



## SAR TEST REPORT

**Test Report No. : 13211373H-C-R2**

**Applicant : SANYO MACHINE WORKS, LTD.**

**Type of EUT : Module of Wireless Pistol Tool**

**Model Number of EUT : SX-ULPAN**

**FCC ID : 2AVOZ-SHBN**

**Test regulation : FCC47CFR 2.1093**

**Test Result : Complied (Refer to SECTION 4)**

**Reported SAR(1g) Value**      **The highest reported SAR(1g)**  
Body : 0.66 W/kg

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers SAR technical requirements. It does not cover administrative issues such as Manual or non-SAR test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 13211373H-C-R1. 13211373H-C-R1 is replaced with this report.

**Date of test:** April 9 to 13, 2020, January 20, 2021

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- ☐ This report contains data that are not covered by the NVLAP accreditation.
- ☒ There is no testing item of "Non-accreditation".

## **REVISION HISTORY**

### **Original Test Report No.: 13211373H-C**

| Revision        | Test report No. | Date              | Page revised                           | Contents                                                                                                                                                |
|-----------------|-----------------|-------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| -<br>(Original) | 13211373H-C     | June 23, 2020     | -                                      | -                                                                                                                                                       |
| 1               | 13211373H-C-R1  | December 24, 2020 | P.24, 25                               | Replacement of the result table of Section 12.2 / 12.3 / 12.4 of “Measured and Reported (Scaled) SAR Results”.                                          |
| 1               | 13211373H-C-R1  | December 24, 2020 | P.93                                   | Change the model number of the Host device;<br>From “SHB-TA1-016P” To “SHB-TA1”                                                                         |
| 1               | 13211373H-C-R1  | December 24, 2020 | P.94<br>(original report)              | Deletion of the Whole photo of the complete product                                                                                                     |
| 2               | 13211373H-C-R2  | January 22, 2021  | P.10, 11,<br>12, 16, 24,<br>25         | Replacement of the table by Tune-up upper power change in SECTION 5 / 6.2 / 8.1 / 12.2 / 12.3 / 12.4.                                                   |
| 2               | 13211373H-C-R2  | January 22, 2021  | P.18, 20,<br>21, 22, 24,<br>27, 36, 40 | Deletion of 5.3GHz data and addition of 5.2GHz data due to change of Tune-up upper power in Section 9.1 / 10.1 / 10.2 / 11 / 12.2 / 13, Appendix 1 / 2. |
| 2               | 13211373H-C-R2  | January 22, 2021  | P.16                                   | Addition of sentence in Note(s)                                                                                                                         |
| 2               | 13211373H-C-R2  | January 22, 2021  | P.25                                   | Correction of modes and Measured average power in Sections 12.3 / 12.4.                                                                                 |
| 2               | 13211373H-C-R2  | January 22, 2021  | P.41, 42                               | Correction of the mode                                                                                                                                  |

## Reference: Abbreviations (Including words undescribed in this report)

|                |                                                                 |         |                                                     |
|----------------|-----------------------------------------------------------------|---------|-----------------------------------------------------|
| A2LA           | The American Association for Laboratory Accreditation           | NSA     | Normalized Site Attenuation                         |
| AC             | Alternating Current                                             | NVLAP   | National Voluntary Laboratory Accreditation Program |
| AFH            | Adaptive Frequency Hopping                                      | OBW     | Occupied Band Width                                 |
| AM             | Amplitude Modulation                                            | OFDM    | Orthogonal Frequency Division Multiplexing          |
| Amp, AMP       | Amplifier                                                       | P/M     | Power meter                                         |
| ANSI           | American National Standards Institute                           | PCB     | Printed Circuit Board                               |
| Ant, ANT       | Antenna                                                         | PER     | Packet Error Rate                                   |
| AP             | Access Point                                                    | PHY     | Physical Layer                                      |
| Atten., ATT    | Attenuator                                                      | PK      | Peak                                                |
| AV             | Average                                                         | PN      | Pseudo random Noise                                 |
| BPSK           | Binary Phase-Shift Keying                                       | PRBS    | Pseudo-Random Bit Sequence                          |
| BR             | Bluetooth Basic Rate                                            | PSD     | Power Spectral Density                              |
| BT             | Bluetooth                                                       | QAM     | Quadrature Amplitude Modulation                     |
| BT LE          | Bluetooth Low Energy                                            | QP      | Quasi-Peak                                          |
| BW             | BandWidth                                                       | QPSK    | Quadri-Phase Shift Keying                           |
| Cal Int        | Calibration Interval                                            | RBW     | Resolution Band Width                               |
| CCK            | Complementary Code Keying                                       | RDS     | Radio Data System                                   |
| Ch., CH        | Channel                                                         | RE      | Radio Equipment                                     |
| CISPR          | Comite International Special des Perturbations Radioelectriques | RF      | Radio Frequency                                     |
| CW             | Continuous Wave                                                 | RMS     | Root Mean Square                                    |
| DBPSK          | Differential BPSK                                               | Rx      | Receiving                                           |
| DC             | Direct Current                                                  | SA, S/A | Spectrum Analyzer                                   |
| DFS            | Dynamic Frequency Selection                                     | SG      | Signal Generator                                    |
| DQPSK          | Differential QPSK                                               | SVSWR   | Site-Voltage Standing Wave Ratio                    |
| DSSS           | Direct Sequence Spread Spectrum                                 | TR      | Test Receiver                                       |
| EDR            | Enhanced Data Rate                                              | Tx      | Transmitting                                        |
| EIRP, e.i.r.p. | Equivalent Isotropically Radiated Power                         | VBW     | Video BandWidth                                     |
| EMC            | ElectroMagnetic Compatibility                                   | Vert.   | Vertical                                            |
| EMI            | ElectroMagnetic Interference                                    | WLAN    | Wireless LAN                                        |
| EN             | European Norm                                                   |         |                                                     |
| ERP, e.r.p.    | Effective Radiated Power                                        |         |                                                     |
| EU             | European Union                                                  |         |                                                     |
| EUT            | Equipment Under Test                                            |         |                                                     |
| Fac.           | Factor                                                          |         |                                                     |
| FCC            | Federal Communications Commission                               |         |                                                     |
| FHSS           | Frequency Hopping Spread Spectrum                               |         |                                                     |
| FM             | Frequency Modulation                                            |         |                                                     |
| Freq.          | Frequency                                                       |         |                                                     |
| GFSK           | Gaussian Frequency-Shift Keying                                 |         |                                                     |
| GNSS           | Global Navigation Satellite System                              |         |                                                     |
| GPS            | Global Positioning System                                       |         |                                                     |
| Hori.          | Horizontal                                                      |         |                                                     |
| IEC            | International Electrotechnical Commission                       |         |                                                     |
| IEEE           | Institute of Electrical and Electronics Engineers               |         |                                                     |
| IF             | Intermediate Frequency                                          |         |                                                     |
| ILAC           | International Laboratory Accreditation Conference               |         |                                                     |
| ISED           | Innovation, Science and Economic Development Canada             |         |                                                     |
| ISO            | International Organization for Standardization                  |         |                                                     |
| JAB            | Japan Accreditation Board                                       |         |                                                     |
| LAN            | Local Area Network                                              |         |                                                     |
| LIMS           | Laboratory Information Management System                        |         |                                                     |
| MCS            | Modulation and Coding Scheme                                    |         |                                                     |
| MRA            | Mutual Recognition Arrangement                                  |         |                                                     |
| NIST           | National Institute of Standards and Technology                  |         |                                                     |
| NS             | No signal detect.                                               |         |                                                     |

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## **SECTION1: Customer information**

|                  |   |                                                        |
|------------------|---|--------------------------------------------------------|
| Company Name     | : | SANYO MACHINE WORKS, LTD.                              |
| Address          | : | 1 Oka, Okimura, Kitanagoya-Shi, Aichi, 481-8540, Japan |
| Telephone Number | : | +81-568-21-3196                                        |
| Facsimile Number | : | +81-568-25-7238                                        |
| Contact Person   | : | Hisashi Ryota                                          |

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. FCC ID on the cover and other relevant pages
  - Operating/Test Mode(s) (Mode(s)) on all the relevant pages
  - SECTION 1: Customer information
  - SECTION 2: Equipment under test (EUT) other than the Receipt Date
  - SECTION 5: Tune-up tolerance information and software information
- \* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2.

## **SECTION2: Equipment under test (EUT)**

### **2.1 Identification of EUT**

|                            |   |                                 |
|----------------------------|---|---------------------------------|
| Type                       | : | Module of Wireless Pistol Tool  |
| Model Number               | : | SX-ULPAN                        |
| Serial number              | : | MC004956                        |
| Rating                     | : | DC 3.3 V                        |
| Receipt Date               | : | April 3, 2020                   |
| Country of Mass-production | : | Japan                           |
| Condition                  | : | Production model                |
| Modification               | : | No Modification by the test lab |

## 2.2 Product description

Model: SX-ULPAN (referred to as the EUT in this report) is a Module of Wireless Pistol Tool.

### General Specification

|                                |   |             |
|--------------------------------|---|-------------|
| Radio Type                     | : | Transceiver |
| Method of Frequency Generation | : | Synthesizer |

### Radio Specification

|                            | IEEE802.11b                                                          | IEEE802.11g                            | IEEE802.11a                                                  | IEEE802.11n<br>(20 M band)                                                   |
|----------------------------|----------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------|
| Frequency of operation     | 2412-2462MHz                                                         | 2412-2462MHz                           | 5180-5240MHz<br>5260-5320MHz<br>5500-5700MHz<br>5745-5825MHz | 2412-2462MHz<br>5180-5240MHz<br>5260-5320MHz<br>5500-5700MHz<br>5745-5825MHz |
| Type of modulation         | DSSS<br>(CCK, DQPSK, DBPSK)                                          | OFDM-CCK<br>(64QAM, 16QAM, QPSK, BPSK) | OFDM<br>(64QAM, 16QAM, QPSK, BPSK)                           |                                                                              |
| Channel spacing            | 5MHz                                                                 |                                        | 20MHz                                                        | <u>2.4GHz band</u><br>5MHz<br><u>5GHz band</u><br>20MHz                      |
| Antenna type               | On board printed PCB antenna                                         |                                        |                                                              |                                                                              |
| Antenna Gain:<br>$G_{ANT}$ | On board printed PCB antenna<br>2.1dBi@2.4GHz band, 2.2dBi@5GHz band |                                        |                                                              |                                                                              |
| Antenna Connector type     | U.FL Alternative connector                                           |                                        |                                                              |                                                                              |

### **SECTION3: Test standard information**

#### **3.1 Test Specification**

- Title : **FCC47CFR 2.1093**  
Radiofrequency radiation exposure evaluation: portable devices.
- : **IEEE Std 1528-2013:**  
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
- : **Published RF exposure KDB procedures**
- ☒ **KDB447498D01(v06)** RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
  - ☐ **KDB447498D02(v02r01)** SAR Measurement Procedures for USB Dongle Transmitters
  - ☐ **KDB648474D04(v01r04)** SAR Evaluation Considerations for Wireless Handsets
  - ☐ **KDB941225D01(v03r01)** 3G SAR Measurement Procedures
  - ☐ **KDB941225D05(v02r05)** SAR Evaluation Considerations for LTE Devices
  - ☐ **KDB941225D06(v02r01)** SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities (Hot Spot SAR)
  - ☐ **KDB941225D07(v01r02)** SAR Evaluation Procedures for UMPC Mini-Tablet Devices
  - ☐ **KDB616217D04(v01r02)** SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers
  - ☒ **KDB865664D01(v01r04)** SAR Measurement Requirements for 100MHz to 6 GHz
  - ☒ **KDB248227D01(v02r02)** SAR Guidance for 802.11(Wi-Fi) Transmitters

#### **Reference**

- [1]SPEAG uncertainty document (AN 15-7/AN19-17) for DASY 5 System from SPEAG (Schmid & Partner Engineering AG).
- [2]IEC62209-2:2010+AMD1:2019 CSV

#### **3.2 Procedure**

| Transmitter                                                             | WLAN and Bluetooth                   |
|-------------------------------------------------------------------------|--------------------------------------|
| Test Procedure                                                          | Published RF exposure KDB procedures |
| Category                                                                | SAR                                  |
| Note: UL Japan, Inc. 's SAR Work Procedures 13-EM-W0429 and 13-EM-W0430 |                                      |

This EUT operates only with the specified Wireless Nutrunner.  
Therefore the test was performed with the Wireless Nutrunner (Host) in which the distance to the exterior surface is shortest.

#### **3.3 Additions or deviations to standard**

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Exposure limit

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

| Spatial Average<br>(averaged over the whole body) | Spatial Peak<br>(averaged over any 1g of tissue) | Spatial Peak<br>(hands/wrists/feet/ankles averaged over 10g) |
|---------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------|
| 0.4                                               | 8.0                                              | 20.0                                                         |

(B) Limits for General population/Uncontrolled Exposure (W/kg)

| Spatial Average<br>(averaged over the whole body) | Spatial Peak<br>(averaged over any 1g of tissue) | Spatial Peak<br>(hands/wrists/feet/ankles averaged over 10g) |
|---------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------|
| 0.08                                              | 1.6                                              | 4.0                                                          |

**Occupational/Controlled Environments:** are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

**General Population/Uncontrolled Environments:** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE  
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT  
1.6 W/kg**

### 3.5 SAR

Specific Absorption Rate (SAR): The time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ), as shown in the following equation:

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

SAR is expressed in units of watts per kilogram (W/kg) or equivalently milliwatts per gram (mW/g).

SAR is related to the E-field at a point by the following equation:

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

where

$\sigma$  = conductivity of the tissue (S/m)

$\rho$  = mass density of the tissue (kg/m<sup>3</sup>)

E = rms E-field strength (V/m)

### 3.6 Test Location

UL Japan, Inc. Ise EMC Lab.

Shielded room for SAR testings

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## **SECTION4: Test result**

### **4.1 Result**

Complied

Highest values at each band are listed next section.

### **4.2 Stand-alone SAR result**

#### **Reported SAR**

Measured SAR is scaled to the maximum tune-up tolerance limit and the maximum duty by the following formulas.

Reported SAR= Measured SAR [W/kg] \* Scaled factor for power \* Scaled factor for duty

Maximum tune-up tolerance limit is by the specification from a customer.

\* Scaled factor for power = Maximum tune-up tolerance limit [mW] / Measured power [mW]

\* Scaled factor for duty = 1 / Duty

#### **Body SAR Duty**

| Mode    | Ch #. | Freq.<br>(MHz) | Power (dBm)               |                              |               | Duty  |               | 1-g SAR (W/kg) |          |
|---------|-------|----------------|---------------------------|------------------------------|---------------|-------|---------------|----------------|----------|
|         |       |                | Tune-up<br>upper<br>Power | Measured<br>average<br>Power | Scaled factor |       | Scaled factor | Meas.          | Reported |
| 802.11b | 1     | 2412           | 16.50                     | 16.47                        | 1.01          | 0.996 | 1.004         | 0.649          | 0.656    |

#### **Note(s):**

The sample used by the SAR test is not more than 2 dB lower than the maximum tune-up tolerance limit. That is, measured power is included the tune-up tolerance range.

\*Details are shown at section 12.

### **4.3 Simultaneous transmission SAR result**

EUT does not have simultaneous transmission configuration.

## SECTION5: Tune-up tolerance information and software information

Maximum tune-up tolerance limit

| Mode         | Band or Ch              | Maximum tune-up tolerance limit [dBm] | Maximum tune-up tolerance limit [mW] |
|--------------|-------------------------|---------------------------------------|--------------------------------------|
| WLAN 11b     | 1                       | 16.50                                 | 44.67                                |
| WLAN 11b     | 2,3                     | 16.00                                 | 39.81                                |
| WLAN 11b     | 4-6                     | 15.50                                 | 35.48                                |
| WLAN 11b     | 7,8                     | 15.00                                 | 31.62                                |
| WLAN 11b     | 9-11                    | 14.50                                 | 28.18                                |
| WLAN 11g     | 1                       | 14.50                                 | 28.18                                |
| WLAN 11g     | 2-10                    | 15.50                                 | 35.48                                |
| WLAN 11g     | 11                      | 12.50                                 | 17.78                                |
| WLAN 11n20   | 1                       | 14.50                                 | 28.18                                |
| WLAN 11n20   | 2-10                    | 17.00                                 | 50.12                                |
| WLAN 11n20   | 11                      | 12.50                                 | 17.78                                |
| WLAN 11a/n20 | U-NII-1<br>(5.2G band)  | 12.18                                 | 16.52                                |
| WLAN 11a/n20 | U-NII-2A<br>(5.3G band) | 11.44                                 | 13.93                                |
| WLAN 11a/n20 | U-NII-2C<br>(5.5G band) | 8.89                                  | 7.74                                 |
| WLAN 11a/n20 | U-NII-3<br>(5.8G band)  | 5.26                                  | 3.36                                 |

For WLAN On time maximum tune-up tolerance limit is defined by a customer.

| Software setting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>*The power value of the EUT was set for testing as follows (setting value might be different from product specification value);</p> <p>Power settings: See section 8.1</p> <p>Software: ART2_IoE version 2.3</p> <p>*This setting of software is the worst case.</p> <p>The test was performed with condition that obtained the maximum average power (Burst) in pre-check.</p> <p>Any conditions under the normal use do not exceed the condition of setting.</p> <p>In addition, end users cannot change the settings of the output power of the product.</p> |  |

## SECTION6: RF Exposure Conditions (Test Configurations)

### 6.1 Summary of the distance between antenna and surface of EUT

| Test position | Distance[mm] |
|---------------|--------------|
| Top           | 132.10       |
| Bottom        | 66.00        |
| Right         | 30.10        |
| Left          | 26.10        |
| Front         | 105.10       |
| Rear          | 7.90         |

\*Details are shown in appendix 4

### 6.2 SAR test exclusion considerations according to KDB447498 D01

The following is based on KDB447498D01.

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$$
  
for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR

- The upper frequency of the frequency band was used in order to calculate standalone SAR test exclusion considerations.
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion. When the separation of antenna to EUT's surfaces and edges are  $\leq 50$  mm, the separation distance used for the SAR exclusion calculations is 5 mm.
- "N/A" displayed on below exclusion calculation means not applicable this formula since distance between antenna and surface is  $> 50$  mm.

When the calculated threshold value by a numerical formula above-mentioned in the following table is 3.0 or less, SAR test is excluded.

SAR exclusion calculations for antenna <50mm from the user

| Antenna | Tx Interface | Frequency (MHz) | Output Power |    | Separation Distances (mm) |        |       |       |        |      | Calculated Threshold Value |        |          |          |       |          |
|---------|--------------|-----------------|--------------|----|---------------------------|--------|-------|-------|--------|------|----------------------------|--------|----------|----------|-------|----------|
|         |              |                 | dBm          | mW | Top                       | Bottom | Right | Left  | Front  | Rear | Top                        | Bottom | Right    | Left     | Front | Rear     |
| Main    | 11b          | 2462            | 16.50        | 45 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | N/A                        | N/A    | 14.1     | 14.1     | N/A   | 14.1     |
| Main    | 11g          | 2462            | 15.50        | 35 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | N/A                        | N/A    | 11       | 11       | N/A   | 11       |
| Main    | 11n20        | 2462            | 17.00        | 50 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | N/A                        | N/A    | 15.7     | 15.7     | N/A   | 15.7     |
| Main    | 11a / n20    | 5240            | 12.18        | 17 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | N/A                        | N/A    | 7.8      | 7.8      | N/A   | 7.8      |
| Main    | 11a / n20    | 5320            | 11.44        | 14 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | N/A                        | N/A    | 6.5      | 6.5      | N/A   | 6.5      |
| Main    | 11a / n20    | 5700            | 8.89         | 8  | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | N/A                        | N/A    | 3.8      | 3.8      | N/A   | 3.8      |
| Main    | 11a / n20    | 5825            | 5.26         | 3  | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | N/A                        | N/A    | 1.4      | 1.4      | N/A   | 1.4      |
|         |              |                 |              |    |                           |        |       |       |        |      |                            |        | -EXEMPT- | -EXEMPT- |       | -EXEMPT- |

Band U-NII-3 is excluded but for conservative testing, test is conducted.

2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following.

- a)  $[(3 \cdot 50) / (\sqrt{f(\text{GHz})})] + (\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz}) / 150) \text{ mW}$  at > 100 MHz and ≤ 1500 MHz  
b)  $[(3 \cdot 50) / (\sqrt{f(\text{GHz})})] + (\text{test separation distance} - 50 \text{ mm}) \cdot 10 \text{ mW}$  at > 1500 MHz and ≤ 6 GHz

1. The upper frequency of the frequency band was used in order to calculate standalone SAR test exclusion considerations.
2. Power and distance are rounded to the nearest mW and mm before calculation
3. “N/A” displayed on below exclusion calculation means not applicable this formula since distance between antenna and surface is < 50 mm.

When output power is less than the calculated threshold value by a numerical formula above-mentioned in the following table, SAR test is excluded.

SAR exclusion calculations for antenna >50mm from the user

| Antenna | Tx Interface | Frequency (MHz) | Output Power |    | Separation Distances (mm) |        |       |       |        |      | Calculated Threshold Value |                      |       |      |                      |      |
|---------|--------------|-----------------|--------------|----|---------------------------|--------|-------|-------|--------|------|----------------------------|----------------------|-------|------|----------------------|------|
|         |              |                 | dBm          | mW | Top                       | Bottom | Right | Left  | Front  | Rear | Top                        | Bottom               | Right | Left | Front                | Rear |
| Main    | 11b          | 2462            | 16.50        | 45 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | 916.6 mW<br>-EXEMPT-       | 255.6 mW<br>-EXEMPT- | N/A   | N/A  | 646.6 mW<br>-EXEMPT- | N/A  |
| Main    | 11g          | 2462            | 15.50        | 35 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | 916.6 mW<br>-EXEMPT-       | 255.6 mW<br>-EXEMPT- | N/A   | N/A  | 646.6 mW<br>-EXEMPT- | N/A  |
| Main    | 11n20        | 2462            | 17.00        | 50 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | 916.6 mW<br>-EXEMPT-       | 255.6 mW<br>-EXEMPT- | N/A   | N/A  | 646.6 mW<br>-EXEMPT- | N/A  |
| Main    | 11a / n20    | 5240            | 12.18        | 17 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | 886.5 mW<br>-EXEMPT-       | 225.5 mW<br>-EXEMPT- | N/A   | N/A  | 616.5 mW<br>-EXEMPT- | N/A  |
| Main    | 11a / n20    | 5320            | 11.44        | 14 | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | 886 mW<br>-EXEMPT-         | 225 mW<br>-EXEMPT-   | N/A   | N/A  | 616 mW<br>-EXEMPT-   | N/A  |
| Main    | 11a / n20    | 5700            | 8.89         | 8  | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | 883.8 mW<br>-EXEMPT-       | 222.8 mW<br>-EXEMPT- | N/A   | N/A  | 613.8 mW<br>-EXEMPT- | N/A  |
| Main    | 11a / n20    | 5825            | 5.26         | 3  | 132.10                    | 66.00  | 30.10 | 26.10 | 105.10 | 7.90 | 883.2 mW<br>-EXEMPT-       | 222.2 mW<br>-EXEMPT- | N/A   | N/A  | 613.2 mW<br>-EXEMPT- | N/A  |

## **SECTION7: Description of the Body setup**

### **7.1 Procedure for SAR test position determination**

-The tested procedure was performed according to the KDB 447498 D01 (Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies).

### **7.2 Test position for Body setup**

| No. | Position | Test distance | WLAN                                |
|-----|----------|---------------|-------------------------------------|
|     |          |               | Tested                              |
| 1   | Front    | 0mm           | <input type="checkbox"/>            |
| 2   | Rear     | 0mm           | <input checked="" type="checkbox"/> |
| 3   | Left     | 0mm           | <input checked="" type="checkbox"/> |
| 4   | Right    | 0mm           | <input checked="" type="checkbox"/> |
| 5   | Top      | 0mm           | <input type="checkbox"/>            |
| 6   | Bottom   | 0mm           | <input type="checkbox"/>            |

\*1 According to the KDB 447498 D01 SAR test of this position was excluded; however, considering for simultaneous transmission evaluation, it was tested.

## SECTION8: Description of the operating mode

### 8.1 Output Power and SAR test required

According to KDB248227D01, The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

1. The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
2. If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
3. If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
4. When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

#### Wi-Fi 2.4GHz (DTS Band)

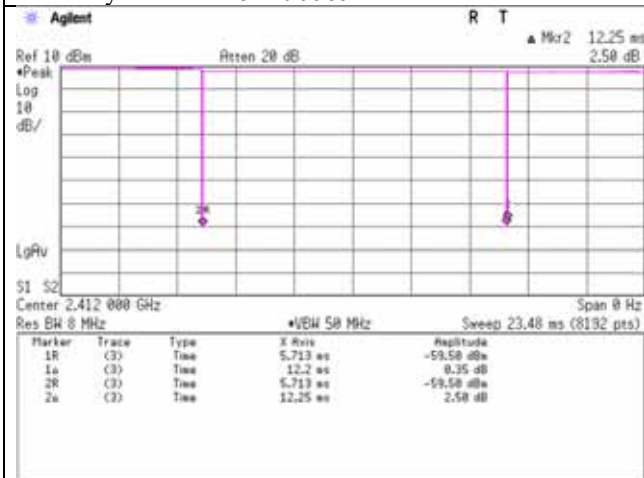
| Band (GHz) | Mode   | Data Rate        | Ch # | Freq. (MHz) | Tune-up upper Power (dBm) | Measured average Power (dBm) | Initial test configuration | setting value | Note(s) |
|------------|--------|------------------|------|-------------|---------------------------|------------------------------|----------------------------|---------------|---------|
| 2.4        | 11b    | 1 Mbps           | 1    | 2412        | 16.50                     | <b>16.47</b>                 | Yes                        | 16.0          |         |
|            |        |                  | 2    | 2417        | 16.00                     | 15.91                        |                            | 16.0          |         |
|            |        |                  | 3    | 2422        | 16.00                     | 15.89                        |                            | 15.5          |         |
|            |        |                  | 4    | 2427        | 15.50                     | 15.18                        |                            | 15.5          |         |
|            |        |                  | 5    | 2432        | 15.50                     | 15.28                        |                            | 15.0          |         |
|            |        |                  | 6    | 2437        | 15.50                     | 15.09                        |                            | 14.5          |         |
|            |        |                  | 7    | 2442        | 15.00                     | 14.84                        |                            | 14.0          |         |
|            |        |                  | 8    | 2447        | 15.00                     | 14.68                        |                            | 14.5          |         |
|            |        |                  | 9    | 2452        | 14.50                     | 14.08                        |                            | 14.0          |         |
|            |        |                  | 10   | 2457        | 14.50                     | 14.02                        |                            | 14.0          |         |
|            |        |                  | 11   | 2462        | 14.50                     | 14.44                        |                            | 14.0          |         |
|            | 11g    | 6 Mbps           | 1    | 2412        | 14.50                     | 14.30                        |                            | 14.0          |         |
|            |        |                  | 2    | 2417        | 15.50                     | 15.16                        |                            | 15.0          |         |
|            |        |                  | 6    | 2437        | 15.50                     | 15.49                        |                            | 14.5          |         |
|            |        |                  | 10   | 2457        | 15.50                     | 14.95                        |                            | 14.5          |         |
|            | 11n-20 | 6.5 Mbps (MCS 0) | 11   | 2462        | 12.50                     | 12.13                        |                            | 11.5          |         |
|            |        |                  | 1    | 2412        | 14.50                     | 14.29                        |                            | 14.0          |         |
|            |        |                  | 2    | 2417        | 17.00                     | <b>16.99</b>                 |                            | 17.0          |         |
|            |        |                  | 6    | 2437        | 17.00                     | 16.88                        |                            | 16.0          |         |
|            |        |                  | 10   | 2457        | 17.00                     | 16.75                        |                            | 16.5          |         |
|            |        |                  | 11   | 2462        | 12.50                     | 12.49                        |                            | 12.0          |         |

#### Note(s):

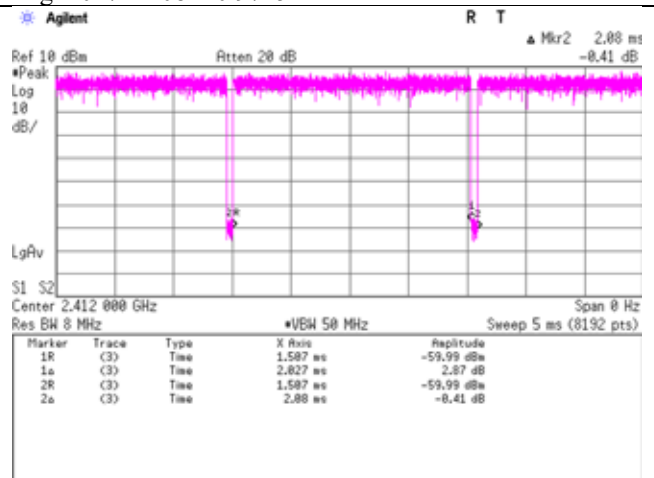
1. When the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR is not required for that subsequent test configuration.
2. Initial SAR test channel was chosen. (shaded blue frame)

Duty for 2.4GHz

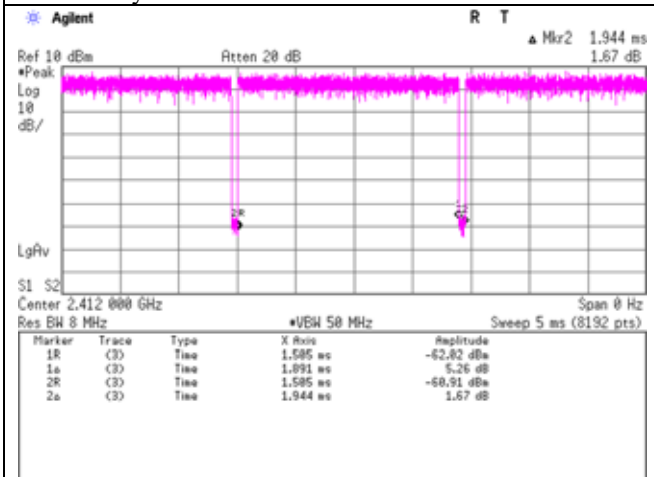
11b Duty  $12.2 / 12.25 = 0.9959$



11g 2.027 / 2.08 = 0.9745



11n20 Duty  $1.891 / 1.944 = 0.9727$



#### Wi-Fi 5GHz (U-NII-1 and U-NII-2A Bands)

| Band (GHz)    | Mode      | Data Rate | Ch # | Freq. (MHz) | Tune-up upper Power (dBm) | Measured average Power (dBm) | Initial test configuration | setting value | Note(s) |
|---------------|-----------|-----------|------|-------------|---------------------------|------------------------------|----------------------------|---------------|---------|
| 5.2 (U-NII-1) | 802.11a   | 6 Mbps    | 36   | 5180        | 12.18                     | <b>12.16</b>                 | Yes                        | 14.5          |         |
|               |           |           | 44   | 5220        | 12.18                     | <b>12.11</b>                 |                            | 16.0          |         |
|               |           |           | 48   | 5240        | 12.18                     | <b>12.10</b>                 |                            | 16.0          |         |
|               | 802.11n20 | 6.5 Mbps  | 36   | 5180        | 12.18                     | <b>11.97</b>                 |                            | 14.5          |         |
|               |           |           | 44   | 5220        | 12.18                     | <b>12.03</b>                 |                            | 16.0          |         |
|               |           |           | 48   | 5240        | 12.18                     | <b>11.76</b>                 |                            | 16.0          |         |

| Band (GHz)     | Mode      | Data Rate | Ch # | Freq. (MHz) | Tune-up upper Power (dBm) | Measured average Power (dBm) | Initial test configuration | setting value | Note(s) |
|----------------|-----------|-----------|------|-------------|---------------------------|------------------------------|----------------------------|---------------|---------|
| 5.3 (U-NII-2A) | 802.11a   | 6 Mbps    | 52   | 5260        | 11.44                     | <b>10.94</b>                 |                            | 13.0          |         |
|                |           |           | 60   | 5300        | 11.44                     | <b>10.77</b>                 |                            | 13.0          |         |
|                |           |           | 64   | 5320        | 11.44                     | <b>10.72</b>                 |                            | 13.0          |         |
|                | 802.11n20 | 6.5 Mbps  | 52   | 5260        | 11.44                     | <b>10.57</b>                 |                            | 13.0          |         |
|                |           |           | 60   | 5300        | 11.44                     | <b>10.13</b>                 |                            | 13.0          |         |
|                |           |           | 64   | 5320        | 11.44                     | <b>10.57</b>                 |                            | 13.0          |         |

#### Wi-Fi 5GHz (U-NII-2C Band)

| Band (GHz)     | Mode      | Data Rate | Ch # | Freq. (MHz) | Tune-up upper Power (dBm) | Measured average Power (dBm) | Initial test configuration | setting value | Note(s) |
|----------------|-----------|-----------|------|-------------|---------------------------|------------------------------|----------------------------|---------------|---------|
| 5.5 (U-NII-2C) | 802.11a   | 6 Mbps    | 100  | 5500        | 8.89                      | <b>8.85</b>                  |                            | 12.0          |         |
|                |           |           | 116  | 5580        | 8.89                      | <b>8.58</b>                  |                            | 13.0          |         |
|                |           |           | 140  | 5700        | 8.89                      | <b>8.87</b>                  | Yes                        | 13.0          |         |
|                | 802.11n20 | 6.5 Mbps  | 100  | 5500        | 8.89                      | <b>8.73</b>                  |                            | 12.5          |         |
|                |           |           | 116  | 5580        | 8.89                      | <b>8.65</b>                  |                            | 13.0          |         |
|                |           |           | 140  | 5700        | 8.89                      | <b>8.81</b>                  |                            | 12.5          |         |

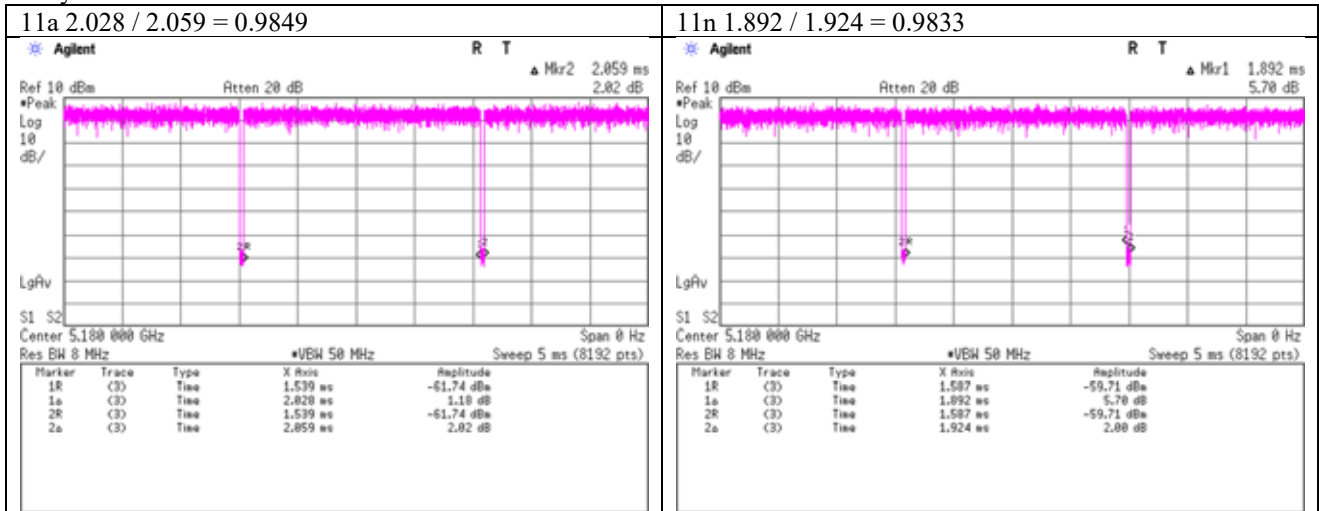
#### Wi-Fi 5GHz (U-NII-3 Band)

| Band (GHz)    | Mode      | Data Rate | Ch # | Freq. (MHz) | Tune-up upper Power (dBm) | Measured average Power (dBm) | Initial test configuration | setting value | Note(s) |
|---------------|-----------|-----------|------|-------------|---------------------------|------------------------------|----------------------------|---------------|---------|
| 5.8 (U-NII-3) | 802.11a   | 6 Mbps    | 149  | 5745        | 5.26                      | <b>5.17</b>                  | Yes                        | 8.0           |         |
|               |           |           | 157  | 5785        | 5.26                      | <b>5.13</b>                  |                            | 7.0           |         |
|               |           |           | 165  | 5825        | 5.26                      | <b>5.05</b>                  |                            | 6.5           |         |
|               | 802.11n20 | 6.5 Mbps  | 149  | 5745        | 5.26                      | <b>5.18</b>                  |                            | 8.0           |         |
|               |           |           | 157  | 5785        | 5.26                      | <b>5.05</b>                  |                            | 7.0           |         |
|               |           |           | 165  | 5825        | 5.26                      | <b>4.92</b>                  |                            | 6.5           |         |

#### Note(s):

- When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel with the largest bandwidth and lowest data rate is selected (i.e. 802.11ac VHT80).
- In U-NII-1 and U-NII-2A Bands when different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is  $\leq 1.2$  W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.
- The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
- SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

Duty for 5GHz



## SECTION9: Test surrounding

### 9.1 Measurement uncertainty

This measurement uncertainty budget is suggested by IEEE Std 1528(2013) and IEC62209-2:2010+AMD1:2019 CSV, and determined by Schmid & Partner Engineering AG (DASY5/6 Uncertainty Budget). Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz Section 2.8.1., when the highest measured SAR(1g) within a frequency band is < 1.5W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std.1528 (2013) is not required in SAR reports submitted for equipment approval.

<Body>

| Error Description                     | Uncert.<br>value | Prob.<br>Dist. | Div. | (ci)<br>1g | (ci)<br>10g | Std. Unc.<br>(1g) | Std.Unc.<br>(10g) |
|---------------------------------------|------------------|----------------|------|------------|-------------|-------------------|-------------------|
| <b>Measurement System</b>             |                  |                |      |            |             |                   |                   |
| Probe Calibration                     | ± 6.55 %         | N              | 1    | 1          | 1           | ±6.55%            | ±6.55%            |
| Axial Isotropy                        | ± 4.7 %          | R              | √3   | 0.7        | 0.7         | ±1.9%             | ±1.9%             |
| Hemispherical Isotropy                | ± 9.6 %          | R              | √3   | 0.7        | 0.7         | ±3.9%             | ±3.9%             |
| Linearity                             | ± 4.7 %          | R              | √3   | 1          | 1           | ±2.7%             | ±2.7%             |
| Modulation Response                   | ± 2.4 %          | R              | √3   | 1          | 1           | ±1.4%             | ±1.4%             |
| System Detection Limits               | ± 1.0 %          | R              | √3   | 1          | 1           | ±0.6%             | ±0.6%             |
| Boundary Effects                      | ± 2.0 %          | R              | √3   | 1          | 1           | ±1.2%             | ±1.2%             |
| Readout Electronics                   | ± 0.3 %          | N              | 1    | 1          | 1           | ±0.3%             | ±0.3%             |
| Response Time                         | ± 0.8 %          | R              | √3   | 1          | 1           | ±0.5%             | ±0.5%             |
| Integration Time                      | ± 2.6 %          | R              | √3   | 1          | 1           | ±1.5%             | ±1.5%             |
| RF Ambient Noise                      | ± 3.0 %          | R              | √3   | 1          | 1           | ±1.7%             | ±1.7%             |
| RF Ambient Reflections                | ± 3.0 %          | R              | √3   | 1          | 1           | ±1.7%             | ±1.7%             |
| Probe Positioner                      | ± 0.04 %         | R              | √3   | 1          | 1           | ±0.0%             | ±0.0%             |
| Probe Positioning                     | ± 0.8 %          | R              | √3   | 1          | 1           | ±0.5%             | ±0.5%             |
| Post-processing                       | ± 4.0 %          | R              | √3   | 1          | 1           | ±2.3%             | ±2.3%             |
| <b>Test Sample Related</b>            |                  |                |      |            |             |                   |                   |
| Device Holder                         | ± 3.6 %          | N              | 1    | 1          | 1           | ±3.6%             | ±3.6%             |
| Test sample Positioning               | ± 2.9 %          | N              | 1    | 1          | 1           | ±2.9%             | ±2.9%             |
| Power Scaling                         | ± 0.0 %          | R              | √3   | 1          | 1           | ±0.0%             | ±0.0%             |
| Power Drift                           | ± 5.0 %          | R              | √3   | 1          | 1           | ±2.9%             | ±2.9%             |
| <b>Phantom and Setup</b>              |                  |                |      |            |             |                   |                   |
| Phantom Uncertainty                   | ± 7.6 %          | R              | √3   | 1          | 1           | ±4.4%             | ±4.4%             |
| SAR correction                        | ± 1.9 %          | N              | 1    | 1          | 0.84        | ±1.9%             | ±1.6%             |
| Liquid Conductivity (mea.)            | + 4.8 %          | N              | 1    | 0.78       | 0.71        | ±3.8%             | ±3.4%             |
| Liquid Permittivity (mea.)            | - 3.5 %          | N              | 1    | 0.23       | 0.26        | ±0.8%             | ±0.9%             |
| Temp. unc. - Conductivity             | ± 3.4 %          | R              | √3   | 0.78       | 0.71        | ±1.5%             | ±1.4%             |
| Temp. unc. - Permittivity             | ± 0.4 %          | R              | √3   | 0.23       | 0.26        | ±0.1%             | ±0.1%             |
| Combined Std. Uncertainty             |                  |                |      |            |             | ±12.5%            | ±12.4%            |
| <b>Expanded STD Uncertainty (κ=2)</b> |                  |                |      |            |             | ±25.0%            | ±24.7%            |

Note: This uncertainty budget for validation is worst-case.  
Table of uncertainties are listed for ISO/IEC 17025.

## **SECTION10: Parameter Check**

The dielectric parameters were checked prior to assessment using the DAK dielectric probe kit.  
The dielectric parameters measurement is reported in each correspondent section.

According to KDB865664 D01, +/- 5% tolerances are required for  $\epsilon_r$  and  $\sigma$  and then below table which is the target value of the simulated tissue liquid is quoted from KDB865664 D01.

| Target Frequency | Head         |                | Body         |                |
|------------------|--------------|----------------|--------------|----------------|
| (MHz)            | $\epsilon_r$ | $\sigma$ (S/m) | $\epsilon_r$ | $\sigma$ (S/m) |
| 150              | 52.3         | 0.76           | 61.9         | 0.80           |
| 300              | 45.3         | 0.87           | 58.2         | 0.92           |
| 450              | 43.5         | 0.87           | 56.7         | 0.94           |
| 835              | 41.5         | 0.90           | 55.2         | 0.97           |
| 900              | 41.5         | 0.97           | 55.0         | 1.05           |
| 915              | 41.5         | 0.98           | 55.0         | 1.06           |
| 1450             | 40.5         | 1.20           | 54.0         | 1.30           |
| 1610             | 40.3         | 1.29           | 53.8         | 1.40           |
| 1800 – 2000      | 40.0         | 1.40           | 53.3         | 1.52           |
| 2450             | 39.2         | 1.80           | 52.7         | 1.95           |
| 3000             | 38.5         | 2.40           | 52.0         | 2.73           |
| 5800             | 35.3         | 5.27           | 48.2         | 6.00           |

( $\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho = 1000 \text{ kg/m}^3$ )

## 10.1 For SAR system check

| DIELECTRIC PARAMETERS MEASUREMENT RESULTS |                       |                       |               |                      |                          |            |             |             |              |                 |                  |           |        |
|-------------------------------------------|-----------------------|-----------------------|---------------|----------------------|--------------------------|------------|-------------|-------------|--------------|-----------------|------------------|-----------|--------|
| Date                                      | Ambient Temp. [deg.c] | Relative Humidity [%] | Liquid type   | Liquid Temp. [deg.c] | Measured Frequency [MHz] | Target [σ] | Target [εr] | Measure [σ] | Measure [εr] | Deviation σ [%] | Deviation εr [%] | Limit [%] | Remark |
| 2020/4/9                                  | 21.0                  | 30.0                  | HBBL600-10000 | 19.7                 | 2450.0                   | 1.86       | 37.9        | 1.86        | 39.3         | 0.2             | 3.7              | +5        |        |
| 2020/4/10                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.8                 | 5250.0                   | 4.49       | 34.8        | 4.61        | 35.1         | 2.7             | 1.0              | +5        |        |
| 2020/4/13                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.7                 | 5600.0                   | 5.07       | 35.5        | 5.02        | 34.5         | -0.9            | -2.9             | +5        |        |
| 2020/4/13                                 | 21.0                  | 45.0                  | HBBL600-10000 | 19.7                 | 5800.0                   | 5.27       | 35.3        | 5.21        | 34.1         | -1.1            | -3.3             | +5        |        |
| 2021/1/20                                 | 21.0                  | 42.0                  | HBBL600-10000 | 20.0                 | 5250.0                   | 4.71       | 35.9        | 4.57        | 35.0         | -2.9            | -2.5             | +5        |        |

σ : Conductivity / εr: Relative Permittivity

\* The dielectric parameters were linearly interpolated between the closest pair of target frequencies defined in KDB 865664D01 to determine the applicable dielectric parameters corresponding to the device test frequency.

### Correlation confirmation with measured TSL parameters of the calibration certificate of system check dipoles (Refer to Appendix 3)

+/- 6% limit for deviation provided by manufacture tolerances are required for εr and σ and then below table which is the target value of the simulated tissue liquid is quoted from data measured TSL parameters of dipole calibration.

2020/4/9 to 2020/4/13

| Freq [MHz] | Model,S/N   | Head |      | Body |      |
|------------|-------------|------|------|------|------|
|            |             | σ    | ε    | σ    | ε    |
| 2450       | D2450,713   | 1.86 | 37.9 | 2.04 | 50.7 |
| 5250       | D5GHV2,1020 | 4.49 | 34.8 | 5.51 | 47.0 |
| 5600       | D5GHV2,1020 | 4.84 | 34.3 | 5.99 | 46.4 |
| 5800       | D5GHV2,1020 | 5.05 | 34.0 | 6.26 | 46.0 |

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| Freq [MHz] | Model,S/N   | Head |      | Body |      |
|------------|-------------|------|------|------|------|
|            |             | σ    | ε    | σ    | ε    |
| 5250       | D5GHV2,1020 | 4.60 | 36.3 | 5.43 | 47.1 |

| DIELECTRIC PARAMETERS MEASUREMENT RESULTS |                       |                       |               |                      |                          |            |             |             |              |                 |                  |           |        |
|-------------------------------------------|-----------------------|-----------------------|---------------|----------------------|--------------------------|------------|-------------|-------------|--------------|-----------------|------------------|-----------|--------|
| Date                                      | Ambient Temp. [deg.c] | Relative Humidity [%] | Liquid type   | Liquid Temp. [deg.c] | Measured Frequency [MHz] | Target [σ] | Target [εr] | Measure [σ] | Measure [εr] | Deviation σ [%] | Deviation εr [%] | Limit [%] | Remark |
| 2020/4/13                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.7                 | 2450.0                   | 1.80       | 39.2        | 1.86        | 39.3         | 3.6             | 0.3              | +/-6      | *1     |
| 2020/4/10                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.8                 | 5250.0                   | 4.71       | 35.9        | 4.61        | 35.1         | -2.0            | -2.2             | +/-6      | *1     |
| 2020/4/13                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.7                 | 5600.0                   | 4.84       | 34.3        | 5.02        | 34.5         | 3.7             | 0.6              | +/-6      | *1     |
| 2020/4/13                                 | 21.0                  | 45.0                  | HBBL600-10000 | 19.7                 | 5800.0                   | 5.05       | 34.0        | 5.21        | 34.1         | 3.2             | 0.4              | +/-6      | *1     |
| 2021/1/20                                 | 21.0                  | 42.0                  | HBBL600-10000 | 20.0                 | 5250.0                   | 4.60       | 36.3        | 4.57        | 35.0         | -0.7            | -3.6             | +/-6      | *1     |

εr: Relative Permittivity / σ : Conductivity

\*1 The Target value is a parameter defined in each Dipole.

## 10.2 For SAR measurement

| DIELECTRIC PARAMETERS MEASUREMENT RESULTS |                       |                       |               |                      |                          |                 |                     |                  |                      |                        |                            |           |        |
|-------------------------------------------|-----------------------|-----------------------|---------------|----------------------|--------------------------|-----------------|---------------------|------------------|----------------------|------------------------|----------------------------|-----------|--------|
| Date                                      | Ambient Temp. [deg.c] | Relative Humidity [%] | Liquid type   | Liquid Temp. [deg.c] | Measured Frequency [MHz] | Target $\sigma$ | Target $\epsilon_r$ | Measure $\sigma$ | Measure $\epsilon_r$ | Deviation $\sigma$ [%] | Deviation $\epsilon_r$ [%] | Limit [%] | Remark |
| 2020/4/10                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.7                 | 2412.0                   | 1.77            | 39.3                | 1.83             | 39.4                 | 3.8                    | 0.3                        | +5        |        |
| 2020/4/10                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.7                 | 2417.0                   | 1.77            | 39.3                | 1.84             | 39.4                 | 3.8                    | 0.3                        | +5        |        |
| 2020/4/10                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.7                 | 2422.0                   | 1.78            | 39.2                | 1.84             | 39.4                 | 3.8                    | 0.3                        | +5        |        |
| 2020/4/10                                 | 21.0                  | 30.0                  | HBBL600-10000 | 19.8                 | 5260.0                   | 4.72            | 35.9                | 4.63             | 35.1                 | -1.8                   | -2.2                       | +5        |        |
| 2020/4/13                                 | 22.0                  | 45.0                  | HBBL600-10000 | 19.7                 | 5700.0                   | 5.17            | 35.4                | 5.19             | 34.2                 | 0.4                    | -3.5                       | +5        |        |
| 2020/4/13                                 | 22.0                  | 45.0                  | HBBL600-10000 | 19.7                 | 5745.0                   | 5.21            | 35.4                | 5.21             | 34.2                 | 0.0                    | -3.3                       | +5        |        |
| 2021/1/20                                 | 21.0                  | 42.0                  | HBBL600-10000 | 20.0                 | 5180.0                   | 4.63            | 36.0                | 4.41             | 35.3                 | -4.8                   | -2.0                       | +5        |        |

$\sigma$  : Conductivity /  $\epsilon_r$ : Relative Permittivity

\* The dielectric parameters were linearly interpolated between the closest pair of target frequencies defined in KDB 865664D01 to determine the applicable dielectric parameters corresponding to the device test frequency.

Listed conductivity and relative permittivity values including the target are rounded one or two decimal places due to significant digit, so some differences might be observed, and actual SAR calculation is done four decimal places.

## SECTION11: System Check confirmation

The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness:  $2.0 \pm 0.2$  mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.

The depth of tissue-equivalent liquid in a phantom must be  $\geq 15.0$  cm  $\pm 0.5$  cm for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm  $\pm 0.5$  cm for measurements  $> 3$  GHz.

The DASY system with an E-Field Probe was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom).

The standard measuring distance was 10 mm (above 1GHz to 6GHz) and 15 mm (below 1GHz) from dipole center to the simulating liquid surface.

The coarse grid with a grid spacing of 12 mm (1GHz to 3GHz) and 15 mm (below 1GHz) was aligned with the dipole.

For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.

Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.

Distance between probe sensors and phantom surface was set to 3 mm.

For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm

The dipole input power (forward power) was 100 mW (For 5GHz band) or 250 mW (For other band).

The results are normalized to 1 W input power.

### Target Value

2020/4/9 to 2020/4/13

| Freq<br>[MHz] | Model,S/N   | Head                 |                      | Body                 |                      |
|---------------|-------------|----------------------|----------------------|----------------------|----------------------|
|               |             | (SPEAG)<br>1g [W/kg] | (SPEAG)<br>10g[W/kg] | (SPEAG)<br>1g [W/kg] | (SPEAG)<br>10g[W/kg] |
| 2450          | D2450,713   | 54.80                | 25.40                | 53.20                | 24.72                |
| 5250          | D5GHV2,1020 | 82.20                | 23.50                | 76.70                | 21.40                |
| 5600          | D5GHV2,1020 | 85.00                | 24.20                | 80.90                | 22.40                |
| 5800          | D5GHV2,1020 | 81.50                | 23.00                | 76.50                | 21.10                |

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| Freq<br>[MHz] | Model,S/N   | Head                 |                      | Body                 |                      |
|---------------|-------------|----------------------|----------------------|----------------------|----------------------|
|               |             | (SPEAG)<br>1g [W/kg] | (SPEAG)<br>10g[W/kg] | (SPEAG)<br>1g [W/kg] | (SPEAG)<br>10g[W/kg] |
| 5250          | D5GHV2,1020 | 79.30                | 23.00                | 75.80                | 21.60                |

The target(reference) SAR values can be obtained from the calibration certificate of system validation dipoles(Refer to Appendix 2). The target SAR values are SAR measured value in the calibration certificate scaled to 1W.

| Date Tested | Test Freq | Model,S/N   | T.S.<br>Liquid | Measured Results |                     | Target<br>(Ref.<br>Value) | Delta<br>$\pm 10$ % |
|-------------|-----------|-------------|----------------|------------------|---------------------|---------------------------|---------------------|
|             |           |             |                | Zoom Scan        | Normalize<br>to 1 W |                           |                     |
| 2020/4/9    | 2450      | D2450,713   | Head           | 1g               | 13.80               | 55.2                      | 54.80               |
|             |           |             |                | 10g              | 6.34                | 25.4                      | 25.40               |
| 2020/4/10   | 5250      | D5GHV2,1020 | Head           | 1g               | 7.94                | 79.4                      | 82.20               |
|             |           |             |                | 10g              | 2.22                | 22.20                     | 23.50               |
| 2020/4/13   | 5600      | D5GHV2,1020 | Head           | 1g               | 8.31                | 83.1                      | 85.00               |
|             |           |             |                | 10g              | 2.29                | 22.90                     | 24.20               |
| 2020/4/13   | 5800      | D5GHV2,1020 | Head           | 1g               | 8.09                | 80.90                     | 81.50               |
|             |           |             |                | 10g              | 2.23                | 22.30                     | 23.00               |
| 2021/1/20   | 5250      | D5GHV2,1020 | Body           | 1g               | 7.97                | 79.70                     | 79.30               |
|             |           |             |                | 10g              | 2.30                | 23.00                     | 23.00               |

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## **SECTION12: Measured and Reported (Scaled) SAR Results**

WLAN SAR Test Reduction criteria are as follows

### ● **KDB 248227 D01 (SAR Guidance for 802.11(Wi-Fi) Transmitters):**

SAR test reduction for 802.11 WLAN transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- ✧  $\leq 0.4$  W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- ✧  $> 0.4$  W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is  $\leq 0.8$  W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- ✧ For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is  $> 0.8$  W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is  $\leq 1.2$  W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- ✧ When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is  $\leq 1.2$  W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- ✧ When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is  $\leq 1.2$  W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the initial test position.

## 12.1 WLAN 2.4GHz Band

| Test Position | Dist. (mm) | Mode    | Ch #. | Freq. (MHz) | Power (dBm)         |                        |               | Duty  |               | 1-g SAR (W/kg) |          | Plot No. |
|---------------|------------|---------|-------|-------------|---------------------|------------------------|---------------|-------|---------------|----------------|----------|----------|
|               |            |         |       |             | Tune-up upper Power | Measured average Power | Scaled factor |       | Scaled factor | Meas.          | Reported |          |
| Rear          | 0          | 802.11b | 1     | 2412        | 16.50               | 16.47                  | 1.01          | 0.996 | 1.004         | 0.649          | 0.656    | 1        |
|               |            |         | 2     | 2417        | 16.00               | 15.91                  | 1.02          | 0.996 | 1.004         | 0.560          | 0.574    |          |
|               |            |         | 3     | 2422        | 16.00               | 15.89                  | 1.03          | 0.996 | 1.004         | 0.530          | 0.546    |          |
| Right         | 0          | 802.11b | 1     | 2412        | 16.00               | 16.47                  | 0.90          | 0.996 | 1.004         | 0.046          | 0.041    |          |
|               |            |         | 2     | 2417        | 16.00               | 15.91                  | 1.02          | 0.996 | 1.004         |                |          |          |
|               |            |         | 3     | 2422        | 16.00               | 15.89                  | 1.03          | 0.996 | 1.004         |                |          |          |
| Left          | 0          | 802.11b | 1     | 2412        | 16.00               | 16.47                  | 0.90          | 0.996 | 1.004         | 0.038          | 0.034    |          |
|               |            |         | 2     | 2417        | 16.00               | 15.91                  | 1.02          | 0.996 | 1.004         |                |          |          |
|               |            |         | 3     | 2422        | 16.00               | 15.89                  | 1.03          | 0.996 | 1.004         |                |          |          |

OFDM was excluded from the following table according to KDB248227D01.

SAR is not required for the following 2.4 GHz OFDM conditions according to KDB248227D01.

- 1) When KDB447498D01 SAR test exclusion applies to the OFDM configuration.
- 2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

| Maximum tune-up tolerance limit |       | Maximum tune-up tolerance limit |       | OFDM scaled factor | Position | DSSS Reported SAR value [W/kg] | OFDM Estimated SAR value [W/kg] | Exclusion limit [W/kg] | Standalone SAR request |
|---------------------------------|-------|---------------------------------|-------|--------------------|----------|--------------------------------|---------------------------------|------------------------|------------------------|
| DSSS                            |       | OFDM                            |       |                    |          |                                |                                 |                        |                        |
| [dBm]                           | [mW]  | [dBm]                           | [mW]  |                    |          |                                |                                 |                        |                        |
| 16.50                           | 44.67 | 17.00                           | 50.12 | 1.122              | Rear     | 0.656                          | 0.736                           | < 1.2                  | No                     |

### Note(s):

- OFDM scaled factor = Maximum tune-up tolerance limit of OFDM [mW] / Maximum tune-up tolerance limit of DSSS [mW]
- Estimated SAR of OFDM = Reported SAR of DSSS [W/kg] · OFDM scaled factor

## 12.2 WLAN 5.2GHz Band

| Test Position | Dist. (mm) | Mode    | Ch #. | Freq. (MHz) | Power (dBm)         |                        |               | Duty  |               | 1-g SAR (W/kg) |          | Plot No. |
|---------------|------------|---------|-------|-------------|---------------------|------------------------|---------------|-------|---------------|----------------|----------|----------|
|               |            |         |       |             | Tune-up upper Power | Measured average Power | Scaled factor |       | Scaled factor | Meas.          | Reported |          |
| Rear          | 0          | 802.11a | 36    | 5180        | 12.18               | 12.16                  | 1.00          | 0.983 | 1.017         | 0.530          | 0.541    | 2        |
|               |            |         | 44    | 5220        | 12.18               | 12.11                  | 1.02          | 0.983 | 1.017         |                |          |          |
|               |            |         | 48    | 5240        | 12.18               | 12.10                  | 1.02          | 0.983 | 1.017         |                |          |          |
| Right         | 0          | 802.11a | 36    | 5180        | 12.18               | 12.16                  | 1.00          | 0.983 | 1.017         | 0.053          | 0.054    |          |
|               |            |         | 44    | 5220        | 12.18               | 12.11                  | 1.02          | 0.983 | 1.017         |                |          |          |
|               |            |         | 48    | 5240        | 12.18               | 12.10                  | 1.02          | 0.983 | 1.017         |                |          |          |
| Left          | 0          | 802.11a | 36    | 5180        | 12.18               | 12.16                  | 1.00          | 0.983 | 1.017         | 0.050          | 0.051    |          |
|               |            |         | 44    | 5220        | 12.18               | 12.11                  | 1.02          | 0.983 | 1.017         |                |          |          |
|               |            |         | 48    | 5240        | 12.18               | 12.10                  | 1.02          | 0.983 | 1.017         |                |          |          |

Per KDB 248227 D01, U-NII-2A band is omitted.

### 12.3 WLAN 5.5GHz Band

| Test Position | Dist.<br>(mm) | Mode    | Ch #. | Freq.<br>(MHz) | Power (dBm)               |                              |               | Duty  |               | 1-g SAR (W/kg) |          | Plot No. |
|---------------|---------------|---------|-------|----------------|---------------------------|------------------------------|---------------|-------|---------------|----------------|----------|----------|
|               |               |         |       |                | Tune-up<br>upper<br>Power | Measured<br>average<br>Power | Scaled factor |       | Scaled factor | Meas.          | Reported |          |
| Rear          | 0             | 802.11a | 100   | 5500           | 8.89                      | 8.85                         | 1.01          | 0.983 | 1.017         |                |          |          |
|               |               |         | 116   | 5580           | 8.89                      | 8.58                         | 1.07          | 0.983 | 1.017         |                |          |          |
|               |               |         | 140   | 5700           | 8.89                      | 8.87                         | 1.00          | 0.983 | 1.017         | 0.146          | 0.149    | 3        |
| Right         | 0             | 802.11a | 100   | 5500           | 8.89                      | 8.85                         | 1.01          | 0.983 | 1.017         |                |          |          |
|               |               |         | 116   | 5580           | 8.89                      | 8.58                         | 1.07          | 0.983 | 1.017         |                |          |          |
|               |               |         | 140   | 5700           | 8.89                      | 8.87                         | 1.00          | 0.983 | 1.017         | 0.000          | 0.000    |          |
| Left          | 0             | 802.11a | 100   | 5500           | 8.89                      | 8.85                         | 1.01          | 0.983 | 1.017         |                |          |          |
|               |               |         | 116   | 5580           | 8.89                      | 8.58                         | 1.07          | 0.983 | 1.017         |                |          |          |
|               |               |         | 140   | 5700           | 8.89                      | 8.87                         | 1.00          | 0.983 | 1.017         | 0.000          | 0.000    |          |

### 12.4 WLAN 5.8GHz Band

| Test Position | Dist.<br>(mm) | Mode    | Ch #. | Freq.<br>(MHz) | Power (dBm)               |                              |               | Duty  |               | 1-g SAR (W/kg) |          | Plot No. |
|---------------|---------------|---------|-------|----------------|---------------------------|------------------------------|---------------|-------|---------------|----------------|----------|----------|
|               |               |         |       |                | Tune-up<br>upper<br>Power | Measured<br>average<br>Power | Scaled factor |       | Scaled factor | Meas.          | Reported |          |
| Rear          | 0             | 802.11a | 149   | 5745           | 5.26                      | 5.17                         | 1.02          | 0.983 | 1.017         | 0.047          | 0.049    | 4        |
|               |               |         | 157   | 5785           | 5.26                      | 5.13                         | 1.03          | 0.983 | 1.017         |                |          |          |
|               |               |         | 165   | 5825           | 5.26                      | 5.05                         | 1.05          | 0.983 | 1.017         |                |          |          |
| Right         | 0             | 802.11a | 149   | 5745           | 5.26                      | 5.17                         | 1.02          | 0.983 | 1.017         | 0.000          | 0.000    |          |
|               |               |         | 157   | 5785           | 5.26                      | 5.13                         | 1.03          | 0.983 | 1.017         |                |          |          |
|               |               |         | 165   | 5825           | 5.26                      | 5.05                         | 1.05          | 0.983 | 1.017         |                |          |          |
| Left          | 0             | 802.11a | 149   | 5745           | 5.26                      | 5.17                         | 1.02          | 0.983 | 1.017         | 0.000          | 0.000    |          |
|               |               |         | 157   | 5785           | 5.26                      | 5.13                         | 1.03          | 0.983 | 1.017         |                |          |          |
|               |               |         | 165   | 5825           | 5.26                      | 5.05                         | 1.05          | 0.983 | 1.017         |                |          |          |

## SECTION13: Test instruments

### Test equipment (1/2)

| Test Name | Local Id       | Description                    | Manufacturer                    | Model                           | Serial          | Last Cal Date | Interval |
|-----------|----------------|--------------------------------|---------------------------------|---------------------------------|-----------------|---------------|----------|
| SAR       | MOS-14         | Thermo-Hygrometer              | CUSTOM                          | CTH-201                         | 1401            | 2020/01/07    | 12       |
| SAR       | MAT-83         | Attenuator                     | Weinschel Associates            | WA1-20-33                       | 100133          | 2020/04/02    | 12       |
| SAR       | MPM-16         | Power Meter                    | Keysight Technologies Inc       | 8990B                           | MY51000271      | 2019/08/02    | 12       |
| SAR       | MPSE-23        | Power sensor                   | Keysight Technologies Inc       | N1923A                          | MY54070004      | 2019/08/02    | 12       |
| SAR       | MDA-07         | Dipole Antenna                 | Schmid&Partner Engineering AG   | D2450V2                         | 713             | 2019/09/09    | 12       |
| SAR       | MDA-08         | Dipole Antenna                 | Schmid&Partner Engineering AG   | D5GHzV2                         | 1020            | 2019/11/19    | 12       |
| SAR       | COTS-MSAR-03   | Dasy5                          | Schmid&Partner Engineering AG   | DASY5                           | -               | -             | -        |
| SAR       | MHBBL600-10000 | Head Simulating Liquid         | Schmid & Partner Engineering AG | HBBL600-10000V6                 | SL AAH U16 BC   | -             | -        |
| SAR       | MRENT-S17      | Dielectric assessment kit      | Schmid&Partner Engineering AG   | DAK-3.5                         | 1058            | 2019/04/09    | 12       |
| SAR       | MRENT-S01      | Vector Reflectometer           | COPPER MOUNTAIN TECHNOLOGIES    | PLANAR R140                     | 110614          | -             | x        |
| SAR       | MOS-37         | Digital thermometer            | LKM electronic                  | DTM3000                         | -               | 2019/07/03    | 12       |
| SAR       | COTS-MSAR-04   | Dielectric assessment software | Schmid&Partner Engineering AG   | DAK                             | -               | -             | -        |
| SAR       | MDAE-01        | Data Acquisition Electronics   | Schmid&Partner Engineering AG   | DAE4                            | 509             | 2019/07/08    | 12       |
| SAR       | MPB-07         | Dosimetric E-Field Probe       | Schmid&Partner Engineering AG   | EX3DV4                          | 3825            | 2019/12/13    | 12       |
| SAR       | MPF-02         | 2mm Oval Flat Phantom          | Schmid&Partner Engineering AG   | QDOVA001BB                      | 1045            | 2019/05/13    | 12       |
| SAR       | MDH-01         | Device holder                  | Schmid&Partner Engineering AG   | Mounting device for transmitter | -               | 2019/11/28    | 12       |
| SAR       | MOS-33         | Thermo-Hygrometer              | CUSTOM                          | CTH-201                         | -               | 2019/07/03    | 12       |
| SAR       | MRBT-02        | SAR robot                      | Schmid&Partner Engineering AG   | TX60 Lspeag                     | F10/5E3LA1/A/01 | 2019/04/26    | 12       |
| SAR       | MRENT-S09      | Dosimetric E-Field Probe       | Schmid & Partner Engineering AG | EX3DV4                          | 3803            | -             | -        |
| SAR       | MPM-11         | Dual Power Meter               | Keysight Technologies Inc       | E4419B                          | MY45102060      | 2019/08/02    | 12       |
| SAR       | MPSE-15        | Power sensor                   | Keysight Technologies Inc       | E9301A                          | MY41498311      | 2019/08/02    | 12       |
| SAR       | MPSE-16        | Power sensor                   | Keysight Technologies Inc       | E9301A                          | MY41498313      | 2019/08/02    | 12       |
| SAR       | MRFA-24        | Pre Amplifier                  | R&K                             | R&K CGA020M602-2633R            | B30550          | 2019/06/17    | 12       |
| SAR       | MSG-10         | Signal Generator               | Keysight Technologies Inc       | N5181A                          | MY47421098      | 2019/11/25    | 12       |
| SAR       | MAT-78         | Attenuator                     | Telegrartner                    | J01156A0011                     | 42294119        | -             | -        |
| SAR       | MAT-81         | Attenuator                     | Weinschel Associates            | WA1-20-33                       | 100131          | 2020/04/02    | 12       |
| SAR       | MPSE-24        | Power sensor                   | Anritsu Limited                 | MA24106A                        | 1026164         | 2019/08/02    | 12       |
| SAR       | COTS-MPSE-02   | Software for MA24106A          | Anritsu Limited                 | Anritsu PowerXpert              | -               | -             | -        |
| SAR       | MHDC-12        | Dual Directional Coupler       | Hewlett Packard                 | 772D                            | 2839A0016       | -             | -        |

## Test equipment (2/2)

| Test Name | Local Id        | Description                    | Manufacturer                  | Model                           | Serial          | Last Cal Date | Interval |
|-----------|-----------------|--------------------------------|-------------------------------|---------------------------------|-----------------|---------------|----------|
| SAR       | MDA-08          | Dipole Antenna                 | Schmid&Partner Engineering AG | D5GHzV2                         | 1020            | 2020/11/17    | 12       |
| SAR       | COTS-MSAR-03    | Dasy5                          | Schmid&Partner Engineering AG | DASY5                           | -               | -             | -        |
| SAR       | MHBBL6 00-10000 | Head Simulating Liquid         | Schmid&Partner Engineering AG | SL AAH U16 BC                   | -               | -             | -        |
| SAR       | MNA-03          | Vector Reflectometer           | Copper Mountain Technologies  | PLANAR R140                     | 0030913         | 2020/04/22    | 12       |
| SAR       | MDPK-03         | Dielectric assessment kit      | Schmid&Partner Engineering AG | DAK-3.5                         | 0008            | 2020/04/28    | 12       |
| SAR       | MOS-37          | Digital thermometer            | LKM electronic                | DTM3000                         | -               | 2020/07/10    | 12       |
| SAR       | COTS-MSAR-04    | Dielectric assessment software | Schmid&Partner Engineering AG | DAK                             | -               | -             | -        |
| SAR       | MDAE-03         | Data Acquisition Electronics   | Schmid&Partner Engineering AG | DAE4                            | 1372            | 2020/08/12    | 12       |
| SAR       | MPB-09          | Dosimetric E-Field Probe       | Schmid&Partner Engineering AG | EX3DV4                          | 3922            | 2020/08/17    | 12       |
| SAR       | MPF-03          | 2mm Oval Flat Phantom          | Schmid&Partner Engineering AG | QDOVA001BB                      | 1203            | 2020/05/25    | 12       |
| SAR       | MDH-04          | Device holder                  | Schmid&Partner Engineering AG | Mounting device for transmitter | -               | -             | -        |
| SAR       | MOS-35          | Digital thermometer            | HANNA                         | Checktemp 4                     | -               | 2020/07/10    | 12       |
| SAR       | MRBT-03         | SAR robot                      | Schmid&Partner Engineering AG | TX60 Lspeag                     | F13/5PPLD1/A/01 | 2020/04/26    | 12       |
| SAR       | MPM-15          | Power Meter                    | Keysight Technologies Inc     | N1914A                          | MY53060017      | 2020/06/10    | 12       |
| SAR       | MPSE-20         | Power sensor                   | Agilent                       | N8482H                          | MY53050001      | 2020/06/10    | 12       |
| SAR       | MRFA-24         | Pre Amplifier                  | R&K                           | R&K CGA020M602-2633R            | B30550          | 2020/06/10    | 12       |
| SAR       | MSG-10          | Signal Generator               | Agilent                       | N5181A                          | MY47421098      | 2020/11/17    | 12       |
| SAR       | MAT-78          | Attenuator                     | Telegrafartner                | J01156A0011                     | 0042294119      | -             | -        |
| SAR       | MPSE-24         | Power sensor                   | Anritsu Limited               | MA24106A                        | 1026164         | 2020/08/19    | 12       |
| SAR       | MPSE-25         | Power sensor                   | Anritsu Limited               | MA24106A                        | 1031504         | 2020/08/19    | 12       |
| SAR       | COTS-MPSE-02    | Software for MA24106A          | Anritsu Limited               | Anritsu PowerXpert              | -               | -             | -        |
| SAR       | MHDC-12         | Dual Directional Coupler       | Hewlett Packard               | 772D                            | 2839A0016       | -             | -        |

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

SAR room is checked before every testing and ambient noise is <0.012W/kg

## **APPENDIX 1 : System Check**

### **System check result Body 2450MHz**

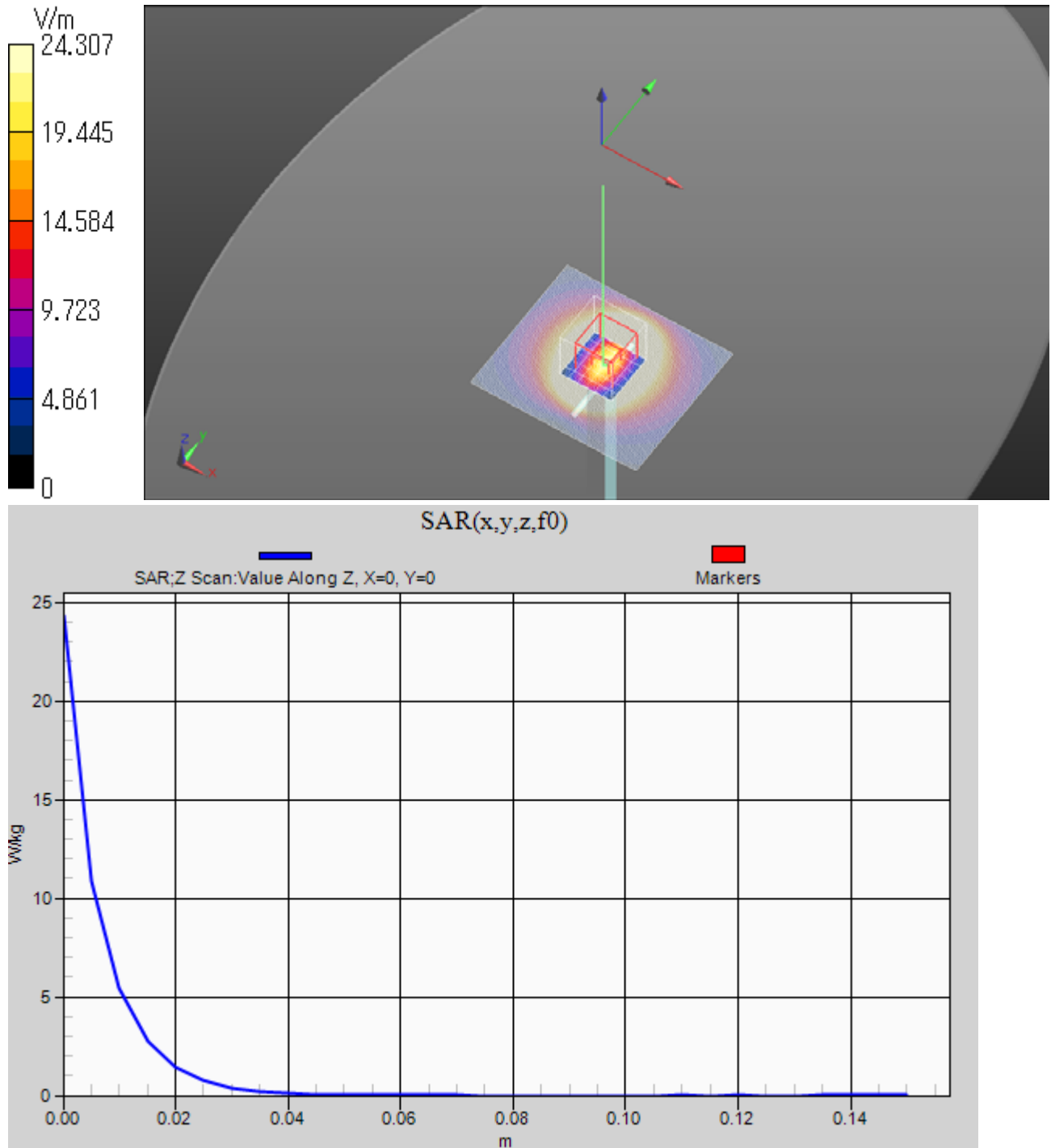
Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); ; Duty Cycle: 1:1  
Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.864$  S/m;  
 $\epsilon_r = 39.31$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
DASY5 Configuration  
Probe: EX3DV4 - SN3825; ConvF(7.65, 7.65, 7.65) @ 2450 MHz;  
Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 0mm (Fix Surface)  
Electronics: DAE4 Sn509;  
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1045  
Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

**Pin/250mW/Area Scan (81x71x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm  
Maximum value of Total (interpolated) = 116.7 V/m

**Pin/250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 114.7 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 29.6 W/kg  
**SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.34 W/kg**  
Smallest distance from peaks to all points 3 dB below = 9 mm  
Ratio of SAR at M2 to SAR at M1 = 46.8%  
Maximum value of SAR (measured) = 23.3 W/kg

**Pin/250mW/Z Scan (1x1x31):** Measurement grid: dx=20mm, dy=20mm, dz=5mm  
Maximum value of SAR (measured) = 24.3 W/kg

Ambient Temp. : 22.5 degree.C. Liquid Temp.; 19.7degree.C.  
Liquid temp. is kept within the 2 degree.C. during the test.  
Date: 2020/04/09



### System check result Body 5250MHz

Communication System: UID 0, CW; Communication System Band: D5GHz (5000.0 - 6000.0 MHz); ; Duty Cycle: 1:1  
Medium parameters used:  $f = 5250 \text{ MHz}$ ;  $\sigma = 4.611 \text{ S/m}$ ;  $\epsilon_r = 35.135$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(5.02, 5.02, 5.02) @ 5250 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn509;

Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1045

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

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

Maximum value of SAR (interpolated) = 18.0 W/kg

**Pin/100mW/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$

Reference Value = 73.49 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 33.3 W/kg

**SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.22 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 64.3%

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

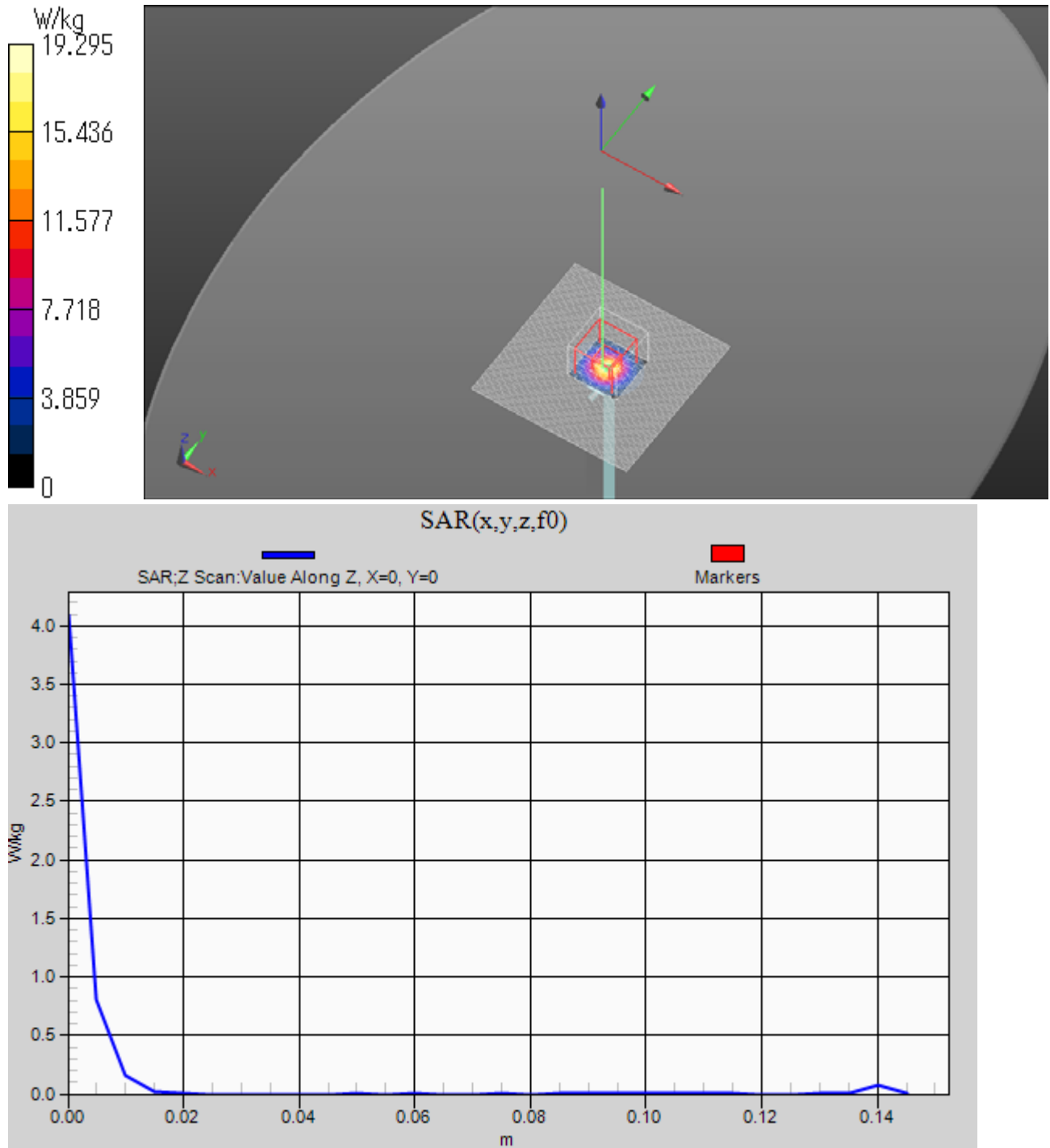
**Pin/100mW/Z Scan (1x1x31):** Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$

Maximum value of SAR (measured) = 4.09 W/kg

Ambient Temp. : 22.5 degree.C. Liquid Temp.; 19.8degree.C.

Liquid temp. is kept within the 2 degree.C. during the test.

Date: 2020/04/10



### System check result Body 5600MHz

Communication System: UID 0, #CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); ; Duty Cycle: 1:1

Medium parameters used:  $f = 5600 \text{ MHz}$ ;  $\sigma = 5.02 \text{ S/m}$ ;  $\epsilon_r = 34.498$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(4.61, 4.61, 4.61) @ 5600 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn509;

Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1045

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

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

Maximum value of SAR (interpolated) = 21.2 W/kg

**Pin/100mW/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$

Reference Value = 73.93 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 38.8 W/kg

**SAR(1 g) = 8.31 W/kg; SAR(10 g) = 2.29 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 60.9%

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

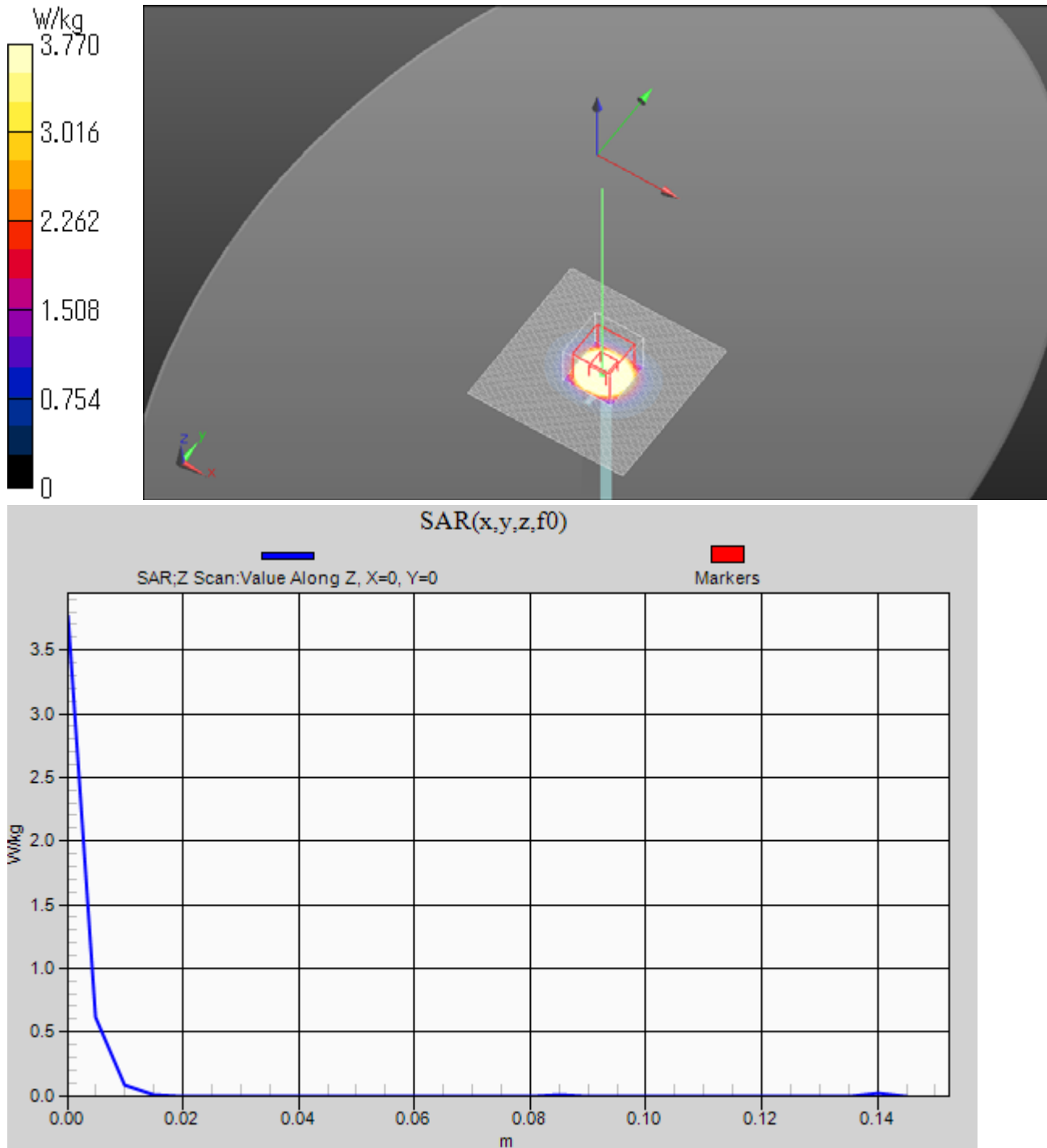
**Pin/100mW/Z Scan (1x1x31):** Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$

Maximum value of SAR (measured) = 3.77 W/kg

Ambient Temp. : 22.5 degree.C. Liquid Temp.; 19.7 degree.C.

Liquid temp. is kept within the 2 degree.C. during the test.

Date: 2020/04/13



### System check result Body 5800MHz

Communication System: UID 0, #CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); ; Duty Cycle: 1:1

Medium parameters used:  $f = 5800 \text{ MHz}$ ;  $\sigma = 5.214 \text{ S/m}$ ;  $\epsilon_r = 34.144$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(4.65, 4.65, 4.65) @ 5800 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn509;

Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1045

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

**Pin/100mW 2/Area Scan (91x91x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 21.6 W/kg

**Pin/100mW 2/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$

Reference Value = 71.75 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 39.7 W/kg

**SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.23 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 59.2%

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

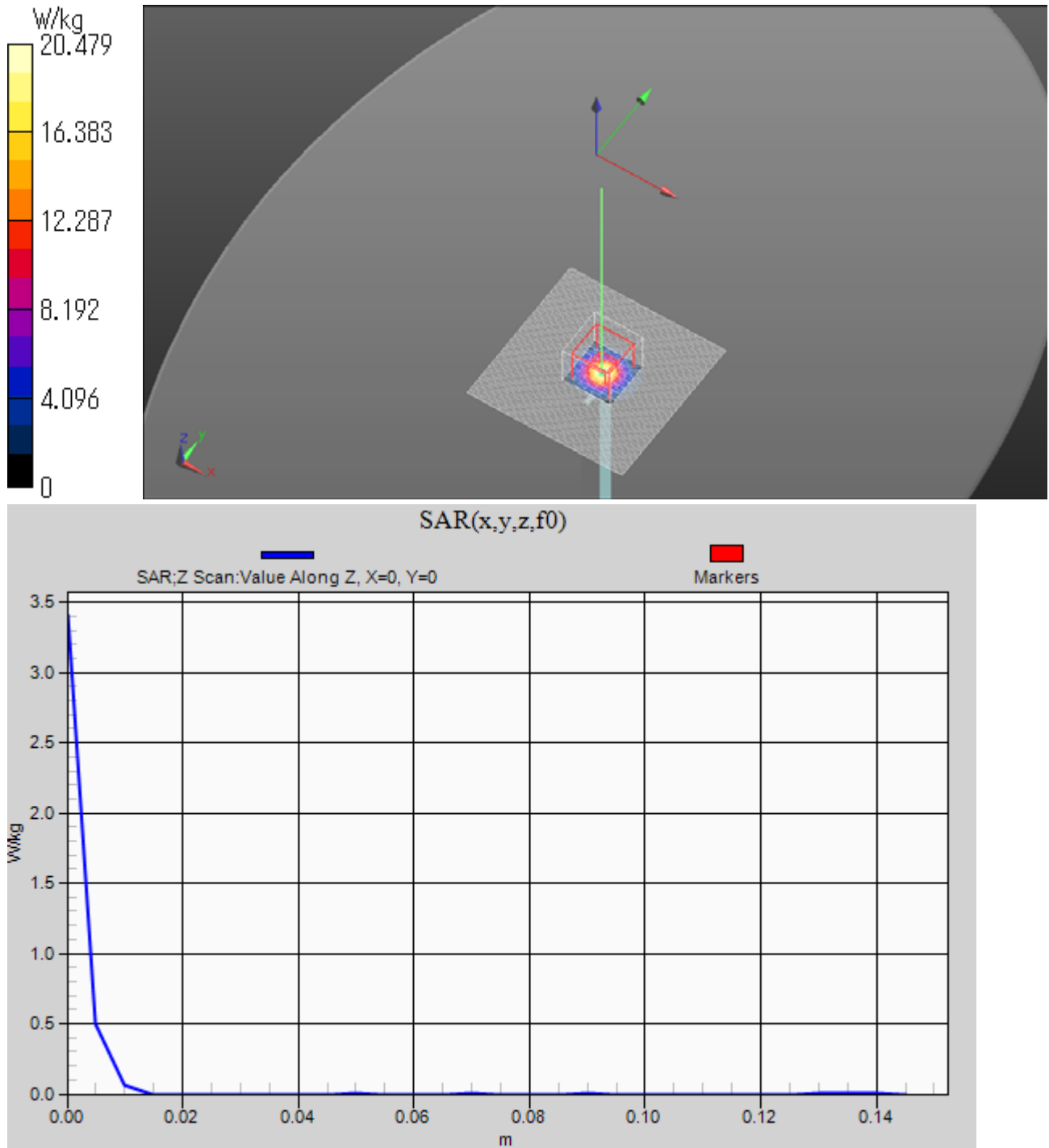
**Pin/100mW 2/Z Scan (1x1x31):** Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$

Maximum value of SAR (measured) = 3.41 W/kg

Ambient Temp. : 22.5 degree.C. Liquid Temp.; 19.7 degree.C.

Liquid temp. is kept within the 2 degree.C. during the test.

Date: 2020/04/13



### System check result Body 5250MHz

Communication System: UID 0, #CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); ; Duty Cycle: 1:1

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 4.568$  S/m;  $\epsilon_r = 35.013$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(5.5, 5.5, 5.5) @ 5250 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372;

Phantom: ELI v5.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1203

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

**Pin/100mW /Area Scan (61x61x1):** Interpolated grid:  $dx=1.000$  mm,  $dy=1.000$  mm  
Maximum value of SAR (interpolated) = 19.5 W/kg

**Pin/100mW/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid:  $dx=4$ mm,  $dy=4$ mm,  $dz=1.4$ mm  
Reference Value = 68.94 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 30.8 W/kg

**SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.3 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 66.7%

Maximum value of SAR (measured) = 18.3 W/kg

**Pin/100mW/Z Scan, Uniform (1x1x25):** Measurement grid:  $dx=20$ mm,  $dy=20$ mm,  $dz=1.4$ mm

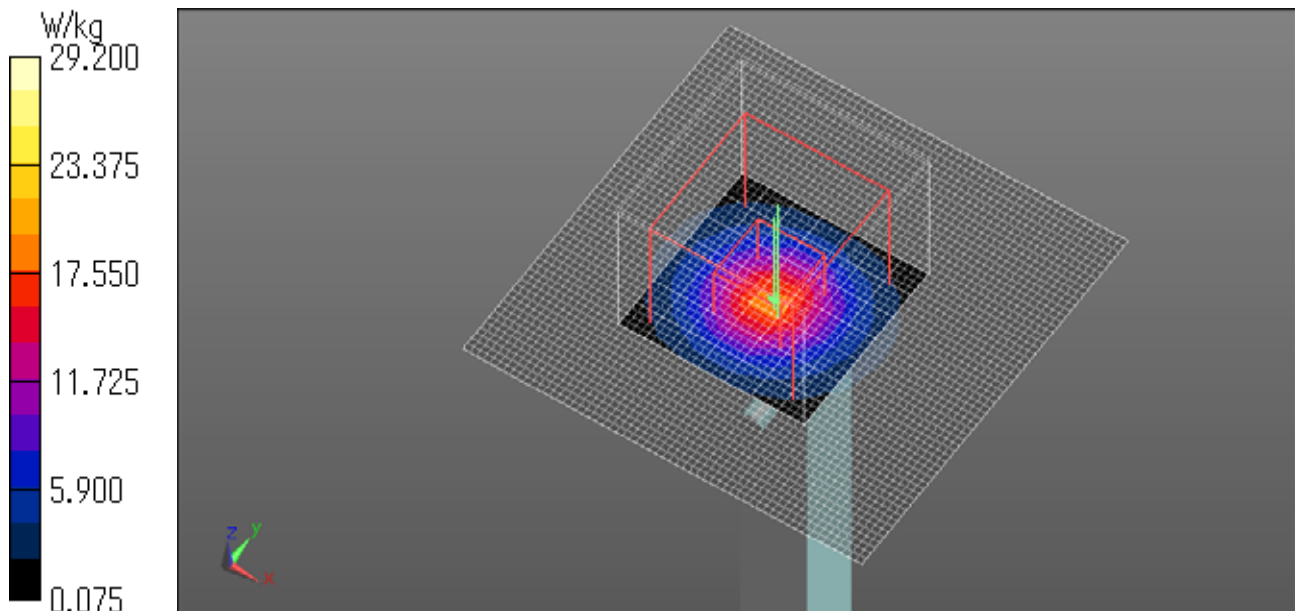
Penetration depth = 3.219 (3.490, 3.170) [mm]

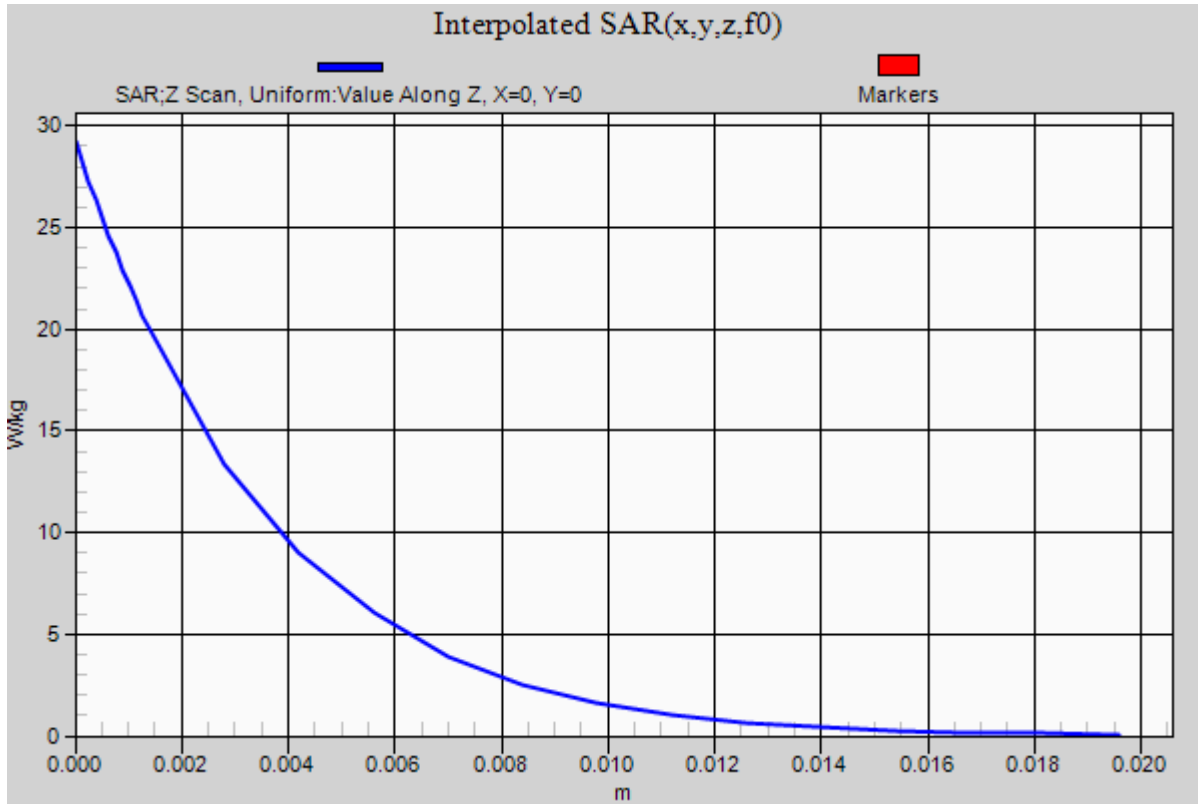
Maximum value of SAR (interpolated) = 29.2 W/kg

Ambient Temp. : 21.0 degree.C. Liquid Temp.; 20.0 degree.C.

Liquid temp. is kept within the 2 degree.C. during the test.

Date: 2021/01/20





## **APPENDIX 2 : SAR Measurement data**

### **Evaluation procedure**

**The evaluation was performed with the following procedure:**

**Step 1:** Measurement of the E-field at a fixed location above the ear point or central position of flat phantom was used as a reference value for assessing the power drop.

**Step 2:** The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the antenna of EUT and the horizontal grid spacing was 15 mm x 15 mm, 12 mm x 12 mm or 10mm x 10mm. Based on these data, the area of the maximum absorption was determined by spline interpolation.

**Step 3:** Around this point found in the Step 2 (area scan), a volume of 30mm x 30mm x 30mm or more was assessed by measuring 7 x 7 x 7 points at least for below 3GHz and a volume of 28 mm x 28mm x 22.5mm or more was assessed by measuring 8 x 8 x 6(ratio step method (\*1)) points at least for 5GHz band.

And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

(1). The data at the surface were extrapolated, since the center of the dipoles is 1mm(EX3DV4) away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

(2). The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x, y and z-directions) [4], [5]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

(3). All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

#### **\*1. Ratio step method parameters used;**

**The first measurement point: 2mm from the phantom surface, the initial grid separation: 2mm, subsequent graded grid ratio: 1.5**

**These parameters comply with the requirement of the KDB 865664D01.**

**Step 4:** Re-measurement of the E-field at the same location as in Step 1.

Confirmation after SAR testing

It was checked that the power drift [W] is within +/-5%.The verification of power drift during the SAR test is that DASY5 system calculates the power drift by measuring the e-field at the same location at beginning and the end of the scan measurement for each test position.

DASY5 system calculation Power drift value[dB] =  $20\log(E_a)/(E_b)$

Before SAR testing :  $E_b[V/m]$

After SAR testing :  $E_a[V/m]$

Limit of power drift[W] = +/-5%

$X[dB]=10\log[P]=10\log(1.05/1)=10\log(1.05)-10\log(1)=0.212dB$

from E-field relations with power.

$p=E^2/\eta=E^2/$

Therefore, The correlation of power and the E-field

$XdB=10\log(P)=10\log(E)^2=20\log(E)$

Therefore,

The calculated power drift of DASY5 System must be the less than +/-0.212dB.

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## Measurement data

### WLAN 2.4G 11b 1Mbps 2412MHz Rear 0mm

Communication System: UID 0, #WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); ; Duty Cycle: 1:1

Medium parameters used:  $f = 2412$  MHz;  $\sigma = 1.833$  S/m;  $\epsilon_r = 39.379$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.65, 7.65, 7.65) @ 2412 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509;

Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1045

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

**2.4G/11b 2412MHz/Area Scan (81x71x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.04 W/kg

**2.4G/11b 2412MHz/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.87 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.33 W/kg

**SAR(1 g) = 0.649 W/kg; SAR(10 g) = 0.286 W/kg**

Smallest distance from peaks to all points 3 dB below = 9.8 mm

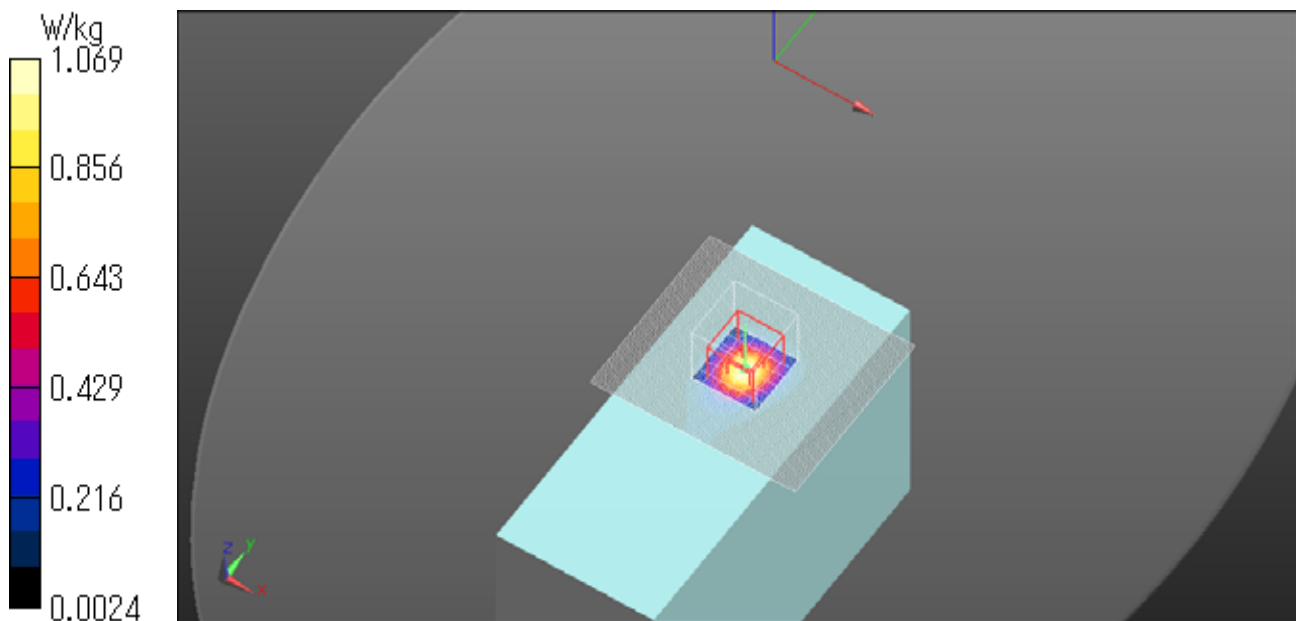
Ratio of SAR at M2 to SAR at M1 = 50.4%

Maximum value of SAR (measured) = 1.07 W/kg

Ambient Temp. : 22.5 degree.C. Liquid Temp.; 19.7 degree.C.

Liquid temp. is kept within the 2 degree.C. during the test.

Date: 2020/04/09



### WLAN 5.2G 11a 5180MHz Rear 0mm

Communication System: UID 0, #WLAN 5GHz (0); Communication System Band: WLAN 5GHz Low; ; Duty Cycle: 1:1

Medium parameters used:  $f = 5180 \text{ MHz}$ ;  $\sigma = 4.411 \text{ S/m}$ ;  $\epsilon_r = 35.296$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(5.5, 5.5, 5.5) @ 5180 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372;

Phantom: ELI v5.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1203

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

**5.25G/Rear 11a 5180MHz/Area Scan 3 (91x91x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) =  $1.21 \text{ W/kg}$

**5.25G/Rear 11a 5180MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid:

$dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$

Reference Value =  $18.53 \text{ V/m}$ ; Power Drift =  $-0.04 \text{ dB}$

Peak SAR (extrapolated) =  $1.94 \text{ W/kg}$

**SAR(1 g) =  $0.530 \text{ W/kg}$ ; SAR(10 g) =  $0.177 \text{ W/kg}$**

Smallest distance from peaks to all points 3 dB below =  $8.4 \text{ mm}$

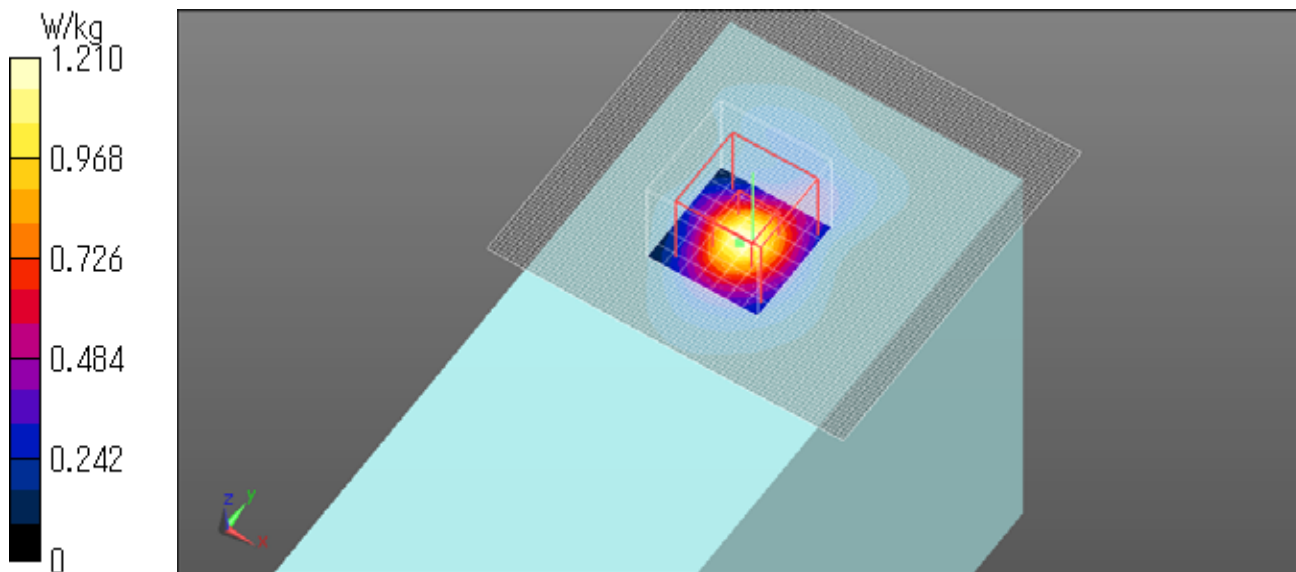
Ratio of SAR at M2 to SAR at M1 =  $65.4\%$

Maximum value of SAR (measured) =  $1.21 \text{ W/kg}$

Ambient Temp. :  $21.0 \text{ degree.C.}$  Liquid Temp.;  $20.0 \text{ degree.C.}$

Liquid temp. is kept within the  $2 \text{ degree.C.}$  during the test.

Date: 2021/01/20



### WLAN 5.6G 11a 5700MHz Rear 0mm

Communication System: UID 0, #WLAN 11a/b/g/n (0); Communication System Band: 11a/n (W56); ; Duty Cycle: 1:1  
Medium parameters used:  $f = 5700 \text{ MHz}$ ;  $\sigma = 5.19 \text{ S/m}$ ;  $\epsilon_r = 34.191$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(4.61, 4.61, 4.61) @ 5700 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509;

Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1045

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

**5.25G/Rear 11a 5700MHz/Area Scan 2 (91x91x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 0.429 W/kg

**5.25G/Rear 11a 5700MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid:

$dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$

Reference Value = 10.05 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.699 W/kg

**SAR(1 g) = 0.146 W/kg; SAR(10 g) = 0.047 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.6 mm

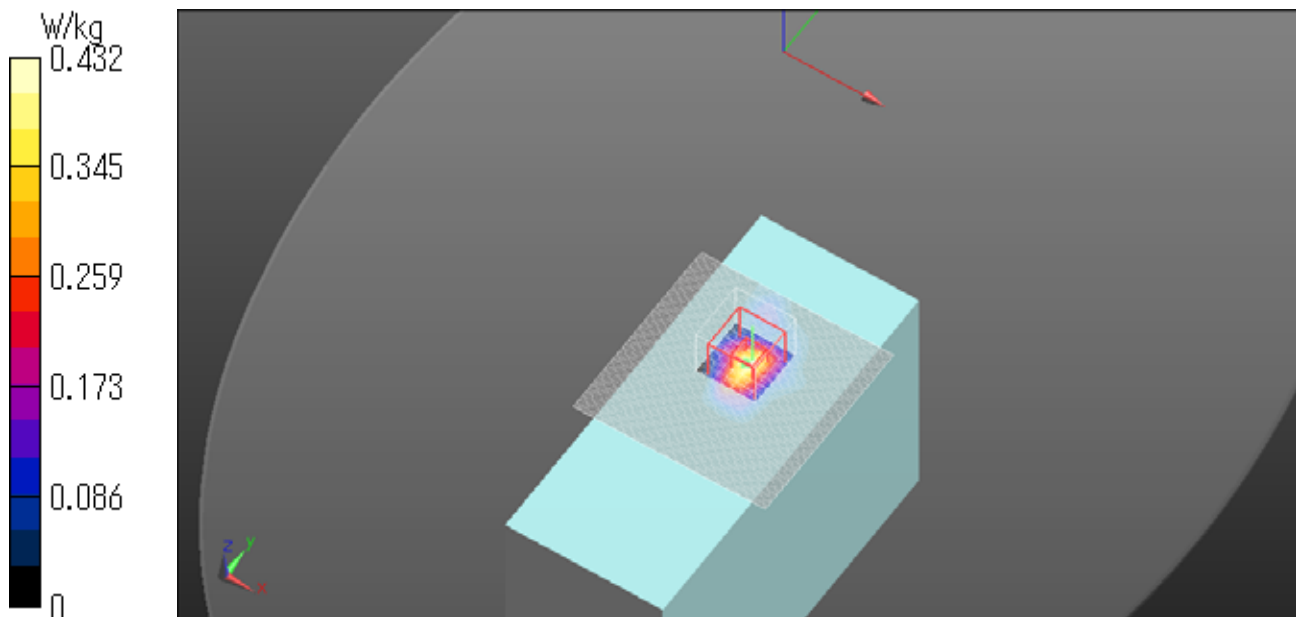
Ratio of SAR at M2 to SAR at M1 = 59.7%

Maximum value of SAR (measured) = 0.432 W/kg

Ambient Temp. : 22.5 degree.C. Liquid Temp.; 19.7 degree.C.

Liquid temp. is kept within the 2 degree.C. during the test.

Date: 2020/04/13



### WLAN 5.8G 11a 5745MHz Rear 0mm

Communication System: UID 0, #WLAN 11a/b/g/n (0); Communication System Band: 11a/n (W58); ; Duty Cycle: 1:1

Medium parameters used:  $f = 5745 \text{ MHz}$ ;  $\sigma = 5.212 \text{ S/m}$ ;  $\epsilon_r = 34.184$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(4.65, 4.65, 4.65) @ 5745 MHz;

Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509;

Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB;Serial: TP:1045

Measurement SW: DASY52, Version 52.10 (3);SEMCAD X Version 14.6.13 (7474)

**5.25G/Rear 11a 5745MHz/Area Scan 2 (91x91x1):** Interpolated grid:  $dx=1.000 \text{ mm}$ ,  $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 0.208 W/kg

**5.25G/Rear 11a 5745MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$

Reference Value = 5.480 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.301 W/kg

**SAR(1 g) = 0.047 W/kg; SAR(10 g) = 0.014 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

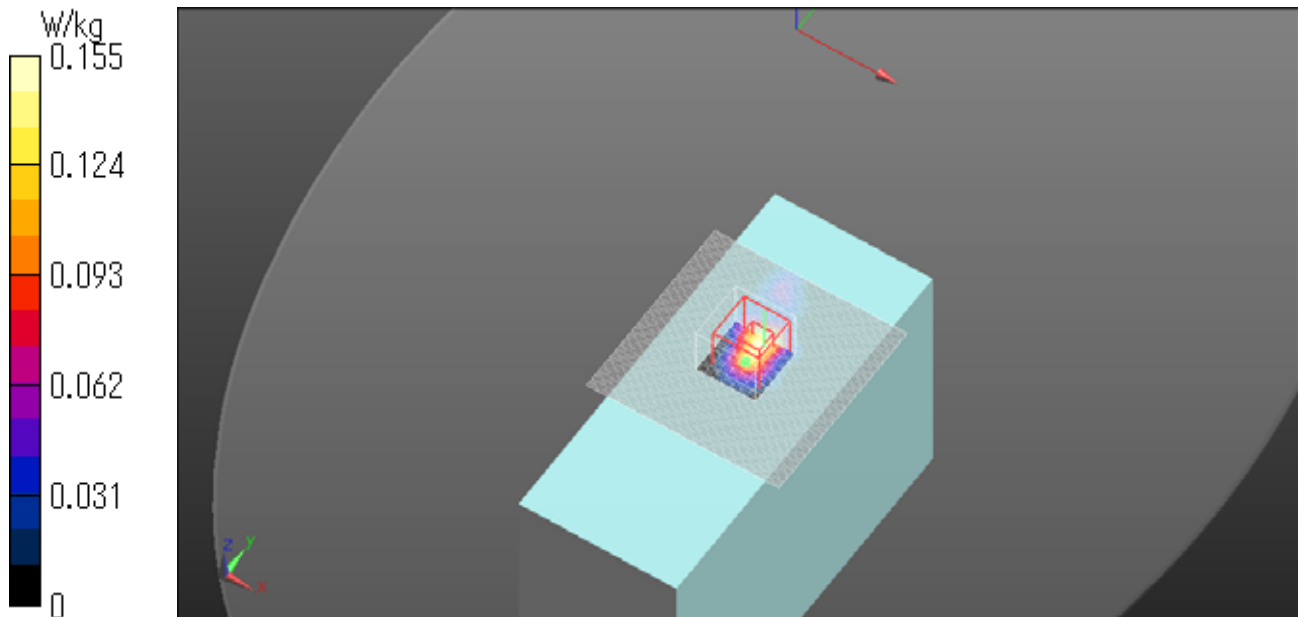
Ratio of SAR at M2 to SAR at M1 = 49.3%

Maximum value of SAR (measured) = 0.155 W/kg

Ambient Temp. : 22.5 degree.C. Liquid Temp.; 19.7 degree.C.

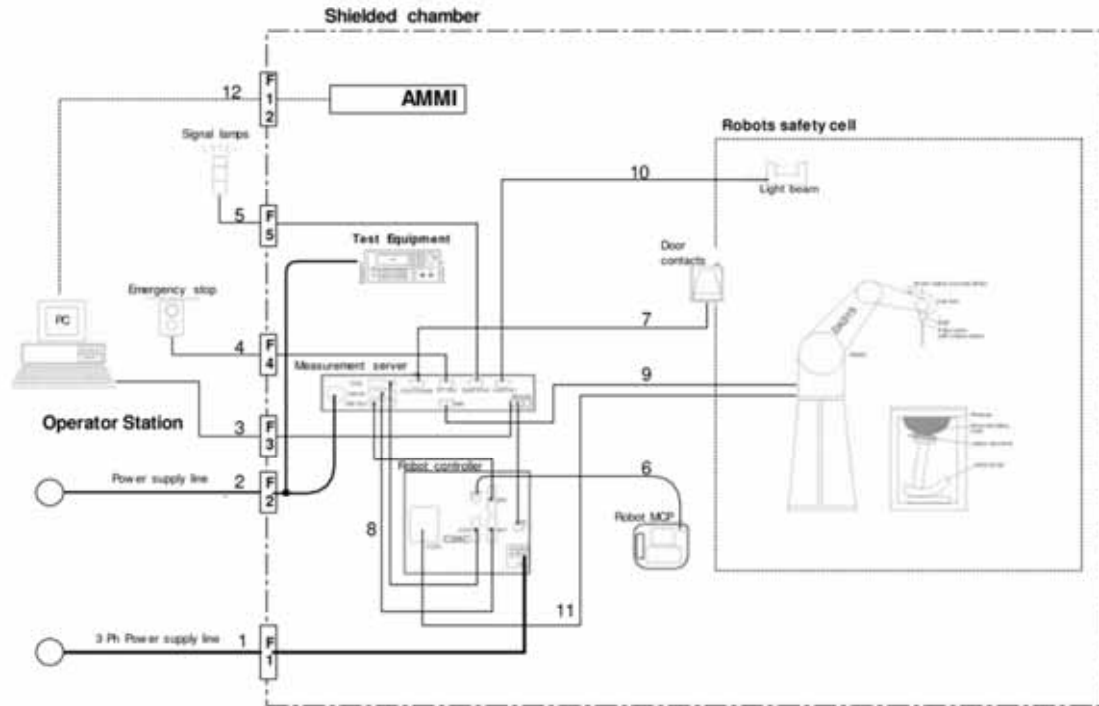
Liquid temp. is kept within the 2 degree.C. during the test.

Date: 2020/04/13



## APPENDIX 3 : System specifications

### Configuration and peripherals



The DASY5 system for performing compliance tests consist of the following items:  
Our system is DASY6; however, it behaves as DASY5.

- A standard high precision 6-axis robot (Stäubli RX family) with controller 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 electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection.  
The EOC is connected 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 Windows 10 or 7 and the DASY5/6 software.
- Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## Specifications

### **a)Robot TX60L**

|                      |   |                  |
|----------------------|---|------------------|
| Number of Axes       | : | 6                |
| Nominal Load         | : | 2 kg             |
| Maximum Load         | : | 5kg              |
| Reach                | : | 920mm            |
| Repeatability        | : | +/-0.03mm        |
| Control Unit         | : | CS8c             |
| Programming Language | : | VAL3             |
| Weight               | : | 52.2kg           |
| Manufacture          | : | Stäubli Robotics |

### **b)E-Field Probe**

|               |   |                                                                                                                                                                                                              |
|---------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model         | : | EX3DV4                                                                                                                                                                                                       |
| Construction  | : | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material<br>(resistant to organic solvents, e.g., glycol ether)                                       |
| Frequency     | : | 10 MHz to > 6 GHz Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)                                                                                                                                                  |
| Directivity   | : | +/-0.3 dB in HSL (rotation around probe axis)<br>+/-0.5 dB in tissue material (rotation normal probe axis)                                                                                                   |
| Dynamic Range | : | 10uW/g to > 100 mW/g;Linearity<br>+/-0.2 dB(noise: typically < 1uW/g)                                                                                                                                        |
| Dimensions    | : | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm                                                                          |
| Application   | : | Highprecision dosimetric measurement in any exposure scenario<br>(e.g., very strong gradient fields).Only probe which enables compliance<br>testing for frequencies up to 6GHz with precision of better 30%. |
| Manufacture   | : | Schmid & Partner Engineering AG                                                                                                                                                                              |



**EX3DV4 E-field Probe**

#### **c)Data Acquisition Electronic (DAE4)**

|                      |   |                                                                                                                                                                                                                                                         |
|----------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Features             | : | Signal amplifier, multiplexer, A/D converter and control logic<br>Serial optical link for communication with DASY5 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 M $\Omega$                                                                                                                                                                                                                                          |
| Input Bias Current   | : | < 50 fA                                                                                                                                                                                                                                                 |
| Battery Power        | : | > 10 h of operation (with two 9.6 V NiMH accus)                                                                                                                                                                                                         |
| Dimension            | : | 60 x 60 x 68 mm                                                                                                                                                                                                                                         |
| Manufacture          | : | Schmid & Partner Engineering AG                                                                                                                                                                                                                         |

#### **d)Electro-Optic Converter (EOC)**

|             |   |                                                |
|-------------|---|------------------------------------------------|
| Version     | : | EOC 61                                         |
| Description | : | for TX60 robot arm, including proximity sensor |
| Manufacture | : | Schmid & Partner Engineering AG                |

#### **e)DASY5 Measurement server**

|                        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Features               | : | Intel ULV Celeron 400MHz<br>128MB chip disk and 128MB RAM<br>16 Bit A/D converter for surface detection system<br>Vacuum Fluorescent Display<br>Robot Interface<br>Serial link to DAE (with watchdog supervision)<br>Door contact port (Possibility to connect a light curtain)<br>Emergency stop port (to connect the remote control)<br>Signal lamps port<br>Light beam port<br>Three Ethernet connection ports<br>Two USB 2.0 Ports<br>Two serial links<br>Expansion port for future applications |
| Dimensions (L x W x H) | : | 440 x 241 x 89 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Manufacture            | : | Schmid & Partner Engineering AG                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

#### **f) Light Beam Switches**

|                    |   |                                 |
|--------------------|---|---------------------------------|
| Version            | : | LB5                             |
| Dimensions (L x H) | : | 110 x 80 mm                     |
| Thickness          | : | 12 mm                           |
| Beam-length        | : | 80 mm                           |
| Manufacture        | : | Schmid & Partner Engineering AG |

#### **g)Software**

|                      |   |                                    |
|----------------------|---|------------------------------------|
| Item                 | : | Dosimetric Assessment System DASY5 |
| Type No.             | : | SD 000 401A, SD 000 402A           |
| Software version No. | : | DASY52, Version 52.6 (1)           |
| Manufacture / Origin | : | Schmid & Partner Engineering AG    |

#### **h)Robot Control Unit**

|                  |   |                  |
|------------------|---|------------------|
| Weight           | : | 70 Kg            |
| AC Input Voltage | : | selectable       |
| Manufacturer     | : | Stäubli Robotics |

## **i)Phantom and Device Holder**

### **Phantom**

|                |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type           | : | SAM Twin Phantom V4.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Description    | : | The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. |
| Material       | : | Vinylester, glass fiber reinforced (VE-GF)                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Shell Material | : | Fiberglass                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Thickness      | : | 2.0 +/-0.2 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Dimensions     | : | Length: 1000 mm Width: 500 mm Height: adjustable feet                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Volume         | : | Approx. 25 liters                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Manufacture    | : | Schmid & Partner Engineering AG                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type            | : | 2mm Flat phantom ELI4.0 or 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Description     | : | Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles. |
| Material        | : | Vinylester, glass fiber reinforced (VE-GF)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Shell Thickness | : | 2.0 ± 0.2 mm (sagging: <1%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Filling Volume  | : | approx. 30 liters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Dimensions      | : | Major ellipse axis: 600 mm Minor axis: 400 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Manufacture     | : | Schmid & Partner Engineering AG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

### **Device Holder**

In combination with the Twin SAM Phantom V4.0/V4.0c or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).

|          |   |     |
|----------|---|-----|
| Material | : | POM |
|----------|---|-----|

### **Laptio Extensions kit**

Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM, ELI4 Phantoms.

|          |   |                          |
|----------|---|--------------------------|
| Material | : | POM, Acrylic glass, Foam |
|----------|---|--------------------------|

### **Urethane**

For this measurement, the urethane foam was used as device holder.

#### **j) Simulated Tissues (Liquid)**

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

#### **Product identifier**

|                       |                                                                                      |
|-----------------------|--------------------------------------------------------------------------------------|
| Trade name            | Broad Band Tissue Simulation Liquid<br>HBBL600-10000V6, MBBL600-6000V6, HU16B, MU16B |
| Manufacturer/Supplier | Schmid & Partner Engineering AG                                                      |

#### **Declarable components:**

|                                                                        |                                                                                                                        |        |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------|
| CAS: 107-21-1<br>EINECS: 203-473-3<br>Reg.nr.: 01-2119456816-28-0000   | <b>Ethenediol</b><br>STOT RE 2, H373;<br>Acute Tox. 4, H302                                                            | < 5.2% |
| CAS: 68608-26-4<br>EINECS: 271-781-5<br>Reg.nr.: 01-2119527859-22-0000 | <b>Sodium petroleum sulfonate</b><br>Eye Irrit. 2, H319                                                                | < 2.9% |
| CAS: 107-41-5<br>EINECS: 203-489-0<br>Reg.nr.: 01-2119539582-35-0000   | <b>Hexylene Glycol / 2-Methyl-pentane-2,4-diol</b><br>Skin Irrit. 2, H315; Eye Irrit. 2, H319                          | < 2.9% |
| CAS: 68920-66-1<br>NLP: 500-236-9<br>Reg.nr.: 01-2119489407-26-0000    | <b>Alkoxylated alcohol, &gt; C<sub>16</sub></b><br>Aquatic Chronic 2, H411;<br>Skin Irrit. 2, H315; Eye Irrit. 2, H319 | < 2.0% |

## System Check Dipole SAR Calibration Certificate -Dipole 2450MHz(D2450V2,S/N:713)

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**S** Service suisse d'étalonnage  
**C** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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 0108

Client **UL Japan (KYCOM)**

Certificate No: D2450V2-713\_Sep19

### CALIBRATION CERTIFICATE

Object **D2450V2 - SN:713**

Calibration procedure(s) **QA CAL-05.v11**  
**Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **September 09, 2019**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103244         | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103245         | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)         | Apr-20                 |
| Reference Probe EX3DV4          | SN: 7349           | 29-May-19 (No. EX3-7349_May19)    | May-20                 |
| DAE4                            | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)    | Apr-20                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

|                |                      |                                   |               |
|----------------|----------------------|-----------------------------------|---------------|
| Calibrated by: | Name<br>Leif Klysner | Function<br>Laboratory Technician | Signature<br> |
|----------------|----------------------|-----------------------------------|---------------|

|              |                       |                               |               |
|--------------|-----------------------|-------------------------------|---------------|
| Approved by: | Name<br>Katja Pokovic | Function<br>Technical Manager | Signature<br> |
|--------------|-----------------------|-------------------------------|---------------|

Issued: September 13, 2019

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

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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 0108**

**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 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**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                  | V52.10.2    |
| 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 | 37.9 $\pm$ 6 % | 1.86 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 | 13.7 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 53.5 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 | 6.35 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 25.1 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 | 50.7 $\pm$ 6 % | 2.04 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 | 13.3 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 51.6 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 | 6.18 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 24.3 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 53.5 $\Omega$ + 1.6 j $\Omega$ |
| Return Loss                          | - 28.6 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 49.6 $\Omega$ + 4.0 j $\Omega$ |
| Return Loss                          | - 27.9 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.159 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 |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 09.09.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:713**

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

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.86$  S/m;  $\epsilon_r = 37.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.9, 7.9, 7.9) @ 2450 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

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

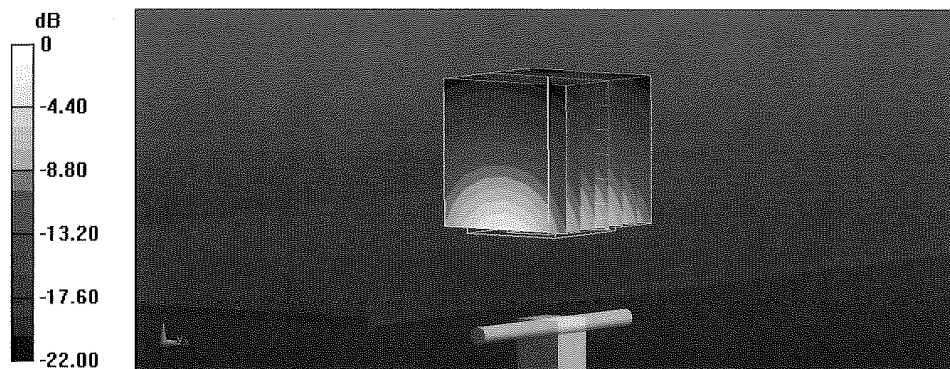
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 118.4 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 27.2 W/kg

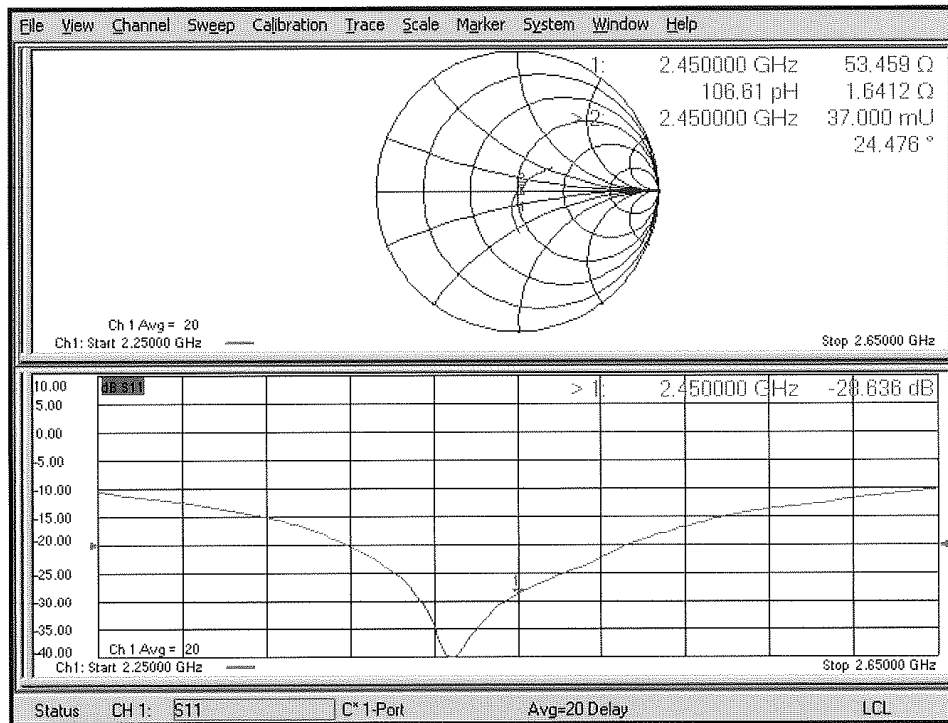
**SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.35 W/kg**

Maximum value of SAR (measured) = 22.5 W/kg



0 dB = 22.5 W/kg = 13.52 dBW/kg

### Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 09.09.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:713**

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

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.04$  S/m;  $\epsilon_r = 50.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94) @ 2450 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

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

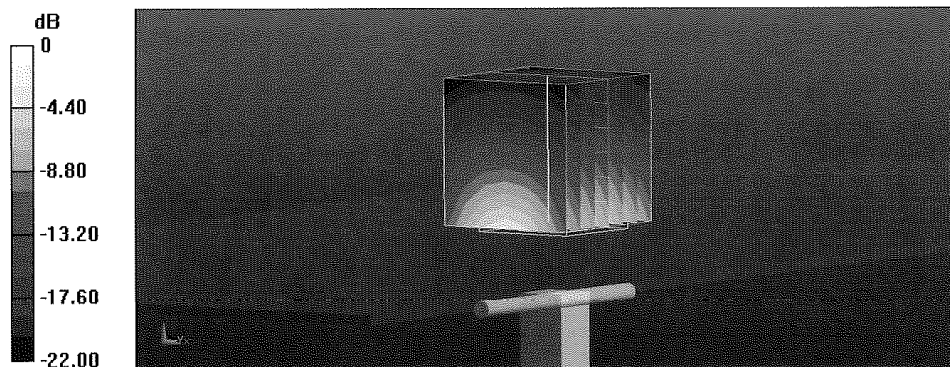
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.7 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 26.6 W/kg

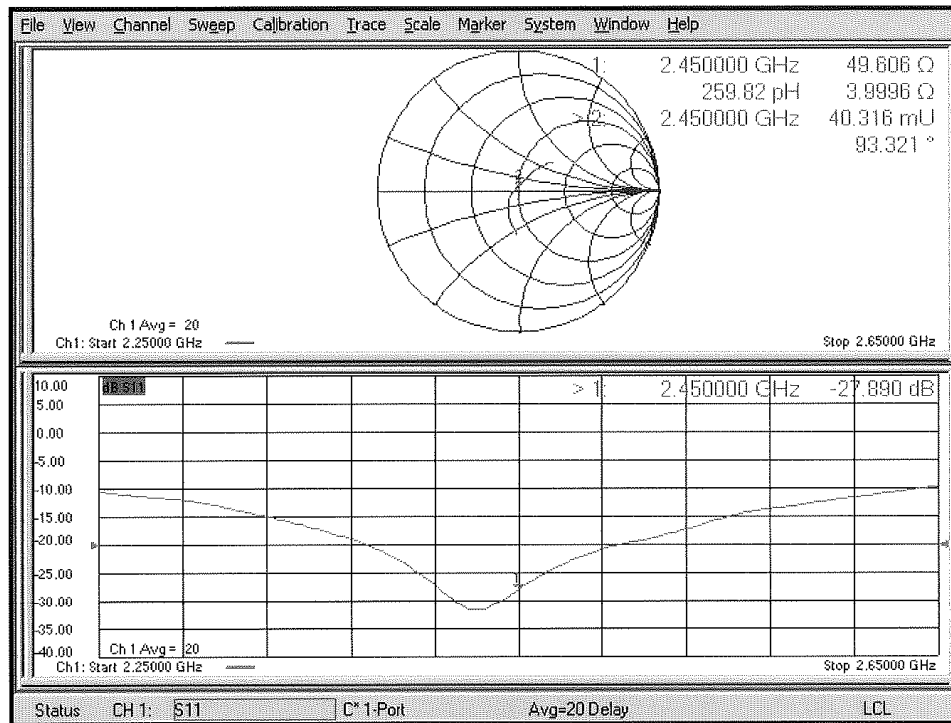
**SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.18 W/kg**

Maximum value of SAR (measured) = 21.9 W/kg



0 dB = 21.9 W/kg = 13.40 dBW/kg

### Impedance Measurement Plot for Body TSL



## System Check Dipole SAR Calibration Certificate -DipoleD5GHz (D5GHzV2 S/N: 1020) Part 1

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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 0108

Client **UL Japan (KYCOM)**

Certificate No: **D5GHzV2-1020\_Nov19**

### CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1020**

Calibration procedure(s) **QA CAL-22.v4**  
**Calibration Procedure for SAR Validation Sources between 3-6 GHz**

Calibration date: **November 19, 2019**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103244         | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103245         | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)         | Apr-20                 |
| Reference Probe EX3DV4          | SN: 3503           | 25-Mar-19 (No. EX3-3503_Mar19)    | Mar-20                 |
| DAE4                            | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)    | Apr-20                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-19) | In house check: Oct-20 |

|                |               |                       |           |
|----------------|---------------|-----------------------|-----------|
|                | Name          | Function              | Signature |
| Calibrated by: | Leif Klysner  | Laboratory Technician |           |
| Approved by:   | Katja Pokovic | Technical Manager     |           |

Issued: November 20, 2019

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

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



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**S** Swiss Calibration Service

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 0108**

**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 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**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                                                    | V52.10.3                         |
| 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                    | 5250 MHz ± 1 MHz<br>5600 MHz ± 1 MHz<br>5800 MHz ± 1 MHz |                                  |

### Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.9         | 4.71 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.8 ± 6 %   | 4.49 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5250 MHz

|                                                       |                    |                          |
|-------------------------------------------------------|--------------------|--------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
| SAR measured                                          | 100 mW input power | 8.22 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 81.6 W/kg ± 19.9 % (k=2) |

|                                                         |                    |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
| SAR measured                                            | 100 mW input power | 2.35 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.3 W/kg ± 19.5 % (k=2) |

#### Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.5         | 5.07 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.3 ± 6 %   | 4.84 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Head TSL at 5600 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|-------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                          | 100 mW input power | 8.50 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 84.2 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.42 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.9 W/kg ± 19.5 % (k=2) |

#### 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 | 34.0 ± 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 | 8.15 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 80.7 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.30 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 22.7 W/kg ± 19.5 % (k=2) |

#### Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.9         | 5.36 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 47.0 ± 6 %   | 5.51 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Body TSL at 5250 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|-------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                          | 100 mW input power | 7.67 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 76.2 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.14 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 21.2 W/kg ± 19.5 % (k=2) |

#### Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.5         | 5.77 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 46.4 ± 6 %   | 5.99 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Body TSL at 5600 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|-------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                          | 100 mW input power | 8.09 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 80.3 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.24 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 22.2 W/kg ± 19.5 % (k=2) |

#### 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 | 46.0 ± 6 %   | 6.26 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 | 7.65 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 75.9 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.11 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.9 W/kg ± 19.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.9 $\Omega$ - 8.1 j $\Omega$ |
| Return Loss                          | - 21.9 dB                      |

### Antenna Parameters with Head TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.7 $\Omega$ - 3.0 j $\Omega$ |
| Return Loss                          | - 25.5 dB                      |

### Antenna Parameters with Head TSL at 5800 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 57.2 $\Omega$ + 1.4 j $\Omega$ |
| Return Loss                          | - 23.3 dB                      |

### Antenna Parameters with Body TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.0 $\Omega$ - 6.1 j $\Omega$ |
| Return Loss                          | - 24.3 dB                      |

### Antenna Parameters with Body TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.8 $\Omega$ - 2.4 j $\Omega$ |
| Return Loss                          | - 25.9 dB                      |

### Antenna Parameters with Body TSL at 5800 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 57.7 $\Omega$ + 2.0 j $\Omega$ |
| Return Loss                          | - 22.6 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.199 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 |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 18.11.2019

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1020

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz  
Medium parameters used:  $f = 5250$  MHz;  $\sigma = 4.49$  S/m;  $\epsilon_r = 34.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>,  
Medium parameters used:  $f = 5600$  MHz;  $\sigma = 4.84$  S/m;  $\epsilon_r = 34.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>,  
Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.05$  S/m;  $\epsilon_r = 34$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.4, 5.4, 5.4) @ 5250 MHz, ConvF(4.95, 4.95, 4.95) @ 5600 MHz, ConvF(4.96, 4.96, 4.96) @ 5800 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

#### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

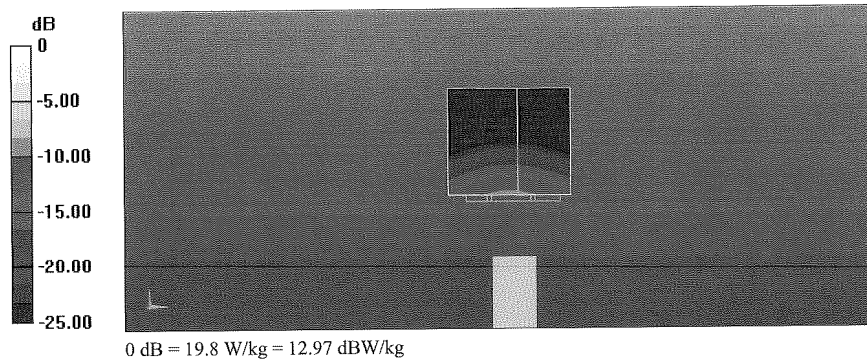
Reference Value = 77.97 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 28.4 W/kg  
**SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.35 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.2 mm  
Ratio of SAR at M2 to SAR at M1 = 70.3%  
Maximum value of SAR (measured) = 18.8 W/kg

#### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

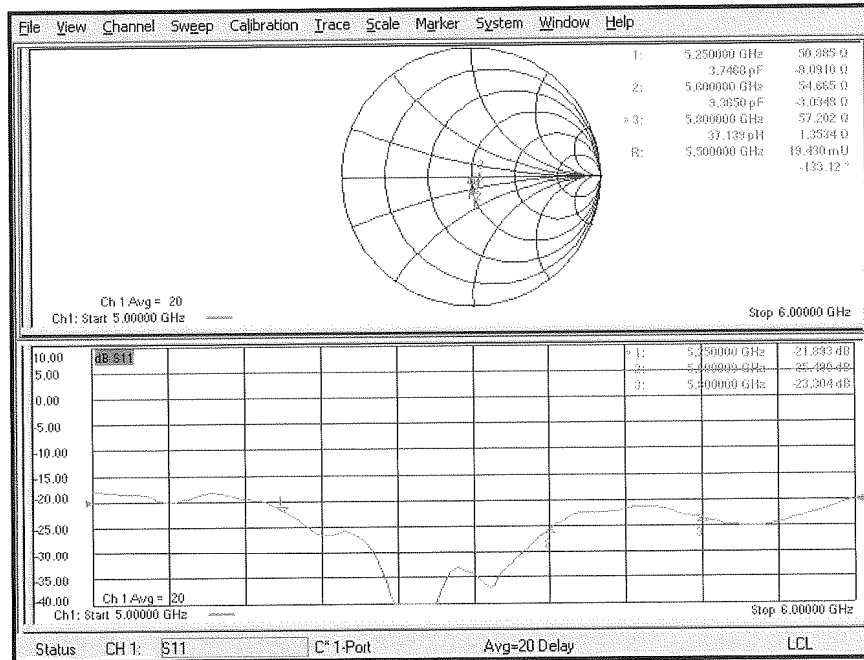
Reference Value = 77.98 V/m; Power Drift = -0.01 dB  
Peak SAR (extrapolated) = 31.8 W/kg  
**SAR(1 g) = 8.50 W/kg; SAR(10 g) = 2.42 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.4 mm  
Ratio of SAR at M2 to SAR at M1 = 67.6%  
Maximum value of SAR (measured) = 20.1 W/kg

#### 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 = 74.30 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 32.6 W/kg  
**SAR(1 g) = 8.15 W/kg; SAR(10 g) = 2.3 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.4 mm  
Ratio of SAR at M2 to SAR at M1 = 65.3%  
Maximum value of SAR (measured) = 19.8 W/kg



# Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 19.11.2019

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1020

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz  
Medium parameters used:  $f = 5250$  MHz;  $\sigma = 5.51$  S/m;  $\epsilon_r = 47$ ;  $\rho = 1000$  kg/m<sup>3</sup>,  
Medium parameters used:  $f = 5600$  MHz;  $\sigma = 5.99$  S/m;  $\epsilon_r = 46.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>,  
Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.26$  S/m;  $\epsilon_r = 46$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.26, 5.26, 5.26) @ 5250 MHz, ConvF(4.74, 4.74, 4.74) @ 5600 MHz, ConvF(4.62, 4.62, 4.62) @ 5800 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

#### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

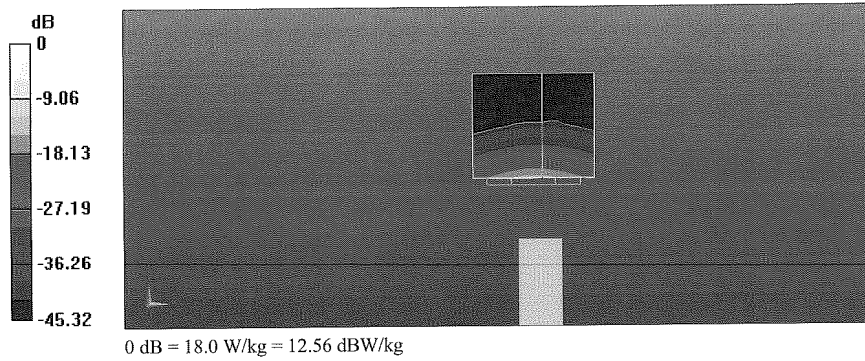
Reference Value = 68.82 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 29.7 W/kg  
SAR(1 g) = 7.67 W/kg; SAR(10 g) = 2.14 W/kg  
Smallest distance from peaks to all points 3 dB below = 7.2 mm  
Ratio of SAR at M2 to SAR at M1 = 66.8%  
Maximum value of SAR (measured) = 18.0 W/kg

#### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

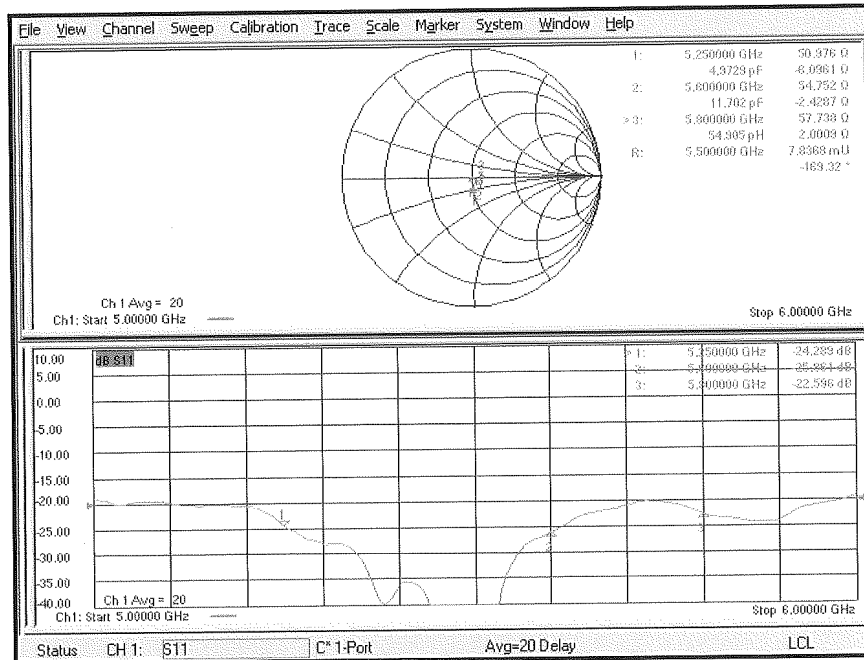
Reference Value = 68.78 V/m; Power Drift = 0.00 dB  
Peak SAR (extrapolated) = 34.8 W/kg  
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.24 W/kg  
Smallest distance from peaks to all points 3 dB below = 7.2 mm  
Ratio of SAR at M2 to SAR at M1 = 63.5%  
Maximum value of SAR (measured) = 19.8 W/kg

#### 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 = 66.62 V/m; Power Drift = -0.01 dB  
Peak SAR (extrapolated) = 33.7 W/kg  
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.11 W/kg  
Smallest distance from peaks to all points 3 dB below = 7.2 mm  
Ratio of SAR at M2 to SAR at M1 = 62.9%  
Maximum value of SAR (measured) = 19.0 W/kg



# Impedance Measurement Plot for Body TSL



## System Check Dipole SAR Calibration Certificate -DipoleD5GHz (D5GHzV2 S/N: 1020) Part 2

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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 0108**

Client **UL Japan (RCC)**

Certificate No: **D5GHzV2-1020\_Nov20**

### CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1020**

Calibration procedure(s) **QA CAL-22.v5  
Calibration Procedure for SAR Validation Sources between 3-10 GHz**

Calibration date: **November 17, 2020**

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 NRP                 | SN: 104778         | 01-Apr-20 (No. 217-03100/03101)   | Apr-21                 |
| Power sensor NRP-Z91            | SN: 103244         | 01-Apr-20 (No. 217-03100)         | Apr-21                 |
| Power sensor NRP-Z91            | SN: 103245         | 01-Apr-20 (No. 217-03101)         | Apr-21                 |
| Reference 20 dB Attenuator      | SN: BH9394 (20k)   | 31-Mar-20 (No. 217-03106)         | Apr-21                 |
| Type-N mismatch combination     | SN: 310982 / 06327 | 31-Mar-20 (No. 217-03104)         | Apr-21                 |
| Reference Probe EX3DV4          | SN: 3503           | 31-Dec-19 (No. EX3-3503_Dec19)    | Dec-20                 |
| DAE4                            | SN: 601            | 02-Nov-20 (No. DAE4-601_Nov20)    | Nov-21                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-20) | In house check: Oct-22 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-20) | In house check: Oct-21 |

|                |                              |                                          |               |
|----------------|------------------------------|------------------------------------------|---------------|
| Calibrated by: | Name<br><b>Leif Klysner</b>  | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:   | Name<br><b>Katja Pokovic</b> | Function<br><b>Technical Manager</b>     | Signature<br> |

Issued: November 20, 2020

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

Certificate No: D5GHzV2-1020\_Nov20

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**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



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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 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**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                                                                        | V52.10.4                         |
| Extrapolation                | Advanced Extrapolation                                                       |                                  |
| Phantom                      | Modular Flat Phantom V5.0                                                    |                                  |
| Distance Dipole Center - TSL | 10 mm                                                                        | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 10.0 mm, dz = 10.0 mm                                               | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 5250 MHz ± 1 MHz<br>5600 MHz ± 1 MHz<br>5800 MHz ± 1 MHz<br>5850 MHz ± 1 MHz |                                  |

### Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.9         | 4.71 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 36.3 ± 6 %   | 4.60 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5250 MHz

|                                                       |                    |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                 |
| SAR measured                                          | 100 mW input power | 7.93 W/kg                       |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | <b>79.4 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 | 2.30 W/kg                       |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | <b>23.0 W/kg ± 19.5 % (k=2)</b> |

#### Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.5         | 5.07 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 35.7 ± 6 %   | 4.96 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Head TSL at 5600 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|-------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                          | 100 mW input power | 8.20 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 82.0 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.34 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.4 W/kg ± 19.5 % (k=2) |

#### 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 | 35.4 ± 6 %   | 5.18 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 | 7.91 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 79.1 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.23 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 22.3 W/kg ± 19.5 % (k=2) |

#### Head TSL parameters at 5850 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.2         | 5.32 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 35.4 ± 6 %   | 5.23 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Head TSL at 5850 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR measured                                          | 100 mW input power | 8.20 W/kg                       |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | <b>82.0 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 | 2.34 W/kg                       |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | <b>23.4 W/kg ± 19.5 % (k=2)</b> |

#### Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.9         | 5.36 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 47.1 ± 6 %   | 5.43 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Body TSL at 5250 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR measured                                          | 100 mW input power | 7.58 W/kg                       |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | <b>75.2 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 | 2.16 W/kg                       |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | <b>21.4 W/kg ± 19.5 % (k=2)</b> |

#### Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.5         | 5.77 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 46.5 ± 6 %   | 5.92 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Body TSL at 5600 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                                 |
|-------------------------------------------------------|--------------------|---------------------------------|
| SAR measured                                          | 100 mW input power | 7.96 W/kg                       |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | <b>79.0 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 | 2.25 W/kg                       |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | <b>22.3 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 | 46.2 ± 6 %   | 6.20 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 | 7.50 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 74.5 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.11 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.9 W/kg ± 19.5 % (k=2) |

#### Body TSL parameters at 5850 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.1         | 6.06 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 46.1 ± 6 %   | 6.27 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

#### SAR result with Body TSL at 5850 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|-------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                          | 100 mW input power | 7.78 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 77.3 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---------------------------------------------------------|--------------------|--------------------------|
| SAR measured                                            | 100 mW input power | 2.18 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 21.6 W/kg ± 19.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.4 $\Omega$ - 7.5 j $\Omega$ |
| Return Loss                          | - 22.5 dB                      |

### Antenna Parameters with Head TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.4 $\Omega$ - 3.0 j $\Omega$ |
| Return Loss                          | - 24.7 dB                      |

### Antenna Parameters with Head TSL at 5800 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.9 $\Omega$ - 0.1 j $\Omega$ |
| Return Loss                          | - 25.0 dB                      |

### Antenna Parameters with Head TSL at 5850 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.9 $\Omega$ - 0.4 j $\Omega$ |
| Return Loss                          | - 26.6 dB                      |

### Antenna Parameters with Body TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.3 $\Omega$ - 5.5 j $\Omega$ |
| Return Loss                          | - 25.2 dB                      |

### Antenna Parameters with Body TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.1 $\Omega$ - 2.3 j $\Omega$ |
| Return Loss                          | - 25.5 dB                      |

### Antenna Parameters with Body TSL at 5800 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.8 $\Omega$ + 1.0 j $\Omega$ |
| Return Loss                          | - 25.1 dB                      |

### Antenna Parameters with Body TSL at 5850 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 56.5 $\Omega$ + 0.5 j $\Omega$ |
| Return Loss                          | - 24.3 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.199 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 |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 16.11.2020

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1020**

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz, Frequency: 5850 MHz

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 4.6$  S/m;  $\epsilon_r = 36.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5600$  MHz;  $\sigma = 4.96$  S/m;  $\epsilon_r = 35.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.18$  S/m;  $\epsilon_r = 35.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5850$  MHz;  $\sigma = 5.23$  S/m;  $\epsilon_r = 35.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 MHz, ConvF(4.99, 4.99, 4.99) @ 5850 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

### **Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 75.66 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 27.3 W/kg

**SAR(1 g) = 7.93 W/kg; SAR(10 g) = 2.3 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 70%

Maximum value of SAR (measured) = 17.7 W/kg

### **Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 74.83 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 30.4 W/kg

**SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.34 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 67.8%

Maximum value of SAR (measured) = 18.9 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 = 71.91 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 31.7 W/kg

**SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.23 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 65.2%

Maximum value of SAR (measured) = 18.7 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5850 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 72.03 V/m; Power Drift = 0.01 dB

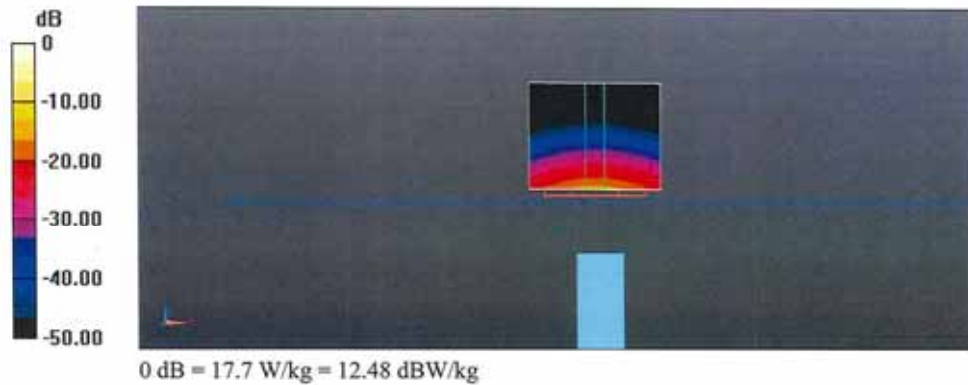
Peak SAR (extrapolated) = 33.1 W/kg

**SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.34 W/kg**

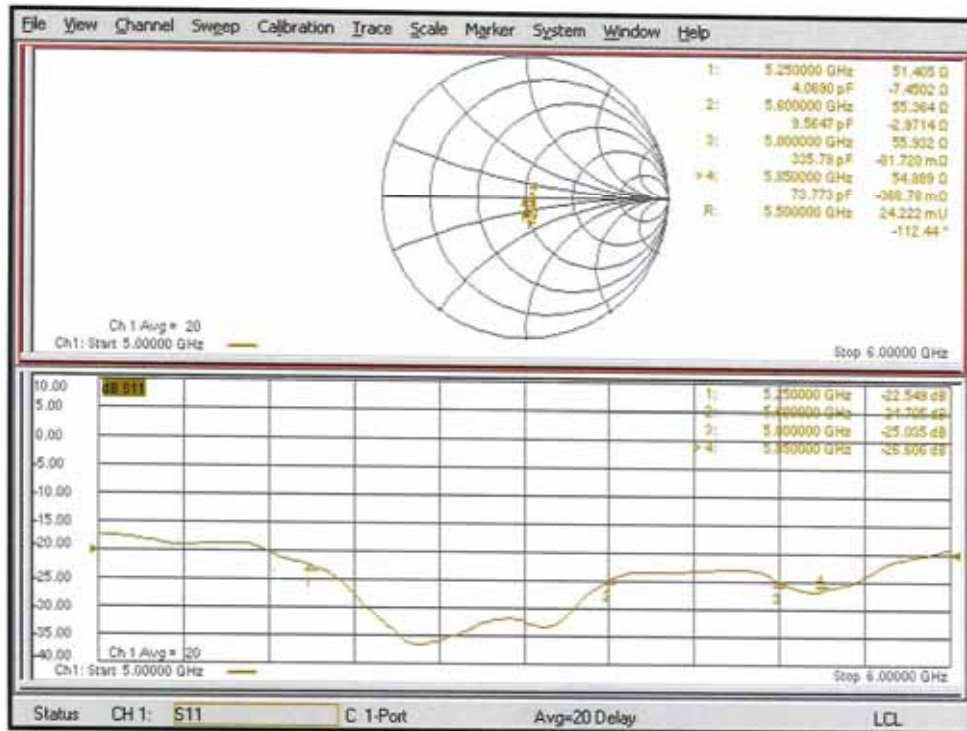
Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 64.9%

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



### Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 13.11.2020

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1020**

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz, Frequency: 5850 MHz

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 5.43$  S/m;  $\epsilon_r = 47.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5600$  MHz;  $\sigma = 5.92$  S/m;  $\epsilon_r = 46.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.2$  S/m;  $\epsilon_r = 46.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5850$  MHz;  $\sigma = 6.27$  S/m;  $\epsilon_r = 46.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.26, 5.26, 5.26) @ 5250 MHz, ConvF(4.79, 4.79, 4.79) @ 5600 MHz, ConvF(4.62, 4.62, 4.62) @ 5800 MHz, ConvF(4.61, 4.61, 4.61) @ 5850 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

### **Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.98 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 27.6 W/kg

**SAR(1 g) = 7.58 W/kg; SAR(10 g) = 2.16 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 68.4%

Maximum value of SAR (measured) = 17.5 W/kg

### **Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.76 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 32.2 W/kg

**SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.25 W/kg**

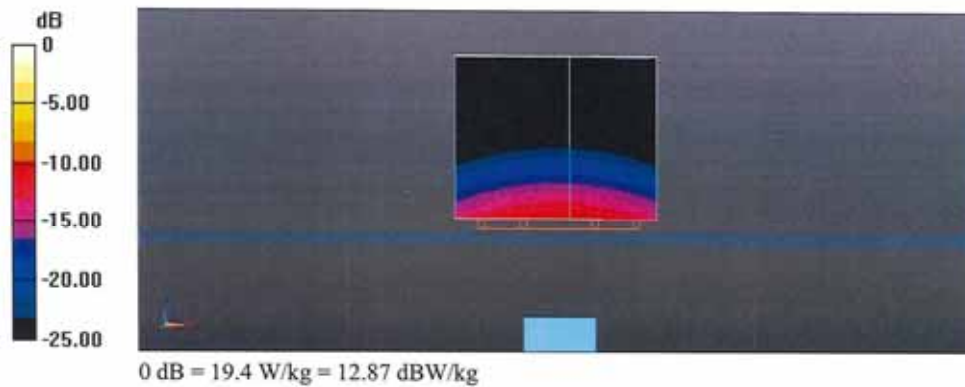
Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 64.9%

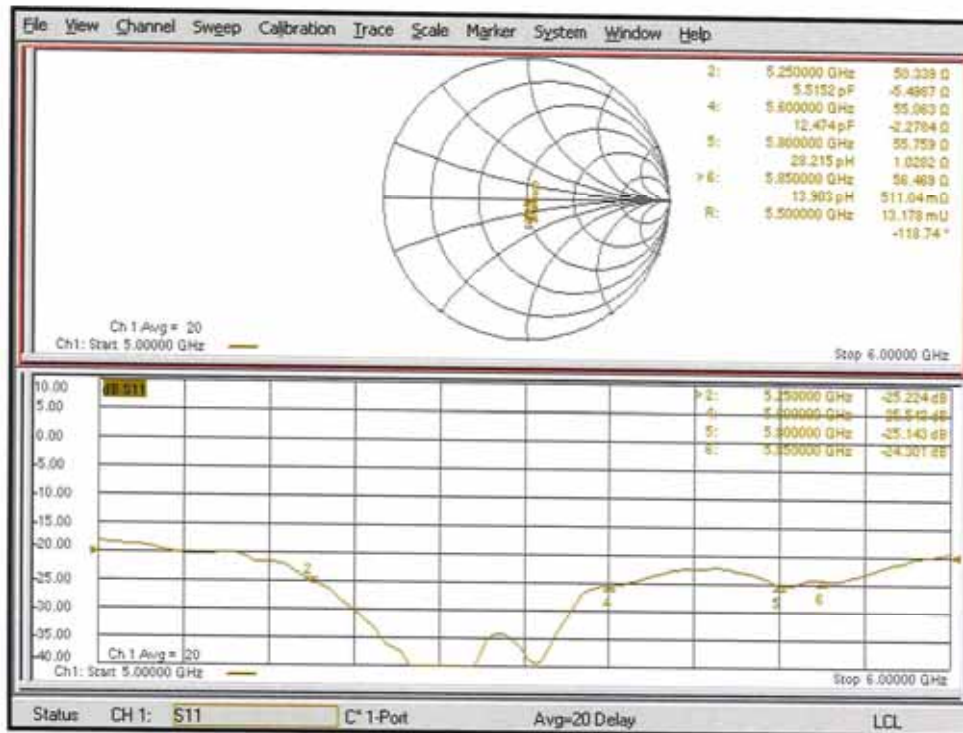
Maximum value of SAR (measured) = 19.2 W/kg

**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 = 64.62 V/m; Power Drift = -0.02 dB  
Peak SAR (extrapolated) = 30.9 W/kg  
**SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.11 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.4 mm  
Ratio of SAR at M2 to SAR at M1 = 64.5%  
Maximum value of SAR (measured) = 18.4 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5850 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 65.37 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 33.0 W/kg  
**SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.18 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.5 mm  
Ratio of SAR at M2 to SAR at M1 = 63.3%  
Maximum value of SAR (measured) = 19.4 W/kg



## Impedance Measurement Plot for Body TSL



## Dosimetric E-Field Probe Calibration Certificate (EX3DV4, S/N: 3825)

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



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

Accreditation No.: **SCS 0108**

Client **UL Japan (KYCOM)**

Certificate No: **EX3-3825\_Dec19**

### CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3825**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **December 13, 2019**

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

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

Calibration Equipment used (M&T critical for calibration)

| Primary Standards          | ID               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP            | SN: 104778       | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103244       | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103245       | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator | SN: S5277 (20x)  | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| DAE4                       | SN: 660          | 07-Oct-19 (No. DAE4-660_Oct19)    | Oct-20                 |
| Reference Probe ES3DV2     | SN: 3013         | 31-Dec-18 (No. ES3-3013_Dec18)    | Dec-19                 |
| Secondary Standards        | ID               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B         | SN: GB41293874   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: MY41498087   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: 000110210    | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| RF generator HP 8648C      | SN: US3642U01700 | 04-Aug-99 (in house check Jun-18) | In house check: Jun-20 |
| Network Analyzer E8358A    | SN: US41080477   | 31-Mar-14 (in house check Oct-19) | In house check: Oct-20 |

|                |                               |                                          |               |
|----------------|-------------------------------|------------------------------------------|---------------|
| Calibrated by: | Name<br><b>Jeton Kastrati</b> | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:   | <b>Katja Pokovic</b>          | <b>Technical Manager</b>                 |               |

Issued: December 13, 2019

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

Accreditation No.: **SCS 0108**

#### 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### 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  $E^2$ -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).

EX3DV4 – SN:3825

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## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825

### Basic Calibration Parameters

|                                                    | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|----------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V/m})^2$ ) <sup>A</sup> | 0.43     | 0.38     | 0.42     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                              | 100.4    | 102.5    | 92.2     |           |

### Calibration Results for Modulation Response

| UID           | Communication System Name   |   | A<br>dB | B<br>dB·μV | C     | D<br>dB | VR<br>mV | Max<br>dev. | Max<br>Unc <sup>E</sup><br>(k=2) |
|---------------|-----------------------------|---|---------|------------|-------|---------|----------|-------------|----------------------------------|
| 0             | CW                          | X | 0.00    | 0.00       | 1.00  | 0.00    | 141.1    | ± 3.5 %     | ± 4.7 %                          |
|               |                             | Y | 0.00    | 0.00       | 1.00  |         | 138.4    |             |                                  |
|               |                             | Z | 0.00    | 0.00       | 1.00  |         | 146.2    |             |                                  |
| 10352-<br>AAA | Pulse Waveform (200Hz, 10%) | X | 5.42    | 73.65      | 14.75 | 10.00   | 60.0     | ± 2.5 %     | ± 9.6 %                          |
|               |                             | Y | 5.48    | 73.92      | 14.79 |         | 60.0     |             |                                  |
|               |                             | Z | 15.00   | 86.61      | 19.65 |         | 60.0     |             |                                  |
| 10353-<br>AAA | Pulse Waveform (200Hz, 20%) | X | 5.93    | 76.55      | 14.51 | 6.99    | 80.0     | ± 1.7 %     | ± 9.6 %                          |
|               |                             | Y | 15.00   | 85.51      | 17.22 |         | 80.0     |             |                                  |
|               |                             | Z | 15.00   | 87.46      | 18.61 |         | 80.0     |             |                                  |
| 10354-<br>AAA | Pulse Waveform (200Hz, 40%) | X | 7.42    | 79.36      | 13.68 | 3.98    | 95.0     | ± 1.0 %     | ± 9.6 %                          |
|               |                             | Y | 15.00   | 87.29      | 16.55 |         | 95.0     |             |                                  |
|               |                             | Z | 15.00   | 87.86      | 17.08 |         | 95.0     |             |                                  |
| 10355-<br>AAA | Pulse Waveform (200Hz, 60%) | X | 0.70    | 64.20      | 7.27  | 2.22    | 120.0    | ± 1.1 %     | ± 9.6 %                          |
|               |                             | Y | 15.00   | 90.48      | 16.84 |         | 120.0    |             |                                  |
|               |                             | Z | 15.00   | 84.98      | 14.20 |         | 120.0    |             |                                  |
| 10387-<br>AAA | QPSK Waveform, 1 MHz        | X | 0.51    | 60.00      | 6.80  | 0.00    | 150.0    | ± 2.9 %     | ± 9.6 %                          |
|               |                             | Y | 0.48    | 60.15      | 6.67  |         | 150.0    |             |                                  |
|               |                             | Z | 0.54    | 60.00      | 7.23  |         | 150.0    |             |                                  |
| 10388-<br>AAA | QPSK Waveform, 10 MHz       | X | 1.98    | 66.90      | 15.07 | 0.00    | 150.0    | ± 1.3 %     | ± 9.6 %                          |
|               |                             | Y | 2.24    | 69.44      | 16.52 |         | 150.0    |             |                                  |
|               |                             | Z | 2.02    | 66.90      | 14.99 |         | 150.0    |             |                                  |
| 10396-<br>AAA | 64-QAM Waveform, 100 kHz    | X | 2.53    | 67.94      | 17.59 | 3.01    | 150.0    | ± 0.9 %     | ± 9.6 %                          |
|               |                             | Y | 3.07    | 72.55      | 19.52 |         | 150.0    |             |                                  |
|               |                             | Z | 2.85    | 69.06      | 17.98 |         | 150.0    |             |                                  |
| 10399-<br>AAA | 64-QAM Waveform, 40 MHz     | X | 3.33    | 66.56      | 15.45 | 0.00    | 150.0    | ± 2.4 %     | ± 9.6 %                          |
|               |                             | Y | 3.38    | 67.26      | 15.87 |         | 150.0    |             |                                  |
|               |                             | Z | 3.37    | 66.62      | 15.45 |         | 150.0    |             |                                  |
| 10414-<br>AAA | WLAN CCDF, 64-QAM, 40MHz    | X | 4.67    | 65.32      | 15.37 | 0.00    | 150.0    | ± 4.4 %     | ± 9.6 %                          |
|               |                             | Y | 4.62    | 65.73      | 15.54 |         | 150.0    |             |                                  |
|               |                             | Z | 4.74    | 65.36      | 15.39 |         | 150.0    |             |                                  |

Note: For details on UID parameters see Appendix

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>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.

EX3DV4- SN:3825

December 13, 2019

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825

### Sensor Model Parameters

|   | C1<br>fF | C2<br>fF | $\alpha$<br>$V^{-1}$ | T1<br>$ms.V^{-2}$ | T2<br>$ms.V^{-1}$ | T3<br>ms | T4<br>$V^{-2}$ | T5<br>$V^{-1}$ | T6   |
|---|----------|----------|----------------------|-------------------|-------------------|----------|----------------|----------------|------|
| X | 39.4     | 298.42   | 36.40                | 9.22              | 0.75              | 5.03     | 0.00           | 0.47           | 1.01 |
| Y | 33.0     | 236.78   | 33.32                | 9.16              | 0.64              | 4.99     | 1.62           | 0.10           | 1.00 |
| Z | 43.3     | 331.12   | 36.95                | 12.15             | 0.77              | 5.07     | 0.14           | 0.57           | 1.01 |

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -24.9      |
| 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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## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825

### 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) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 9.80    | 9.80    | 9.80    | 0.61               | 0.80                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 9.58    | 9.58    | 9.58    | 0.52               | 0.80                    | ± 12.0 %  |
| 900                  | 41.5                               | 0.97                            | 9.44    | 9.44    | 9.44    | 0.39               | 0.97                    | ± 12.0 %  |
| 1450                 | 40.5                               | 1.20                            | 8.75    | 8.75    | 8.75    | 0.40               | 0.85                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 8.66    | 8.66    | 8.66    | 0.33               | 0.86                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 8.33    | 8.33    | 8.33    | 0.41               | 0.86                    | ± 12.0 %  |
| 1950                 | 40.0                               | 1.40                            | 8.21    | 8.21    | 8.21    | 0.23               | 0.80                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 7.65    | 7.65    | 7.65    | 0.22               | 0.95                    | ± 12.0 %  |
| 3500                 | 37.9                               | 2.91                            | 6.74    | 6.74    | 6.74    | 0.30               | 1.30                    | ± 13.1 %  |
| 3700                 | 37.7                               | 3.12                            | 6.55    | 6.55    | 6.55    | 0.30               | 1.30                    | ± 13.1 %  |
| 5250                 | 35.9                               | 4.71                            | 5.02    | 5.02    | 5.02    | 0.40               | 1.80                    | ± 13.1 %  |
| 5600                 | 35.5                               | 5.07                            | 4.61    | 4.61    | 4.61    | 0.40               | 1.80                    | ± 13.1 %  |
| 5800                 | 35.3                               | 5.27                            | 4.65    | 4.65    | 4.65    | 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. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. 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.

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## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825

### 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) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 9.97    | 9.97    | 9.97    | 0.47               | 0.80                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 9.62    | 9.62    | 9.62    | 0.44               | 0.85                    | ± 12.0 %  |
| 1450                 | 54.0                               | 1.30                            | 8.34    | 8.34    | 8.34    | 0.29               | 0.80                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 8.04    | 8.04    | 8.04    | 0.33               | 0.86                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 7.71    | 7.71    | 7.71    | 0.39               | 0.86                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 7.50    | 7.50    | 7.50    | 0.29               | 0.90                    | ± 12.0 %  |
| 3500                 | 51.3                               | 3.31                            | 6.40    | 6.40    | 6.40    | 0.35               | 1.35                    | ± 13.1 %  |
| 3700                 | 51.0                               | 3.55                            | 6.38    | 6.38    | 6.38    | 0.40               | 1.35                    | ± 13.1 %  |
| 5250                 | 48.9                               | 5.36                            | 4.41    | 4.41    | 4.41    | 0.50               | 1.90                    | ± 13.1 %  |
| 5600                 | 48.5                               | 5.77                            | 3.81    | 3.81    | 3.81    | 0.50               | 1.90                    | ± 13.1 %  |
| 5800                 | 48.2                               | 6.00                            | 4.00    | 4.00    | 4.00    | 0.50               | 1.90                    | ± 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. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

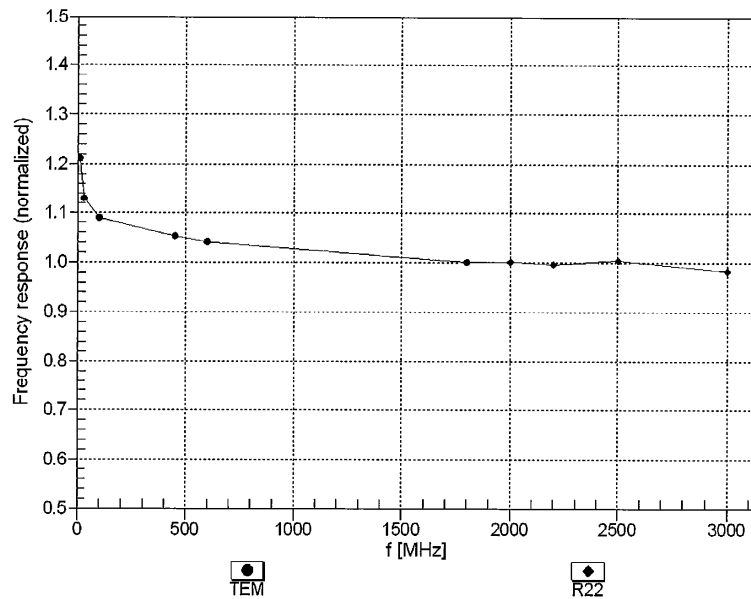
<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted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

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### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

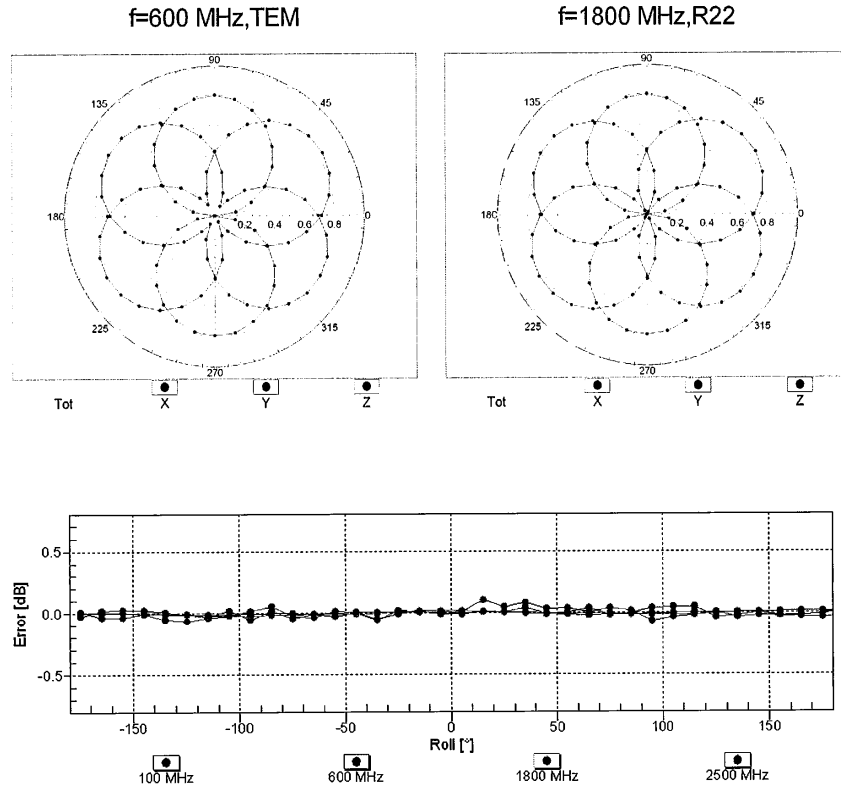


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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

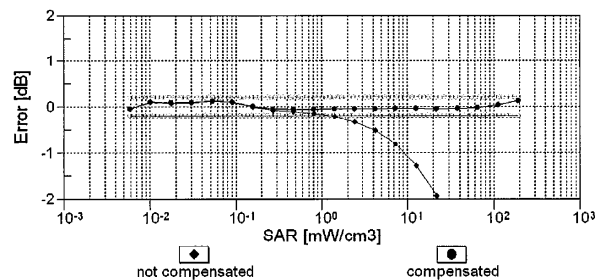
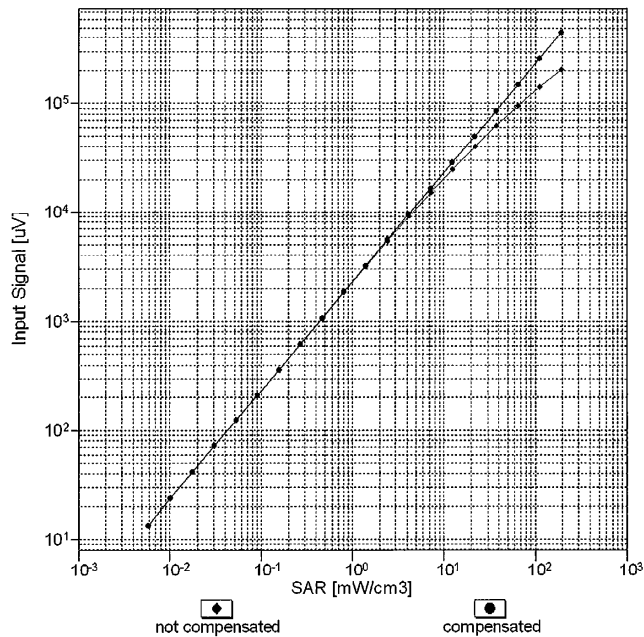


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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

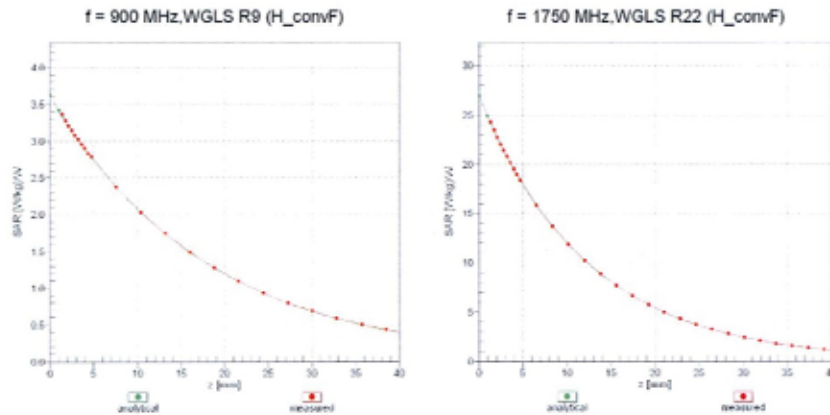


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

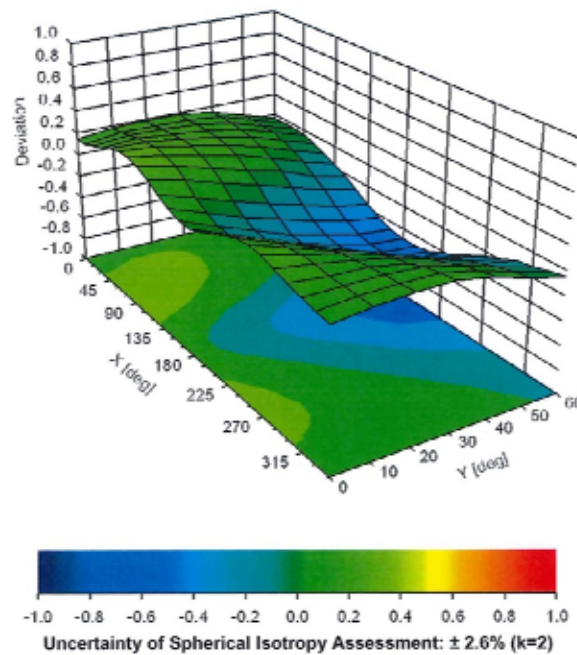
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## Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi$ , $\theta$ ), $f = 900$ MHz



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# Appendix: Modulation Calibration Parameters

| UID   | Rev | Communication System Name                           | Group     | PAR (dB) | Unc <sup>E</sup> (k=2) |
|-------|-----|-----------------------------------------------------|-----------|----------|------------------------|
| 0     |     | CW                                                  | CW        | 0.00     | ± 4.7 %                |
| 10010 | CAA | SAR Validation (Square, 100ms, 10ms)                | Test      | 10.00    | ± 9.6 %                |
| 10011 | CAB | UMTS-FDD (WCDMA)                                    | WCDMA     | 2.91     | ± 9.6 %                |
| 10012 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)            | WLAN      | 1.87     | ± 9.6 %                |
| 10013 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)       | WLAN      | 9.46     | ± 9.6 %                |
| 10021 | DAC | GSM-FDD (TDMA, GMSK)                                | GSM       | 9.39     | ± 9.6 %                |
| 10023 | DAC | GPRS-FDD (TDMA, GMSK, TN 0)                         | GSM       | 9.57     | ± 9.6 %                |
| 10024 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1)                       | GSM       | 6.56     | ± 9.6 %                |
| 10025 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0)                         | GSM       | 12.62    | ± 9.6 %                |
| 10026 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1)                       | GSM       | 9.55     | ± 9.6 %                |
| 10027 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2)                     | GSM       | 4.80     | ± 9.6 %                |
| 10028 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)                   | GSM       | 3.55     | ± 9.6 %                |
| 10029 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2)                     | GSM       | 7.78     | ± 9.6 %                |
| 10030 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH1)                 | Bluetooth | 5.30     | ± 9.6 %                |
| 10031 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH3)                 | Bluetooth | 1.87     | ± 9.6 %                |
| 10032 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)                 | Bluetooth | 1.16     | ± 9.6 %                |
| 10033 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)           | Bluetooth | 7.74     | ± 9.6 %                |
| 10034 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)           | Bluetooth | 4.53     | ± 9.6 %                |
| 10035 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)           | Bluetooth | 3.83     | ± 9.6 %                |
| 10036 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH1)               | Bluetooth | 8.01     | ± 9.6 %                |
| 10037 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH3)               | Bluetooth | 4.77     | ± 9.6 %                |
| 10038 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH5)               | Bluetooth | 4.10     | ± 9.6 %                |
| 10039 | CAB | CDMA2000 (1xRTT, RC1)                               | CDMA2000  | 4.57     | ± 9.6 %                |
| 10042 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate) | AMPS      | 7.78     | ± 9.6 %                |
| 10044 | CAA | IS-91/EIA/TIA-553 FDD (FDMA, FM)                    | AMPS      | 0.00     | ± 9.6 %                |
| 10048 | CAA | DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)           | DECT      | 13.80    | ± 9.6 %                |
| 10049 | CAA | DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)         | DECT      | 10.79    | ± 9.6 %                |
| 10056 | CAA | UMTS-TDD (TD-SCDMA, 1.28 Mcps)                      | TD-SCDMA  | 11.01    | ± 9.6 %                |
| 10058 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)                   | GSM       | 6.52     | ± 9.6 %                |
| 10059 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)            | WLAN      | 2.12     | ± 9.6 %                |
| 10060 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)          | WLAN      | 2.83     | ± 9.6 %                |
| 10061 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)           | WLAN      | 3.60     | ± 9.6 %                |
| 10062 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)            | WLAN      | 8.68     | ± 9.6 %                |
| 10063 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)            | WLAN      | 8.63     | ± 9.6 %                |
| 10064 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)           | WLAN      | 9.09     | ± 9.6 %                |
| 10065 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)           | WLAN      | 9.00     | ± 9.6 %                |
| 10066 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)           | WLAN      | 9.38     | ± 9.6 %                |
| 10067 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)           | WLAN      | 10.12    | ± 9.6 %                |
| 10068 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)           | WLAN      | 10.24    | ± 9.6 %                |
| 10069 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)           | WLAN      | 10.56    | ± 9.6 %                |
| 10071 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)       | WLAN      | 9.83     | ± 9.6 %                |
| 10072 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)      | WLAN      | 9.62     | ± 9.6 %                |
| 10073 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)      | WLAN      | 9.94     | ± 9.6 %                |
| 10074 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)      | WLAN      | 10.30    | ± 9.6 %                |
| 10075 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)      | WLAN      | 10.77    | ± 9.6 %                |
| 10076 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)      | WLAN      | 10.94    | ± 9.6 %                |
| 10077 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)      | WLAN      | 11.00    | ± 9.6 %                |
| 10081 | CAB | CDMA2000 (1xRTT, RC3)                               | CDMA2000  | 3.97     | ± 9.6 %                |
| 10082 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate) | AMPS      | 4.77     | ± 9.6 %                |
| 10090 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-4)                       | GSM       | 6.56     | ± 9.6 %                |
| 10097 | CAB | UMTS-FDD (HSDPA)                                    | WCDMA     | 3.98     | ± 9.6 %                |
| 10098 | CAB | UMTS-FDD (HSUPA, Subtest 2)                         | WCDMA     | 3.98     | ± 9.6 %                |
| 10099 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-4)                       | GSM       | 9.55     | ± 9.6 %                |
| 10100 | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)            | LTE-FDD   | 5.67     | ± 9.6 %                |
| 10101 | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)          | LTE-FDD   | 6.42     | ± 9.6 %                |
| 10102 | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)          | LTE-FDD   | 6.60     | ± 9.6 %                |
| 10103 | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)            | LTE-TDD   | 9.29     | ± 9.6 %                |
| 10104 | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)          | LTE-TDD   | 9.97     | ± 9.6 %                |
| 10105 | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)          | LTE-TDD   | 10.01    | ± 9.6 %                |
| 10108 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)            | LTE-FDD   | 5.80     | ± 9.6 %                |

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| 10109 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)     | LTE-FDD | 6.43  | ± 9.6 % |
| 10110 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)        | LTE-FDD | 5.75  | ± 9.6 % |
| 10111 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)      | LTE-FDD | 6.44  | ± 9.6 % |
| 10112 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)     | LTE-FDD | 6.59  | ± 9.6 % |
| 10113 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)      | LTE-FDD | 6.62  | ± 9.6 % |
| 10114 | CAC | IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)  | WLAN    | 8.10  | ± 9.6 % |
| 10115 | CAC | IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)  | WLAN    | 8.46  | ± 9.6 % |
| 10116 | CAC | IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM) | WLAN    | 8.15  | ± 9.6 % |
| 10117 | CAC | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)       | WLAN    | 8.07  | ± 9.6 % |
| 10118 | CAC | IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)       | WLAN    | 8.59  | ± 9.6 % |
| 10119 | CAC | IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)      | WLAN    | 8.13  | ± 9.6 % |
| 10140 | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)     | LTE-FDD | 6.49  | ± 9.6 % |
| 10141 | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)     | LTE-FDD | 6.53  | ± 9.6 % |
| 10142 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)        | LTE-FDD | 5.73  | ± 9.6 % |
| 10143 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)      | LTE-FDD | 6.35  | ± 9.6 % |
| 10144 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)      | LTE-FDD | 6.65  | ± 9.6 % |
| 10145 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)      | LTE-FDD | 5.76  | ± 9.6 % |
| 10146 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)    | LTE-FDD | 6.41  | ± 9.6 % |
| 10147 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)    | LTE-FDD | 6.72  | ± 9.6 % |
| 10149 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)      | LTE-FDD | 6.42  | ± 9.6 % |
| 10150 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)      | LTE-FDD | 6.60  | ± 9.6 % |
| 10151 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)        | LTE-TDD | 9.28  | ± 9.6 % |
| 10152 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)      | LTE-TDD | 9.92  | ± 9.6 % |
| 10153 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)      | LTE-TDD | 10.05 | ± 9.6 % |
| 10154 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)        | LTE-FDD | 5.75  | ± 9.6 % |
| 10155 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)      | LTE-FDD | 6.43  | ± 9.6 % |
| 10156 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)         | LTE-FDD | 5.79  | ± 9.6 % |
| 10157 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)       | LTE-FDD | 6.49  | ± 9.6 % |
| 10158 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)      | LTE-FDD | 6.62  | ± 9.6 % |
| 10159 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)       | LTE-FDD | 6.56  | ± 9.6 % |
| 10160 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)        | LTE-FDD | 5.82  | ± 9.6 % |
| 10161 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)      | LTE-FDD | 6.43  | ± 9.6 % |
| 10162 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)      | LTE-FDD | 6.58  | ± 9.6 % |
| 10166 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)       | LTE-FDD | 5.46  | ± 9.6 % |
| 10167 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)     | LTE-FDD | 6.21  | ± 9.6 % |
| 10168 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)     | LTE-FDD | 6.79  | ± 9.6 % |
| 10169 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)          | LTE-FDD | 5.73  | ± 9.6 % |
| 10170 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)        | LTE-FDD | 6.52  | ± 9.6 % |
| 10171 | AAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)        | LTE-FDD | 6.49  | ± 9.6 % |
| 10172 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)          | LTE-TDD | 9.21  | ± 9.6 % |
| 10173 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)        | LTE-TDD | 9.48  | ± 9.6 % |
| 10174 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)        | LTE-TDD | 10.25 | ± 9.6 % |
| 10175 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)          | LTE-FDD | 5.72  | ± 9.6 % |
| 10176 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)        | LTE-FDD | 6.52  | ± 9.6 % |
| 10177 | CAI | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)           | LTE-FDD | 5.73  | ± 9.6 % |
| 10178 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)         | LTE-FDD | 6.52  | ± 9.6 % |
| 10179 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)        | LTE-FDD | 6.50  | ± 9.6 % |
| 10180 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)         | LTE-FDD | 6.50  | ± 9.6 % |
| 10181 | CAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)          | LTE-FDD | 5.72  | ± 9.6 % |
| 10182 | CAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)        | LTE-FDD | 6.52  | ± 9.6 % |
| 10183 | AAD | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)        | LTE-FDD | 6.50  | ± 9.6 % |
| 10184 | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)           | LTE-FDD | 5.73  | ± 9.6 % |
| 10185 | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)         | LTE-FDD | 6.51  | ± 9.6 % |
| 10186 | AAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)         | LTE-FDD | 6.50  | ± 9.6 % |
| 10187 | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)         | LTE-FDD | 5.73  | ± 9.6 % |
| 10188 | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)       | LTE-FDD | 6.52  | ± 9.6 % |
| 10189 | AAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)       | LTE-FDD | 6.50  | ± 9.6 % |
| 10193 | CAC | IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)   | WLAN    | 8.09  | ± 9.6 % |
| 10194 | CAC | IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)  | WLAN    | 8.12  | ± 9.6 % |
| 10195 | CAC | IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)  | WLAN    | 8.21  | ± 9.6 % |
| 10196 | CAC | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)        | WLAN    | 8.10  | ± 9.6 % |
| 10197 | CAC | IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)       | WLAN    | 8.13  | ± 9.6 % |
| 10198 | CAC | IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)       | WLAN    | 8.27  | ± 9.6 % |
| 10219 | CAC | IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)        | WLAN    | 8.03  | ± 9.6 % |

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| 10220 | CAC | IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)  | WLAN     | 8.13  | ± 9.6 % |
| 10221 | CAC | IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)  | WLAN     | 8.27  | ± 9.6 % |
| 10222 | CAC | IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)      | WLAN     | 8.06  | ± 9.6 % |
| 10223 | CAC | IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)    | WLAN     | 8.48  | ± 9.6 % |
| 10224 | CAC | IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)   | WLAN     | 8.08  | ± 9.6 % |
| 10225 | CAB | UMTS-FDD (HSPA+)                            | WCDMA    | 5.97  | ± 9.6 % |
| 10226 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)    | LTE-TDD  | 9.49  | ± 9.6 % |
| 10227 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)    | LTE-TDD  | 10.26 | ± 9.6 % |
| 10228 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)      | LTE-TDD  | 9.22  | ± 9.6 % |
| 10229 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)      | LTE-TDD  | 9.48  | ± 9.6 % |
| 10230 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)      | LTE-TDD  | 10.25 | ± 9.6 % |
| 10231 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)        | LTE-TDD  | 9.19  | ± 9.6 % |
| 10232 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)      | LTE-TDD  | 9.48  | ± 9.6 % |
| 10233 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)      | LTE-TDD  | 10.25 | ± 9.6 % |
| 10234 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)        | LTE-TDD  | 9.21  | ± 9.6 % |
| 10235 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)     | LTE-TDD  | 9.48  | ± 9.6 % |
| 10236 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)     | LTE-TDD  | 10.25 | ± 9.6 % |
| 10237 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)       | LTE-TDD  | 9.21  | ± 9.6 % |
| 10238 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)     | LTE-TDD  | 9.48  | ± 9.6 % |
| 10239 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)     | LTE-TDD  | 10.25 | ± 9.6 % |
| 10240 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)       | LTE-TDD  | 9.21  | ± 9.6 % |
| 10241 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)  | LTE-TDD  | 9.82  | ± 9.6 % |
| 10242 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)  | LTE-TDD  | 9.86  | ± 9.6 % |
| 10243 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)    | LTE-TDD  | 9.46  | ± 9.6 % |
| 10244 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)    | LTE-TDD  | 10.06 | ± 9.6 % |
| 10245 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)    | LTE-TDD  | 10.06 | ± 9.6 % |
| 10246 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)      | LTE-TDD  | 9.30  | ± 9.6 % |
| 10247 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)    | LTE-TDD  | 9.91  | ± 9.6 % |
| 10248 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)    | LTE-TDD  | 10.09 | ± 9.6 % |
| 10249 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)      | LTE-TDD  | 9.29  | ± 9.6 % |
| 10250 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)   | LTE-TDD  | 9.81  | ± 9.6 % |
| 10251 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)   | LTE-TDD  | 10.17 | ± 9.6 % |
| 10252 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)     | LTE-TDD  | 9.24  | ± 9.6 % |
| 10253 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)   | LTE-TDD  | 9.90  | ± 9.6 % |
| 10254 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)   | LTE-TDD  | 10.14 | ± 9.6 % |
| 10255 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)     | LTE-TDD  | 9.20  | ± 9.6 % |
| 10256 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | LTE-TDD  | 9.96  | ± 9.6 % |
| 10257 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM) | LTE-TDD  | 10.08 | ± 9.6 % |
| 10258 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)   | LTE-TDD  | 9.34  | ± 9.6 % |
| 10259 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)   | LTE-TDD  | 9.98  | ± 9.6 % |
| 10260 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)   | LTE-TDD  | 9.97  | ± 9.6 % |
| 10261 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)     | LTE-TDD  | 9.24  | ± 9.6 % |
| 10262 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)   | LTE-TDD  | 9.83  | ± 9.6 % |
| 10263 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)   | LTE-TDD  | 10.16 | ± 9.6 % |
| 10264 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)     | LTE-TDD  | 9.23  | ± 9.6 % |
| 10265 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)  | LTE-TDD  | 9.92  | ± 9.6 % |
| 10266 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)  | LTE-TDD  | 10.07 | ± 9.6 % |
| 10267 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)    | LTE-TDD  | 9.30  | ± 9.6 % |
| 10268 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)  | LTE-TDD  | 10.06 | ± 9.6 % |
| 10269 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)  | LTE-TDD  | 10.13 | ± 9.6 % |
| 10270 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)    | LTE-TDD  | 9.58  | ± 9.6 % |
| 10274 | CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)   | WCDMA    | 4.87  | ± 9.6 % |
| 10275 | CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)    | WCDMA    | 3.96  | ± 9.6 % |
| 10277 | CAA | PHS (QPSK)                                  | PHS      | 11.81 | ± 9.6 % |
| 10278 | CAA | PHS (QPSK, BW 884MHz, Rolloff 0.5)          | PHS      | 11.81 | ± 9.6 % |
| 10279 | CAA | PHS (QPSK, BW 884MHz, Rolloff 0.38)         | PHS      | 12.18 | ± 9.6 % |
| 10290 | AAB | CDMA2000, RC1, SO55, Full Rate              | CDMA2000 | 3.91  | ± 9.6 % |
| 10291 | AAB | CDMA2000, RC3, SO55, Full Rate              | CDMA2000 | 3.46  | ± 9.6 % |
| 10292 | AAB | CDMA2000, RC3, SO32, Full Rate              | CDMA2000 | 3.39  | ± 9.6 % |
| 10293 | AAB | CDMA2000, RC3, SO3, Full Rate               | CDMA2000 | 3.50  | ± 9.6 % |
| 10295 | AAB | CDMA2000, RC1, SO3, 1/8th Rate 25 fr.       | CDMA2000 | 12.49 | ± 9.6 % |
| 10297 | AAD | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)     | LTE-FDD  | 5.81  | ± 9.6 % |
| 10298 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)      | LTE-FDD  | 5.72  | ± 9.6 % |
| 10299 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)    | LTE-FDD  | 6.39  | ± 9.6 % |

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|       |     |                                                                                 |          |       |         |
|-------|-----|---------------------------------------------------------------------------------|----------|-------|---------|
| 10300 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)                                        | LTE-FDD  | 6.60  | ± 9.6 % |
| 10301 | AAA | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)                              | WiMAX    | 12.03 | ± 9.6 % |
| 10302 | AAA | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)              | WiMAX    | 12.57 | ± 9.6 % |
| 10303 | AAA | IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)                             | WiMAX    | 12.52 | ± 9.6 % |
| 10304 | AAA | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)                             | WiMAX    | 11.86 | ± 9.6 % |
| 10305 | AAA | IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)                | WiMAX    | 15.24 | ± 9.6 % |
| 10306 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)                | WiMAX    | 14.67 | ± 9.6 % |
| 10307 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)                 | WiMAX    | 14.49 | ± 9.6 % |
| 10308 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)                            | WiMAX    | 14.46 | ± 9.6 % |
| 10309 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)             | WiMAX    | 14.58 | ± 9.6 % |
| 10310 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)              | WiMAX    | 14.57 | ± 9.6 % |
| 10311 | AAD | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                                        | LTE-FDD  | 6.06  | ± 9.6 % |
| 10313 | AAA | iDEN 1:3                                                                        | iDEN     | 10.51 | ± 9.6 % |
| 10314 | AAA | iDEN 1:6                                                                        | iDEN     | 13.48 | ± 9.6 % |
| 10315 | AAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)                       | WLAN     | 1.71  | ± 9.6 % |
| 10316 | AAB | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)                   | WLAN     | 8.36  | ± 9.6 % |
| 10317 | AAC | IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)                         | WLAN     | 8.36  | ± 9.6 % |
| 10352 | AAA | Pulse Waveform (200Hz, 10%)                                                     | Generic  | 10.00 | ± 9.6 % |
| 10353 | AAA | Pulse Waveform (200Hz, 20%)                                                     | Generic  | 6.99  | ± 9.6 % |
| 10354 | AAA | Pulse Waveform (200Hz, 40%)                                                     | Generic  | 3.98  | ± 9.6 % |
| 10355 | AAA | Pulse Waveform (200Hz, 60%)                                                     | Generic  | 2.22  | ± 9.6 % |
| 10356 | AAA | Pulse Waveform (200Hz, 80%)                                                     | Generic  | 0.97  | ± 9.6 % |
| 10387 | AAA | QPSK Waveform, 1 MHz                                                            | Generic  | 5.10  | ± 9.6 % |
| 10388 | AAA | QPSK Waveform, 10 MHz                                                           | Generic  | 5.22  | ± 9.6 % |
| 10396 | AAA | 64-QAM Waveform, 100 kHz                                                        | Generic  | 6.27  | ± 9.6 % |
| 10399 | AAA | 64-QAM Waveform, 40 MHz                                                         | Generic  | 6.27  | ± 9.6 % |
| 10400 | AAD | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)                             | WLAN     | 8.37  | ± 9.6 % |
| 10401 | AAD | IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)                             | WLAN     | 8.60  | ± 9.6 % |
| 10402 | AAD | IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)                             | WLAN     | 8.53  | ± 9.6 % |
| 10403 | AAB | CDMA2000 (1xEV-DO, Rev. 0)                                                      | CDMA2000 | 3.76  | ± 9.6 % |
| 10404 | AAB | CDMA2000 (1xEV-DO, Rev. A)                                                      | CDMA2000 | 3.77  | ± 9.6 % |
| 10406 | AAB | CDMA2000, RC3, SO32, SCH0, Full Rate                                            | CDMA2000 | 5.22  | ± 9.6 % |
| 10410 | AAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4) | LTE-TDD  | 7.82  | ± 9.6 % |
| 10414 | AAA | WLAN CCDF, 64-QAM, 40MHz                                                        | Generic  | 8.54  | ± 9.6 % |
| 10415 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)                       | WLAN     | 1.54  | ± 9.6 % |
| 10416 | AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)                   | WLAN     | 8.23  | ± 9.6 % |
| 10417 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)                       | WLAN     | 8.23  | ± 9.6 % |
| 10418 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preamble)   | WLAN     | 8.14  | ± 9.6 % |
| 10419 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preamble)  | WLAN     | 8.19  | ± 9.6 % |
| 10422 | AAB | IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)                                    | WLAN     | 8.32  | ± 9.6 % |
| 10423 | AAB | IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)                                 | WLAN     | 8.47  | ± 9.6 % |
| 10424 | AAB | IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)                                 | WLAN     | 8.40  | ± 9.6 % |
| 10425 | AAB | IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)                                     | WLAN     | 8.41  | ± 9.6 % |
| 10426 | AAB | IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)                                   | WLAN     | 8.45  | ± 9.6 % |
| 10427 | AAB | IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)                                  | WLAN     | 8.41  | ± 9.6 % |
| 10430 | AAD | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)                                                | LTE-FDD  | 8.28  | ± 9.6 % |
| 10431 | AAD | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)                                               | LTE-FDD  | 8.38  | ± 9.6 % |
| 10432 | AAC | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)                                               | LTE-FDD  | 8.34  | ± 9.6 % |
| 10433 | AAC | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)                                               | LTE-FDD  | 8.34  | ± 9.6 % |
| 10434 | AAA | W-CDMA (BS Test Model 1, 64 DPCH)                                               | WCDMA    | 8.60  | ± 9.6 % |
| 10435 | AAF | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)                  | LTE-TDD  | 7.82  | ± 9.6 % |
| 10447 | AAD | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)                                  | LTE-FDD  | 7.56  | ± 9.6 % |
| 10448 | AAD | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)                                 | LTE-FDD  | 7.53  | ± 9.6 % |
| 10449 | AAC | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)                                 | LTE-FDD  | 7.51  | ± 9.6 % |
| 10450 | AAC | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)                                 | LTE-FDD  | 7.48  | ± 9.6 % |

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