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# TEST REPORT

**KCTL Inc.**
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Report No.: KR20-SPF0013


**1. Client**

- Name : Intel Mobile Communications
- Address : 100 Center Point Circle, Suite 200 Columbia, South Carolina 29210 USA
- Date of Receipt : FCC,IC : 2020-02-07

**2. Use of Report** : Class IV permissive change

**3. Name of Product and Model** : WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card
- Model Number : AX200D2WL
- Manufacturer and Country of Origin : Intel Mobile Communications / USA

**4. Host Product Name** : Notebook PC
- Host Model Number : NP767XCM
- Manufacturer : Samsung Electronics Co., Ltd

**5. FCC ID Number** : PD9AX200D2L
**IC Certificate Number** : 1000M-AX200D2L

**6. Date of Test** : 2020-03-05 ~ 2020-03-25

**7. Test Standards** : RSS-102 Issue 5 2015, IEC 62209-2 : 2010+A1 : 2019, KDB Publication

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

| | | |
|---|---|---|
| Affirmation | Tested by<br>Name : Kyounghoo Min (Signature) | Technical Manager<br>Name : Jongwon Ma (Signature) |

2020-03-30

## KCTL Inc.

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**Report revision history**

| Date | Revision | Page No |
|---|---|---|
| 2020-03-30 | Initial report | - |
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# 1. General information

| | | |
|---|---|---|
| Client | : | Intel Mobile Communications |
| Address | : | 100 Center Point Circle, Suite 200 Columbia, South Carolina 29210 USA |
| Manufacturer | : | Intel Mobile Communications |
| Address | : | 100 Center Point Circle, Suite 200 Columbia, South Carolina 29210 USA |
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| Accreditations | : | FCC Site Designation No: KR0040, FCC Site Registration No: 687132<br>VCCI Registration No. : R-3327, G-198, C-3706, T-1849<br>Industry Canada Registration No. : 8035A<br>KOLAS No.: KT231 |

## 1.1 Report Overview

This report details the results of testing carried out on the samples listed in section 2, 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.

The information provided by the manufacturer is marked “#” in front of the section.

# 2. Device information

## 2.1 Basic description

| | | | | |
|---|---|---|---|---|
| Product Name | | WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card | | |
| Product Model Number | | AX200D2WL | | |
| Product Manufacturer | | Intel Mobile Communications | | |
| Host Product Name | | Notebook PC | | |
| Host Model Number | | NP767XCM | | |
| Host Manufacturer | | Samsung Electronics Co., Ltd. | | |
| Host Product Serial Number | Radiation | 1CEL91ZN100246M | | |
| | Conduction | 1CEL91ZN100246M | | |
| Device Overview | | Band | Operating Modes | Tx Frequency (㎒) |
| | | WLAN 2.4 ㎓ | Data | 2 412.0 ~ 2 462.0 |
| | | U-NII-1 | Data | 5 180.0 ~ 5 240.0 |
| | | U-NII-2A | Data | 5 260.0 ~ 5 320.0 |
| | | U-NII-2C | Data | 5 500.0 ~ 5 720.0 |
| | | U-NII-3 | Data | 5 745.0 ~ 5 825.0 |
| | | Bluetooth | Data | 2 402.0 ~ 2 480.0 |
| TDWR Information | | 5.60 ㎓ ~ 5.65 ㎓ band (TDWR) is supported by the device. | | |

## 2.2 Summary of SAR Test Results

| Band | Equipment Class | Highest Reported |
|---|---|---|
| | | 1g SAR (W/kg) |
| | | Body |
| WLAN 2.4 ㎓ | DTS | 0.89 |
| U-NII-1 | NII | 1.09 |
| U-NII-2A | NII | 1.28 |
| U-NII-2C | NII | 1.09 |
| U-NII-3 | NII | **1.29** |
| Bluetooth | DSS/DTS | 0.26 |
| Simultaneous SAR per KDB 690783 D01v01r03 | | 1.55 |

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## 2.3 #Maximum Tune-up power

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

### 2.3.1 #Maximum WLAN and Bluetooth Output Power

| Band | Ant. | Mode | Channel | Output Power (dB m) | | |
|---|---|---|---|---|---|---|
| | | | | Target | Max. Allowed | SAR Test |
| WLAN 2.4 GHz | Main | 802.11b | All Channel | 14.00 | **15.00** | **Yes** |
| | | 802.11g | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 20 MHz (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 40 MHz (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | Aux | 802.11b | All Channel | 14.00 | **15.00** | **Yes** |
| | | 802.11g | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 20 MHz (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 40 MHz (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | MIMO | 802.11n(BW20) | All Channel | 11.50 | **12.50** | No |
| | | 802.11n(BW40) | All Channel | 11.50 | **12.50** | **Yes** |
| | | 802.11ax - 20 MHz (SU_HE0) | All Channel | 11.50 | **12.50** | No |
| | | 802.11ax - 40 MHz (SU_HE0) | All Channel | 11.50 | **12.50** | No |

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| Band | Ant. | Mode | Channel | Output Power (dB m) | | |
|---|---|---|---|---|---|---|
| | | | | Target | Max. Allowed | SAR Test |
| U-NII-1 | Main | 802.11a | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW80) | All Channel | 14.00 | **15.00** | **Yes** |
| | | 802.11ac(BW160) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | Aux | 802.11a | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW80) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW160) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | MIMO | 802.11n(BW20) | All Channel | 9.50 | **10.50** | No |
| | | 802.11n(BW40) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW20) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW40) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW80) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW160) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |

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| Band | Ant. | Mode | Channel | Output Power (dB m) | | |
|---|---|---|---|---|---|---|
| | | | | Target | Max. Allowed | SAR Test |
| U-NII-2A | Main | 802.11a | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW80) | All Channel | 14.00 | **15.00** | **Yes** |
| | | 802.11ac(BW160) | All Channel | 14.00 | **15.00** | **Yes** |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | Aux | 802.11a | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW80) | All Channel | 10.00 | **11.00** | **Yes** |
| | | 802.11ac(BW160) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | MIMO | 802.11n(BW20) | All Channel | 9.50 | **10.50** | No |
| | | 802.11n(BW40) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW20) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW40) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW80) | All Channel | 9.50 | **10.50** | **Yes** |
| | | 802.11ac(BW160) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |

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| Band | Ant. | Mode | Channel | Output Power (dB m) | | |
|---|---|---|---|---|---|---|
| | | | | Target | Max. Allowed | SAR Test |
| U-NII-2C | Main | 802.11a | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11n(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW20) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW40) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ac(BW80) | All Channel | 14.00 | **15.00** | **Yes** |
| | | 802.11ac(BW160) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 14.00 | **15.00** | No |
| | Aux | 802.11a | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW80) | All Channel | 10.00 | **11.00** | **Yes** |
| | | 802.11ac(BW160) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | MIMO | 802.11n(BW20) | All Channel | 9.50 | **10.50** | No |
| | | 802.11n(BW40) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW20) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW40) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ac(BW80) | All Channel | 9.50 | **10.50** | **Yes** |
| | | 802.11ac(BW160) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |
| | | 802.11ax - 160 ㎒ (SU_HE0) | All Channel | 9.50 | **10.50** | No |

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| Band | Ant. | Mode | Channel | Output Power (dB m) | | |
|---|---|---|---|---|---|---|
| | | | | Target | Max. Allowed | SAR Test |
| U-NII-3 | Main | 802.11a | All Channel | 16.00 | **17.00** | No |
| | | 802.11n(BW20) | All Channel | 16.00 | **17.00** | No |
| | | 802.11n(BW40) | All Channel | 16.00 | **17.00** | No |
| | | 802.11ac(BW20) | All Channel | 16.00 | **17.00** | No |
| | | 802.11ac(BW40) | All Channel | 16.00 | **17.00** | No |
| | | 802.11ac(BW80) | All Channel | 16.00 | **17.00** | **Yes** |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 16.00 | **17.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 15.00 | **16.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 15.00 | **16.00** | No |
| | Aux | 802.11a | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11n(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW20) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW40) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ac(BW80) | All Channel | 10.00 | **11.00** | **Yes** |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 10.00 | **11.00** | No |
| | MIMO | 802.11n(BW20) | All Channel | 11.00 | **12.00** | No |
| | | 802.11n(BW40) | All Channel | 11.00 | **12.00** | No |
| | | 802.11ac(BW20) | All Channel | 11.00 | **12.00** | No |
| | | 802.11ac(BW40) | All Channel | 11.00 | **12.00** | No |
| | | 802.11ac(BW80) | All Channel | 11.00 | **12.00** | **Yes** |
| | | 802.11ax - 20 ㎒ (SU_HE0) | All Channel | 11.00 | **12.00** | No |
| | | 802.11ax - 40 ㎒ (SU_HE0) | All Channel | 10.50 | **11.50** | No |
| | | 802.11ax - 80 ㎒ (SU_HE0) | All Channel | 10.50 | **11.50** | No |

| Band | Ant. | Mode | Channel | Output Power (dB m) | | |
|---|---|---|---|---|---|---|
| | | | | Target | Max. Allowed | SAR Test |
| Bluetooth | Aux | BDR(GFSK) | All Channel | 9.50 | **11.00** | **Yes** |
| | | EDR (π/4DQPSK) | All Channel | 5.50 | **7.00** | No |
| | | EDR(8DPSK) | All Channel | 5.50 | **7.00** | No |
| | | LE(GFSK) | All Channel | 5.50 | **7.00** | No |

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## 2.4 SAR Test Configurations

### 2.4.1 #DUT Antenna Locations

A diagram showing the location of the device antennas can be found in Appendix D.

### 2.4.2 SAR Test Exclusion Considerations

| Device Type | Band / Ant. | Device Edge for SAR Testing | | | | | |
|---|---|---|---|---|---|---|---|
| | | Front | Rear | Left Edge | Right Edge | Top | Bottom |
| Notebook | WLAN & Bluetooth | No | Yes | No | No | No | No |

## 2.5 SAR Test Methods and Procedures

The tests documented in this report were performed in accordance with the following published KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 865664 D01 SAR measurement 100 ㎒ to 6 ㎓ v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 616217 D04 SAR for laptop and tablets v01r02
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)
- April 2019 TCB Workshop Notes (Tissue Simulating Liquids)
- RSS-102 Issue 5 2015
- IEC 62209-2 : 2010+A1 : 2019

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# 3. Specific Absorption Rate

## 3.1 Introduction

The SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational / controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

## 3.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

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

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

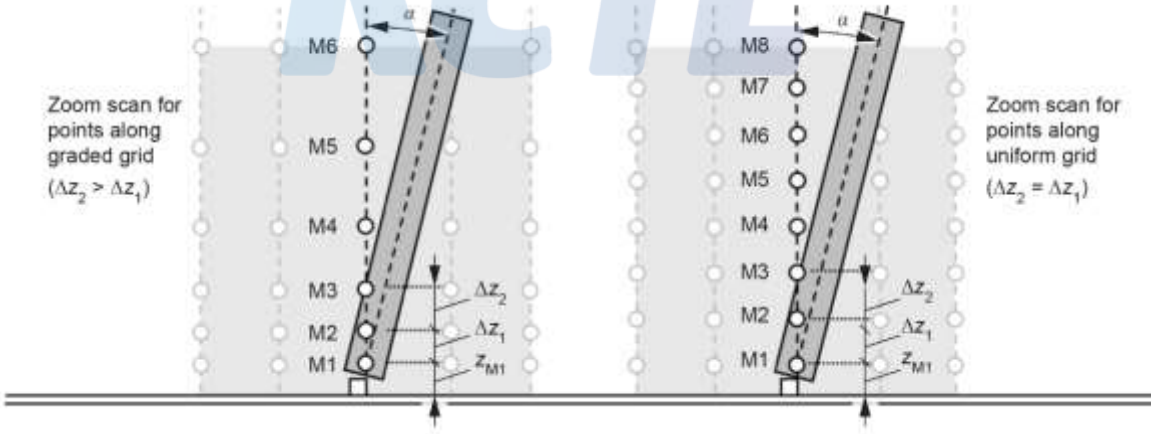
# 4. SAR Measurement Procedures

## 4.1 SAR Scan 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 sensors to surface is 1.4 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 & Zoom 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 and Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing1 g and 10 g of simulated tissue. 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 & Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 ㎒ to 6 ㎓ v01r04.

If the zoom scan measured as defined below complies with both of the following criteria, or if the peak spatial-average SAR is below 0.1 W/kg, no additional measurements are needed:

1) The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak shall be larger than the horizontal grid steps in both *x* and y directions ($\Delta x$, $\Delta y$). This shall be checked for the measured zoom scan plane conformal to the phantom at the distance $z_{M1}$. The minimum distance shall be recorded in the SAR test report
2) The ratio of the SAR at the second measured point (M2) to the SAR at the closest measured point (M1) at the *x*-*y* location of the measured maximum SAR value shall be at least 30 %. This ratio (in %) shall be recorded in the SAR test report.



| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | | | 5 mm ± 1 mm | ½·δ·ln(2) mm 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. | |
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | ≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 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 3: 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.

## 5. RF Exposure Limits

**UNCONTROLLED ENVIRONMENTS** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

**CONTROLLED ENVIRONMENTS** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

| Human Exposure | Uncontrolled Environment General Population | Controlled Environment Occupational |
|---|---|---|
| **Partial Peak SAR** [1] (Partial) | 1.60 mW/g | 8.00 mW/g |
| **Partial Average SAR** [2] (Whole Body) | 0.08 mW/g | 0.40 mW/g |
| **Partial Peak SAR** [3] (Hands/Feet/Ankle/Wrist) | 4.00 mW/g | 20.00 mW/g |

1) The spatial Peak value of the SAR averaged over any 1g gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2) The spatial Average value of the SAR averaged over the whole body.
3) The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

# 6. FCC SAR General Measurement Procedures

## 6.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

## 6.2 SAR Testing with 802.11 Transmitters

The normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

### 6.2.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 – 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

### 6.2.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

### 6.2.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 ㎒ (5.47 – 5.85 ㎓), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 ㎓ in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. When band gap channels are disabled, each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency point requirements.

### 6.2.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

### 6.2.5 2.4 ㎓ SAR Test Requirement

SAR is measured for 2.4 ㎓ 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following.

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel; i.e., all channels require testing.

2.4 ㎓ 802.11g/n OFDM are additionally evaluated for SAR if highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 ㎓ band, the Initial Test Configuration Procedures should be followed.

### 6.2.6 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 ㎓ and 5 ㎓ band, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel band width, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

### 6.2.7 Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 ㎓ bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 ㏈ of each other, mid channel of the transmission mode with highest average RF output power is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

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When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements.

### 6.2.8 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

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# 7. RF Average Conducted Output Power

## 7.1 WLAN Average Conducted Output Power

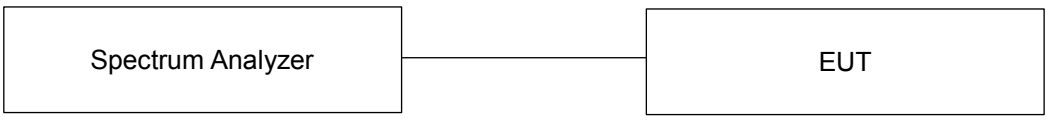
| Band | Ant. | Mode | Conducted Powers (dBm) | | |
|---|---|---|---|---|---|
| | | | Low | Mid. | High |
| WLAN 2.4 GHz | Main | 802.11b | 14.85 | 14.86 | 14.91 |
| | Aux | 802.11b | 14.91 | 14.88 | 14.93 |
| | MIMO (Main) | 802.11n(BW40) | 12.39 | 12.46 | 12.38 |
| | MIMO (Aux) | 802.11n(BW40) | 12.49 | 12.31 | 12.30 |

| Band | Ant. | Mode | Conducted Powers (dBm) | | |
|---|---|---|---|---|---|
| | | | Low | Mid. | High |
| U-NII-1 | Main | 802.11ac(BW80) | - | 14.86 | - |
| U-NII-2A | Main | 802.11ac(BW80) | - | 14.90 | - |
| | Main | 802.11ac(BW160) | - | 14.76 | - |
| | Aux | 802.11ac(BW80) | - | 10.96 | - |
| | MIMO (Main) | 802.11ac(BW80) | - | 10.49 | - |
| | MIMO (Aux) | 802.11ac(BW80) | - | 10.29 | - |
| U-NII-2C | Main | 802.11ac(BW80) | 14.88 | 14.79 | 14.78 |
| | Aux | 802.11ac(BW80) | 10.82 | 10.88 | 10.98 |
| | MIMO (Main) | 802.11ac(BW80) | 10.44 | 10.40 | 10.34 |
| | MIMO (Aux) | 802.11ac(BW80) | 10.37 | 10.47 | 10.40 |
| U-NII-3 | Main | 802.11ac(BW80) | - | 16.88 | - |
| | Aux | 802.11ac(BW80) | - | 10.89 | - |
| | MIMO (Main) | 802.11ac(BW80) | - | 11.95 | - |
| | MIMO (Aux) | 802.11ac(BW80) | - | 11.90 | - |

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported.

Power Measurement Setup



## 7.2 Bluetooth Average Conducted Output Power

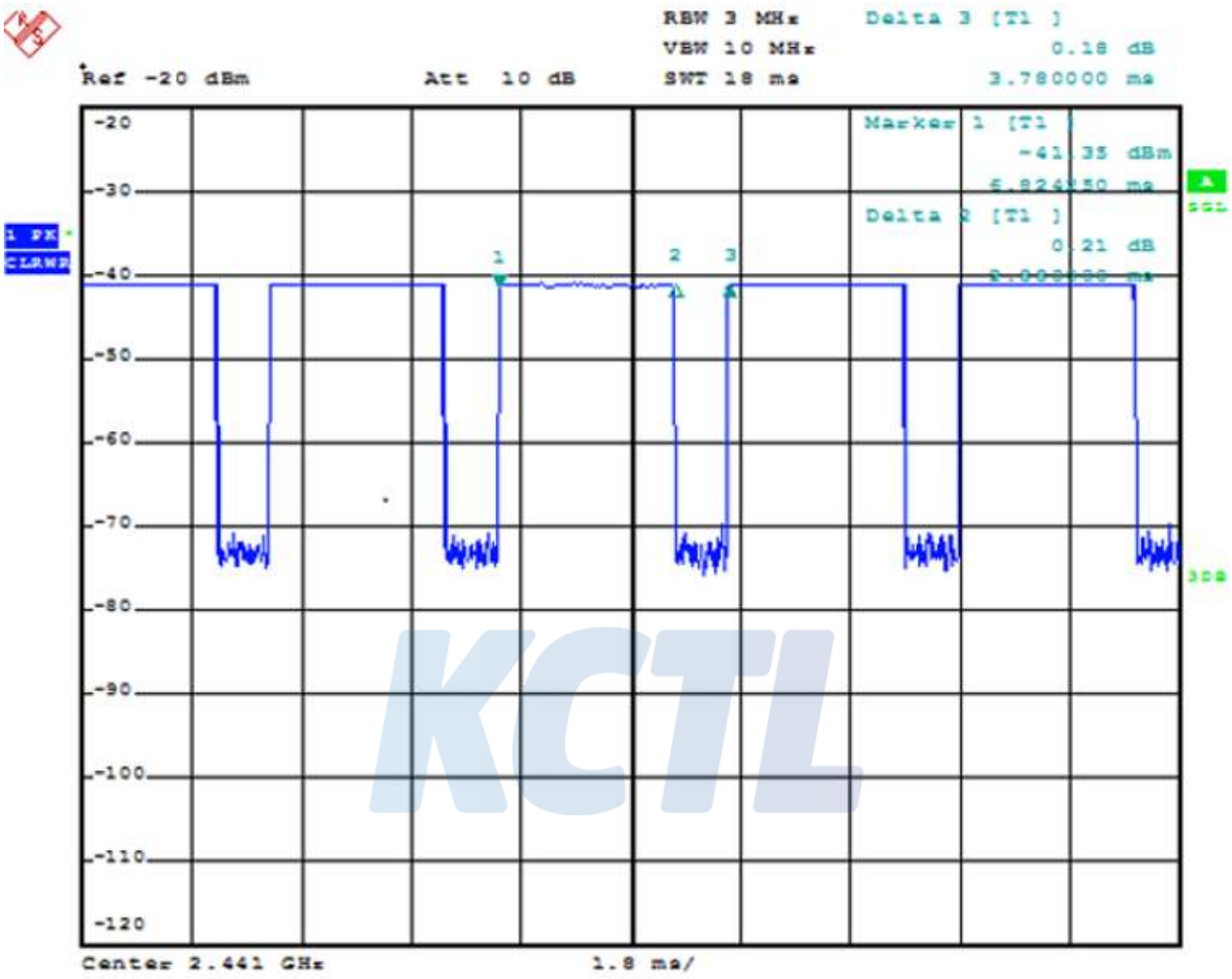
| Mode | Freq. [㎒] | Channel | Conducted Powers (dBm) |
|---|---|---|---|
| BDR_DH5 (1 Mbps) | 2 402.0 | 0 | 9.16 |
| | 2 441.0 | 39 | 9.93 |
| | 2 480.0 | 78 | 9.43 |
| EDR_2-DH5 (2 Mbps) | 2 402.0 | 0 | 6.04 |
| | 2 441.0 | 39 | 6.60 |
| | 2 480.0 | 78 | 5.76 |
| EDR_3-DH5 (3 Mbps) | 2 402.0 | 0 | 6.00 |
| | 2 441.0 | 39 | 6.60 |
| | 2 480.0 | 78 | 5.77 |
| LE (1M) | 2 402.0 | 0 | 5.02 |
| | 2 440.0 | 19 | 5.05 |
| | 2 480.0 | 39 | 5.12 |
| LE (2M) | 2 402.0 | 0 | 5.01 |
| | 2 440.0 | 19 | 5.05 |
| | 2 480.0 | 39 | 5.13 |

## 7.3 Bluetooth Duty Factor

| Mode | Packet | On Time (㎳) | On-Off Time (㎳) | Duty Cycle (%) | Duty Cycle Compensate Factor |
|---|---|---|---|---|---|
| BDR(GFSK) | DH5 | 2.88 | 3.78 | 76.19 | 1.312 |

## 7.4 Bluetooth Power Measurement Setup

## 7.5 Bluetooth Duty Plot

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# 8. System Verification

## 8.1 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 ㎒). The Conductivity (σ) and Permittivity (ρ) are listed in Table 1.For the SAR measurement given in this report. The temperature variation of the Tissue Simulant Liquids was (22 ± 2) ℃.

| Freq. (㎒) | Limit/Measured | | Permittivity (ρ) | Conductivity (σ) | Temp. (°C) |
|---|---|---|---|---|---|
| 2 450.0 | Recommended Limit | | 39.20 ± 5 % (37.24 ~ 41.16) | 1.80 ± 5 % (1.71 ~ 1.89) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.49 | 1.80 | 20.55 |
| 2 402.0 | Recommended Limit | | 39.28 ± 5 % (37.32 ~ 41.24) | 1.76 ± 5 % (1.67 ~ 1.85) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.58 | 1.75 | 20.55 |
| 2 412.0 | Recommended Limit | | 39.27 ± 5 % (37.31 ~ 41.23) | 1.77 ± 5 % (1.68 ~ 1.86) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.60 | 1.76 | 20.55 |
| 2 422.0 | Recommended Limit | | 39.25 ± 5 % (37.29 ~ 41.21) | 1.78 ± 5 % (1.69 ~ 1.87) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.56 | 1.77 | 20.55 |
| 2 437.0 | Recommended Limit | | 39.22 ± 5 % (37.26 ~ 41.18) | 1.79 ± 5 % (1.70 ~ 1.88) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.54 | 1.79 | 20.55 |
| 2 441.0 | Recommended Limit | | 39.22 ± 5 % (37.26 ~ 41.18) | 1.79 ± 5 % (1.70 ~ 1.88) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.52 | 1.79 | 20.55 |
| 2 452.0 | Recommended Limit | | 39.20 ± 5 % (37.24 ~ 41.16) | 1.80 ± 5 % (1.71 ~ 1.89) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.48 | 1.81 | 20.55 |
| 2 462.0 | Recommended Limit | | 39.18 ± 5 % (37.22 ~ 41.14) | 1.81 ± 5 % (1.72 ~ 1.90) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.45 | 1.82 | 20.55 |
| 2 480.0 | Recommended Limit | | 39.16 ± 5 % (37.20 ~ 41.12) | 1.83 ± 5 % (1.74 ~ 1.92) | 22 ± 2 |
| | Measured | 2020-03-05 | 38.39 | 1.83 | 20.55 |
| 2 450.0 | Recommended Limit | | 39.20 ± 5 % (37.24 ~ 41.16) | 1.80 ± 5 % (1.71 ~ 1.89) | 22 ± 2 |
| | Measured | 2020-03-24 | 39.93 | 1.82 | 21.13 |
| 2 402.0 | Recommended Limit | | 39.28 ± 5 % (37.32 ~ 41.24) | 1.76 ± 5 % (1.67 ~ 1.85) | 22 ± 2 |
| | Measured | 2020-03-24 | 40.13 | 1.77 | 21.13 |
| 2 412.0 | Recommended Limit | | 39.27 ± 5 % (37.31 ~ 41.23) | 1.77 ± 5 % (1.68 ~ 1.86) | 22 ± 2 |
| | Measured | 2020-03-24 | 40.09 | 1.78 | 21.13 |
| 2 422.0 | Recommended Limit | | 39.25 ± 5 % (37.29 ~ 41.21) | 1.78 ± 5 % (1.69 ~ 1.87) | 22 ± 2 |
| | Measured | 2020-03-24 | 40.04 | 1.79 | 21.13 |
| 2 441.0 | Recommended Limit | | 39.22 ± 5 % (37.26 ~ 41.18) | 1.79 ± 5 % (1.70 ~ 1.88) | 22 ± 2 |
| | Measured | 2020-03-24 | 39.99 | 1.81 | 21.13 |
| 2 437.0 | Recommended Limit | | 39.22 ± 5 % (37.26 ~ 41.18) | 1.79 ± 5 % (1.70 ~ 1.88) | 22 ± 2 |
| | Measured | 2020-03-24 | 40.01 | 1.80 | 21.13 |

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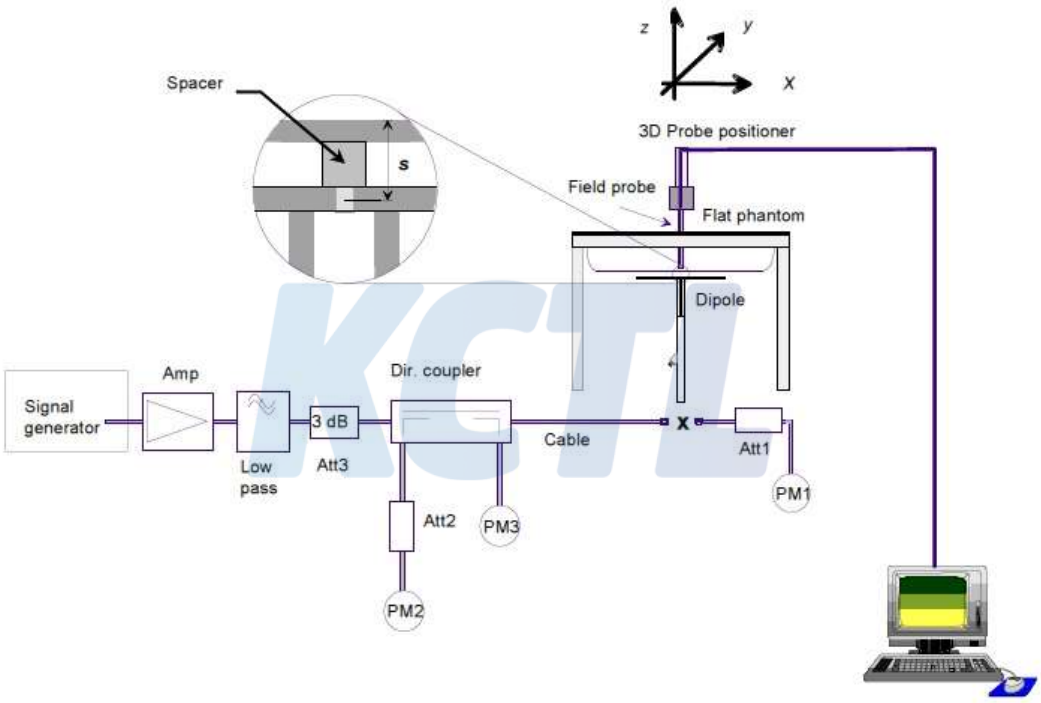
| Freq. (MHz) | Limit/Measured | | Permittivity (ρ) | Conductivity (σ) | Temp. (°C) |
|---|---|---|---|---|---|
| 2 452.0 | Recommended Limit | | 39.20 ± 5 %<br>(37.24 ~ 41.16) | 1.80 ± 5 %<br>(1.71 ~ 1.89) | 22 ± 2 |
| | Measured | 2020-03-24 | 39.92 | 1.82 | 21.13 |
| 2 462.0 | Recommended Limit | | 39.18 ± 5 %<br>(37.22 ~ 41.14) | 1.81 ± 5 %<br>(1.72 ~ 1.90) | 22 ± 2 |
| | Measured | 2020-03-24 | 39.91 | 1.83 | 21.13 |
| 2 480.0 | Recommended Limit | | 39.16 ± 5 %<br>(37.20 ~ 41.12) | 1.83 ± 5 %<br>(1.74 ~ 1.92) | 22 ± 2 |
| | Measured | 2020-03-24 | 39.83 | 1.85 | 21.13 |
| 5 200.0 | Recommended Limit | | 36.00 ± 5 %<br>(34.20 ~ 37.80) | 4.66 ± 5 %<br>(4.43 ~ 4.89) | 22 ± 2 |
| | Measured | 2020-03-09 | 36.68 | 4.54 | 20.86 |
| 5 210.0 | Recommended Limit | | 35.99 ± 5 %<br>(34.19 ~ 37.79) | 4.67 ± 5 %<br>(4.44 ~ 4.90) | 22 ± 2 |
| | Measured | 2020-03-09 | 36.66 | 4.54 | 20.86 |
| 5 300.0 | Recommended Limit | | 35.90 ± 5 %<br>(34.11 ~ 37.70) | 4.76 ± 5 %<br>(4.52 ~ 5.00) | 22 ± 2 |
| | Measured | 2020-03-09 | 36.55 | 4.65 | 20.86 |
| 5 250.0 | Recommended Limit | | 35.95 ± 5 %<br>(34.15 ~ 37.75) | 4.71 ± 5 %<br>(4.47 ~ 4.95) | 22 ± 2 |
| | Measured | 2020-03-09 | 36.48 | 4.59 | 20.86 |
| 5 290.0 | Recommended Limit | | 35.91 ± 5 %<br>(34.11 ~ 37.71) | 4.75 ± 5 %<br>(4.51 ~ 4.99) | 22 ± 2 |
| | Measured | 2020-03-09 | 36.52 | 4.65 | 20.86 |
| 5 600.0 | Recommended Limit | | 35.50 ± 5 %<br>(33.73 ~ 37.28) | 5.07 ± 5 %<br>(4.82 ~ 5.32) | 22 ± 2 |
| | Measured | 2020-03-10 | 36.09 | 4.95 | 20.93 |
| 5 530.0 | Recommended Limit | | 35.61 ± 5 %<br>(33.83 ~ 37.39) | 5.00 ± 5 %<br>(4.75 ~ 5.25) | 22 ± 2 |
| | Measured | 2020-03-10 | 36.20 | 4.88 | 20.93 |
| 5 610.0 | Recommended Limit | | 35.49 ± 5 %<br>(33.72 ~ 37.26) | 5.08 ± 5 %<br>(4.83 ~ 5.33) | 22 ± 2 |
| | Measured | 2020-03-10 | 36.11 | 4.96 | 20.93 |
| 5 690.0 | Recommended Limit | | 35.41 ± 5 %<br>(33.64 ~ 37.18) | 5.16 ± 5 %<br>(4.90 ~ 5.42) | 22 ± 2 |
| | Measured | 2020-03-10 | 35.95 | 5.05 | 20.93 |
| 5 600.0 | Recommended Limit | | 35.50 ± 5 %<br>(33.73 ~ 37.28) | 5.07 ± 5 %<br>(4.82 ~ 5.32) | 22 ± 2 |
| | Measured | 2020-03-25 | 34.84 | 5.19 | 20.96 |
| 5 530.0 | Recommended Limit | | 35.61 ± 5 %<br>(33.83 ~ 37.39) | 5.00 ± 5 %<br>(4.75 ~ 5.25) | 22 ± 2 |
| | Measured | 2020-03-25 | 34.95 | 5.10 | 20.96 |
| 5 610.0 | Recommended Limit | | 35.49 ± 5 %<br>(33.72 ~ 37.26) | 5.08 ± 5 %<br>(4.83 ~ 5.33) | 22 ± 2 |
| | Measured | 2020-03-25 | 34.83 | 5.20 | 20.96 |
| 5 690.0 | Recommended Limit | | 35.41 ± 5 %<br>(33.64 ~ 37.18) | 5.16 ± 5 %<br>(4.90 ~ 5.42) | 22 ± 2 |
| | Measured | 2020-03-25 | 34.69 | 5.29 | 20.96 |
| 5 800.0 | Recommended Limit | | 35.30 ± 5 %<br>(33.54 ~ 37.07) | 5.27 ± 5 %<br>(5.01 ~ 5.53) | 22 ± 2 |
| | Measured | 2020-03-06 | 35.30 | 5.26 | 21.02 |
| 5 775.0 | Recommended Limit | | 35.33 ± 5 %<br>(33.56 ~ 37.10) | 5.25 ± 5 %<br>(4.99 ~ 5.51) | 22 ± 2 |
| | Measured | 2020-03-06 | 35.38 | 5.24 | 21.02 |

**<Table 1. Measurement result of Tissue electric parameters>**

## 8.2 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 ± 10% from the t arget 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 ± 2) ℃, th e relative humidity was in the range(50 ± 20)% and the liquid depth Above the ear/grid refer ence 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.



| Verification Kit | Probe S/N | Frequency (㎒) | Tissue Type | Limit/Measured (Normalized to 1 W) | | |
|---|---|---|---|---|---|---|
| D2450V2 SN: 895 | EX3DV4 SN: 3865 | 2 450.0 | HSL | Recommended Limit 1g (Normalized) | | 51.30 ± 10 % (46.17 ~ 56.43) |
| | | | | Measured | 2020-03-05 | 50.30 |
| D2450V2 SN: 895 | EX3DV4 SN: 3865 | 2 450.0 | HSL | Recommended Limit 1g (Normalized) | | 51.30 ± 10 % (46.17 ~ 56.43) |
| | | | | Measured | 2020-03-24 | 53.60 |
| D5GHzV2 SN: 1293 | EX3DV4 SN: 3865 | 5 200.0 | HSL | Recommended Limit 1g (Normalized) | | 79.30 ± 10 % (71.37 ~ 87.23) |
| | | | | Measured | 2020-03-09 | 82.20 |
| D5GHzV2 SN: 1293 | EX3DV4 SN: 3865 | 5 300.0 | HSL | Recommended Limit 1g (Normalized) | | 81.10 ± 10 % (72.99 ~ 89.21) |
| | | | | Measured | 2020-03-09 | 79.90 |
| D5GHzV2 SN: 1293 | EX3DV4 SN: 3865 | 5 600.0 | HSL | Recommended Limit 1g (Normalized) | | 82.60 ± 10 % (74.34 ~ 90.86) |
| | | | | Measured | 2020-03-10 | 80.50 |
| D5GHzV2 SN: 1293 | EX3DV4 SN: 3865 | 5 600.0 | HSL | Recommended Limit 1g (Normalized) | | 82.60 ± 10 % (74.34 ~ 90.86) |
| | | | | Measured | 2020-03-25 | 82.40 |
| D5GHzV2 SN: 1293 | EX3DV4 SN: 3865 | 5 800.0 | HSL | Recommended Limit 1g (Normalized) | | 79.30 ± 10 % (71.37 ~ 87.23) |
| | | | | Measured | 2020-03-06 | 83.20 |

**<Table 2. System Verification Result>**

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# 9. SAR Test Results

## 9.1 Standalone Body SAR Test Results

| WLAN 2.4 GHz | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Ant. | EUT Position | Distance (mm) | Frequency (MHz) | Measured Conducted Power (dBm) | Max. Tune-up Power (dBm) | Power Scaling Factor | Duty Cycle Compensate Factor | Zoom require | | Measured 1g SAR (W/kg) | Scaled 1g SAR (W/kg) | Plot No. |
| | | | | | | | | | Step1) (mm)) | Step2) (%) | | | |
| 802.11b | Main | Rear | 0 | 2 412.0 | 14.85 | 15.00 | 1.035 | 1.005 | 8.0 | 36.2 | 0.831 | 0.865 | |
| 802.11b | Main | Rear | 0 | 2 437.0 | 14.86 | 15.00 | 1.033 | 1.005 | 7.6 | 35.5 | 0.853 | 0.885 | |
| 802.11b | Main | Rear | 0 | 2 462.0 | 14.91 | 15.00 | 1.021 | 1.005 | 6.7 | 37.1 | 0.757 | 0.777 | |
| 802.11b | Aux | Rear | 0 | 2 412.0 | 14.91 | 15.00 | 1.021 | 1.005 | 7.2 | 37.3 | 0.597 | 0.613 | |
| 802.11b | Aux | Rear | 0 | 2 437.0 | 14.88 | 15.00 | 1.028 | 1.005 | 7.1 | 37.3 | 0.633 | **0.654** | 2 |
| 802.11b | Aux | Rear | 0 | 2 462.0 | 14.93 | 15.00 | 1.016 | 1.005 | 8.0 | 36.6 | 0.560 | 0.572 | |
| 802.11n (BW40) | MIMO | Rear | 0 | 2 422.0 | 12.39<br>12.49 | 12.50 | 1.026 | 1.011 | 6.0 | 36.7 | 0.468 | 0.485 | |
| 802.11n (BW40) | MIMO | Rear | 0 | 2 437.0 | 12.46<br>12.31 | 12.50 | 1.045 | 1.011 | 7.3 | 34.7 | 0.475 | **0.502** | 3 |
| 802.11n (BW40) | MIMO | Rear | 0 | 2 452.0 | 12.38<br>12.30 | 12.50 | 1.047 | 1.011 | 7.1 | 39.8 | 0.434 | 0.460 | |
| Repeated SAR Test | | | | | | | | | | | | | |
| 802.11b | Main | Rear | 0 | 2 437.0 | 14.86 | 15.00 | 1.033 | 1.005 | 7.6 | 36.1 | 0.857 | **0.890** | 1 |

| U-NII-1 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Ant. | EUT Position | Distance (mm) | Frequency (MHz) | Measured Conducted Power (dBm) | Max. Tune-up Power (dBm) | Power Scaling Factor | Duty Cycle Compensate Factor | Zoom require | | Measured 1g SAR (W/kg) | Scaled 1g SAR (W/kg) | Plot No. |
| | | | | | | | | | Step1) (mm)) | Step2) (%) | | | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 210.0 | 14.86 | 15.00 | 1.033 | 1.011 | 5.6 | 59.4 | 1.000 | 1.044 | |
| Repeated SAR Test | | | | | | | | | | | | | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 210.0 | 14.86 | 15.00 | 1.033 | 1.011 | 6.1 | 59.5 | 1.040 | **1.086** | 4 |

Note:
UNII band 1 SAR was tested due to UNII band 2A Reported SAR > 1.2 W/kg.

| U-NII-2A | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Ant. | EUT Position | Distance (mm) | Frequency (MHz) | Measured Conducted Power (dBm) | Max. Tune-up Power (dBm) | Power Scaling Factor | Duty Cycle Compensate Factor | Zoom require | | Measured 1g SAR (W/kg) | Scaled 1g SAR (W/kg) | Plot No. |
| | | | | | | | | | Step1) (mm)) | Step2) (%) | | | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 290.0 | 14.90 | 15.00 | 1.023 | 1.011 | 5.7 | 58.6 | 1.180 | 1.221 | |
| 802.11ac (BW160) | Main | Rear | 0 | 5 250.0 | 14.76 | 15.00 | 1.057 | 1.011 | 5.8 | 59.9 | 1.200 | **1.282** | 5 |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 290.0 | 10.96 | 11.00 | 1.009 | 1.011 | 4.8 | 64.9 | 0.975 | 0.995 | |
| 802.11ac (BW80) | MIMO | Rear | 0 | 5 290.0 | 10.49<br>10.29 | 10.50 | 1.050 | 1.011 | 5.4 | 63.5 | 0.796 | **0.845** | 7 |
| Repeated SAR Test | | | | | | | | | | | | | |
| 802.11ac (BW160) | Main | Rear | 0 | 5 250.0 | 14.76 | 15.00 | 1.057 | 1.011 | 5.7 | 60.5 | 1.200 | 1.282 | |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 290.0 | 10.96 | 11.00 | 1.009 | 1.011 | 5.6 | 64.3 | 0.997 | **1.017** | 6 |

Note:
802.11ac(BW160) SAR was tested due to ratio adjusted peak SAR > 1.2 W/kg.

| U-NII-2C | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Ant. | EUT Position | Distance (mm) | Frequency (㎒) | Measured Conducted Power (dBm) | Max. Tune-up Power (dBm) | Power Scaling Factor | Duty Cycle Compensate Factor | Zoom require | | Measured 1g SAR (W/kg) | Scaled 1g SAR (W/kg) | Plot No. |
| | | | | | | | | | Step 1) (mm) | Step 2) (%) | | | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 530.0 | 14.88 | 15.00 | 1.028 | 1.011 | 6.1 | 58.2 | 1.000 | **1.039** | 8 |
| 802.11ac (BW80) | Main | Rear | 0 | 5 610.0 | 14.79 | 15.00 | 1.050 | 1.011 | 4.7 | 59.0 | 0.804 | 0.853 | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 690.0 | 14.78 | 15.00 | 1.052 | 1.011 | 5.1 | 55.5 | 0.744 | 0.791 | |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 530.0 | 10.82 | 11.00 | 1.042 | 1.011 | 5.4 | 62.7 | 0.955 | 1.006 | |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 610.0 | 10.88 | 11.00 | 1.028 | 1.011 | 5.1 | 61.3 | 0.993 | 1.032 | |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 690.0 | 10.98 | 11.00 | 1.005 | 1.011 | 5.1 | 59.1 | 1.070 | **1.087** | 9 |
| 802.11ac (BW80) | MIMO | Rear | 0 | 5 530.0 | 10.44<br>10.37 | 10.50 | 1.030 | 1.011 | 5.6 | 64.3 | 0.847 | 0.882 | |
| 802.11ac (BW80) | MIMO | Rear | 0 | 5 610.0 | 10.40<br>10.47 | 10.50 | 1.023 | 1.011 | 4.0 | 61.4 | 0.817 | 0.845 | |
| 802.11ac (BW80) | MIMO | Rear | 0 | 5 690.0 | 10.34<br>10.40 | 10.50 | 1.038 | 1.011 | 5.1 | 61.6 | 0.907 | **0.952** | 10 |
| Repeated SAR Test | | | | | | | | | | | | | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 530.0 | 14.88 | 15.00 | 1.028 | 1.011 | 5.1 | 57.7 | 1.000 | 1.039 | |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 690.0 | 10.98 | 11.00 | 1.005 | 1.011 | 4.8 | 62.6 | 1.050 | 1.067 | |
| 802.11ac (BW80) | MIMO | Rear | 0 | 5 690.0 | 10.34<br>10.40 | 10.50 | 1.038 | 1.011 | 5.7 | 55.0 | 0.890 | 0.934 | |

| U-NII-3 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Ant. | EUT Position | Distance (mm) | Frequency (㎒) | Measured Conducted Power (dBm) | Max. Tune-up Power (dBm) | Power Scaling Factor | Duty Cycle Compensate Factor | Zoom require | | Measured 1g SAR (W/kg) | Scaled 1g SAR (W/kg) | Plot No. |
| | | | | | | | | | Step 1) (mm) | Step 2) (%) | | | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 775.0 | 16.88 | 17.00 | 1.028 | 1.011 | 5.4 | 55.6 | 1.240 | **1.289** | 11 |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 775.0 | 10.89 | 11.00 | 1.026 | 1.011 | 4.5 | 62.4 | 1.020 | 1.058 | |
| 802.11ac (BW80) | MIMO | Rear | 0 | 5 775.0 | 11.95<br>11.90 | 12.00 | 1.023 | 1.011 | 5.7 | 61.0 | 1.210 | 1.252 | |
| Repeated SAR Test | | | | | | | | | | | | | |
| 802.11ac (BW80) | Main | Rear | 0 | 5 775.0 | 16.88 | 17.00 | 1.028 | 1.011 | 5.4 | 55.8 | 1.200 | 1.247 | |
| 802.11ac (BW80) | Aux | Rear | 0 | 5 775.0 | 10.89 | 11.00 | 1.026 | 1.011 | 5.4 | 62.6 | 1.060 | **1.099** | 12 |
| 802.11ac (BW80) | MIMO | Rear | 0 | 5 775.0 | 11.95<br>11.90 | 12.00 | 1.023 | 1.011 | 5.1 | 59.0 | 1.220 | **1.262** | 13 |

| Bluetooth | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Ant. | EUT Position | Distance (mm) | Frequency (㎒) | Measured Conducted Power (dBm) | Max. Tune-up Power (dBm) | Power Scaling Factor | Duty Cycle Compensate Factor | Zoom require | | Measured 1g SAR (W/kg) | Scaled 1g SAR (W/kg) | Plot No. |
| | | | | | | | | | Step 1) (mm) | Step 2) (%) | | | |
| BDR_DH5 | Rear | Rear | 0 | 2 402.0 | 9.16 | 11.00 | 1.528 | 1.312 | 7.6 | 34.4 | 0.114 | 0.229 | |
| BDR_DH5 | Rear | Rear | 0 | 2 441.0 | 9.93 | 11.00 | 1.279 | 1.312 | 7.1 | 34.8 | 0.090 | 0.151 | |
| BDR_DH5 | Rear | Rear | 0 | 2 480.0 | 9.43 | 11.00 | 1.435 | 1.312 | 7.6 | 33.3 | 0.137 | **0.258** | 14 |

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**General Notes:**

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 447498 D01v06.
2. All modes of operation were investigated, and worst-case results are reported.
3. Battery is fully charged for all readings and the standard batteries are the only options.
4. Liquid tissue depth was at least 15 cm.
5. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.

**WLAN & Bluetooth Notes:**

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4㎓ WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 ㎓ 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
2. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance.
3. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.
4. When the specified maximum output power is the same for both UNII Band1 and UNII Band 2A, begins SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is ≤ 1.2W/kg, SAR is not required for UNII band1 > 1.2W/kg, both bands should be tested independently for SAR.
5. When SAR measurement is required for at least one of the bands(UNII-1 or UNII-2A) and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel.
6. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
7. WLAN & Bluetooth transmission was verified using a spectrum analyzer

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# 10. Simultaneous Transmission

## 10.1 #Simultaneous Transmission Configurations

| No. | Scenario | Operation |
|---|---|---|
| 1 | WLAN 2.4 ㎓ Main + Bluetooth Aux | **Yes** |
| 2 | WLAN 5 ㎓ Main + Bluetooth Aux | **Yes** |
| 3 | WLAN 5 ㎓ Aux + Bluetooth Aux | **Yes** |
| 4 | WLAN 5 ㎓ MIMO (Main, Aux) + Bluetooth Aux | **Yes** |

Notes:

- It does not to transmit simultaneously the Bluetooth and WLAN 2.4 ㎓ Aux.

## 10.2 Simultaneous Transmission Analysis

| Exposure Condition /Position | | WLAN | | | | Bluetooth Aux | Summation | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2.4 ㎓ Main | 5 ㎓ Main | 5 ㎓ Aux | 5 ㎓ MIMO | | | | | |
| | | [①] | [②] | [③] | [④] | [⑤] | [①+⑤] | [②+⑤] | [③+⑤] | [④+⑤] |
| **Body** | Rear | 0.890 | 1.289 | 1.099 | 1.262 | 0.258 | 1.148 | **1.547** | 1.357 | 1.520 |

Notes:

- Simultaneous transmission SAR test exclusion considerations
  Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneously transmitting antenna. When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration. Per KDB Publication 447498 D01v06.
- When the sum of SAR1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR1g 1.6 W/kg), the SPLSR procedures is not required. When the sum of SAR1g is greater than the SAR limit (SAR1g 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

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# 11. SAR Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg.
2) **When the original highest measured SAR is ≥ 0.80 W/㎏, the measurement was repeated once.**
3) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

| Band | Mode | Ant. | Frequency (㎒) | EUT Position | Separation Distance (㎜) | Measured 1 g SAR (W/kg) | Repeated 1 g SAR (W/kg) | Ratio |
|---|---|---|---|---|---|---|---|---|
| WLAN 2.4 ㎓ | 802.11b | Main | 2 437.0 | Rear | 0 | 0.853 | 0.857 | 1.00 |
| U-NII-1 | 802.11ac(BW80) | Main | 5 210.0 | Rear | 0 | 1.000 | 1.040 | 1.04 |
| U-NII-2A | 802.11ac(BW160) | Main | 5 250.0 | Rear | 0 | 1.200 | 1.200 | 1.00 |
| | 802.11ac(BW80) | Aux | 5 290.0 | Rear | 0 | 0.975 | 0.997 | 1.02 |
| U-NII-2C | 802.11ac(BW80) | Main | 5 530.0 | Rear | 0 | 1.000 | 1.000 | 1.00 |
| | 802.11ac(BW80) | Aux | 5 690.0 | Rear | 0 | 1.070 | 1.050 | 1.02 |
| | 802.11ac(BW80) | MIMO | 5 690.0 | Rear | 0 | 0.907 | 0.890 | 1.02 |
| U-NII-3 | 802.11ac(BW80) | Main | 5 775.0 | Rear | 0 | 1.240 | 1.200 | 1.03 |
| | 802.11ac(BW80) | Aux | 5 775.0 | Rear | 0 | 1.020 | 1.060 | 1.04 |
| | 802.11ac(BW80) | MIMO | 5 775.0 | Rear | 0 | 1.210 | 1.220 | 1.01 |

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## 12. 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.

| Source of Uncertainty | Tol. Value (± %) | Prob. Dist. | Div. | $c_i$ (1 g) | $c_i$ (10 g) | Standard Uncertainty | | $v_i$ or $v_{eff}$ |
|---|---|---|---|---|---|---|---|---|
| | | | | | | ± %, (1 g) | ± %, (10 g) | |
| Measurement System | | | | | | | | |
| Probe calibration | 6.55 | N | 1.00 | 1.00 | 1.00 | 6.55 | 6.55 | ∞ |
| Axial isotropy | 4.70 | R | 1.73 | 0.70 | 0.70 | 1.90 | 1.90 | ∞ |
| Hemispherical isotropy | 9.60 | R | 1.73 | 0.70 | 0.70 | 3.88 | 3.88 | ∞ |
| Boundary effect | 2.00 | R | 1.73 | 1.00 | 1.00 | 1.15 | 1.15 | ∞ |
| Linearity | 4.70 | R | 1.73 | 1.00 | 1.00 | 2.71 | 2.71 | ∞ |
| System detection limits | 0.25 | R | 1.73 | 1.00 | 1.00 | 0.14 | 0.14 | ∞ |
| Modulation response | 4.80 | R | 1.73 | 1.00 | 1.00 | 2.77 | 2.77 | ∞ |
| Readout electronics | 0.30 | N | 1.00 | 1.00 | 1.00 | 0.30 | 0.30 | ∞ |
| Response time | 0.80 | R | 1.73 | 1.00 | 1.00 | 0.46 | 0.46 | ∞ |
| Integration time | 2.60 | R | 1.73 | 1.00 | 1.00 | 1.50 | 1.50 | ∞ |
| RF ambient conditions – noise | 3.00 | R | 1.73 | 1.00 | 1.00 | 1.73 | 1.73 | ∞ |
| RF ambient conditions – reflections | 3.00 | R | 1.73 | 1.00 | 1.00 | 1.73 | 1.73 | ∞ |
| Probe positioner mech. Tolerance | 0.40 | R | 1.73 | 1.00 | 1.00 | 0.23 | 0.23 | ∞ |
| Probe positioning with respect to phantom shell | 6.70 | R | 1.73 | 1.00 | 1.00 | 3.87 | 3.87 | ∞ |
| Extrapolation, interpolation, and integration algorithms for max. SAR evaluation | 4.00 | R | 1.73 | 1.00 | 1.00 | 2.31 | 2.31 | ∞ |
| Test sample related | | | | | | | | |
| Test sample positioning | 5.77 | N | 1.00 | 1.00 | 1.00 | 5.77 | 5.77 | 29 |
| Device holder Uncertainty | 3.97 | N | 1.00 | 1.00 | 1.00 | 3.97 | 3.97 | 5 |
| Output power variation—SAR drift measurement | 5.00 | R | 1.73 | 1.00 | 1.00 | 2.89 | 2.89 | ∞ |
| SAR scaling | 0.00 | R | 1.73 | 1.00 | 1.00 | 0.00 | 0.00 | ∞ |
| Phantom and set-up | | | | | | | | |
| Phantom shell uncertainty—shape, thickness, and permittivity | 7.60 | R | 1.73 | 1.00 | 1.00 | 4.39 | 4.39 | ∞ |
| Liquid conductivity deviation from target values | 5.00 | R | 1.73 | 0.64 | 0.43 | 1.85 | 1.24 | ∞ |
| Liquid permittivity deviation from target values | 5.00 | R | 1.73 | 0.60 | 0.49 | 1.73 | 1.41 | ∞ |
| Liquid conductivity measurement | 0.93 | N | 1.00 | 0.78 | 0.71 | 0.73 | 0.66 | 4 |
| Liquid permittivity measurement | 0.74 | N | 1.00 | 0.26 | 0.26 | 0.19 | 0.19 | 4 |
| Liquid conductivity—temperature uncertainty | 1.10 | R | 1.73 | 0.78 | 0.71 | 0.49 | 0.45 | ∞ |
| Liquid permittivity—temperature uncertainty | 1.16 | R | 1.73 | 0.23 | 0.26 | 0.15 | 0.17 | ∞ |
| Combined standard uncertainty | | | RSS | | | 13.81 | 13.70 | 413 |
| Expanded uncertainty (95 % confidence interval) | | | $k$ = 2 | | | 27.62 | 27.40 | |

## 13. Test Equipment Information

| Test Platform | SPEAG DASY5 System | | | |
|---|---|---|---|---|
| Version | DASY52: 52.10.3.1513 / SEMCAD: 14.6.13 (7474) | | | |
| Location | KCTL Inc, 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea | | | |
| Manufacture | SPEAG | | | |
| Hardware Reference | | | | |
| Equipment | Model | Serial Number | Date of Calibration | Due date of next Calibration |
| Shield Room | - | 8F -2 | - | - |
| DASY5 Robot | TX90XL | F12/5L7FA1/A/01 | - | - |
| Phantom | 2mm Oval Phantom ELI5 | 1178 | - | - |
| Mounting Device | Laptop Holder | - | - | - |
| DAE | DAE4 | 1342 | 2019-05-23 | 2020-05-23 |
| Probe | EX3DV4 | 3865 | 2019-08-28 | 2020-08-28 |
| ESG Vector Signal Generator | E4438C | MY42080486 | 2019-05-13 | 2020-05-13 |
| Dual Power Meter | E4419B | GB43312301 | 2019-05-13 | 2020-05-13 |
| Power Sensor | 8481H | 3318A 19379 | 2019-05-13 | 2020-05-13 |
| Power Sensor | 8481H | 3318A 19377 | 2019-05-13 | 2020-05-13 |
| Attenuator | 8491B 3dB | 17387 | 2019-05-13 | 2020-05-13 |
| Attenuator | 8491B-6dB | MY39270294 | 2019-05-13 | 2020-05-13 |
| Attenuator | 8491B 10dB | 29425 | 2019-05-13 | 2020-05-13 |
| Power Amplifier | 5190FE | 1012 | 2019-05-14 | 2020-05-14 |
| Dual Directional Coupler | 772D | 2839A00719 | 2019-05-13 | 2020-05-13 |
| Low Pass Filter | LA-30N | 40058 | 2019-05-13 | 2020-05-13 |
| Low Pass Filter | LA-60N | 40059 | 2019-05-13 | 2020-05-13 |
| Dipole Validation Kits | D2450V2 | 895 | 2018-07-24 | 2020-07-24 |
| Dipole Validation Kits | D5GHzV2 | 1293 | 2019-07-04 | 2021-07-04 |
| Network Analyzer | E5071B | MY42403524 | 2020-02-27 | 2021-02-27 |
| Dielectric Assessment Kit | DAK-3.5 | 1078 | 2019-05-22 | 2020-05-22 |
| Humidity/Temp | MHB-382SD | 23107 | 2019-05-16 | 2020-05-16 |
| Spectrum Analyzer | FSP7 | 100289 | 2020-01-03 | 2021-01-03 |

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# 14. Test System Verification Results

Date: 2020-03-05

Test Laboratory: KCTL Inc.
**File Name: 2450 MHz Verification Input Power 100 mW 2020-03-05.da5:0**

**DUT: Dipole 2450 MHz D2450V2, Type: D2450V2, Serial: D2450V2 - SN:895**

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2450 MHz; $\sigma$ = 1.802 S/m; $\varepsilon_r$ = 38.486; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

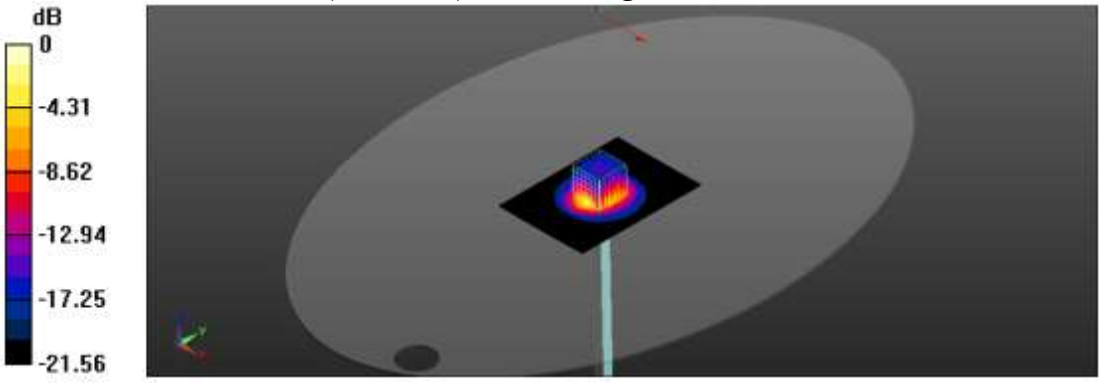
- Probe: EX3DV4 - SN3865; ConvF(7.84, 7.84, 7.84) @ 2450 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/2450 MHz Verification Input Power 100 mW 2020-03-05/Area Scan (9x12x1):**
Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 7.54 W/kg

**Configuration/2450 MHz Verification Input Power 100 mW 2020-03-05/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 69.65 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 10.2 W/kg
**SAR(1 g) = 5.03 W/kg; SAR(10 g) = 2.33 W/kg**
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 49.5%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 8.36 W/kg




0 dB = 8.36 W/kg = 9.22 dBW/kg

Date: 2020-03-24

Test Laboratory: KCTL Inc.
**File Name: 2450 MHz Verification Input Power 100 mW 2020-03-24.da5:0**

**DUT: Dipole 2450 MHz D2450V2, Type: D2450V2, Serial: D2450V2 - SN:895**

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2450 MHz; $\sigma$ = 1.816 S/m; $\varepsilon_r$ = 39.933; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

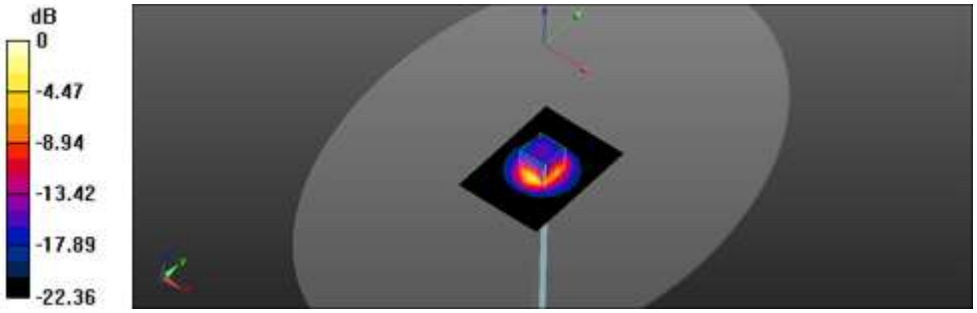
- Probe: EX3DV4 - SN3865; ConvF(7.84, 7.84, 7.84) @ 2450 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/2450 MHz Verification Input Power 100 mW 2020-03-24/Area Scan (9x12x1):**
Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 7.80 W/kg

**Configuration/2450 MHz Verification Input Power 100 mW 2020-03-24/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 73.67 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 11.2 W/kg
**SAR(1 g) = 5.36 W/kg; SAR(10 g) = 2.49 W/kg**
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 48%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 9.01 W/kg




0 dB = 9.01 W/kg = 9.55 dBW/kg

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Date: 2020-03-09

Test Laboratory: KCTL Inc.
**File Name: 5200 MHz Verification Input Power 100 mW 2020-03-09.da5:0**

**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293**

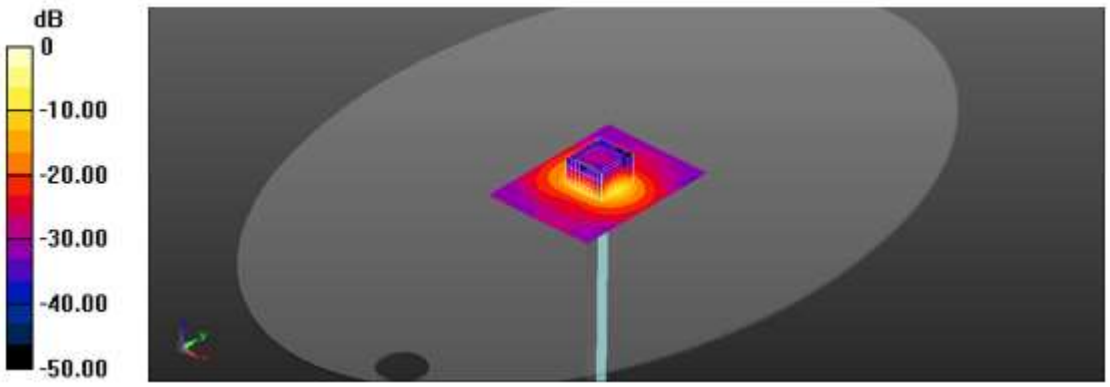
Communication System: UID 0, CW (0); Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; $\sigma$ = 4.536 S/m; $\varepsilon_r$ = 36.683; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.79, 4.79, 4.79) @ 5200 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/5200 MHz Verification Input Power 100 mW 2020-03-09/Area Scan (10x13x1):**
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 14.9 W/kg

**Configuration/5200 MHz Verification Input Power 100 mW 2020-03-09/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 73.61 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 32.5 W/kg
**SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.39 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 65.1%
Maximum value of SAR (measured) = 20.5 W/kg




0 dB = 20.5 W/kg = 13.12 dBW/kg

Date: 2020-03-09

Test Laboratory: KCTL Inc.
**File Name: 5300 MHz Verification Input Power 100 mW 2020-03-09.da5:0**

**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293**

Communication System: UID 0, CW (0); Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5300 MHz; $\sigma$ = 4.653 S/m; $\varepsilon_r$ = 36.553; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

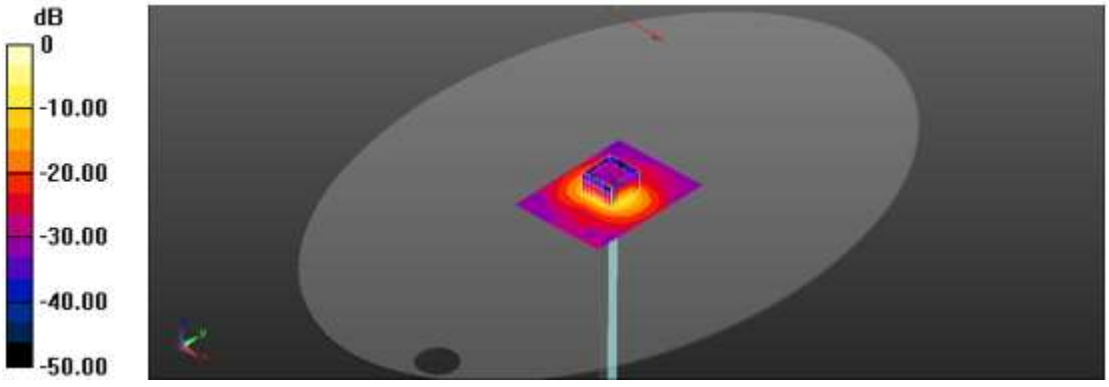
- Probe: EX3DV4 - SN3865; ConvF(4.62, 4.62, 4.62) @ 5300 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/5300 MHz Verification Input Power 100 mW 2020-03-09/Area Scan (10x13x1):**
Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 15.6 W/kg

**Configuration/5300 MHz Verification Input Power 100 mW 2020-03-09/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.84 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 31.7 W/kg
**SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.33 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 65.1%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 20.0 W/kg




0 dB = 20.0 W/kg = 13.01 dBW/kg

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Date: 2020-03-10

Test Laboratory: KCTL Inc.
**File Name: 5600 MHz Verification Input Power 100 mW 2020-03-10.da5:0**

**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293**

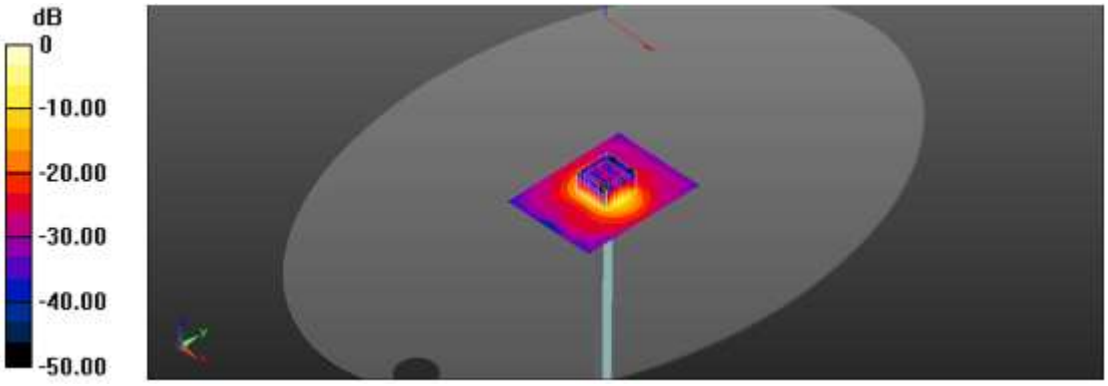
Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; $\sigma$ = 4.949 S/m; $\varepsilon_r$ = 36.093; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.4, 4.4, 4.4) @ 5600 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/5600 MHz Verification Input Power 100 mW 2020-03-10/Area Scan (10x13x1):**
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 17.7 W/kg

**Configuration/5600 MHz Verification Input Power 100 mW 2020-03-10/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.91 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 33.2 W/kg
**SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.33 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 63.8%
Maximum value of SAR (measured) = 20.4 W/kg




0 dB = 20.4 W/kg = 13.10 dBW/kg

Date: 2020-03-25

Test Laboratory: KCTL Inc.
**File Name: 5600 MHz Verification Input Power 100 mW 2020-03-25.da5:0**

**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293**

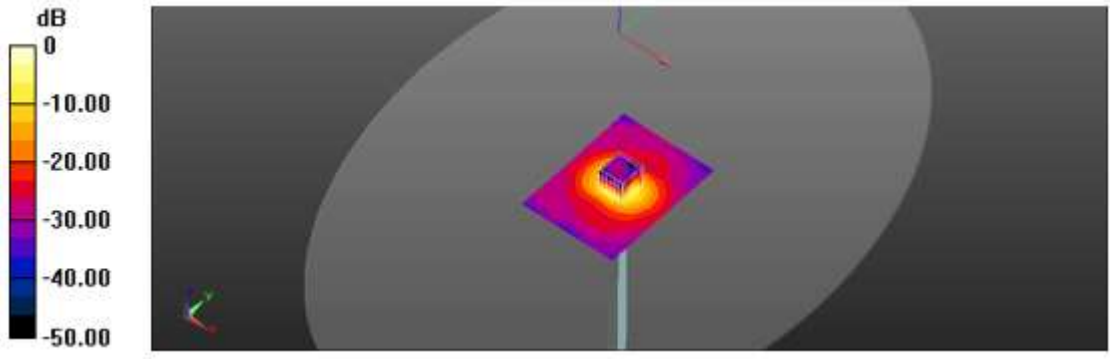
Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; $\sigma$ = 5.193 S/m; $\varepsilon_r$ = 34.839; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.4, 4.4, 4.4) @ 5600 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/5600 MHz Verification Input Power 100 mW 2020-03-25/Area Scan (10x13x1):**
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 15.0 W/kg

**Configuration/5600 MHz Verification Input Power 100 mW 2020-03-25/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.28 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 34.7 W/kg
**SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.39 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 63.1%




0 dB = 21.1 W/kg = 13.24 dBW/kg

Date: 2020-03-06

Test Laboratory: KCTL Inc.
**File Name: 5800 MHz Verification Input Power 100 mW 2020-03-06.da5:0**

**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293**

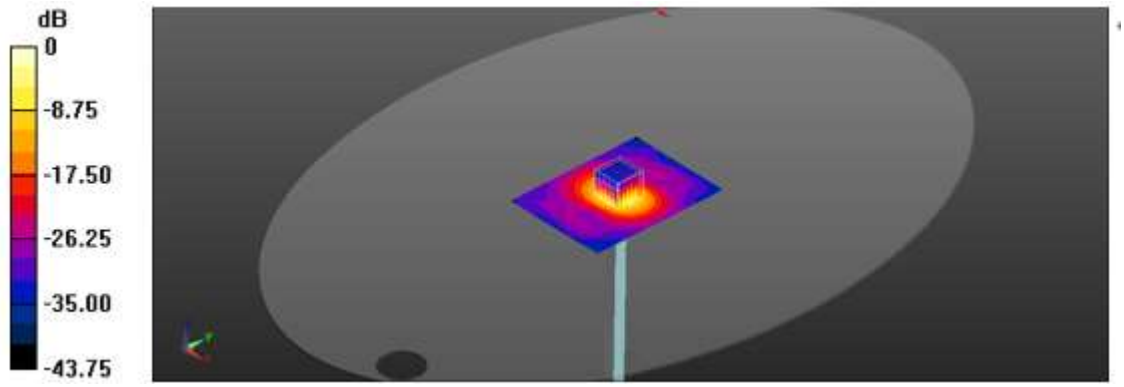
Communication System: UID 0, CW (0); Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; $\sigma$ = 5.261 S/m; $\varepsilon_r$ = 35.303; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.46, 4.46, 4.46) @ 5800 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/5800 MHz Verification Input Power 100 mW 2020-03-06/Area Scan (10x13x1):**
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 15.6 W/kg

**Configuration/5800 MHz Verification Input Power 100 mW 2020-03-06/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.34 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 36.2 W/kg
**SAR(1 g) = 8.32 W/kg; SAR(10 g) = 2.41 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 62%
Maximum value of SAR (measured) = 21.6 W/kg




0 dB = 21.6 W/kg = 13.34 dBW/kg

# 15. Test Results

1)

Date: 2020-03-24

Test Laboratory: KCTL Inc.
**File Name: 1. 802.11_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 2.4GWLAN (0); Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.803 S/m; $\varepsilon_r$ = 40.007; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

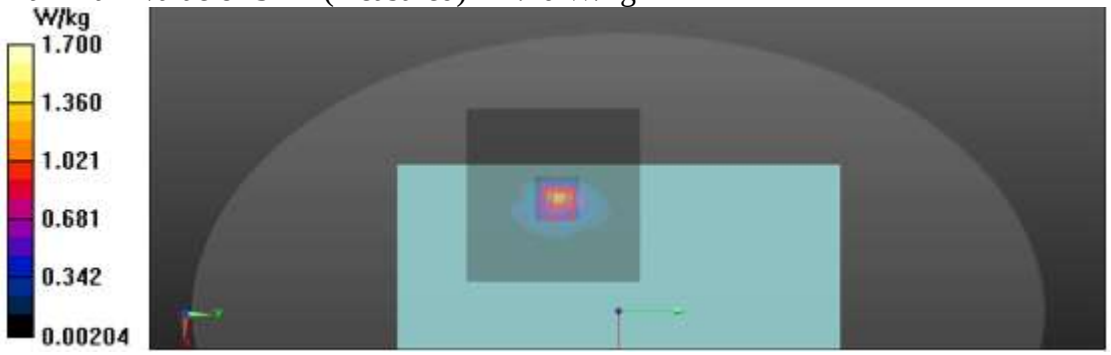
- Probe: EX3DV4 - SN3865; ConvF(7.84, 7.84, 7.84) @ 2437 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 b_Main_CH6_Rear 0mm Repeat/Area Scan (11x11x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.37 W/kg

**Configuration/802.11 b_Main_CH6_Rear 0mm Repeat/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.74 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 2.45 W/kg
**SAR(1 g) = 0.857 W/kg; SAR(10 g) = 0.345 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.6 mm
Ratio of SAR at M2 to SAR at M1 = 36.1%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.70 W/kg



2)

Date: 2020-03-24

Test Laboratory: KCTL Inc.
**File Name: 1. 802.11_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 2.4GWLAN (0); Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.803 S/m; $\varepsilon_r$ = 40.007; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

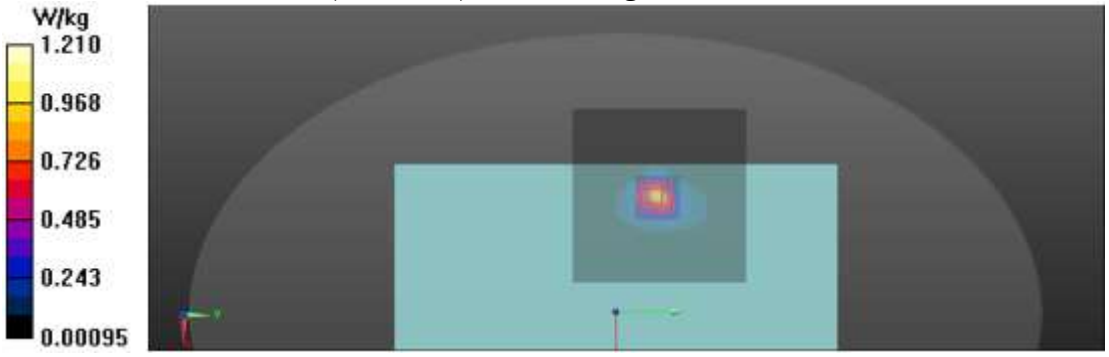
- Probe: EX3DV4 - SN3865; ConvF(7.84, 7.84, 7.84) @ 2437 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 b_Aux_CH6_Rear 0mm/Area Scan (11x11x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.14 W/kg

**Configuration/802.11 b_Aux_CH6_Rear 0mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.35 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 1.80 W/kg
**SAR(1 g) = 0.633 W/kg; SAR(10 g) = 0.251 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.1 mm
Ratio of SAR at M2 to SAR at M1 = 37.3%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.21 W/kg



3)

Date: 2020-03-24

Test Laboratory: KCTL Inc.
**File Name: 1. 802.11_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 2.4GWLAN (0); Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.803 S/m; $\varepsilon_r$ = 40.007; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

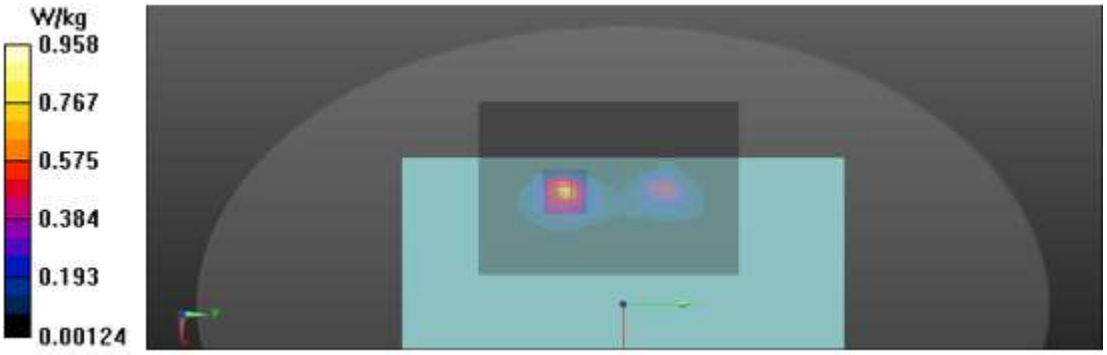
- Probe: EX3DV4 - SN3865; ConvF(7.84, 7.84, 7.84) @ 2437 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 n_HT40_MIMO_CH6_Rear 0mm/Area Scan (11x16x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.906 W/kg

**Configuration/802.11 n_HT40_MIMO_CH6_Rear 0mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.84 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.32 W/kg
**SAR(1 g) = 0.475 W/kg; SAR(10 g) = 0.195 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.3 mm
Ratio of SAR at M2 to SAR at M1 = 34.7%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.958 W/kg



4)

Date: 2020-03-09

Test Laboratory: KCTL Inc.
**File Name: 1. 5.2G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 5GWLAN (0); Frequency: 5210 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5210 MHz; $\sigma$ = 4.539 S/m; $\varepsilon_r$ = 36.664; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

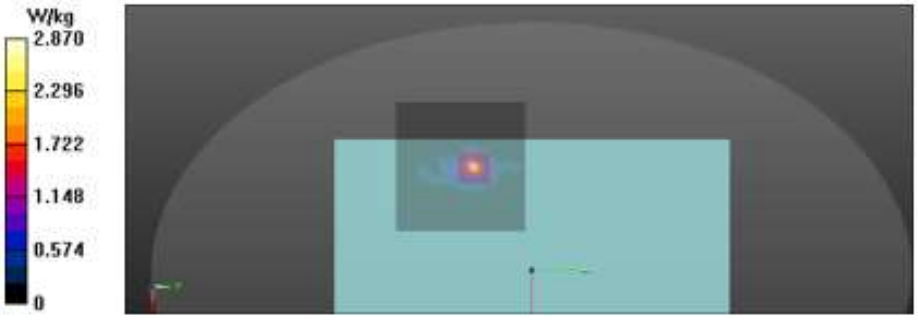
- Probe: EX3DV4 - SN3865; ConvF(4.79, 4.79, 4.79) @ 5210 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_Main_CH42_Rear 0mm Repeat/Area Scan (11x11x1):**
Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.89 W/kg

**Configuration/802.11 ac_VHT80_Main_CH42_Rear 0mm Repeat/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 24.43 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 5.16 W/kg
**SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.287 W/kg**
Smallest distance from peaks to all points 3 dB below = 6.1 mm
Ratio of SAR at M2 to SAR at M1 = 59.5%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.87 W/kg

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5)

Date: 2020-03-09

Test Laboratory: KCTL Inc.
**File Name: 1. 5.3G_VHT160_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 5GWLAN (0); Frequency: 5250 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5250 MHz; $\sigma$ = 4.59 S/m; $\varepsilon_r$ = 36.482; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

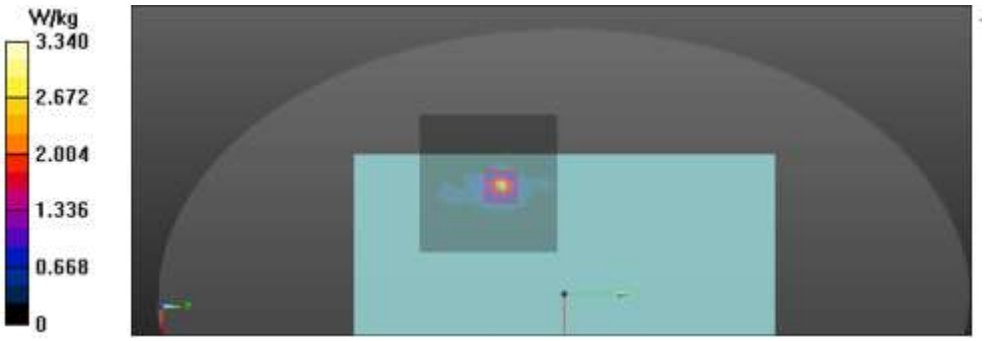
- Probe: EX3DV4 - SN3865; ConvF(4.79, 4.79, 4.79) @ 5250 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT160_Main_CH50_Rear 0mm/Area Scan (11x11x1):** Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 3.04 W/kg

**Configuration/802.11 ac_VHT160_Main_CH50_Rear 0mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 23.23 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 6.02 W/kg
**SAR(1 g) = 1.2 W/kg; SAR(10 g) = 0.335 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.8 mm
Ratio of SAR at M2 to SAR at M1 = 59.9%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 3.34 W/kg



6)

Date: 2020-03-09

Test Laboratory: KCTL Inc.
**File Name: 2. 5.3G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 5GWLAN (0); Frequency: 5290 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5290 MHz; $\sigma$ = 4.65 S/m; $\varepsilon_r$ = 36.518; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

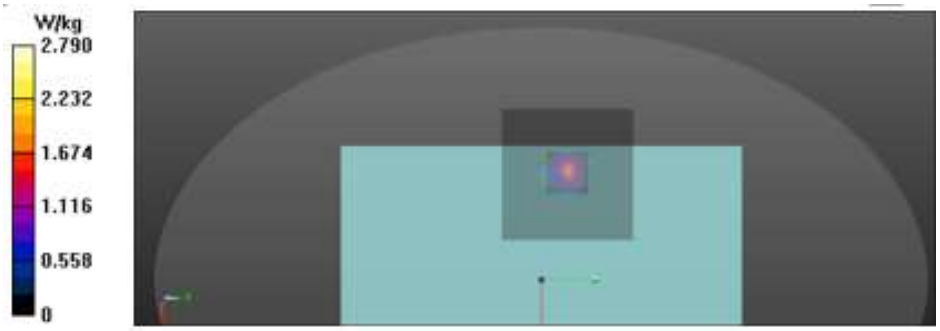
- Probe: EX3DV4 - SN3865; ConvF(4.62, 4.62, 4.62) @ 5290 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_Aux_CH58_Rear 0mm Repeat/Area Scan (11x11x1):**
Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.04 W/kg

**Configuration/802.11 ac_VHT80_Aux_CH58_Rear 0mm Repeat/Zoom Scan (9x9x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 26.01 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 6.38 W/kg
**SAR(1 g) = 0.997 W/kg; SAR(10 g) = 0.244 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.6 mm
Ratio of SAR at M2 to SAR at M1 = 64.3%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.79 W/kg



7)

Date: 2020-03-09

Test Laboratory: KCTL Inc.
**File Name: 2. 5.3G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 5GWLAN (0); Frequency: 5290 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5290 MHz; $\sigma$ = 4.65 S/m; $\varepsilon_r$ = 36.518; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

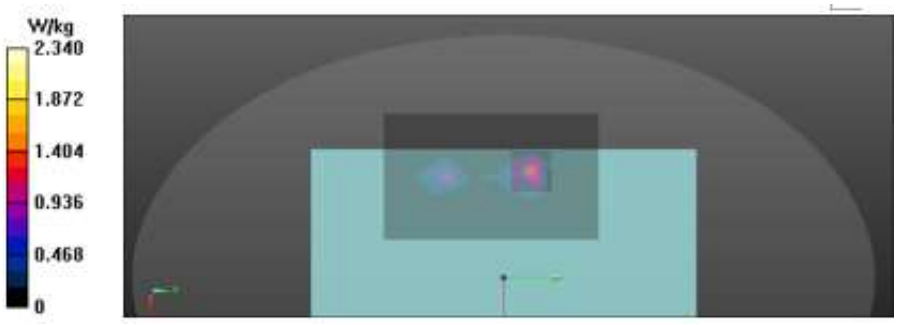
- Probe: EX3DV4 - SN3865; ConvF(4.62, 4.62, 4.62) @ 5290 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_MIMO_CH58_Rear 0mm/Area Scan (11x18x1):**
Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.33 W/kg

**Configuration/802.11 ac_VHT80_MIMO_CH58_Rear 0mm/Zoom Scan (9x9x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 15.68 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.73 W/kg
**SAR(1 g) = 0.796 W/kg; SAR(10 g) = 0.198 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.4 mm
Ratio of SAR at M2 to SAR at M1 = 63.5%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.34 W/kg

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8)

Date: 2020-03-10

Test Laboratory: KCTL Inc.
**File Name: 1. 5.6G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 5GWLAN (0); Frequency: 5530 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5530 MHz; $\sigma$ = 4.876 S/m; $\varepsilon_r$ = 36.198; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

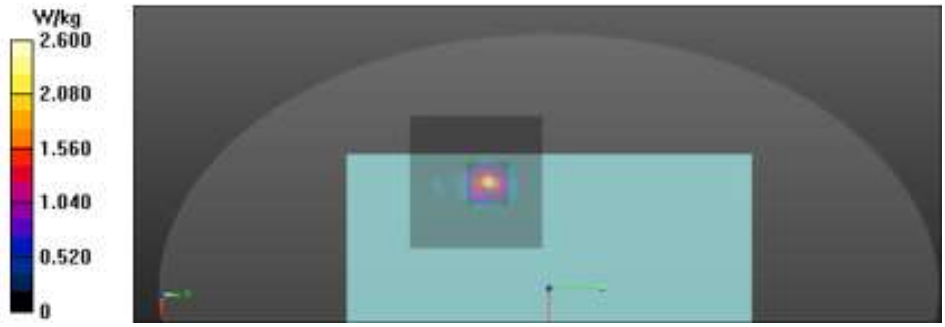
- Probe: EX3DV4 - SN3865; ConvF(4.58, 4.58, 4.58) @ 5530 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_Main_CH106_Rear 0mm/Area Scan (11x11x1):** Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.85 W/kg

**Configuration/802.11 ac_VHT80_Main_CH106_Rear 0mm/Zoom Scan (9x9x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 24.46 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 7.46 W/kg
**SAR(1 g) = 1 W/kg; SAR(10 g) = 0.292 W/kg**
Smallest distance from peaks to all points 3 dB below = 6.1 mm
Ratio of SAR at M2 to SAR at M1 = 58.2%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.60 W/kg



9)

Date: 2020-03-10

Test Laboratory: KCTL Inc.
**File Name: 1. 5.6G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 5GWLAN (0); Frequency: 5690 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5690 MHz; $\sigma$ = 5.049 S/m; $\varepsilon_r$ = 35.948; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

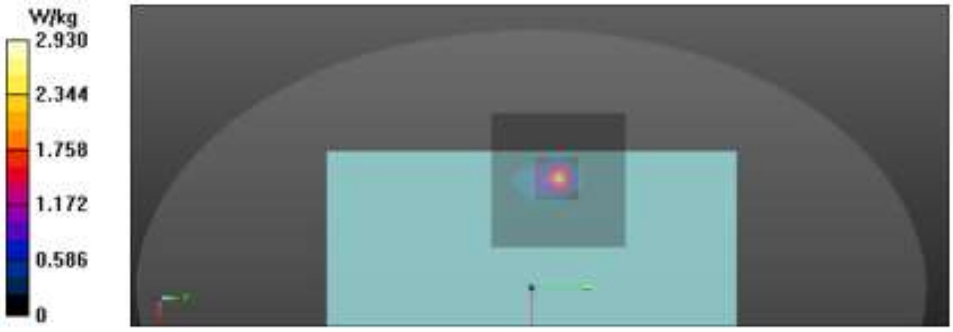
- Probe: EX3DV4 - SN3865; ConvF(4.4, 4.4, 4.4) @ 5690 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_Aux_CH138_Rear 0mm/Area Scan (11x11x1):** Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.63 W/kg

**Configuration/802.11 ac_VHT80_Aux_CH138_Rear 0mm/Zoom Scan (9x9x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 26.77 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 5.70 W/kg
**SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.275 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.1 mm
Ratio of SAR at M2 to SAR at M1 = 59.1%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.93 W/kg

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10)

Date: 2020-03-25

Test Laboratory: KCTL Inc.
**File Name: 1. 5.6G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, 5GWLAN (0); Frequency: 5690 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5690 MHz; $\sigma$ = 5.288 S/m; $\varepsilon_r$ = 34.687; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

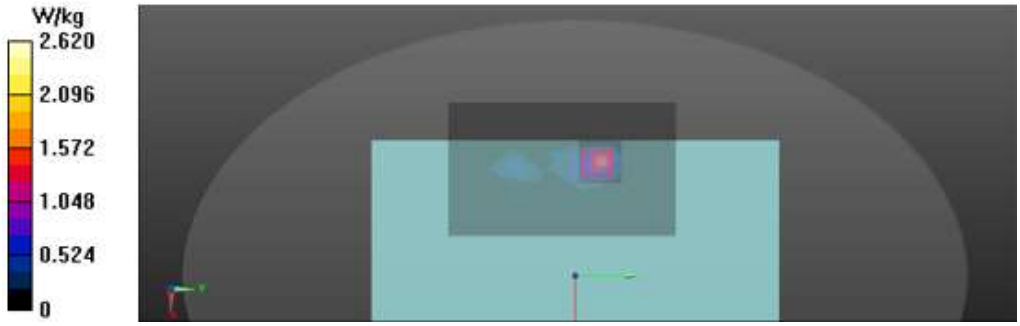
- Probe: EX3DV4 - SN3865; ConvF(4.4, 4.4, 4.4) @ 5690 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_MIMO_CH138_Rear 0mm/Area Scan (11x18x1):**
Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.21 W/kg

**Configuration/802.11 ac_VHT80_MIMO_CH138_Rear 0mm/Zoom Scan (9x9x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 12.49 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 4.89 W/kg
**SAR(1 g) = 0.907 W/kg; SAR(10 g) = 0.232 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.1 mm
Ratio of SAR at M2 to SAR at M1 = 61.6%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.62 W/kg

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11)

Date: 2020-03-06

Test Laboratory: KCTL Inc.
**File Name: 1. 5.8G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

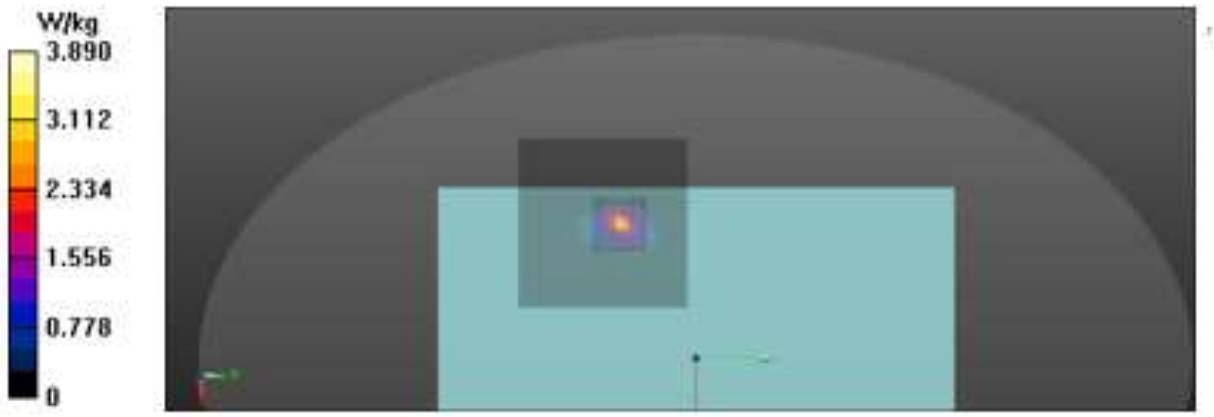
Communication System: UID 0, 5GWLAN (0); Frequency: 5775 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5775 MHz; $\sigma$ = 5.237 S/m; $\varepsilon_r$ = 35.375; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.46, 4.46, 4.46) @ 5775 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_Main_CH155_Rear 0mm/Area Scan (11x11x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 3.93 W/kg

**Configuration/802.11 ac_VHT80_Main_CH155_Rear 0mm/Zoom Scan (9x9x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 25.73 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 7.78 W/kg
**SAR(1 g) = 1.24 W/kg; SAR(10 g) = 0.313 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.4 mm
Ratio of SAR at M2 to SAR at M1 = 55.6%
Maximum value of SAR (measured) = 3.89 W/kg



12)

Date: 2020-03-06

Test Laboratory: KCTL Inc.
**File Name: 1. 5.8G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

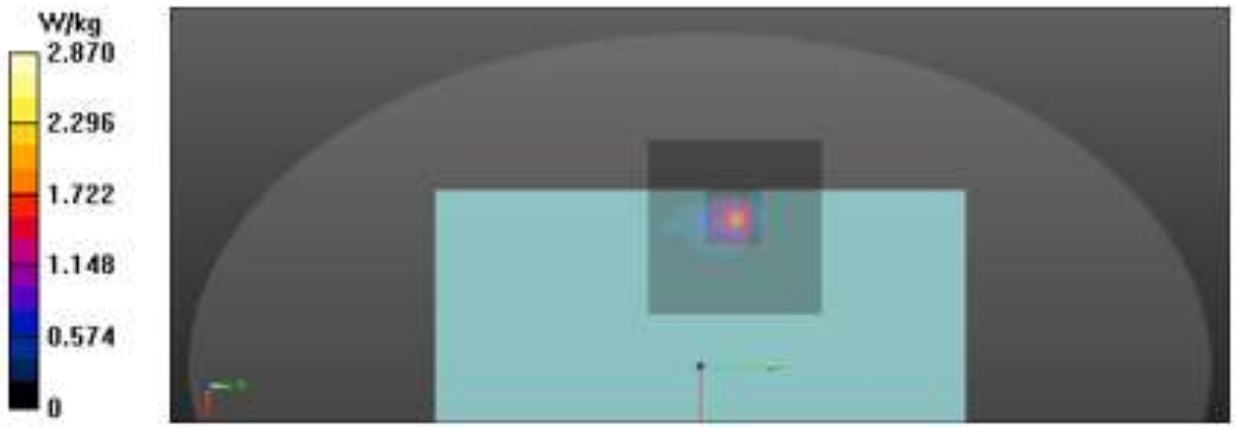
Communication System: UID 0, 5GWLAN (0); Frequency: 5775 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5775 MHz; $\sigma$ = 5.237 S/m; $\varepsilon_r$ = 35.375; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.46, 4.46, 4.46) @ 5775 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_Aux_CH155_Rear 0mm Repeat/Area Scan (11x11x1):**
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.89 W/kg

**Configuration/802.11 ac_VHT80_Aux_CH155_Rear 0mm Repeat/Zoom Scan (9x9x7)/Cube 0:**
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 24.64 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 5.57 W/kg
**SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.271 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.4 mm
Ratio of SAR at M2 to SAR at M1 = 62.6%
Maximum value of SAR (measured) = 2.87 W/kg



13)

Date: 2020-03-06

Test Laboratory: KCTL Inc.
**File Name: 1. 5.8G_VHT80_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

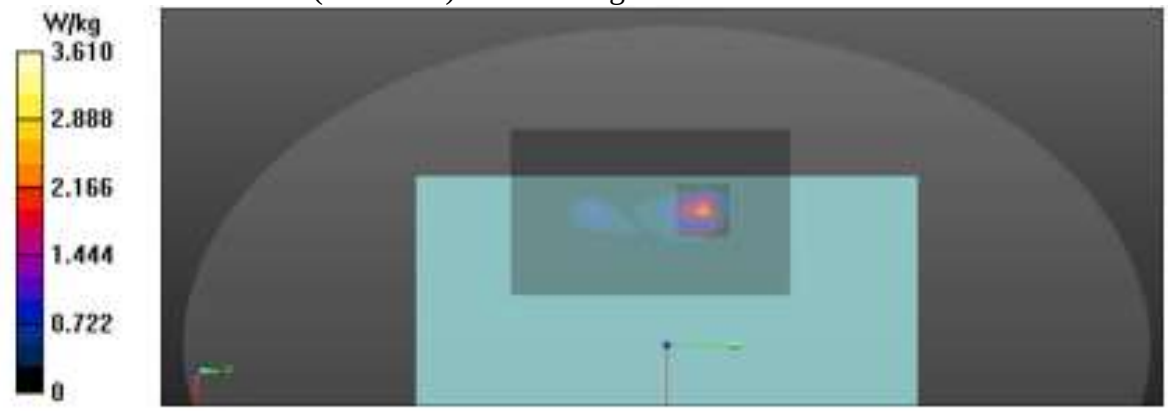
Communication System: UID 0, 5GWLAN (0); Frequency: 5775 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5775 MHz; $\sigma$ = 5.237 S/m; $\varepsilon_r$ = 35.375; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.46, 4.46, 4.46) @ 5775 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/802.11 ac_VHT80_MIMO_CH155_Rear 0mm Repeat/Area Scan (11x18x1):**
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.56 W/kg

**Configuration/802.11 ac_VHT80_MIMO_CH155_Rear 0mm Repeat/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 15.19 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 6.49 W/kg
**SAR(1 g) = 1.22 W/kg; SAR(10 g) = 0.324 W/kg**
Smallest distance from peaks to all points 3 dB below = 5.1 mm
Ratio of SAR at M2 to SAR at M1 = 59%
Maximum value of SAR (measured) = 3.61 W/kg



14)

Date: 2020-03-24

Test Laboratory: KCTL Inc.
**File Name: 2. Bluetooth_GFSK_DH5_Body.da53:0**

**DUT: NP767XCM, Type: Notebook, Serial: 1CEL91ZN100246M**

Communication System: UID 0, Bluetooth (0); Frequency: 2480 MHz; Duty Cycle: 1:1.30017
Medium parameters used: f = 2480 MHz; $\sigma$ = 1.849 S/m; $\varepsilon_r$ = 39.832; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.84, 7.84, 7.84) @ 2480 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2019-05-23
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (3);

**Configuration/Bluetooth_GFSK_DH5_CH78_Rear 0mm/Area Scan (11x11x1):** Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.199 W/kg

**Configuration/Bluetooth_GFSK_DH5_CH78_Rear 0mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.83 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.401 W/kg
**SAR(1 g) = 0.137 W/kg; SAR(10 g) = 0.053 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.6 mm
Ratio of SAR at M2 to SAR at M1 = 33.3%
Maximum value of SAR (measured) = 0.284 W/kg