# TEST REPORT

| | |
|---|---|
| **Report No. .................................... :** | **CHTEW19120059** Report verificaiton: |
| **Project No..................................... :** | **SHT1912021002EW** |
| **Contains FCC ID ........................... :** | **2AJTNDL01** |
| **Contains IC.................................... :** | **22057-DL01** |
| **Applicant's name .......................... :** | **Powervision Robot Inc.** |
| Address............................................: | Building No.33,Yungu Park,No. 79 Shuangying West Road, Technology Park, Changping, Beijing,China |
| Manufacturer......................................: | Powervision Robot Inc. |
| Address..............................................: | Building No.33,Yungu Park,No. 79 Shuangying West Road, Technology Park, Changping, Beijing,China |
| **Test item description ................... :** | **Datalink** |
| Trade Mark .......................................: | PowerVision |
| Model/Type reference.......................: | DL01 |
| Listed Model(s) ................................: | - |
| **Standard ....................................... :** | **FCC 47 CFR Part2.1093**<br>**RSS-102,Issue 5**<br>**IEC 62209-2:2010+AMD1:2019 CSV** |
| Date of receipt of test sample……….: | Sep. 10, 2019 |
| Date of testing…………………………...: | Sep. 11, 2019- Oct. 23, 2019 |
| Date of issue………………………….: | Dec. 06, 2019 |
| **Result................. …………………...:** | **PASS** |

| | | |
|---|---|---|
| Compiled by<br>( position+printedname+signature)...: | File administrators:Xiaodong Zhao | Xiaodong Zhao |
| Supervised by<br>( position+printedname+signature)...: | Test Engineer: Xiaodong Zhao | Xiaodong Zhao |
| Approved by<br>( position+printedname+signature)...: | Manager: Hans Hu | Hans Hu |

| | |
|---|---|
| **Testing Laboratory Name ............. :** | **Shenzhen Huatongwei International Inspection Co., Ltd** |
| Address............................................: | 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China |



*The test report merely correspond to the test sample.*

# Contents

# 1 . Test Standards and Report version

## 1.1. Test Standards

The tests were performed according to following standards:

FCC 47 Part 2.1093: Radiofrequency radiation exposure evaluation: portable devices.

RSS-102,Issue 5: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

IEC 62209-2:2010+AMD1:2019 CSV: Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)

FCC published RF exposure KDB procedures:
865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz
865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations
447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
248227 D01 802 11 Wi-Fi SAR v02r02: SAR Measurement Proceduresfor802.11 a/b/g Transmitters

TCB workshop April, 2019; Page 19, Tissue Simulating Liquids (TSL)
Notice 2019-DRS001: Applicability of IEC 62209-2 AMD1:2019 Standard

## 1.2. Report version

| Revision No. | Date of issue | Description |
|---|---|---|
| N/A | 2019-10-24 | Original |
| | | |
| | | |
| | | |
| | | |

# 2. Summary

## 2.1. Client Information

| | |
|---|---|
| Applicant: | Powervision Robot Inc. |
| Address: | Building No.33,Yungu Park,No. 79 Shuangying West Road, Technology Park, Changping, Beijing,China |
| Manufacturer: | Powervision Robot Inc. |
| Address: | Building No.33,Yungu Park,No. 79 Shuangying West Road, Technology Park, Changping, Beijing,China |

## 2.2. Host Information

| | |
|---|---|
| Manufacturer: | Powervision Tech Inc. |
| Address: | 5th Floor,Building No.33 Yungu park, No.79 Shuangying West Road,Science Park,Changping District, Beijing,102200,PRC |
| Name of EUT: | Remote Controller |
| Trade Mark: | PowerVision |
| Model No.: | PRC20 |
| Serial Number: | PRC20-001 |
| Hardware version: | VB |
| Software version: | 1.18.58 |

## 2.3. Product Description

| | | |
|---|---|---|
| Name of EUT: | Datalink | |
| Trade Mark: | PowerVision | |
| Model No.: | DL01 | |
| Listed Model(s): | - | |
| Power supply: | DC 3.3V | |
| Device Category: | Portable | |
| Product stage: | Production unit | |
| RF Exposure Environment: | General Population/Uncontrolled | |
| **Maximum SAR Value** | | |
| Separation Distance: | Limbs: | 0mm |
| Max Report SAR Value(1g): | **Limbs:** | 2.115 W/kg |
| **WiFi 2.4G** | | |
| Operating Mode: | 802.11b<br>802.11g<br>802.11n(HT20) | |
| Antenna Type: | External | |
| *Remark:*<br>*1. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power.* | | |

# 3. Test Environment

## 3.1. Test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

## 3.2. Test Facility

**CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

**A2LA-Lab Cert. No.: 3902.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**FCC-Registration No.: 762235**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 762235.

**IC-Registration No.: 5377A**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A.

**ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

## 3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Ambient temperature | 18 °C to 25 °C |
| Ambient humidity | 30%RH to 70%RH |
| Air Pressure | 950-1050mbar |

# 4. Equipments Used during the Test

| Used | Test Equipment | Manufacturer | Model No. | Serial No. | Cal. date (YY-MM-DD) | Due date (YY-MM-DD) |
|---|---|---|---|---|---|---|
| ● | Data Acquisition Electronics DAEx | SPEAG | DAE4 | 1549 | 2019/03/19 | 2020/03/18 |
| ● | E-field Probe | SPEAG | EX3DV4 | 7494 | 2019/03/25 | 2020/03/24 |
| ○ | Universal Radio Communication Tester | R&S | CMW500 | 137681 | 2019/06/27 | 2020/06/26 |
| ● Tissue-equivalent liquids Validation | | | | | | |
| ● | Dielectric Assessment Kit | SPEAG | DAK-3.5 | 1267 | N/A | N/A |
| ○ | Dielectric Assessment Kit | SPEAG | DAK-12 | 1130 | N/A | N/A |
| ● | Network analyzer | Keysight | E5071C | MY46733048 | 2019/09/21 | 2020/09/20 |
| ● System Validation | | | | | | |
| ○ | System Validation Antenna | SPEAG | CLA-150 | 4024 | 2018/02/21 | 2021/02/20 |
| ○ | System Validation Dipole | SPEAG | D450V3 | 1102 | 2018/02/23 | 2021/02/22 |
| ○ | System Validation Dipole | SPEAG | D750V3 | 1180 | 2018/02/07 | 2021/02/06 |
| ○ | System Validation Dipole | SPEAG | D835V2 | 4d238 | 2018/02/19 | 2021/02/18 |
| ○ | System Validation Dipole | SPEAG | D1750V2 | 1164 | 2018/02/06 | 2021/02/05 |
| ○ | System Validation Dipole | SPEAG | D1900V2 | 5d226 | 2018/02/22 | 2021/02/21 |
| ● | System Validation Dipole | SPEAG | D2450V2 | 1009 | 2018/02/05 | 2021/02/04 |
| ○ | System Validation Dipole | SPEAG | D2600V2 | 1150 | 2018/02/05 | 2021/02/04 |
| ○ | System Validation Dipole | SPEAG | D5GHzV2 | 1273 | 2018/02/21 | 2021/02/20 |
| ● | Signal Generator | R&S | SMB100A | 114360 | 2019/08/15 | 2020/08/14 |
| ● | Power Viewer for Windows | R&S | N/A | N/A | N/A | N/A |
| ● | Power sensor | R&S | NRP18A | 101010 | 2019/08/15 | 2020/08/14 |
| ● | Power sensor | R&S | NRP18A | 101011 | 2019/08/15 | 2020/08/14 |
| ● | Power Amplifier | BONN | BLWA 0160-2M | 1811887 | 2018/11/15 | 2019/11/14 |
| ● | Dual Directional Coupler | Mini-Circuits | ZHDC-10-62-S+ | F975001814 | 2018/11/15 | 2019/11/14 |
| ● | Attenuator | Mini-Circuits | VAT-3W2+ | 1819 | 2018/11/15 | 2019/11/14 |
| ● | Attenuator | Mini-Circuits | VAT-10W2+ | 1741 | 2018/11/15 | 2019/11/14 |

*Note:*

1. *The Probe,Dipole and DAE calibration reference to the Appendix B and C.*
2. *Referring to KDB865664 D01, the dipole calibration interval can be extended to 3 years with justifcatio. The dipole are also not physically damaged or repaired during the interval.*

# 5. Measurement Uncertainty

| Measurement uncertainty evaluation for DUT SAR test IEC 62209-2（30M-6GHz） | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | Error Description | Uncertainty Value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
| Measurement System | | | | | | | | | |
| 1 | Probe calibration | 6.65% | N | 1 | 1 | 1 | 6.65% | 6.65% | ∞ |
| 2 | Axial isotropy | 0.60% | R | $\sqrt{3}$ | 0.7 | 0.7 | 0.24% | 0.24% | ∞ |
| 3 | Hemispherical isotropy | 1.60% | R | $\sqrt{3}$ | 0.7 | 0.7 | 0.65% | 0.65% | ∞ |
| 4 | Boundary Effects | 2.00% | R | $\sqrt{3}$ | 1 | 1 | 1.15% | 1.15% | ∞ |
| 5 | Probe Linearity | 0.45% | R | $\sqrt{3}$ | 1 | 1 | 0.26% | 0.26% | ∞ |
| 6 | System Detection Limits | 1.00% | R | $\sqrt{3}$ | 1 | 1 | 0.58% | 0.58% | ∞ |
| 7 | Modulation response | 2.40% | R | $\sqrt{3}$ | 1 | 1 | 1.39% | 1.39% | ∞ |
| 8 | Readout electronics | 0.30% | N | 1 | 1 | 1 | 0.30% | 0.30% | ∞ |
| 9 | Response time | 0.80% | R | $\sqrt{3}$ | 1 | 1 | 0.46% | 0.46% | ∞ |
| 10 | Integration time | 2.60% | R | $\sqrt{3}$ | 1 | 1 | 1.50% | 1.50% | ∞ |
| 11 | RF Ambient Noise | 3.00% | R | $\sqrt{3}$ | 1 | 1 | 1.73% | 1.73% | ∞ |
| 12 | RF Ambient Reections | 3.00% | R | $\sqrt{3}$ | 1 | 1 | 1.73% | 1.73% | ∞ |
| 13 | Probe Positioner | 0.04% | R | $\sqrt{3}$ | 1 | 1 | 0.02% | 0.02% | ∞ |
| 14 | Probe Positioning | 0.80% | R | $\sqrt{3}$ | 1 | 1 | 0.46% | 0.46% | ∞ |
| 15 | Max. SAR Eval. | 4.00% | R | $\sqrt{3}$ | 1 | 1 | 2.31% | 2.31% | ∞ |
| Test Sample Related | | | | | | | | | |
| 16 | Test sample positioning | 2.90% | N | 1 | 1 | 1 | 2.90% | 2.90% | 145 |
| 17 | Device holder uncertainty | 3.60% | N | 1 | 1 | 1 | 3.60% | 3.60% | 5 |
| 18 | Power Drift | 5.00% | R | $\sqrt{3}$ | 1 | 1 | 2.89% | 2.89% | ∞ |
| 19 | Power Scaling | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| Phantom and Setup | | | | | | | | | |
| 20 | Phantom uncertainty | 7.60% | R | $\sqrt{3}$ | 1 | 1 | 4.39% | 4.39% | ∞ |
| 21 | SAR correction | 0.00% | N | 1 | 1 | 0.84 | 0.00% | 0.00% | ∞ |
| 22 | Liquid conductivity (meas.) | 2.50% | N | 1 | 0.78 | 0.71 | 1.95% | 1.78% | ∞ |
| 23 | Liquid permittivity (meas.) | 2.50% | N | 1 | 0.23 | 0.26 | 0.58% | 0.65% | ∞ |
| 24 | Temp. unc. - Conductivity | 3.60% | R | $\sqrt{3}$ | 0.78 | 0.71 | 1.62% | 1.48% | ∞ |
| 25 | Temp. unc. - Permittivity | 0.50% | R | $\sqrt{3}$ | 0.23 | 0.26 | 0.07% | 0.08% | ∞ |
| **Combined standard uncertainty** | | | **RSS** | | | | **11.29%** | **11.23%** | |
| **Expanded uncertainty (confidence interval of 95%)** | | | **K=2** | | | | **22.59%** | **22.47%** | |

| Measurement uncertainty evaluation for System Check (0.3-3GHz) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | Error Description | Uncertainty Value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
| Measurement System | | | | | | | | | |
| 1 | Probe calibration | 6.05% | N | 1 | 1 | 1 | 6.05% | 6.05% | ∞ |
| 2 | Axial isotropy | 0.00% | R | $\sqrt{3}$ | 0.7 | 0.7 | 0.00% | 0.00% | ∞ |
| 3 | Hemispherical isotropy | 0.00% | R | $\sqrt{3}$ | 0.7 | 0.7 | 0.00% | 0.00% | ∞ |
| 4 | Boundary Effects | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 5 | Probe Linearity | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 6 | System Detection Limits | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 7 | Modulation response | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 8 | Readout electronics | 0.00% | N | 1 | 1 | 1 | 0.00% | 0.00% | ∞ |
| 9 | Response time | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 10 | Integration time | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 11 | RF Ambient Noise | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 12 | RF Ambient Reections | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| 13 | Probe Positioner | 0.02% | R | $\sqrt{3}$ | 1 | 1 | 0.01% | 0.01% | ∞ |
| 14 | Probe Positioning | 0.40% | R | $\sqrt{3}$ | 1 | 1 | 0.23% | 0.23% | ∞ |
| 15 | Max. SAR Eval. | 0.00% | R | $\sqrt{3}$ | 1 | 1 | 0.00% | 0.00% | ∞ |
| System check source (dipole) | | | | | | | | | |
| 16 | Dev. of experimental dipole | 0.00% | N | 1 | 1 | 1 | 0.00% | 0.00% | ∞ |
| 17 | Dipole Axis to Liquid Dist. | 2.00% | R | $\sqrt{3}$ | 1 | 1 | 1.15% | 1.15% | ∞ |
| 18 | Input power & SAR drift | 5.00% | R | $\sqrt{3}$ | 1 | 1 | 2.89% | 2.89% | ∞ |
| Phantom and Setup | | | | | | | | | |
| 19 | Phantom uncertainty | 7.20% | R | $\sqrt{3}$ | 1 | 1 | 4.16% | 4.16% | ∞ |
| 20 | SAR correction | 0.00% | N | 1 | 1 | 0.84 | 0.00% | 0.00% | ∞ |
| 21 | Liquid conductivity (meas.) | 2.50% | N | 1 | 0.78 | 0.71 | 1.95% | 1.78% | ∞ |
| 22 | Liquid permittivity (meas.) | 2.50% | N | 1 | 0.23 | 0.26 | 0.58% | 0.65% | ∞ |
| 23 | Temp. unc. - Conductivity | 3.60% | R | $\sqrt{3}$ | 0.78 | 0.71 | 1.62% | 1.48% | ∞ |
| 24 | Temp. unc. - Permittivity | 0.50% | R | $\sqrt{3}$ | 0.23 | 0.26 | 0.07% | 0.08% | ∞ |
| **Combined standard uncertainty** | | **RSS** | | | | | **8.65%** | **8.57%** | |
| **Expanded uncertainty (confidence interval of 95%)** | | **K=2** | | | | | **17.30%** | **17.14%** | |

# 6. SAR Measurements System Configuration

## 6.1. SAR Measurement Set-up

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

A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).

A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

A unit to operate the optical surface detector which is connected to the EOC.

The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.

DASY5 software and SEMCAD data evaluation software.

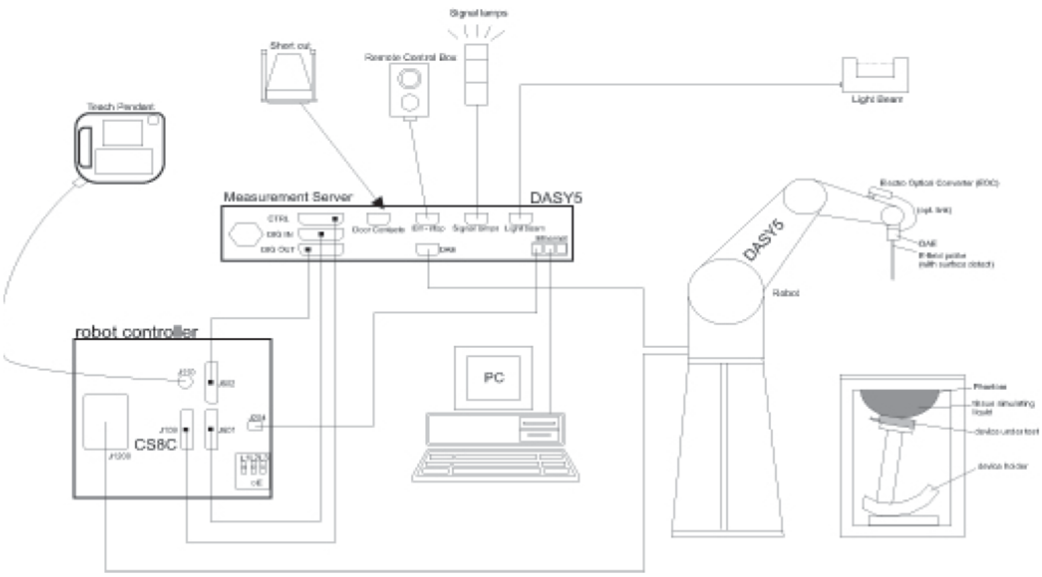
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles allowing to validate the proper functioning of the system.



## 6.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

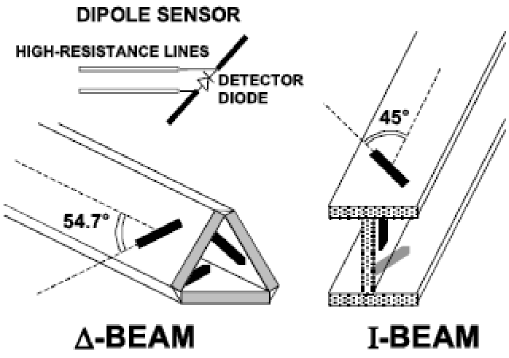
- **Probe Specification**

| | |
|---|---|
| Construction | Symmetrical design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| Calibration | ISO/IEC 17025 calibration service available. |
| Frequency | 4 MHz to 10 GHz;<br>Linearity: ± 0.2 dB (30 MHz to 6 GHz) |
| Directivity | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) |
| Dynamic Range | 10 µW/g to > 100 W/kg;<br>Linearity: ± 0.2 dB |
| Dimensions | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 1.0 mm |
| Application | General dosimetry up to 6 GHz<br>Dosimetry in strong gradient fields<br>Compliance tests of Mobile Phones |
| Compatibility | DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI |

- **Isotropic E-Field Probe**

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



## 6.3. Phantoms

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI isfully compatible with standard and all known tissuesimulating liquids. ELI has been optimized regarding its performance and can beintegrated into our standard phantom tables. A cover prevents evaporation ofthe liquid. Reference markings on the phantom allow installation of thecomplete setup, including all predefined phantom positions and measurementgrids, by teaching three points. The phantom is compatible with all SPEAGdosimetric probes and dipoles.

ELI Phantom

## 6.4. Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.
The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

Device holder supplied by SPEAG

# 7. SAR Test Procedure

## 7.1. Scanning Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5%.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

**Area Scan**

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

**Zoom Scan**

After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm.

**Spatial Peak Detection**

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses.The DASY5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.
Extrapolation routines require at least 10 measurement points in 3-D space.
They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard’s method for extrapolation.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

**Table 1: Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v04**

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>$>$ 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 mm ± 1 mm</td><td>½·$\delta$·ln(2) mm ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$</td><td>$\leq$ 2 GHz: $\leq$ 15 mm<br>2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm<br>4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$</td><td>$\leq$ 2 GHz: $\leq$ 8 mm<br>2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*<br>4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm<br>4 – 5 GHz: $\leq$ 3 mm<br>5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm<br>4 – 5 GHz: $\leq$ 2.5 mm<br>5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm<br>4 – 5 GHz: $\geq$ 25 mm<br>5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.<br>* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 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.</td></tr>
</table>

**Table 2:Zoom Scan Parameters extracted from EN 62209-2**

| Parameter | DUT transmit frequency being tested | |
|---|---|---|
| | $f \leq 3$ GHz | 3 GHz < $f \leq 6$ GHz |
| Maximum distance between the closest measured points and the phantom surface ($z_{M1}$ in Figure 14 and Table 2, in mm) | 5 | $\delta \ln(2)/2$ [a] |
| Maximum angle between the probe axis and the flat phantom surface normal ($\alpha$ in Figure 14) | 5° | 5° |
| Maximum spacing between measured points in the $x$- and $y$-directions ($\Delta x$ and $\Delta y$, in mm) | 8 | $24/f$ [b,c] |
| For uniform grids:<br>Maximum spacing between measured points in the direction normal to the phantom shell ($\Delta z_1$ in Figure 14, in mm) | 5 | $10/(f - 1)$ |
| For graded grids:<br>Maximum spacing between the two closest measured points in the direction normal to the phantom shell ($\Delta z_1$ in Figure 14, in mm) | 4 | $12/f$ |
| For graded grids:<br>Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2/\Delta z_1$ in Figure 14) | 1,5 | 1,5 |
| Minimum edge length of the zoom scan volume in the $x$- and $y$-directions ($L_z$ in 7.2.5.3, in mm) | 30 | 22 |
| Minimum edge length of the zoom scan volume in the direction normal to the phantom shell ($L_h$ in 7.2.5.3, in mm) | 30 | 22 |
| Tolerance in the probe angle | 1° | 1° |

[a] $\delta$ is the penetration depth for a plane-wave incident normally on a planar half-space.

[b] This is the maximum spacing allowed, which may not work for all circumstances.

[c] $f$ is the frequency in GHz.

## 7.2. Data Storage and Evaluation

### Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors),s together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [W/kg], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

### Data Evaluation

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

| | | |
|---|---|---|
| Probe parameters: | Sensitivity: | Normi, ai0, ai1, ai2 |
| | Conversion factor: | ConvFi |
| | Diode compression point: | Dcpi |
| Device parameters: | Frequency: | f |
| | Crest factor: | cf |
| Media parameters: | Conductivity: | σ |
| | Density: | ρ |

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

Vi: compensated signal of channel ( i = x, y, z )
Ui: input signal of channel ( i = x, y, z )
cf: crest factor of exciting field (DASY parameter)
dcpi: diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\mathrm{E-fieldprobes:} \qquad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\mathrm{H-fieldprobes:} \qquad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

Vi: compensated signal of channel ( i = x, y, z )
Normi: sensor sensitivity of channel ( i = x, y, z ), [mV/(V/m)2] for E-field Probes
ConvF: sensitivity enhancement in solution
aij: sensor sensitivity factors for H-field probes
f: carrier frequency [GHz]
Ei: electric field strength of channel i in V/m
Hi: magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

| | |
|---|---|
| SAR: | local specific absorption rate in W/kg |
| Etot: | total field strength in V/m |
| σ: | conductivity in [mho/m] or [Siemens/m] |
| ρ: | equivalent tissue density in g/cm3 |

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

# 8. Dielectric Property Measurements & System Check

## 8.1. Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18℃ to 25℃ and within ± 2℃ of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3-4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
The dielectric constant ($\varepsilon_r$) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 5% of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for $\varepsilon_r$ and σ may be relaxed to ± 10%. This is limited to frequencies ≤ 3 GHz.

**Tissue Dielectric Parameters**
FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

| Tissue dielectric parameters for Head and Body | | | | |
|---|---|---|---|---|
| Target Frequency (MHz) | Head | | Body | |
| | $\varepsilon_r$ | σ(S/m) | $\varepsilon_r$ | σ(S/m) |
| 2450 | 39.2 | 1.80 | 52.7 | 1.95 |

**Dielectric Property Measurements Results:**

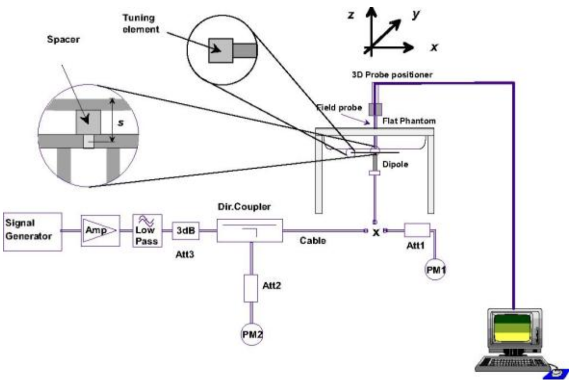
| **Dielectric performance of Head tissue simulating liquid** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | $\varepsilon_r$ | | σ(S/m) | | Delta ($\varepsilon_r$) | Delta (σ) | Limit | Temp (℃) | Date |
| | Target | Measured | Target | Measured | | | | | |
| 2400 | 39.30 | 40.81 | 1.750 | 1.817 | 3.84% | 3.83% | ±5% | 22.5 | 2019/9/27 |
| 2450 | 39.20 | 40.71 | 1.800 | 1.857 | 3.85% | 3.17% | ±5% | 22.5 | 2019/9/27 |
| 2480 | 39.16 | 40.65 | 1.830 | 1.883 | 3.80% | 2.90% | ±5% | 22.5 | 2019/9/27 |

## 8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

**System Performance Check Measurement Conditions:**

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- The results are normalized to 1 W input power.



System Performance Check Setup

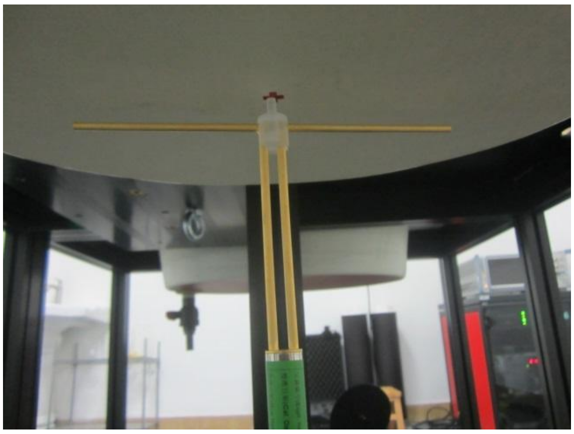


Photo of Dipole Setup

**System Check Result:**

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within ±10% of the manufacturer calibrated dipole SAR target.

| Head | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | 1g SAR | | | 10g SAR | | | Delta (1g) | Delta (10g) | Limit | Temp (℃) | Date |
| | Target 1W | Normalize to 1W | Measured 250mW | Target 1W | Normalize to 1W | Measured 250mW | | | | | |
| 2450 | 51.50 | 52.80 | 13.20 | 24.10 | 24.72 | 6.18 | 2.52% | 2.57% | ±10% | 22.5 | 2019/9/27 |

## Plots of System Performance Check

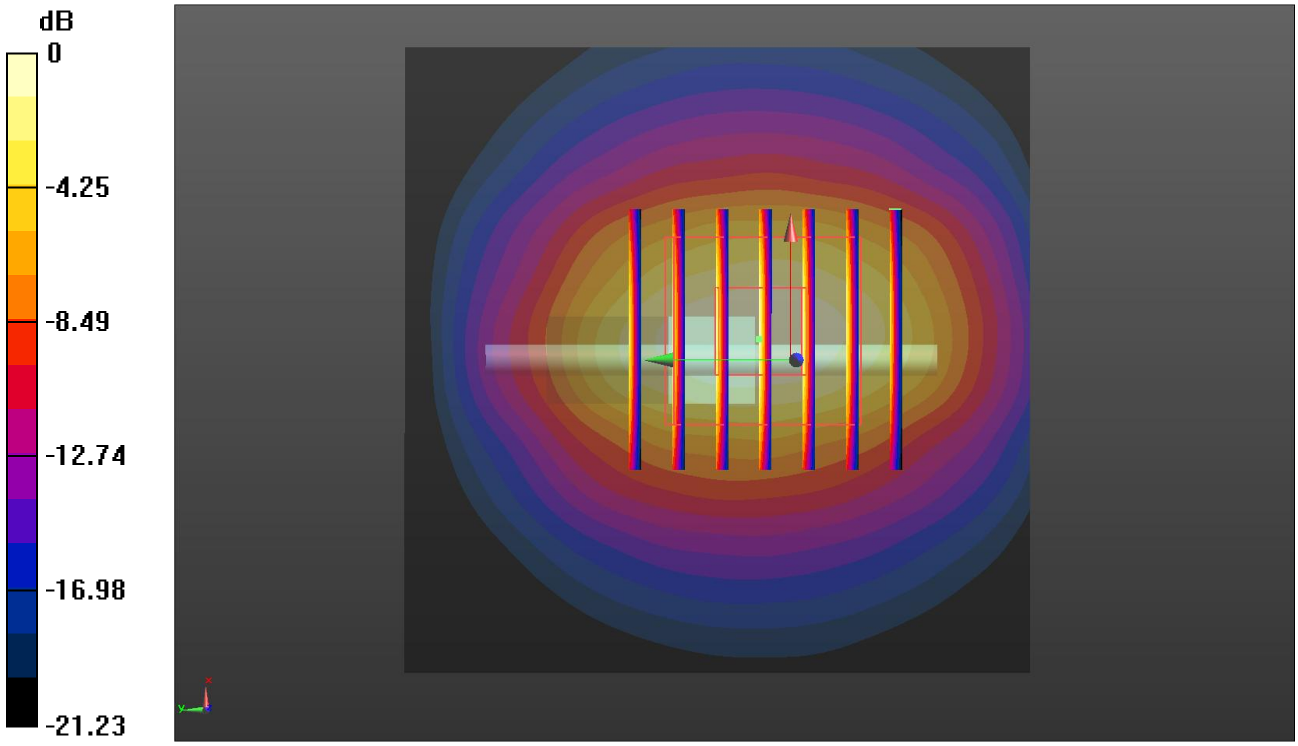
**SystemPerformanceCheck-Head 2450MHz**

DUT: D2450V2; Type: D2450V2; Serial: 1009
Date:2019-09-27
Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2450 MHz; $\sigma$ = 1.857 S/m; $\varepsilon_r$ = 40.706; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Ambient Temperature:22.3℃;Liquid Temperature:22.0℃;

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(7.9, 7.9, 7.9) @ 2450 MHz; Calibrated: 3/25/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 3/19/2019
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

**Head/d=10mm,Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 22.2 W/kg
**Head/d=10mm,Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 111.6 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.1 W/kg
**SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.18 W/kg**
Maximum value of SAR (measured) = 22.0 W/kg




0 dB = 22.0 W/kg = 13.42 dBW/kg

# 9. SAR Exposure Limits

SAR assessments have been made in line with the requirements of FCC 47 CFR § 2.1093.

| Type Exposure | Limit (W/kg) | |
|---|---|---|
| | General Population/ Uncontrolled Exposure Environment | Occupational/ Controlled Exposure Environment |
| Spatial Average SAR (whole body) | 0.08 | 0.4 |
| Spatial Peak SAR (1g cube tissue for head and trunk) | 1.6 | 8.0 |
| Spatial Peak SAR (10g for limb) | **4.0** | 20.0 |

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

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

# 10. Conducted Power Measurement Results

For 2.4GHz WiFi SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were for SAR evaluation.

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.
SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

| WiFi 2.4G SISO ANT0 | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | Conducted Average Power (dBm) | Duty Cycle |
| 802.11b | 1 | 2412 | 24.11 | 99.65% |
| | 6 | 2437 | 25.17 | |
| | | 2462 | 24.15 | |
| 802.11g | 1 | 2412 | 24.11 | 97.63% |
| | 6 | 2437 | 25.14 | |
| | 11 | 2462 | 23.94 | |
| 802.11n (HT20) | 1 | 2412 | 24.18 | 97.46% |
| | 6 | 2437 | 25.18 | |
| | 11 | 2462 | 24.00 | |

| WiFi 2.4G SISO ANT2 | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | Conducted Average Power (dBm) | Duty Cycle |
| 802.11b | 1 | 2412 | 24.03 | 99.65% |
| | 6 | 2437 | 24.99 | |
| | | 2462 | 24.00 | |
| 802.11g | 1 | 2412 | 23.98 | 97.63% |
| | 6 | 2437 | 24.94 | |
| | 11 | 2462 | 23.81 | |
| 802.11n (HT20) | 1 | 2412 | 24.20 | 97.46% |
| | 6 | 2437 | 24.92 | |
| | 11 | 2462 | 23.96 | |

| WiFi 2.4G MIMO | | | | |
|---|---|---|---|---|
| Mode | Channel | Frequency (MHz) | Conducted Average Power (dBm) | Duty Cycle |
| 802.11n (HT20) | 1 | 2412 | 27.37 | 97.46% |
| | 6 | 2437 | 27.58 | |
| | 11 | 2462 | 26.99 | |

# 11. Maximum Tune-up Limit

| WiFi 2.4G ANT0 | |
|---|---|
| Mode | Maximum Tune-up (dBm)<br>Conducted Average Power |
| 802.11b | 25.50 |
| 802.11g | 25.50 |
| 802.11n(HT20) | 25.50 |

| WiFi 2.4G ANT2 | |
|---|---|
| Mode | Maximum Tune-up (dBm)<br>Conducted Average Power |
| 802.11b | 25.00 |
| 802.11g | 25.00 |
| 802.11n(HT20) | 25.00 |

| WiFi 2.4G MIMO | |
|---|---|
| Mode | Maximum Tune-up (dBm)<br>Conducted Average Power |
| 802.11n(HT20) | 28.00 |

# 12. Measured and Reported SAR Results

**SAR Test Reduction criteria are as follows:**

- Reported SAR(W/kg) for WWAN = Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

**KDB 447498 D01 General RF Exposure Guidance:**

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

**KDB 248227 D01 SAR meas for 802.11:**

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 must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

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

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

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

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

| WiFi 2.4G | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Test Position | Frequency | | Conducted Power (dBm) | Tune-up limit (dBm) | Tune-up scaling factor | Duty Cycle | Duty Cycle Scaling Factor | Power Drift (dB) | Measured SAR(10g) (W/kg) | Report SAR(10g) (W/kg) | 30% Duty SAR(10g) (W/kg) | Plot No. |
| | | CH | MHz | | | | | | | | | | |
| 802.11b ANT0 | Edge 1 | 6 | 2437 | 25.17 | 25.50 | 1.08 | 99.65% | 1.004 | -0.11 | 0.680 | 0.736 | 0.221 | - |
| | Edge 2 | 1 | 2412 | 24.11 | 25.50 | 1.377 | 99.65% | 1.004 | -0.17 | 4.690 | 6.482 | 1.945 | - |
| | | 6 | 2437 | 25.17 | 25.50 | 1.079 | 99.65% | 1.004 | 0.10 | 6.290 | 6.810 | 2.043 | 1 |
| | | 11 | 2462 | 24.15 | 25.50 | 1.365 | 99.65% | 1.004 | 0.09 | 4.770 | 6.532 | 1.960 | - |
| | Edge 3 | 6 | 2437 | 25.17 | 25.50 | 1.08 | 99.65% | 1.004 | 0.15 | 5.390 | 5.836 | 1.751 | - |
| | Edge 4 | 6 | 2437 | 25.17 | 25.50 | 1.08 | 99.65% | 1.004 | -0.13 | 4.770 | 5.165 | 1.549 | - |
| 802.11b ANT2 | Edge 1 | 6 | 2437 | 24.99 | 25.00 | 1.00 | 99.65% | 1.004 | -0.10 | 0.662 | 0.666 | 0.200 | - |
| | Edge 2 | 1 | 2412 | 24.03 | 25.00 | 1.250 | 99.65% | 1.004 | -0.06 | 5.470 | 6.863 | 2.059 | - |
| | | 6 | 2437 | 24.99 | 25.00 | 1.002 | 99.65% | 1.004 | 0.13 | 7.010 | 7.051 | 2.115 | 2 |
| | | 11 | 2462 | 24.00 | 25.00 | 1.259 | 99.65% | 1.004 | 0.07 | 5.190 | 6.557 | 1.967 | - |
| | Edge 3 | 6 | 2437 | 24.99 | 25.00 | 1.00 | 99.65% | 1.004 | 0.10 | 4.200 | 4.224 | 1.267 | - |
| | Edge 4 | 6 | 2437 | 24.99 | 25.00 | 1.00 | 99.65% | 1.004 | -0.13 | 3.790 | 3.812 | 1.144 | - |
| 802.11n (HT20) MIMO | Edge 1 | 6 | 2437 | 27.58 | 28.00 | 1.102 | 97.46% | 1.026 | -0.05 | 0.176 | 0.199 | 0.060 | - |
| | Edge 2 | 6 | 2437 | 27.58 | 28.00 | 1.102 | 97.46% | 1.026 | 0.12 | 1.934 | 2.186 | 0.656 | 3 |
| | Edge 3 | 6 | 2437 | 27.58 | 28.00 | 1.102 | 97.46% | 1.026 | 0.10 | 1.040 | 1.175 | 0.353 | - |
| | Edge 4 | 6 | 2437 | 27.58 | 28.00 | 1.102 | 97.46% | 1.026 | 0.07 | 1.520 | 1.718 | 0.515 | - |

*Note:*

1. *The distance of the Limbs test is 0mm.*
2. *EUT has a maximum duty cycle of 30%.*
3. *SAR Test Data Plots to the Appendix A.*
4. *The antenna of EUT is more than 20cm away from the human body during normal handheld photography.See figure A below.*

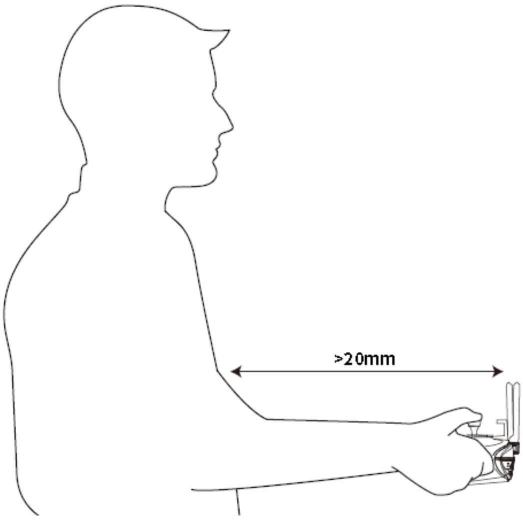



Figure A

# 13. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

| Band | Test Position | Frequency | | Highest Measured SAR (W/kg) | First Repeated | | Second Repeated | |
|---|---|---|---|---|---|---|---|---|
| | | CH | MHz | | Measured SAR(W/kg) | Largest to Smallest SAR Ratio | Measured SAR(W/kg) | Largest to Smallest SAR Ratio |
| 802.11b ANT2 | Edge 2 | 6 | 2437 | 7.01 | 6.74 | 1.04 | N/A | N/A |

***---------End of Report----------***