; ConvF(4.92, 4.92, 4.92); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**- Area Scan (81x221x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.632 W/kg

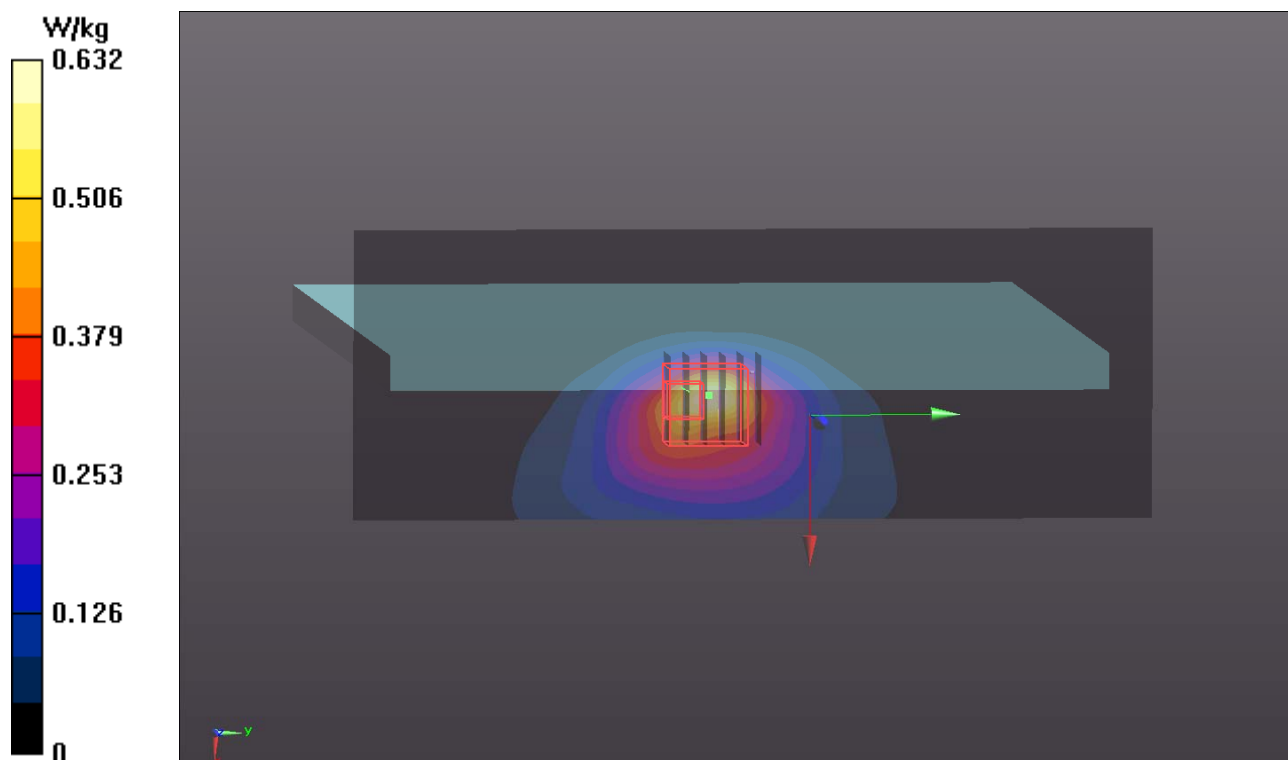
**- Zoom Scan (6x6x12)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 5.777 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.68 W/kg

**SAR(1 g) = 0.409 W/kg; SAR(10 g) = 0.139 W/kg**

Maximum value of SAR (measured) = 0.739 W/kg



**P04 802.11a\_Right Side\_0cm\_Ch100\_Tablet Mode****DUT: 140611C22**

Communication System: WLAN\_5G; Frequency: 5500 MHz; Duty Cycle: 1:1.19

Medium: B50T60N2\_0630 Medium parameters used:  $f = 5500$  MHz;  $\sigma = 5.779$  S/m;  $\epsilon_r = 46.963$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 22.2°C; Liquid Temperature : 21.3°C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3590; ConvF(4.64, 4.64, 4.64); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**- Area Scan (81x221x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.576 W/kg

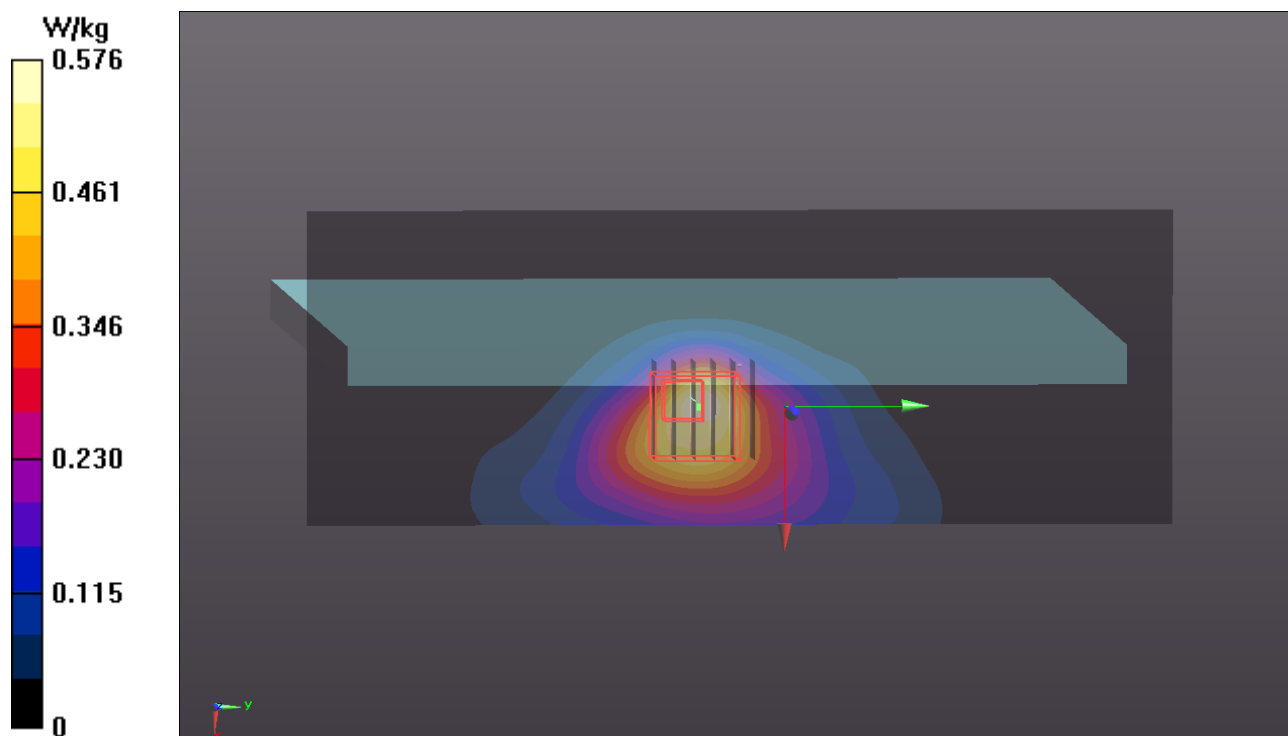
**- Zoom Scan (6x6x12)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 6.929 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 2.22 W/kg

**SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.177 W/kg**

Maximum value of SAR (measured) = 0.936 W/kg



**P05 802.11a\_Right Side\_0cm\_Ch157\_Tablet Mode****DUT: 140611C22**

Communication System: WLAN\_5G; Frequency: 5785 MHz; Duty Cycle: 1:1.21

Medium: B50T60N1\_0704 Medium parameters used:  $f = 5785$  MHz;  $\sigma = 5.928$  S/m;  $\epsilon_r = 47.619$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 21.7°C; Liquid Temperature : 21.3°C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3590; ConvF(4.74, 4.74, 4.74); Calibrated: 2014/03/04;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2014/04/23
- Phantom: ELI v4.0\_Left; Type: QDOVA001BB; Serial: TP:1039
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**- Area Scan (41x221x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.676 W/kg

**- Zoom Scan (6x6x12)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=2mm

Reference Value = 9.567 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.06 W/kg

**SAR(1 g) = 0.267 W/kg; SAR(10 g) = 0.096 W/kg**

Maximum value of SAR (measured) = 0.521 W/kg

