



Test report No:

**NIE: 46071RRF.004**

## Test report

### REFERENCE STANDARDS:

FCC 47CFR Part 2.1093, Published RF Exposure KDB Procedures,  
IEEE Std 1528:2013, IEEE Std C95-3:2002,  
IEEE Std C95-1:2005, IC RSS -102 Issue 5:2015

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identification of item tested.....:       | INTEL DUAL BAND WIRELESS – AC 8260                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Trade .....                               | INTEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Model and /or type reference .....        | 8260D2W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Other identification of the product ..... | FCC ID: PD98260D2<br>IC ID: 1000M-8260D2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Final HW version .....                    | Engineering Sample                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Final SW version .....                    | --                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Features .....                            | 802.11 a/b/g/n/ac Wireless LAN + BT 4.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Manufacturer.....:                        | INTEL MOBILE COMMUNICATIONS<br>100 Center Point Circle, Suite 200<br>Columbia, South Carolina 29210 USA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Test method requested, standard.....:     | <ol style="list-style-type: none"> <li>1. FCC 47 CFR Part 2.1093. (10-1-14 Edition) Radiofrequency radiation exposure evaluation: portable devices.</li> <li>2. IEEE Std. 1528 (2013) – Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurements Techniques</li> <li>3. IEEE Std. C95-3 (2002) – IEEE Recommended Practice for Measurement and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to Such Fields, 100 kHz-300GHz.</li> <li>4. IEEE Std. C95-1(2005) – IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.</li> <li>5. FCC OET KDB 447498 D01 General RF Exposure Guidance v05r02 (February 2014)</li> <li>6. FCC OET KDB 865664 D01 v01r03 – SAR Measurement Requirements for 100 MHz to 6 GHz (February 2014).</li> <li>7. FCC OET KDB 248227 D01 802.11 Wi-Fi SAR v02 (March 2015).</li> </ol> |

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                    |                                                                                     |                                                                    |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|
|                                                            | <p>8. IC RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)</p> <p>9. Canada's Safety Code No.6 – Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                    |                                                                                     |                                                                    |
| <p>Summary .....</p>                                       | <p>Considering the results of the performed test according to FCC 47CFR Part 2.1093, the item under test is IN COMPLIANCE with the requested specifications specified in the standards.</p> <p>The maximum 1g volume averaged SAR found during this test has been 0.719 W/kg, at minimum 12 mm separation distance, for 802.11a mode, in the 5.2 GHz frequency band.</p> <p>The maximum 1g volume averaged SAR for MIMO transmission found during this test has been 1.434 W/kg.</p> <p>NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".</p> |                                                                    |                                                                                     |                                                                    |
| <p>Approved by (name / position &amp; signature) .....</p> | <table border="0"> <tr> <td data-bbox="708 936 943 1056"> <p>A. Llamas<br/>RF Lab. Manager</p> </td> <td data-bbox="943 936 1154 1056">  </td> <td data-bbox="1154 936 1399 1056"> <p>Firmado digitalmente<br/>por Alejandro Llamas<br/>Rodríguez</p> </td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                            | <p>A. Llamas<br/>RF Lab. Manager</p>                               |  | <p>Firmado digitalmente<br/>por Alejandro Llamas<br/>Rodríguez</p> |
| <p>A. Llamas<br/>RF Lab. Manager</p>                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>Firmado digitalmente<br/>por Alejandro Llamas<br/>Rodríguez</p> |                                                                                     |                                                                    |
| <p>Date of issue .....</p>                                 | <table border="0"> <tr> <td data-bbox="708 1066 943 1136"> <p>2015-06-11</p> </td> <td data-bbox="943 1066 1399 1136"> <p>Fecha: 2015.06.11<br/>15:20:12 +02'00'</p> </td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>2015-06-11</p>                                                  | <p>Fecha: 2015.06.11<br/>15:20:12 +02'00'</p>                                       |                                                                    |
| <p>2015-06-11</p>                                          | <p>Fecha: 2015.06.11<br/>15:20:12 +02'00'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                    |                                                                                     |                                                                    |
| <p>Report template No.....</p>                             | <p>FDT08_16</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                    |                                                                                     |                                                                    |

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## Competences and guarantees

AT4 wireless is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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## General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

## Uncertainty

Uncertainty (factor  $k=2$ ) was calculated according to the following documents:

1. FCC OET KDB 865664 D01 - SAR Measurement 100 MHz to 6 GHz (February 2014).

## Usage of samples

Samples undergoing test have been selected by: the client

Sample M/01 is composed of the following elements:

| Control N° | Description       | Model           | Serial N°  | Date of reception |
|------------|-------------------|-----------------|------------|-------------------|
| 46071/01   | Laptop PC         | E5440           | JBSYN32    | 23/04/2015        |
| 46071/02   | Test Board        | 8260 Test Board | -          | 23/04/2015        |
| 46071/04   | WiFi & BT module  | 8260 D2W        | -          | 23/04/2015        |
| 46071/12   | Socket adapter    | D2W             | -          | 23/04/2015        |
| 46071/13   | Reference antenna | SkyCross        | Wimax/WLAN | 23/04/2015        |
| 46071/14   | Reference antenna | SkyCross        | Wimax/WLAN | 23/04/2015        |

1. Sample M/01 has undergone the test(s) specified in subclause "Test method requested".

## Test sample description

The test sample consists of a WiFi & BT module.

## Identification of the client

INTEL MOBILE COMMUNICATIONS

100 Center Point Circle, Suite 200

Columbia, South Carolina 29210 USA

Contact person: Steve Hackett

Telephone: Tel: 803-216-2344

e-mail: steven.c.hackett@intel.com

## Testing period

The performed test started on 2015-05-15 and finished on 2015-05-28.

The tests have been performed at AT4 wireless.

## Environmental conditions

In the laboratory for measurements, the following limits were not exceeded during the test:

|                   |                                    |
|-------------------|------------------------------------|
| Temperature       | Min. = 21.15 °C<br>Max. = 24.84 °C |
| Relative humidity | Min. = 40.90 %<br>Max. = 61.17 %   |

## Remarks and comments

- 1: Testing of other required channels is not required according to FCC OET KDB 447498 D01 General RF Exposure Guidance v05r02, paragraph “4.3.3. SAR test reduction considerations”.
- 2: Testing is not required for this subsequent test configuration according to FCC OET KDB 248227 D01 802.11 Wi-Fi SAR v02, paragraph “5.3.4. Subsequent Test Configuration Procedures”.
- 3: Only the test position with the highest measured SAR for this frequency band has been tested, due to testing reductions mentioned in FCC OET KDB 447498 D01 General RF Exposure Guidance v05r02 (February 2014).
- 4: Only the plots of the highest reported SAR for each test position and mode/band are included in appendix C.

## Used instrumentation

1. Dosimetric E-field probes SPEAG ES3DV3 and SPEAG EX3DV4
2. Data acquisition device SPEAG DAE4
3. Electro-optical converter SPEAG EOC3
4. 2450 MHz dipole validation kit SPEAG D2450V2
5. 5000 MHz dipole validation kit SPEAG D5GHzV2
6. Robot Stäubli RX60BL
7. Robot controller Stäubli CM7MB
8. SAR measurement software SPEAG DASY52 V52.8.8.1222
9. SAR post processing software SPEAG SEMCAD X
10. Measurement server SPEAG DASY5 SE UMS 011 BS
11. Oval flat phantom SPEAG ELI 4
12. Body Tissue Equivalent Liquids for 2450MHz and 5GHz bands
13. Vector network analyzer Agilent E5071C.
14. Dielectric probe kit SPEAG DAK-3.5
15. Power meter R&S NRVD and power sensor R&S NRV-Z51
16. RF Generator R&S SMU200A
17. DC Power supply Agilent U8002A
18. Dual directional coupler NARDA FSCM 99899
19. Power amplifier MITEQ AMF-4D-00400600-50-30P
20. Handset positioner SPEAG Device Holder
21. Anritsu MT8852A Bluetooth testing unit.

## Testing verdicts

|                             |     |
|-----------------------------|-----|
| <b>Not applicable</b> ..... | N/A |
| <b>Pass</b> .....           | P   |
| <b>Fail</b> .....           | F   |
| <b>Not measured</b> .....   | N/M |

### 2450 MHz band

| FCC 47CFR Part 2.1093 Paragraph | VERDICT |   |   |                 |
|---------------------------------|---------|---|---|-----------------|
|                                 | NA      | P | F | NM              |
| (d)(2) 802.11b                  |         | P |   |                 |
| (d)(2) 802.11g                  |         |   |   | NM <sup>2</sup> |
| (d)(2) 802.11n                  |         | P |   |                 |
| (d)(2) Bluetooth                |         | P |   |                 |

2: See Remarks and Comments.

### 5200 MHz band

| FCC 47CFR Part 2.1093 Paragraph | VERDICT |   |   |                 |
|---------------------------------|---------|---|---|-----------------|
|                                 | NA      | P | F | NM              |
| (d)(2) 802.11a                  |         | P |   |                 |
| (d)(2) 802.11g                  |         |   |   | NM <sup>2</sup> |
| (d)(2) 802.11n                  |         | P |   |                 |
| (d)(2) 802.11ac                 |         | P |   |                 |

2: See Remarks and Comments.

### 5300 MHz band

| FCC 47CFR Part 2.1093 Paragraph | VERDICT |   |   |                 |
|---------------------------------|---------|---|---|-----------------|
|                                 | NA      | P | F | NM              |
| (d)(2) 802.11a                  |         | P |   |                 |
| (d)(2) 802.11g                  |         |   |   | NM <sup>2</sup> |
| (d)(2) 802.11n                  |         | P |   |                 |
| (d)(2) 802.11ac                 |         | P |   |                 |

2: See Remarks and Comments.

5500 MHz band

| FCC 47CFR Part 2.1093 Paragraph | VERDICT         |   |   |    |
|---------------------------------|-----------------|---|---|----|
|                                 | NA              | P | F | NM |
| (d)(2) 802.11a                  | P               |   |   |    |
| (d)(2) 802.11g                  | NM <sup>2</sup> |   |   |    |
| (d)(2) 802.11n                  | P               |   |   |    |
| (d)(2) 802.11ac                 | P               |   |   |    |

2: See Remarks and Comments.

5800 MHz band

| FCC 47CFR Part 2.1093 Paragraph | VERDICT         |   |   |    |
|---------------------------------|-----------------|---|---|----|
|                                 | NA              | P | F | NM |
| (d)(2) 802.11a                  | P               |   |   |    |
| (d)(2) 802.11g                  | NM <sup>2</sup> |   |   |    |
| (d)(2) 802.11n                  | P               |   |   |    |
| (d)(2) 802.11ac                 | P               |   |   |    |

2: See Remarks and Comments.

## Appendix A – Test configuration

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## 1. GENERAL INTRODUCTION

### 1.1. Application Standard

The Federal Communications Commission (FCC) sets the limits for General Population / Uncontrolled exposure to radio frequency electromagnetic fields for transmitting devices designed to be used within 20 centimetres of the body of the user under FCC 47 CFR Part 2.1093 - “Radiofrequency radiation exposure evaluation: portable devices”, paragraph (d)(2).

### 1.2. General requirements

The SAR measurement has been performed continuing the following considerations and environment conditions:

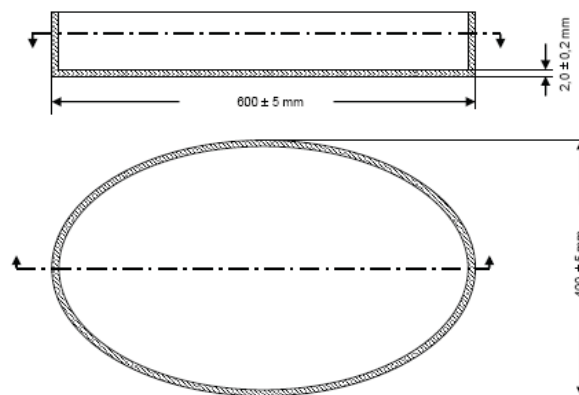
- The ambient temperature shall be in the range of 18°C to 25°C and the variation shall not exceed +/- 2°C during the test.
- The ambient humidity shall be in the range of and 30% - 70%.
- The device battery shall be fully charged before each measurement.

### 1.3. Measurement system requirements

The measurement system used for SAR tests fulfils the procedural and technical requirements described at the reference standards used.

### 1.4. Phantom requirements

The phantom model for body measurements is an elliptical open-top container with a flat bottom, with the following shape and dimension:



**Figure 1:** Proportions and shape of Phantom shell

### 1.5. Measurement Liquids requirements.

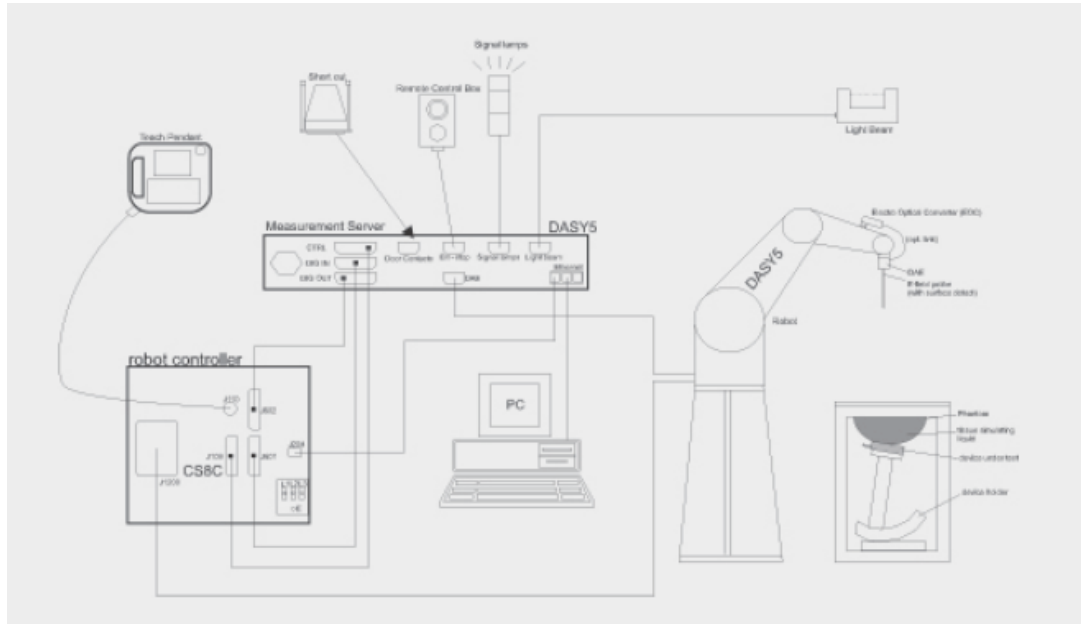
The liquids used to simulate the human tissues, must fulfils the requirements of the dielectric properties required. These target dielectric properties per FCC OET KDB 450824 instructions come from the dipole and probe calibration data which are included in Appendix B, Section 3, of this document.

To minimize the effect of reflections on peak spatial-average SAR values, from the upper surface of the tissue-equivalent liquid, the depth of the liquid should be at least 15 cm.

## 2. MEASUREMENT SYSTEM

### 2.1. Measurement System

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



**Figure 2:** SAR Measurement system

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

| Manufacturer                    | Device                            | Type                   |
|---------------------------------|-----------------------------------|------------------------|
| Schmid & Partner Engineering AG | Dosimetric E-Field Probe          | ES3DV3                 |
| Schmid & Partner Engineering AG | Dosimetric E-Field Probe          | EX3DV4                 |
| Schmid & Partner Engineering AG | Data Acquisition Electronics      | DAE4                   |
| Schmid & Partner Engineering AG | Electro-Optical Converter         | EOC3                   |
| Stäubli                         | Robot                             | RX60BL                 |
| Stäubli                         | Robot controller                  | CS7MB                  |
| Schmid & Partner Engineering AG | Measurement Server                | DASY5 SE UMS 011 BS    |
| Schmid & Partner Engineering AG | Oval flat phantom                 | SPEAG ELI 4            |
| Schmid & Partner Engineering AG | Handset Positioner                | SD000 HD1HA            |
| Schmid & Partner Engineering AG | Measurement Software              | DASY52 V52.8.8.1222    |
| Schmid & Partner Engineering AG | Postprocessing Software           | SEMCAD X               |
| Rohde & Schwarz                 | RF Generator                      | SMU 200A               |
| MITEQ                           | Power amplifier                   | AMF-4D-00400600-50-30P |
| Agilent                         | DC Power supply                   | U8002A                 |
| NARDA                           | Directional coupler               | FSCM 99899             |
| Weinschel                       | 6dB attenuator                    | 75A-6-11               |
| Weinschel                       | 20 dB attenuator                  | 75A-20-11              |
| Rohde & Schwarz                 | Power Meter & Power Sensor        | NRVD & NRV-Z51         |
| Agilent                         | Power Meter                       | E4419B                 |
| Schmid & Partner Engineering AG | 2450 MHz System Validation Dipole | D2450V2                |
| Schmid & Partner Engineering AG | 5000 MHz System Validation Dipole | D5GHzV2                |
| Agilent                         | Vector Network Analyser           | E5071C                 |
| Schmid & Partner Engineering AG | Dielectric Probe Kit              | DAK-3.5                |

**Table 1:** Measurement Equipment

## DOSIMETRIC E-FIELD PROBE

### ES3DV3

#### Isotropic E-Field Probe for Dosimetric Measurements

|                                                                                   |                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Symmetrical design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| Calibration                                                                       | ISO/IEC 17025                                                                                                                                                                      |
| Frequency                                                                         | 10 MHz to 4 GHz;<br>Linearity: $\pm 0.2$ dB (30 MHz to 4 GHz)                                                                                                                      |
| Directivity                                                                       | $\pm 0.2$ dB in TSL (rotation around probe axis)<br>$\pm 0.3$ dB in TSL (rotation normal to probe axis)                                                                            |
| Dynamic Range                                                                     | 5 $\mu$ W/g to > 100 mW/g;<br>Linearity: $\pm 0.2$ dB                                                                                                                              |
| Dimensions                                                                        | 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                                                     |

## DOSIMETRIC E-FIELD PROBE

### EX3DV4

#### Smallest Isotropic E-Field Probe for Dosimetric Measurements

|                                                                                    |                                                                                                                                                             |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| Calibration                                                                        | ISO/IEC 17025                                                                                                                                               |
| Frequency                                                                          | 10 MHz to > 6 GHz<br>Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)                                                                                              |
| Directivity                                                                        | $\pm 0.3$ dB in TSL (rotation around probe axis)<br>$\pm 0.5$ dB in TSL (rotation normal to probe axis)                                                     |
| Dynamic Range                                                                      | 10 $\mu$ W/g to > 100 mW/g<br>Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)                                                                      |
| Dimensions                                                                         | 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                        |

## DATA ACQUISITION ELECTRONICS

### DAE4 - Data Acquisition Electronics

|                                                                                     |                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Signal amplifier, multiplexer, A/D converter, and control logic<br>Serial optical link for communication with DASY4/5 embedded system (fully remote controlled)<br>Two-step probe touch detector for mechanical surface detection and emergency robot stop |
| Measurement Range                                                                   | -100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)                                                                                                                                                                                     |
| Input Offset Voltage                                                                | < 5 $\mu$ V (with auto zero)                                                                                                                                                                                                                               |
| Input Resistance                                                                    | 200 MOhm                                                                                                                                                                                                                                                   |
| Input Bias Current                                                                  | < 50 fA                                                                                                                                                                                                                                                    |

## OVAL FLAT PHANTOM

| ELI                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>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.</p> <p>ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.</p> |
|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Material</b>                                                                   | Vinylester, glass fiber reinforced (VE-GF)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Liquid Compatibility</b>                                                       | Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Shell Thickness</b>                                                            | 2.0 ± 0.2 mm (bottom plate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Dimensions</b>                                                                 | Major axis: 600 mm<br>Minor axis: 400 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Filling Volume</b>                                                             | approx. 30 liters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Wooden Support</b>                                                             | SPEAG standard phantom table                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## HANDSET POSITIONER

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Mounting Device for Hand-Held Transmitters</b></p> <p>In combination with the Twin SAM V5.0/V5.0c or ELI Phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).</p> <p><b>Material:</b> Polyoxymethylene (POM)</p> |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## DIPOLES

| System Validation Kits 300 MHz – 6 GHz                                              |                                                                                                                                                                                       |                      |                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------|
|  | <p>Symmetrical dipole with 1/4 balun<br/>Enables measurement of feedpoint impedance with NWA<br/>Matched for use near flat phantoms filled with tissue simulating solutions</p>       |                      |                       |
|                                                                                     |                                                                                                                                                                                       |                      |                       |
| <b>Calibration</b>                                                                  | ISO/IEC 17025                                                                                                                                                                         |                      |                       |
| <b>Frequency</b>                                                                    | 300, 400, 450, 600, 733, 750, 835, 850, 900, 1300, 1450, 1500, 1640, 1750, 1800, 1900, 1950, 2000, 2100, 2300, 2450, 2550, 2600, 3000, 3300, 3500, 3700 MHz and D5GHz (5100-5800 MHz) |                      |                       |
| <b>Return Loss</b>                                                                  | > 20 dB at specified validation position                                                                                                                                              |                      |                       |
| <b>Power Capability</b>                                                             | > 100 W (f < 1GHz); > 40 W (f > 1GHz)                                                                                                                                                 |                      |                       |
| <b>Dimensions (length and overall height in mm)</b>                                 | <b>Product</b>                                                                                                                                                                        | <b>Dipole length</b> | <b>Overall height</b> |
|                                                                                     | D750V3                                                                                                                                                                                | 179.0                | 330.0                 |
|                                                                                     | D900V2                                                                                                                                                                                | 148.5                | 340.0                 |
|                                                                                     | D1800V2                                                                                                                                                                               | 72.5                 | 300.0                 |
|                                                                                     | D2000V2                                                                                                                                                                               | 65.0                 | 300.0                 |
|                                                                                     | D2450V2                                                                                                                                                                               | 52.0                 | 290.0                 |
|                                                                                     | D2600V2                                                                                                                                                                               | 49.2                 | 290.0                 |
|                                                                                     | D5GHzV2                                                                                                                                                                               | 20.6                 | 300.0                 |

## **2.2. Test Positions of device relative to body**

The transmitter was tested using a representative antenna at different orientations relative to the phantom surface, in order to find the orientation with the highest measured SAR value. The test separation distance from the antenna to the phantom surface was 12 mm.

The transmitter was placed more than 15 cm away from the phantom to avoid interferences.

## **2.3. Test to be performed**

Using a host laptop to configure the transmitter, all transmission modes were measured at the reference distance (12 mm) to confirm that the highest measured SAR value was  $\leq 0.8$  W/kg.

## **2.4. Description of interpolation/extrapolation scheme**

The local SAR inside the Phantom is measured using small dipole sensing elements inside a probe element. The probe tip must not be in contact with the Phantom's surface in order to minimise measurement errors, but the highest local SAR is obtained from measurements at a certain distance from the shell through extrapolation. The accurate assessment of the maximum SAR averaged over 1 gr and 10 gr. requires a very fine resolution in the three dimensional scanned data array. Since the measurements have to be performed over a limited time, the measured data have to be interpolated to provide an array of sufficient resolution.

The interpolation of 2D area scan is used after the initial area scan, at a fixed distance from the Phantom shell wall. The initial scan data is collected with approx. 15 mm spatial resolution and this interpolation is used to find the location of the local maximum for positioning the subsequent 3D scanning within a 1 mm resolution.

For the 3D scan, data is collected on a spatially regular 3D grid having 5 mm steps in both directions. After the data collection by the SAR probe, the data are extrapolated in the depth direction to assign values to points in the 3D array closer to the shell wall. A notional extrapolation value is also assigned to the first point outside the shell wall so that subsequent interpolation schemes will be applicable right up to the shell wall boundary.

## **2.5. Determination of the largest peak spatial-average SAR**

To determine the maximum value of the peak spatial-average SAR of a EUT, all device positions, configurations and operational modes should be tested for each frequency band.

The averaging volume shall be chosen as 1gr. of contiguous tissue. The cubic volumes, over which the SAR measurements are averaged after extrapolation and interpolation, are chosen in order to include the highest values of local SAR.

The maximum SAR level for the EUT will be the maximum level obtained of the performed measurements, and indicated in the previous points.

## **2.6. System Validation**

Prior to the SAR measurements, system verification is done to verify the system accuracy. A complete SAR evaluation is done using a half-wavelength dipole as source with the frequency of the mid-band channel of the operating band, or within 10% of this channel.

The measured 1 gr. and 10 gr. SAR should be within 10% of the expected target values specified in the calibration certificate of the dipole, for the specific tissue and frequency used.

### 3. UNCERTAINTY

#### Uncertainty for 300 MHz – 6 GHz

| ERROR SOURCES                                                                | Uncertainty value ( $\pm$ %)                  | Probability distribution | Divisor    | (c <sub>i</sub> ) 1g | (c <sub>i</sub> ) 10g | Standard uncertainty (1g) ( $\pm$ %) | Standard uncertainty (10g) ( $\pm$ %) |
|------------------------------------------------------------------------------|-----------------------------------------------|--------------------------|------------|----------------------|-----------------------|--------------------------------------|---------------------------------------|
| <b>Measurement Equipment</b>                                                 |                                               |                          |            |                      |                       |                                      |                                       |
| Probe Calibration                                                            | 6.550                                         | N                        | 1          | 1                    | 1                     | 6.550                                | 6.550                                 |
| Isotropy                                                                     | 7.558                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 4.364                                | 4.364                                 |
| Linearity                                                                    | 4.700                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 2.714                                | 2.714                                 |
| Probe modulation response                                                    | 2.300                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 1.328                                | 1.328                                 |
| Detection limits                                                             | 0.250                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 0.144                                | 0.144                                 |
| Boundary effect                                                              | 2.000                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 1.155                                | 1.155                                 |
| Readout electronics                                                          | 0.300                                         | N                        | 1          | 1                    | 1                     | 0.300                                | 0.300                                 |
| Response time                                                                | 0.000                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 0.000                                | 0.000                                 |
| Integration time                                                             | 1.900                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 1.097                                | 1.097                                 |
| RF Ambien conditions - noise                                                 | 3.000                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 1.732                                | 1.732                                 |
| RF Ambien conditions – reflections                                           | 3.000                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 1.732                                | 1.732                                 |
| Probe positioner mech. restrictions                                          | 0.400                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 0.231                                | 0.231                                 |
| Probe positioning with respect to phantom shell                              | 6.700                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 3.868                                | 3.868                                 |
| Post-processing                                                              | 4.000                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 2.309                                | 2.309                                 |
| <b>Test Sample Related</b>                                                   |                                               |                          |            |                      |                       |                                      |                                       |
| Device holder uncertainty                                                    | 2.900                                         | N                        | 1          | 1                    | 1                     | 2.900                                | 2.900                                 |
| Test sample positioning                                                      | 3.600                                         | N                        | 1          | 1                    | 1                     | 3.600                                | 3.600                                 |
| Drift of output power                                                        | 5.000                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 2.887                                | 2.887                                 |
| <b>Phantom and Setup</b>                                                     |                                               |                          |            |                      |                       |                                      |                                       |
| Phantom uncertainty (shape and thickness tolerances)                         | 7.900                                         | R                        | $\sqrt{3}$ | 1                    | 1                     | 4.561                                | 4.561                                 |
| Algorithm for correcting SAR for deviations in permittivity and conductivity | 1.900                                         | N                        | 1          | 1                    | 0.84                  | 1.900                                | 1.596                                 |
| Liquid conductivity (meas.)                                                  | 3.350                                         | N                        | 1          | 0.78                 | 0.71                  | 2.613                                | 2.379                                 |
| Liquid permittivity (meas.)                                                  | 1.500                                         | N                        | 1          | 0.23                 | 0.26                  | 0.345                                | 0.390                                 |
| Liquid conductivity – temperature uncertainty                                | 0.440                                         | R                        | $\sqrt{3}$ | 0.78                 | 0.71                  | 0.198                                | 0.180                                 |
| Liquid permittivity – temperature uncertainty                                | 3.120                                         | R                        | $\sqrt{3}$ | 0.23                 | 0.26                  | 0.414                                | 0.468                                 |
| <b>Combined standard uncertainty</b>                                         | $u_c = \sqrt{\sum_{i=1}^m c_i^2 \cdot u_i^2}$ |                          |            |                      |                       | <b>12.70</b>                         | <b>12.62</b>                          |
| <b>Expanded uncertainty (confidence interval of 95%)</b>                     | $ue = 2.00 u_c$                               |                          |            |                      |                       | <b>25.40</b>                         | <b>25.23</b>                          |

**Table 2:** Uncertainty Assessment for 300 MHz - 6 GHz

## 4. SAR LIMIT

Having a worst case measurement, the SAR limit is valid for general population/uncontrolled exposure.

The SAR values have to be averaged over a mass of 1 gr. (SAR 1 gr.) with the shape of a cube and averaged over a mass of 10 gr (Extremity SAR 10 gr). These levels couldn't exceed the values indicated in the application Standard:

| Standard                                   | SAR                  | SAR Limit (W/Kg) |
|--------------------------------------------|----------------------|------------------|
| FCC 47 CFR Part 2.1093<br>Paragraph (d)(2) | SAR <sub>1 gr.</sub> | 1.6              |

**Table 3:** SAR limit

## 5. DEVICE UNDER TEST

### 5.1. Dimmensions

| Dimmensions            | Millimetres       |
|------------------------|-------------------|
| Height x Width x Depth | 40.0 x 75.0 x 0.8 |

**Table 4:** Antenna dimmensions

### 5.2. Wireless Technology

| Wireless Technology | Frequency Bands | Modes          |
|---------------------|-----------------|----------------|
| Wi-Fi               | 2.4 GHz         | - 802.11b/g/n  |
|                     | 5 GHz           | - 802.11a/n/ac |
| Bluetooth           | 2.4 GHz         | - Bluetooth    |

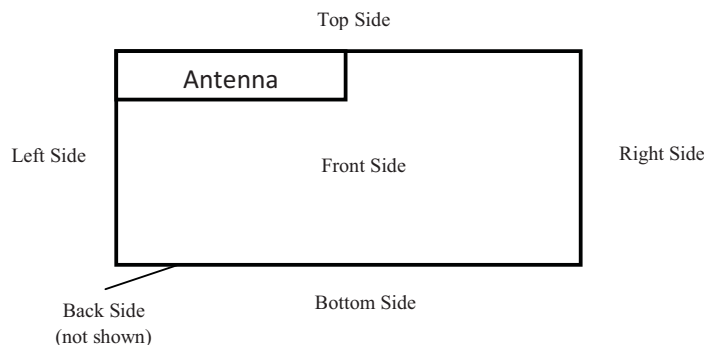
**Table 5:** DUT supported modes

### 5.3. Simultaneous Transmission

| RF Exposure Condition                 | Capable Transmit Configurations<br>(Chain A + Chain B) |
|---------------------------------------|--------------------------------------------------------|
| Portable transmitter next to the body | Wi-Fi 2.45 GHz + (Wi-Fi 2.45 GHz or BT)                |
|                                       | Wi-Fi 5GHz + (Wi-Fi 5GHz + BT)                         |

**Table 6:** DUT simultaneous transmission

### 5.4. Antenna Reference Positions



**Figure 3:** Antenna position against the flat phantom.

## Appendix B – Test results

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## **1. TEST CONDITIONS**

### **1.1. Temperature (°C):**

$T_n = +21.15$  to  $+24.84$

The subscript n indicates normal test conditions.

### **1.2. Test signal, Output Power and Frequencies**

The device was put into operation by using manufacturer proprietary test mode software (DRTU version 1.8.1.1252). For each channel into the 802.11 modes, the output power of the device was set to transmit at maximum power for all tests (continuous transmission aprox. 100% duty cycle).

The maximum average conducted power of the device was measured with a Power meter R&S NRVD and a thermocoupled Power sensor NRV-Z51.

### **1.3. EUT and test-site configurations**

The device under test was an INTEL 8260D2W module controlled by a host laptop (Dell E5440) computer using a SkyCross Electronics antenna as reference antenna.

The reference antenna was placed with each face against the phantom at 12 mm test separation distance. Measurements have been performed for the highest output power channel per mode, except for those with applicable test reductions, for each supported frequency band.

## 2. CONDUCTED AVERAGE POWER MEASUREMENTS

### 2.1. Wi-Fi & Bluetooth

#### - 2.4 GHz Band SISO:

| Band    | Mode      | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|-----------|----------------------|---------------------------------|---------------------------------|
| 2.4 GHz | 802.11b   | 1 / 2412             | 21.25                           | 21.06                           |
|         |           | 2 / 2417             | 21.26                           | 21.04                           |
|         |           | 3 / 2422             | 21.05                           | 21.05                           |
|         |           | 4 / 2427             | 21.07                           | 21.06                           |
|         |           | 5 / 2432             | 21.04                           | 21.05                           |
|         |           | 6 / 2437             | 21.20                           | 21.02                           |
|         |           | 7 / 2442             | 21.16                           | 21.08                           |
|         |           | 8 / 2447             | 20.98                           | 21.05                           |
|         |           | 9 / 2452             | 21.16                           | 20.99                           |
|         |           | 10 / 2457            | 21.11                           | 20.78                           |
|         |           | 11 / 2462            | 20.72                           | 18.15                           |
|         | 802.11g   | 1 / 2412             | 19.90                           | 18.38                           |
|         |           | 2 / 2417             | 20.98                           | 20.04                           |
|         |           | 3 / 2422             | 21.02                           | 20.99                           |
|         |           | 4 / 2427             | 21.05                           | 21.24                           |
|         |           | 5 / 2432             | 21.04                           | 21.06                           |
|         |           | 6 / 2437             | 21.01                           | 21.04                           |
|         |           | 7 / 2442             | 20.99                           | 20.58                           |
|         |           | 8 / 2447             | 20.94                           | 20.06                           |
|         |           | 9 / 2452             | 20.68                           | 19.36                           |
|         |           | 10 / 2457            | 19.49                           | 18.56                           |
|         |           | 11 / 2462            | 18.22                           | 17.14                           |
|         | 802.11n20 | 1 / 2412             | 19.10                           | 18.05                           |
|         |           | 2 / 2417             | 20.65                           | 19.96                           |
|         |           | 3 / 2422             | 21.19                           | 20.92                           |
|         |           | 4 / 2427             | 21.22                           | 21.19                           |
|         |           | 5 / 2432             | 21.23                           | 20.98                           |
|         |           | 6 / 2437             | 21.21                           | 20.96                           |
|         |           | 7 / 2442             | 20.67                           | 20.24                           |
|         |           | 8 / 2447             | 20.20                           | 19.96                           |
|         |           | 9 / 2452             | 19.92                           | 18.84                           |
|         |           | 10 / 2457            | 18.67                           | 18.03                           |
|         |           | 11 / 2462            | 17.20                           | 15.91                           |
|         | 802.11n40 | 3 / 2422             | 16.73                           | 14.71                           |
|         |           | 4 / 2427             | 17.17                           | 16.60                           |
|         |           | 5 / 2432             | 19.15                           | 18.13                           |
|         |           | 6 / 2437             | 18.34                           | 17.33                           |
|         |           | 7 / 2442             | 18.04                           | 17.79                           |
|         |           | 8 / 2447             | 17.26                           | 16.41                           |
|         |           | 9 / 2452             | 14.55                           | 14.01                           |

- **2.4 GHz Band MIMO:**

| Band    | Mode      | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|-----------|----------------------|---------------------------------|---------------------------------|
| 2.4 GHz | 802.11n20 | 1 / 2412             | 17.34                           | 17.11                           |
|         |           | 2 / 2417             | 17.96                           | 18.01                           |
|         |           | 3 / 2422             | 18.04                           | 18.09                           |
|         |           | 4 / 2427             | 18.01                           | 18.05                           |
|         |           | 5 / 2432             | 18.01                           | 18.03                           |
|         |           | 6 / 2437             | 18.02                           | 18.03                           |
|         |           | 7 / 2442             | 18.12                           | 18.01                           |
|         |           | 8 / 2447             | 18.07                           | 17.96                           |
|         |           | 9 / 2452             | 18.02                           | 17.92                           |
|         |           | 10 / 2457            | 17.97                           | 17.97                           |
|         |           | 11 / 2462            | 16.3                            | 16.28                           |
|         | 802.11n40 | 3 / 2422             | 14.85                           | 14.56                           |
|         |           | 4 / 2427             | 15.48                           | 15.49                           |
|         |           | 5 / 2432             | 17.22                           | 17.29                           |
|         |           | 6 / 2437             | 17.23                           | 17.26                           |
|         |           | 7 / 2442             | 15.45                           | 15.45                           |
|         |           | 8 / 2447             | 13.9                            | 13.9                            |
|         |           | 9 / 2452             | 16.01                           | 15.84                           |

- **Bluetooth:**

| Band    | Mode                              | Channel | Frequency | Averaged<br>Power (dBm) |
|---------|-----------------------------------|---------|-----------|-------------------------|
| 2.4 GHz | Bluetooth BR<br>(GFSK)            | 0       | 2402      | 9.34                    |
|         |                                   | 39      | 2441      | 8.91                    |
|         |                                   | 78      | 2480      | 9.00                    |
|         | Bluetooth EDR2<br>( $\pi$ 4DQPSK) | 0       | 2402      | 8.42                    |
|         |                                   | 39      | 2441      | 8.67                    |
|         |                                   | 78      | 2480      | 8.51                    |
|         | Bluetooth EDR3<br>(8DPSK)         | 0       | 2402      | 8.49                    |
|         |                                   | 39      | 2441      | 8.98                    |
|         |                                   | 78      | 2480      | 8.51                    |
|         | Bluetooth LE                      | 0       | 2402      | 6.13                    |
|         |                                   | 39      | 2441      | 6.09                    |
|         |                                   | 78      | 2480      | 6.11                    |

- **5.2 GHz Band SISO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.2 GHz | 802.11a    | 36/5180              | 20.28                           | 19.21                           |
|         |            | 40/5200              | 21.08                           | 21.28                           |
|         |            | 48/5240              | 21.25                           | 21.39                           |
|         | 802.11n20  | 36/5180              | 19.94                           | 18.61                           |
|         |            | 40/5200              | 21.32                           | 21.23                           |
|         |            | 48/5240              | 21.27                           | 21.34                           |
|         | 802.11n40  | 38/5190              | 18.23                           | 17.37                           |
|         |            | 46/5230              | 21.22                           | 21.21                           |
|         | 802.11ac80 | 42/5210              | 18.48                           | 17.64                           |

- **5.2 GHz Band MIMO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.2 GHz | 802.11n20  | 36/5180              | 18.19                           | 18.41                           |
|         |            | 40/5200              | 18.25                           | 17.99                           |
|         |            | 48/5240              | 18.02                           | 17.97                           |
|         | 802.11n40  | 38/5190              | 15.76                           | 15.75                           |
|         |            | 46/5230              | 18.14                           | 17.83                           |
|         | 802.11ac80 | 42/5210              | 14.83                           | 14.95                           |

**- 5.3 GHz Bands SISO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.3 GHz | 802.11a    | 52/5260              | 21.34                           | 21.02                           |
|         |            | 60/5300              | 21.33                           | 21.28                           |
|         |            | 64/5320              | 18.32                           | 18.47                           |
|         | 802.11n20  | 52/5260              | 21.38                           | 21.22                           |
|         |            | 60/5300              | 21.32                           | 21.15                           |
|         |            | 64/5320              | 18.00                           | 17.68                           |
|         | 802.11n40  | 54/5270              | 21.23                           | 21.13                           |
|         |            | 62/5310              | 16.45                           | 15.81                           |
|         | 802.11ac80 | 58/5290              | 16.25                           | 15.59                           |

**- 5.3 GHz Band MIMO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.3 GHz | 802.11n20  | 52/5260              | 18.25                           | 17.81                           |
|         |            | 60/5300              | 18.41                           | 17.99                           |
|         |            | 64/5320              | 17.01                           | 17.32                           |
|         | 802.11n40  | 54/5270              | 18.24                           | 17.71                           |
|         |            | 62/5310              | 14.81                           | 14.62                           |
|         | 802.11ac80 | 58/5290              | 13.71                           | 14.12                           |

**- 5.6 GHz Band SISO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.6 GHz | 802.11a    | 100/5500             | 19.39                           | 17.35                           |
|         |            | 116/5580             | 21.30                           | 21.36                           |
|         |            | 140/5700             | 21.23                           | 21.34                           |
|         | 802.11n20  | 100/5500             | 18.39                           | 17.68                           |
|         |            | 116/5580             | 21.24                           | 21.29                           |
|         |            | 140/5700             | 21.17                           | 21.28                           |
|         | 802.11ac20 | 144/5720             | 17.61                           | 17.57                           |
|         | 802.11n40  | 102/5510             | 16.53                           | 16.63                           |
|         |            | 110/5550             | 21.33                           | 21.15                           |
|         |            | 134/ 5670            | 21.25                           | 21.27                           |
|         | 802.11ac40 | 142/5710             | 21.19                           | 21.19                           |
|         | 802.11ac80 | 106/5530             | 15.34                           | 14.92                           |
|         |            | 138/5690             | 18.60                           | 18.15                           |

**- 5.6 GHz Band MIMO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.6 GHz | 802.11n20  | 100/5500             | 17.21                           | 17.74                           |
|         |            | 116/5580             | 18.53                           | 17.89                           |
|         |            | 140/5700             | 18.68                           | 17.61                           |
|         | 802.11ac20 | 144/5720             | 17.02                           | 17.06                           |
|         | 802.11n40  | 102/5510             | 16.14                           | 16.08                           |
|         |            | 110/5550             | 18.55                           | 18.08                           |
|         |            | 134/ 5670            | 18.50                           | 17.72                           |
|         | 802.11ac40 | 142/5710             | 17.19                           | 17.53                           |
|         | 802.11ac80 | 106/5530             | 11.90                           | 12.33                           |
|         |            | 138/5690             | 18.34                           | 18.11                           |

- **5.8 GHz Band SISO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.8 GHz | 802.11a    | 149/5745             | 20.87                           | 20.62                           |
|         |            | 157/5785             | 20.70                           | 20.59                           |
|         |            | 165/5825             | 20.56                           | 20.80                           |
|         | 802.11n20  | 149/5745             | 20.80                           | 20.54                           |
|         |            | 157/5785             | 20.67                           | 20.54                           |
|         |            | 165/5825             | 20.81                           | 20.44                           |
|         | 802.11n40  | 151/5755             | 20.93                           | 20.73                           |
|         |            | 159/5795             | 21.05                           | 20.70                           |
|         | 802.11ac80 | 155/5775             | 20.82                           | 20.63                           |

- **5.8 GHz Band MIMO:**

| Band    | Mode       | Channel / Freq (MHz) | Chain A<br>Averaged Power (dBm) | Chain B<br>Averaged Power (dBm) |
|---------|------------|----------------------|---------------------------------|---------------------------------|
| 5.8 GHz | 802.11n20  | 149/5745             | 18.13                           | 18.11                           |
|         |            | 157/5785             | 18.06                           | 17.97                           |
|         |            | 165/5825             | 18.03                           | 17.96                           |
|         | 802.11n40  | 151/5755             | 18.12                           | 18.07                           |
|         |            | 159/5795             | 18.28                           | 18.03                           |
|         | 802.11ac80 | 155/5775             | 20.79                           | 20.83                           |

### 3. TISSUE PARAMETERS MEASUREMENTS

| Frequency (MHz) | Target Body Tissue: Parameters used in Probe Calibration |                    | Target Body Tissue: Parameters used in Dipole Calibration |                    | Measured Body Tissue |                    | Measured Date |
|-----------------|----------------------------------------------------------|--------------------|-----------------------------------------------------------|--------------------|----------------------|--------------------|---------------|
|                 | Permittivity                                             | Conductivity [S/m] | Permittivity                                              | Conductivity [S/m] | Permittivity         | Conductivity [S/m] |               |
| 2450            | 52.70 ± 5%                                               | 1.95 ± 5%          | 50.5 ± 6%                                                 | 2.01 ± 6%          | 51.61 ± 5%           | 1.98 ± 5%          | 20-05-2015    |
| 2450            | 52.70 ± 5%                                               | 1.95 ± 5%          | 50.5 ± 6%                                                 | 2.01 ± 6%          | 51.55 ± 5%           | 1.95 ± 5%          | 28-05-2015    |
| 5200            | 49.01 ± 5%                                               | 5.30 ± 5%          | 48.9 ± 6%                                                 | 5.40 ± 6%          | 50.19 ± 5%           | 5.17 ± 5%          | 21-05-2015    |
| 5200            | 49.01 ± 5%                                               | 5.30 ± 5%          | 48.9 ± 6%                                                 | 5.40 ± 6%          | 50.37 ± 5%           | 5.20 ± 5%          | 25-05-2015    |
| 5500            | 48.61 ± 5%                                               | 5.65 ± 5%          | 48.4 ± 6%                                                 | 5.79 ± 6%          | 48.35 ± 5%           | 5.61 ± 5%          | 26-05-2015    |
| 5800            | 48.20 ± 5%                                               | 6.00 ± 5%          | 47.9 ± 6%                                                 | 6.21 ± 6%          | 47.60 ± 5%           | 6.20 ± 5%          | 27-05-2015    |

Note: The dielectric properties have been measured by the contact probe method at 23° C.

#### - Composition / Information on ingredients

##### Muscle Tissue Simulation Liquids HBBL1900-3800V3/M HBBL1900-3800V3

|                              |                                                                                                                |
|------------------------------|----------------------------------------------------------------------------------------------------------------|
| Water                        | 50 – 73 %                                                                                                      |
| Non-ionic detergents         | 27 – 50 % polyoxyethylenesorbitan monolaurate                                                                  |
| NaCl                         | 0 – 2 %                                                                                                        |
| Preservative                 | 0.05 – 0.1% Preventol-D7                                                                                       |
| Safety relevant ingredients: |                                                                                                                |
| CAS-No. 55965-84-9           | < 0.1 % aqueous preparation, containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone |
| CAS-No. 9005-64-5            | <50 % polyoxyethylenesorbitan monolaurate                                                                      |

##### Muscle Tissue Simulation Liquids HBBL5GHzV2

|                    |           |
|--------------------|-----------|
| Water              | 76 – 80 % |
| Mineral Oil        | 10 – 12 % |
| Emulsifiers        | 8 – 10 %  |
| Additives and Salt | 1 – 3%    |

## 4. SYSTEM CHECK MEASUREMENTS

### 4.1. Validation results in 2450 MHz Band for Body TSL

| DATE       | SAR over | Target SAR | Measured SAR | Drift (%) | ± 10% Limit | SAR (W/Kg) |
|------------|----------|------------|--------------|-----------|-------------|------------|
| 20/05/2015 | 1 gr.    | 51.10      | 48.86        | -4.39     | √           | 12.20      |
|            | 10 gr.   | 23.90      | 22.83        | -4.49     | √           | 5.70       |

### 4.2. Validation results in 2450 MHz Band for Body TSL

| DATE       | SAR over | Target SAR | Measured SAR | Drift (%) | ± 10% Limit | SAR (W/Kg) |
|------------|----------|------------|--------------|-----------|-------------|------------|
| 28/05/2015 | 1 gr.    | 51.10      | 48.57        | -4.96     | √           | 12.10      |
|            | 10 gr.   | 23.90      | 22.56        | -5.56     | √           | 5.62       |

### 4.3. Validation results in 5200 MHz Band for Body TSL

| DATE       | SAR over | Target SAR | Measured SAR | Drift (%) | ± 10% Limit | SAR (W/Kg) |
|------------|----------|------------|--------------|-----------|-------------|------------|
| 21/05/2015 | 1 gr.    | 74.70      | 71.43        | -4.38     | √           | 7.11       |
|            | 10 gr.   | 20.90      | 20.90        | -2.42     | √           | 2.03       |

### 4.4. Validation results in 5200 MHz Band for Body TSL

| DATE       | SAR over | Target SAR | Measured SAR | Drift (%) | ± 10% Limit | SAR (W/Kg) |
|------------|----------|------------|--------------|-----------|-------------|------------|
| 25/05/2015 | 1 gr.    | 74.70      | 72.40        | -3.08     | √           | 7.24       |
|            | 10 gr.   | 20.90      | 20.90        | -1.44     | √           | 2.06       |

### 4.5. Validation results in 5500 MHz Band for Body TSL

| DATE       | SAR over | Target SAR | Measured SAR | Drift (%) | ± 10% Limit | SAR (W/Kg) |
|------------|----------|------------|--------------|-----------|-------------|------------|
| 26/05/2015 | 1 gr.    | 78.70      | 76.89        | -2.30     | √           | 7.68       |
|            | 10 gr.   | 21.90      | 21.42        | -2.17     | √           | 2.14       |

### 4.6. Validation results in 5800 MHz Band for Body TSL

| DATE       | SAR over | Target SAR | Measured SAR | Drift (%) | ± 10% Limit | SAR (W/Kg) |
|------------|----------|------------|--------------|-----------|-------------|------------|
| 27/05/2015 | 1 gr.    | 75.10      | 75.44        | 0.46      | √           | 7.72       |
|            | 10 gr.   | 20.80      | 20.91        | 0.54      | √           | 2.14       |

## 5. MEASUREMENT RESULTS FOR SAR (SPECIFIC ABSORPTION RATE)

### 5.1. Summary maximum results for 1g SAR measurements.

| Band     | Mode       | Chain / Orientation | Channel (Frequency) | Reported SAR 1g (W/Kg) | SAR limit 1g (W/Kg) |
|----------|------------|---------------------|---------------------|------------------------|---------------------|
| 2450 MHz | 802.11b    | Chain B/ Back side  | CH 1 (2412 Mhz)     | 0.532                  | 1.6                 |
|          | Bluetooth  | Chain B/ Back side  | CH 0 (2402 Mhz)     | 0.027                  | 1.6                 |
| 5200 MHz | 802.11a    | Chain B/ Front side | CH 48 (5240 Mhz)    | 0.625                  | 1.6                 |
| 5300 MHz | 802.11a    | Chain A/ Top side   | CH 52 (5260 Mhz)    | 0.719                  | 1.6                 |
| 5500 MHz | 802.11a    | Chain B/ Front side | CH 116 (5580 Mhz)   | 0.663                  | 1.6                 |
| 5800 MHz | 802.11ac80 | Chain B/ Front side | CH 155 (5775 MHz)   | 0.626                  | 1.6                 |

### 5.2. Result for 1g body simultaneous evaluation MIMO

| Transmission Mode  | Band     | Reported SAR 1g (W/Kg) | $\Sigma$ SARi (W/kg) | SAR limit 1g (W/Kg) | Verdict |
|--------------------|----------|------------------------|----------------------|---------------------|---------|
| 802.11b/Chain A    | 2450 MHz | 0.515                  | 1.047                | 1.6                 | Pass    |
| 802.11b/Chain B    | 2450 MHz | 0.532                  |                      |                     |         |
| 802.11a/Chain A    | 5.2GHz   | 0.614                  | 1.266                | 1.6                 | Pass    |
| 802.11a/Chain B    | 5.2GHz   | 0.625                  |                      |                     |         |
| Bluetooth          | 2450 MHz | 0.027                  |                      |                     |         |
| 802.11a/Chain A    | 5.3 GHz  | 0.719                  | 1.434                | 1.6                 | Pass    |
| 802.11a/Chain B    | 5.3 GHz  | 0.688                  |                      |                     |         |
| Bluetooth          | 2450 MHz | 0.027                  |                      |                     |         |
| 802.11a/Chain A    | 5.5 GHz  | 0.578                  | 1.268                | 1.6                 | Pass    |
| 802.11a/Chain B    | 5.5 GHz  | 0.663                  |                      |                     |         |
| Bluetooth          | 2450 MHz | 0.027                  |                      |                     |         |
| 802.11ac80/Chain A | 5.8 GHz  | 0.503                  | 1.156                | 1.6                 | Pass    |
| 802.11ac80/Chain B | 5.8 GHz  | 0.626                  |                      |                     |         |
| Bluetooth          | 2450 MHz | 0.027                  |                      |                     |         |

To calculate the separation ratio the following formula is used:  
 $(SAR_1 + SAR_2)^{1.5} / R_i$ , where  $R_i$  is in mm, must be  $\leq 0.04$

For each of the pairs, the following calculations show the separation ratio at the 50 mm separation stated in the installation guide:

$$2.4 \text{ GHz Band: } (0.515 + 0.532)^{1.5} / 50 = 0.02$$

$$5.2 \text{ GHz Band: } (0.614 + 0.625 + 0.027)^{1.5} / 50 = 0.03$$

$$5.3 \text{ GHz Band: } (0.719 + 0.688 + 0.027)^{1.5} / 50 = 0.03$$

$$5.6 \text{ GHz Band: } (0.578 + 0.663 + 0.027)^{1.5} / 50 = 0.03$$

$$5.8 \text{ GHz Band: } (0.503 + 0.626 + 0.027)^{1.5} / 50 = 0.02$$

### 5.3. Results for Wi-Fi 2450 MHz Band.

#### - 802.11b

| Side / Position      | Dist (mm) | Mode    | Ch #. (Freq)     | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|---------|------------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.486           | 1.98            | 21.50                  | 0.515                 | 1        |
| Chain A/ Front side  | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.381           | 1.27            | 21.50                  | 0.404                 |          |
| Chain A/ Top side    | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.226           | 0               | 21.50                  | 0.239                 |          |
| Chain A/ Bottom side | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.077           | 1.62            | 21.50                  | 0.082                 |          |
| Chain A/ Left side   | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.167           | -0.34           | 21.50                  | 0.177                 |          |
| Chain A/ Right side  | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.091           | 1.27            | 21.50                  | 0.096                 |          |
| Chain A/ Back side   | 12        | 802.11b | CH 6 (2437 Mhz)  | NM <sup>1</sup> |                 |                        |                       |          |
| Chain A/ Back side   | 12        | 802.11b | CH 11 (2462 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1: See remarks and comments

| Side / Position      | Dist (mm) | Mode    | Ch #. (Freq)     | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|---------|------------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.481           | 0.35            | 21.50                  | 0.532                 | 2        |
| Chain B/ Front side  | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.398           | -0.80           | 21.50                  | 0.440                 |          |
| Chain B/ Top side    | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.216           | 0.35            | 21.50                  | 0.239                 |          |
| Chain B/ Bottom side | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.071           | 0               | 21.50                  | 0.079                 |          |
| Chain B/ Left side   | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.208           | 0.81            | 21.50                  | 0.230                 |          |
| Chain B/ Right side  | 12        | 802.11b | CH 1 (2412 Mhz)  | 0.062           | 1.04            | 21.50                  | 0.069                 |          |
| Chain B/ Back side   | 12        | 802.11b | CH 6 (2437 Mhz)  | NM <sup>1</sup> |                 |                        |                       |          |
| Chain B/ Back side   | 12        | 802.11b | CH 11 (2462 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1: See remarks and comments

**- 802.11g**

| Side / Position         | Dist (mm) | Mode    | Ch #.<br>(Freq)    | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|---------|--------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Top side    | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Bottom side | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Left side   | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Right side  | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

| Side / Position         | Dist (mm) | Mode    | Ch #.<br>(Freq)    | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|---------|--------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Top side    | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Bottom side | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Left side   | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Right side  | 12        | 802.11g | CH 6<br>(2437 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

**- 802.11n20**

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)    | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|-----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11n20  | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Top side    | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |

2: See remarks and comments

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)    | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|-----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11n20  | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Top side    | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11 n20 | CH 6 (2437 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |

2: See remarks and comments

**- 802.11n40**

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)    | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|-----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11n40  | CH 6 (2437 Mhz) | 0.246           | -0.34           | 18.5                   | 0.255                 |          |
| Chain A/ Front side  | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Top side    | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Back side   | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain A/ Back side   | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)    | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|-----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11n40  | CH 6 (2437 Mhz) | 0.201           | 2.80            | 17.5                   | 0.209                 |          |
| Chain B/ Front side  | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Top side    | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Back side   | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain B/ Back side   | 12        | 802.11 n40 | CH 6 (2437 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

## - Bluetooth

| Side / Position         | Dist (mm) | Mode | Ch #.<br>(Freq)     | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|------|---------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | GFSK | CH 0<br>(2402 Mhz)  | 0.023             | -0.57              | 10                           | 0.027                       |             |
| Chain B/<br>Front side  | 12        | GFSK | CH 0<br>(2402 Mhz)  | 0.017             | 0.12               | 10                           | 0.02                        |             |
| Chain B/<br>Top side    | 12        | GFSK | CH 0<br>(2402 Mhz)  | 0.0124            | 4.83               | 10                           | 0.014                       |             |
| Chain B/<br>Bottom side | 12        | GFSK | CH 0<br>(2402 Mhz)  | 0.0043            | -3.62              | 10                           | 0.005                       |             |
| Chain B/<br>Left side   | 12        | GFSK | CH 0<br>(2402 Mhz)  | 0.0086            | -3.95              | 10                           | 0.01                        |             |
| Chain B/<br>Right side  | 12        | GFSK | CH 0<br>(2402 Mhz)  | 0.0025            | -0.23              | 10                           | 0.003                       |             |
| Chain B/<br>Back side   | 12        | GFSK | CH 39<br>(2442 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |
| Chain B/<br>Back side   | 12        | GFSK | CH 78<br>(2480 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |

1: See remarks and comments

#### 5.4. Results for Wi-Fi 5200 MHz Band.

##### - 802.11a

| Side / Position      | Dist (mm) | Mode    | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|---------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11a | 48 (5240 Mhz) | 0.265           | 0.46            | 21.50                  | 0.281                 |          |
| Chain A/ Front side  | 12        | 802.11a | 48 (5240 Mhz) | 0.580           | 1.39            | 21.50                  | 0.614                 | 3        |
| Chain A/ Top side    | 12        | 802.11a | 48 (5240 Mhz) | 0.497           | 1.39            | 21.50                  | 0.526                 |          |
| Chain A/ Bottom side | 12        | 802.11a | 48 (5240 Mhz) | 0.056           | 4.11            | 21.50                  | 0.059                 |          |
| Chain A/ Left side   | 12        | 802.11a | 48 (5240 Mhz) | 0.106           | 0.35            | 21.50                  | 0.112                 |          |
| Chain A/ Right side  | 12        | 802.11a | 48 (5240 Mhz) | 0.030           | 2.92            | 21.50                  | 0.032                 |          |
| Chain A/ Front side  | 12        | 802.11a | 36 (5180 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11a | 40 (5200 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1: See remarks and comments

| Side / Position      | Dist (mm) | Mode    | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|---------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11a | 48 (5240 Mhz) | 0.259           | 0.81            | 21.50                  | 0.266                 |          |
| Chain B/ Front side  | 12        | 802.11a | 48 (5240 Mhz) | 0.609           | 0.93            | 21.50                  | 0.625                 | 4        |
| Chain B/ Top side    | 12        | 802.11a | 48 (5240 Mhz) | 0.606           | 1.51            | 21.50                  | 0.622                 |          |
| Chain B/ Bottom side | 12        | 802.11a | 48 (5240 Mhz) | 0.090           | -0.80           | 21.50                  | 0.092                 |          |
| Chain B/ Left side   | 12        | 802.11a | 48 (5240 Mhz) | 0.109           | 0.93            | 21.50                  | 0.112                 |          |
| Chain B/ Right side  | 12        | 802.11a | 48 (5240 Mhz) | 0.031           | -0.23           | 21.50                  | 0.032                 |          |
| Chain B/ Front side  | 12        | 802.11a | 36 (5180 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11a | 40 (5200 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1: See remarks and comments

**- 802.11n20**

| Side / Position         | Dist (mm) | Mode      | Ch #.<br>(Freq)  | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|-----------|------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11n20 | 40<br>(5200 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11n20 | 40<br>(5200 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Top side    | 12        | 802.11n20 | 40<br>(5200 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Bottom side | 12        | 802.11n20 | 40<br>(5200 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Left side   | 12        | 802.11n20 | 40<br>(5200 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Right side  | 12        | 802.11n20 | 40<br>(5200 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

| Side / Position         | Dist (mm) | Mode      | Ch #.<br>(Freq)  | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|-----------|------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11n20 | 48<br>(5240 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11n20 | 48<br>(5240 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Top side    | 12        | 802.11n20 | 48<br>(5240 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Bottom side | 12        | 802.11n20 | 48<br>(5240 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Left side   | 12        | 802.11n20 | 48<br>(5240 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Right side  | 12        | 802.11n20 | 48<br>(5240 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

**- 802.11n40**

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 46 (5230 Mhz) | 0.573           | 0.12            | 21.50                  | 0.611                 |          |
| Chain A/ Top side    | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 38 (5190 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 46 (5230 Mhz) | 0.575           | 1.98            | 21.50                  | 0.615                 |          |
| Chain B/ Top side    | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11n40 | 46 (5230 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 38 (5190 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

**- 802.11ac80**

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11ac80 | 42 (5210 Mhz) | 0.317           | 1.74            | 18.50                  | 0.318                 |          |
| Chain A/ Top side    | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |

3: See remarks and comments

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11ac80 | 42 (5210 Mhz) | 0.277           | 0.0             | 18                     | 0.301                 |          |
| Chain B/ Top side    | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11ac80 | 42 (5210 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |

3: See remarks and comments

## 5.5. Results for Wi-Fi 5300 MHz Band.

### - 802.11a

| Side / Position         | Dist (mm) | Mode    | Ch #.<br>(Freq)  | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|---------|------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11a | 52<br>(5260 Mhz) | 0.311             | -0.57              | 21.50                        | 0.323                       |             |
| Chain A/<br>Front side  | 12        | 802.11a | 52<br>(5260 Mhz) | 0.674             | 1.16               | 21.50                        | 0.699                       |             |
| Chain A/<br>Top side    | 12        | 802.11a | 52<br>(5260 Mhz) | 0.693             | 1.27               | 21.50                        | 0.719                       | 5           |
| Chain A/<br>Bottom side | 12        | 802.11a | 52<br>(5260 Mhz) | 0.086             | 2.45               | 21.50                        | 0.089                       |             |
| Chain A/<br>Left side   | 12        | 802.11a | 52<br>(5260 Mhz) | 0.1               | 2.68               | 21.50                        | 0.104                       |             |
| Chain A/<br>Right side  | 12        | 802.11a | 52<br>(5260 Mhz) | 0.03              | 2.92               | 21.50                        | 0.031                       |             |
| Chain A/<br>Top side    | 12        | 802.11a | 60<br>(5300 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |
| Chain A/<br>Top side    | 12        | 802.11a | 64<br>(5320 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |

1: See remarks and comments

| Side / Position         | Dist (mm) | Mode    | Ch #.<br>(Freq)  | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|---------|------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11a | 60<br>(5300 Mhz) | 0.287             | 0.23               | 21.50                        | 0.302                       |             |
| Chain B/<br>Front side  | 12        | 802.11a | 60<br>(5300 Mhz) | 0.648             | 1.74               | 21.50                        | 0.682                       |             |
| Chain B/<br>Top side    | 12        | 802.11a | 60<br>(5300 Mhz) | 0.517             | 1.51               | 21.50                        | 0.544                       |             |
| Chain B/<br>Bottom side | 12        | 802.11a | 60<br>(5300 Mhz) | 0.066             | 1.74               | 21.50                        | 0.069                       |             |
| Chain B/<br>Left side   | 12        | 802.11a | 60<br>(5300 Mhz) | 0.1               | -0.46              | 21.50                        | 0.105                       |             |
| Chain B/<br>Right side  | 12        | 802.11a | 60<br>(5300 Mhz) | 0.035             | 2.80               | 21.50                        | 0.037                       |             |
| Chain B/<br>Front side  | 12        | 802.11a | 52<br>(5260 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11a | 64<br>(5320 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |

1: See remarks and comments

**- 802.11n20**

| Side / Position         | Dist (mm) | Mode       | Ch #.<br>(Freq)  | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|------------|------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Top side    | 12        | 8802.11n20 | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Bottom side | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Left side   | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Right side  | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

| Side / Position         | Dist (mm) | Mode       | Ch #.<br>(Freq)  | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|------------|------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Top side    | 12        | 8802.11n20 | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Bottom side | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Left side   | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Right side  | 12        | 802.11n20  | 52<br>(5260 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

**- 802.11n40**

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Top side    | 12        | 802.11n40 | 54 (5270 Mhz) | 0.578           | 1.86            | 21.50                  | 0.615                 |          |
| Chain A/ Bottom side | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Top side    | 12        | 802.11n40 | 62 (5310 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 54 (5270 Mhz) | 0.632           | 1.04            | 21.50                  | 0.688                 | 6        |
| Chain B/ Top side    | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11n40 | 54 (5270 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 62 (5310 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

**- 802.11ac80**

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Top side    | 12        | 802.11ac80 | 58 (5290 Mhz) | 0.166           | 0.12            | 16.50                  | 0.176                 |          |
| Chain A/ Bottom side | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |

2: See remarks and comments

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)  | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|---------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11ac80 | 58 (5290 Mhz) | 0.15            | 1.86            | 16                     | 0.165                 |          |
| Chain B/ Top side    | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11ac80 | 58 (5290 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |

2: See remarks and comments

## 5.6. Results for Wi-Fi 5600 MHz Band.

### - 802.11a

| Side / Position      | Dist (mm) | Mode    | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|---------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11a | 116 (5580 Mhz) | 0.354           | 1.39            | 21.50                  | 0.371                 |          |
| Chain A/ Front side  | 12        | 802.11a | 116 (5580 Mhz) | 0.552           | 1.62            | 21.50                  | 0.578                 | 7        |
| Chain A/ Top side    | 12        | 802.11a | 116 (5580 Mhz) | 0.304           | 3.87            | 21.50                  | 0.318                 |          |
| Chain A/ Bottom side | 12        | 802.11a | 116 (5580 Mhz) | 0.073           | 4.71            | 21.50                  | 0.076                 |          |
| Chain A/ Left side   | 12        | 802.11a | 116 (5580 Mhz) | 0.097           | 1.04            | 21.50                  | 0.102                 |          |
| Chain A/ Right side  | 12        | 802.11a | 116 (5580 Mhz) | 0.019           | 3.04            | 21.50                  | 0.02                  |          |
| Chain A/ Front side  | 12        | 802.11a | 100 (5500 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11a | 140 (5700 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1: See remarks and comments

| Side / Position      | Dist (mm) | Mode    | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|---------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11a | 116 (5580 Mhz) | 0.344           | 0.12            | 21.50                  | 0.355                 |          |
| Chain B/ Front side  | 12        | 802.11a | 116 (5580 Mhz) | 0.642           | -0.34           | 21.50                  | 0.663                 | 8        |
| Chain B/ Top side    | 12        | 802.11a | 116 (5580 Mhz) | 0.338           | 2.45            | 21.50                  | 0.349                 |          |
| Chain B/ Bottom side | 12        | 802.11a | 116 (5580 Mhz) | 0.067           | 0.46            | 21.50                  | 0.069                 |          |
| Chain B/ Left side   | 12        | 802.11a | 116 (5580 Mhz) | 0.187           | -1.26           | 21.50                  | 0.193                 |          |
| Chain B/ Right side  | 12        | 802.11a | 116 (5580 Mhz) | 0.032           | -0.57           | 21.50                  | 0.033                 |          |
| Chain B/ Front side  | 12        | 802.11a | 100 (5500 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11a | 140 (5700 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1: See remarks and comments

**- 802.11n20**

| Side / Position         | Dist (mm) | Mode      | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|-----------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Top side    | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Bottom side | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Left side   | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Right side  | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

| Side / Position         | Dist (mm) | Mode      | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|-----------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Top side    | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Bottom side | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Left side   | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Right side  | 12        | 802.11n20 | 116<br>(5580 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

**- 802.11ac20**

| Side / Position         | Dist (mm) | Mode       | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|------------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Top side    | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Bottom side | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Left side   | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Right side  | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

| Side / Position         | Dist (mm) | Mode       | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|------------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Top side    | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Bottom side | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Left side   | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Right side  | 12        | 802.11ac20 | 144<br>(5720 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |

2: See remarks and comments

**- 802.11n40**

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11n40 | 110 (5550 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 110 (5550 Mhz) | 0.567           | 1.39            | 21.50                  | 0.590                 |          |
| Chain A/ Top side    | 12        | 802.11n40 | 110 (5550 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11n40 | 110 (5550 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11n40 | 110 (5550 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11n40 | 110 (5550 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 102 (5510 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 134 (5670 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11n40 | 134 (5670 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 134 (5670 Mhz) | 0.477           | 0               | 21.50                  | 0.503                 |          |
| Chain B/ Top side    | 12        | 802.11n40 | 134 (5670 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11n40 | 134 (5670 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11n40 | 134 (5670 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11n40 | 134 (5670 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 102 (5510 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 110 (5550 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

**- 802.11ac40**

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Top side    | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |

2: See remarks and comments

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Top side    | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11ac40 | 142 (5710 Mhz) | NM <sup>2</sup> |                 |                        |                       |          |

2: See remarks and comments

**- 802.11ac80**

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11ac80 | 138 (5690 Mhz) | 0.317           | 3.28            | 19                     | 0.348                 |          |
| Chain A/ Top side    | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11ac80 | 106 (5530 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11ac80 | 138 (5690 Mhz) | 0.317           | 1.04            | 18.50                  | 0.344                 |          |
| Chain B/ Top side    | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11ac80 | 138 (5690 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11ac80 | 106 (5530 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 2: See remarks and comments

## 5.7. Results for Wi-Fi 5800 MHz Band.

### - 802.11a

| Side / Position         | Dist (mm) | Mode    | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|---------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11a | 149<br>(5745 Mhz) | 0.352             | 2.57               | 21                           | 0.363                       |             |
| Chain A/<br>Front side  | 12        | 802.11a | 149<br>(5745 Mhz) | 0.215             | 1.74               | 21                           | 0.222                       |             |
| Chain A/<br>Top side    | 12        | 802.11a | 149<br>(5745 Mhz) | 0.267             | 0.46               | 21                           | 0.275                       |             |
| Chain A/<br>Bottom side | 12        | 802.11a | 149<br>(5745 Mhz) | 0.038             | 1.27               | 21                           | 0.039                       |             |
| Chain A/<br>Left side   | 12        | 802.11a | 149<br>(5745 Mhz) | 0.089             | 1.39               | 21                           | 0.092                       |             |
| Chain A/<br>Right side  | 12        | 802.11a | 149<br>(5745 Mhz) | 0.021             | -2.28              | 21                           | 0.022                       |             |
| Chain A/<br>Front side  | 12        | 802.11a | 157<br>(5785 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11a | 165<br>(5825 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |

1: See remarks and comments

| Side / Position         | Dist (mm) | Mode    | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|---------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11a | 165<br>(5825 Mhz) | 0.231             | 0.81               | 21                           | 0.242                       |             |
| Chain B/<br>Front side  | 12        | 802.11a | 165<br>(5825 Mhz) | 0.499             | 2.68               | 21                           | 0.523                       |             |
| Chain B/<br>Top side    | 12        | 802.11a | 165<br>(5825 Mhz) | 0.419             | 1.74               | 21                           | 0.439                       |             |
| Chain B/<br>Bottom side | 12        | 802.11a | 165<br>(5825 Mhz) | 0.038             | 1.27               | 21                           | 0.040                       |             |
| Chain B/<br>Left side   | 12        | 802.11a | 165<br>(5825 Mhz) | 0.107             | -0.80              | 21                           | 0.112                       |             |
| Chain B/<br>Right side  | 12        | 802.11a | 165<br>(5825 Mhz) | 0.021             | -0.57              | 21                           | 0.022                       |             |
| Chain B/<br>Front side  | 12        | 802.11a | 149<br>(5745 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11a | 157<br>(5785 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |

1: See remarks and comments

**- 802.11n20**

| Side / Position         | Dist (mm) | Mode      | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|-----------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain A/<br>Back side   | 12        | 802.11n20 | 165<br>(5825 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11n20 | 165<br>(5825 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Top side    | 12        | 802.11n20 | 165<br>(5825 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Bottom side | 12        | 802.11n20 | 165<br>(5825 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Left side   | 12        | 802.11n20 | 165<br>(5825 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Right side  | 12        | 802.11n20 | 165<br>(5825 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11n20 | 149<br>(5745 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |
| Chain A/<br>Front side  | 12        | 802.11n20 | 157<br>(5785 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |

1 and 2: See remarks and comments

| Side / Position         | Dist (mm) | Mode      | Ch #.<br>(Freq)   | 1-g SAR<br>(W/Kg) | Power<br>Drift (%) | Max Output<br>Power<br>(dBm) | Max.<br>Reported<br>1-g SAR | Plot<br>No. |
|-------------------------|-----------|-----------|-------------------|-------------------|--------------------|------------------------------|-----------------------------|-------------|
| Chain B/<br>Back side   | 12        | 802.11n20 | 157<br>(5785 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11n20 | 157<br>(5785 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Top side    | 12        | 802.11n20 | 157<br>(5785 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Bottom side | 12        | 802.11n20 | 157<br>(5785 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Left side   | 12        | 802.11n20 | 157<br>(5785 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Right side  | 12        | 802.11n20 | 157<br>(5785 Mhz) | NM <sup>2</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11n20 | 149<br>(5745 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |
| Chain B/<br>Front side  | 12        | 802.11n20 | 165<br>(5825 Mhz) | NM <sup>1</sup>   |                    |                              |                             |             |

1 and 2: See remarks and comments

**- 802.11n40**

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11n40 | 159 (5795 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 159 (5795 Mhz) | 0.483           | 0.46            | 21                     | 0.483                 |          |
| Chain A/ Top side    | 12        | 802.11n40 | 159 (5795 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11n40 | 159 (5795 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11n40 | 159 (5795 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11n40 | 159 (5795 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11n40 | 151 (5755 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

| Side / Position      | Dist (mm) | Mode      | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|-----------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11n40 | 151 (5755 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 151 (5755 Mhz) | 0.446           | 2.21            | 21                     | 0.475                 |          |
| Chain B/ Top side    | 12        | 802.11n40 | 151 (5755 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11n40 | 151 (5755 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11n40 | 151 (5755 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11n40 | 151 (5755 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11n40 | 159 (5795 Mhz) | NM <sup>1</sup> |                 |                        |                       |          |

1 and 3: See remarks and comments

**- 802.11ac80**

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain A/ Back side   | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Front side  | 12        | 802.11ac80 | 155 (5775 Mhz) | 0.483           | -0.12           | 21                     | 0.503                 | 9        |
| Chain A/ Top side    | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Bottom side | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Left side   | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain A/ Right side  | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |

3: See remarks and comments

| Side / Position      | Dist (mm) | Mode       | Ch #. (Freq)   | 1-g SAR (W/Kg)  | Power Drift (%) | Max Output Power (dBm) | Max. Reported 1-g SAR | Plot No. |
|----------------------|-----------|------------|----------------|-----------------|-----------------|------------------------|-----------------------|----------|
| Chain B/ Back side   | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Front side  | 12        | 802.11ac80 | 155 (5775 Mhz) | 0.575           | 1.27            | 21                     | 0.626                 | 10       |
| Chain B/ Top side    | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Bottom side | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Left side   | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |
| Chain B/ Right side  | 12        | 802.11ac80 | 155 (5775 Mhz) | NM <sup>3</sup> |                 |                        |                       |          |

3: See remarks and comments

## **5.8. Enhanced Energy Coupling.**

According to KDB 447981 D01 General Exposure Guidance v05r02, section 5.2.4, only modules with no host platform restrictions would need additional SAR evaluation due to RF energy coupling enhancements at increased test separation distance.

## Appendix C – Measurement report

## 2.4 GHz – Chain A – d=12 mm – Back Side / 802.11b – CH 6 – Plot N°1

Test Laboratory: AT4 Wireless; Date: 20/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10012 - CAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2412 MHz; Duty Cycle: 1:1.53815

Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.96$  S/m;  $\epsilon_r = 51.946$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3052; ConvF(4.3, 4.3, 4.3); Calibrated: 24/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### Modular SAR - 2.4GHz - Chain A, d= 12 mm/Back Side, Channel 6, 802.11b, 1Mbps/Area Scan (71x101x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.600 W/kg

### Modular SAR - 2.4GHz - Chain A, d= 12 mm/Back Side, Channel 6, 802.11b, 1Mbps/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

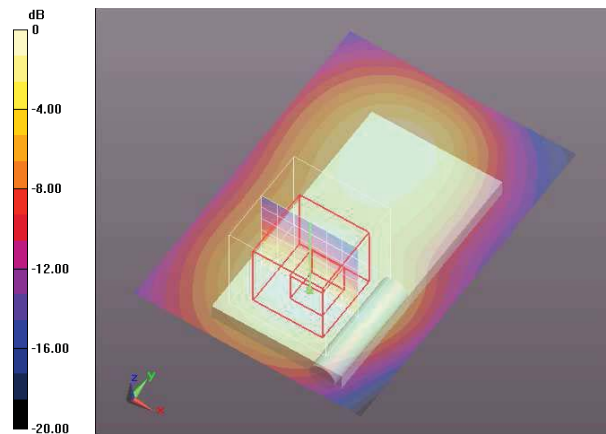
Reference Value = 8.183 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.886 W/kg

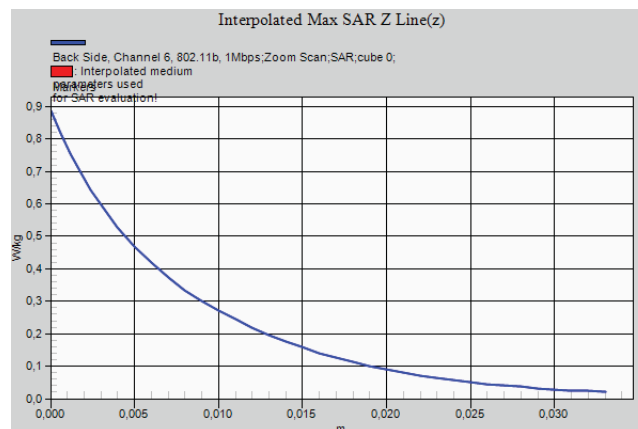
**SAR(1 g) = 0.486 W/kg; SAR(10 g) = 0.267 W/kg** (SAR corrected for target medium)

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.593 W/kg



0 dB = 0.593 W/kg = -2.27 dBW/kg



## **2.4 GHz – Chain B – d=12 mm – Back Side / 802.11b – CH 1 – Plot N°2**

**Test Laboratory: AT4 Wireless; Date: 21/05/2015**

**DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003**

Communication System: UID 10012 - CAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2412 MHz; Duty Cycle: 1:1.53815

Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.96$  S/m;  $\epsilon_r = 51.946$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3052; ConvF(4.3, 4.3, 4.3); Calibrated: 24/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### **Modular SAR - 2.4GHz - Chain B, d= 12 mm/Back Side, Channel 1, 802.11b, 1Mbps/Area Scan (71x101x1):**

Interpolated grid: dx=1.000 mm, dy=1.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.601 W/kg

### **Modular SAR - 2.4GHz - Chain B, d= 12 mm/Back Side, Channel 1, 802.11b, 1Mbps/Zoom Scan (7x7x7)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=5mm

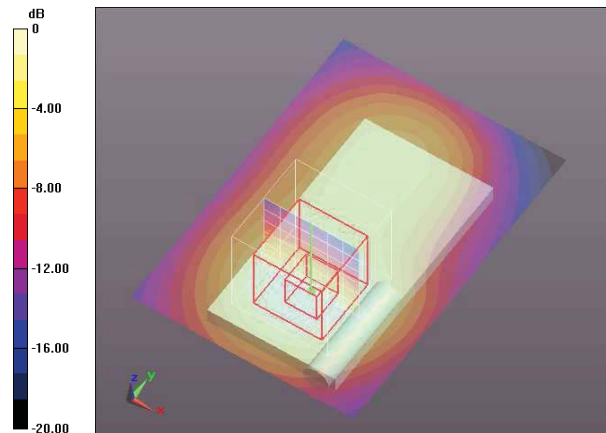
Reference Value = 9.293 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.870 W/kg

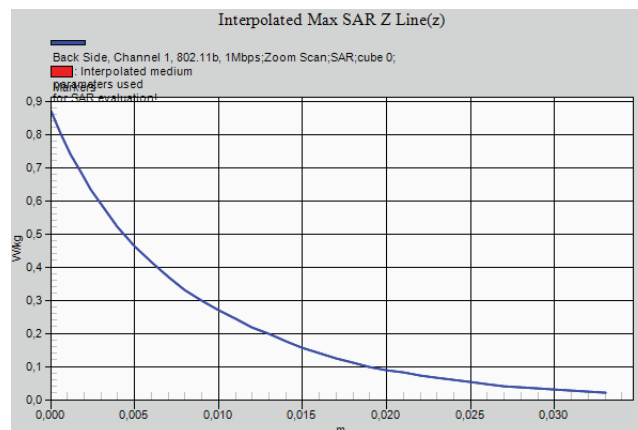
**SAR(1 g) = 0.481 W/kg; SAR(10 g) = 0.267 W/kg** (SAR corrected for target medium)

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.588 W/kg



0 dB = 0.588 W/kg = -2.31 dBW/kg



## 5.2 GHz – Chain A – d=12 mm – Front Side / 802.11a – CH 48 – Plot N°3

Test Laboratory: AT4 Wireless; Date: 22/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10062 - CAA, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps); Frequency: 5240 MHz; Duty Cycle: 1:7.37904

Medium parameters used:  $f = 5240$  MHz;  $\sigma = 5.19$  S/m;  $\epsilon_r = 50.04$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(4.32, 4.32, 4.32); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### Modular SAR - 5.2GHz - d=12mm/Chain A, Front Side, Channel 48, 802.11a, 6Mbps/Area Scan (61x91x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.10 W/kg

### Modular SAR - 5.2GHz - d=12mm/Chain A, Front Side, Channel 48, 802.11a, 6Mbps/Zoom Scan (8x8x6)/Cube 0:

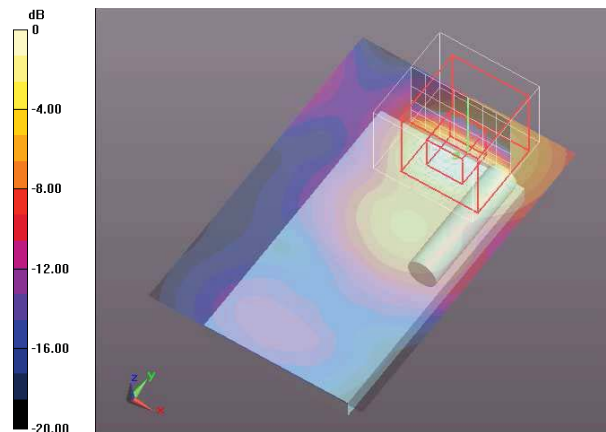
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 9.649 V/m; Power Drift = 0.12 dB

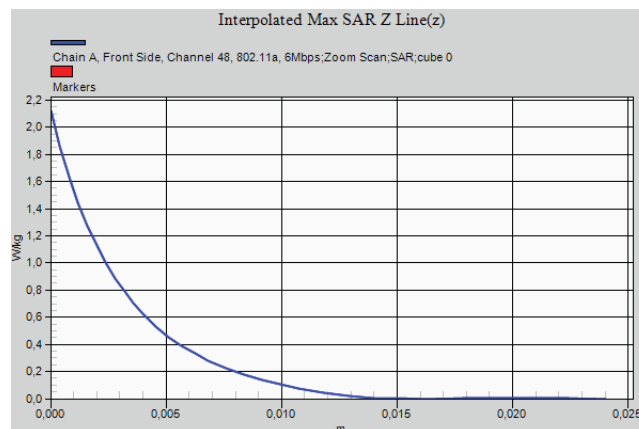
Peak SAR (extrapolated) = 2.12 W/kg

**SAR(1 g) = 0.580 W/kg; SAR(10 g) = 0.188 W/kg** (SAR corrected for target medium)

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



0 dB = 1.08 W/kg = 0.33 dBW/kg



## 5.2 GHz – Chain B – d=12 mm – Front Side / 802.11a – CH 48 – Plot N°4

Test Laboratory: AT4 Wireless; Date: 22/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10062 - CAA, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps); Frequency: 5240 MHz; Duty Cycle: 1:7.37904

Medium parameters used:  $f = 5240$  MHz;  $\sigma = 5.19$  S/m;  $\epsilon_r = 50.04$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(4.32, 4.32, 4.32); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Modular SAR - 5.2GHz - d=12mm/Chain B, Front Side, Channel 48, 802.11a, 6Mbps/Area Scan (61x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.14 W/kg

**Modular SAR - 5.2GHz - d=12mm/Chain B, Front Side, Channel 48, 802.11a, 6Mbps/Zoom Scan (8x8x6)/Cube 0:**

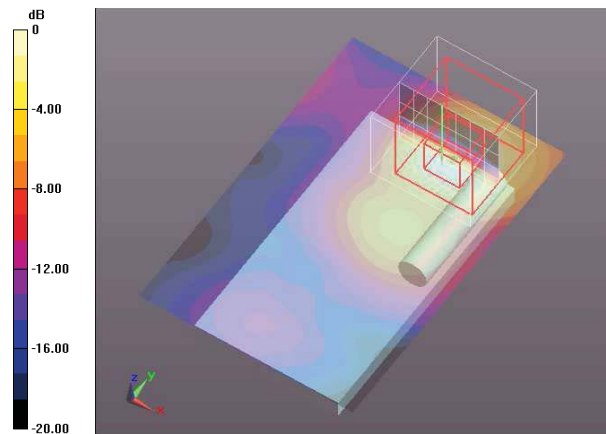
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 10.20 V/m; Power Drift = 0.08 dB

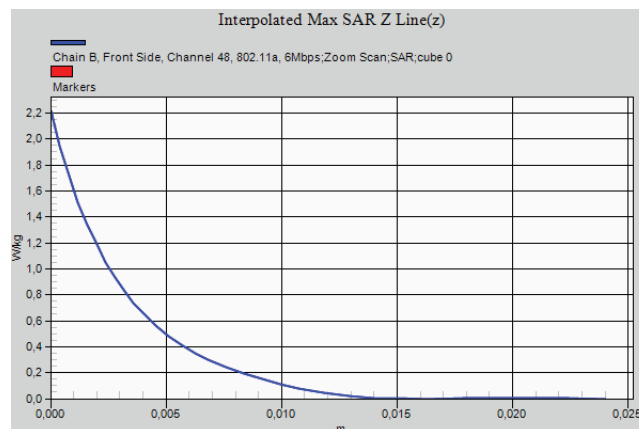
Peak SAR (extrapolated) = 2.22 W/kg

**SAR(1 g) = 0.609 W/kg; SAR(10 g) = 0.197 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg



### 5.3 GHz – Chain A – d=12 mm – Top Side / 802.11a – CH 52 – Plot N°5

Test Laboratory: AT4 Wireless; Date: 25/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10062 - CAA, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps); Frequency: 5260 MHz; Duty Cycle: 1:7.37904

Medium parameters used:  $f = 5260$  MHz;  $\sigma = 5.27$  S/m;  $\epsilon_r = 50.18$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(4.15, 4.15, 4.15); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

#### Modular SAR - 5.3GHz - d=12mm/Chain A, Top Side, Channel 52, 802.11a, 6Mbps/Area Scan (51x91x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

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

#### Modular SAR - 5.3GHz - d=12mm/Chain A, Top Side, Channel 52, 802.11a, 6Mbps/Zoom Scan (8x8x6)/Cube 0:

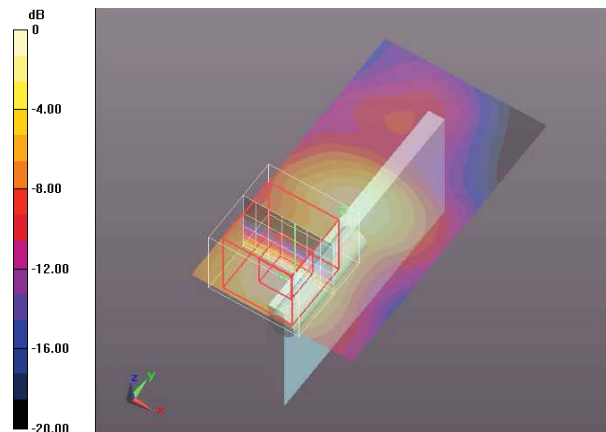
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 12.65 V/m; Power Drift = 0.11 dB

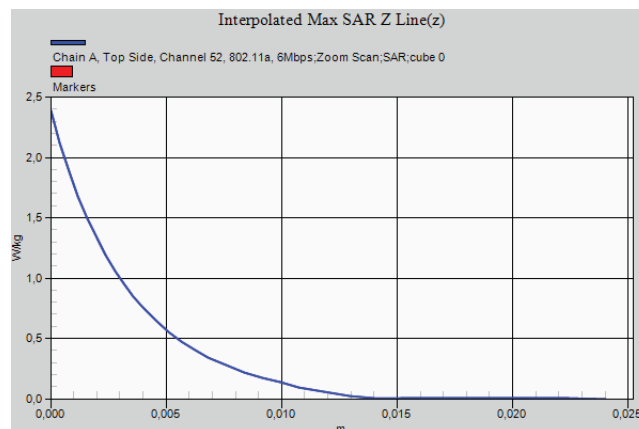
Peak SAR (extrapolated) = 2.38 W/kg

**SAR(1 g) = 0.693 W/kg; SAR(10 g) = 0.242 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 1.31 W/kg



0 dB = 1.31 W/kg = 1.17 dBW/kg



### 5.3 GHz – Chain B – d=12 mm – Front Side / 802.11n40 – CH 54 – Plot N°6

Test Laboratory: AT4 Wireless; Date: 25/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10117 - CAA, IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5270 MHz; Duty Cycle: 1:6.4121

Medium parameters used (interpolated):  $f = 5270$  MHz;  $\sigma = 5.29$  S/m;  $\epsilon_r = 50.175$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(4.15, 4.15, 4.15); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

#### Modular SAR - 5.3GHz - d=12mm/Chain B, Front Side, Channel 54, 802.11n40, HT0/Area Scan (61x91x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

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

#### Modular SAR - 5.3GHz - d=12mm/Chain B, Front Side, Channel 54, 802.11n40, HT0/Zoom Scan (8x8x6)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

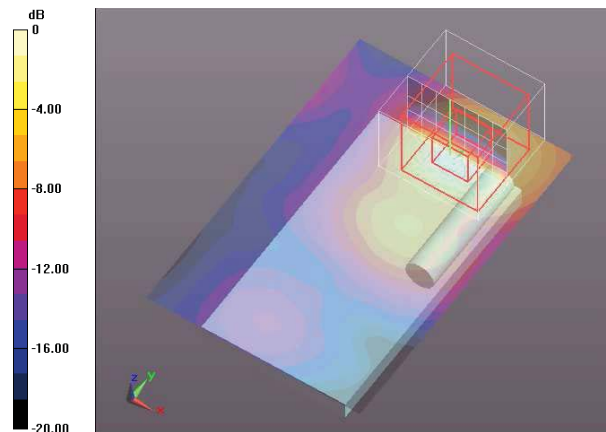
Reference Value = 10.38 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 2.27 W/kg

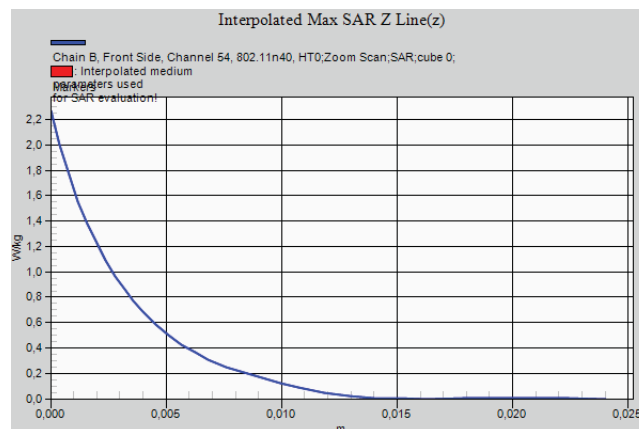
SAR(1 g) = 0.632 W/kg; SAR(10 g) = 0.209 W/kg (SAR corrected for target medium)

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.18 W/kg



0 dB = 1.18 W/kg = 0.72 dBW/kg



### **5.6 GHz – Chain A – d=12 mm – Front Side / 802.11a – CH 116 – Plot N°7**

**Test Laboratory: AT4 Wireless; Date: 26/05/2015**

**DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003**

Communication System: UID 10062 - CAA, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps); Frequency: 5580 MHz; Duty Cycle: 1:7.37904

Medium parameters used:  $f = 5580$  MHz;  $\sigma = 5.73$  S/m;  $\epsilon_r = 48.11$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(3.67, 3.67, 3.67); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### **Modular SAR - 5.5GHz - d=12mm/Chain A, Front Side, Channel 116, 802.11a, 6Mbps/Area Scan (61x91x1):**

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.10 W/kg

### **Modular SAR - 5.5GHz - d=12mm/Chain A, Front Side, Channel 116, 802.11a, 6Mbps/Zoom Scan (8x8x6)/Cube 0:**

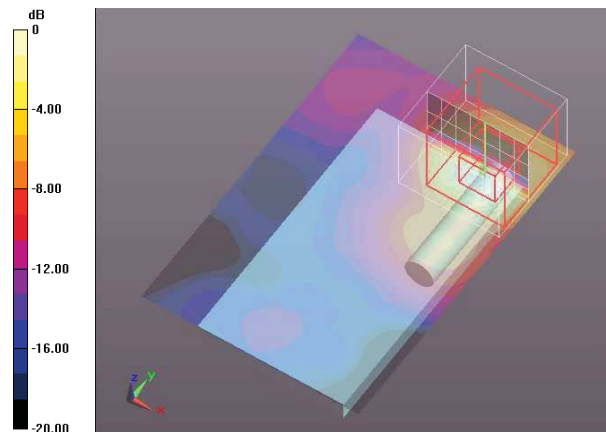
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 10.86 V/m; Power Drift = 0.14 dB

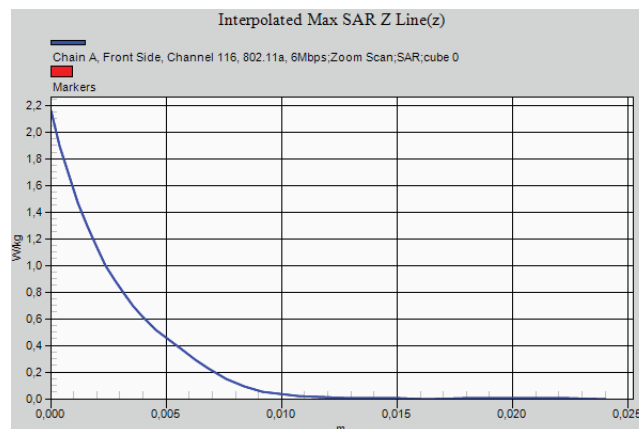
Peak SAR (extrapolated) = 2.16 W/kg

**SAR(1 g) = 0.552 W/kg; SAR(10 g) = 0.171 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 1.11 W/kg



0 dB = 1.11 W/kg = 0.45 dBW/kg



## 5.6 GHz – Chain B – d=12 mm – Front Side / 802.11a – CH 116 – Plot N°8

Test Laboratory: AT4 Wireless; Date: 26/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10062 - CAA, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps); Frequency: 5580 MHz; Duty Cycle: 1:7.37904

Medium parameters used:  $f = 5580$  MHz;  $\sigma = 5.73$  S/m;  $\epsilon_r = 48.11$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(3.67, 3.67, 3.67); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### Modular SAR - 5.5GHz - d=12mm/Chain B, Front Side, Channel 116, 802.11a, 6Mbps/Area Scan (61x91x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.26 W/kg

### Modular SAR - 5.5GHz - d=12mm/Chain B, Front Side, Channel 116, 802.11a, 6Mbps/Zoom Scan (8x8x6)/Cube 0:

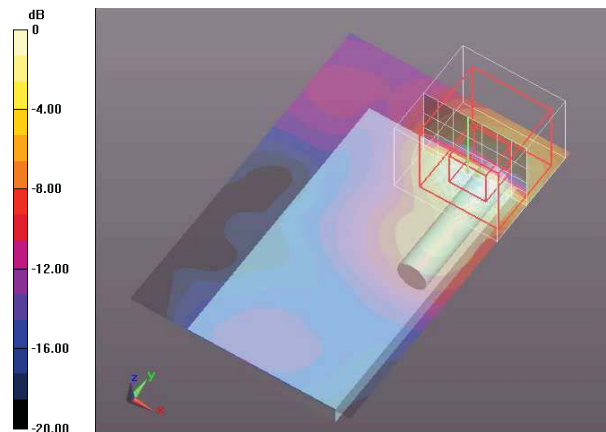
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 11.74 V/m; Power Drift = -0.03 dB

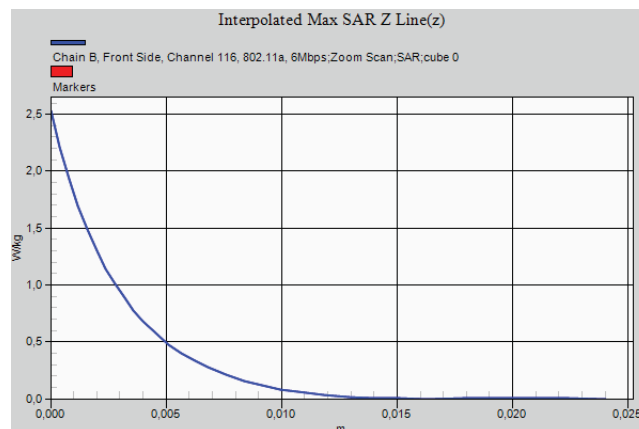
Peak SAR (extrapolated) = 2.53 W/kg

**SAR(1 g) = 0.642 W/kg; SAR(10 g) = 0.200 W/kg** (SAR corrected for target medium)

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



0 dB = 1.24 W/kg = 0.93 dBW/kg



## 5.8 GHz – Chain A – d=12 mm – Front Side / 802.11ac80 – CH 155 – Plot N°9

Test Laboratory: AT4 Wireless; Date: 27/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10402 - AAA, IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle); Frequency: 5775 MHz; Duty Cycle: 1:7.12853

Medium parameters used (interpolated):  $f = 5775$  MHz;  $\sigma = 6.21$  S/m;  $\epsilon_r = 47.565$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(3.89, 3.89, 3.89); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### Modular SAR - 5.8GHz - d=12mm/Chain A, Front Side, Channel 155, 802.11ac80, VHT0/Area Scan (61x91x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.988 W/kg

### Modular SAR - 5.8GHz - d=12mm/Chain A, Front Side, Channel 155, 802.11ac80, VHT0/Zoom Scan (8x8x6)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

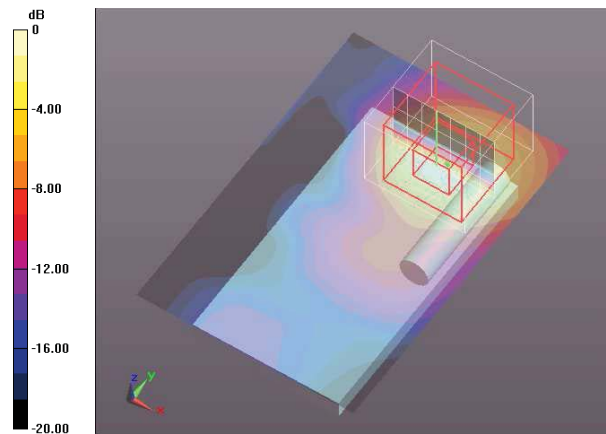
Reference Value = 7.240 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 2.01 W/kg

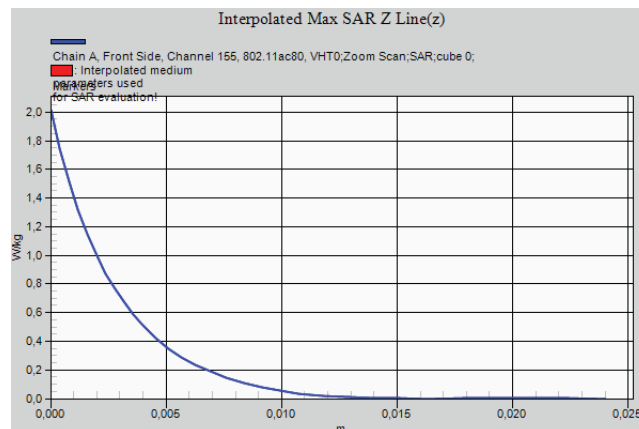
SAR(1 g) = 0.483 W/kg; SAR(10 g) = 0.154 W/kg (SAR corrected for target medium)

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.985 W/kg



0 dB = 0.985 W/kg = -0.07 dBW/kg



## 5.8 GHz – Chain B – d=12 mm – Front Side / 802.11ac80 – CH 155 – Plot N°10

Test Laboratory: AT4 Wireless; Date: 27/05/2015

DUT: 8260D2W + SkyCross; Type: -; Serial: REF: H66846-003

Communication System: UID 10402 - AAA, IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle); Frequency: 5775 MHz; Duty Cycle: 1:7.12853

Medium parameters used (interpolated):  $f = 5775$  MHz;  $\sigma = 6.21$  S/m;  $\epsilon_r = 47.565$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(3.89, 3.89, 3.89); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### Modular SAR - 5.8GHz - d=12mm/Chain B, Front Side, Channel 155, 802.11ac80, VHT0/Area Scan (61x91x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 1.19 W/kg

### Modular SAR - 5.8GHz - d=12mm/Chain B, Front Side, Channel 155, 802.11ac80, VHT0/Zoom Scan (8x8x6)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

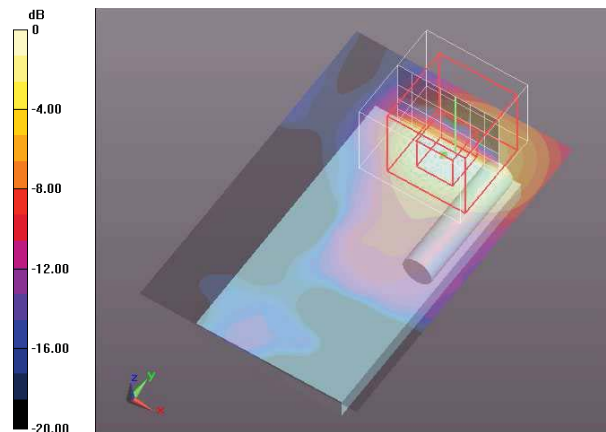
Reference Value = 7.782 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 2.34 W/kg

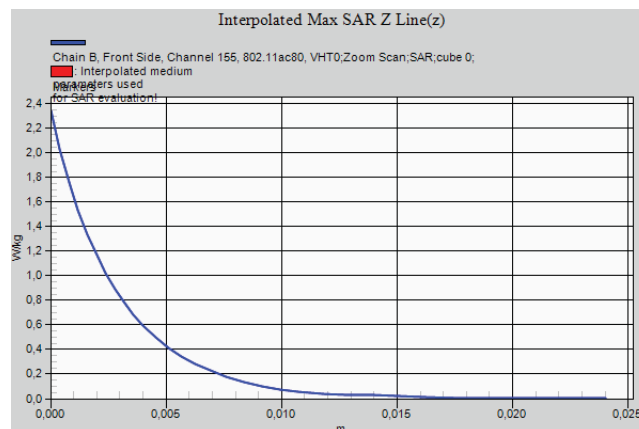
**SAR(1 g) = 0.575 W/kg; SAR(10 g) = 0.180 W/kg** (SAR corrected for target medium)

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.12 W/kg



0 dB = 1.12 W/kg = 0.49 dBW/kg



## Appendix D – System Validation Reports

## Validation results in 2450 MHz Band for Body TSL

Test Laboratory: AT4 Wireless; Date: 20/05/2015

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:756

Communication System: UID 10000, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.98$  S/m;  $\epsilon_r = 51.61$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3052; ConvF(4.3, 4.3, 4.3); Calibrated: 24/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### System Performance Check with D2450V2 Dipole/d=10mm, Pin=250mW/Area Scan (61x61x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 16.8 W/kg

### System Performance Check with D2450V2 Dipole/d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

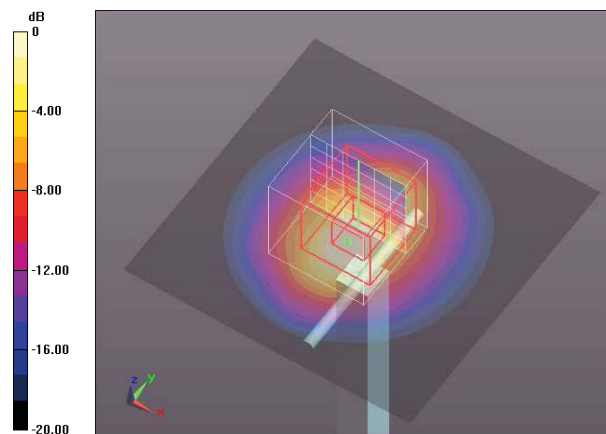
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.69 V/m; Power Drift = -0.23 dB

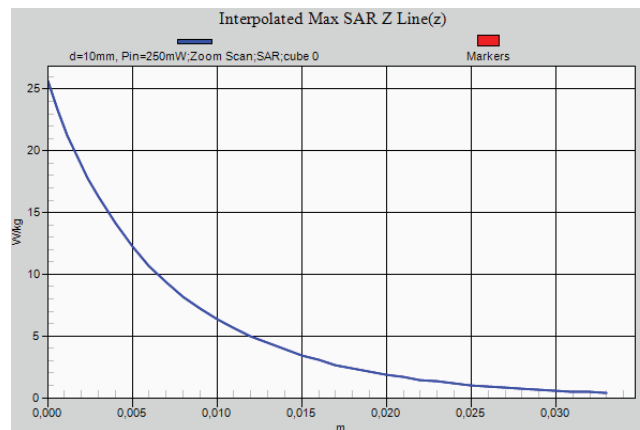
Peak SAR (extrapolated) = 25.6 W/kg

**SAR(1 g) = 12.2 W/kg; SAR(10 g) = 5.7 W/kg** (SAR corrected for target medium)

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



0 dB = 16.2 W/kg = 12.10 dBW/kg



## Validation results in 2450 MHz Band for Body TSL

Test Laboratory: AT4 Wireless; Date: 28/05/2015

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:756

Communication System: UID 10000, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.95$  S/m;  $\epsilon_r = 51.55$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3052; ConvF(4.3, 4.3, 4.3); Calibrated: 24/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### System Performance Check with D2450V2 Dipole, 28-05-2015/d=10mm, Pin=250mW/Area Scan (61x61x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 16.9 W/kg

### System Performance Check with D2450V2 Dipole, 28-05-2015/d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

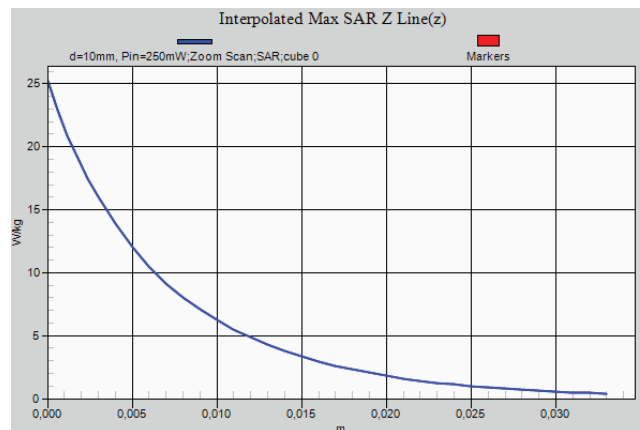
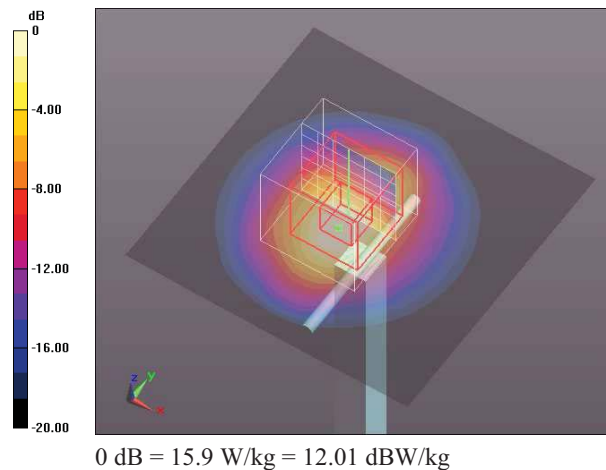
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.60 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 25.2 W/kg

**SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.62 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 15.9 W/kg



## Validation results in 5200 MHz Band for Body TSL

Test Laboratory: AT4 Wireless; Date: 21/05/2015

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1071

Communication System: UID 0, CW-5GHz; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.17$  S/m;  $\epsilon_r = 50.19$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(4.32, 4.32, 4.32); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### System Performance Check with D5.2GHzV2 Dipole/d=10mm, Pin=100mW, f=5200 MHz/Area Scan (61x61x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 14.5 W/kg

### System Performance Check with D5.2GHzV2 Dipole/d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x13)/Cube 0:

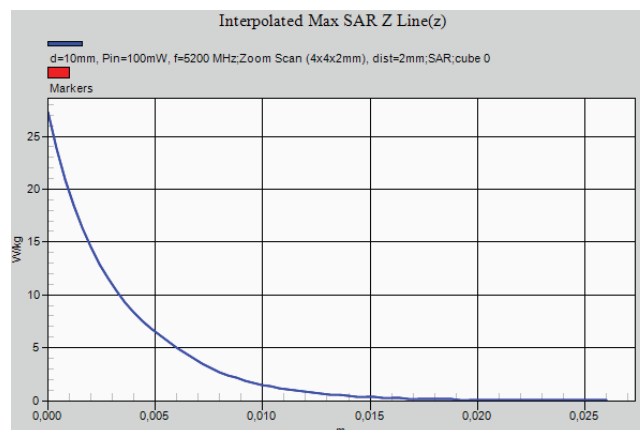
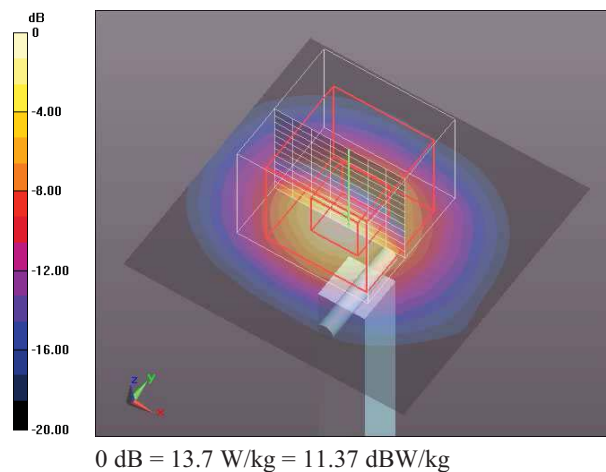
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 55.03 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 27.3 W/kg

**SAR(1 g) = 7.11 W/kg; SAR(10 g) = 2.03 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 13.7 W/kg



## **Validation results in 5200 MHz Band for Body TSL**

**Test Laboratory: AT4 Wireless; Date: 25/05/2015**

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1071**

Communication System: UID 0, CW-5GHz; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.2$  S/m;  $\epsilon_r = 50.37$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(4.32, 4.32, 4.32); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### **System Performance Check with D5.2GHzV2 Dipole 25\_05\_2015/d=10mm, Pin=100mW, f=5200 MHz/Area Scan (61x61x1):**

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 14.9 W/kg

### **System Performance Check with D5.2GHzV2 Dipole 25\_05\_2015/d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x13)/Cube 0:**

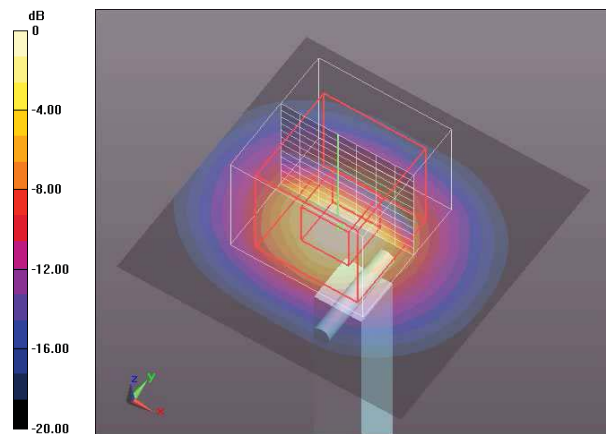
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 56.39 V/m; Power Drift = 0.05 dB

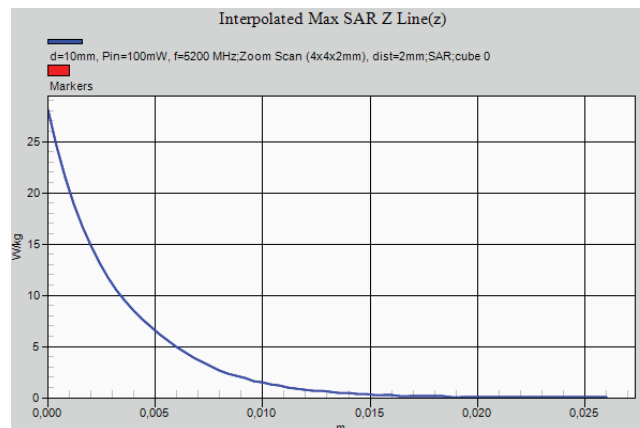
Peak SAR (extrapolated) = 28.1 W/kg

**SAR(1 g) = 7.24 W/kg; SAR(10 g) = 2.06 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 13.5 W/kg



0 dB = 13.5 W/kg = 11.30 dBW/kg



## Validation results in 5500 MHz Band for Body TSL

Test Laboratory: AT4 Wireless; Date: 26/05/2015

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1071

Communication System: UID 0, CW-5GHz; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5500$  MHz;  $\sigma = 5.61$  S/m;  $\epsilon_r = 48.35$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(3.67, 3.67, 3.67); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### System Performance Check with D5.5GHzV2 Dipole/d=10mm, Pin=100mW, f=5500 MHz/Area Scan (61x61x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

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

### System Performance Check with D5.5GHzV2 Dipole/d=10mm, Pin=100mW, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x13)/Cube 0:

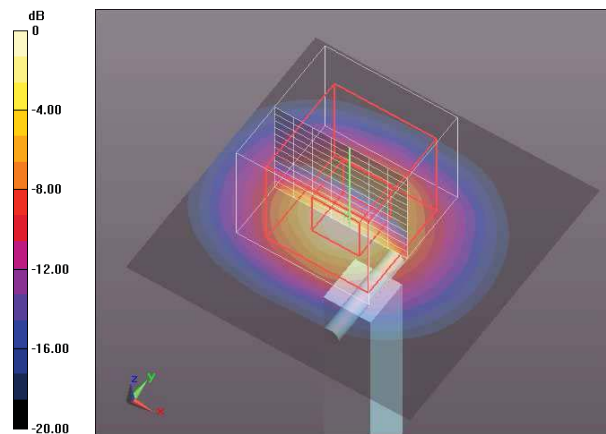
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 53.61 V/m; Power Drift = 0.39 dB

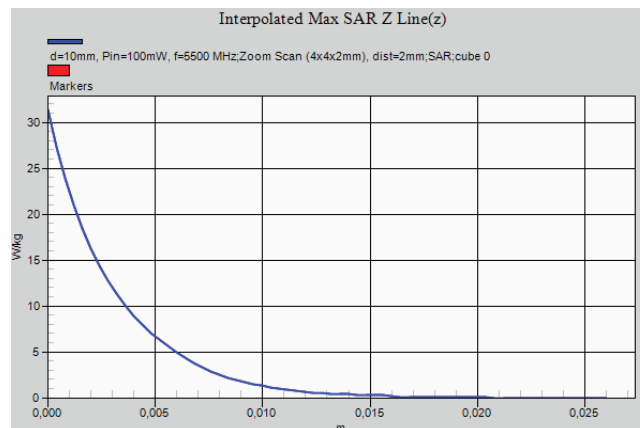
Peak SAR (extrapolated) = 31.4 W/kg

**SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.14 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 15.4 W/kg



0 dB = 15.4 W/kg = 11.88 dBW/kg



## Validation results in 5800 MHz Band for Body TSL

Test Laboratory: AT4 Wireless; Date: 27/05/2015

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1071

Communication System: UID 0, CW-5GHz; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.2$  S/m;  $\epsilon_r = 47.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3687; ConvF(3.89, 3.89, 3.89); Calibrated: 14/07/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/07/2014
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

### System Performance Check with D5.8GHzV2 Dipole/d=10mm, Pin=100mW, f=5800 MHz/Area Scan (61x61x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

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

### System Performance Check with D5.8GHzV2 Dipole/d=10mm, Pin=100mW, f=5800 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x13)/Cube 0:

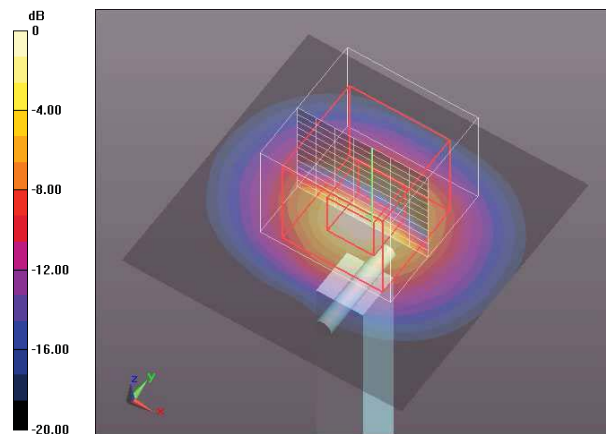
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 52.06 V/m; Power Drift = 0.12 dB

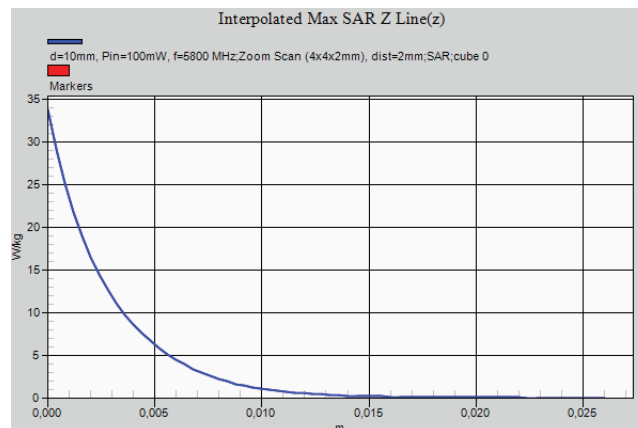
Peak SAR (extrapolated) = 33.8 W/kg

**SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.14 W/kg** (SAR corrected for target medium)

Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg



## Appendix E – Calibration data



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Client **AT4 Wireless**

Certificate No: **DAE4-669\_Jul14**

## CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 669**

Calibration procedure(s) **QA CAL-06.v26**  
**Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **July 08, 2014**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards             | ID #               | Cal Date (Certificate No.) | Scheduled Calibration  |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278        | 01-Oct-13 (No:13976)       | Oct-14                 |
| Secondary Standards           | ID #               | Check Date (in house)      | Scheduled Check        |
| Auto DAE Calibration Unit     | SE UWS 053 AA 1001 | 07-Jan-14 (in house check) | In house check: Jan-15 |
| Calibrator Box V2.1           | SE UMS 006 AA 1002 | 07-Jan-14 (in house check) | In house check: Jan-15 |

Calibrated by: **Dominique Steffen** **Technician**

Signature

Approved by: **Fin Bomholt** **Deputy Technical Manager**

Issued: July 8, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



## Glossary

|                 |                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------|
| DAE             | data acquisition electronics                                                            |
| Connector angle | information used in DASY system to align probe sensor X to the robot coordinate system. |

## Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X                         | Y                         | Z                         |
|---------------------|---------------------------|---------------------------|---------------------------|
| High Range          | 403.321 $\pm$ 0.02% (k=2) | 403.870 $\pm$ 0.02% (k=2) | 404.236 $\pm$ 0.02% (k=2) |
| Low Range           | 3.95654 $\pm$ 1.50% (k=2) | 3.97463 $\pm$ 1.50% (k=2) | 3.97450 $\pm$ 1.50% (k=2) |

### Connector Angle

|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Connector Angle to be used in DASY system | 193.0 $^{\circ}$ $\pm$ 1 $^{\circ}$ |
|-------------------------------------------|-------------------------------------|

## Appendix (Additional assessments outside the scope of SCS108)

### 1. DC Voltage Linearity

| High Range        | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 199998.19                 | 1.59                         | 0.00      |
| Channel X + Input | 20005.64                  | 5.16                         | 0.03      |
| Channel X - Input | -19996.31                 | 4.81                         | -0.02     |
| Channel Y + Input | 199995.73                 | -1.00                        | -0.00     |
| Channel Y + Input | 20004.06                  | 3.54                         | 0.02      |
| Channel Y - Input | -19997.93                 | 3.28                         | -0.02     |
| Channel Z + Input | 199997.38                 | 0.79                         | 0.00      |
| Channel Z + Input | 20004.17                  | 3.55                         | 0.02      |
| Channel Z - Input | -19997.90                 | 3.31                         | -0.02     |

| Low Range         | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 2000.84                   | 0.28                         | 0.01      |
| Channel X + Input | 201.50                    | 0.42                         | 0.21      |
| Channel X - Input | -197.83                   | 0.90                         | -0.45     |
| Channel Y + Input | 2001.06                   | 0.57                         | 0.03      |
| Channel Y + Input | 200.71                    | -0.32                        | -0.16     |
| Channel Y - Input | -199.39                   | -0.60                        | 0.30      |
| Channel Z + Input | 2001.12                   | 0.68                         | 0.03      |
| Channel Z + Input | 199.84                    | -1.25                        | -0.62     |
| Channel Z - Input | -200.65                   | -1.79                        | 0.90      |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Common mode Input Voltage (mV) | High Range Average Reading ( $\mu\text{V}$ ) | Low Range Average Reading ( $\mu\text{V}$ ) |
|-----------|--------------------------------|----------------------------------------------|---------------------------------------------|
| Channel X | 200                            | 2.02                                         | 0.88                                        |
|           | - 200                          | 1.03                                         | -0.74                                       |
| Channel Y | 200                            | 11.55                                        | 10.93                                       |
|           | - 200                          | -12.37                                       | -12.38                                      |
| Channel Z | 200                            | -9.56                                        | -9.90                                       |
|           | - 200                          | 8.49                                         | 8.06                                        |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Input Voltage (mV) | Channel X ( $\mu\text{V}$ ) | Channel Y ( $\mu\text{V}$ ) | Channel Z ( $\mu\text{V}$ ) |
|-----------|--------------------|-----------------------------|-----------------------------|-----------------------------|
| Channel X | 200                | -                           | -2.27                       | -2.78                       |
| Channel Y | 200                | 9.49                        | -                           | -1.75                       |
| Channel Z | 200                | 3.99                        | 7.50                        | -                           |

#### 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 16079            | 16148           |
| Channel Y | 15795            | 15263           |
| Channel Z | 15997            | 15243           |

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M $\Omega$

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.48               | -0.54                  | 1.65                   | 0.44                      |
| Channel Y | -0.35              | -1.84                  | 1.53                   | 0.54                      |
| Channel Z | 0.15               | -1.16                  | 0.99                   | 0.42                      |

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance (Typical values for information)

|           | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 200            | 200              |
| Channel Y | 200            | 200              |
| Channel Z | 200            | 200              |

#### 8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9              |
| Supply (- Vcc) | -7.6              |

#### 9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01             | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **AT4 Wireless**

Certificate No: **ES3-3052\_Sep14**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3052**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
 Calibration procedure for dosimetric E-field probes

Calibration date: **September 24, 2014**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Power sensor E4412A        | MY41498087      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 03-Apr-14 (No. 217-01915)         | Apr-15                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919)         | Apr-15                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920)         | Apr-15                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-13 (No. ES3-3013_Dec13)    | Dec-14                 |
| DAE4                       | SN: 660         | 13-Dec-13 (No. DAE4-660_Dec13)    | Dec-14                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

|                                                                                                                 | Name          | Function              | Signature |
|-----------------------------------------------------------------------------------------------------------------|---------------|-----------------------|-----------|
| Calibrated by:                                                                                                  | Leif Klysner  | Laboratory Technician |           |
| Approved by:                                                                                                    | Katja Pokovic | Technical Manager     |           |
| Issued: September 24, 2014                                                                                      |               |                       |           |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |               |                       |           |



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#### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

#### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(*f*)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* frequency\_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR:** PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>:** A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle:** The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV3

## SN:3052

|               |                    |
|---------------|--------------------|
| Manufactured: | September 30, 2003 |
| Repaired:     | September 18, 2014 |
| Calibrated:   | September 24, 2014 |

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3052

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)    |
|-----------------------------------------------------------|----------|----------|----------|--------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.13     | 0.42     | 1.10     | $\pm 10.1\%$ |
| DCP (mV) <sup>B</sup>                                     | 104.3    | 98.3     | 102.9    |              |

### Modulation Calibration Parameters

| UID           | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|---------------|-----------------------------------------------|---|---------|------------------------------|------|---------|----------|---------------------------|
| 0             | CW                                            | X | 0.0     | 0.0                          | 1.0  | 0.00    | 199.5    | $\pm 3.5\%$               |
|               |                                               | Y | 0.0     | 0.0                          | 1.0  |         | 180.7    |                           |
|               |                                               | Z | 0.0     | 0.0                          | 1.0  |         | 199.0    |                           |
| 10011-<br>CAB | UMTS-FDD (WCDMA)                              | X | 3.36    | 67.7                         | 18.9 | 2.91    | 136.2    | $\pm 0.7\%$               |
|               |                                               | Y | 3.05    | 64.3                         | 16.5 |         | 144.5    |                           |
|               |                                               | Z | 3.24    | 66.7                         | 18.2 |         | 136.3    |                           |
| 10012-<br>CAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 2.93    | 69.1                         | 19.0 | 1.87    | 138.2    | $\pm 0.7\%$               |
|               |                                               | Y | 2.41    | 64.0                         | 15.8 |         | 143.3    |                           |
|               |                                               | Z | 2.90    | 68.5                         | 18.4 |         | 137.9    |                           |
| 10013-<br>CAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 11.13   | 70.8                         | 23.4 | 9.46    | 135.8    | $\pm 3.3\%$               |
|               |                                               | Y | 10.99   | 69.1                         | 21.9 |         | 143.7    |                           |
|               |                                               | Z | 11.06   | 70.4                         | 23.1 |         | 135.3    |                           |
| 10021-<br>DAB | GSM-FDD (TDMA, GMSK)                          | X | 10.62   | 86.4                         | 23.2 | 9.39    | 144.0    | $\pm 1.9\%$               |
|               |                                               | Y | 2.75    | 68.5                         | 16.2 |         | 87.9     |                           |
|               |                                               | Z | 17.37   | 95.8                         | 26.8 |         | 144.4    |                           |
| 10023-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 15.14   | 93.2                         | 25.8 | 9.57    | 145.2    | $\pm 2.2\%$               |
|               |                                               | Y | 2.61    | 67.2                         | 15.9 |         | 82.8     |                           |
|               |                                               | Z | 19.74   | 98.0                         | 27.4 |         | 130.3    |                           |
| 10024-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 32.39   | 99.8                         | 25.1 | 6.56    | 128.1    | $\pm 1.4\%$               |
|               |                                               | Y | 4.81    | 76.8                         | 17.9 |         | 126.8    |                           |
|               |                                               | Z | 34.20   | 99.8                         | 25.0 |         | 141.2    |                           |
| 10025-<br>DAB | EDGE-FDD (TDMA, 8PSK, TN 0)                   | X | 13.71   | 99.1                         | 38.4 | 12.62   | 139.8    | $\pm 3.0\%$               |
|               |                                               | Y | 4.87    | 67.9                         | 23.1 |         | 59.1     |                           |
|               |                                               | Z | 13.94   | 99.6                         | 38.7 |         | 126.3    |                           |
| 10026-<br>DAB | EDGE-FDD (TDMA, 8PSK, TN 0-1)                 | X | 11.01   | 90.1                         | 31.4 | 9.55    | 126.7    | $\pm 2.5\%$               |
|               |                                               | Y | 5.75    | 74.5                         | 24.4 |         | 124.5    |                           |
|               |                                               | Z | 12.89   | 93.9                         | 33.0 |         | 139.8    |                           |
| 10027-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 32.71   | 94.5                         | 21.4 | 4.80    | 144.2    | $\pm 1.4\%$               |
|               |                                               | Y | 2.79    | 69.7                         | 13.7 |         | 132.6    |                           |
|               |                                               | Z | 50.44   | 99.9                         | 22.9 |         | 130.7    |                           |
| 10028-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 47.66   | 99.5                         | 22.1 | 3.55    | 126.6    | $\pm 2.2\%$               |
|               |                                               | Y | 24.59   | 92.3                         | 19.6 |         | 146.3    |                           |
|               |                                               | Z | 55.77   | 99.6                         | 21.9 |         | 143.7    |                           |
| 10029-<br>DAB | EDGE-FDD (TDMA, 8PSK, TN 0-1-2)               | X | 16.20   | 99.3                         | 33.6 | 7.78    | 147.3    | $\pm 3.3\%$               |
|               |                                               | Y | 5.14    | 72.9                         | 22.5 |         | 132.6    |                           |
|               |                                               | Z | 10.86   | 89.3                         | 29.7 |         | 137.0    |                           |

|           |                                             |   |       |      |      |       |       |         |
|-----------|---------------------------------------------|---|-------|------|------|-------|-------|---------|
| 10048-CAA | DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)   | X | 7.45  | 83.0 | 25.7 | 13.80 | 90.0  | ±1.9 %  |
|           |                                             | Y | 2.39  | 62.3 | 15.5 |       | 32.0  |         |
|           |                                             | Z | 7.27  | 82.6 | 25.8 |       | 84.7  |         |
| 10049-CAA | DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12) | X | 13.92 | 91.7 | 26.1 | 10.79 | 148.8 | ±1.7 %  |
|           |                                             | Y | 3.21  | 69.9 | 17.8 |       | 65.7  |         |
|           |                                             | Z | 14.37 | 92.6 | 26.6 |       | 138.7 |         |
| 10058-DAB | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)           | X | 7.02  | 80.2 | 25.3 | 6.52  | 128.8 | ±2.2 %  |
|           |                                             | Y | 5.09  | 73.7 | 22.3 |       | 141.9 |         |
|           |                                             | Z | 14.75 | 96.3 | 31.4 |       | 144.1 |         |
| 10098-CAB | UMTS-FDD (HSUPA, Subtest 2)                 | X | 4.49  | 66.4 | 18.4 | 3.98  | 127.8 | ±0.9 %  |
|           |                                             | Y | 4.51  | 65.2 | 17.4 |       | 150.0 |         |
|           |                                             | Z | 4.62  | 66.8 | 18.7 |       | 140.4 |         |
| 10100-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)    | X | 6.34  | 67.3 | 19.6 | 5.67  | 134.3 | ±1.4 %  |
|           |                                             | Y | 6.31  | 66.1 | 18.5 |       | 134.8 |         |
|           |                                             | Z | 6.54  | 68.0 | 20.0 |       | 148.0 |         |
| 10102-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)  | X | 7.72  | 67.9 | 20.3 | 6.60  | 147.1 | ±1.9 %  |
|           |                                             | Y | 7.76  | 66.9 | 19.3 |       | 148.6 |         |
|           |                                             | Z | 7.62  | 67.5 | 20.1 |       | 134.4 |         |
| 10101-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)  | X | 7.72  | 67.9 | 20.3 | 6.42  | 147.1 | ±12.2 % |
|           |                                             | Y | 7.76  | 66.9 | 19.3 |       | 148.6 |         |
|           |                                             | Z | 7.62  | 67.5 | 20.1 |       | 134.4 |         |
| 10110-CAB | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)     | X | 5.87  | 66.2 | 19.2 | 5.75  | 129.6 | ±1.4 %  |
|           |                                             | Y | 5.91  | 65.3 | 18.3 |       | 130.0 |         |
|           |                                             | Z | 6.06  | 67.0 | 19.7 |       | 141.4 |         |
| 10154-CAB | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)     | X | 5.87  | 66.2 | 19.2 | 5.75  | 129.6 | ±12.2 % |
|           |                                             | Y | 5.91  | 65.3 | 18.3 |       | 130.0 |         |
|           |                                             | Z | 6.06  | 67.0 | 19.7 |       | 141.4 |         |
| 10112-CAB | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)  | X | 7.44  | 67.6 | 20.2 | 6.59  | 142.4 | ±1.9 %  |
|           |                                             | Y | 7.48  | 66.6 | 19.2 |       | 144.0 |         |
|           |                                             | Z | 7.35  | 67.3 | 20.0 |       | 130.5 |         |
| 10109-CAB | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)  | X | 7.44  | 67.6 | 20.2 | 6.43  | 142.4 | ±12.2 % |
|           |                                             | Y | 7.48  | 66.6 | 19.2 |       | 144.0 |         |
|           |                                             | Z | 7.35  | 67.3 | 20.0 |       | 130.5 |         |
| 10150-CAB | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)   | X | 7.44  | 67.6 | 20.2 | 6.60  | 142.4 | ±12.2 % |
|           |                                             | Y | 7.48  | 66.6 | 19.2 |       | 144.0 |         |
|           |                                             | Z | 7.35  | 67.3 | 20.0 |       | 130.5 |         |
| 10149-CAB | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)   | X | 7.44  | 67.6 | 20.2 | 6.42  | 142.4 | ±12.2 % |
|           |                                             | Y | 7.48  | 66.6 | 19.2 |       | 144.0 |         |
|           |                                             | Z | 7.35  | 67.3 | 20.0 |       | 130.5 |         |
| 10117-CAA | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)    | X | 10.44 | 69.6 | 21.7 | 8.07  | 149.5 | ±2.7 %  |
|           |                                             | Y | 10.10 | 67.7 | 20.2 |       | 124.9 |         |
|           |                                             | Z | 10.31 | 69.2 | 21.5 |       | 136.0 |         |
| 10140-CAB | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)  | X | 7.66  | 68.0 | 20.2 | 6.49  | 147.5 | ±1.7 %  |
|           |                                             | Y | 7.46  | 66.2 | 18.9 |       | 124.4 |         |
|           |                                             | Z | 7.58  | 67.6 | 20.1 |       | 134.6 |         |

|           |                                             |   |      |      |      |      |       |         |
|-----------|---------------------------------------------|---|------|------|------|------|-------|---------|
| 10141-CAB | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)  | X | 7.66 | 68.0 | 20.2 | 6.53 | 147.5 | ±12.2 % |
|           |                                             | Y | 7.46 | 66.2 | 18.9 |      | 124.4 |         |
|           |                                             | Z | 7.58 | 67.6 | 20.1 |      | 134.6 |         |
| 10146-CAB | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | X | 6.36 | 66.9 | 19.8 | 6.41 | 127.6 | ±1.4 %  |
|           |                                             | Y | 6.30 | 65.7 | 18.7 |      | 128.9 |         |
|           |                                             | Z | 6.55 | 67.6 | 20.2 |      | 139.3 |         |
| 10147-CAB | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM) | X | 6.63 | 67.1 | 20.0 | 6.72 | 127.1 | ±1.7 %  |
|           |                                             | Y | 6.58 | 65.9 | 19.0 |      | 128.3 |         |
|           |                                             | Z | 6.83 | 67.8 | 20.5 |      | 139.2 |         |
| 10157-CAB | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)    | X | 6.62 | 66.8 | 19.8 | 6.49 | 130.4 | ±1.7 %  |
|           |                                             | Y | 6.65 | 65.8 | 18.9 |      | 133.0 |         |
|           |                                             | Z | 6.83 | 67.5 | 20.2 |      | 142.9 |         |
| 10158-CAB | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)   | X | 7.15 | 67.3 | 20.0 | 6.62 | 137.7 | ±1.9 %  |
|           |                                             | Y | 7.22 | 66.4 | 19.2 |      | 140.7 |         |
|           |                                             | Z | 7.05 | 66.9 | 19.9 |      | 125.4 |         |
| 10111-CAB | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)   | X | 7.15 | 67.3 | 20.0 | 6.44 | 137.7 | ±12.2 % |
|           |                                             | Y | 7.22 | 66.4 | 19.2 |      | 140.7 |         |
|           |                                             | Z | 7.05 | 66.9 | 19.9 |      | 125.4 |         |
| 10113-CAB | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)   | X | 7.15 | 67.3 | 20.0 | 6.62 | 137.7 | ±12.2 % |
|           |                                             | Y | 7.22 | 66.4 | 19.2 |      | 140.7 |         |
|           |                                             | Z | 7.05 | 66.9 | 19.9 |      | 125.4 |         |
| 10155-CAB | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)   | X | 7.15 | 67.3 | 20.0 | 6.43 | 137.7 | ±12.2 % |
|           |                                             | Y | 7.22 | 66.4 | 19.2 |      | 140.7 |         |
|           |                                             | Z | 7.05 | 66.9 | 19.9 |      | 125.4 |         |
| 10161-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)   | X | 7.15 | 67.3 | 20.0 | 6.43 | 137.7 | ±12.2 % |
|           |                                             | Y | 7.22 | 66.4 | 19.2 |      | 140.7 |         |
|           |                                             | Z | 7.05 | 66.9 | 19.9 |      | 125.4 |         |
| 10162-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)   | X | 7.15 | 67.3 | 20.0 | 6.58 | 137.7 | ±12.2 % |
|           |                                             | Y | 7.22 | 66.4 | 19.2 |      | 140.7 |         |
|           |                                             | Z | 7.05 | 66.9 | 19.9 |      | 125.4 |         |
| 10159-CAB | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)    | X | 6.78 | 67.1 | 20.0 | 6.56 | 132.1 | ±1.9 %  |
|           |                                             | Y | 6.79 | 66.1 | 19.0 |      | 135.6 |         |
|           |                                             | Z | 6.97 | 67.8 | 20.4 |      | 144.2 |         |
| 10173-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)     | X | 8.21 | 77.1 | 27.3 | 9.48 | 128.8 | ±2.7 %  |
|           |                                             | Y | 6.63 | 70.6 | 23.3 |      | 143.3 |         |
|           |                                             | Z | 9.09 | 80.2 | 29.0 |      | 142.6 |         |
| 10226-CAA | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)    | X | 8.21 | 77.1 | 27.3 | 9.49 | 128.8 | ±12.2 % |
|           |                                             | Y | 6.63 | 70.6 | 23.3 |      | 143.3 |         |
|           |                                             | Z | 9.09 | 80.2 | 29.0 |      | 142.6 |         |
| 10235-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)     | X | 8.21 | 77.1 | 27.3 | 9.48 | 128.8 | ±12.2 % |
|           |                                             | Y | 6.63 | 70.6 | 23.3 |      | 143.3 |         |
|           |                                             | Z | 9.09 | 80.2 | 29.0 |      | 142.6 |         |
| 10229-CAB | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)      | X | 8.21 | 77.1 | 27.3 | 9.48 | 128.8 | ±12.2 % |
|           |                                             | Y | 6.63 | 70.6 | 23.3 |      | 143.3 |         |
|           |                                             | Z | 9.09 | 80.2 | 29.0 |      | 142.6 |         |

|           |                                          |   |      |      |      |      |       |         |
|-----------|------------------------------------------|---|------|------|------|------|-------|---------|
| 10232-CAB | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)   | X | 8.21 | 77.1 | 27.3 | 9.48 | 128.8 | ±12.2 % |
|           |                                          | Y | 6.63 | 70.6 | 23.3 |      | 143.3 |         |
|           |                                          | Z | 9.09 | 80.2 | 29.0 |      | 142.6 |         |
| 10238-CAB | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)  | X | 8.21 | 77.1 | 27.3 | 9.48 | 128.8 | ±12.2 % |
|           |                                          | Y | 6.63 | 70.6 | 23.3 |      | 143.3 |         |
|           |                                          | Z | 9.09 | 80.2 | 29.0 |      | 142.6 |         |
| 10179-CAB | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)  | X | 5.61 | 67.5 | 20.4 | 6.50 | 131.2 | ±1.9 %  |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10170-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)  | X | 5.61 | 67.5 | 20.4 | 6.52 | 131.2 | ±12.2 % |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10176-CAB | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)  | X | 5.61 | 67.5 | 20.4 | 6.52 | 131.2 | ±12.2 % |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10188-CAB | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM) | X | 5.61 | 67.5 | 20.4 | 6.52 | 131.2 | ±12.2 % |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10180-CAB | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)   | X | 5.61 | 67.5 | 20.4 | 6.50 | 131.2 | ±12.2 % |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10178-CAB | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)   | X | 5.61 | 67.5 | 20.4 | 6.52 | 131.2 | ±12.2 % |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10182-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)  | X | 5.61 | 67.5 | 20.4 | 6.52 | 131.2 | ±12.2 % |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10185-CAB | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)   | X | 5.61 | 67.5 | 20.4 | 6.51 | 131.2 | ±12.2 % |
|           |                                          | Y | 5.52 | 66.6 | 19.5 |      | 149.2 |         |
|           |                                          | Z | 5.78 | 68.2 | 20.8 |      | 142.1 |         |
| 10187-CAB | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)   | X | 4.91 | 66.6 | 19.6 | 5.73 | 132.5 | ±1.7 %  |
|           |                                          | Y | 4.82 | 65.4 | 18.6 |      | 149.1 |         |
|           |                                          | Z | 5.03 | 67.1 | 19.9 |      | 144.0 |         |
| 10166-CAB | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK) | X | 4.91 | 66.6 | 19.6 | 5.46 | 132.5 | ±12.2 % |
|           |                                          | Y | 4.82 | 65.4 | 18.6 |      | 149.1 |         |
|           |                                          | Z | 5.03 | 67.1 | 19.9 |      | 144.0 |         |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.91 | 66.6 | 19.6 | 5.72 | 132.5 | ±12.2 % |
|           |                                          | Y | 4.82 | 65.4 | 18.6 |      | 149.1 |         |
|           |                                          | Z | 5.03 | 67.1 | 19.9 |      | 144.0 |         |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.91 | 66.6 | 19.6 | 5.73 | 132.5 | ±12.2 % |
|           |                                          | Y | 4.82 | 65.4 | 18.6 |      | 149.1 |         |
|           |                                          | Z | 5.03 | 67.1 | 19.9 |      | 144.0 |         |
| 10175-CAB | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.91 | 66.6 | 19.6 | 5.72 | 132.5 | ±12.2 % |
|           |                                          | Y | 4.82 | 65.4 | 18.6 |      | 149.1 |         |
|           |                                          | Z | 5.03 | 67.1 | 19.9 |      | 144.0 |         |

|           |                                             |   |       |      |      |      |       |         |
|-----------|---------------------------------------------|---|-------|------|------|------|-------|---------|
| 10177-CAD | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)        | X | 4.91  | 66.6 | 19.6 | 5.73 | 132.5 | ±12.2 % |
|           |                                             | Y | 4.82  | 65.4 | 18.6 |      | 149.1 |         |
|           |                                             | Z | 5.03  | 67.1 | 19.9 |      | 144.0 |         |
| 10184-CAB | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)        | X | 4.91  | 66.6 | 19.6 | 5.73 | 132.5 | ±12.2 % |
|           |                                             | Y | 4.82  | 65.4 | 18.6 |      | 149.1 |         |
|           |                                             | Z | 5.03  | 67.1 | 19.9 |      | 144.0 |         |
| 10196-CAA | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)     | X | 9.98  | 69.0 | 21.5 | 8.10 | 140.6 | ±2.7 %  |
|           |                                             | Y | 10.10 | 68.2 | 20.6 |      | 140.7 |         |
|           |                                             | Z | 9.90  | 68.8 | 21.4 |      | 129.4 |         |
| 10225-CAB | UMTS-FDD (HSPA+)                            | X | 6.99  | 67.1 | 19.5 | 5.97 | 143.6 | ±1.4 %  |
|           |                                             | Y | 7.11  | 66.4 | 18.8 |      | 149.0 |         |
|           |                                             | Z | 6.91  | 66.8 | 19.3 |      | 133.0 |         |
| 10228-CAA | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)      | X | 8.00  | 76.7 | 27.1 | 9.22 | 132.0 | ±2.7 %  |
|           |                                             | Y | 6.43  | 70.1 | 23.1 |      | 147.2 |         |
|           |                                             | Z | 8.85  | 79.7 | 28.7 |      | 146.7 |         |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)       | X | 8.00  | 76.7 | 27.1 | 9.21 | 132.0 | ±12.2 % |
|           |                                             | Y | 6.43  | 70.1 | 23.1 |      | 147.2 |         |
|           |                                             | Z | 8.85  | 79.7 | 28.7 |      | 146.7 |         |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)       | X | 8.00  | 76.7 | 27.1 | 9.21 | 132.0 | ±12.2 % |
|           |                                             | Y | 6.43  | 70.1 | 23.1 |      | 147.2 |         |
|           |                                             | Z | 8.85  | 79.7 | 28.7 |      | 146.7 |         |
| 10231-CAB | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)        | X | 8.00  | 76.7 | 27.1 | 9.19 | 132.0 | ±12.2 % |
|           |                                             | Y | 6.43  | 70.1 | 23.1 |      | 147.2 |         |
|           |                                             | Z | 8.85  | 79.7 | 28.7 |      | 146.7 |         |
| 10234-CAB | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)        | X | 8.00  | 76.7 | 27.1 | 9.21 | 132.0 | ±12.2 % |
|           |                                             | Y | 6.43  | 70.1 | 23.1 |      | 147.2 |         |
|           |                                             | Z | 8.85  | 79.7 | 28.7 |      | 146.7 |         |
| 10240-CAB | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)       | X | 8.00  | 76.7 | 27.1 | 9.21 | 132.0 | ±12.2 % |
|           |                                             | Y | 6.43  | 70.1 | 23.1 |      | 147.2 |         |
|           |                                             | Z | 8.85  | 79.7 | 28.7 |      | 146.7 |         |
| 10246-CAB | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)      | X | 8.24  | 73.2 | 25.3 | 9.30 | 124.9 | ±3.8 %  |
|           |                                             | Y | 7.22  | 68.4 | 22.2 |      | 139.6 |         |
|           |                                             | Z | 8.98  | 75.8 | 26.8 |      | 140.1 |         |
| 10249-CAB | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)      | X | 8.24  | 73.2 | 25.3 | 9.29 | 124.9 | ±12.2 % |
|           |                                             | Y | 7.22  | 68.4 | 22.2 |      | 139.6 |         |
|           |                                             | Z | 8.98  | 75.8 | 26.8 |      | 140.1 |         |
| 10258-CAA | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)   | X | 8.24  | 73.2 | 25.3 | 9.34 | 124.9 | ±12.2 % |
|           |                                             | Y | 7.22  | 68.4 | 22.2 |      | 139.6 |         |
|           |                                             | Z | 8.98  | 75.8 | 26.8 |      | 140.1 |         |
| 10256-CAA | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | X | 9.05  | 73.9 | 26.0 | 9.96 | 128.6 | ±3.8 %  |
|           |                                             | Y | 8.03  | 69.3 | 22.9 |      | 146.6 |         |
|           |                                             | Z | 9.83  | 76.5 | 27.6 |      | 144.6 |         |
| 10247-CAB | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)    | X | 9.05  | 73.9 | 26.0 | 9.91 | 128.6 | ±12.2 % |
|           |                                             | Y | 8.03  | 69.3 | 22.9 |      | 146.6 |         |
|           |                                             | Z | 9.83  | 76.5 | 27.6 |      | 144.6 |         |

|           |                                                           |   |       |      |      |       |       |         |
|-----------|-----------------------------------------------------------|---|-------|------|------|-------|-------|---------|
| 10244-CAB | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)                  | X | 9.05  | 73.9 | 26.0 | 10.06 | 128.6 | ±12.2 % |
|           |                                                           | Y | 8.03  | 69.3 | 22.9 |       | 146.6 |         |
|           |                                                           | Z | 9.83  | 76.5 | 27.6 |       | 144.6 |         |
| 10262-CAB | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)                 | X | 10.05 | 74.8 | 26.4 | 9.83  | 145.4 | ±3.3 %  |
|           |                                                           | Y | 8.44  | 68.3 | 22.1 |       | 138.9 |         |
|           |                                                           | Z | 9.81  | 74.1 | 26.1 |       | 133.2 |         |
| 10250-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)                 | X | 10.05 | 74.8 | 26.4 | 9.81  | 145.4 | ±12.2 % |
|           |                                                           | Y | 8.44  | 68.3 | 22.1 |       | 138.9 |         |
|           |                                                           | Z | 9.81  | 74.1 | 26.1 |       | 133.2 |         |
| 10259-CAB | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)                 | X | 10.05 | 74.8 | 26.4 | 9.98  | 145.4 | ±12.2 % |
|           |                                                           | Y | 8.44  | 68.3 | 22.1 |       | 138.9 |         |
|           |                                                           | Z | 9.81  | 74.1 | 26.1 |       | 133.2 |         |
| 10264-CAB | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)                   | X | 9.03  | 74.4 | 25.8 | 9.23  | 135.1 | ±3.3 %  |
|           |                                                           | Y | 7.47  | 67.7 | 21.5 |       | 132.4 |         |
|           |                                                           | Z | 8.83  | 73.7 | 25.5 |       | 124.7 |         |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)                   | X | 9.03  | 74.4 | 25.8 | 9.24  | 135.1 | ±12.2 % |
|           |                                                           | Y | 7.47  | 67.7 | 21.5 |       | 132.4 |         |
|           |                                                           | Z | 8.83  | 73.7 | 25.5 |       | 124.7 |         |
| 10261-CAB | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)                   | X | 9.03  | 74.4 | 25.8 | 9.24  | 135.1 | ±12.2 % |
|           |                                                           | Y | 7.47  | 67.7 | 21.5 |       | 132.4 |         |
|           |                                                           | Z | 8.83  | 73.7 | 25.5 |       | 124.7 |         |
| 10265-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)                | X | 9.82  | 72.7 | 25.2 | 9.92  | 127.0 | ±3.8 %  |
|           |                                                           | Y | 8.92  | 68.6 | 22.3 |       | 145.9 |         |
|           |                                                           | Z | 10.52 | 74.9 | 26.6 |       | 142.0 |         |
| 10152-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)                 | X | 9.82  | 72.7 | 25.2 | 9.92  | 127.0 | ±12.2 % |
|           |                                                           | Y | 8.92  | 68.6 | 22.3 |       | 145.9 |         |
|           |                                                           | Z | 10.52 | 74.9 | 26.6 |       | 142.0 |         |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)                  | X | 9.90  | 75.7 | 26.4 | 9.30  | 144.2 | ±3.5 %  |
|           |                                                           | Y | 7.92  | 68.2 | 21.7 |       | 136.6 |         |
|           |                                                           | Z | 9.53  | 74.6 | 25.9 |       | 131.7 |         |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                   | X | 9.90  | 75.7 | 26.4 | 9.28  | 144.2 | ±12.2 % |
|           |                                                           | Y | 7.92  | 68.2 | 21.7 |       | 136.6 |         |
|           |                                                           | Z | 9.53  | 74.6 | 25.9 |       | 131.7 |         |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                   | X | 6.25  | 67.0 | 19.6 | 5.81  | 133.5 | ±1.4 %  |
|           |                                                           | Y | 6.26  | 65.9 | 18.6 |       | 134.7 |         |
|           |                                                           | Z | 6.44  | 67.6 | 19.9 |       | 147.8 |         |
| 10299-AAA | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)                  | X | 6.52  | 67.2 | 19.9 | 6.39  | 130.9 | ±1.7 %  |
|           |                                                           | Y | 6.48  | 66.0 | 18.9 |       | 130.5 |         |
|           |                                                           | Z | 6.68  | 67.7 | 20.2 |       | 144.1 |         |
| 10300-AAA | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)                  | X | 6.71  | 67.2 | 20.0 | 6.60  | 131.2 | ±1.7 %  |
|           |                                                           | Y | 6.66  | 66.0 | 19.0 |       | 129.6 |         |
|           |                                                           | Z | 6.89  | 67.9 | 20.4 |       | 143.8 |         |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle) | X | 2.67  | 68.6 | 18.7 | 1.54  | 145.7 | ±0.5 %  |
|           |                                                           | Y | 2.30  | 64.3 | 16.0 |       | 141.9 |         |
|           |                                                           | Z | 2.54  | 67.4 | 18.1 |       | 135.2 |         |

|           |                                                                                |   |       |      |      |      |       |        |
|-----------|--------------------------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)                  | X | 10.13 | 69.3 | 21.7 | 8.23 | 143.5 | ±2.7 % |
|           |                                                                                | Y | 10.20 | 68.2 | 20.7 |      | 142.2 |        |
|           |                                                                                | Z | 10.02 | 68.9 | 21.5 |      | 131.6 |        |
| 10418-AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preamble)  | X | 10.01 | 69.2 | 21.6 | 8.14 | 142.9 | ±2.5 % |
|           |                                                                                | Y | 10.10 | 68.3 | 20.7 |      | 142.3 |        |
|           |                                                                                | Z | 9.92  | 69.0 | 21.6 |      | 132.0 |        |
| 10419-AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preamble) | X | 10.08 | 69.2 | 21.7 | 8.19 | 144.0 | ±2.7 % |
|           |                                                                                | Y | 10.19 | 68.3 | 20.0 |      | 143.7 |        |
|           |                                                                                | Z | 10.00 | 69.0 | 21.6 |      | 132.9 |        |

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

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 11 and 12.

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3052

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>c</sup> | Relative Permittivity <sup>f</sup> | Conductivity (S/m) <sup>f</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>g</sup> | Depth <sup>g</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 6.73    | 6.73    | 6.73    | 0.80               | 1.13                    | ± 12.0 %    |
| 835                  | 41.5                               | 0.90                            | 6.50    | 6.50    | 6.50    | 0.52               | 1.40                    | ± 12.0 %    |
| 900                  | 41.5                               | 0.97                            | 6.40    | 6.40    | 6.40    | 0.77               | 1.16                    | ± 12.0 %    |
| 1750                 | 40.1                               | 1.37                            | 5.28    | 5.28    | 5.28    | 0.41               | 1.60                    | ± 12.0 %    |
| 1900                 | 40.0                               | 1.40                            | 5.12    | 5.12    | 5.12    | 0.43               | 1.62                    | ± 12.0 %    |
| 2000                 | 40.0                               | 1.40                            | 5.10    | 5.10    | 5.10    | 0.41               | 1.60                    | ± 12.0 %    |
| 2450                 | 39.2                               | 1.80                            | 4.52    | 4.52    | 4.52    | 0.71               | 1.28                    | ± 12.0 %    |
| 2600                 | 39.0                               | 1.96                            | 4.37    | 4.37    | 4.37    | 0.80               | 1.21                    | ± 12.0 %    |

<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>g</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3052

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 55.5                               | 0.96                            | 6.34    | 6.34    | 6.34    | 0.80               | 1.14                    | ± 12.0 %    |
| 835                  | 55.2                               | 0.97                            | 6.26    | 6.26    | 6.26    | 0.75               | 1.18                    | ± 12.0 %    |
| 900                  | 55.0                               | 1.05                            | 6.14    | 6.14    | 6.14    | 0.44               | 1.56                    | ± 12.0 %    |
| 1750                 | 53.4                               | 1.49                            | 4.94    | 4.94    | 4.94    | 0.46               | 1.68                    | ± 12.0 %    |
| 1900                 | 53.3                               | 1.52                            | 4.71    | 4.71    | 4.71    | 0.45               | 1.73                    | ± 12.0 %    |
| 2000                 | 53.3                               | 1.52                            | 4.75    | 4.75    | 4.75    | 0.55               | 1.56                    | ± 12.0 %    |
| 2450                 | 52.7                               | 1.95                            | 4.30    | 4.30    | 4.30    | 0.74               | 1.10                    | ± 12.0 %    |
| 2600                 | 52.5                               | 2.16                            | 4.16    | 4.16    | 4.16    | 0.80               | 1.01                    | ± 12.0 %    |

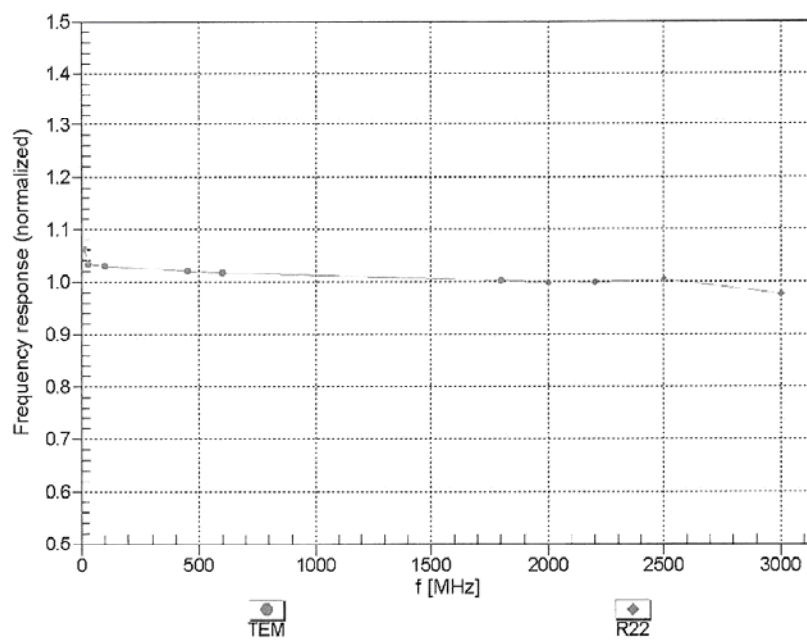
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

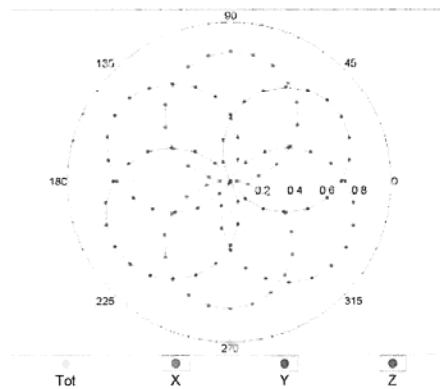
(TEM-Cell:ifi110 EXX, Waveguide: R22)



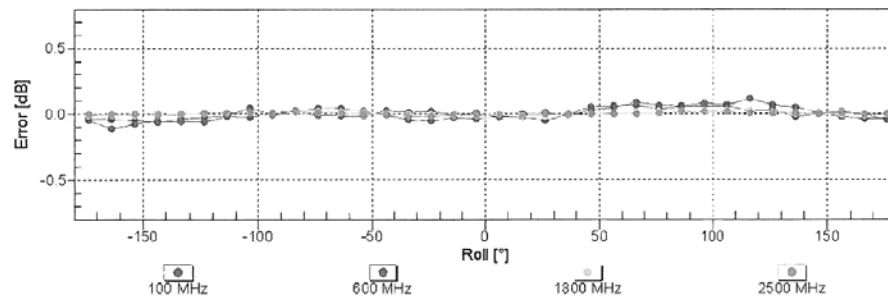
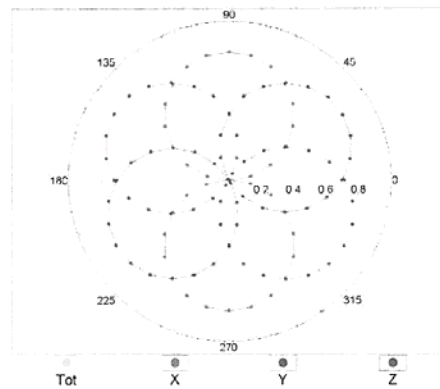
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

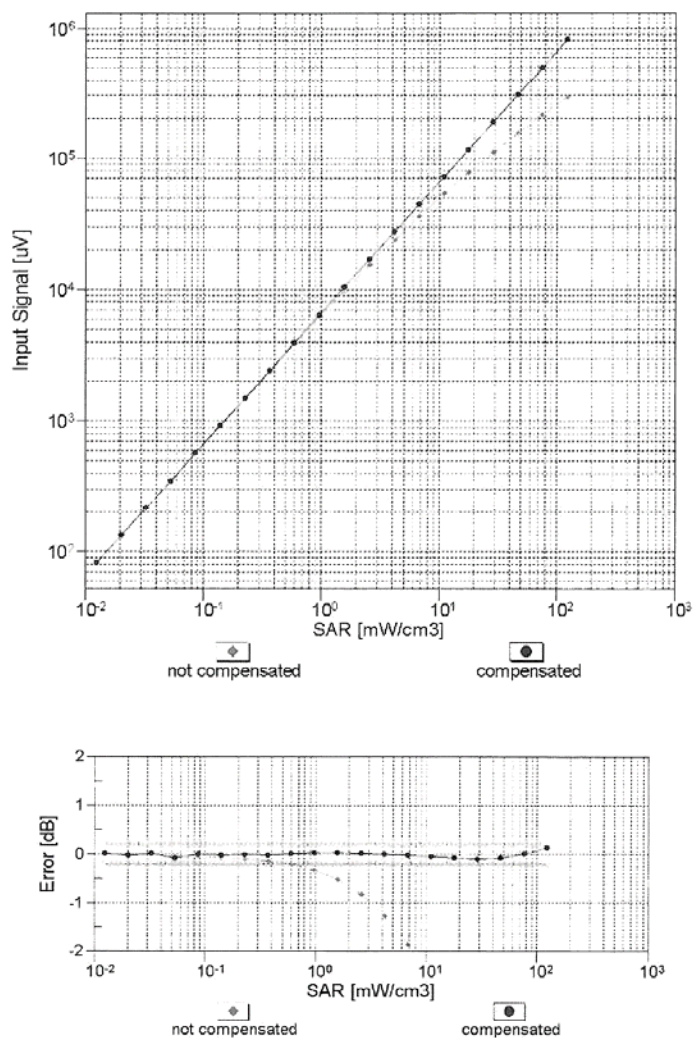
f=600 MHz,TEM



f=1800 MHz,R22

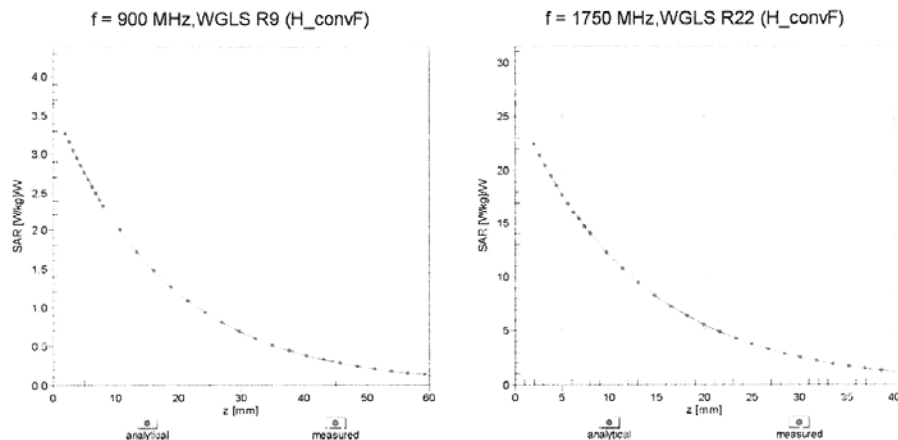
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

### Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f<sub>eval</sub>= 1900 MHz)



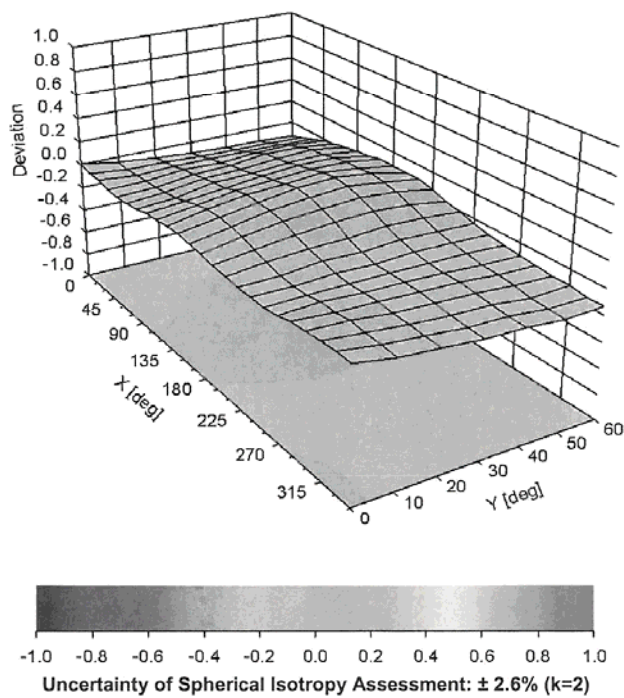
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ),  $f = 900 \text{ MHz}$



**DASY/EASY - Parameters of Probe: ES3DV3 - SN:3052****Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -53.7      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 2 mm       |



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **AT4 Wireless**

Certificate No: **EX3-3687\_Jul14**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3687**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6**  
 Calibration procedure for dosimetric E-field probes

Calibration date: **July 14, 2014**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Power sensor E4412A        | MY41498087      | 03-Apr-14 (No. 217-01911)         | Apr-15                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 03-Apr-14 (No. 217-01915)         | Apr-15                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919)         | Apr-15                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920)         | Apr-15                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-13 (No. ES3-3013_Dec13)    | Dec-14                 |
| DAE4                       | SN: 660         | 13-Dec-13 (No. DAE4-660_Dec13)    | Dec-14                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

|                | Name          | Function              | Signature             |
|----------------|---------------|-----------------------|-----------------------|
| Calibrated by: | Leif Klysner  | Laboratory Technician |                       |
| Approved by:   | Katja Pokovic | Technical Manager     |                       |
|                |               |                       | Issued: July 17, 2014 |

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

#### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe EX3DV4

## SN:3687

Manufactured: March 10, 2009  
Calibrated: July 14, 2014

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3687

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.51     | 0.44     | 0.50     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 100.3    | 100.4    | 99.5     |               |

### Modulation Calibration Parameters

| UID       | Communication System Name                                 |   | A<br>dB | B<br>dB/ $\mu\text{V}$ | C    | D<br>dB | VR<br>mV | lin <sup>C</sup><br>(k=2) |
|-----------|-----------------------------------------------------------|---|---------|------------------------|------|---------|----------|---------------------------|
| 0         | CW                                                        | X | 0.0     | 0.0                    | 1.0  | 0.00    | 140.8    | $\pm 3.5 \%$              |
|           |                                                           | Y | 0.0     | 0.0                    | 1.0  |         | 148.4    |                           |
|           |                                                           | Z | 0.0     | 0.0                    | 1.0  |         | 130.5    |                           |
| 10062-CAA | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)                  | X | 9.95    | 68.3                   | 21.3 | 8.68    | 123.7    | $\pm 3.3 \%$              |
|           |                                                           | Y | 10.27   | 68.5                   | 21.3 |         | 130.5    |                           |
|           |                                                           | Z | 10.38   | 69.1                   | 21.8 |         | 137.7    |                           |
| 10117-CAA | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)                  | X | 10.08   | 68.3                   | 20.9 | 8.07    | 132.6    | $\pm 3.0 \%$              |
|           |                                                           | Y | 10.13   | 68.1                   | 20.6 |         | 130.4    |                           |
|           |                                                           | Z | 10.50   | 69.3                   | 21.4 |         | 149.7    |                           |
| 10196-CAA | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)                   | X | 9.65    | 68.1                   | 20.9 | 8.10    | 125.9    | $\pm 3.0 \%$              |
|           |                                                           | Y | 9.83    | 68.0                   | 20.7 |         | 126.2    |                           |
|           |                                                           | Z | 10.05   | 68.9                   | 21.3 |         | 142.9    |                           |
| 10400-AAA | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)       | X | 9.90    | 68.3                   | 21.1 | 8.37    | 126.1    | $\pm 3.0 \%$              |
|           |                                                           | Y | 10.11   | 68.3                   | 21.0 |         | 127.6    |                           |
|           |                                                           | Z | 10.29   | 69.1                   | 21.6 |         | 141.6    |                           |
| 10401-AAA | IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)       | X | 10.73   | 69.0                   | 21.5 | 8.60    | 135.8    | $\pm 3.0 \%$              |
|           |                                                           | Y | 10.79   | 68.7                   | 21.2 |         | 134.6    |                           |
|           |                                                           | Z | 10.66   | 68.6                   | 21.3 |         | 125.2    |                           |
| 10402-AAA | IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)       | X | 11.00   | 69.4                   | 21.5 | 8.53    | 138.1    | $\pm 3.0 \%$              |
|           |                                                           | Y | 10.77   | 68.6                   | 21.0 |         | 134.0    |                           |
|           |                                                           | Z | 10.89   | 69.0                   | 21.3 |         | 127.7    |                           |
| 10417-AAA | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle) | X | 9.70    | 68.0                   | 20.9 | 8.23    | 124.9    | $\pm 2.7 \%$              |
|           |                                                           | Y | 9.88    | 68.0                   | 20.7 |         | 124.3    |                           |
|           |                                                           | Z | 10.13   | 69.0                   | 21.5 |         | 142.6    |                           |

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

<sup>A</sup> The uncertainties of Norm X, Y, Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>C</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3687

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 5200                 | 36.0                               | 4.66                            | 4.77    | 4.77    | 4.77    | 0.30               | 1.80                    | ± 13.1 %    |
| 5300                 | 35.9                               | 4.76                            | 4.60    | 4.60    | 4.60    | 0.35               | 1.80                    | ± 13.1 %    |
| 5600                 | 35.5                               | 5.07                            | 4.25    | 4.25    | 4.25    | 0.40               | 1.80                    | ± 13.1 %    |
| 5800                 | 35.3                               | 5.27                            | 4.29    | 4.29    | 4.29    | 0.40               | 1.80                    | ± 13.1 %    |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3687

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth (mm) <sup>G</sup> | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 5200                 | 49.0                               | 5.30                            | 4.32    | 4.32    | 4.32    | 0.45               | 1.90                    | ± 13.1 %    |
| 5300                 | 48.9                               | 5.42                            | 4.15    | 4.15    | 4.15    | 0.45               | 1.90                    | ± 13.1 %    |
| 5600                 | 48.5                               | 5.77                            | 3.67    | 3.67    | 3.67    | 0.50               | 1.90                    | ± 13.1 %    |
| 5800                 | 48.2                               | 6.00                            | 3.89    | 3.89    | 3.89    | 0.50               | 1.90                    | ± 13.1 %    |

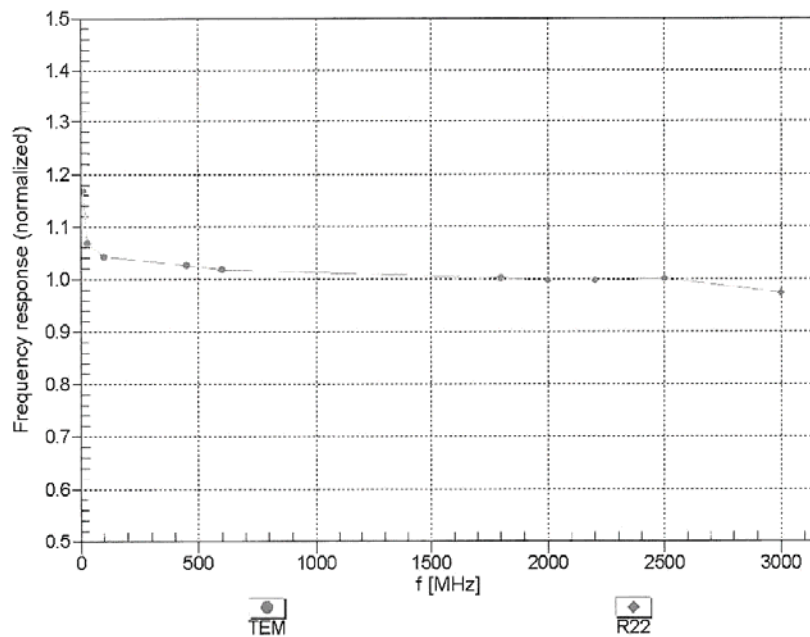
<sup>C</sup> Frequency validity above 300 MHz of  $\pm 100$  MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to  $\pm 50$  MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is  $\pm 10$ , 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to  $\pm 110$  MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to  $\pm 10\%$  if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to  $\pm 5\%$ . The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than  $\pm 1\%$  for frequencies below 3 GHz and below  $\pm 2\%$  for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

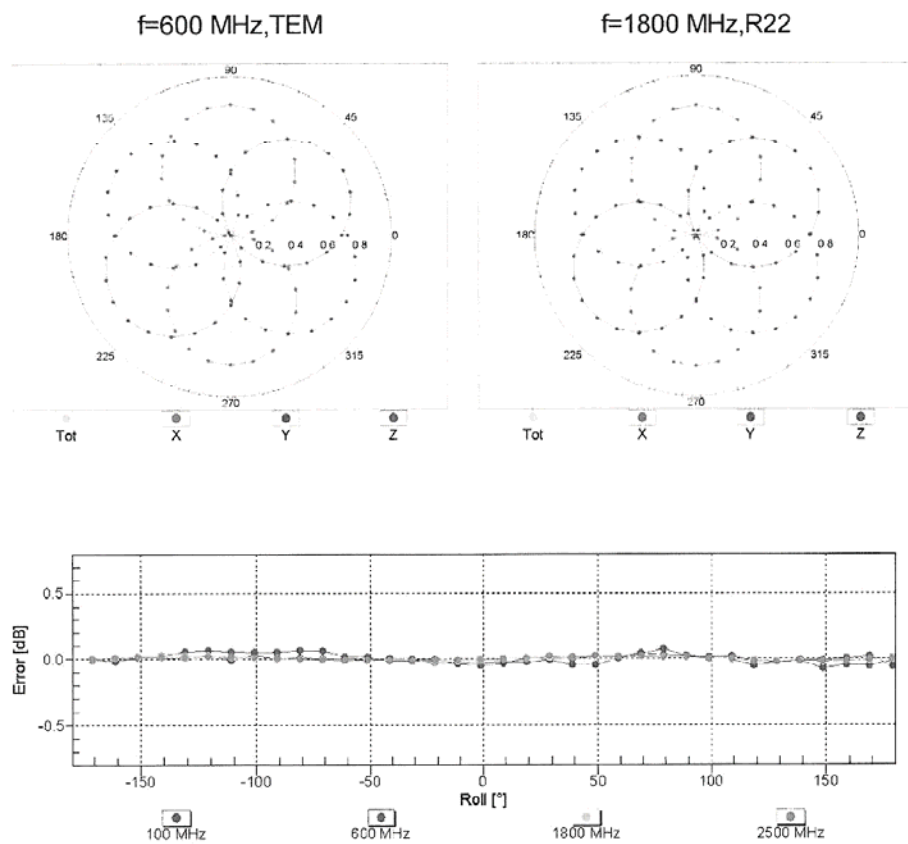
## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



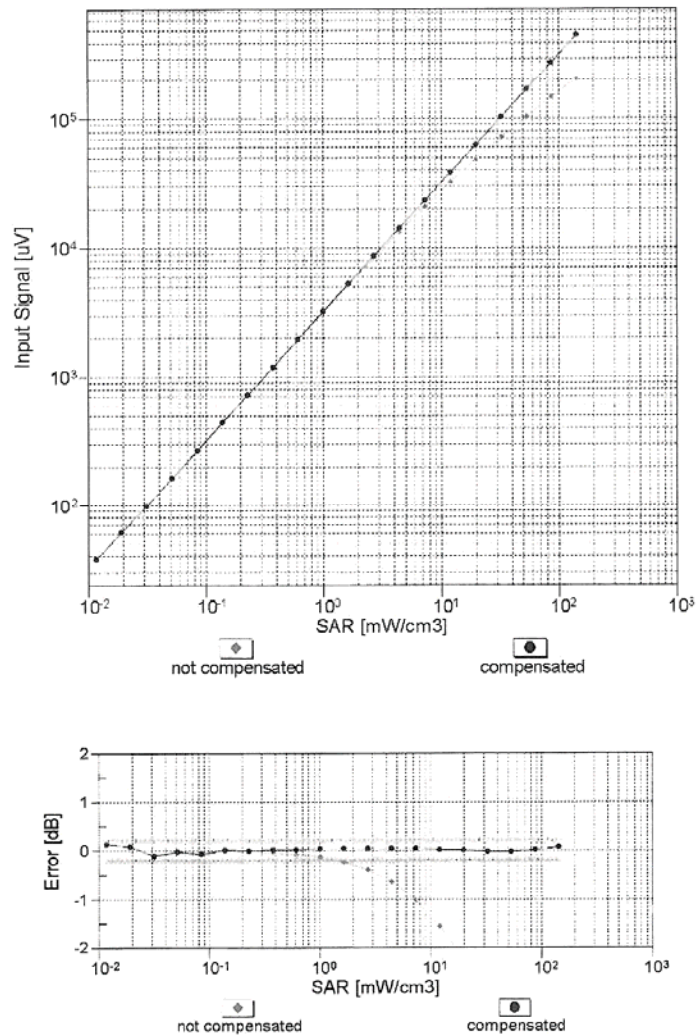
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



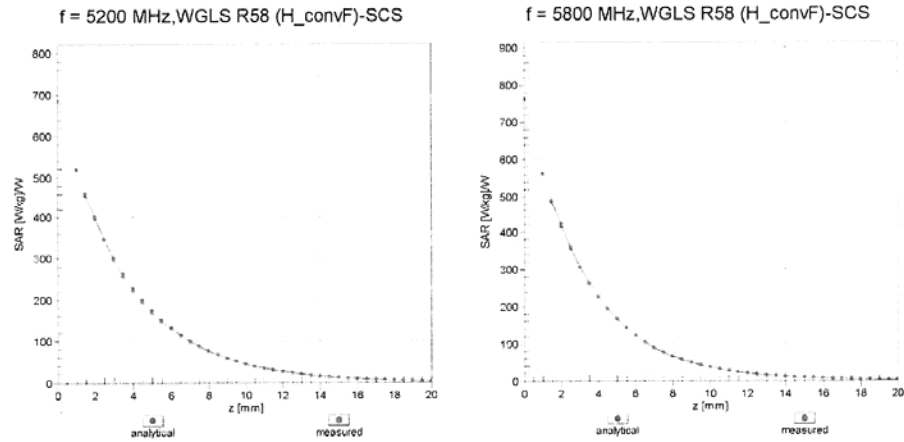
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

### Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f<sub>eval</sub>= 1900 MHz)



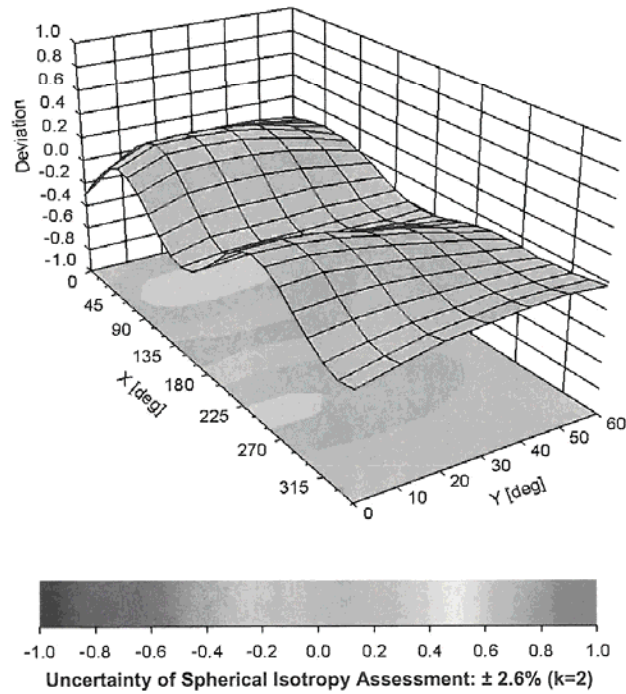
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  (k=2)

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ), f = 900 MHz



**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3687****Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -51.1      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **AT4 Wireless**

Certificate No: **D2450V2-756\_Jul13**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 756**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **July 22, 2013**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 01-Nov-12 (No. 217-01640)         | Oct-13                 |
| Power sensor HP 8481A       | US37292783         | 01-Nov-12 (No. 217-01640)         | Oct-13                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-13 (No. 217-01736)         | Apr-14                 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739)         | Apr-14                 |
| Reference Probe ES3DV3      | SN: 3205           | 28-Dec-12 (No. ES3-3205_Dec12)    | Dec-13                 |
| DAE4                        | SN: 601            | 25-Apr-13 (No. DAE4-601_Apr13)    | Apr-14                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

|                |                |                       |           |
|----------------|----------------|-----------------------|-----------|
|                | Name           | Function              | Signature |
| Calibrated by: | Jeton Kastrati | Laboratory Technician |           |
| Approved by:   | Katja Pokovic  | Technical Manager     |           |

Issued: July 22, 2013

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.7     |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2450 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.2           | 1.80 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 37.8 $\pm$ 6 % | 1.81 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 13.4 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 53.0 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 6.20 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.6 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 52.7           | 1.95 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 50.5 $\pm$ 6 % | 2.01 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 13.1 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 51.1 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 6.06 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 23.9 W/kg $\pm$ 16.5 % (k=2) |

## Appendix

### Antenna Parameters with Head TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $56.2 \Omega + 2.2 j\Omega$ |
| Return Loss                          | - 24.2 dB                   |

### Antenna Parameters with Body TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $51.8 \Omega + 3.8 j\Omega$ |
| Return Loss                          | - 27.8 dB                   |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.157 ns |
|----------------------------------|----------|

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                |
|-----------------|----------------|
| Manufactured by | SPEAG          |
| Manufactured on | April 22, 2004 |

## DASY5 Validation Report for Head TSL

Date: 22.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 756**

Communication System: UID 0 - CW ; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.81$  S/m;  $\epsilon_r = 37.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

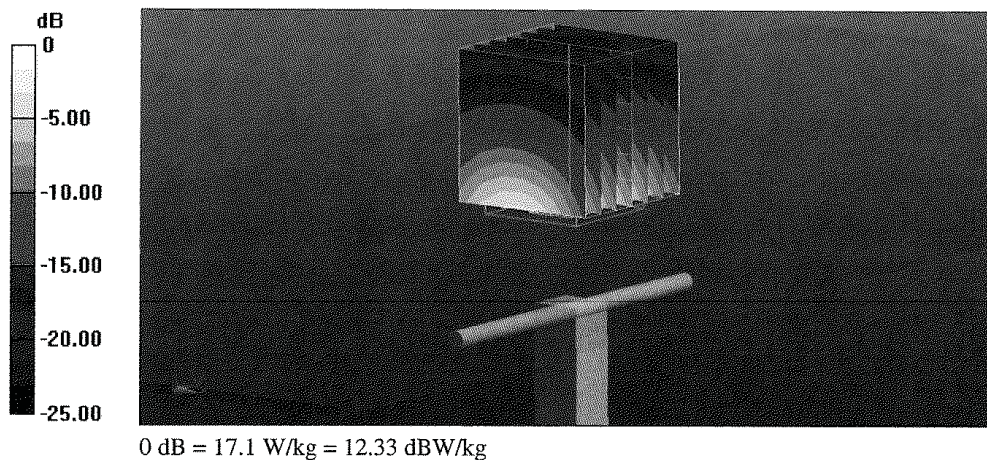
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.304 V/m; Power Drift = 0.04 dB

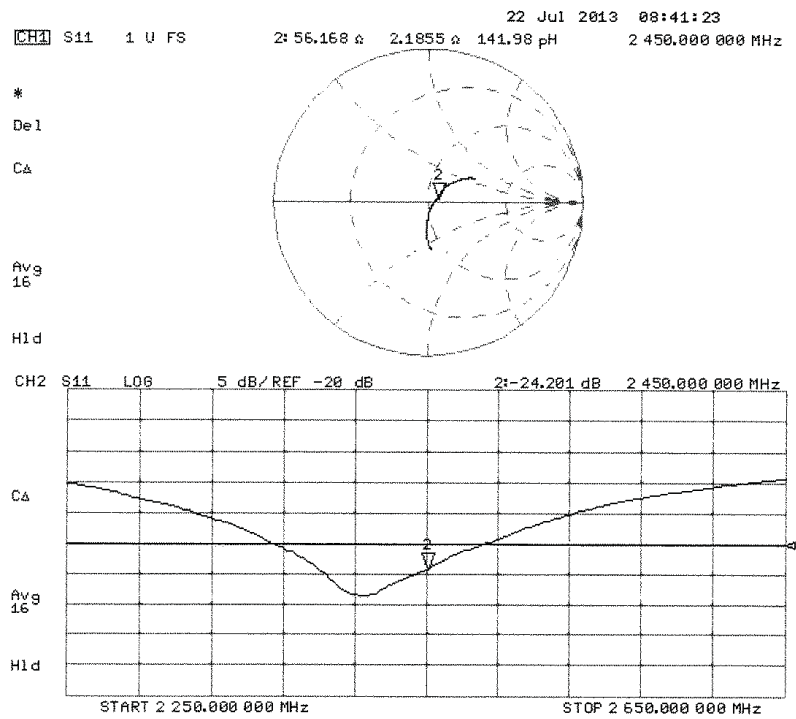
Peak SAR (extrapolated) = 27.7 W/kg

**SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.2 W/kg**

Maximum value of SAR (measured) = 17.1 W/kg



## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 19.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 756**

Communication System: UID 0 - CW ; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.01$  S/m;  $\epsilon_r = 50.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

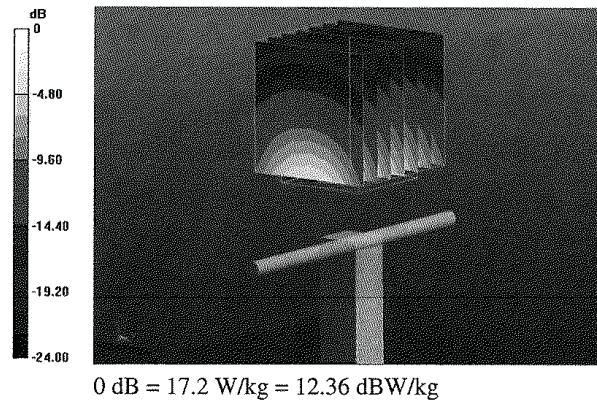
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.304 V/m; Power Drift = 0.01 dB

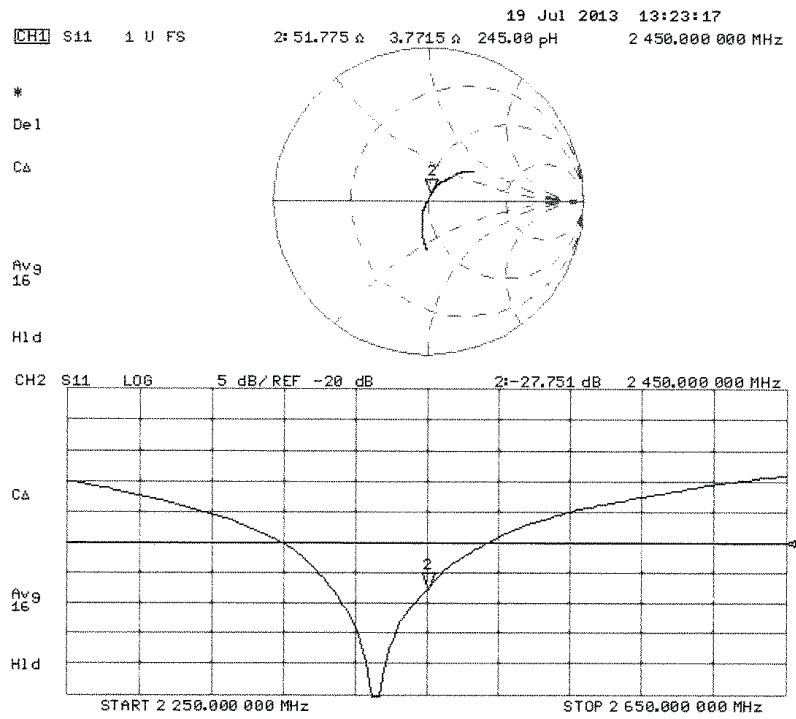
Peak SAR (extrapolated) = 27.3 W/kg

**SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.06 W/kg**

Maximum value of SAR (measured) = 17.2 W/kg



## Impedance Measurement Plot for Body TSL





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Client **AT4 Wireless**

Certificate No: **D5GHzV2-1071\_Jul13**

## CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1071**

Calibration procedure(s) **QA CAL-22.v2**  
**Calibration procedure for dipole validation kits between 3-6 GHz**

Calibration date: **July 23, 2013**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 01-Nov-12 (No. 217-01640)         | Oct-13                 |
| Power sensor HP 8481A       | US37292783         | 01-Nov-12 (No. 217-01640)         | Oct-13                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-13 (No. 217-01736)         | Apr-14                 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739)         | Apr-14                 |
| Reference Probe EX3DV4      | SN: 3503           | 28-Dec-12 (No. EX3-3503_Dec12)    | Dec-13                 |
| DAE4                        | SN: 601            | 25-Apr-13 (No. DAE4-601_Apr13)    | Apr-14                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

Calibrated by: **Name** **Function**  
**Claudio Leubler** **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** **Technical Manager**

Issued: July 24, 2013

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D5GHzV2-1071\_Jul13

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Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- b) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

- c) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

|                              |                                                                      |                                  |
|------------------------------|----------------------------------------------------------------------|----------------------------------|
| DASY Version                 | DASY5                                                                | V52.8.7                          |
| Extrapolation                | Advanced Extrapolation                                               |                                  |
| Phantom                      | Modular Flat Phantom V5.0                                            |                                  |
| Distance Dipole Center - TSL | 10 mm                                                                | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 4.0 mm, dz = 1.4 mm                                         | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 5200 MHz $\pm$ 1 MHz<br>5500 MHz $\pm$ 1 MHz<br>5800 MHz $\pm$ 1 MHz |                                  |

## Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 36.0           | 4.66 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 35.2 $\pm$ 6 % | 4.46 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 5200 MHz

|                                                       |                    |                                                |
|-------------------------------------------------------|--------------------|------------------------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                                |
| SAR measured                                          | 100 mW input power | 7.95 W/kg                                      |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | <b>79.1 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                         |                    |                                                |
|---------------------------------------------------------|--------------------|------------------------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                                |
| SAR measured                                            | 100 mW input power | 2.29 W/kg                                      |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | <b>22.7 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

## Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 35.6           | 4.96 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 34.8 $\pm$ 6 % | 4.74 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 5500 MHz

|                                                       |                    |                                                  |
|-------------------------------------------------------|--------------------|--------------------------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                                  |
| SAR measured                                          | 100 mW input power | 8.36 W/kg                                        |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | <b>83.0 W / kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                         |                    |                                                |
|---------------------------------------------------------|--------------------|------------------------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                                |
| SAR measured                                            | 100 mW input power | 2.39 W/kg                                      |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | <b>23.7 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

### Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.3         | 5.27 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.4 ± 6 %   | 5.05 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5800 MHz

|                                                       |                    |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                 |
| SAR measured                                          | 100 mW input power | 7.97 W/kg                       |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | <b>79.1 W/kg ± 19.9 % (k=2)</b> |

|                                                         |                    |                                 |
|---------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                 |
| SAR measured                                            | 100 mW input power | 2.28 W/kg                       |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | <b>22.6 W/kg ± 19.5 % (k=2)</b> |

**Body TSL parameters at 5200 MHz**

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 49.0         | 5.30 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 48.9 ± 6 %   | 5.40 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

**SAR result with Body TSL at 5200 MHz**

|                                                       |                    |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                                 |
| SAR measured                                          | 100 mW input power | 7.47 W/kg                       |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | <b>74.7 W/kg ± 19.9 % (k=2)</b> |

|                                                         |                    |                                 |
|---------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                                 |
| SAR measured                                            | 100 mW input power | 2.09 W/kg                       |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | <b>20.9 W/kg ± 19.5 % (k=2)</b> |

**Body TSL parameters at 5500 MHz**

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.6         | 5.65 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 48.4 ± 6 %   | 5.79 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

**SAR result with Body TSL at 5500 MHz**

|                                                       |                    |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                                 |
| SAR measured                                          | 100 mW input power | 7.87 W/kg                       |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | <b>78.7 W/kg ± 19.9 % (k=2)</b> |

|                                                         |                    |                                 |
|---------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                                 |
| SAR measured                                            | 100 mW input power | 2.19 W/kg                       |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | <b>21.9 W/kg ± 19.5 % (k=2)</b> |

**Body TSL parameters at 5800 MHz**

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.2         | 6.00 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 47.9 ± 6 %   | 6.21 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

**SAR result with Body TSL at 5800 MHz**

|                                                       |                    |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                                 |
| SAR measured                                          | 100 mW input power | 7.51 W/kg                       |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | <b>75.1 W/kg ± 19.9 % (k=2)</b> |

|                                                         |                    |                                 |
|---------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                                 |
| SAR measured                                            | 100 mW input power | 2.08 W/kg                       |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | <b>20.8 W/kg ± 19.5 % (k=2)</b> |

## Appendix

### Antenna Parameters with Head TSL at 5200 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 52.9 $\Omega$ - 7.4 j $\Omega$ |
| Return Loss                          | - 22.3 dB                      |

### Antenna Parameters with Head TSL at 5500 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 53.0 $\Omega$ - 3.1 j $\Omega$ |
| Return Loss                          | - 27.6 dB                      |

### Antenna Parameters with Head TSL at 5800 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 53.9 $\Omega$ - 1.2 j $\Omega$ |
| Return Loss                          | - 28.1 dB                      |

### Antenna Parameters with Body TSL at 5200 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.8 $\Omega$ - 3.9 j $\Omega$ |
| Return Loss                          | - 27.5 dB                      |

### Antenna Parameters with Body TSL at 5500 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.3 $\Omega$ + 0.3 j $\Omega$ |
| Return Loss                          | - 27.7 dB                      |

### Antenna Parameters with Body TSL at 5800 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.6 $\Omega$ - 0.2 j $\Omega$ |
| Return Loss                          | - 27.1 dB                      |

## General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.208 ns |
|----------------------------------|----------|

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                    |
|-----------------|--------------------|
| Manufactured by | SPEAG              |
| Manufactured on | September 26, 2008 |

## DASY5 Validation Report for Head TSL

Date: 23.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1071**

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.46$  S/m;  $\epsilon_r = 35.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5500$  MHz;  $\sigma = 4.74$  S/m;  $\epsilon_r = 34.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.05$  S/m;  $\epsilon_r = 34.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.878 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 28.6 W/kg

**SAR(1 g) = 7.95 W/kg; SAR(10 g) = 2.29 W/kg**

Maximum value of SAR (measured) = 18.5 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.722 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 32.0 W/kg

**SAR(1 g) = 8.36 W/kg; SAR(10 g) = 2.39 W/kg**

Maximum value of SAR (measured) = 19.8 W/kg

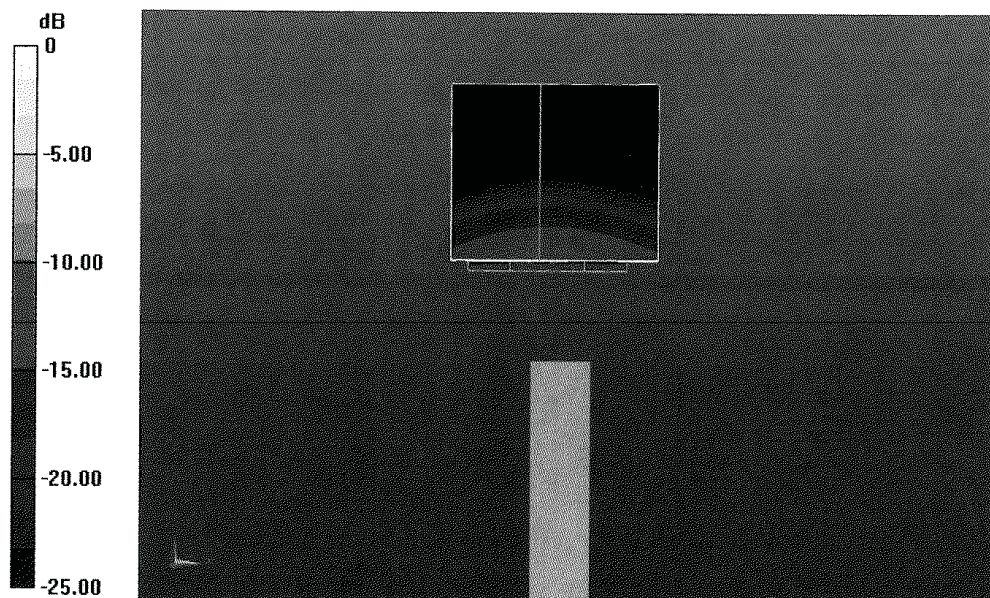
**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.571 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 32.2 W/kg

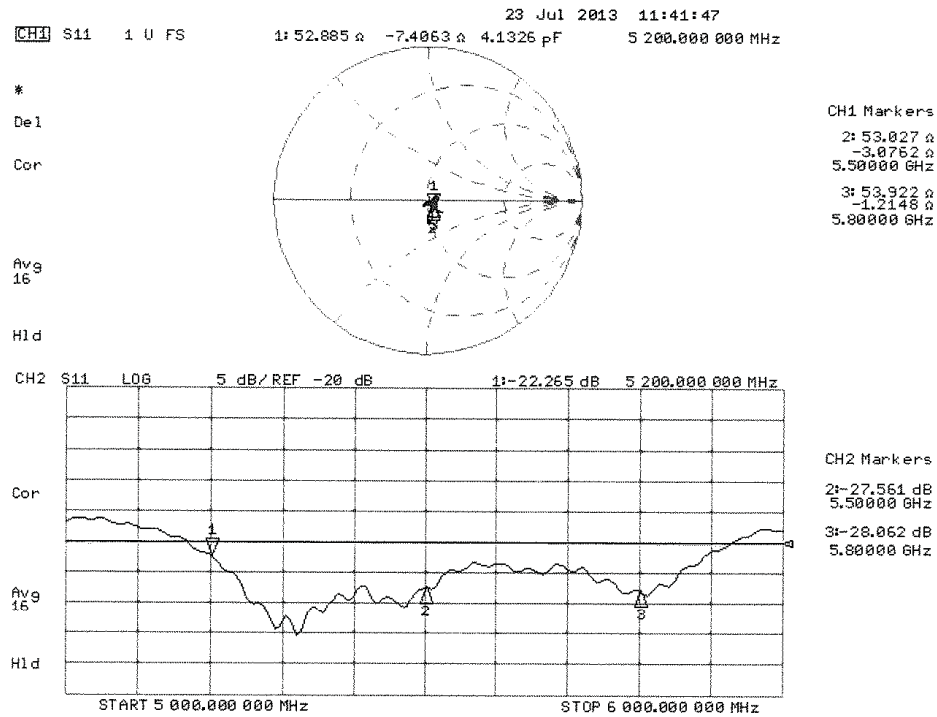
**SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.28 W/kg**

Maximum value of SAR (measured) = 19.5 W/kg



0 dB = 19.5 W/kg = 12.90 dBW/kg

Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 16.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1071

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.4$  S/m;  $\epsilon_r = 48.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5500$  MHz;  $\sigma = 5.79$  S/m;  $\epsilon_r = 48.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.21$  S/m;  $\epsilon_r = 47.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

#### DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.43, 4.43, 4.43); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

#### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 59.271 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.4 W/kg

**SAR(1 g) = 7.47 W/kg; SAR(10 g) = 2.09 W/kg**

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

#### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 59.207 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 33.7 W/kg

**SAR(1 g) = 7.87 W/kg; SAR(10 g) = 2.19 W/kg**

Maximum value of SAR (measured) = 19.3 W/kg

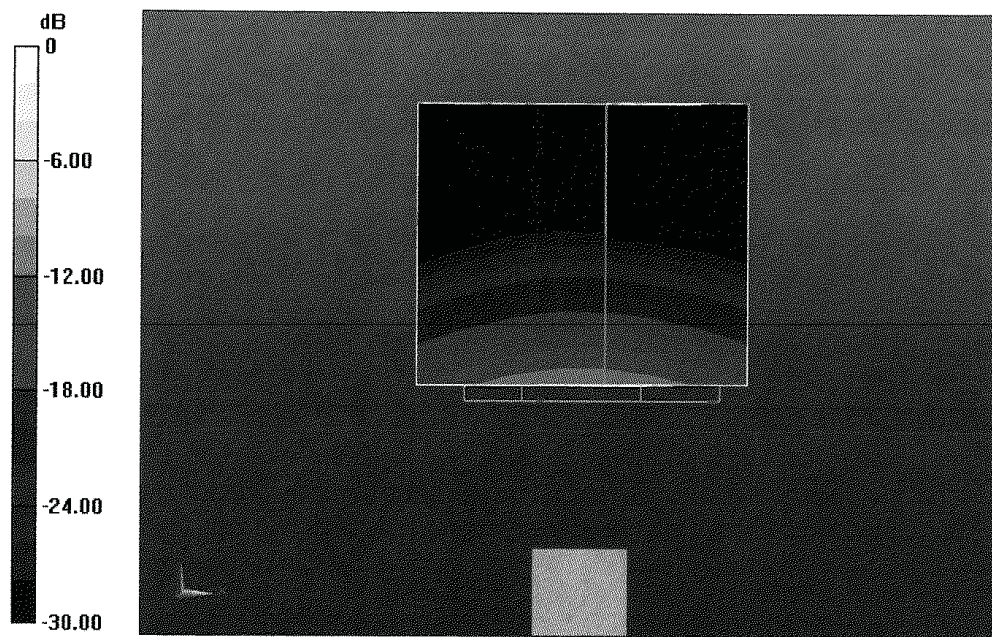
#### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 55.736 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 34.6 W/kg

**SAR(1 g) = 7.51 W/kg; SAR(10 g) = 2.08 W/kg**

Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

Impedance Measurement Plot for Body TSL

