



# TEST REPORT

## KCTL Inc.

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Report No.:  
KR17-SPF0004-D

Page (1) of (95)

# KCTL

### 1. Client

- Name : Vieworks Co., Ltd.
- Address : 41-3, Burim-ro 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do,  
431-060 Republic of Korea
- Date of Receipt : 2017-01-17

### 2. Use of Report : -

### 3. Name of Product and Model : X-ray Detector

- Host Model Number : FXRD-1417NAW / FXRD-1417NBW
- Module Product Name : 802.11ac Dual Band Module
- Module Model Number : WLE900VX 7AA000S-VW

### 4. Manufacturer and Country of Origin : Vieworks Co., Ltd. / Korea

### 5. FCC ID / IC

- Host model FCC ID / IC : PFRFXRD1417N / 11233A-FXRD1417N
- Module FCC ID / IC : PFRWLE900VXVW / 11233A-WLE900VXVW

### 6. Date of Test : 2017-03-14 to 2017-03-16

### 7. Test method used : IEEE 1528-2013, ANSI/IEEE C95.1, KDB Publication RSS-102 Issue 5:2015

### 8. Test Results : Refer to the test result in the test report

|             |                                                                                                                          |                                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Affirmation | Tested by                                                                                                                | Technical Manager                                                                                                          |
|             | <br>Name : Kyounghoo, Min (Signature) | <br>Name : Cheonsig, Choi (Signature) |

2017-10-19

## KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

## REPORT REVISION HISTORY

| Date       | Revision                         | Page No |
|------------|----------------------------------|---------|
| 2017-07-11 | Originally issued                | -       |
| 2017-07-21 | Change EUT Type                  | 6       |
| 2017-07-24 | Change Normal Voltage            | 6       |
| 2017-10-17 | Added Wi-Fi module's FCC/IC IDs. | 1       |
| 2017-10-19 | Added Test method used           | 1       |
|            |                                  |         |
|            |                                  |         |
|            |                                  |         |
|            |                                  |         |
|            |                                  |         |

Please note: Report KR17-SPF0004-D issued on 2017-10-19 supercedes previously issued report KR17-SPF0004-C issued on 2017-10-17

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## Contents

|                                             |    |
|---------------------------------------------|----|
| 1. Client information.....                  | 4  |
| 2. Laboratory information.....              | 5  |
| 3. Identification of Sample .....           | 6  |
| 4. Test Result Summary .....                | 8  |
| 5. Report Overview.....                     | 9  |
| 6. Test Lab Declaration or Comments.....    | 9  |
| 7. Applicant Declaration or Comments.....   | 9  |
| 8. Measurement Uncertainty.....             | 10 |
| 9. The SAR Measurement System .....         | 14 |
| 10. System Verification .....               | 18 |
| 11. Operation Configurations .....          | 23 |
| 12. SAR Measurement Procedures .....        | 24 |
| 13. Test Equipment Information .....        | 26 |
| 14. RF Average Conducted Output Power ..... | 27 |
| 15. SAR Test Results.....                   | 38 |
| 16. Test System Verification Results .....  | 44 |
| 17. Test Results.....                       | 50 |
| Appendix A. Calibration certificate .....   | 53 |
| Appendix B. EUT Photo.....                  | 88 |
| Appendix C. Test Photo .....                | 91 |

|                                                                                                                                                                                                            |                                                              |                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------|
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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------|

## 1. Client information

**Client:** Vieworks Co., Ltd.

**Address:** 41-3, Burim-ro 170beon-gil, Dongan-gu, Anyang-si,  
Gyeonggi-do, 431-060 Republic of Korea

**Telephone:** +82-70-4496-1860

**Fax:** +82-31-386-8631

**E-mail:** mykwon@vieworks.com

**Contact name:** Hayun ,Kwon

**Manufacturer:** Vieworks Co., Ltd.

**Address:** 41-3, Burim-ro 170beon-gil, Dongan-gu, Anyang-si,  
Gyeonggi-do, 431-060 Republic of Korea

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Report No.:  
KR17-SPF0004-D  
Page (5) of (95)

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## 2. Laboratory information

### Address

**KCTL Inc.**

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea

TEL: 82 31 285 0894 FAX: 82 505 299 8311

### Certificate

KOLAS No.: KT231

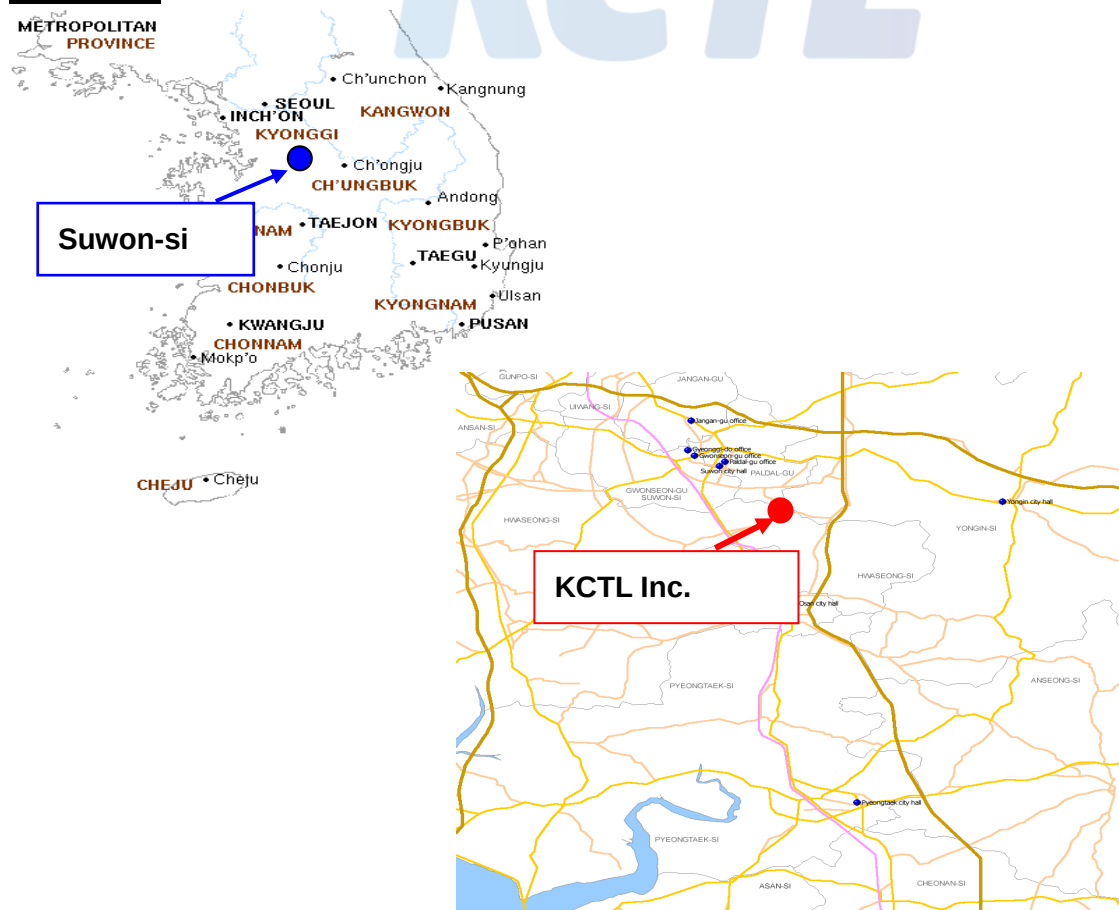
FCC Site Designation No.: KR0040

FCC Site Registration No.: 687132

VCCI Site Registration No.: R-3327, G-198, C-3706, T-1849

IC Site Registration No.: 8035A-2

### SITE MAP



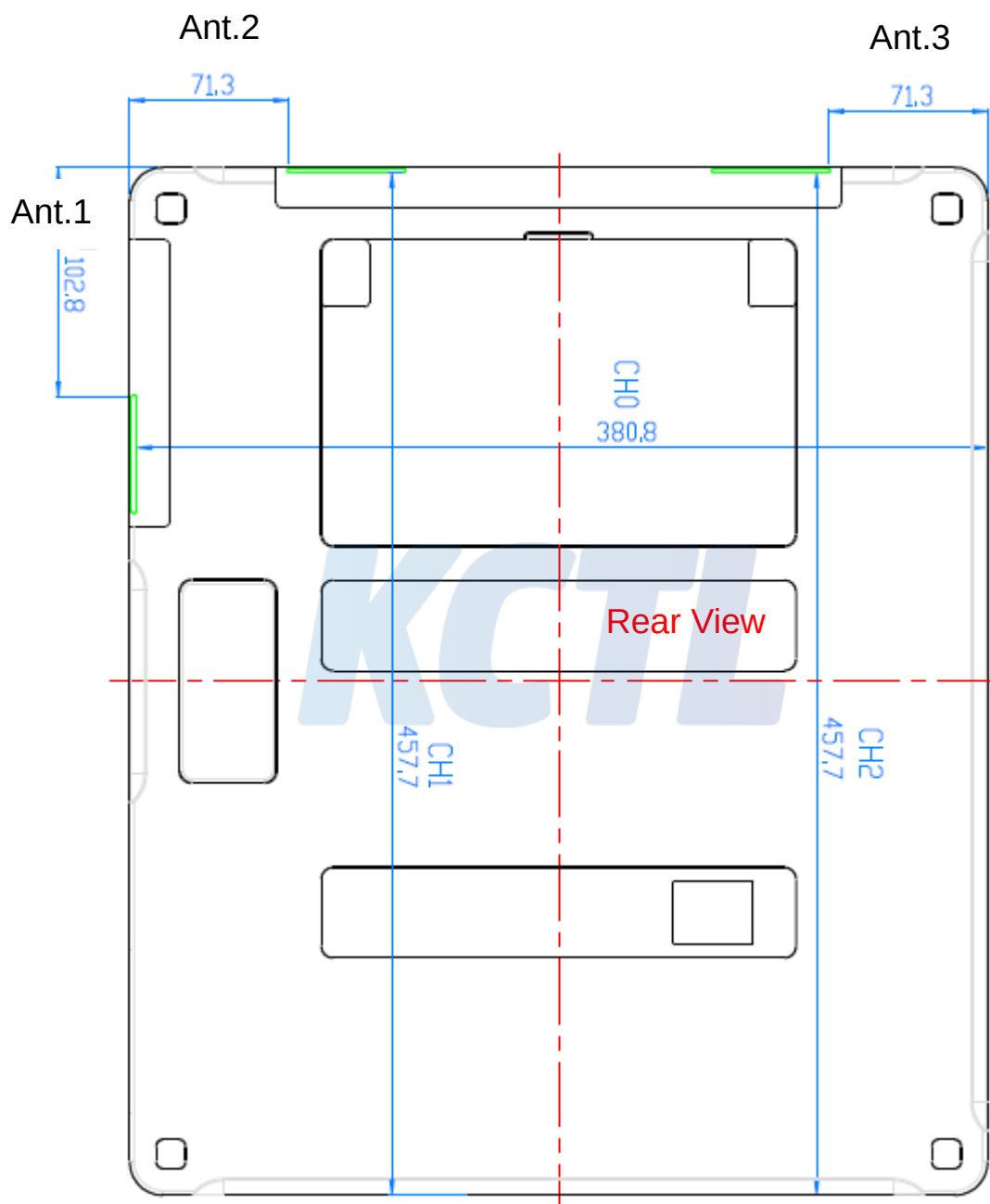
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KCTL-TIA002-004/1

### 3. Identification of Sample

|                   |                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------|
| EUT Type          | X-ray Detector                                                                                                    |
| Brand Name        | Viewworks Co., Ltd.                                                                                               |
| Mode of Operation | WLAN 2.4 GHz / 5 GHz                                                                                              |
| Model Number      | FXRD-1417NAW                                                                                                      |
| Serial Number     | VVDAFA907                                                                                                         |
| Max. Power        | WLAN 2.4 GHz: 20 dBm<br>WLAN 5.2 GHz: 18 dBm<br>WLAN 5.8 GHz: 21 dBm                                              |
| Tx Freq.Range     | WLAN 2.4 GHz: 2 412 MHz ~ 2 462 MHz<br>WLAN 5.2 GHz: 5 180 MHz ~ 5 240 MHz<br>WLAN 5.8 GHz: 5 745 MHz ~ 5 825 MHz |
| Rx Freq.Range     | WLAN 2.4 GHz: 2 412 MHz ~ 2 462 MHz<br>WLAN 5.2 GHz: 5 180 MHz ~ 5 240 MHz<br>WLAN 5.8 GHz: 5 745 MHz ~ 5 825 MHz |
| Antenna Type      | PCB Antenna                                                                                                       |
| Antenna Size      | 43.5 mm x 10 mm                                                                                                   |
| Normal Voltage    | DC 7.6 V                                                                                                          |
| HW Version        | D04                                                                                                               |
| SW Version        | V1.0.0.6TS                                                                                                        |

### 3.1 Antenna Diagram



## 4. Test Result Summary

### 4.1 WLAN 5.2 GHz Head SAR Test Results

| Mode    | Frequency<br>(MHz) | Average<br>Power<br>(dBm) | Max. tune<br>up power<br>(dBm) | EUT<br>Position | Distance<br>(mm) | Measured<br>1 g SAR<br>(W/kg) | Duty Cycle<br>Compensate<br>Factor | Scaling<br>Factor | Scaled<br>1 g SAR<br>(W/kg) | Ant.# | Sum<br>(Ant.<br>1+2+3) |
|---------|--------------------|---------------------------|--------------------------------|-----------------|------------------|-------------------------------|------------------------------------|-------------------|-----------------------------|-------|------------------------|
| 802.11a | 5 200              | 17.82                     | 18.00                          | Front           | 0                | 0.338                         | 1.04                               | 1.042             | <b>0.366</b>                | Ant.1 | <b>0.966</b>           |
|         | 5 200              | 17.61                     | 18.00                          | Front           | 0                | 0.256                         | 1.04                               | 1.094             | 0.291                       | Ant.2 |                        |
|         | 5 200              | 17.62                     | 18.00                          | Front           | 0                | 0.272                         | 1.04                               | 1.091             | 0.309                       | Ant.3 |                        |

#### <Note>

When antennas are spatially separated to the extent that SAR distributions do not overlap and can be treated independently, SAR compliance for simultaneous transmission is determined separately for each individual antenna. In general, when the aggregate SAR from multiple antennas at any location in the combined SAR distribution is either  $\leq 1.2$  W/kg where at least 90% of the SAR is attributed to a single SAR distribution or  $\leq 0.4$  W/kg where no more than one SAR distribution is contributing  $> 0.1$  W/kg, the antennas may be considered spatially separated. The conditions can be established either by inspection or quantitative comparison using interpolated results from area scans to determine that the antennas are spatially separated. Under such circumstances, each transmitting antenna is tested independently, one at a time, according to procedures in this document. Per KDB Publication 447498 D01v06.

|                                                                                                                                                                                             |                                                   |                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>KCTL Inc.</b><br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>Tel : 82-31-285-0894 Fax : 82-505-299-8311<br><a href="http://www.kctl.co.kr">www.kctl.co.kr</a> | Report No.:<br>KR17-SPF0004-D<br>Page (9) of (95) |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|

## 5. Report Overview

This report details the results of testing carried out on the samples listed in section 3, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this test report is used in any configuration other than that detailed in the test report, the manufacturer must ensure the new configuration complies with all relevant standards and certification requirements. Any mention of KCTL Inc. Wireless lab or testing done by KCTL Inc. Wireless lab made in connection with the distribution or use of the tested product must be approved in writing by KCTL Inc. Wireless lab.

## 6. Test Lab Declaration or Comments

None

## 7. Applicant Declaration or Comments

None

## 8. Measurement Uncertainty

All measurements and results are recorded and maintained at the laboratory performing the tests and measurement uncertainties are taken into account when comparing measurements to pass/fail criteria.

### Uncertainty of SAR equipments for measurement 300 MHz to 3 GHz (Head)

**SAR Measurement Uncertainty**

| <i>A</i>                                                                         | <i>b</i>                                           | <i>c</i>                                  | <i>D</i>                    | <i>e = f(d,k)</i> | <i>g</i>    | <i>i = c x g / e</i>                  | <i>k</i>         |
|----------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------|-----------------------------|-------------------|-------------|---------------------------------------|------------------|
| Source of Uncertainty                                                            | Description<br>IEEE P1528<br>HEAD<br>(0.3 ~ 3 GHz) | Tolerance/<br>Uncertainty<br>value<br>± % | Probability<br>Distribution | Div.              | Ci<br>(1 g) | Standard<br>uncertainty<br>± %, (1 g) | Vi<br>or<br>Veff |
| <b>Measurement System</b>                                                        |                                                    |                                           |                             |                   |             |                                       |                  |
| Probe calibration(k=1)                                                           | E.2.1                                              | 6.30                                      | N                           | 1                 | 1           | 6.30                                  | ∞                |
| Axial isotropy                                                                   | E.2.2                                              | 0.50                                      | R                           | 1.73              | 0.71        | 0.20                                  | ∞                |
| Hemispherical isotropy                                                           | E.2.2                                              | 2.60                                      | R                           | 1.73              | 0.71        | 1.06                                  | ∞                |
| Linearity                                                                        | E.2.4                                              | 0.60                                      | R                           | 1.73              | 1           | 0.35                                  | ∞                |
| Boundary effect                                                                  | E.2.3                                              | 1.00                                      | R                           | 1.73              | 1           | 0.58                                  | ∞                |
| System detection limits                                                          | E.2.5                                              | 1.00                                      | R                           | 1.73              | 1           | 0.58                                  | ∞                |
| Readout electronics                                                              | E.2.6                                              | 0.30                                      | N                           | 1                 | 1           | 0.30                                  | ∞                |
| Response time                                                                    | E.2.7                                              | 0.80                                      | R                           | 1.73              | 1           | 0.46                                  | ∞                |
| Integration time                                                                 | E.2.8                                              | 2.60                                      | R                           | 1.73              | 1           | 1.50                                  | ∞                |
| RF ambient conditions—noise                                                      | E.6.1                                              | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| RF ambient conditions—reflections                                                | E.6.1                                              | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| Probe positioner mechanical tolerance                                            | E.6.2                                              | 0.40                                      | R                           | 1.73              | 1           | 0.23                                  | ∞                |
| Probe positioning with respect to phantom shell                                  | E.6.3                                              | 2.90                                      | R                           | 1.73              | 1           | 1.67                                  | ∞                |
| Extrapolation, interpolation, and integration algorithms for max. SAR evaluation | E.5                                                | 2.00                                      | R                           | 1.73              | 1           | 1.15                                  | ∞                |
| <b>Test Sample Related</b>                                                       |                                                    |                                           |                             |                   |             |                                       |                  |
| Test sample positioning                                                          | E.4.2                                              | 4.71                                      | N                           | 1                 | 1           | 4.71                                  | 9                |
| Device holder uncertainty                                                        | E.4.1                                              | 3.60                                      | N                           | 1                 | 1           | 3.60                                  | 5                |
| Output power variation—SAR drift measurement                                     | 6.6.2                                              | 5.00                                      | R                           | 1.73              | 1           | 2.89                                  | ∞                |
| <b>Phantom and Tissue Parameters</b>                                             |                                                    |                                           |                             |                   |             |                                       |                  |
| Phantom uncertainty (shape and thickness tolerances)                             | E.3.1                                              | 6.10                                      | R                           | 1.73              | 1           | 3.52                                  | ∞                |
| Liquid conductivity-measurement uncertainty                                      | E.3.3                                              | 1.53                                      | N                           | 1                 | 0.64        | 0.98                                  | 5                |
| Liquid permittivity-measurement uncertainty                                      | E.3.3                                              | 3.07                                      | N                           | 1                 | 0.6         | 1.84                                  | 5                |
| Liquid conductivity-deviation from target values                                 | E.3.2                                              | 5.00                                      | R                           | 1.73              | 0.64        | 1.85                                  | ∞                |
| Liquid permittivity-deviation from target values                                 | E.3.2                                              | 5.00                                      | R                           | 1.73              | 0.6         | 1.73                                  | ∞                |
| Combined standard uncertainty                                                    |                                                    |                                           |                             | RSS               |             | 11.00                                 | 165              |
| Expanded uncertainty (95% CONFIDENCE INTERVAL)                                   |                                                    |                                           |                             | K=2               |             | 22.00                                 |                  |

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Report No.:  
KR17-SPF0004-D  
Page (11) of (95)

**KCTL****Uncertainty of SAR equipments for measurement 3 GHz to 6 GHz(Head)****SAR Measurement Uncertainty**

| <i>A</i>                                                                         | <i>b</i>                                         | <i>c</i>                                  | <i>D</i>                    | <i>e = f(d,k)</i> | <i>g</i>    | <i>i = c x g / e</i>                  | <i>k</i>         |
|----------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------|-----------------------------|-------------------|-------------|---------------------------------------|------------------|
| Source of Uncertainty                                                            | Description<br>IEEE P1528<br>HEAD<br>(3 ~ 6 GHz) | Tolerance/<br>Uncertainty<br>value<br>± % | Probability<br>Distribution | Div.              | Ci<br>(1 g) | Standard<br>uncertainty<br>± %, (1 g) | Vi<br>or<br>Veff |
| <b>Measurement System</b>                                                        |                                                  |                                           |                             |                   |             |                                       |                  |
| Probe calibration(k=1)                                                           | E.2.1                                            | 6.30                                      | N                           | 1                 | 1           | 6.30                                  | ∞                |
| Axial isotropy                                                                   | E.2.2                                            | 0.50                                      | R                           | 1.73              | 0.71        | 0.20                                  | ∞                |
| Hemispherical isotropy                                                           | E.2.2                                            | 2.60                                      | R                           | 1.73              | 0.71        | 1.06                                  | ∞                |
| Linearity                                                                        | E.2.4                                            | 0.60                                      | R                           | 1.73              | 1           | 0.35                                  | ∞                |
| Boundary effect                                                                  | E.2.3                                            | 2.00                                      | R                           | 1.73              | 1           | 1.15                                  | ∞                |
| System detection limits                                                          | E.2.5                                            | 1.00                                      | R                           | 1.73              | 1           | 0.58                                  | ∞                |
| Readout electronics                                                              | E.2.6                                            | 0.30                                      | N                           | 1                 | 1           | 0.30                                  | ∞                |
| Response time                                                                    | E.2.7                                            | 0.80                                      | R                           | 1.73              | 1           | 0.46                                  | ∞                |
| Integration time                                                                 | E.2.8                                            | 2.60                                      | R                           | 1.73              | 1           | 1.50                                  | ∞                |
| RF ambient conditions-noise                                                      | E.6.1                                            | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| RF ambient conditions-reflections                                                | E.6.1                                            | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| Probe positioner mechanical tolerance                                            | E.6.2                                            | 0.80                                      | R                           | 1.73              | 1           | 0.46                                  | ∞                |
| Probe positioning with respect to phantom shell                                  | E.6.3                                            | 6.70                                      | R                           | 1.73              | 1           | 3.87                                  | ∞                |
| Extrapolation, interpolation, and integration algorithms for max. SAR evaluation | E.5                                              | 4.00                                      | R                           | 1.73              | 1           | 2.31                                  | ∞                |
| <b>Test Sample Related</b>                                                       |                                                  |                                           |                             |                   |             |                                       |                  |
| Test sample positioning                                                          | E.4.2                                            | 4.63                                      | N                           | 1                 | 1           | 4.63                                  | 9                |
| Device holder uncertainty                                                        | E.4.1                                            | 3.60                                      | N                           | 1                 | 1           | 3.60                                  | 5                |
| Output power variation—SAR drift measurement                                     | 6.6.2                                            | 5.00                                      | R                           | 1.73              | 1           | 2.89                                  | ∞                |
| <b>Phantom and Tissue Parameters</b>                                             |                                                  |                                           |                             |                   |             |                                       |                  |
| Phantom uncertainty (shape and thickness tolerances)                             | E.3.1                                            | 6.60                                      | R                           | 1.73              | 1           | 3.81                                  | ∞                |
| Liquid conductivity-measurement uncertainty                                      | E.3.3                                            | 1.50                                      | N                           | 1                 | 0.64        | 0.96                                  | 5                |
| Liquid permittivity-measurement uncertainty                                      | E.3.3                                            | 2.23                                      | N                           | 1                 | 0.6         | 1.34                                  | 5                |
| Liquid conductivity-deviation from target values                                 | E.3.2                                            | 5.00                                      | R                           | 1.73              | 0.64        | 1.85                                  | ∞                |
| Liquid permittivity-deviation from target values                                 | E.3.2                                            | 5.00                                      | R                           | 1.73              | 0.6         | 1.73                                  | ∞                |
| Combined standard uncertainty                                                    |                                                  |                                           |                             | RSS               |             | 11.75                                 | 225              |
| Expanded uncertainty (95% CONFIDENCE INTERVAL)                                   |                                                  |                                           |                             | K=2               |             | 23.50                                 |                  |

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Report No.:  
KR17-SPF0004-D  
Page (12) of (95)

**KCTL****Uncertainty of SAR equipments for measurement 300 MHz to 3 GHz (Body)****SAR Measurement Uncertainty**

| <i>A</i>                                                                               | <i>b</i>                                           | <i>c</i>                                  | <i>D</i>                    | <i>e = f(d,k)</i> | <i>g</i>    | <i>i = c x g / e</i>                  | <i>k</i>         |
|----------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------|-----------------------------|-------------------|-------------|---------------------------------------|------------------|
| Source of Uncertainty                                                                  | Description<br>IEEE P1528<br>BODY<br>(0.3 ~ 3 GHz) | Tolerance/<br>Uncertainty<br>value<br>± % | Probability<br>Distribution | Div.              | Ci<br>(1 g) | Standard<br>uncertainty<br>± %, (1 g) | Vi<br>or<br>Veff |
| <b>Measurement System</b>                                                              |                                                    |                                           |                             |                   |             |                                       |                  |
| Probe calibration(k=1)                                                                 | E.2.1                                              | 6.30                                      | N                           | 1                 | 1           | 6.30                                  | ∞                |
| Axial isotropy                                                                         | E.2.2                                              | 0.50                                      | R                           | 1.73              | 0.71        | 0.20                                  | ∞                |
| Hemispherical isotropy                                                                 | E.2.2                                              | 2.60                                      | R                           | 1.73              | 0.71        | 1.06                                  | ∞                |
| Linearity                                                                              | E.2.4                                              | 0.60                                      | R                           | 1.73              | 1           | 0.35                                  | ∞                |
| Boundary effect                                                                        | E.2.3                                              | 1.00                                      | R                           | 1.73              | 1           | 0.58                                  | ∞                |
| System detection limits                                                                | E.2.5                                              | 1.00                                      | R                           | 1.73              | 1           | 0.58                                  | ∞                |
| Readout electronics                                                                    | E.2.6                                              | 0.30                                      | N                           | 1                 | 1           | 0.30                                  | ∞                |
| Response time                                                                          | E.2.7                                              | 0.80                                      | R                           | 1.73              | 1           | 0.46                                  | ∞                |
| Integration time                                                                       | E.2.8                                              | 2.60                                      | R                           | 1.73              | 1           | 1.50                                  | ∞                |
| RF ambient conditions—noise                                                            | E.6.1                                              | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| RF ambient conditions—<br>reflections                                                  | E.6.1                                              | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| Probe positioner mechanical<br>tolerance                                               | E.6.2                                              | 0.40                                      | R                           | 1.73              | 1           | 0.23                                  | ∞                |
| Probe positioning with respect to<br>phantom shell                                     | E.6.3                                              | 2.90                                      | R                           | 1.73              | 1           | 1.67                                  | ∞                |
| Extrapolation, interpolation, and<br>integration algorithms for max.<br>SAR evaluation | E.5                                                | 2.00                                      | R                           | 1.73              | 1           | 1.15                                  | ∞                |
| <b>Test Sample Related</b>                                                             |                                                    |                                           |                             |                   |             |                                       |                  |
| Test sample positioning                                                                | E.4.2                                              | 4.71                                      | N                           | 1                 | 1           | 4.71                                  | 9                |
| Device holder uncertainty                                                              | E.4.1                                              | 3.60                                      | N                           | 1                 | 1           | 3.60                                  | 5                |
| Output power variation—SAR<br>drift measurement                                        | 6.6.2                                              | 5.00                                      | R                           | 1.73              | 1           | 2.89                                  | ∞                |
| <b>Phantom and Tissue Parameters</b>                                                   |                                                    |                                           |                             |                   |             |                                       |                  |
| Phantom uncertainty<br>(shape and thickness tolerances)                                | E.3.1                                              | 7.50                                      | R                           | 1.73              | 1           | 4.33                                  | ∞                |
| Liquid conductivity-measurement<br>uncertainty                                         | E.3.3                                              | 1.53                                      | N                           | 1                 | 0.64        | 0.98                                  | 5                |
| Liquid permittivity-measurement<br>uncertainty                                         | E.3.3                                              | 3.07                                      | N                           | 1                 | 0.6         | 1.84                                  | 5                |
| Liquid conductivity-deviation<br>from target values                                    | E.3.2                                              | 5.00                                      | R                           | 1.73              | 0.64        | 1.85                                  | ∞                |
| Liquid permittivity-deviation<br>from target values                                    | E.3.2                                              | 5.00                                      | R                           | 1.73              | 0.6         | 1.73                                  | ∞                |
| Combined standard uncertainty                                                          |                                                    |                                           |                             | RSS               |             | 11.29                                 | 183              |
| Expanded uncertainty<br>(95% CONFIDENCE<br>INTERVAL)                                   |                                                    |                                           |                             | K=2               |             | 22.57                                 |                  |

**KCTL Inc.**

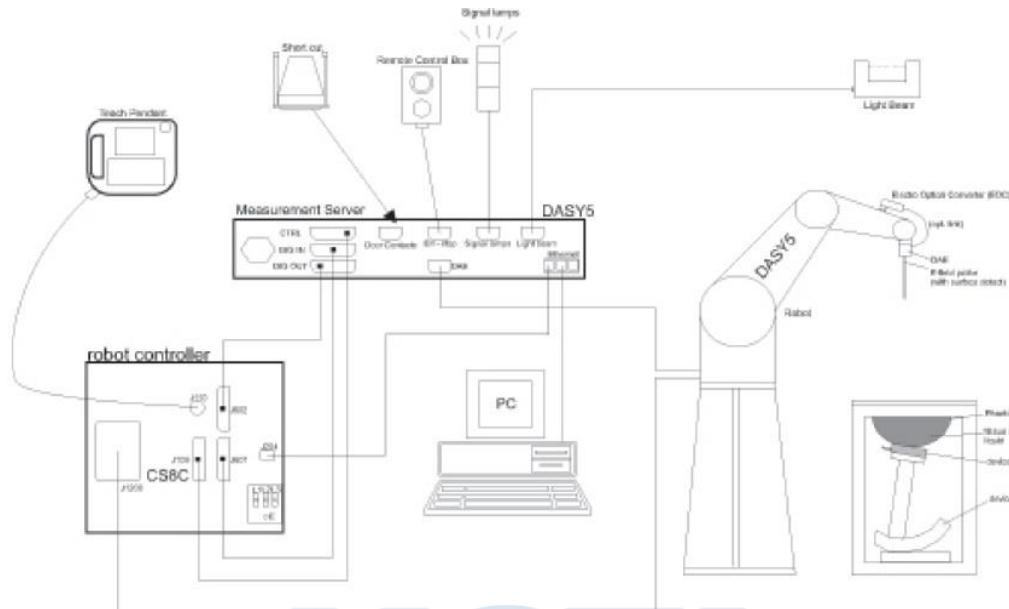
65, Sinwon-ro, Yeongtong-gu,  
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Report No.:  
KR17-SPF0004-D  
Page (13) of (95)

**KCTL****Uncertainty of SAR equipments for measurement 3 GHz to 6 GHz (Body)****SAR Measurement Uncertainty**

| <i>A</i>                                                                               | <i>b</i>                                         | <i>c</i>                                  | <i>D</i>                    | <i>e = f(d,k)</i> | <i>g</i>    | <i>i = c x g / e</i>                  | <i>k</i>         |
|----------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------|-----------------------------|-------------------|-------------|---------------------------------------|------------------|
| Source of Uncertainty                                                                  | Description<br>IEEE P1528<br>BODY<br>(3 ~ 6 GHz) | Tolerance/<br>Uncertainty<br>value<br>± % | Probability<br>Distribution | Div.              | Ci<br>(1 g) | Standard<br>uncertainty<br>± %, (1 g) | Vi<br>or<br>Veff |
| <b>Measurement System</b>                                                              |                                                  |                                           |                             |                   |             |                                       |                  |
| Probe calibration(k=1)                                                                 | E.2.1                                            | 6.30                                      | N                           | 1                 | 1           | 6.30                                  | ∞                |
| Axial isotropy                                                                         | E.2.2                                            | 0.50                                      | R                           | 1.73              | 0.71        | 0.20                                  | ∞                |
| Hemispherical isotropy                                                                 | E.2.2                                            | 2.60                                      | R                           | 1.73              | 0.71        | 1.06                                  | ∞                |
| Linearity                                                                              | E.2.4                                            | 0.60                                      | R                           | 1.73              | 1           | 0.35                                  | ∞                |
| Boundary effect                                                                        | E.2.3                                            | 2.00                                      | R                           | 1.73              | 1           | 1.15                                  | ∞                |
| System detection limits                                                                | E.2.5                                            | 1.00                                      | R                           | 1.73              | 1           | 0.58                                  | ∞                |
| Readout electronics                                                                    | E.2.6                                            | 0.30                                      | N                           | 1                 | 1           | 0.30                                  | ∞                |
| Response time                                                                          | E.2.7                                            | 0.80                                      | R                           | 1.73              | 1           | 0.46                                  | ∞                |
| Integration time                                                                       | E.2.8                                            | 2.60                                      | R                           | 1.73              | 1           | 1.50                                  | ∞                |
| RF ambient conditions—noise                                                            | E.6.1                                            | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| RF ambient conditions—<br>reflections                                                  | E.6.1                                            | 3.00                                      | R                           | 1.73              | 1           | 1.73                                  | ∞                |
| Probe positioner mechanical<br>tolerance                                               | E.6.2                                            | 0.80                                      | R                           | 1.73              | 1           | 0.46                                  | ∞                |
| Probe positioning with respect to<br>phantom shell                                     | E.6.3                                            | 6.70                                      | R                           | 1.73              | 1           | 3.87                                  | ∞                |
| Extrapolation, interpolation, and<br>integration algorithms for max.<br>SAR evaluation | E.5                                              | 4.00                                      | R                           | 1.73              | 1           | 2.31                                  | ∞                |
| <b>Test Sample Related</b>                                                             |                                                  |                                           |                             |                   |             |                                       |                  |
| Test sample positioning                                                                | E.4.2                                            | 4.63                                      | N                           | 1                 | 1           | 4.63                                  | 9                |
| Device holder uncertainty                                                              | E.4.1                                            | 3.60                                      | N                           | 1                 | 1           | 3.60                                  | 5                |
| Output power variation—SAR<br>drift measurement                                        | 6.6.2                                            | 5.00                                      | R                           | 1.73              | 1           | 2.89                                  | ∞                |
| <b>Phantom and Tissue Parameters</b>                                                   |                                                  |                                           |                             |                   |             |                                       |                  |
| Phantom uncertainty<br>(shape and thickness tolerances)                                | E.3.1                                            | 7.90                                      | R                           | 1.73              | 1           | 4.56                                  | ∞                |
| Liquid conductivity-measurement<br>uncertainty                                         | E.3.3                                            | 1.50                                      | N                           | 1                 | 0.64        | 0.96                                  | 5                |
| Liquid permittivity-measurement<br>uncertainty                                         | E.3.3                                            | 2.23                                      | N                           | 1                 | 0.6         | 1.34                                  | 5                |
| Liquid conductivity-deviation<br>from target values                                    | E.3.2                                            | 5.00                                      | R                           | 1.73              | 0.64        | 1.85                                  | ∞                |
| Liquid permittivity-deviation<br>from target values                                    | E.3.2                                            | 5.00                                      | R                           | 1.73              | 0.6         | 1.73                                  | ∞                |
| Combined standard uncertainty                                                          |                                                  |                                           |                             | RSS               |             | 12.02                                 | 246              |
| Expanded uncertainty<br>(95% CONFIDENCE<br>INTERVAL)                                   |                                                  |                                           |                             | K=2               |             | 24.03                                 |                  |

## 9. The SAR Measurement System



### <SAR System Configuration>

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

## 9.1 Isotropic E-field Probe

| <b>ES3DV3</b><br><b>Isotropic E-Field Probe for Dosimetric Measurements</b>       |                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Symmetrical design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| Calibration                                                                       | ISO/IEC 17025 <a href="#">calibration service</a> available.                                                                                                                       |
| Frequency                                                                         | 10 MHz to 4 GHz;<br>Linearity: $\pm 0.2$ dB (30 MHz to 4 GHz)                                                                                                                      |
| Directivity                                                                       | $\pm 0.2$ dB in TSL (rotation around probe axis)<br>$\pm 0.3$ dB in TSL (rotation normal to probe axis)                                                                            |
| Dynamic Range                                                                     | 5 $\mu$ W/g to > 100 mW/g;<br>Linearity: $\pm 0.2$ dB                                                                                                                              |
| Dimensions                                                                        | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 3.9 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.0 mm                                                     |
| Application                                                                       | General dosimetry up to 4 GHz<br>Dosimetry in strong gradient fields<br>Compliance tests of mobile phones                                                                          |
| Compatibility                                                                     | DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI                                                                                                                                     |

| <b>EX3DV4</b><br><b>Smallest Isotropic E-Field Probe for Dosimetric Measurements</b><br><b>(Preliminary Specifications)</b> |                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                          | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE)                                                   |
| Calibration                                                                                                                 | ISO/IEC 17025 <a href="#">calibration service</a> available.                                                                                                                                                  |
| Frequency                                                                                                                   | 10 MHz to > 6 GHz<br>Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)                                                                                                                                                |
| Directivity                                                                                                                 | $\pm 0.3$ dB in TSL (rotation around probe axis)<br>$\pm 0.5$ dB in TSL (rotation normal to probe axis)                                                                                                       |
| Dynamic Range                                                                                                               | 10 $\mu$ W/g to > 100 mW/g<br>Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)                                                                                                                        |
| Dimensions                                                                                                                  | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm                                                                          |
| Application                                                                                                                 | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%. |
| Compatibility                                                                                                               | DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI                                                                                                                                                                |

## 9.2 Phantom

| Twin SAM                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>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.</p> <p>Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.</p> |
| Material                                                                          | Vinylester, glass fiber reinforced (VE-GF)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Liquid Compatibility                                                              | Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Shell Thickness                                                                   | 2 ± 0.2 mm (6 ± 0.2 mm at ear point)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Dimensions<br>(incl. Wooden Support)                                              | Length: 1000 mm<br>Width: 500 mm<br>Height: adjustable feet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Filling Volume                                                                    | approx. 25 liters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Wooden Support                                                                    | SPEAG standard phantom table                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Accessories                                                                       | <a href="#">Mounting Device and Adaptors</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| ELI                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.</p> <p>ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure. ELI V6.0, released in August 2014, has the same shell geometry as ELI4 but offers increased longterm stability.</p> |
| Material                                                                            | Vinylester, glass fiber reinforced (VE-GF)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Liquid Compatibility                                                                | Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Shell Thickness                                                                     | 2.0 ± 0.2 mm (bottom plate)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Dimensions                                                                          | Major axis: 600 mm<br>Minor axis: 400 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Filling Volume                                                                      | approx. 30 liters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Wooden Support                                                                      | SPEAG standard phantom table                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Accessories                                                                         | <a href="#">Mounting Device and Adaptors</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### 9.3 Device Holder for Transmitters

#### Mounting Devices and Adaptors



Mounting Device for Hand-Held Transmitters

##### MD4HHTV5 - Mounting Device for Hand-Held Transmitters

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

**Material:** Polyoxymethylene (POM)



Mounting Device for Laptops

##### MD4LAPV5 - Mounting Device for Laptops and other Body-Worn Transmitters

In combination with the Twin SAM V5.0/V5.0c or ELI Phantoms, the Mounting Device (Body-Worn) enables testing of transmitter devices according to IEC 62209-2 specifications. The device holder can be locked for positioning at flat phantom section.

**Material:** Polyoxymethylene (POM), PET-G, Foam

## 10. System Verification

### 10.1 Tissue Verification

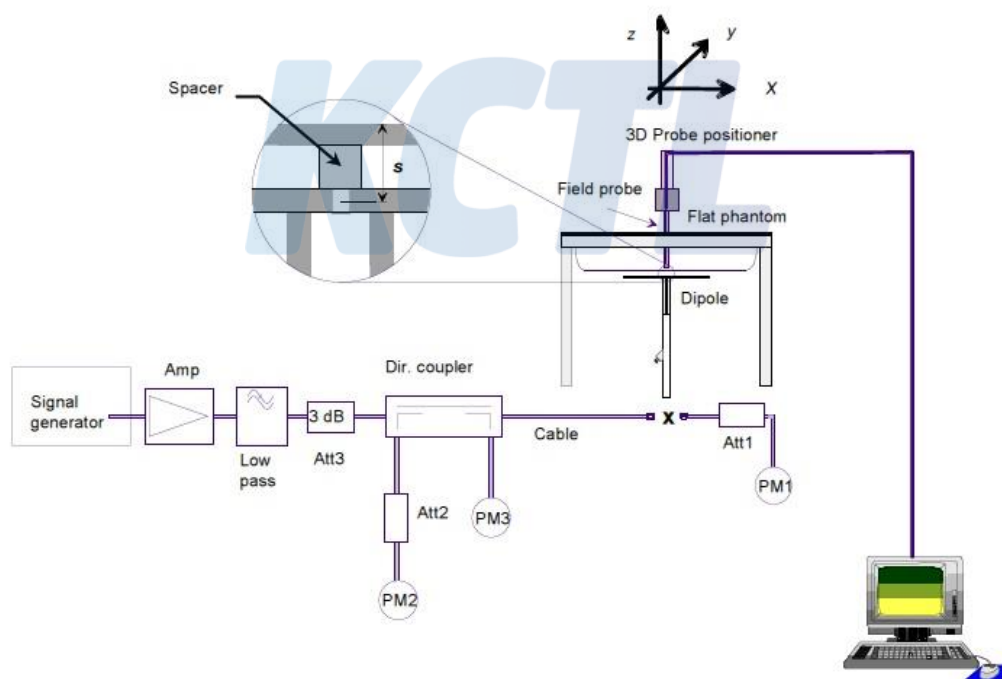
The dielectric properties for this Tissue Simulant Liquids were measured by using the SPEAG Model DAK3.5 Dielectric Probe in conjunction with Agilent E5071B Network Analyzer (300 kHz – 8 500 MHz). The Conductivity ( $\sigma$ ) and Permittivity ( $\rho$ ) are listed in Table 1. For the SAR measurement given in this report. The temperature variation of the Tissue Simulant Liquids was  $(22 \pm 2) ^\circ\text{C}$ .

| Freq.<br>(MHz) | Tissue<br>Type | Limit/Measured       | Permittivity ( $\rho$ )             | Conductivity ( $\sigma$ )        | Temp<br>( $^\circ\text{C}$ ) |
|----------------|----------------|----------------------|-------------------------------------|----------------------------------|------------------------------|
| 2 450          | HSL            | Recommended Limit    | $39.20 \pm 5 \%$<br>(37.24 ~ 41.16) | $1.80 \pm 5 \%$<br>(1.71 ~ 1.89) | $22 \pm 2$                   |
|                |                | Measured, 2017-03-16 | 39.08                               | 1.82                             | 21.22                        |
| 2 450          | MSL            | Recommended Limit    | $52.70 \pm 5 \%$<br>(50.07 ~ 55.34) | $1.95 \pm 5 \%$<br>(1.85 ~ 2.05) | $22 \pm 2$                   |
|                |                | Measured, 2017-03-15 | 52.16                               | 2.00                             | 21.28                        |
| 5 200          | HSL            | Recommended Limit    | $36.00 \pm 5 \%$<br>(34.20 ~ 37.80) | $4.66 \pm 5 \%$<br>(4.43 ~ 4.89) | $22 \pm 2$                   |
|                |                | Measured, 2017-03-14 | 36.85                               | 4.79                             | 21.96                        |
| 5 200          | MSL            | Recommended Limit    | $49.01 \pm 5 \%$<br>(46.56 ~ 51.46) | $5.30 \pm 5 \%$<br>(5.04 ~ 5.57) | $22 \pm 2$                   |
|                |                | Measured, 2017-03-15 | 48.94                               | 5.10                             | 21.56                        |
| 5 800          | HSL            | Recommended Limit    | $35.30 \pm 5 \%$<br>(33.54 ~ 37.07) | $5.27 \pm 5 \%$<br>(5.01 ~ 5.53) | $22 \pm 2$                   |
|                |                | Measured, 2017-03-14 | 34.48                               | 5.39                             | 21.96                        |
| 5 800          | MSL            | Recommended Limit    | $48.20 \pm 5 \%$<br>(45.79 ~ 50.61) | $6.00 \pm 5 \%$<br>(5.70 ~ 6.30) | $22 \pm 2$                   |
|                |                | Measured, 2017-03-15 | 47.73                               | 6.04                             | 21.56                        |

<Table 1. Measurement result of Tissue electric parameters>

## 10.2 Test System Verification

The microwave circuit arrangement for system verification is sketched below picture. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within  $\pm 10\%$  from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the Table 2. During the tests, the ambient temperature of the laboratory was in the range  $(22 \pm 2) ^\circ\text{C}$ , the relative humidity was in the range  $(50 \pm 20)\%$  and the liquid depth above the ear/grid reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



|                                                                                                                                                                                             |                                                    |                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------|
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| Validation<br>Kit | Dipole Ant.<br>S/N | Frequency<br>(MHz) | Tissue<br>Type | Limit/Measurement (Normalized to 1 W) |                                 |
|-------------------|--------------------|--------------------|----------------|---------------------------------------|---------------------------------|
|                   |                    |                    |                |                                       | 1 g                             |
| D2450V2           | 895                | 2 450              | HSL            | Recommended Limit<br>(Normalized)     | 52.00 ± 10 %<br>(46.80 ~ 57.20) |
|                   |                    |                    |                | Measured, 2017-03-16                  | 53.60                           |
| D2450V2           | 895                | 2 450              | MSL            | Recommended Limit<br>(Normalized)     | 50.80 ± 10 %<br>(45.72 ~ 55.88) |
|                   |                    |                    |                | Measured, 2017-03-15                  | 51.20                           |
| D5GHzV2           | 1134               | 5 200              | HSL            | Recommended Limit<br>(Normalized)     | 76.90 ± 10 %<br>(69.21 ~ 84.59) |
|                   |                    |                    |                | Measured, 2017-03-14                  | 80.40                           |
| D5GHzV2           | 1134               | 5 200              | MSL            | Recommended Limit<br>(Normalized)     | 74.80 ± 10 %<br>(67.32 ~ 82.28) |
|                   |                    |                    |                | Measured, 2017-03-15                  | 76.40                           |
| D5GHzV2           | 1134               | 5 800              | HSL            | Recommended Limit<br>(Normalized)     | 77.70 ± 10 %<br>(69.93 ~ 85.47) |
|                   |                    |                    |                | Measured, 2017-03-14                  | 80.90                           |
| D5GHzV2           | 1134               | 5 800              | MSL            | Recommended Limit<br>(Normalized)     | 76.70 ± 10 %<br>(69.03 ~ 84.37) |
|                   |                    |                    |                | Measured, 2017-03-15                  | 75.70                           |

<Table 2. Test System Verification Result>

### 10.3 Justification for Extended SAR Dipole Calibrations

Instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements

KDB 865664 D01v01r04 requirements

a ) return loss : < - 20 dB, within 20 % of previous measurement

b ) impedance : within 5Ω from previous measurement.

#### 5 200 MHz

| Dipole Antenna     | Head/Body | Date of Measurement | Return Loss (dB) | Δ % | Impedance (Ω) | Δ Ω |
|--------------------|-----------|---------------------|------------------|-----|---------------|-----|
| D5GHzV2<br>SN 1134 | Head      | 2015. 05. 22        | -20.2            | 3.0 | 47.9          | 0.9 |
|                    |           | 2016. 05. 13        | -20.8            |     | 47.0          |     |

| Dipole Antenna     | Head/Body | Date of Measurement | Return Loss (dB) | Δ % | Impedance (Ω) | Δ Ω |
|--------------------|-----------|---------------------|------------------|-----|---------------|-----|
| D5GHzV2<br>SN 1134 | Body      | 2015. 05. 22        | -21.8            | 5.5 | 48.0          | 1.7 |
|                    |           | 2016. 05. 13        | -20.6            |     | 49.7          |     |

#### 5 800 MHz

| Dipole Antenna     | Head/Body | Date of Measurement | Return Loss (dB) | Δ % | Impedance (Ω) | Δ Ω |
|--------------------|-----------|---------------------|------------------|-----|---------------|-----|
| D5GHzV2<br>SN 1134 | Head      | 2015. 05. 22        | -23.3            | 6.9 | 55.3          | 0.3 |
|                    |           | 2016. 05. 13        | -21.7            |     | 55.6          |     |

| Dipole Antenna     | Head/Body | Date of Measurement | Return Loss (dB) | Δ % | Impedance (Ω) | Δ Ω |
|--------------------|-----------|---------------------|------------------|-----|---------------|-----|
| D5GHzV2<br>SN 1134 | Body      | 2015. 05. 22        | -23.7            | 8.4 | 55.9          | 3.1 |
|                    |           | 2016. 05. 13        | -21.7            |     | 52.8          |     |

c) extrapolated peak SAR : within 15% of that reported in the calibration data

**5 200 MHz**

| Dipole Antenna     | Head/Body | Date of Measurement | extrapolated peak SAR (W/kg) | Δ %  |
|--------------------|-----------|---------------------|------------------------------|------|
| D5GHzV2<br>SN 1134 | Head      | 2015. 05. 22        | 27.9                         | 14.0 |
|                    |           | 2016. 10. 18        | 31.8                         |      |

| Dipole Antenna     | Head/Body | Date of Measurement | extrapolated peak SAR (W/kg) | Δ % |
|--------------------|-----------|---------------------|------------------------------|-----|
| D5GHzV2<br>SN 1134 | Body      | 2015. 05. 22        | 29.5                         | 2.7 |
|                    |           | 2016. 10. 19        | 30.3                         |     |

**5 800 MHz**

| Dipole Antenna     | Head/Body | Date of Measurement | extrapolated peak SAR (W/kg) | Δ % |
|--------------------|-----------|---------------------|------------------------------|-----|
| D5GHzV2<br>SN 1134 | Head      | 2015. 05. 22        | 32.1                         | 7.8 |
|                    |           | 2016. 10. 17        | 34.6                         |     |

| Dipole Antenna     | Head/Body | Date of Measurement | extrapolated peak SAR (W/kg) | Δ %  |
|--------------------|-----------|---------------------|------------------------------|------|
| D5GHzV2<br>SN 1134 | Body      | 2015. 05. 22        | 35.6                         | 11.2 |
|                    |           | 2016. 10. 20        | 31.6                         |      |

|                                                                                                                                                                                             |                                                    |                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------|
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## 11. Operation Configurations

Measurements were performed at the middle channel of the operating band. All the tests were done at the maximum power level of EUT which is connected to power supply.

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## 12. SAR Measurement Procedures

### Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensor to surface is 2 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.

### Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04.

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

### Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures 5x5x7 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04.

|                                                                                                                                                                                                                                                                                                                                               |                                           |                                                                                             | $\leq 3 \text{ GHz}$                                                                | $> 3 \text{ GHz}$                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$                                                                                                                                                                                                                                                        |                                           |                                                                                             | $\leq 2 \text{ GHz}: \leq 8 \text{ mm}$<br>$2 - 3 \text{ GHz}: \leq 5 \text{ mm}^*$ | $3 - 4 \text{ GHz}: \leq 5 \text{ mm}^*$<br>$4 - 6 \text{ GHz}: \leq 4 \text{ mm}^*$                                          |
| Maximum zoom scan spatial resolution, normal to phantom surface                                                                                                                                                                                                                                                                               | uniform grid: $\Delta z_{\text{Zoom}}(n)$ |                                                                                             | $\leq 5 \text{ mm}$                                                                 | $3 - 4 \text{ GHz}: \leq 4 \text{ mm}$<br>$4 - 5 \text{ GHz}: \leq 3 \text{ mm}$<br>$5 - 6 \text{ GHz}: \leq 2 \text{ mm}$    |
|                                                                                                                                                                                                                                                                                                                                               | graded grid                               | $\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface | $\leq 4 \text{ mm}$                                                                 | $3 - 4 \text{ GHz}: \leq 3 \text{ mm}$<br>$4 - 5 \text{ GHz}: \leq 2.5 \text{ mm}$<br>$5 - 6 \text{ GHz}: \leq 2 \text{ mm}$  |
|                                                                                                                                                                                                                                                                                                                                               |                                           | $\Delta z_{\text{Zoom}}(n>1)$ : between subsequent points                                   | $\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$                                        |                                                                                                                               |
| Minimum zoom scan volume                                                                                                                                                                                                                                                                                                                      | x, y, z                                   |                                                                                             | $\geq 30 \text{ mm}$                                                                | $3 - 4 \text{ GHz}: \geq 28 \text{ mm}$<br>$4 - 5 \text{ GHz}: \geq 25 \text{ mm}$<br>$5 - 6 \text{ GHz}: \geq 22 \text{ mm}$ |
| Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.                                                                                                                                                                                             |                                           |                                                                                             |                                                                                     |                                                                                                                               |
| * When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4 \text{ W/kg}$ , $\leq 8 \text{ mm}$ , $\leq 7 \text{ mm}$ and $\leq 5 \text{ mm}$ zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz. |                                           |                                                                                             |                                                                                     |                                                                                                                               |

### Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

### Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

\* Z Scan Report on Liquid Measure the height Annex C Liquid Depth photo to replace

### 13. Test Equipment Information

|                            |                                                               |                 |                     |                              |
|----------------------------|---------------------------------------------------------------|-----------------|---------------------|------------------------------|
| Test Platform              | SPEAG DASY5 System                                            |                 |                     |                              |
| Version                    | DASY5 : Version 52.8.8.1222 / SEMCAD : Version 14.6.10 (7331) |                 |                     |                              |
| Location                   | KCTL Inc.                                                     |                 |                     |                              |
| Manufacture                | SPEAG                                                         |                 |                     |                              |
| Hardware Reference         |                                                               |                 |                     |                              |
| Equipment                  | Model                                                         | Serial Number   | Date of Calibration | Due date of next Calibration |
| Shield Room                | Shield Room                                                   | 8F - #2         | N/A                 | N/A                          |
| DASY5 Robot                | TX90XL Speag                                                  | F12/5L7FA1/A/01 | N/A                 | N/A                          |
| DASY5 Controller           | TX90XL Speag                                                  | F12/5L7FA1/C/01 | N/A                 | N/A                          |
| Phantom                    | 2mm Oval Phantom ELI 5                                        | 1178            | N/A                 | N/A                          |
| Mounting Device            | Mounting Device                                               | None            | N/A                 | N/A                          |
| DAE                        | DAE4                                                          | 1342            | 2016-07-26          | 2017-07-26                   |
| Probe                      | EX3DV4                                                        | 3865            | 2016-08-30          | 2017-08-30                   |
| Signal Generator           | E4438C                                                        | MY42080486      | 2017-01-06          | 2018-01-06                   |
| Dual Power Meter           | E4419B                                                        | GB43312301      | 2016-07-12          | 2017-07-12                   |
| Power Sensor               | 8481H                                                         | 3318A19377      | 2016-07-20          | 2017-07-20                   |
| Power Sensor               | 8481H                                                         | 3318A19379      | 2016-07-20          | 2017-07-20                   |
| Attenuator                 | 8491B 3dB                                                     | 17387           | 2016-07-14          | 2017-07-14                   |
| Attenuator                 | 8491B-6dB                                                     | MY39270294      | 2016-08-04          | 2017-08-04                   |
| Attenuator                 | 8491B-6dB                                                     | MY39270295      | 2016-08-04          | 2017-08-04                   |
| Attenuator                 | 8491B 10dB                                                    | 29425           | 2016-07-14          | 2017-07-14                   |
| Power Amplifier            | 2055 BBS3Q7E9I                                                | 1005D/C0521     | 2016-05-18          | 2017-05-18                   |
| Power Amplifier            | 5190FE                                                        | 1012            | 2016-07-12          | 2017-07-12                   |
| Dual Directional Coupler   | 772D                                                          | 2839A00719      | 2016-07-12          | 2017-07-12                   |
| Low Pass Filter            | LA-30N                                                        | 36543           | 2016-07-14          | 2017-07-14                   |
| Low Pass Filter            | LA-60N                                                        | 40058           | 2016-07-12          | 2017-07-12                   |
| Dipole Validation Kits     | D2450V2                                                       | 895             | 2016-07-25          | 2018-07-25                   |
| Dipole Validation Kits     | D5GHzV2                                                       | 1134            | 2015-05-22          | 2017-05-22                   |
| Network Analyzer           | E5071B                                                        | MY42403524      | 2017-01-06          | 2018-01-06                   |
| Dielectric Assessment kit  | DAK-3.5                                                       | 1078            | 2016-08-25          | 2017-08-25                   |
| HumidityTemp.Data Recorder | MHB-382SD                                                     | 73871           | 2016-07-15          | 2017-07-15                   |
| Usb Rf Power Sensor        | RPR3006W                                                      | 13100030SNO73   | 2016-08.29          | 2017-08.29                   |

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Report No.:  
KR17-SPF0004-D  
Page (27) of (95)



## 14. RF Average Conducted Output Power

### 14.1 Average Conducted Output Power

#### 14.1.1 WLAN 2.4 GHz

##### Ant.1 (SISO)

| Mode           | Data Rate | Conducted Powers (dBm) |       |       |
|----------------|-----------|------------------------|-------|-------|
|                |           | Low                    | Mid.  | High  |
| 802.11b        | 1 Mbps    | 19.22                  | 19.43 | 19.28 |
| 802.11g        | 6 Mbps    | 14.88                  | 18.74 | 14.92 |
| 802.11n(HT-20) | MCS0      | 14.75                  | 18.66 | 14.74 |
| 802.11n(HT-40) | MCS0      | 13.09                  | 16.33 | 13.21 |

##### Ant.2 (SISO)

| Mode           | Data Rate | Conducted Powers (dBm) |       |       |
|----------------|-----------|------------------------|-------|-------|
|                |           | Low                    | Mid.  | High  |
| 802.11b        | 1 Mbps    | 19.17                  | 19.46 | 19.33 |
| 802.11g        | 6 Mbps    | 15.20                  | 18.84 | 15.40 |
| 802.11n(HT-20) | MCS0      | 15.00                  | 18.66 | 15.42 |
| 802.11n(HT-40) | MCS0      | 12.87                  | 16.40 | 12.91 |

##### Ant.3 (SISO)

| Mode           | Data Rate | Conducted Powers (dBm) |       |       |
|----------------|-----------|------------------------|-------|-------|
|                |           | Low                    | Mid.  | High  |
| 802.11b        | 1 Mbps    | 19.21                  | 19.55 | 19.12 |
| 802.11g        | 6 Mbps    | 15.27                  | 18.84 | 14.76 |
| 802.11n(HT-20) | MCS0      | 15.21                  | 18.83 | 14.72 |
| 802.11n(HT-40) | MCS0      | 13.20                  | 16.09 | 13.18 |

##### Ant.1 + Ant.2 (MIMO)

| Mode           | Data Rate | Conducted Powers (dBm) |       |       |
|----------------|-----------|------------------------|-------|-------|
|                |           | Low                    | Mid.  | High  |
| 802.11n(HT-20) | MCS8      | 15.69                  | 18.37 | 15.61 |
| 802.11n(HT-40) | MCS8      | 13.47                  | 16.04 | 13.50 |

##### Ant.1 + Ant.2 + Ant.3 (MIMO)

| Mode           | Data Rate | Conducted Powers (dBm) |       |       |
|----------------|-----------|------------------------|-------|-------|
|                |           | Low                    | Mid.  | High  |
| 802.11n(HT-20) | MCS16     | 16.33                  | 18.84 | 16.22 |
| 802.11n(HT-40) | MCS16     | 14.11                  | 16.22 | 14.17 |

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Report No.:  
KR17-SPF0004-D  
Page (28) of (95)

**14.1.2 WLAN 5 GHz****Ant.1 (SISO)**

| Mode                  | Conducted Powers (dBm) |       |       |       |       |       |
|-----------------------|------------------------|-------|-------|-------|-------|-------|
|                       | 5.2G                   |       |       | 5.8G  |       |       |
|                       | Low                    | Mid.  | High  | Low   | Mid.  | High  |
| 802.11a_6 Mbps        | 17.74                  | 17.82 | 17.75 | 19.24 | 19.36 | 19.27 |
| 802.11n(HT-20)_MCS0   | 17.34                  | 17.25 | 17.26 | 18.93 | 18.92 | 18.77 |
| 802.11n(HT-40)_MCS0   | 13.63                  | -     | 14.18 | 18.68 | -     | 19.00 |
| 802.11ac(VHT-20)_VHT0 | 17.24                  | 17.29 | 17.26 | 19.00 | 18.83 | 18.85 |
| 802.11ac(VHT-40)_VHT0 | 13.63                  | -     | 14.13 | 18.76 | -     | 18.72 |
| 802.11ac(VHT-80)_VHT0 | 12.05                  | -     | -     | 18.92 | -     | -     |

**Ant.2 (SISO)**

| Mode                  | Conducted Powers (dBm) |       |       |       |       |       |
|-----------------------|------------------------|-------|-------|-------|-------|-------|
|                       | 5.2G                   |       |       | 5.8G  |       |       |
|                       | Low                    | Mid.  | High  | Low   | Mid.  | High  |
| 802.11a_6 Mbps        | 17.64                  | 17.61 | 17.60 | 19.21 | 19.25 | 19.18 |
| 802.11n(HT-20)_MCS0   | 17.14                  | 15.75 | 16.65 | 18.86 | 18.88 | 18.75 |
| 802.11n(HT-40)_MCS0   | 13.28                  | -     | 13.60 | 18.88 | -     | 18.96 |
| 802.11ac(VHT-20)_VHT0 | 17.19                  | 15.71 | 16.20 | 18.83 | 19.08 | 18.93 |
| 802.11ac(VHT-40)_VHT0 | 13.23                  | -     | 13.55 | 18.63 | -     | 18.88 |
| 802.11ac(VHT-80)_VHT0 | 12.02                  | -     | -     | 18.85 | -     | -     |

**Ant.3 (SISO)**

| Mode                  | Conducted Powers (dBm) |       |       |       |       |       |
|-----------------------|------------------------|-------|-------|-------|-------|-------|
|                       | 5.2G                   |       |       | 5.8G  |       |       |
|                       | Low                    | Mid.  | High  | Low   | Mid.  | High  |
| 802.11a_6 Mbps        | 17.14                  | 17.62 | 17.60 | 19.32 | 19.19 | 19.30 |
| 802.11n(HT-20)_MCS0   | 16.51                  | 17.04 | 17.15 | 18.73 | 18.78 | 18.60 |
| 802.11n(HT-40)_MCS0   | 13.45                  | -     | 13.82 | 18.80 | -     | 18.96 |
| 802.11ac(VHT-20)_VHT0 | 16.43                  | 16.82 | 16.92 | 18.73 | 18.83 | 18.74 |
| 802.11ac(VHT-40)_VHT0 | 13.44                  | -     | 13.84 | 18.78 | -     | 18.94 |
| 802.11ac(VHT-80)_VHT0 | 12.09                  | -     | -     | 18.97 | -     | -     |

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Report No.:  
KR17-SPF0004-D  
Page (29) of (95)

**Ant.1 + Ant.2 (MIMO)**

| Mode                  | Conducted Powers (dBm) |       |       |       |       |       |
|-----------------------|------------------------|-------|-------|-------|-------|-------|
|                       | 5.2G                   |       |       | 5.8G  |       |       |
|                       | Low                    | Mid.  | High  | Low   | Mid.  | High  |
| 802.11n(HT-20)_MCS8   | 16.15                  | 16.65 | 16.73 | 18.51 | 18.52 | 18.59 |
| 802.11n(HT-40)_MCS8   | 13.42                  | -     | 13.36 | 18.56 | -     | 18.56 |
| 802.11ac(VHT-20)_VHT8 | 16.41                  | 16.89 | 16.96 | 18.53 | 18.55 | 18.53 |
| 802.11ac(VHT-40)_VHT8 | 13.49                  | -     | 13.88 | 18.72 | -     | 18.67 |
| 802.11ac(VHT-80)_VHT8 | 11.92                  | -     | -     | 18.60 | -     | -     |

**Ant.1 + Ant.2 + Ant.3 (MIMO)**

| Mode                   | Conducted Powers (dBm) |       |       |       |       |       |
|------------------------|------------------------|-------|-------|-------|-------|-------|
|                        | 5.2G                   |       |       | 5.8G  |       |       |
|                        | Low                    | Mid.  | High  | Low   | Mid.  | High  |
| 802.11n(HT-20)_MCS16   | 16.15                  | 16.79 | 16.69 | 18.55 | 18.65 | 18.61 |
| 802.11n(HT-40)_MCS16   | 13.45                  | -     | 14.03 | 18.92 | -     | 18.74 |
| 802.11ac(VHT-20)_VHT16 | 16.04                  | 16.45 | 16.66 | 18.53 | 18.57 | 18.52 |
| 802.11ac(VHT-40)_VHT16 | 13.74                  | -     | 13.92 | 18.82 | -     | 18.62 |
| 802.11ac(VHT-80)_VHT16 | 12.03                  | -     | -     | 18.67 | -     | -     |

## 14.2 Max. tune up power

### 14.2.1 WLAN 2.4 GHz Ant.1 (SISO)

| Mode           |        | Target Power | Tolerance     | Max. Allowed Power |
|----------------|--------|--------------|---------------|--------------------|
| 802.11b        | Low    | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | Middle | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | High   | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
| 802.11g        | Low    | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
|                | Middle | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | High   | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
| 802.11n(HT-20) | Low    | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
|                | Middle | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | High   | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
| 802.11n(HT-40) | Low    | 13.00 dBm    | $\pm 1.00$ dB | 14.00 dBm          |
|                | Middle | 16.00 dBm    | $\pm 1.00$ dB | 17.00 dBm          |
|                | High   | 13.00 dBm    | $\pm 1.00$ dB | 14.00 dBm          |

### 14.2.2 WLAN 2.4 GHz Ant.2 (SISO)

| Mode           |        | Target Power | Tolerance     | Max. Allowed Power |
|----------------|--------|--------------|---------------|--------------------|
| 802.11b        | Low    | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | Middle | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | High   | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
| 802.11g        | Low    | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
|                | Middle | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | High   | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
| 802.11n(HT-20) | Low    | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
|                | Middle | 19.00 dBm    | $\pm 1.00$ dB | 20.00 dBm          |
|                | High   | 15.00 dBm    | $\pm 1.00$ dB | 16.00 dBm          |
| 802.11n(HT-40) | Low    | 13.00 dBm    | $\pm 1.00$ dB | 14.00 dBm          |
|                | Middle | 16.00 dBm    | $\pm 1.00$ dB | 17.00 dBm          |
|                | High   | 13.00 dBm    | $\pm 1.00$ dB | 14.00 dBm          |

#### 14.2.3 WLAN 2.4 GHz Ant.3 (SISO)

| Mode           |        | Target Power | Tolerance | Max. Allowed Power |
|----------------|--------|--------------|-----------|--------------------|
| 802.11b        | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11g        | Low    | 15.0 dBm     | ± 1.0 dB  | 16.0 dBm           |
|                | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                | High   | 15.0 dBm     | ± 1.0 dB  | 16.0 dBm           |
| 802.11n(HT-20) | Low    | 15.0 dBm     | ± 1.0 dB  | 16.0 dBm           |
|                | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                | High   | 15.0 dBm     | ± 1.0 dB  | 16.0 dBm           |
| 802.11n(HT-40) | Low    | 13.0 dBm     | ± 1.0 dB  | 14.0 dBm           |
|                | Middle | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
|                | High   | 13.0 dBm     | ± 1.0 dB  | 14.0 dBm           |

#### 14.2.4 WLAN 2.4 GHz (MIMO)

| Mode                            |        | Target Power | Tolerance | Max. Allowed Power |
|---------------------------------|--------|--------------|-----------|--------------------|
| 802.11n(HT-20)<br>Ant.1 + 2     | Low    | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
|                                 | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                 | High   | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
| 802.11n(HT-40)<br>Ant.1 + 2     | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                                 | Middle | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
|                                 | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
| 802.11n(HT-20)<br>Ant.1 + 2 + 3 | Low    | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
|                                 | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                 | High   | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
| 802.11n(HT-40)<br>Ant.1 + 2 + 3 | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                                 | Middle | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
|                                 | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |

#### 14.2.5 WLAN 5.2 GHz Ant. 1 (SISO)

| Mode             |        | Target Power | Tolerance | Max. Allowed Power |
|------------------|--------|--------------|-----------|--------------------|
| 802.11a          | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11n(HT-20)   | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11n(HT-40)   | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                  | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
| 802.11ac(VHT-20) | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11ac(VHT-40) | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                  | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
| 802.11ac(VHT-80) | Low    | 12.0 dBm     | ± 1.0 dB  | 13.0 dBm           |

#### 14.2.6 WLAN 5.2 GHz Ant. 2 (SISO)

| Mode             |        | Target Power | Tolerance | Max. Allowed Power |
|------------------|--------|--------------|-----------|--------------------|
| 802.11a          | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11n(HT-20)   | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11n(HT-40)   | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                  | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
| 802.11ac(VHT-20) | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 16.0 dBm     | ± 1.0 dB  | 17.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11ac(VHT-40) | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                  | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
| 802.11ac(VHT-80) | Low    | 12.0 dBm     | ± 1.0 dB  | 13.0 dBm           |

#### 14.2.7 WLAN 5.2 GHz Ant. 3 (SISO)

| Mode             |        | Target Power | Tolerance | Max. Allowed Power |
|------------------|--------|--------------|-----------|--------------------|
| 802.11a          | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11n(HT-20)   | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11n(HT-40)   | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                  | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
| 802.11ac(VHT-20) | Low    | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | Middle | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
|                  | High   | 17.0 dBm     | ± 1.0 dB  | 18.0 dBm           |
| 802.11ac(VHT-40) | Low    | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
|                  | High   | 14.0 dBm     | ± 1.0 dB  | 15.0 dBm           |
| 802.11ac(VHT-80) | Low    | 12.0 dBm     | ± 1.0 dB  | 13.0 dBm           |

#### 14.2.8 WLAN 5.8 GHz Ant.1 (SISO)

| Mode             |        | Target Power | Tolerance | Max. Allowed Power |
|------------------|--------|--------------|-----------|--------------------|
| 802.11a          | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-20)   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-40)   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-20) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-40) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-80) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |

#### 14.2.9 WLAN 5.8 GHz Ant.2 (SISO)

| Mode             |        | Target Power | Tolerance | Max. Allowed Power |
|------------------|--------|--------------|-----------|--------------------|
| 802.11a          | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-20)   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-40)   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-20) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-40) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-80) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |

#### 14.2.10 WLAN 5.8 GHz Ant.3 (SISO)

| Mode             |        | Target Power | Tolerance | Max. Allowed Power |
|------------------|--------|--------------|-----------|--------------------|
| 802.11a          | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-20)   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-40)   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-20) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-40) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                  | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-80) | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |

#### 14.2.11 WLAN 5.2 GHz (MIMO)

| Mode                              |        | Target Power | Tolerance | Max. Allowed Power |
|-----------------------------------|--------|--------------|-----------|--------------------|
| 802.11n(HT-20)<br>Ant.1 + 2       | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-40)<br>Ant.1 + 2       | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-20)<br>Ant.1 + 2     | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-40)<br>Ant.1 + 2     | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-80)<br>Ant.1 + 2     | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-20)<br>Ant.1 + 2 + 3   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-40)<br>Ant.1 + 2 + 3   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-20)<br>Ant.1 + 2 + 3 | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-40)<br>Ant.1 + 2 + 3 | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-80)<br>Ant.1 + 2 + 3 | Low    | 19.0 dBm     | ± 1.00 dB | 20.0 dBm           |

#### 14.2.12 WLAN 5.8 GHz (MIMO)

| Mode                              |        | Target Power | Tolerance | Max. Allowed Power |
|-----------------------------------|--------|--------------|-----------|--------------------|
| 802.11n(HT-20)<br>Ant.1 + 2       | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-40)<br>Ant.1 + 2       | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-20)<br>Ant.1 + 2     | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-40)<br>Ant.1 + 2     | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-80)<br>Ant.1 + 2     | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-20)<br>Ant.1 + 2 + 3   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11n(HT-40)<br>Ant.1 + 2 + 3   | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-20)<br>Ant.1 + 2 + 3 | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | Middle | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-40)<br>Ant.1 + 2 + 3 | Low    | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
|                                   | High   | 19.0 dBm     | ± 1.0 dB  | 20.0 dBm           |
| 802.11ac(VHT-80)<br>Ant.1 + 2 + 3 | Low    | 19.0 dBm     | ± 1.0 dB  | 20.00 dBm          |

## 15. SAR Test Results

### 15.1 WLAN 2.4 GHz Head SAR Test Results

| Mode    | Frequency (MHz) | Average Power (dBm) | Max. tune up power (dBm) | EUT Position | Distance (mm) | Measured 1 g SAR (W/kg) | Duty Cycle Compensate Factor | Scaling Factor | Scaled 1 g SAR (W/kg) | Ant.# |
|---------|-----------------|---------------------|--------------------------|--------------|---------------|-------------------------|------------------------------|----------------|-----------------------|-------|
| 802.11b | 2 437           | 19.43               | 20.00                    | Front        | 0             | 0.293                   | 1.01                         | 1.140          | <b>0.337</b>          | Ant.1 |
|         | 2 437           | 19.46               | 20.00                    | Front        | 0             | 0.091                   | 1.01                         | 1.132          | 0.104                 | Ant.2 |
|         | 2 437           | 19.55               | 20.00                    | Front        | 0             | 0.046                   | 1.01                         | 1.109          | 0.052                 | Ant.3 |

<Note>

- \* The front with touch configuration was only tested since only the front is touched to human body in normal operation condition of this device.
- \* SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.
- \* For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg per KDB Publication 248227 D01v02r02.

## 15.2 WLAN 2.4 GHz Body SAR Test Results

| Mode    | Frequency (MHz) | Average Power (dBm) | Max. tune up power (dBm) | EUT Position | Distance (mm) | Measured 1 g SAR (W/kg) | Duty Cycle Compensate Factor | Scaling Factor | Scaled 1 g SAR (W/kg) | Ant.# |
|---------|-----------------|---------------------|--------------------------|--------------|---------------|-------------------------|------------------------------|----------------|-----------------------|-------|
| 802.11b | 2 437           | 19.43               | 20.00                    | Front        | 0             | 0.238                   | 1.01                         | 1.140          | <b>0.274</b>          | Ant.1 |
|         | 2 437           | 19.46               | 20.00                    | Front        | 0             | 0.086                   | 1.01                         | 1.132          | 0.098                 | Ant.2 |
|         | 2 437           | 19.55               | 20.00                    | Front        | 0             | 0.047                   | 1.01                         | 1.109          | 0.053                 | Ant.3 |

<Note>

- \* The front with touch configuration was only tested since only the front is touched to human body in normal operation condition of this device.
- \* SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.
- \* For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg per KDB Publication 248227 D01v02r02.

### 15.3 WLAN 5.2 GHz Head SAR Test Results

| Mode    | Frequency (MHz) | Average Power (dBm) | Max. tune up power (dBm) | EUT Position | Distance (mm) | Measured 1 g SAR (W/kg) | Duty Cycle Compensate Factor | Scaling Factor | Scaled 1 g SAR (W/kg) | Ant.# |
|---------|-----------------|---------------------|--------------------------|--------------|---------------|-------------------------|------------------------------|----------------|-----------------------|-------|
| 802.11a | 5 200           | 17.82               | 18.00                    | Front        | 0             | 0.338                   | 1.04                         | 1.042          | <b>0.366</b>          | Ant.1 |
|         | 5 200           | 17.61               | 18.00                    | Front        | 0             | 0.256                   | 1.04                         | 1.094          | 0.291                 | Ant.2 |
|         | 5 200           | 17.62               | 18.00                    | Front        | 0             | 0.272                   | 1.04                         | 1.091          | 0.309                 | Ant.3 |

<Note>

- \* The front with touch configuration was only tested since only the front is touched to human body in normal operation condition of this device.
- \* SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.
- \* For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg per KDB Publication 248227 D01v02r02.

#### 15.4 WLAN 5.2 GHz Body SAR Test Results

| Mode    | Frequency (MHz) | Average Power (dBm) | Max. tune up power (dBm) | EUT Position | Distance (mm) | Measured 1 g SAR (W/kg) | Duty Cycle Compensate Factor | Scaling Factor | Scaled 1 g SAR (W/kg) | Ant.# |
|---------|-----------------|---------------------|--------------------------|--------------|---------------|-------------------------|------------------------------|----------------|-----------------------|-------|
| 802.11a | 5 200           | 17.82               | 18.00                    | Front        | 0             | 0.200                   | 1.04                         | 1.042          | 0.217                 | Ant.1 |
|         | 5 200           | 17.61               | 18.00                    | Front        | 0             | 0.192                   | 1.04                         | 1.094          | 0.218                 | Ant.2 |
|         | 5 200           | 17.62               | 18.00                    | Front        | 0             | 0.197                   | 1.04                         | 1.091          | <b>0.224</b>          | Ant.3 |

<Note>

- \* The front with touch configuration was only tested since only the front is touched to human body in normal operation condition of this device.
- \* SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.
- \* For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg per KDB Publication 248227 D01v02r02.

### 15.5 WLAN 5.8 GHz Head SAR Test Results

| Mode    | Frequency (MHz) | Average Power (dBm) | Max. tune up power (dBm) | EUT Position | Distance (mm) | Measured 1 g SAR (W/kg) | Duty Cycle Compensate Factor | Scaling Factor | Scaled 1 g SAR (W/kg) | Ant.# |
|---------|-----------------|---------------------|--------------------------|--------------|---------------|-------------------------|------------------------------|----------------|-----------------------|-------|
| 802.11a | 5 785           | 19.36               | 20.00                    | Front        | 0             | 0.375                   | 1.04                         | 1.159          | <b>0.452</b>          | Ant.1 |
|         | 5 785           | 19.25               | 20.00                    | Front        | 0             | 0.176                   | 1.04                         | 1.189          | 0.218                 | Ant.2 |
|         | 5 785           | 19.19               | 20.00                    | Front        | 0             | 0.067                   | 1.04                         | 1.205          | 0.084                 | Ant.3 |

<Note>

- \* The front with touch configuration was only tested since only the front is touched to human body in normal operation condition of this device.
- \* SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.
- \* For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg per KDB Publication 248227 D01v02r02.

## 15.6 WLAN 5.8 GHz Body SAR Test Results

| Mode    | Frequency (MHz) | Average Power (dBm) | Max. tune up power (dBm) | EUT Position | Distance (mm) | Measured 1 g SAR (W/kg) | Duty Cycle Compensate Factor | Scaling Factor | Scaled 1 g SAR (W/kg) | Ant.# |
|---------|-----------------|---------------------|--------------------------|--------------|---------------|-------------------------|------------------------------|----------------|-----------------------|-------|
| 802.11a | 5 785           | 19.36               | 20.00                    | Front        | 0             | 0.279                   | 1.04                         | 1.159          | <b>0.336</b>          | Ant.1 |
|         | 5 785           | 19.25               | 20.00                    | Front        | 0             | 0.134                   | 1.04                         | 1.189          | 0.166                 | Ant.2 |
|         | 5 785           | 19.19               | 20.00                    | Front        | 0             | 0.053                   | 1.04                         | 1.205          | 0.066                 | Ant.3 |

<Note>

- \* The front with touch configuration was only tested since only the front is touched to human body in normal operation condition of this device.
- \* SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.
- \* For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg per KDB Publication 248227 D01v02r02.

## 16. Test System Verification Results

### Head 2 450 MHz

**Procedure Name:** d=10 mm, Pin=250 mW, dist=2.0mm (EX-Probe)

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.82$  S/m;  $\epsilon_r = 39.08$ ;  $\rho = 1000$  kg/m<sup>3</sup>

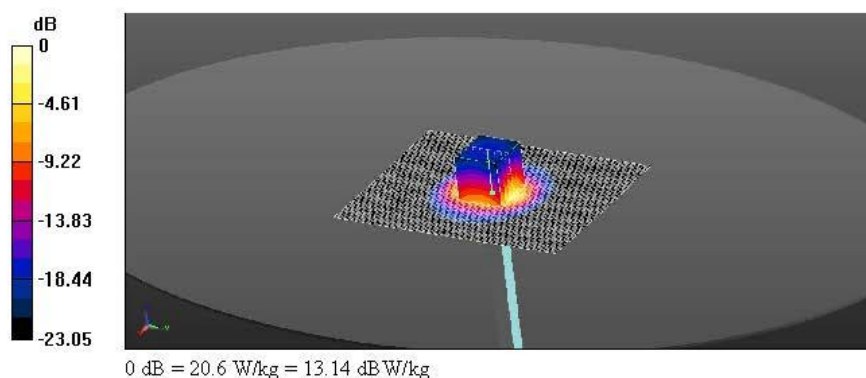
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.81, 7.81, 7.81); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**System Performance Check (without Area Scan)/d=10 mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Area Scan (101x131x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm  
Maximum value of SAR (interpolated) = 21.4 W/kg

**System Performance Check (without Area Scan)/d=10 mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 108.1 V/m; Power Drift = 0.04 dB  
Peak SAR (extrapolated) = 28.3 W/kg  
**SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.17 W/kg**  
Maximum value of SAR (measured) = 20.6 W/kg



## Body 2450 MHz

**Procedure Name:** d=10 mm, Pin=250 mW, dist=2.0mm (EX-Probe)

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.001$  S/m;  $\epsilon_r = 52.158$ ;  $\rho = 1000$  kg/m<sup>3</sup>

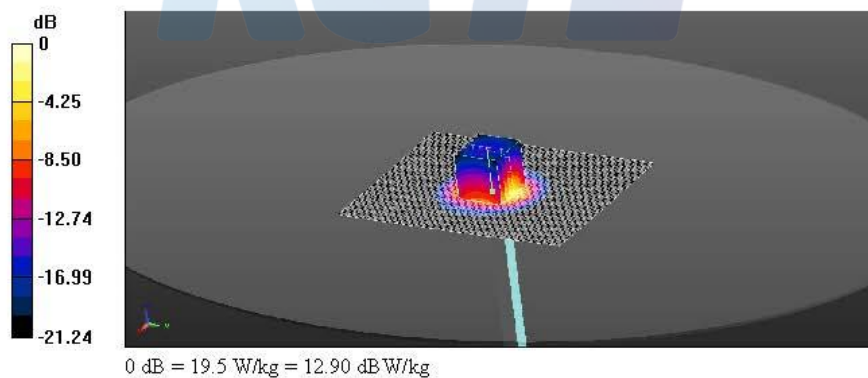
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.86, 7.86, 7.86); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**System Performance Check (without Area Scan)/d=10 mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Area Scan (101x131x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm  
Maximum value of SAR (interpolated) = 19.8 W/kg

**System Performance Check (without Area Scan)/d=10 mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 97.02 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 25.9 W/kg  
**SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6.01 W/kg**  
Maximum value of SAR (measured) = 19.5 W/kg



## Head 5 200 MHz

**Procedure Name:** d=10mm, Pin=100mW, f=5200MHz

Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200 \text{ MHz}$ ;  $\sigma = 4.791 \text{ S/m}$ ;  $\epsilon_r = 36.851$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.06, 5.06, 5.06); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/d=10mm, Pin=100mW, f=5200MHz/Area Scan (91x91x1):** Interpolated  
grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 15.5 W/kg

**Configuration/d=10mm, Pin=100mW, f=5200MHz/Zoom Scan (7x7x12)/Cube 0:**

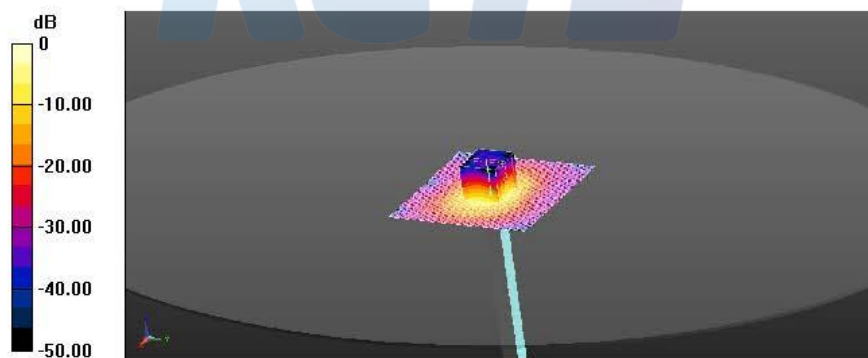
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 60.99 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 36.6 W/kg

**SAR(1 g) = 8.04 W/kg; SAR(10 g) = 2.33 W/kg**

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



0 dB = 16.8 W/kg = 12.25 dB W/kg

## Body 5 200 MHz

**Procedure Name:** d=10mm, Pin=100mW, f=5200MHz

Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200 \text{ MHz}$ ;  $\sigma = 5.104 \text{ S/m}$ ;  $\epsilon_r = 48.939$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.61, 4.61, 4.61); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/d=10mm, Pin=100mW, f=5200MHz/Area Scan (91x91x1):** Interpolated  
grid: dx=1.000 mm, dy=1.000 mm

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

**Configuration/d=10mm, Pin=100mW, f=5200MHz/Zoom Scan (7x7x12)/Cube 0:**

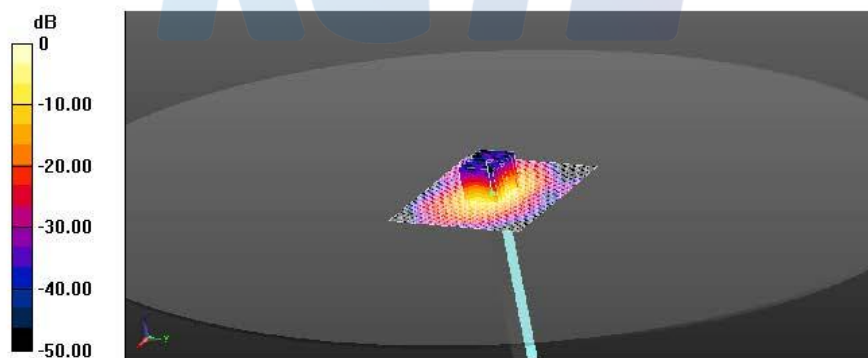
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 59.85 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 31.8 W/kg

**SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.19 W/kg**

Maximum value of SAR (measured) = 16.0 W/kg



0 dB = 16.0 W/kg = 12.04 dB W/kg

## Head 5 800 MHz

**Procedure Name:** d=10mm, Pin=100mW, f=5800MHz

Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.389$  S/m;  $\epsilon_r = 34.482$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.55, 4.55, 4.55); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/d=10mm, Pin=100mW, f=5800MHz/Area Scan (91x91x1):** Interpolated  
grid: dx=1.000 mm, dy=1.000 mm

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

**Configuration/d=10mm, Pin=100mW, f=5800MHz/Zoom Scan (7x7x12)/Cube 0:**

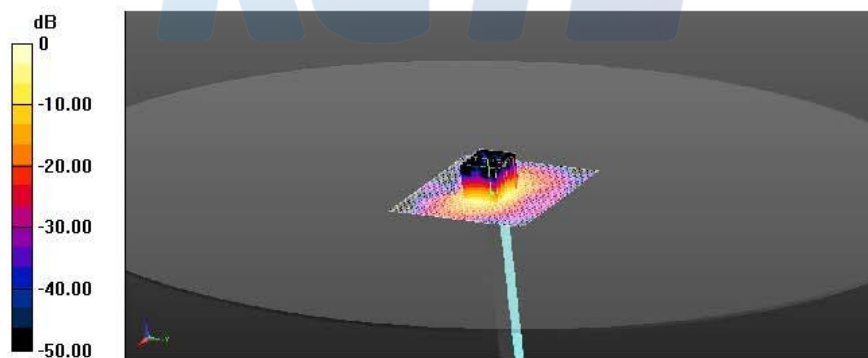
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 59.63 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 40.3 W/kg

**SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.27 W/kg**

Maximum value of SAR (measured) = 17.6 W/kg



0 dB = 17.6 W/kg = 12.46 dB W/kg

## Body 5 800 MHz

**Procedure Name:** d=10mm, Pin=100mW, f=5800MHz

Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5800 \text{ MHz}$ ;  $\sigma = 6.041 \text{ S/m}$ ;  $\epsilon_r = 47.732$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.29, 4.29, 4.29); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/d=10mm, Pin=100mW, f=5800MHz/Area Scan (91x91x1):** Interpolated  
grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 16.7 W/kg

**Configuration/d=10mm, Pin=100mW, f=5800MHz/Zoom Scan (7x7x12)/Cube 0:**

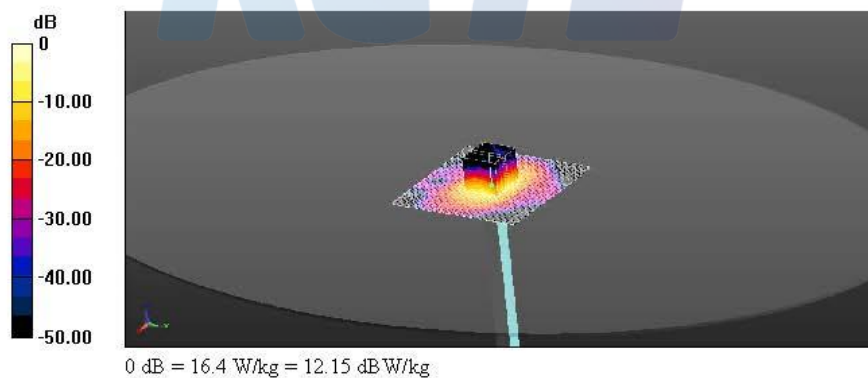
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 56.38 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 35.8 W/kg

**SAR(1 g) = 7.57 W/kg; SAR(10 g) = 2.11 W/kg**

Maximum value of SAR (measured) = 16.4 W/kg



## 17. Test Results

**Procedure Name: 802.11a\_f.5 200\_Front\_0 mm\_Ant 1**

Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.791$  S/m;  $\epsilon_r = 36.851$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.06, 5.06, 5.06); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11a\_f.5 200\_Front\_0 mm\_Ant 1/Area Scan (151x101x1): Interpolated**grid:  $dx=1.000$  mm,  $dy=1.000$  mm

Maximum value of SAR (interpolated) = 1.09 W/kg

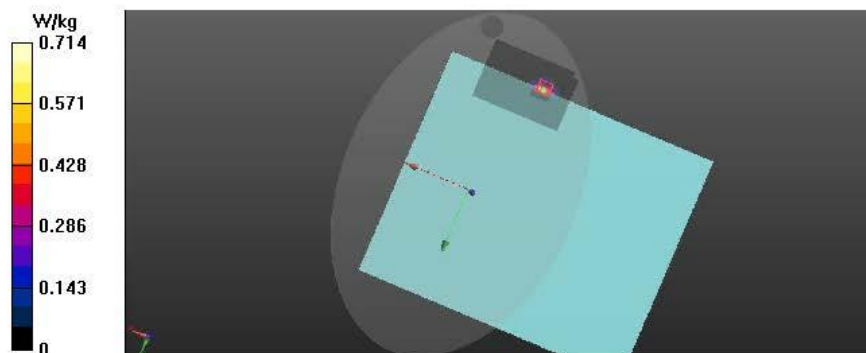
**Configuration/802.11a\_f.5 200\_Front\_0 mm\_Ant 1/Zoom Scan (9x9x12)/Cube 0:**Measurement grid:  $dx=4$ mm,  $dy=4$ mm,  $dz=2$ mm

Reference Value = 8.818 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.77 W/kg

**SAR(1 g) = 0.338 W/kg; SAR(10 g) = 0.097 W/kg**

Maximum value of SAR (measured) = 0.714 W/kg



**Procedure Name: 802.11a\_f.5 200\_Front\_0 mm\_Ant 2**

Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.791$  S/m;  $\epsilon_r = 36.851$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.06, 5.06, 5.06); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11a\_f.5 200\_Front\_0 mm\_Ant 2/Area Scan (101x151x1):** Interpolated

grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.706 W/kg

**Configuration/802.11a\_f.5 200\_Front\_0 mm\_Ant 2/Zoom Scan (9x9x12)/Cube 0:**

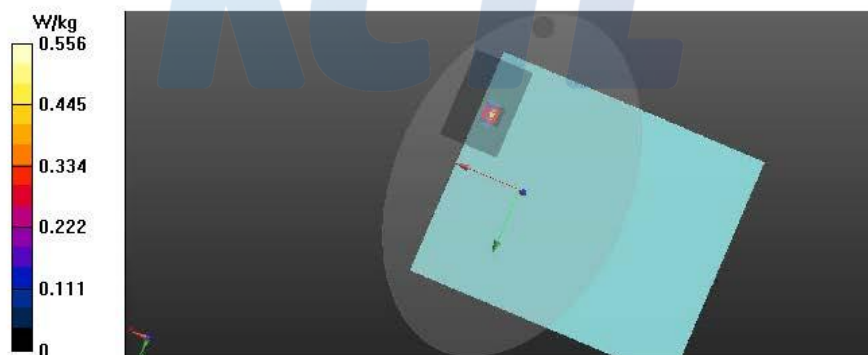
Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 7.101 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.36 W/kg

**SAR(1 g) = 0.256 W/kg; SAR(10 g) = 0.071 W/kg**

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



**Procedure Name: 802.11a\_f.5 200\_Front\_0 mm\_Ant 3**

Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.791$  S/m;  $\epsilon_r = 36.851$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.06, 5.06, 5.06); Calibrated: 2016-08-30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2016-07-26
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11a\_f.5 200\_Front\_0 mm\_Ant 3/Area Scan (101x151x1):** Interpolated

grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.606 W/kg

**Configuration/802.11a\_f.5 200\_Front\_0 mm\_Ant 3/Zoom Scan (9x9x12)/Cube 0:**

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

Reference Value = 10.80 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 1.65 W/kg

**SAR(1 g) = 0.272 W/kg; SAR(10 g) = 0.079 W/kg**

Maximum value of SAR (measured) = 0.542 W/kg

