# RF Exposure Compliance Test Report

| | | | |
|---|---|---|---|
| **Date of Report** | 27/01/2025 | **Client's Contact person:** | Martin Reiss |
| **Number of pages:** | 126 | | |
| | | **Responsible Test engineer:** | Ilari Kinnunen |
| **Testing laboratory:** | **Verkotan Oy**<br>Elektroniikkatie 17<br>90590 Oulu<br>Finland | **Client:** | **Siemens Aktiengesellschaft**<br>Oestliche Rheinbrueckenstr. 50<br>76187 Karlsruhe<br>Germany |
| **Tested device** | **Industrial Notebook IPC MD-57A** | | |
| **Related reports:** | - | | |
| **Testing has been carried out in accordance with:** | **47CFR §2.1093**<br>Radiofrequency Radiation Exposure Evaluation: Portable Devices<br><br>**FCC published RF exposure KDB procedures**<br><br>**IEC/IEEE 62209-1528, 2020**<br>Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices<br><br>**RSS-102, Issue 6, 2023**<br>Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) | | |
| **Documentation:** | The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory | | |
| **Test Results:** | **The EUT complies with the requirements in respect of all parameters subject to the test.**<br>The test results relate only to devices specified in this document | | |
| **Date and signatures:** | 27.01.2025<br><br>**Laboratory Manager**<br>Miia Nurkkala | | |



 

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# 1. SUMMARY OF RF EXPOSURE TEST REPORT

## 1.1 Test Details

### Equipment under Test (DUT):

| | |
|---|---|
| **Product:** | Industrial Notebook |
| **Manufacturer:** | Siemens |
| **Model:** | IPC MD-57A |
| **Serial Number:** | 3G38, 3G36 |
| **FCC ID Number:** | U9A-MD57A |
| **ISED ID Number:** | 267BA-MD57A |
| **DUT Number:** | 21074, 21073 |
| **Battery Type used in testing:** | Li-Ion Battery |
| **State of the Sample:** | Production sample |

### Testing information:

| | |
|---|---|
| **Testing performed:** | 09.08.2023-22.08.2023 |
| **Notes:** | This report replaces report FCC ISED RF Exposure Report_Industrial Notebook_ID6019_13112023.<br>The test report has been evaluated and updated to demonstrate compliance of the tested product against RSS-102 Issue 6 — Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands). |
| **Document history:** | Initial Version |
| **Document ID:** | FCC ISED RF Exposure Report_Industrial Notebook_ID7405_27012025.docx |
| **Temperature °C** | 22±2 / Controlled |
| **Humidity RH%** | 30±20 / Controlled |
| **Measurement performed by:** | Ilari Kinnunen, Jesper Varis, Kalle Orava |
| **FCC Test Firm Designation Number:** | FI0005 |
| **ISED Company Number:** | 22218 |



### 1.2 RSS-102 version update to Issue 6, 2023

Results of the *FCC ISED RF Exposure Report_Industrial Notebook_ID6019_13112023* that were tested according to RSS-102 Issue 5 2015, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) have been evaluated in this test report against the RSS-102 Issue 6 2023, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) and have been found to be compliant.

The changes made to the standard RSS-102, Issue 6 from RSS-102, Issue 5 do not have affect on the compliance of tested results in the report *FCC ISED RF Exposure Report_Industrial Notebook_ID6019_13112023*. The testing was conducted to both WLAN and Bluetooth technologies, thus the changes in exemption limits have no affect on results. Testing was done at separation distance of 0mm, thus it is compliant with RSS-102, Issue 6, 2023.

The *FCC ISED RF Exposure Report_Industrial Notebook_ID7405_27012025* complies with the RSS-102 Issue 6 2023, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

This compliance statement relates only for the DUT tested and identified in the revised report *FCC ISED RF Exposure Report_Industrial Notebook_ID7405_27012025*.



## 1.3 Maximum Results

The maximum reported* SAR/APD/IPD values for Body-worn for transmitting systems are shown in tables below. The device conforms to the requirements of the standards when the maximum reported SAR/APD/IPD value is less than or equal to the limit. The SAR limit specified in *FCC 47 CFR part 2 (2.1093)* and *Health Canada's RF exposure guideline, Safety Code 6* for Head/Body $SAR_{1g}$ is 1.6 W/kg. The APD limit specified in *Health Canada's Safety Code 6 Notice: Localized human exposure limits for radiofrequency fields in the range of 6 GHz to 300 GHz* for APD 4cm$^2$ is 20 W/m$^2$. The IPD limit specified in *FCC § 1.1310(e)(1), Table 1* for general population/uncontrolled exposure for IPD 4cm$^2$ is 1.0 mW/cm$^2$ = 10 W/m$^2$.

### 1.3.1 FCC Standalone Test Results

| System | Highest Reported* $SAR_{1g}$(W/kg) in Body-Worn Exposure Condition, 0mm separation distance | Result |
|---|---|---|
| **Bluetooth** | **0.011** | **PASS** |
| **2.4 GHz WLAN** | **0.01** | **PASS** |
| **5 GHz WLAN** | **0.14** | **PASS** |

* Reported SAR Values are scaled to upper limit of power tuning tolerance.

| System | Highest Reported* IPD 4cm$^2$ (W/m$^2$) in Body-Worn Exposure Condition, 0mm separation distance | Result |
|---|---|---|
| **6 GHz WLAN** | **0.26** | **PASS** |

* Reported SAR Values are scaled to upper limit of power tuning tolerance.

### 1.3.2 ISED Standalone Test Results

| System | Highest Reported* $SAR_{1g}$(W/kg) in Body-Worn Exposure Condition, 0mm separation distance | Result |
|---|---|---|
| **Bluetooth** | **0.011** | **PASS** |
| **2.4 GHz WLAN** | **0.01** | **PASS** |
| **5 GHz WLAN** | **0.14** | **PASS** |

* Reported SAR Values are scaled to upper limit of power tuning tolerance.



| System | Highest Reported* APD 4cm² (W/m²) in Body-Worn Exposure Condition, 0mm separation distance | Result |
|---|---|---|
| 6 GHz WLAN | 0.09 | PASS |

* Reported SAR Values are scaled to upper limit of power tuning tolerance.

### 1.3.3 FCC Simultaneous Transmission

| Highest Simultaneous Transmission | Body-Worn Exposure Condition | Result |
|---|---|---|
| $SAR_{1g}$ summation <6GHz | 0.22 W/kg < 1.6W/kg | PASS |
| $\sum SAR_{Meas}/SAR_{Limit} + IPD_{Meas}/IPD_{Limit}$ | 0.11 < 1 | PASS |

* WLAN 6GHz in SISO mode has 3dBm higher power than in MIMO mode, thus worst-case SISO 6GHz WLAN SAR test configuration was used to address IPD simultaneous transmission

### 1.3.4 ISED Simultaneous Transmission

| Highest Simultaneous Transmission | Body-Worn Exposure Condition | Result |
|---|---|---|
| $SAR_{1g}$ summation <6GHz | 0.22 W/kg < 1.6W/kg | PASS |
| $\sum SAR_{Meas}/SAR_{Limit} + APD_{Meas}/APD_{Limit}$ | 0.09 < 1 | PASS |

* WLAN 6GHz in SISO mode has 3dBm higher power than in MIMO mode, thus worst-case SISO 6GHz WLAN SAR test configuration was used to address APD simultaneous transmission



### 1.3.5 Maximum Drift

| Maximum Drift During Measurements | -1.26dB* |
|---|---|

*Larger than 5% drifts included to scaling factors

### 1.3.6 Measurement Uncertainty

SAR 1g: 0.3 – 3 GHz:

| Expanded Uncertainty (k=2) 95 % | ±22.1 % |
|---|---|

SAR 1g: 3 – 6 GHz:

| Expanded Uncertainty (k=2) 95 % | ±23.3 % |
|---|---|

APD 4cm$^2$: 6 – 10 GHz:

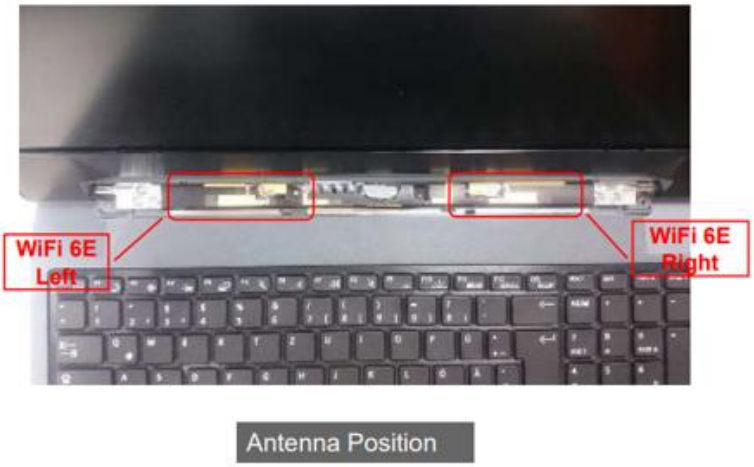
| Expanded Uncertainty (k=2) 95 % | ±31.9 % |
|---|---|



## 2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

DUT is a laptop that supports WLAN 2.4GHz, WLAN 5GHz, WLAN 6GHz and Bluetooth. It has two TX antennas that are located in the keyboard section as shown in the picture below.




Antenna Position

| | |
|---|---|
| **Device Category** | Portable |
| **Exposure Environment** | General population uncontrolled |



## 2.1 Supported Frequency Bands and Operational Modes

| | Modes of Operation | Transmitter Frequency Range [MHz] |
|---|---|---|
| **TX Frequency bands** | 2.4GHz WLAN | 2412 – 2462 |
| | 5GHz WLAN | 5180 – 5825 |
| | 6GHz WLAN | 5995 – 7115 |
| | Bluetooth | 2402 – 2480 |

## 2.2 Simultaneous transmission

Antennas A & B can transmit simultaneously.



## 3. OUTPUT POWER

### 3.1 Maximum specified conducted output power

From the customer, including tune-up tolerances;

**Bluetooth:**

| Bluetooth | Max Output Power [dBm] |
|---|---|
| BR | 11.2 |
| EDR 2 | 8 |
| EDR 3 | 8 |
| LE (LR-125k) | 7 |
| LE (LR-500k) | 7 |
| LE 1M | 7 |
| LE 2M | 7 |

**WLAN 2.4 GHz:**

| WLAN 2.4GHz | Channel | Antenna A Max Output Power [dBm] | Antenna B Max Output Power [dBm] | MIMO Max Output Power [dBm] |
|---|---|---|---|---|
| 802.11b | 1 | 19.25 | 18.0 | - |
| | 6 | 19.75 | 19.25 | - |
| | 11 | 17.75 | 18.0 | - |
| 802.11n | 1 | 17.25 | 17.75 | 15.25 |
| | 6 | 20 | 20 | 20 |
| | 11 | 17.75 | 17.5 | 16 |

802.11n was selected due to maximum output power. 802.11b CH1 and CH11 maximum output power used when testing 802.11n.

**WLAN 5 GHz:**

| WLAN 5GHz | Channel | Antenna A Max Output Power [dBm] | Antenna B Max Output Power [dBm] | MIMO Max Output Power [dBm] |
|---|---|---|---|---|
| 802.11a | 52 | 20 | 20 | 18 |
| | 100 | 19 | 19 | 17.5 |
| | 165 | 20 | 20 | 20 |
| 802.11n (40MHz) | 54 | 20 | 20 | 18.75 |
| | 102 | 17.25 | 17.5 | 15.75 |
| | 159 | 20 | 20 | 20 |
| 802.11ac (80MHz) | 58 | 16 | 17 | 14.75 |
| | 106 | 17 | 17 | 15.25 |
| | 155 | 18.75 | 19 | 17.5 |
| 802.11ac (160MHz) | 50 | 13.75 | 13.25 | 12.25 |
| | 114 | 14.25 | 14.5 | 13.25 |



**WLAN 6 GHz:**

| WLAN 6GHz | Channel | Antenna A Max Output Power [dBm] | Antenna B Max Output Power [dBm] | MIMO Max Output Power [dBm] |
|---|---|---|---|---|
| 802.11ax (20MHz) | 1 | 4.5 | 4.5 | 1.5 |
| | 117 | 3.75 | 3.75 | 0.75 |
| | 233 | -0.5 | -0.5 | -2.5 |
| 802.11ax (40MHz) | 3 | 7.75 | 7.75 | 4.75 |
| | 115 | 7.75 | 7.75 | 4.75 |
| | 227 | 7 | 7 | 4 |
| 802.11ax (80MHz) | 7 | 10.25 | 10.25 | 7.25 |
| | 119 | 10.25 | 10.25 | 7.25 |
| | 215 | 9.5 | 9.5 | 6.5 |
| 802.11ax (160MHz) | 15 | 13 | 13 | 10 |
| | 111 | 13 | 13 | 10 |
| | 207 | 12.25 | 12.25 | 9.25 |



## 3.2 Tested conducted power

Measured conducted output power at transmitting antenna connector;

**Bluetooth:**

| Standard | Packet Type | Output power [dBm] | | |
|---|---|---|---|---|
| | | CH 0<br>2402 MHz | CH 39<br>2441 MHz | CH 78<br>2480 MHz |
| BR | DH5 | 9.46 | 9.97 | 10.41 |

**WLAN 2.4 GHz:**

| Standard | Transmission mode | Data Rate [Mbps] | Antenna | Output power [dBm] | | |
|---|---|---|---|---|---|---|
| | | | | CH 1<br>2422 MHz | CH 6<br>2442 MHz | CH 11<br>2462 MHz |
| 802.11n (20MHz) | OFDM | HT0 | A | 18.67 | 19.26 | 16.89 |
| 802.11n (20MHz) | OFDM | HT0 | B | 17.19 | 19.03 | 17.50 |

**WLAN 5 GHz:**

| Standard | Channel | Frequency [MHz] | Transmission mode | Data Rate [Mbps] | Antenna | Output power [dBm] |
|---|---|---|---|---|---|---|
| 802.11a | 52 | 5260 | OFDM | 6 | A | 19.41 |
| 802.11a | 56 | 5280 | OFDM | 6 | A | 19.38 |
| 802.11a | 60 | 5300 | OFDM | 6 | A | 18.82 |
| 802.11a | 64 | 5320 | OFDM | 6 | A | 18.06 |
| 802.11a | 100 | 5500 | OFDM | 6 | A | 18.57 |
| 802.11a | 112 | 5560 | OFDM | 6 | A | 19.54 |
| 802.11a | 116 | 5580 | OFDM | 6 | A | 19.66 |
| 802.11a | 128 | 5640 | OFDM | 6 | A | 19.68 |
| 802.11a | 132 | 5660 | OFDM | 6 | A | 19.76 |
| 802.11a | 149 | 5745 | OFDM | 6 | A | 19.75 |
| 802.11a | 165 | 5825 | OFDM | 6 | A | 19.59 |
| 802.11a | 52 | 5260 | OFDM | 6 | B | 19.32 |
| 802.11a | 56 | 5280 | OFDM | 6 | B | 19.31 |
| 802.11a | 60 | 5300 | OFDM | 6 | B | 18.66 |
| 802.11a | 64 | 5320 | OFDM | 6 | B | 18.32 |
| 802.11a | 100 | 5500 | OFDM | 6 | B | 18.58 |
| 802.11a | 112 | 5560 | OFDM | 6 | B | 19.61 |
| 802.11a | 116 | 5580 | OFDM | 6 | B | 19.63 |
| 802.11a | 128 | 5640 | OFDM | 6 | B | 19.65 |
| 802.11a | 132 | 5660 | OFDM | 6 | B | 19.73 |
| 802.11a | 149 | 5745 | OFDM | 6 | B | 19.85 |
| 802.11a | 165 | 5825 | OFDM | 6 | B | 19.55 |



**WLAN 6 GHz:**

| Standard | Channel | Frequency [MHz] | Transmission mode | Data Rate | Antenna | Output power [dBm] |
|---|---|---|---|---|---|---|
| 802.11ax (160MHz) | 15 | 6025 | OFDM | HE0 | A | 11.87 |
| 802.11ax (160MHz) | 47 | 6185 | OFDM | HE0 | A | 11.91 |
| 802.11ax (160MHz) | 79 | 6345 | OFDM | HE0 | A | 11.75 |
| 802.11ax (160MHz) | 111 | 6505 | OFDM | HE0 | A | 11.83 |
| 802.11ax (160MHz) | 143 | 6665 | OFDM | HE0 | A | 10.58 |
| 802.11ax (160MHz) | 175 | 6825 | OFDM | HE0 | A | 10.67 |
| 802.11ax (160MHz) | 207 | 6985 | OFDM | HE0 | A | 10.85 |
| 802.11ax (160MHz) | 15 | 6025 | OFDM | HE0 | B | 12.21 |
| 802.11ax (160MHz) | 47 | 6185 | OFDM | HE0 | B | 12.06 |
| 802.11ax (160MHz) | 79 | 6345 | OFDM | HE0 | B | 12.26 |
| 802.11ax (160MHz) | 111 | 6505 | OFDM | HE0 | B | 12.20 |
| 802.11ax (160MHz) | 143 | 6665 | OFDM | HE0 | B | 11.26 |
| 802.11ax (160MHz) | 175 | 6825 | OFDM | HE0 | B | 11.31 |
| 802.11ax (160MHz) | 207 | 6985 | OFDM | HE0 | B | 11.28 |



## 4. TEST EQUIPMENT

DASY8/Dasy52 near field scanning system, manufactured by SPEAG was used for SAR testing. The test system consists of high precision robotics system (Staubli), robot controller, computer, near-field probe, probe alignment sensor, and a phantom containing the tissue equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location of maximum electromagnetic field.

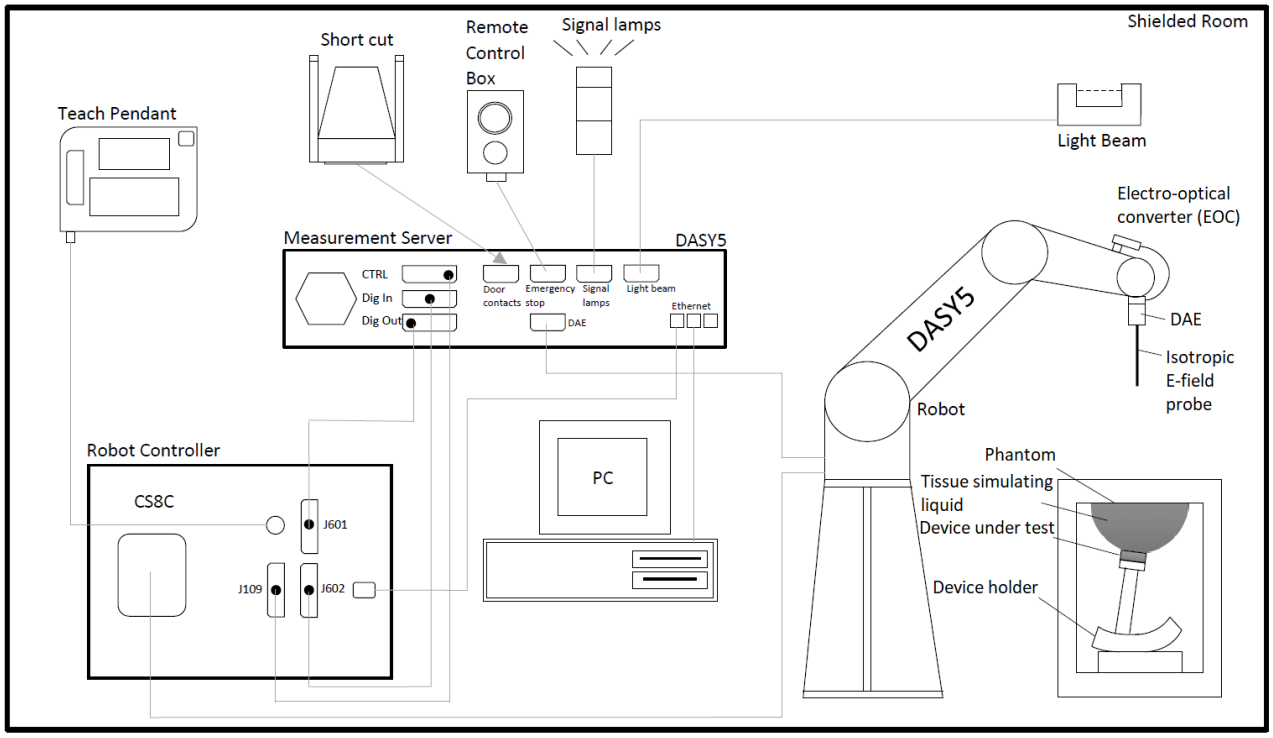



Figure 1 Schematic Laboratory Picture



## 4.1 Test Equipment List

Main used test system components are listed below. For full equipment list and calibration intervals, please contact the testing laboratory.

| Test Equipment | Model | Serial Number | Calibration Date | Interval [years] |
|---|---|---|---|---|
| DASY5 Software | 52.8.8.1258 | - | NA | NA |
| DASY8 Software | 16.2.4.2524 | - | NA | NA |
| Amplifier, 500-8000MHz | ZX60-83LN12+ | NA | NA | NA |
| Amplifier, 800-4200MHz, 50W | 5163F | 1022 | NA | NA |
| DAE4, converter | DAE4 | 1332 | 02/2023 | 1 |
| DAE4, converter | DAE4ip | 1774 | 06/2023 | 1 |
| Inline Peak Power Sensor | MA24105A | 2102058 | 11/2022 | 1 |
| Isotropic DOS probe | EX3DV4 | 7447 | 02/2023 | 1 |
| Isotropic DOS probe | EX3DV4 | 7827 | 06/2023 | 1 |
| Network Analyzer | E5071C | MY46102812 | 05/2023 | 1 |
| Power Sensor | NRP-Z11 | 100265 | 12/2022 | 1 |
| Power Sensor | NRP8S | 1419.0006K02-108509-Zh | 08/2021 | 2 |
| System validation dipole | D2450V2 | 729 | 07/2022 | 3 |
| System validation dipole | D5GHzV2 | 1045 | 03/2023 | 3 |
| System validation dipole | D6.5GHzV2 | 1097 | 06/2023 | 3 |
| Vector Signal Generator | MG3710A | 6201502519 | NA | NA |
| Isotropic DOS probe | EX3DV4 | 7827 | 06/2023 | 1 |
| System validation dipole | D6.5GHzV2 | 1097 | 06/2023 | 3 |
| Vector Signal Generator | SMP02 | 836402/004 | NA | NA |

### 4.1.1 Isotropic E-field Probe Type EX3DV4

| | |
|---|---|
| **Construction** | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| **Calibration** | Calibration certificate in Appendix D |
| **Frequency** | 10 MHz to >6 GHz (dosimetry); 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 mW/g, Linearity: ± 0.2 dB |
| **Dimensions** | Overall length: 330 mm<br>Tip length: 10 mm<br>Body diameter: 12 mm |
| **Application** | General dosimetry up to 6 GHz<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary phantoms |



### 4.2 Phantoms

Eli Phantom:

The phantom used in SAR/APD tests was an ELI phantom, manufactured by SPEAG. ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. The phantom conforms to the requirements of IEC/IEEE 62209-1528 and FCC published RF Exposure KDB Procedures.

### 4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEC/IEEE 62209-1528 and FCC published RF Exposure KDB Procedures. The dielectric parameters of the used tissue simulants were within ±10% of the recommended values at frequencies under 3GHz and ±5% at frequencies above 3GHz. A liquid compensation algorithm was used in DASY5 with which measured peak average SAR/APD values were corrected for the deviation of used liquid. Depth of the tissue simulant was at least 15.0 cm from the inner surface of the flat phantom.

| Tissue simulant liquid Ingredients |
|---|
| Deionized Water, tween, salt |

### 4.4 System Validation Status

| Frequency [MHz] | Dipole Type / SN | Probe Type / SN | Calibrated Signal Type | DAE Unit / SN | Dielectric Constant [ε'] | Conductivity σ [S/m] | Date |
|---|---|---|---|---|---|---|---|
| 2450 | D2450V2 - SN: 729 | EX3DV4 - SN: 7447 | CW | DAE 4 / 1332 | 41.26 | 1.71 | 03/2023 |
| 5250 | D5GHzV2 - SN: 1045 | EX3DV4 - SN: 7827 | CW | DAE4ip / 1774 | 35.22 | 4.87 | 06/2023 |
| 5600 | D5GHzV2 - SN: 1045 | EX3DV4 - SN: 7827 | CW | DAE4ip / 1774 | 35.22 | 4.87 | 06/2023 |
| 5750 | D5GHzV2 - SN: 1045 | EX3DV4 - SN: 7827 | CW | DAE4ip / 1774 | 35.22 | 4.87 | 06/2023 |
| 6500 | D6.5GHzV2 - SN: 1097 | EX3DV4 - SN: 7827 | CW | DAE4ip / 1774 | 33.69 | 6.10 | 07.2023 |



## 4.5 System Check

| Date | Tissue Type | Tissue Temp. [°C] | Frequency [MHz] | Input Power [mW] | Measured $SAR_{1g}$ [W/kg] | 1 W Target $SAR_{1g}$ [W/kg] | 1 W Normalized $SAR_{1g}$ [W/kg] | Deviation [%] | Plot # |
|---|---|---|---|---|---|---|---|---|---|
| 09.08.2023 | WB Head | 22 | 6500 | 100 | 28.4 | 296 | 284 | -4.1 | 1 |
| 14.08.2023 | WB Head | 22 | 5250 | 100 | 7.09 | 73.09 | 70.9 | -3.0 | 2 |
| 15.08.2023 | WB Head | 22 | 5250 | 100 | 6.87 | 73.09 | 68.7 | -6.0 | 3 |
| 16.08.2023 | WB Head | 22 | 2450 | 250 | 11.8 | 52.3 | 47.2 | -9.8 | 4 |
| 16.08.2023 | WB Head | 22 | 5600 | 100 | 7.56 | 72.92 | 75.6 | 3.7 | 5 |
| 17.08.2023 | WB Head | 22 | 5750 | 100 | 6.97 | 69.05 | 69.7 | 0.9 | 6 |
| 21.08.2023 | WB Head | 22 | 5750 | 100 | 7.04 | 69.05 | 70.4 | 2.0 | 7 |
| 21.08.2023 | WB Head | 22 | 2450 | 250 | 11.9 | 52.3 | 47.6 | -9.0 | 8 |
| 22.08.2023 | WB Head | 22 | 6500 | 100 | 28.1 | 296 | 281 | -5.1 | 9 |
| 20.09.2023 | WB Head | 22 | 2450 | 250 | 11.9 | 52.3 | 47.6 | -8.99 | 10 |

### 4.5.1 Tissue Simulant Verification

| | | | | Target | | Measured | | Deviation | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Tissue Type | Tissue Temp [°C] | Frequency [MHz] | Dielectric Constant [ε] Target | Conductivity σ [S/m] Target | Dielectric Constant [ε] | Conductivity σ [S/m] | ε [%] | σ [%] |
| 09.08.2023 | WB Head | 22 | 6025 | 35.07 | 5.51 | 34.06 | 5.7 | -2.9 | 3.4 |
| 09.08.2023 | WB Head | 22 | 6345 | 34.69 | 5.89 | 33.61 | 6.01 | -3.1 | 2.2 |
| 09.08.2023 | WB Head | 22 | 6500 | 34.5 | 6.07 | 33.38 | 6.16 | -3.3 | 1.5 |
| 09.08.2023 | WB Head | 22 | 6505 | 34.49 | 6.08 | 33.37 | 6.17 | -3.3 | 1.5 |
| 09.08.2023 | WB Head | 22 | 6825 | 34.11 | 6.45 | 32.94 | 6.49 | -3.4 | 0.7 |
| 09.08.2023 | WB Head | 22 | 6985 | 33.92 | 6.63 | 32.73 | 6.63 | -3.5 | -0.0 |
| 10.08.2023 | WB Head | 22 | 6025 | 35.07 | 5.51 | 33.49 | 5.51 | -4.5 | -0.0 |
| 10.08.2023 | WB Head | 22 | 6345 | 34.69 | 5.89 | 33.08 | 5.81 | -4.6 | -1.3 |
| 10.08.2023 | WB Head | 22 | 6500 | 34.5 | 6.07 | 32.87 | 5.95 | -4.7 | -1.9 |
| 10.08.2023 | WB Head | 22 | 6505 | 34.49 | 6.08 | 32.86 | 5.96 | -4.7 | -1.9 |
| 10.08.2023 | WB Head | 22 | 6825 | 34.11 | 6.45 | 32.47 | 6.26 | -4.8 | -2.9 |
| 10.08.2023 | WB Head | 22 | 6985 | 33.92 | 6.63 | 32.26 | 6.4 | -4.9 | -3.6 |
| 14.08.2023 | WB Head | 22 | 5250 | 35.95 | 4.71 | 34.32 | 4.83 | -4.5 | 2.6 |
| 14.08.2023 | WB Head | 22 | 5260 | 35.94 | 4.72 | 34.31 | 4.84 | -4.5 | 2.6 |
| 14.08.2023 | WB Head | 22 | 5280 | 35.92 | 4.74 | 34.3 | 4.86 | -4.5 | 2.5 |
| 14.08.2023 | WB Head | 22 | 5320 | 35.88 | 4.78 | 34.24 | 4.89 | -4.6 | 2.3 |
| 15.08.2023 | WB Head | 22 | 5250 | 35.95 | 4.71 | 34.63 | 4.79 | -3.7 | 1.7 |
| 15.08.2023 | WB Head | 22 | 5260 | 35.94 | 4.72 | 34.62 | 4.8 | -3.7 | 1.7 |
| 15.08.2023 | WB Head | 22 | 5280 | 35.92 | 4.74 | 34.61 | 4.82 | -3.6 | 1.6 |
| 15.08.2023 | WB Head | 22 | 5320 | 35.88 | 4.78 | 34.56 | 4.85 | -3.7 | 1.5 |
| 16.08.2023 | WB Head | 22 | 2412 | 39.27 | 1.77 | 38.62 | 1.65 | -1.6 | -6.8 |
| 16.08.2023 | WB Head | 22 | 2422 | 39.25 | 1.78 | 38.61 | 1.65 | -1.6 | -7.0 |
| 16.08.2023 | WB Head | 22 | 2437 | 39.22 | 1.79 | 38.58 | 1.66 | -1.6 | -7.1 |
| 16.08.2023 | WB Head | 22 | 2442 | 39.21 | 1.79 | 38.57 | 1.66 | -1.6 | -7.2 |
| 16.08.2023 | WB Head | 22 | 2450 | 39.2 | 1.8 | 38.57 | 1.67 | -1.6 | -7.2 |
| 16.08.2023 | WB Head | 22 | 2462 | 39.18 | 1.81 | 38.54 | 1.68 | -1.6 | -7.5 |
| 16.08.2023 | WB Head | 22 | 5500 | 35.65 | 4.96 | 33.95 | 5.01 | -4.8 | 1.0 |
| 16.08.2023 | WB Head | 22 | 5580 | 35.53 | 5.05 | 33.85 | 5.08 | -4.7 | 0.6 |
| 16.08.2023 | WB Head | 22 | 5600 | 35.5 | 5.07 | 33.82 | 5.1 | -4.7 | 0.7 |
| 16.08.2023 | WB Head | 22 | 5640 | 35.46 | 5.11 | 33.76 | 5.14 | -4.8 | 0.6 |



| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 17.08.2023 | WB Head | 22 | 5660 | 35.44 | 5.13 | 34.98 | 5.16 | -1.3 | 0.5 |
| 17.08.2023 | WB Head | 22 | 5745 | 35.35 | 5.22 | 34.87 | 5.23 | -1.4 | 0.4 |
| 17.08.2023 | WB Head | 22 | 5750 | 35.35 | 5.22 | 34.86 | 5.24 | -1.4 | 0.4 |
| 17.08.2023 | WB Head | 22 | 5825 | 35.27 | 5.3 | 34.77 | 5.3 | -1.4 | 0.2 |
| 21.08.2023 | WB Head | 22 | 5660 | 35.44 | 5.13 | 34.13 | 5.3 | -3.7 | 3.2 |
| 21.08.2023 | WB Head | 22 | 5745 | 35.35 | 5.22 | 34.01 | 5.38 | -3.8 | 3.1 |
| 21.08.2023 | WB Head | 22 | 5750 | 35.35 | 5.22 | 34.0 | 5.38 | -3.8 | 3.1 |
| 21.08.2023 | WB Head | 22 | 5825 | 35.27 | 5.3 | 33.89 | 5.45 | -3.9 | 2.8 |
| 21.08.2023 | WB Head | 22 | 2412 | 39.27 | 1.77 | 39.13 | 1.66 | -0.4 | -6.2 |
| 21.08.2023 | WB Head | 22 | 2437 | 39.22 | 1.79 | 39.09 | 1.67 | -0.3 | -6.4 |
| 21.08.2023 | WB Head | 22 | 2450 | 39.2 | 1.8 | 39.07 | 1.68 | -0.3 | -6.5 |
| 21.08.2023 | WB Head | 22 | 2462 | 39.18 | 1.81 | 39.04 | 1.69 | -0.4 | -6.8 |
| 22.08.2023 | WB Head | 22 | 6500 | 34.5 | 6.07 | 33.93 | 6.07 | -1.6 | -0.0 |
| 22.08.2023 | WB Head | 22 | 6985 | 33.92 | 6.63 | 33.34 | 6.54 | -1.7 | -1.4 |
| 20.09.2023 | WB Head | 22 | 2402.0 | 39.28 | 1.76 | 39.02 | 1.64 | -0.7 | -6.6 |
| 20.09.2023 | WB Head | 22 | 2441.0 | 39.22 | 1.79 | 38.97 | 1.67 | -0.6 | -6.9 |
| 20.09.2023 | WB Head | 22 | 2450.0 | 39.2 | 1.8 | 38.96 | 1.67 | -0.6 | -7.0 |
| 20.09.2023 | WB Head | 22 | 2480.0 | 39.16 | 1.83 | 38.91 | 1.69 | -0.6 | -7.6 |



# 5. TEST PROCEDURE

Testing was carried out in accordance with FCC KDB Publications 447498 D04 Interim General RF Exposure Guidance v01, 248227 D01 802.11 Wi-Fi SAR, RSS-102 Issue 6 and RSS-102.SAR.MEAS Annex F.

Low, mid and high frequency channels for the configuration with the highest SAR value were tested as per ISED notice 2016-DRS001.

A control software for WLAN and Bluetooth was used to set the DUT to transmit at maximum power.

The WLAN transmission modes for testing were selected according to largest channel bandwidth configuration, lowest order modulation and lowest data rate.
WLAN 2.4GHz and WLAN 5GHz were tested with 802.11n (20MHz) standard with data rate of HT0 and WLAN 6GHz was tested with 802.11ax (160MHz) standard with data rate of HE0.

Bluetooth was tested using worst-case configuration which consisted of BR-mode, packet type DH5 and data rate of 1 Mbps.

APD measurements for WLAN 6GHz were conducted for 5 channels, as per October 2020 TCB Workshop Interim Procedures and RSS-102.SAR.MEAS Annex F, and both antennas to find worst-case configuration, which was then selected for IPD measurement.

## 5.1 Test Positions

### 5.1.1 Body-worn Configuration, 0mm separation distance

The device was placed on the top of a Rohacell and lifted towards the phantom until the separation distance was 0mm. The device was oriented in the foreseeable use case with bottom side facing the phantom as the two TX antennas are located in the keyboard section of the laptop.

Photos of the test positions are presented in appendix A

## 5.2 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan was performed around the highest E-field value to determine the averaged SAR value. For APD testing, additional conversion factors (CF) were automatically applied by the software to calculate the psAPD from the psSAR. Conversion factors of CF1g = 10 kg/m$^2$ and CF8g =20 kg/m$^2$ were used to calculate the 1 cm$^2$ and 4 cm$^2$ from the 1 g psSAR and the 8 g psSAR, respectively. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.



### 5.3 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy52 are all based on the modified Quadratic Shepard's method (Robert J. Renka," Multivariate Interpolation of Large Sets of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).
The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighboring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.



## 6. MEASUREMENT UNCERTAINTY

**DASY5 Uncertainty Budget**
**According to IEC/IEEE 62209-1528**
**(Frequency band: 300MHz - 3GHz range)**

| Symbol | Error Description | Uncert. value | Prob. Dist. | Div. | (ci) 1g | (ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) |
|---|---|---|---|---|---|---|---|---|
| **Measurement System Errors** | | | | | | | | |
| CF | Probe Calibration | ±12.0% | N | √2 | 1 | 1 | ±6.0% | ±6.0% |
| $CF_{drift}$ | Probe Calibration Drift | ±1.7% | R | √3 | 1 | 1 | ±1.0% | ±1.0% |
| LIN | Probe Linearity | ±4.7% | R | √3 | 1 | 1 | ±2.7% | ±2.7% |
| BBS | Broadband Signal | ±3.0% | R | √3 | 1 | 1 | ±1.7% | ±1.7% |
| ISO | Probe Isotropy | ±7.6% | R | 3 | 1 | 1 | ±4.4% | ±4.4% |
| DAE | Data Acquisition | ±0.3% | N | 1 | 1 | 1 | ±0.3% | ±0.3% |
| AMB | RF Ambient | ±1.8% | N | 1 | 1 | 1 | ±1.8% | ±1.8% |
| $\Delta_{syz}$ | Probe Positioning | ±3.9% | N | 1 | 0.14 | 0.14 | ±0.5% | ±0.5% |
| DAT | Data Processing | ±1.2% | N | 1 | 1 | 1 | ±1.2% | ±1.2% |
| **Phantom and Device Errors** | | | | | | | | |
| LIQ(σ) | Conductivity (meas.)[DAK] | ±2.5% | N | √1 | 0.78 | 0.71 | ±2.0% | ±1.8% |
| $LIQ(T_\sigma)$ | Conductivity (temp.)[BB] | ±3.3% | R | √3 | 0.78 | 0.71 | ±1.5% | ±1.4% |
| EPS | Phantom Permittivity | ±14.0% | R | 3 | 0 | 0 | ±0% | ±0% |
| DIS | Distance DUT - TSL | ±2.0% | N | 1 | 2 | 2 | ±4.0% | ±4.0% |
| $D_{xyz}$ | Device Positioning (±0.5mm) | ±1.0% | N | 1 | 1 | 1 | ±1.0% | ±1.0% |
| H | Device Holder | ±3.6% | N | √1 | 1 | 1 | ±3.6% | ±3.6% |
| MOD | DUT Modulation[m] | ±2.4% | R | √3 | 1 | 1 | ±1.4% | ±1.4% |
| TAS | Time-average SAR | ±2.6% | R | 3 | 1 | 1 | ±1.5% | ±1.5% |
| $RF_{drift}$ | DUT drift | ±2.5% | N | 1 | 1 | 1 | ±2.5% | ±2.5% |
| VAL | Val Antenna Unc.[val] | ±0.0% | N | 1 | 1 | 1 | ±0% | ±0% |
| $RF_{in}$ | Unc. Input Power[val] | ±0.0% | N | 1 | 1 | 1 | ±0% | ±0% |
| **Correction to the SAR results** | | | | | | | | |
| C(ε, σ) | Deviation to Target | ±1.9% | N | √1 | 1 | 0.84 | ±1.9% | ±1.6% |
| C(R) | SAR scaling[p] | ±0% | R | 3 | 1 | 1 | ±0% | ±0% |
| u(ΔSAR) | Combined Uncertainty | | | | | | ±11.0% | ±10.9% |
| U | **Expanded Uncertainty** | | | | | | ±22.1% | ±21.9% |



## DASY8 Uncertainty Budget

**According to IEC/IEEE 62209-1528**

**(Frequency band: 300 MHz–3 GHz range)**

| Symbol | Error Description | Uncert. value | Prob. Dist. | Div. | ($c_i$) (1 g) | ($c_i$) (10 g) | Std. Unc. (1 g) | Std. Unc. (10 g) |
|---|---|---|---|---|---|---|---|---|
| **Measurement System Errors** | | | | | | | | |
| CF | Probe Calibration | ±12.0% | N | 2 | 1 | 1 | ±6.0% | ±6.0% |
| $CF_{drift}$ | Probe Calibration Drift | ±1.7% | R | $\sqrt{3}$ | 1 | 1 | ±1.0% | ±1.0% |
| LIN | Probe Linearity | ±4.7% | R | $\sqrt{3}$ | 1 | 1 | ±2.7% | ±2.7% |
| BBS | Broadband Signal | ±3.0% | R | $\sqrt{3}$ | 1 | 1 | ±1.7% | ±1.7% |
| ISO | Probe Isotropy | ±7.6% | R | $\sqrt{3}$ | 1 | 1 | ±4.4% | ±4.4% |
| DAE | Other Probe+Electronic | ±0.7% | N | 1 | 1 | 1 | ±0.7% | ±0.7% |
| AMB | RF Ambient | ±1.8% | N | 1 | 1 | 1 | ±1.8% | ±1.8% |
| $\Delta_{sys}$ | Probe Positioning | ±0.006 mm | N | 1 | 0.14 | 0.14 | ±0.10% | ±0.10% |
| DAT | Data Processing | ±1.2% | N | 1 | 1 | 1 | ±1.2% | ±1.2% |
| **Phantom and Device Errors** | | | | | | | | |
| LIQ($\sigma$) | Conductivity (meas.)$^{DAK}$ | ±2.5% | N | 1 | 0.78 | 0.71 | ±2.0% | ±1.8% |
| LIQ($T_\sigma$) | Conductivity (temp.)$^{BB}$ | ±3.3% | R | $\sqrt{3}$ | 0.78 | 0.71 | ±1.5% | ±1.4% |
| EPS | Phantom Permittivity | ±14.0% | R | $\sqrt{3}$ | 0 | 0 | ±0% | ±0% |
| DIS | Distance DUT – TSL | ±2.0% | N | 1 | 2 | 2 | ±4.0% | ±4.0% |
| $D_{xyz}$ | Device Positioning | ±1.0% | N | 1 | 1 | 1 | ±1.0% | ±1.0% |
| H | Device Holder | ±3.6% | N | 1 | 1 | 1 | ±3.6% | ±3.6% |
| MOD | DUT Modulation$^{m}$ | ±2.4% | R | $\sqrt{3}$ | 1 | 1 | ±1.4% | ±1.4% |
| TAS | Time-average SAR | ±1.7% | R | $\sqrt{3}$ | 1 | 1 | ±1.0% | ±1.0% |
| $RF_{drift}$ | DUT drift | ±2.5% | N | 1 | 1 | 1 | ±2.5% | ±2.5% |
| VAL | Val Antenna Unc.$^{val}$ | ±0.0% | N | 1 | 1 | 1 | ±0% | ±0% |
| $RF_{in}$ | Unc. Input Power$^{val}$ | ±0.0% | N | 1 | 1 | 1 | ±0% | ±0% |
| **Correction to the SAR results** | | | | | | | | |
| C($\varepsilon$, $\sigma$) | Deviation to Target | ±1.9% | N | 1 | 1 | 0.84 | ±1.9% | ±1.6% |
| C(R) | SAR scaling$^{p}$ | ±0% | R | $\sqrt{3}$ | 1 | 1 | ±0% | ±0% |
| u($\Delta$SAR) | Combined Uncertainty | | | | | | ±10.9% | ±10.9% |
| U | **Expanded Uncertainty** | | | | | | ±21.9% | ±21.8% |



# DASY8 Uncertainty Budget

**According to IEC/IEEE 62209-1528**

**(Frequency band: 3 GHz–6 GHz range)**

| Symbol | Error Description | Uncert. value | Prob. Dist. | Div. | ($c_i$) (1 g) | ($c_i$) (10 g) | Std. Unc. (1 g) | Std. Unc. (10 g) |
|---|---|---|---|---|---|---|---|---|
| **Measurement System Errors** | | | | | | | | |
| CF | Probe Calibration | ±13.1% | N | 2 | 1 | 1 | ±6.55% | ±6.55% |
| $CF_{drift}$ | Probe Calibration Drift | ±1.7% | R | $\sqrt{3}$ | 1 | 1 | ±1.0% | ±1.0% |
| LIN | Probe Linearity | ±4.7% | R | $\sqrt{3}$ | 1 | 1 | ±2.7% | ±2.7% |
| BBS | Broadband Signal | ±2.6% | R | $\sqrt{3}$ | 1 | 1 | ±1.5% | ±1.5% |
| ISO | Probe Isotropy | ±7.6% | R | $\sqrt{3}$ | 1 | 1 | ±4.4% | ±4.4% |
| DAE | Other Probe+Electronic | ±1.2% | N | 1 | 1 | 1 | ±1.2% | ±1.2% |
| AMB | RF Ambient | ±1.8% | N | 1 | 1 | 1 | ±1.8% | ±1.8% |
| $\Delta_{sys}$ | Probe Positioning | ±0.005 mm | N | 1 | 0.29 | 0.29 | ±0.15% | ±0.15% |
| DAT | Data Processing | ±2.3% | N | 1 | 1 | 1 | ±2.3% | ±2.3% |
| **Phantom and Device Errors** | | | | | | | | |
| LIQ($\sigma$) | Conductivity (meas.)$^{DAK}$ | ±2.5% | N | 1 | 0.78 | 0.71 | ±2.0% | ±1.8% |
| LIQ($T_\sigma$) | Conductivity (temp.)$^{BB}$ | ±3.4% | R | $\sqrt{3}$ | 0.78 | 0.71 | ±1.5% | ±1.4% |
| EPS | Phantom Permittivity | ±14.0% | R | $\sqrt{3}$ | 0.25 | 0.25 | ±2.0% | ±2.0% |
| DIS | Distance DUT – TSL | ±2.0% | N | 1 | 2 | 2 | ±4.0% | ±4.0% |
| $D_{xyz}$ | Device Positioning | ±1.0% | N | 1 | 1 | 1 | ±1.0% | ±1.0% |
| H | Device Holder | ±3.6% | N | 1 | 1 | 1 | ±3.6% | ±3.6% |
| MOD | DUT Modulation$^{m}$ | ±2.4% | R | $\sqrt{3}$ | 1 | 1 | ±1.4% | ±1.4% |
| TAS | Time-average SAR | ±1.7% | R | $\sqrt{3}$ | 1 | 1 | ±1.0% | ±1.0% |
| $RF_{drift}$ | DUT drift | ±2.5% | N | 1 | 1 | 1 | ±2.5% | ±2.5% |
| VAL | Val Antenna Unc.$^{val}$ | ±0.0% | N | 1 | 1 | 1 | ±0% | ±0% |
| $RF_{in}$ | Unc. Input Power$^{val}$ | ±0.0% | N | 1 | 1 | 1 | ±0% | ±0% |
| **Correction to the SAR results** | | | | | | | | |
| C($\varepsilon$, $\sigma$) | Deviation to Target | ±1.9% | N | 1 | 1 | 0.84 | ±1.9% | ±1.6% |
| C(R) | SAR scaling$^{p}$ | ±0% | R | $\sqrt{3}$ | 1 | 1 | ±0% | ±0% |
| u($\Delta$SAR) | Combined Uncertainty | | | | | | ±11.6% | ±11.5% |
| U | **Expanded Uncertainty** | | | | | | ±23.3% | ±23.0% |



## Uncertainty Budget for psSAR / psAPD Assessments

**(Frequency band: 6 – 10 GHz range)**

| Symbol | Error Description | Uncert. | Prob. Dist. | Div. | $c_i$ (1g) / (1 cm$^2$) | $c_i$ (8 g/10 g) / (4 cm$^2$) | Std. Unc. (1 g) / (1 cm$^2$) | Std. Unc. (8 g/10 g) / (4 cm$^2$) |
|---|---|---|---|---|---|---|---|---|
| psSAR | Module SAR V16.2 (Table 6.3.3) | ±14.2/13.9% | N | 1 | 1 | 1 | ±14.2% | ±13.9% |
| PDC | Power Density Conversion | ±13.5% | R | $\sqrt{3}$ | 1 | 1 | ±7.8% | ±7.8% |
| u($\Delta SAR$) | Combined Uncertainty | | | | | | ±16.2% | ±15.9 % |
| U | **Expanded Uncertainty** *in dB* | | | | | | ±32.4% *±1.2 dB* | ±31.9% *±1.2 dB* |



# 7. TEST RESULTS

## 7.1 Test Results for Body Exposure Condition with 0mm separation

Bluetooth:

| Mode | Packet Type | Frequency [MHz] | Channel | Antenna | Test position | Maximum Power [dBm] | Conducted Power [dBm] | Measured $SAR_{1g}$ [W/kg] | Power Drift [dB] | Scaling Factor | Duty Cycle | Reported $SAR_{1g}$ [W/kg] | Plot # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BR | DH5 | 2402 | 0 | A | Bottom | 11.2 | 9.46 | 0* | 0** | 1.49 | 1:1 | 0.010* | |
| BR | DH5 | 2441 | 39 | A | Bottom | 11.2 | 9.97 | 0.008* | 0** | 1.33 | 1:1 | 0.011* | 11 |
| BR | DH5 | 2480 | 78 | A | Bottom | 11.2 | 10.41 | 0.006* | 0** | 1.20 | 1:1 | 0.007* | |

*Zoom scan not applicable due to low e-field, area scan value is reported.
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.

WLAN 2.4GHz:

| Mode | Data Rate | Bandwidth [MHz] | Frequency [MHz] | Channel | Antenna | Test position | Maximum Power [dBm] | Conducted Power [dBm] | Measured $SAR_{1g}$ [W/kg] | Power Drift [dB] | Scaling Factor | Duty Cycle | Reported $SAR_{1g}$ [W/kg] | Plot # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 802.11n | HT0 | 20 | A | 2412 | 1 | Bottom | 19.25 | 18.67 | 0.0101 | 0** | 1.14 | 1:1 | 0.01 | 12 |
| 802.11n | HT0 | 20 | A | 2437 | 6 | Bottom | 20 | 19.26 | 0.00996 | 0** | 1.19 | 1:1 | 0.01 | |
| 802.11n | HT0 | 20 | A | 2462 | 11 | Bottom | 17.75 | 16.98 | 0.00215 | 0** | 1.19 | 1:1 | 0.003 | |
| 802.11n | HT0 | 20 | B | 2412 | 1 | Bottom | 18 | 17.19 | 0.00186 | 0** | 1.20 | 1:1 | 0.002 | |
| 802.11n | HT0 | 20 | B | 2437 | 6 | Bottom | 20 | 19.03 | 0.00357 | 0** | 1.25 | 1:1 | 0.004 | |
| 802.11n | HT0 | 20 | B | 2462 | 11 | Bottom | 18 | 17.50 | 0.00262 | 0** | 1.12 | 1:1 | 0.003 | |

*Due to low e-field generated by DUT, the measurements are not applicable
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.

WLAN 5GHz:

| Mode | Data Rate | Bandwidth [MHz] | Frequency [MHz] | Channel | Antenna | Test position | Maximum Power [dBm] | Conducted Power [dBm] | Measured $SAR_{1g}$ [W/kg] | Power Drift*** [dB] | Scaling Factor | Duty Cycle | Reported $SAR_{1g}$ [W/kg] | Plot # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 802.11a | 6 | 20 | 5260 | 52 | A | Bottom | 20 | 19.41 | 0.033 | 0.29 | 1.22 | 1:1 | 0.04 | 13 |
| 802.11a | 6 | 20 | 5280 | 56 | A | Bottom | 20 | 19.38 | 0.029 | 0** | 1.15 | 1:1 | 0.03 | |
| 802.11a | 6 | 20 | 5320 | 64 | A | Bottom | 18.5 | 18.06 | 0.016 | -0.02 | 1.11 | 1:1 | 0.02 | |
| 802.11a | 6 | 20 | 5260 | 52 | B | Bottom | 20 | 19.32 | 0.008 | 0** | 1.17 | 1:1 | 0.01 | |
| 802.11a | 6 | 20 | 5280 | 56 | B | Bottom | 20 | 19.31 | 0.009 | 0** | 1.17 | 1:1 | 0.01 | |
| 802.11a | 6 | 20 | 5320 | 64 | B | Bottom | 18.75 | 18.32 | 0.006 | -1.26 | 1.48 | 1:1 | 0.01 | |

*Due to low e-field generated by DUT, the measurements are not applicable
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.
***Larger than 5% drifts included to scaling factors

| Mode | Data Rate | Bandwidth [MHz] | Frequency [MHz] | Channel | Antenna | Test position | Maximum Power [dBm] | Conducted Power [dBm] | Measured $SAR_{1g}$ [W/kg] | Power Drift*** [dB] | Scaling Factor | Duty Cycle | Reported $SAR_{1g}$ [W/kg] | Plot # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 802.11a | 6 | 20 | 5500 | 100 | A | Bottom | 19 | 18.57 | 0.07 | 0** | 1.10 | 1:1 | 0.08 | |
| 802.11a | 6 | 20 | 5580 | 116 | A | Bottom | 20 | 19.66 | 0.113 | 0** | 1.08 | 1:1 | 0.12 | |
| 802.11a | 6 | 20 | 5640 | 128 | A | Bottom | 20 | 19.68 | 0.131 | 0** | 1.08 | 1:1 | 0.14 | 14 |
| 802.11a | 6 | 20 | 5500 | 100 | B | Bottom | 19 | 18.58 | 0.009 | -0.92 | 1.36 | 1:1 | 0.01 | |
| 802.11a | 6 | 20 | 5580 | 116 | B | Bottom | 20 | 19.63 | 0.014 | 0** | 1.09 | 1:1 | 0.02 | |
| 802.11a | 6 | 20 | 5640 | 128 | B | Bottom | 20 | 19.65 | 0.068 | 0** | 1.08 | 1:1 | 0.07 | |

*Due to low e-field generated by DUT, the measurements are not applicable
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.
***Larger than 5% drifts included to scaling factors



| Mode | Data Rate | Bandwidth [MHz] | Frequency [MHz] | Channel | Antenna | Test position | Maximum Power [dBm] | Conducted Power [dBm] | Measured $SAR_{1g}$ [W/kg] | Power Drift** [dB] | Scaling Factor | Duty Cycle | Reported $SAR_{1g}$ [W/kg] | Plot # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 802.11a | 6 | 20 | 5660 | 132 | A | Bottom | 20 | 19.76 | 0.124 | 0** | 1.06 | 1:1 | 0.13 | 15 |
| 802.11a | 6 | 20 | 5745 | 149 | A | Bottom | 20 | 19.75 | 0.120 | 0** | 1.06 | 1:1 | 0.13 | |
| 802.11a | 6 | 20 | 5825 | 165 | A | Bottom | 20 | 19.59 | 0.103 | 0** | 1.10 | 1:1 | 0.11 | |
| 802.11a | 6 | 20 | 5660 | 132 | B | Bottom | 20 | 19.73 | 0.072 | 0** | 1.06 | 1:1 | 0.08 | |
| 802.11a | 6 | 20 | 5745 | 149 | B | Bottom | 20 | 19.85 | 0.072 | 0** | 1.04 | 1:1 | 0.07 | |
| 802.11a | 6 | 20 | 5825 | 165 | B | Bottom | 20 | 19.55 | 0.050 | 0** | 1.11 | 1:1 | 0.06 | |

*Due to low e-field generated by DUT, the measurements are not applicable
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.
**Larger than 5% drifts included to scaling factors

WLAN 6GHz:

| Mode | Data Rate | Bandwidth [MHz] | Frequency [MHz] | Channel | Antenna | Test position | Maximum Power [dBm] | Conducted Power [dBm] | Measured $SAR_{1g}$ [W/kg] | Measured APD 4cm² [W/m²] | Power Drift*** [dB] | Scaling Factor | Duty Cycle | Reported $SAR_{1g}$ [W/kg] | Reported APD 4cm² [W/m²] | Plot # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 802.11ax | HE0 | 160 | 6025 | 15 | A | Bottom | 13 | 11.87 | 0.002 | 0.007 | 0** | 1.30 | 1:1 | 0.003 | 0.01 | |
| 802.11ax | HE0 | 160 | 6345 | 79 | A | Bottom | 13 | 11.75 | 0.005 | 0.035 | 0** | 1.33 | 1:1 | 0.01 | 0.05 | |
| 802.11ax | HE0 | 160 | 6505 | 111 | A | Bottom | 13 | 11.83 | 0.009 | 0.043 | 0** | 1.31 | 1:1 | 0.01 | 0.06 | |
| 802.11ax | HE0 | 160 | 6825 | 175 | A | Bottom | 12.25 | 10.67 | 0.006 | 0.062 | 0.22 | 1.51 | 1:1 | 0.01 | 0.09 | 16 |
| 802.11ax | HE0 | 160 | 6985 | 207 | A | Bottom | 12.25 | 10.85 | 0.004 | 0.016 | 0** | 1.38 | 1:1 | 0.01 | 0.02 | |
| 802.11ax | HE0 | 160 | 6025 | 15 | B | Bottom | 13 | 12.21 | 0.003 | 0.009 | 0** | 1.20 | 1:1 | 0.003 | 0.01 | |
| 802.11ax | HE0 | 160 | 6345 | 79 | B | Bottom | 13 | 12.26 | 0.011 | 0.062 | 0** | 1.19 | 1:1 | 0.01 | 0.07 | |
| 802.11ax | HE0 | 160 | 6505 | 111 | B | Bottom | 13 | 12.20 | 0* | 0* | -0.87 | 1.47 | 1:1 | 0* | 0* | |
| 802.11ax | HE0 | 160 | 6825 | 175 | B | Bottom | 12.25 | 11.31 | 0.002 | 0.011 | 0** | 1.24 | 1:1 | 0.002 | 0.01 | |
| 802.11ax | HE0 | 160 | 6985 | 207 | B | Bottom | 12.25 | 11.28 | 0.003 | 0.015 | 0.29 | 1.34 | 1:1 | 0.003 | 0.02 | |

*Due to low e-field generated by DUT, the measurements are not applicable
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.
***Larger than 5% drifts included to scaling factors

| Mode | Data Rate | Bandwidth [MHz] | Frequency [MHz] | Channel | Antenna | Test position | Maximum Power [dBm] | Conducted Power [dBm] | Measured IPD 4cm² [W/m²] | Power Drift* [dB] | Scaling Factor | Duty Cycle | Reported IPD 4cm² [W/m²] | Plot # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 802.11ax | HE0 | 160 | 6825 | 175 | A | Bottom | 12.25 | 10.67 | 0.109 | 2.14 | 2.36 | 1:1 | 0.26 | |

*Larger than 5% drifts included to scaling factors



### 7.2 IEC 62209-2 AMD1:2019

According to IEC 62209-2 AMD1:2019, the zoom scan complies if the peak spatial-average SAR is below 0.1 W/kg, or if the following criteria is met:

1. The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak is larger than the horizontal grid step.

2. Ratio of 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 is at least 30%.

Zoom scan compliance according to IEC 62209-2 AMD1:2019 is automatically verified by DASY5 software and all zoom scans in this test report do pass the criteria. The smallest horizontal distance and Ratio between measurement points M2 and M1 of the highest SAR results is available in Appendix C.



### 7.3 Simultaneous Transmission Analysis

Simultaneous transmission analysis for the maximum WLAN SAR/APD/IPD is in the table below. Direct summation of SAR results was performed, overestimating the simultaneous transmission SAR/APD as SISO mode has higher power than MIMO mode. WLAN 6GHz in SISO mode has 3dBm higher power than in MIMO mode, thus worst-case SISO 6GHz WLAN SAR test configuration was used to address MIMO transmission.

FCC:

Body SAR:

| Exposure Condition | Body $SAR_{1g}$ [W/kg] |
|---|---|
| **Test Position** | **Bottom** |
| **Bluetooth, Antenna A** | 0.011 |
| **WLAN 2.4GHz, SISO, Antenna A** | 0.01 |
| **WLAN 5GHz, SISO, Antenna A** | **0.14** |
| **WLAN 6GHz, SISO, Antenna A** | - |
| **WLAN 2.4GHz, SISO, Antenna B** | 0.004 |
| **WLAN 5GHz, SISO, Antenna B** | **0.08** |
| **SAR Summation:** | **0.22** |

Combination of SAR & IPD was taken into account by dividing the maximum result with the corresponding limit and summing the values:
WLAN 6GHz (0.26 / 10) + WLAN 5GHz (0.14 / 1.6) = 0.1135<1 Thus, the evaluation result is PASS.



ISED:

Body SAR:

| Exposure Condition | Body $SAR_{1g}$ [W/kg] | Body APD 4$cm^2$ [W/$m^2$] |
|---|---|---|
| **Test Position** | **Bottom** | **Bottom** |
| **Bluetooth, Antenna A** | 0.011 | - |
| **WLAN 2.4GHz, SISO, Antenna A** | 0.01 | - |
| **WLAN 5GHz, SISO, Antenna A** | **0.14** | - |
| **WLAN 6GHz, SISO, Antenna A** | - | **0.09** |
| **WLAN 2.4GHz, SISO, Antenna B** | 0.004 | - |
| **WLAN 5GHz, SISO, Antenna B** | **0.08** | - |
| **WLAN 6GHz, SISO, Antenna B** | - | **0.07** |
| **SAR Summation:** | **0.22** | **0.16** |

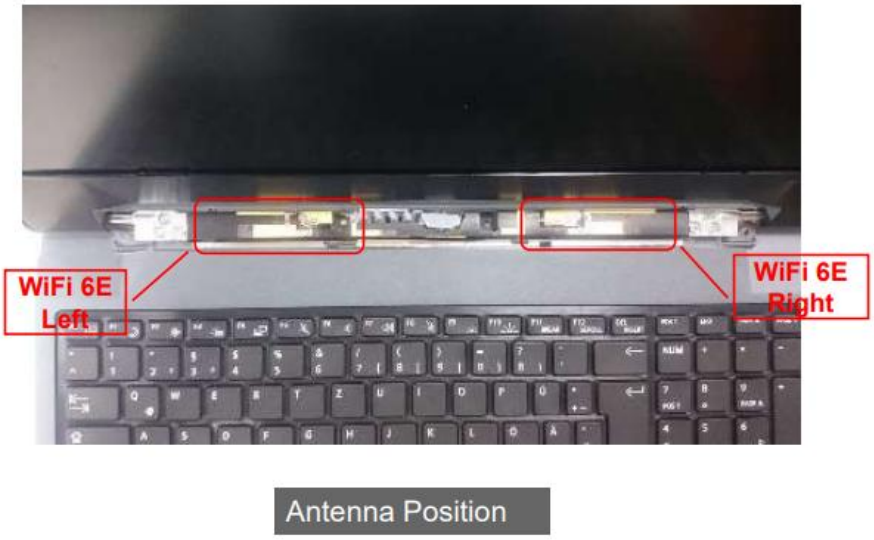
Combination of SAR & APD was taken into account by dividing the maximum result with the corresponding limit and summing the values:
WLAN 6GHz (0.09 / 20) + WLAN 5GHz (0.14 / 1.6) = 0.092<1 Thus, the evaluation result is **PASS.**



**APPENDIX A: PHOTOS OF THE DUT**

Size of the DUT is: keyboard 277 x 380 x 30 mm, screen 258 x 380 x 5 mm




Antenna Position



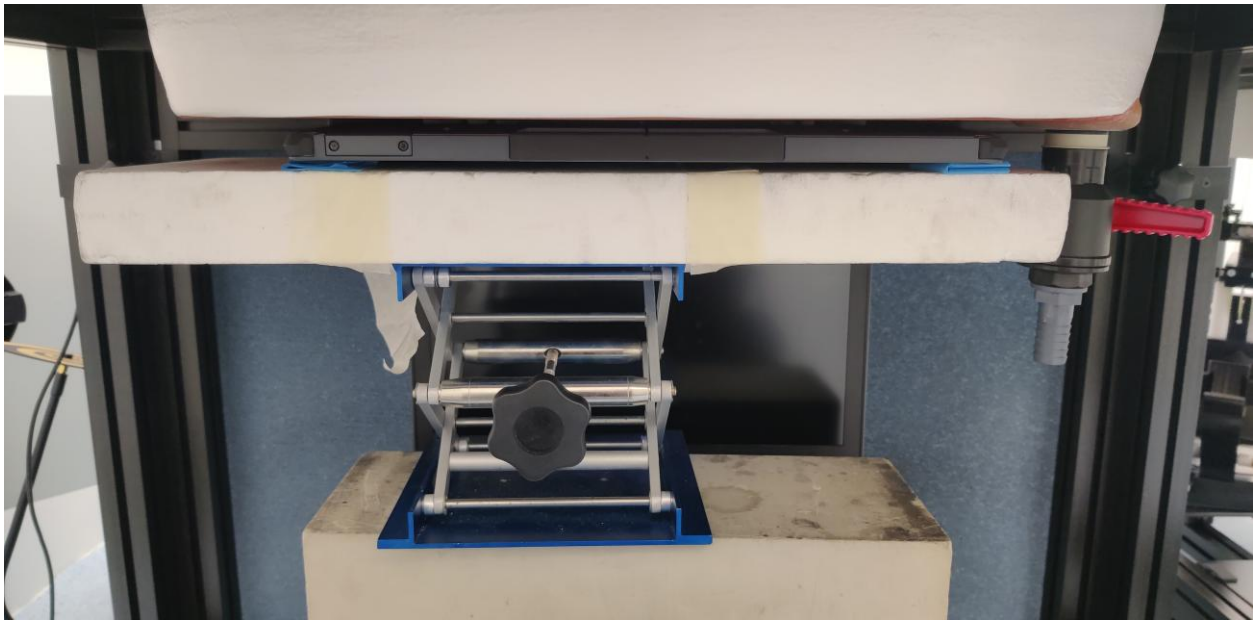


Figure 2 Bottom Test Position, 0mm separation distance

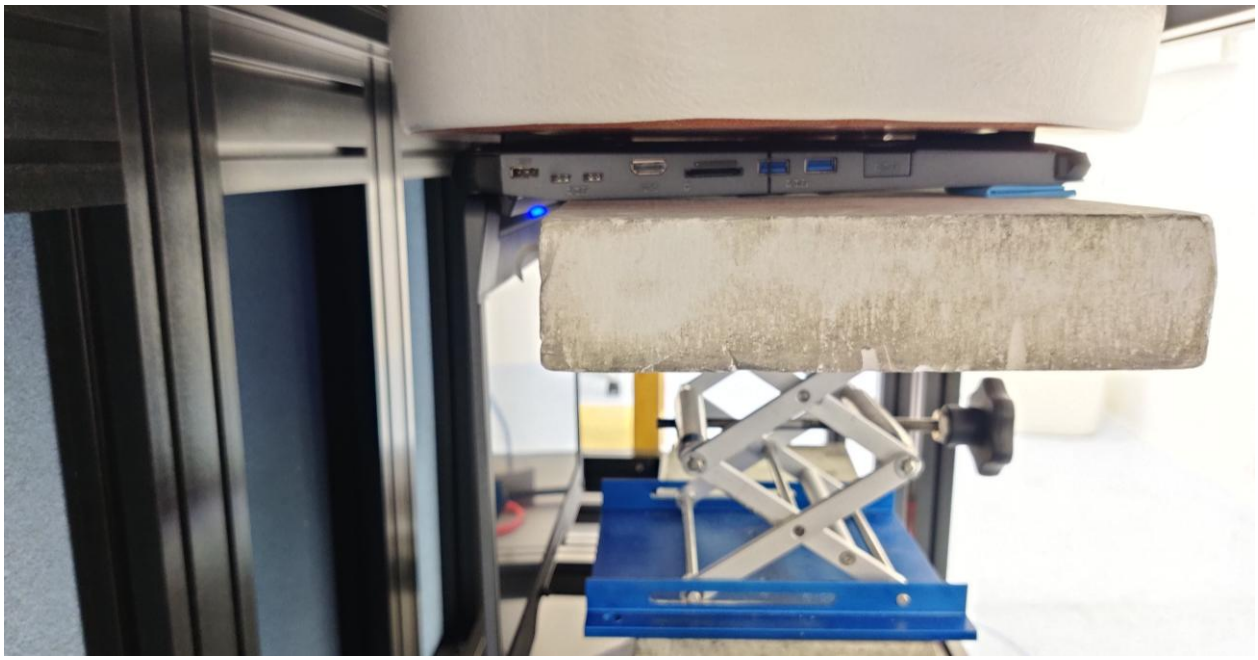


Figure 3 Bottom Test Position, 0mm separation distance



## APPENDIX B: SYSTEM CHECK SCAN

Plot 1

Date/Time: 2023-08-09, 09:39

Test Laboratory: Verkotan Oy

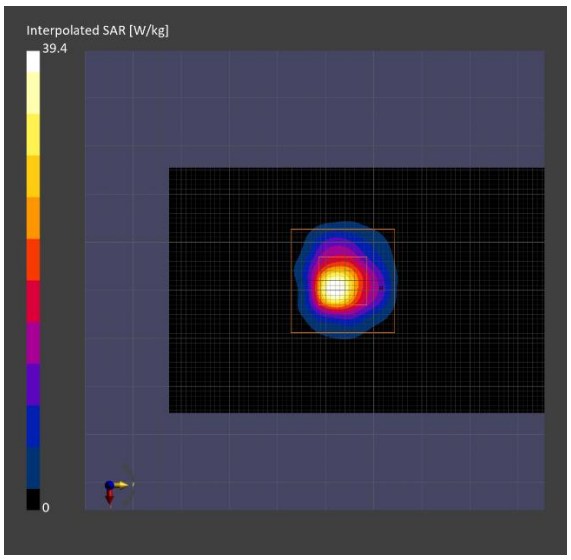
**DUT: Dipole 6500 MHz D6.5GHzV2; Type: D6.5GHzV2; Serial: D6.5GHzV2 - SN:1097**

Communication System: UID 0, CW; Communication System Band: ; Frequency 6500.000 MHz;
Medium parameters used: f= 6500.000; σ = 6.16 S/m; εr = 33.4; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(4.95, 4.87, 4.85); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.09; Mother scan avg offset: 0.04;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (51.0 mm x 85.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = 9.44 V/m; Power Drift = 0.13 dB
**SAR(1 g) = 28.4 W/kg; SAR(10g) = 5.26 W/kg** (Positive only)
**APD (4.0cm$^2$) = 128 W/m$^2$**
Smallest distance from peaks to all points 3dB below = 4.8 mm
Ratio of SAR at M2 to SAR at M1 = 51.1%





Plot 2

Date/Time: 2023-08-14, 10:10

Test Laboratory: Verkotan Oy

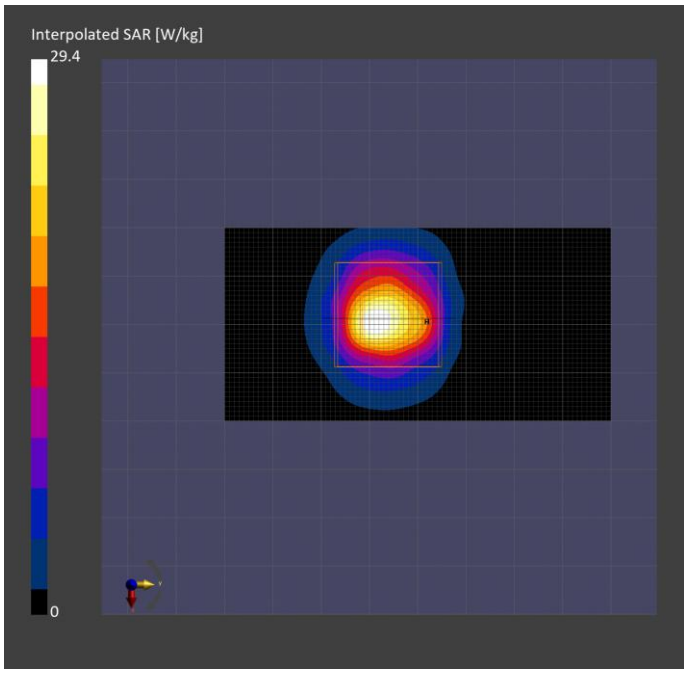
**DUT: Dipole 5000 MHz D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045**

Communication System: UID 0, CW; Communication System Band: ; Frequency 5250.000 MHz;
Medium parameters used: f= 5250.000; σ = 4.83 S/m; εr = 34.3; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(5.6, 5.58, 5.42); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.05; Mother scan avg offset: 0.07;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (40.0 mm x 80.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = 3.33 V/m; Power Drift = 0.10 dB
**SAR(1 g) = 7.09 W/kg; SAR(10g) = 2.03 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 63.0%





Plot 3

Date/Time: 2023-08-15, 09:20

Test Laboratory: Verkotan Oy

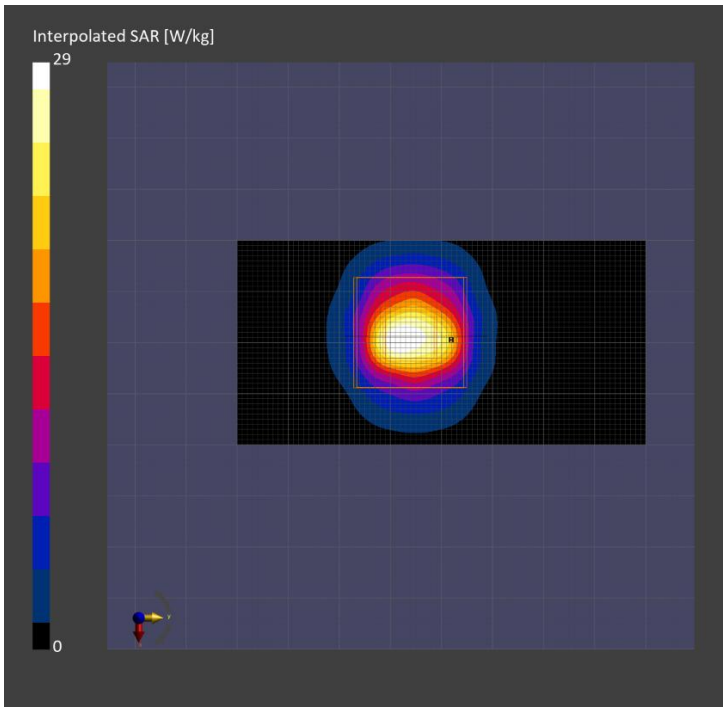
**DUT: Dipole 5000 MHz D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045**

Communication System: UID 0, CW; Communication System Band: ; Frequency 5250.000 MHz;
Medium parameters used: f= 5250.000; σ = 4.79 S/m; εr = 34.6; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(5.6, 5.58, 5.42); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.06; Mother scan avg offset: 0.20;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (40.0 mm x 80.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = 3.23 V/m; Power Drift = 0.05 dB
**SAR(1 g) = 6.87 W/kg; SAR(10g) = 1.96 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 62.1%





Plot 4

Date/Time: 16.8.23 12:04:23

Test Laboratory: Verkotan Oy

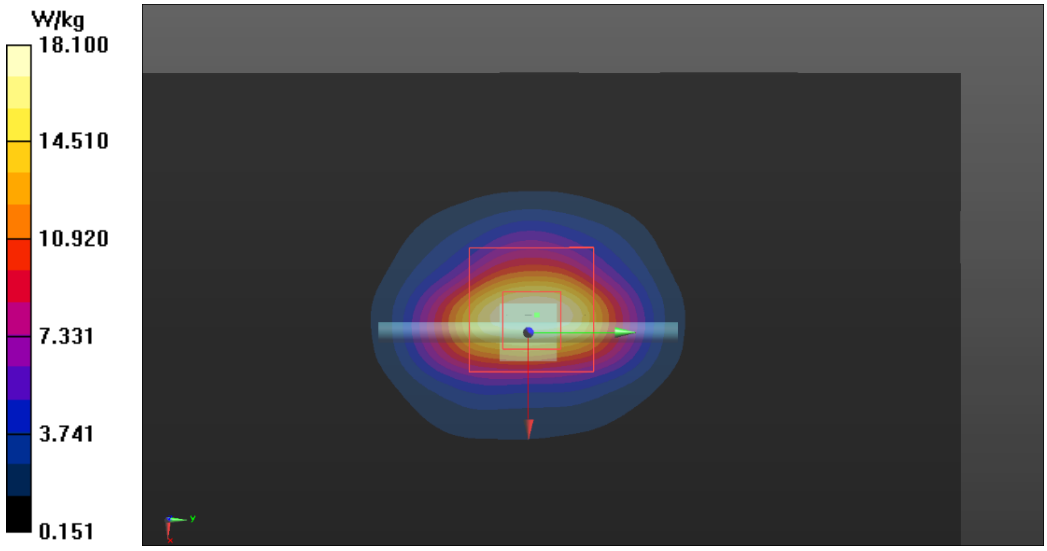
**DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:729**

Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;
Medium parameters used (interpolated): f = 2450 MHz; $\sigma$ = 1.67 S/m; $\varepsilon_r$ = 38.567; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.7, 7.5, 7.63) @ 2450 MHz; Calibrated: 17.2.23
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn1332; Calibrated: 15.2.23
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/System Check 2450MHz/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.5 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 22.4 W/kg
**SAR(1 g) = 11.8 W/kg; SAR(10 g) = 5.57 W/kg** (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7 mm
Ratio of SAR at M2 to SAR at M1 = 53.3%
Maximum value of SAR (measured) = 18.1 W/kg
**Configuration/System Check 2450MHz/Area Scan (101x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 18.6 W/kg





Plot 5

Date/Time: 2023-08-16, 12:18

Test Laboratory: Verkotan Oy

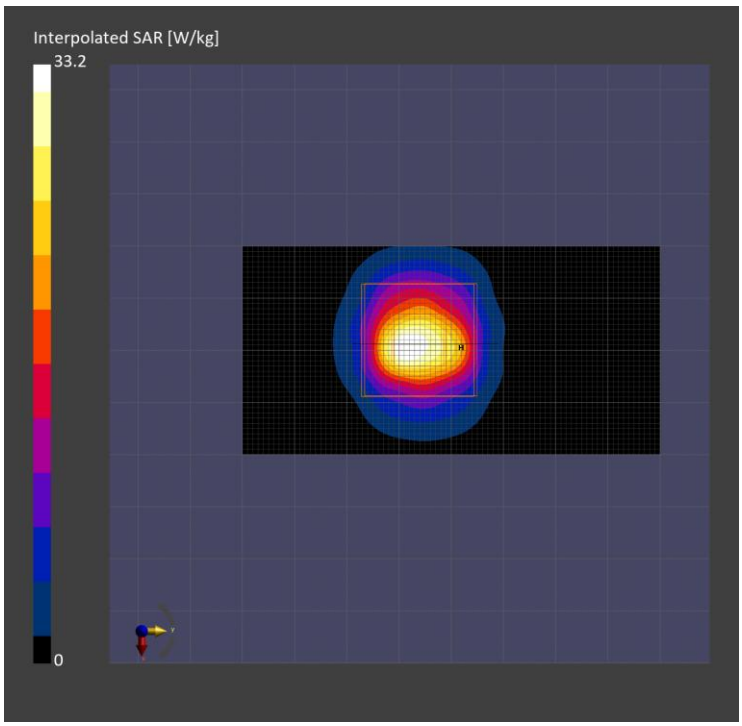
**DUT: Dipole 5000 MHz D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045**

Communication System: UID 0, CW; Communication System Band: ; Frequency 5600.000 MHz;
Medium parameters used: f= 5600.000; σ = 5.10 S/m; εr = 33.8; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(4.95, 4.87, 4.73); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.05; Mother scan avg offset: 0.33;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (40.0 mm x 80.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = 2.97 V/m; Power Drift = 0.09 dB
**SAR(1 g) = 7.56 W/kg; SAR(10g) = 2.14 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 61.0%





Plot 6

Date/Time: 2023-08-17, 15:16

Test Laboratory: Verkotan Oy

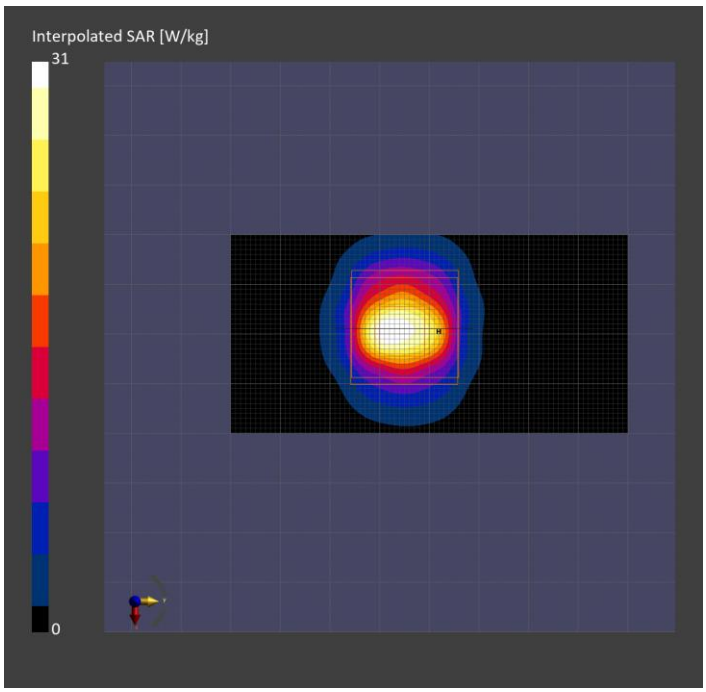
**DUT: Dipole 5000 MHz D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045**

Communication System: UID 0, CW; Communication System Band: ; Frequency 5750.000 MHz;
Medium parameters used: f= 5750.000; σ = 5.24 S/m; εr = 34.9; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(5.14, 5.02, 4.94); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.06; Mother scan avg offset: 0.43;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (40.0 mm x 80.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = 2.59 V/m; Power Drift = 0.08 dB
**SAR(1 g) = 6.97 W/kg; SAR(10g) = 1.97 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 59.8%





Plot 7

Date/Time: 2023-08-21, 09:03

Test Laboratory: Verkotan Oy

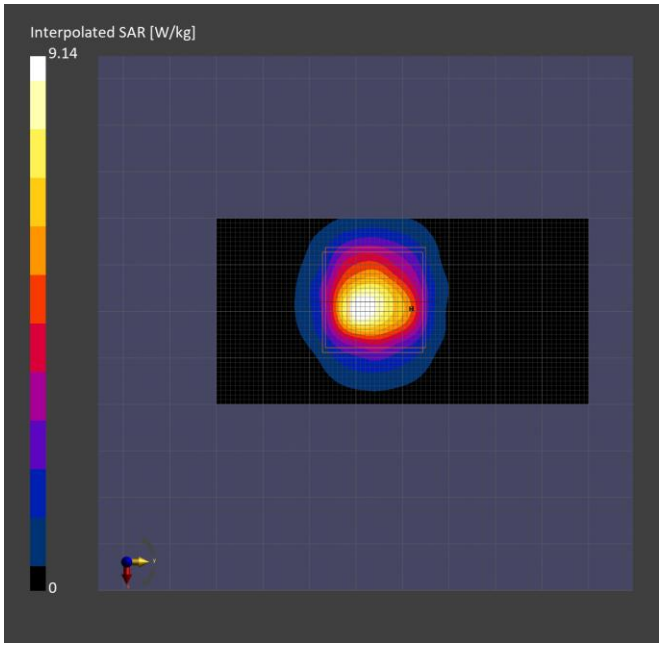
**DUT: Dipole 5000 MHz D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045**

Communication System: UID 0, CW; Communication System Band: ; Frequency 5750.000 MHz;
Medium parameters used: f= 5750.000; σ = 5.38 S/m; εr = 34.0; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(5.14, 5.02, 4.94); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.06; Mother scan avg offset: 0.57;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (40.0 mm x 80.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = 2.29 V/m; Power Drift = 0.01 dB
**SAR(1 g) = 7.04 W/kg; SAR(10g) = 1.98 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 59.8%





Plot 8

Date/Time: 21.8.23 09:04:17

Test Laboratory: Verkotan Oy

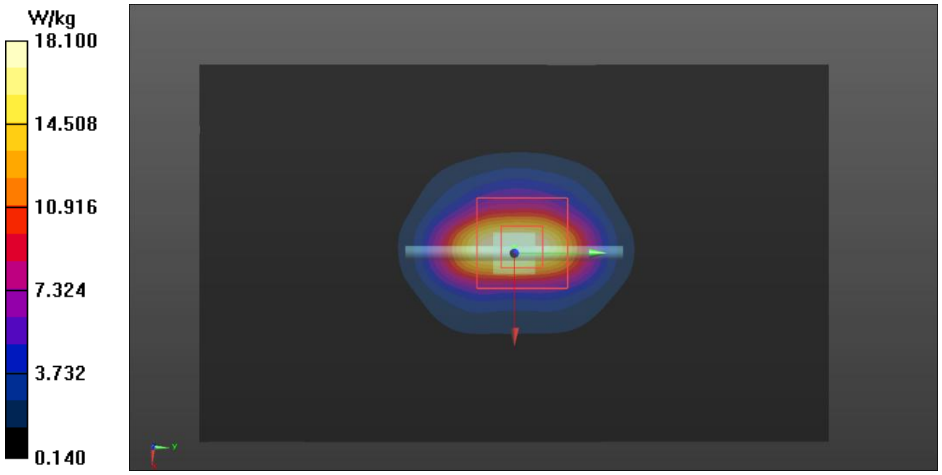
**DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:729**

Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2450 MHz; $\sigma$ = 1.682 S/m; $\varepsilon_r$ = 39.073; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.7, 7.5, 7.63) @ 2450 MHz; Calibrated: 17.2.23
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn1332; Calibrated: 15.2.23
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/System Check 2450MHz/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.6 V/m; Power Drift = -0.27 dB
Peak SAR (extrapolated) = 21.9 W/kg
**SAR(1 g) = 11.9 W/kg; SAR(10 g) = 5.74 W/kg** (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6 mm
Ratio of SAR at M2 to SAR at M1 = 53.6%
Maximum value of SAR (measured) = 18.1 W/kg
**Configuration/System Check 2450MHz/Area Scan (101x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 16.9 W/kg





Plot 9

Date/Time: 2023-08-22, 13:23

Test Laboratory: Verkotan Oy

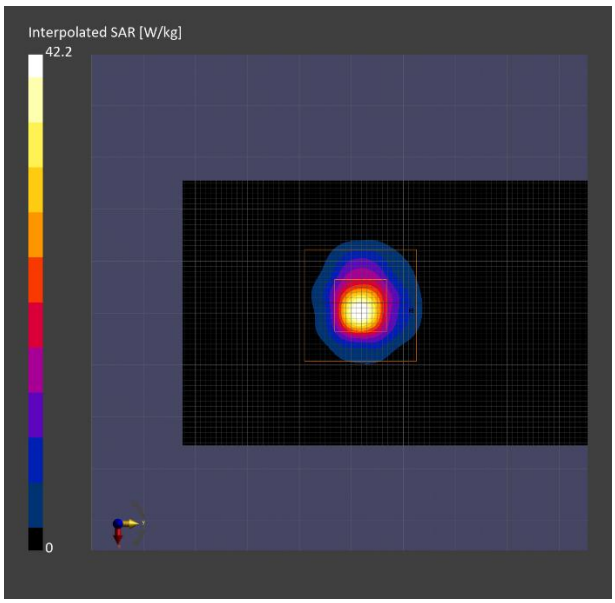
**DUT: Dipole 6500 MHz D6.5GHzV2; Type: D6.5GHzV2; Serial: D6.5GHzV2 - SN:1097**

Communication System: UID 0, CW; Communication System Band: ; Frequency 6500.000 MHz;
Medium parameters used: f= 6500.000; σ = 6.07 S/m; εr = 33.9; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(4.95, 4.87, 4.85); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.06; Mother scan avg offset: 0.36;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (51.0 mm x 85.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = 8.03 V/m; Power Drift = 0.06 dB
**SAR(1 g) = 28.1 W/kg; SAR(10g) = 5.23 W/kg** (Positive only)
**APD (4.0cm$^2$) = 127 W/m$^2$**
Smallest distance from peaks to all points 3dB below = 4.4 mm
Ratio of SAR at M2 to SAR at M1 = 50.8%





Plot 10

Date/Time: 2023-09-20, 10:17

Test Laboratory: Verkotan Oy

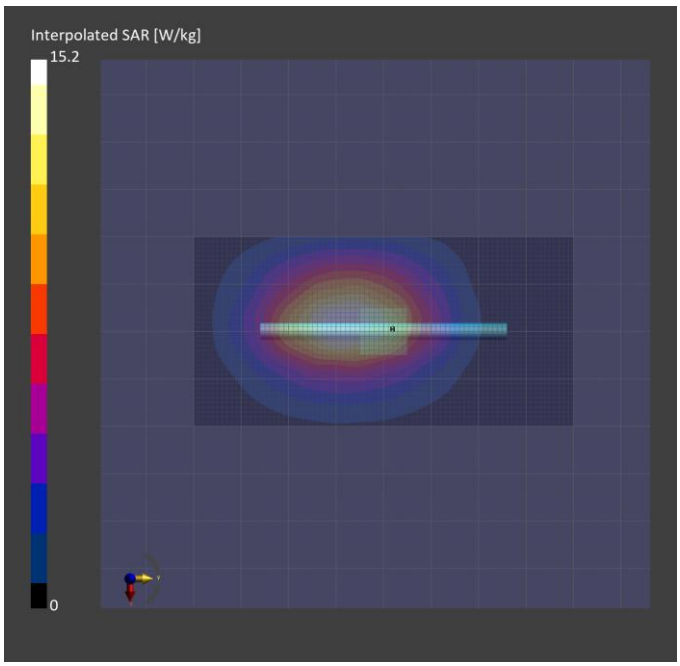
**DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:729**

Communication System: UID 0, CW; Communication System Band: ; Frequency 2450.000 MHz;
Medium parameters used: f= 2450.000; $\sigma$ = 1.67 S/m; $\varepsilon_r$ = 39.0; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(7.5, 7.4, 7.2); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.09; Mother scan avg offset: 0.29;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Area Scan:** Measurement grid: (40.0 mm x 80.0 mm)
**Zoom Scan:** Measurement grid: (30.0 mm x 30.0 mm x 30.0 mm)
Reference Value = 9.90 V/m; Power Drift = 0.00 dB
**SAR(1 g) = 11.9 W/kg; SAR(10g) = 5.61 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 9.0 mm
Ratio of SAR at M2 to SAR at M1 = 81.0%





## APPENDIX C: MEASUREMENT SCANS

Plot 11

Date/Time: 2023-09-20, 14:46

Test Laboratory: Verkotan Oy

**DUT: Siemens Laptop**

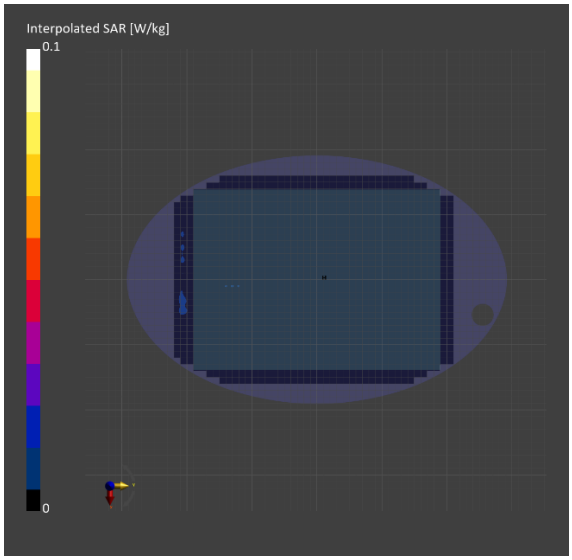
Communication System: UID 10032, Bluetooth; Communication System Band: ISM 2.4 GHz Band; Frequency 2441.000 MHz;
Medium parameters used: f= 2441.000; σ = 1.67 S/m; εr = 39.0; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(7.5, 7.4, 7.2); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.16; Mother scan avg offset: 0.63;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Measurement Group:**
**ISM 2.4 GHz Band, IEEE 802.15.1 Bluetooth (GFSK, DH5), CH39, BACK, 5.00 mm**

**Area Scan:** Measurement grid: (320.0 mm x 420.0 mm)
**Zoom Scan:** Measurement grid: (30.0 mm x 30.0 mm x 30.0 mm)
Reference Value = -0.02 V/m; Power Drift = -1.80 dB
**SAR(1 g) = 0 W/kg; SAR(10g) = 0 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 0.0 mm
Ratio of SAR at M2 to SAR at M1 = 46.8%





Plot 12

Date/Time: 18.8.23 09:01:48

Test Laboratory: Verkotan Oy

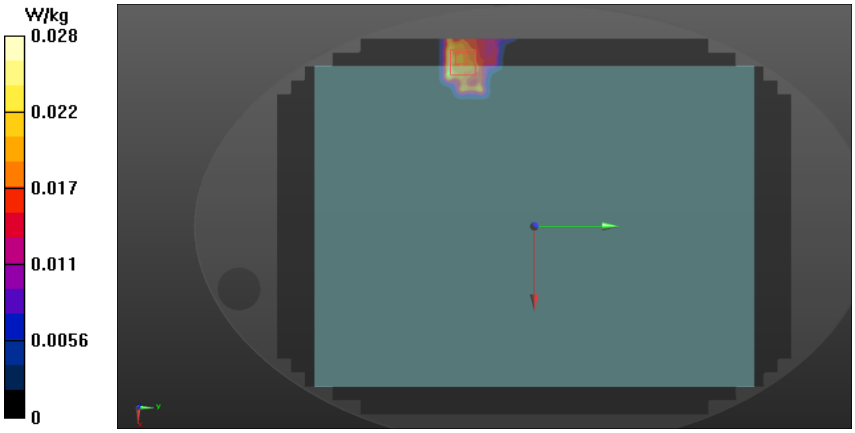
**DUT: Siemens Laptop**

Communication System: UID 0, WLAN 2.4 (0); Communication System Band: WLAN2.4GHz; Frequency: 2412 MHz;
Medium parameters used: f = 2412 MHz; $\sigma$ = 1.646 S/m; $\varepsilon_r$ = 38.624; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN7447; ConvF(7.7, 7.5, 7.63) @ 2412 MHz; Calibrated: 17.2.23
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn1332; Calibrated: 15.2.23
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**FCC/FCC WLAN 2.4GHz, HT0, BW20, Antenna A, Bottom, CH1/Area Scan (371x271x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0280 W/kg
**FCC/FCC WLAN 2.4GHz, HT0, BW20, Antenna A, Bottom, CH1/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.0260 W/kg
**SAR(1 g) = 0.010 W/kg; SAR(10 g) = 0.00417 W/kg** (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 40.3%
Maximum value of SAR (measured) = 0.0173 W/kg





Plot 13

Date/Time: 2023-08-15, 14:32

Test Laboratory: Verkotan Oy

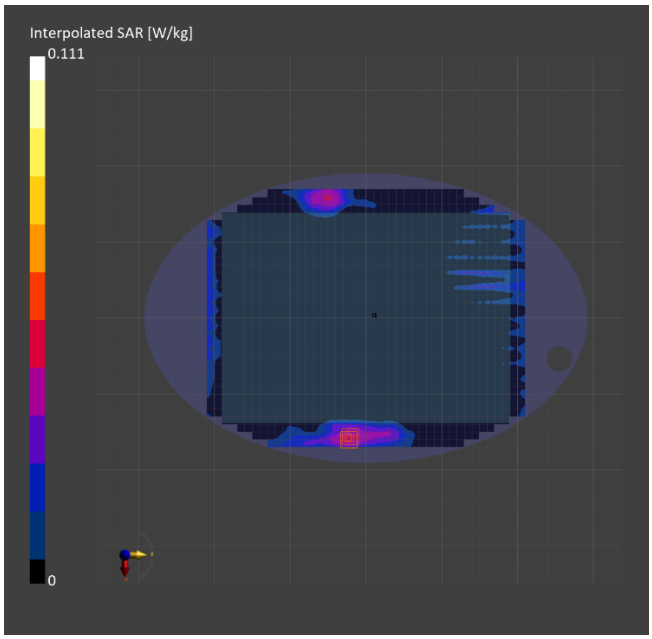
**DUT: Siemens Laptop**

Communication System: UID 10417, WLAN; Communication System Band: U-NII-1, U-NII-2A; Frequency 5260.000 MHz;
Medium parameters used: f= 5260.000; σ = 4.80 S/m; εr = 34.6; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(5.6, 5.58, 5.42); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.08; Mother scan avg offset: 0.38;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**FCC:**
**U-NII-1, U-NII-2A, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle), CH52, BACK, 0.00 mm**
**Area Scan:** Measurement grid: (320.0 mm x 420.0 mm)
**Zoom Scan:** Measurement grid: (24.0 mm x 24.0 mm x 22.0 mm)
Reference Value = -0.03 V/m; Power Drift = 0.29 dB
**SAR(1 g) = 0.033 W/kg; SAR(10g) = 0.013 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = 14.7 mm
Ratio of SAR at M2 to SAR at M1 = 67.1%





Plot 14

Date/Time: 2023-08-17, 11:38

Test Laboratory: Verkotan Oy

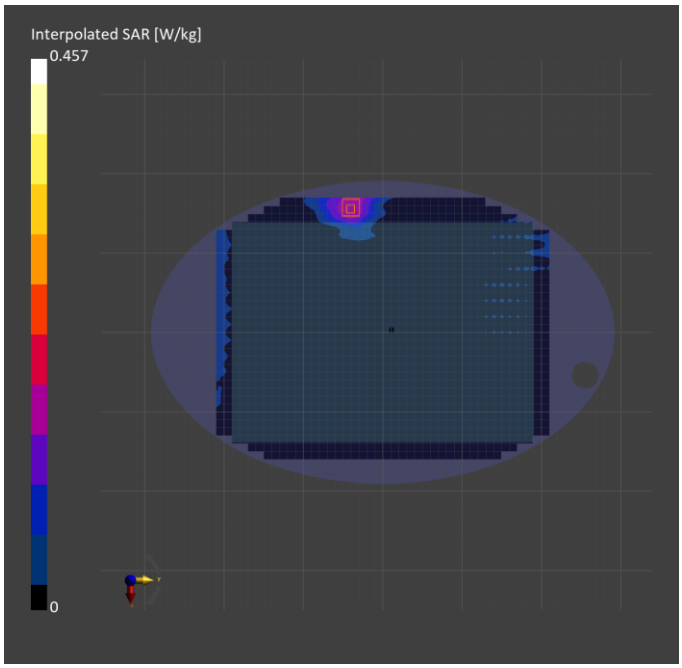
**DUT: Siemens Laptop**

Communication System: UID 10417, WLAN; Communication System Band: U-NII-2C < 5.65 GHz; Frequency 5640.000 MHz;
Medium parameters used: f= 5640.000; σ = 5.14 S/m; εr = 33.8; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(4.95, 4.87, 4.73); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.03; Mother scan avg offset: 0.41;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Measurement Group:**
**U-NII-2C < 5.65 GHz, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle), CH128, BACK, 0.00 mm**
**Area Scan:** Measurement grid: (320.0 mm x 420.0 mm)
**Zoom Scan:** Measurement grid: (24.0 mm x 24.0 mm x 22.0 mm)
Reference Value = -0.08 V/m; Power Drift = -3.31 dB
**SAR(1 g) = 0.131 W/kg; SAR(10g) = 0.058 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = > 12.0 mm
Ratio of SAR at M2 to SAR at M1 = 62.7%





Plot 15

Date/Time: 2023-08-18, 12:01

Test Laboratory: Verkotan Oy

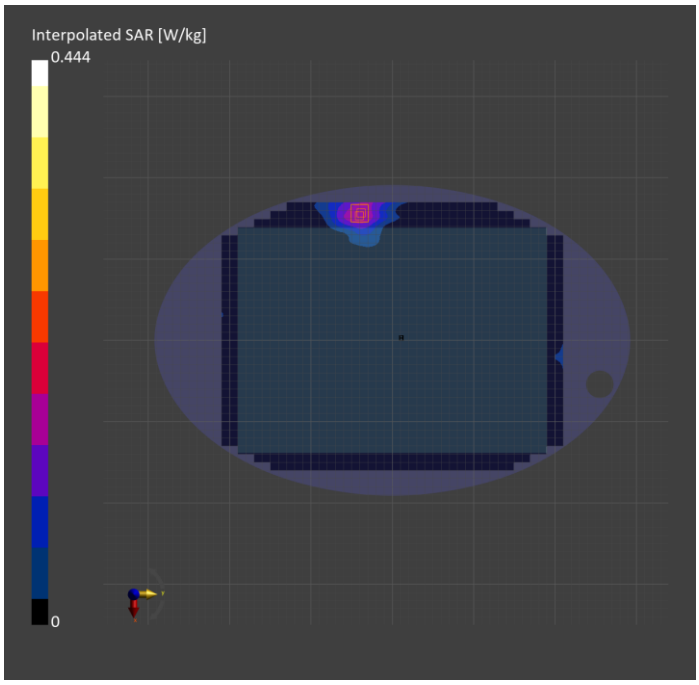
**DUT: Siemens Laptop**

Communication System: UID 10417, WLAN; Communication System Band: U-NII-2C, U-NII-3; Frequency 5660.000 MHz;
Medium parameters used: f= 5660.000; σ = 5.16 S/m; εr = 35.0; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(4.95, 4.87, 4.73); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.02; Mother scan avg offset: 0.47;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Measurement Group:**
**U-NII-2C, U-NII-3, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle), CH132, BACK, 0.00 mm**
**Area Scan:** Measurement grid: (320.0 mm x 420.0 mm)
**Zoom Scan:** Measurement grid: (24.0 mm x 24.0 mm x 22.0 mm)
Reference Value = -0.07 V/m; Power Drift = -1.43 dB
**SAR(1 g) = 0.124 W/kg; SAR(10g) = 0.055 W/kg** (Positive / Negative)
Smallest distance from peaks to all points 3dB below = > 12.0 mm
Ratio of SAR at M2 to SAR at M1 = 59.8%





Plot 16

Date/Time: 2023-08-10, 13:07

Test Laboratory: Verkotan Oy

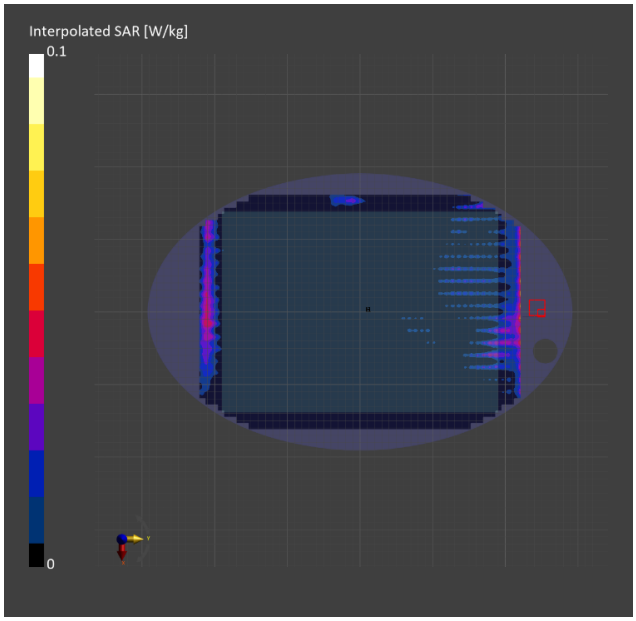
**DUT: Siemens Laptop**

Communication System: UID 10755, WLAN; Communication System Band: U-NII-7; Frequency 6825.000 MHz;
Medium parameters used: f= 6825.000; σ = 6.49 S/m; εr = 32.9; HSL;
Phantom section: Flat section
Measurement Standard: DASY8 (IEC/IECC)

DASY Configuration:

- Probe: EX3DV4 - SN7827; ConvF(4.95, 4.87, 4.85); Calibrated: 2023-06-04
  - Sensor-Surface: 1.4 mm (VMS + 6p), Mother scan peak deviation; 0.06; Mother scan avg offset: 0.31;
  - Electronics: DAE4ip - SN1774; Calibrated: 2023-06-02
  - Phantom: ELI V8.0 (20deg probe tilt)
  - DASY8 16.2.4.2524

**Measurement Group:**
**U-NII-7, IEEE 802.11ax (160MHz, MCS0, 99pc duty cycle), CH175, BACK, 0.00 mm**
**Area Scan:** Measurement grid: (323.0 mm x 425.0 mm)
**Zoom Scan:** Measurement grid: (22.0 mm x 22.0 mm x 22.0 mm)
Reference Value = -0.06 V/m; Power Drift = 0.22 dB
**SAR(1 g) = 0.006 W/kg; SAR(10g) = 0.003 W/kg** (Positive only)
**APD (4.0cm$^2$) = 0.062 W/m$^2$**
Smallest distance from peaks to all points 3dB below = 0.9 mm
Ratio of SAR at M2 to SAR at M1 = 90.3%





## APPENDIX D: RELEVANT PAGES FROM PROBE CALIBRATION REPORTS

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

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

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: **SCS 0108**

Client: **Verkotan** Certificate No: **EX-7447_Feb23**

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV4 - SN:7447 |
| Calibration procedure(s) | QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6, QA CAL-25.v8<br>Calibration procedure for dosimetric E-field probes |
| Calibration date | February 17, 2023 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-22 (No. 217-03525/03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-22 (No. 217-03524) | Apr-23 |
| OCP DAK-3.5 (weighted) | SN: 1249 | 20-Oct-22 (OCP-DAK3.5-1249_Oct22) | Oct-23 |
| OCP DAK-12 | SN: 1016 | 20-Oct-22 (OCP-DAK12-1016_Oct22) | Oct-23 |
| Reference 20 dB Attenuator | SN: CC2552 (20x) | 04-Apr-22 (No. 217-03527) | Apr-23 |
| DAE4 | SN: 660 | 10-Oct-22 (No. DAE4-660_Oct22) | Oct-23 |
| Reference Probe ES3DV2 | SN: 3013 | 06-Jan-23 (No. ES3-3013_Jan23) | Jan-24 |

| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB41293874 | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| Power sensor E4412A | SN: MY41498087 | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| Power sensor E4412A | SN: 000110210 | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| RF generator HP 8648C | SN: US3642U01700 | 04-Aug-99 (in house check Jun-22) | In house check: Jun-24 |
| Network Analyzer E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-22) | In house check: Oct-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by | Joanna Lleshaj | Laboratory Technician | |
| Approved by | Niels Kuster | Quality Manager | |

Issued: February 21, 2023

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

Certificate No: EX-7447_Feb23 Page 1 of 9



## Parameters of Probe: EX3DV4 - SN:7447

### Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc ($k = 2$) |
|---|---|---|---|---|
| Norm ($\mu V/(V/m)^2$) [A] | 0.43 | 0.43 | 0.43 | ±10.1% |
| DCP (mV) [B] | 90.0 | 91.0 | 96.0 | ±4.7% |

### Calibration Results for Modulation Response

| UID | Communication System Name | | A dB | B dB$\sqrt{\mu V}$ | C | D dB | VR mV | Max dev. | Max Unc[E] $k = 2$ |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.00 | 0.00 | 1.00 | 0.00 | 130.7 | ±2.3% | ±4.7% |
| | | Y | 0.00 | 0.00 | 1.00 | | 130.1 | | |
| | | Z | 0.00 | 0.00 | 1.00 | | 134.6 | | |

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

[A] The uncertainties of Norm X,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Page 5).
[B] Linearization parameter uncertainty for maximum specified field strength.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## Parameters of Probe: EX3DV4 - SN:7447

### Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle | -139.3° |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 1.4 mm |

**Note:** Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.



EX3DV4 - SN:7447

February 17, 2023

## Parameters of Probe: EX3DV4 - SN:7447

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz)[C] | Relative Permittivity[F] | Conductivity[F] (S/m) | ConvF X | ConvF Y | ConvF Z | Alpha[G] | Depth[G] (mm) | Unc ($k = 2$) |
|---|---|---|---|---|---|---|---|---|
| 13 | 55.0 | 0.75 | 17.42 | 17.42 | 17.42 | 0.00 | 1.25 | ±13.3% |
| 750 | 41.9 | 0.89 | 9.91 | 8.74 | 9.52 | 0.31 | 1.27 | ±12.0% |
| 900 | 41.5 | 0.97 | 9.37 | 8.45 | 8.89 | 0.32 | 1.27 | ±12.0% |
| 1750 | 40.1 | 1.37 | 8.45 | 7.97 | 8.40 | 0.25 | 1.27 | ±12.0% |
| 1950 | 40.0 | 1.40 | 8.05 | 7.59 | 7.97 | 0.29 | 1.27 | ±12.0% |
| 2150 | 39.7 | 1.53 | 8.01 | 7.58 | 7.90 | 0.28 | 1.27 | ±12.0% |
| 2300 | 39.5 | 1.67 | 7.85 | 7.46 | 7.80 | 0.28 | 1.27 | ±12.0% |
| 2450 | 39.2 | 1.80 | 7.70 | 7.50 | 7.63 | 0.28 | 1.27 | ±12.0% |
| 2600 | 39.0 | 1.96 | 7.55 | 7.37 | 7.73 | 0.28 | 1.27 | ±12.0% |
| 3300 | 38.2 | 2.71 | 7.02 | 6.71 | 7.02 | 0.34 | 1.27 | ±14.0% |
| 5250 | 35.9 | 4.71 | 5.18 | 4.99 | 5.17 | 0.39 | 1.53 | ±14.0% |
| 5600 | 35.5 | 5.07 | 4.40 | 4.29 | 4.43 | 0.38 | 1.77 | ±14.0% |
| 5750 | 35.4 | 5.22 | 4.47 | 4.33 | 4.53 | 0.38 | 1.85 | ±14.0% |

[C] Frequency validity above 300 MHz of ±100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

[F] The probes are calibrated using tissue simulating liquids (TSL) that deviate for $\varepsilon$ and $\sigma$ by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10%. If TSL with deviations from the target of less than ±5% are used, the calibration uncertainties are 11.1% for 0.7 - 3 GHz and 13.1% for 3 - 6 GHz.

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

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

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

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: SCS 0108

| | | | |
|---|---|---|---|
| Client | Verkotan<br>Oulu, Finland | Certificate No. | EX-7827_Jun23 |

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV4 - SN:7827 |
| Calibration procedure(s) | QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6, QA CAL-25.v8<br>Calibration procedure for dosimetric E-field probes |
| Calibration date | June 04, 2023 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP2 | SN: 104778 | 30-Mar-23 (No. 217-03804/03805) | Mar-24 |
| Power sensor NRP-Z91 | SN: 103244 | 30-Mar-23 (No. 217-03804) | Mar-24 |
| OCP DAK-3.5 (weighted) | SN: 1249 | 20-Oct-22 (OCP-DAK3.5-1249_Oct22) | Oct-23 |
| OCP DAK-12 | SN: 1016 | 20-Oct-22 (OCP-DAK12-1016_Oct22) | Oct-23 |
| Reference 20 dB Attenuator | SN: CC2552 (20x) | 30-Mar-23 (No. 217-03809) | Mar-24 |
| DAE4 | SN: 660 | 16-Mar-23 (No. DAE4-660_Mar23) | Mar-24 |
| Reference Probe ES3DV2 | SN: 3013 | 06-Jan-23 (No. ES3-3013_Jan23) | Jan-24 |

| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB41293874 | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| Power sensor E4412A | SN: MY41498087 | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| Power sensor E4412A | SN: 000110210 | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| RF generator HP 8648C | SN: US3642U01700 | 04-Aug-99 (in house check Jun-22) | In house check: Jun-24 |
| Network Analyzer E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-22) | In house check: Oct-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by | Jeton Kastrati | Laboratory Technician | |
| Approved by | Sven Kühn | Technical Manager | i.A. |

Issued: June 06, 2023

## Parameters of Probe: EX3DV4 - SN:7827

### Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc ($k = 2$) |
|---|---|---|---|---|
| Norm ($\mu V/(V/m)^2$) [A] | 0.68 | 0.59 | 0.64 | ±10.1% |
| DCP (mV) [B] | 105.2 | 106.9 | 108.4 | ±4.7% |

### Calibration Results for Modulation Response

| UID | Communication System Name | | A dB | B dB$\sqrt{\mu V}$ | C | D dB | VR mV | Max dev. | Max Unc[E] $k = 2$ |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.00 | 0.00 | 1.00 | 0.00 | 131.5 | ±1.6% | ±4.7% |
| | | Y | 0.00 | 0.00 | 1.00 | | 140.7 | | |
| | | Z | 0.00 | 0.00 | 1.00 | | 126.6 | | |
| 10352 | Pulse Waveform (200Hz, 10%) | X | 1.54 | 60.55 | 6.12 | 10.00 | 60.0 | ±3.5% | ±9.6% |
| | | Y | 1.45 | 60.21 | 5.80 | | 60.0 | | |
| | | Z | 1.40 | 60.00 | 5.79 | | 60.0 | | |
| 10353 | Pulse Waveform (200Hz, 20%) | X | 0.79 | 60.00 | 4.61 | 6.99 | 80.0 | ±2.8% | ±9.6% |
| | | Y | 0.81 | 60.00 | 4.49 | | 80.0 | | |
| | | Z | 0.86 | 60.00 | 4.73 | | 80.0 | | |
| 10354 | Pulse Waveform (200Hz, 40%) | X | 0.07 | 141.02 | 0.21 | 3.98 | 95.0 | ±2.8% | ±9.6% |
| | | Y | 0.03 | 131.64 | 0.01 | | 95.0 | | |
| | | Z | 0.41 | 159.30 | 18.09 | | 95.0 | | |
| 10355 | Pulse Waveform (200Hz, 60%) | X | 3.45 | 131.09 | 9.75 | 2.22 | 120.0 | ±1.7% | ±9.6% |
| | | Y | 3.12 | 159.98 | 2.74 | | 120.0 | | |
| | | Z | 7.70 | 82.24 | 0.21 | | 120.0 | | |
| 10387 | QPSK Waveform, 1 MHz | X | 0.45 | 64.23 | 13.07 | 1.00 | 150.0 | ±3.0% | ±9.6% |
| | | Y | 0.38 | 61.88 | 11.02 | | 150.0 | | |
| | | Z | 0.47 | 64.93 | 13.22 | | 150.0 | | |
| 10388 | QPSK Waveform, 10 MHz | X | 1.27 | 66.90 | 13.96 | 0.00 | 150.0 | ±0.9% | ±9.6% |
| | | Y | 1.09 | 64.87 | 12.54 | | 150.0 | | |
| | | Z | 1.28 | 67.25 | 13.88 | | 150.0 | | |
| 10396 | 64-QAM Waveform, 100 kHz | X | 1.60 | 63.90 | 15.81 | 3.01 | 150.0 | ±1.1% | ±9.6% |
| | | Y | 1.70 | 65.07 | 16.17 | | 150.0 | | |
| | | Z | 1.73 | 65.26 | 16.18 | | 150.0 | | |
| 10399 | 64-QAM Waveform, 40 MHz | X | 2.72 | 66.63 | 15.27 | 0.00 | 150.0 | ±2.6% | ±9.6% |
| | | Y | 2.62 | 66.09 | 14.81 | | 150.0 | | |
| | | Z | 2.75 | 67.08 | 15.37 | | 150.0 | | |
| 10414 | WLAN CCDF, 64-QAM, 40 MHz | X | 3.72 | 66.83 | 15.55 | 0.00 | 150.0 | ±4.0% | ±9.6% |
| | | Y | 3.65 | 66.57 | 15.27 | | 150.0 | | |
| | | Z | 3.61 | 66.64 | 15.34 | | 150.0 | | |

Note: For details on UID parameters see Appendix

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

[A] The uncertainties of Norm X,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).
[B] Linearization parameter uncertainty for maximum specified field strength.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## Parameters of Probe: EX3DV4 - SN:7827

### Sensor Model Parameters

| | C1 fF | C2 fF | α $V^{-1}$ | T1 $ms\,V^{-2}$ | T2 $ms\,V^{-1}$ | T3 ms | T4 $V^{-2}$ | T5 $V^{-1}$ | T6 |
|---|---|---|---|---|---|---|---|---|---|
| x | 7.4 | 53.86 | 33.74 | 1.85 | 0.00 | 4.90 | 0.00 | 0.05 | 1.00 |
| y | 7.2 | 52.61 | 33.58 | 3.25 | 0.00 | 4.90 | 0.53 | 0.00 | 1.00 |
| z | 7.0 | 50.07 | 32.48 | 5.09 | 0.00 | 4.90 | 0.67 | 0.00 | 1.00 |

### Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle | -76.3° |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 1.4 mm |

**Note:** Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.

## Parameters of Probe: EX3DV4 - SN:7827

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz)[C] | Relative Permittivity[F] | Conductivity[F] (S/m) | ConvF X | ConvF Y | ConvF Z | Alpha[G] | Depth[G] (mm) | Unc ($k = 2$) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 9.60 | 9.47 | 9.21 | 0.39 | 1.27 | ±12.0% |
| 900 | 41.5 | 0.97 | 9.32 | 8.86 | 8.61 | 0.38 | 1.27 | ±12.0% |
| 1750 | 40.1 | 1.37 | 8.35 | 8.24 | 7.90 | 0.26 | 1.27 | ±12.0% |
| 1950 | 40.0 | 1.40 | 7.98 | 7.87 | 7.60 | 0.28 | 1.27 | ±12.0% |
| 2100 | 39.8 | 1.49 | 7.88 | 7.77 | 7.55 | 0.29 | 1.27 | ±12.0% |
| 2300 | 39.5 | 1.67 | 7.80 | 7.69 | 7.48 | 0.30 | 1.27 | ±12.0% |
| 2450 | 39.2 | 1.80 | 7.50 | 7.40 | 7.20 | 0.29 | 1.27 | ±12.0% |
| 2600 | 39.0 | 1.96 | 7.43 | 7.31 | 7.12 | 0.29 | 1.27 | ±12.0% |
| 3300 | 38.2 | 2.71 | 7.07 | 7.00 | 6.81 | 0.35 | 1.27 | ±14.0% |
| 3500 | 37.9 | 2.91 | 6.96 | 6.89 | 6.71 | 0.36 | 1.27 | ±14.0% |
| 3700 | 37.7 | 3.12 | 6.88 | 6.80 | 6.63 | 0.36 | 1.27 | ±14.0% |
| 3900 | 37.5 | 3.32 | 6.83 | 6.75 | 6.59 | 0.37 | 1.27 | ±14.0% |
| 4100 | 37.2 | 3.53 | 6.60 | 6.50 | 6.36 | 0.37 | 1.27 | ±14.0% |
| 5250 | 35.9 | 4.71 | 5.60 | 5.58 | 5.42 | 0.39 | 1.53 | ±14.0% |
| 5600 | 35.5 | 5.07 | 4.95 | 4.87 | 4.73 | 0.38 | 1.67 | ±14.0% |
| 5750 | 35.4 | 5.22 | 5.14 | 5.02 | 4.94 | 0.38 | 1.75 | ±14.0% |

[C] Frequency validity above 300 MHz of ±100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4–8 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

[F] The probes are calibrated using tissue simulating liquids (TSL) that deviate for $\varepsilon$ and $\sigma$ by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10%. If TSL with deviations from the target of less than ±5% are used, the calibration uncertainties are 11.1% for 0.7 - 3 GHz and 13.1% for 3 - 6 GHz.

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

## Parameters of Probe: EX3DV4 - SN:7827

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz)[C] | Relative Permittivity[F] | Conductivity[F] (S/m) | ConvF X | ConvF Y | ConvF Z | Alpha[G] | Depth[G] (mm) | Unc ($k = 2$) |
|---|---|---|---|---|---|---|---|---|
| 6500 | 34.5 | 6.07 | 4.95 | 4.87 | 4.85 | 0.20 | 2.50 | ±18.6% |

[C] Frequency validity at 6.5 GHz is −600/+700 MHz, and ±700 MHz at or above 7 GHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] The probes are calibrated using tissue simulating liquids (TSL) that deviate for $\varepsilon$ and $\sigma$ by less than ±10% from the target values (typically better than ±6%) and are valid for TSL with deviations of up to ±10%.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz, below ±2% for frequencies between 3–6 GHz, and below ±4% for frequencies between 6–10 GHz at any distance larger than half the probe tip diameter from the boundary.

## APPENDIX E: RELEVANT PAGES FROM DIPOLE CALIBRATION REPORTS

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

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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client: Verkotan

Certificate No: D2450V2-729_Jul22

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2450V2 - SN:729 |
| Calibration procedure(s) | QA CAL-05.v11<br>Calibration Procedure for SAR Validation Sources between 0.7-3 GHz |
| Calibration date: | July 15, 2022 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-22 (No. 217-03525/03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-22 (No. 217-03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-22 (No. 217-03525) | Apr-23 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 04-Apr-22 (No. 217-03527) | Apr-23 |
| Type-N mismatch combination | SN: 310982 / 06327 | 04-Apr-22 (No. 217-03528) | Apr-23 |
| Reference Probe EX3DV4 | SN: 7349 | 31-Dec-21 (No. EX3-7349_Dec21) | Dec-22 |
| DAE4 | SN: 601 | 02-May-22 (No. DAE4-601_May22) | May-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB39512475 | 30-Oct-14 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: MY41093315 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-20) | In house check: Oct-22 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-20) | In house check: Oct-22 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Aldonia Georgiadou | Laboratory Technician | |
| Approved by: | Niels Kuster | Quality Manager | |

Issued: July 19, 2022

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

Certificate No: D2450V2-729_Jul22 Page 1 of 6



## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY52 | V52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 2450 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 39.2 | 1.80 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 37.9 ± 6 % | 1.85 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | --- | --- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.4 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **52.3 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.21 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.5 W/kg ± 16.5 % (k=2)** |



# SAR Reference Dipole Calibration Report

Ref : ACR.68.8.23.BES.A

**VERKOTAN OY**
**ELEKTRONIIKKATIE 17**
**90590, OULU, FINLAND**
**SAR REFERENCE DIPOLE**
**FREQUENCY: 5200-5800 MHZ**
**SERIAL NO.: 1045**

**Calibrated at MVG**
**Z.I. de la pointe du diable**
**Technopôle Brest Iroise – 295 avenue Alexis de Rochon**
**29280 PLOUZANE - FRANCE**

**Calibration date: 03/09/2023**

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr



*Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

mvg

**SAR REFERENCE DIPOLE CALIBRATION REPORT** Ref: ACR.60.8.23.BES.A

| | Name | Function | Date | Signature |
|---|---|---|---|---|
| *Prepared by :* | Cyrille ONNEE | Measurement Responsible | 3/9/2023 | |
| *Checked & approved by:* | Jérôme Luc | Technical Manager | 3/9/2023 | |
| *Authorized by:* | Yann Toutain | Laboratory Director | 3/9/2023 | |

Yann Toutain ID Signature numérique de Yann Toutain ID Date: 2023.03.09 15:05:03 +01'00'

| | Customer Name |
|---|---|
| *Distribution :* | Verkotan Oy |

| Issue | Name | Date | Modifications |
|---|---|---|---|
| A | Cyrille ONNEE | 3/9/2023 | Initial release |
| | | | |
| | | | |
| | | | |

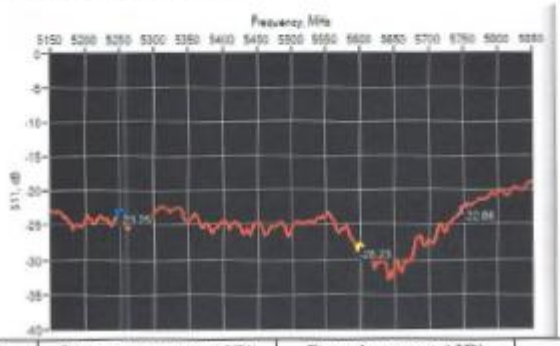
## 6 CALIBRATION RESULTS

### 6.1 MECHANICAL DIMENSIONS

| L mm | | h mm | | d mm | |
|---|---|---|---|---|---|
| Measured | Required | Measured | Required | Measured | Required |
| - | 20.60 +/- 2% | - | 40.30 +/- 2% | - | 3.60 +/- 2% |

### 6.2 S11 PARAMETER

#### 6.2.1 S11 parameter in Head Liquid



| Frequency (MHz) | S11 parameter (dB) | Requirement (dB) | Impedance |
|---|---|---|---|
| 5250 | -23.25 | -20 | 47.8Ω + 6.4jΩ |
| 5600 | -28.23 | -20 | 48.5Ω - 3.5jΩ |
| 5750 | -22.86 | -20 | 46.7Ω + 6.1jΩ |

### 6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

#### 6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

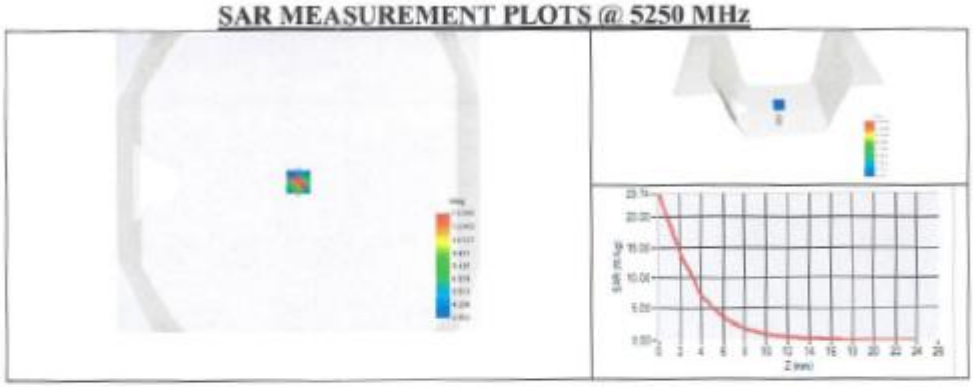
SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.68.5.23.BES.A

| | |
|---|---|
| Software | OPENSAR V5 |
| Phantom | SN 13/09 SAM68 |
| Probe | SN 41/18 EPGO333 |
| Liquid | Head Liquid Values @ 5250 MHz: eps' : 34.3 sigma : 4.67<br>Head Liquid Values @ 5600 MHz: eps' : 33.6 sigma : 5.05<br>Head Liquid Values @ 5750 MHz: eps' : 32.9 sigma : 5.46 |
| Distance between dipole center and liquid | 10.0 mm |
| Area scan resolution | dx=8mm/dy=8mm |
| Zoon Scan Resolution | dx=4mm/dy=4mm/dz=2mm |
| Frequency | 5250 MHz<br>5600 MHz<br>5750 MHz |
| Input power | 20 dBm |
| Liquid Temperature | 20 +/- 1 °C |
| Lab Temperature | 20 +/- 1 °C |
| Lab Humidity | 30-70 % |

| Frequency | 1g SAR (W/kg) | | | 10g SAR (W/kg) | | |
|---|---|---|---|---|---|---|
| | Measured | Measured normalized to 1W | Target normalized to 1W | Measured | Measured normalized to 1W | Target normalized to 1W |
| 5250 MHz | 7.31 | 73.09 | - | 2.11 | 21.12 | - |
| 5600 MHz | 7.29 | 72.92 | 78.30 | 2.13 | 21.29 | 23.20 |
| 5750 MHz | 6.91 | 69.05 | - | 2.03 | 20.27 | - |

## SAR MEASUREMENT PLOTS @ 5250 MHz



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

ilac-MRA

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

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 0108**

**Client** **Verkotan**
**Oulu, Finland**

**Certificate No.** **D6.5GHzV2-1097_Jun23**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D6.5GHzV2 - SN:1097 |
| Calibration procedure(s) | QA CAL-22.v7<br>Calibration Procedure for SAR Validation Sources between 3-10 GHz |
| Calibration date: | June 01, 2023 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power sensor R&S NRP33T | SN: 100967 | 03-Apr-23 (No. 217-03806) | Apr-24 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 30-Mar-23 (No. 217-03809) | Mar-24 |
| Mismatch combination | SN: 84224 / 360D | 03-Apr-23 (No. 217-03812) | Apr-24 |
| Reference Probe EX3DV4 | SN: 7405 | 02-Jun-22 (No. EX3-7405_Jun22) | Jun-23 |
| DAE4 | SN: 908 | 27-Jun-22 (No. DAE4-908_Jun22) | Jun-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator Anapico APSIN20G | SN: 827 | 18-Dec-18 (in house check Dec-21) | In house check: Dec-23 |
| Power sensor NRP-Z23 | SN: 100169 | 10-Jan-19 (in house check Nov-22) | In house check: Nov-23 |
| Power sensor NRP-18T | SN: 100950 | 28-Sep-22 (in house check Nov-22) | In house check: Nov-23 |
| Network Analyzer Keysight E5063A | SN:MY54504221 | 31-Oct-19 (in house check Oct-22) | In house check: Oct-25 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Leif Klysner | Laboratory Technician | |
| Approved by: | Sven Kühn | Technical Manager | |

Issued: June 6, 2023





## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY6 | V16.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 5 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy = 3.4 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| **Frequency** | 6500 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 34.5 | 6.07 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 34.7 ± 6 % | 6.10 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 29.6 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **296 W/kg ± 24.7 % (k=2)** |

| **SAR averaged over 8 cm³ (8 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 6.66 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **66.7 W/kg ± 24.4 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 5.46 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **54.7 W/kg ± 24.4 % (k=2)** |

**APPENDIX F: IPD TEST REPORT**


# Report On

Specific Absorption Rate Testing of the Siemens IPC MD-57A

In accordance with FCC 47CFR 2.1093 (limited testing)
FCC ID: U9A-MD57A

**COMMERCIAL-IN-CONFIDENCE**

**Document 75959236 Report 1 Issue 1** **September 2023**



TÜV SÜD Product Service, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: http://www.tuvsud.com

COMMERCIAL-IN-CONFIDENCE

| | |
|---|---|
| **REPORT ON** | Specific Absorption Rate Testing of the Siemens IPC MD-57A<br><br>Document 75959236 Report 1 Issue 1<br><br>September 2023 |
| **PREPARED FOR** | Verkotan Oy,<br>Elektroniikkatie 17,<br>90590, Oulu,<br>Finland |
| **PREPARED BY** | **Elvis Gomes**<br>Technician (SAR) |
| **APPROVED BY** | **Jon Kenny**<br>Authorised Signatory |
| **DATED** | 22-September-2023 |

CONTENTS

COMMERCIAL-IN-CONFIDENCE

TÜV SÜD

**SECTION 1**

**REPORT SUMMARY**

Power Density Testing of the Siemens IPC MD-57A

COMMERCIAL-IN-CONFIDENCE

TÜV SÜD

## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of incident power density testing of the Siemens IPC MD-57A to the requirements of FCC 47CFR 2.1093

| | |
|---|---|
| Objective | To perform incident power density testing to determine the Equipment Under Test's (EUT's) compliance with the requirements specified of FCC 47CFR 2.1093 for the series of tests carried out. |
| Applicant | Verkotan Oy |
| Manufacturer | Siemens |
| Manufacturing Description | Laptop computer |
| Model Number | IPC MD-57A |
| Serial Number(s) | DE1039043aa01 (DUT number 21074) |
| Number of Samples Tested | 1 |
| Hardware Version | Pre-series |
| Software Version | Test01 |
| Test Specification/Issue/Date | FCC 47CFR 2.1093 |
| Start of Test | 29-August-2023 |
| Finish of Test | 01-September-2023 |
| Related Document(s) | KDB 865664 – D01 v01r04<br>KDB 447498 – D01 v06<br>IEC-IEEE 62209-1528-2020<br>KDB 248227 – D01 v02r02<br>IEC/IEEE 63195-1:2022<br>ICNIRP 2020<br>FCC 47 CFR 1.1310<br>SPEAG, DASY8 Application Note: SAR, APD & PD at 6 - 10 GHz (Version 6.0), August 2022<br>October 2020 TCBC Workshop Notes |
| Name of Engineer(s) | Elvis Gomes |

## 1.2 TEST RESULTS

The limited test measurements shown in this report were made to complete the requirements of FCC 47CFR 2.1093 following methods and procedures described in the related document section of this report.

Testing was carried out at Verkotan OY to determine the configuration that would yield the maximum incident power density in the Wi-Fi 6E band.

The final iPD measurement is documented in this report.

The SAR and other associated test results can be found in report number:
FCC ISED RF Exposure Report_Industrial Notebook_ID6019_20092023

### 1.2.1 Summary of maximum values

The maximum iPD 4cm² found during this Assessment:

| | |
|---|---|
| Max IPD 4cm² (W/m²) | 0.109 W/m² (Measured) |
| The maximum IPD averaged over 4cm² measured for all the tests performed did not exceed the standalone limits for FCC General Population/Uncontrolled Exposure of 10.00 W/m² in accordance with FCC 47 CFR 1.1310. | |

### 1.2.2 Results Summary Tables

WLAN 6 GHz - 802.11ax - HE0 - 160 MHz BW - Core 0 (SISO)
Incident Power Density (iPD)

| Test Position | Channel Number | Frequency (MHz) | Measured IPD 4cm² (W/m²) | Standalone IPD 4cm² limit (W/m²) | Exposure Ratio | Scan Figure Number |
|---|---|---|---|---|---|---|
| Bottom of device | 175 | 6825 | 0.109 | 10.0 | 0.011 | C.1 |
| The measured IPD result above was the highest SAR and APD value recorded and was chosen for the IPD test. | | | | | | |

### 1.2.3 Technical Description

The equipment under test (EUT) was an industrial portable laptop computer.

### 1.2.4 Interim Procedures for FCC Radiofrequency Exposure Evaluations

The interim procedure for FCC radiofrequency (RF) exposure evaluations of U-NII 6–7 GHz band portable devices have been made available during the TCB workshop in October 2020. The procedure is summarized below:

- Evaluate SAR / APD with DASY Module SAR V16.0 or higher. The configurations to be tested are defined in the relevant Knowledge Database (KDB). The peak spatial averaged SAR (psSAR) and the peak spatial averaged absorbed Power Density (psAPD) are reported.

- For the configuration with the highest SAR / APD, evaluate the PD with DASY Module mmWave V3.0 or higher.

### 1.2.5 Test Configuration and Modes of Operation

The testing was performed with an integral battery supplied and manufactured by Siemens.

Supported technologies are 6 GHz WLAN (802.11a/ax).

The test set up for the EUT was as follows: -

| Country Code | Standard | Data Rate | Duty Cycle (%) | Chain | Output Power Setting (dBm) | Bandwidth (MHz) | Frequency (MHz) | Channel |
|---|---|---|---|---|---|---|---|---|
| US | 802.11ax | HE0 | 99 | A | 9.25 | 160 | 6825 | 175 |

Testing was achieved using a test application suite provided by the laptop chipset manufacturer that allowed full control over the device's Wi-Fi radio.

For each scan, the device was configured into a continuous transmission test mode at a maximum power setting of 9.25 dBm as defined by the customer.

Testing was performed in each position at the frequency that gave the highest SAR and APD value for the wi-Fi 6E band.

Power scaling was not performed on the EUT as the iPD was very low and the distribution was noise like in its behaviour.

For each relevant antenna, the bottom surface of the EUT was assessed for iPD.

Included in this report are descriptions of the test method; the equipment used and an analysis of the test uncertainties applicable and diagrams indicating the locations of maximum iPD for each relevant test position.

### 1.2.6 Deviations from Standard

None.

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**SECTION 2**

**TEST DETAILS**

Incident Power Density Testing of the Siemens IPC MD-57A

## 2.1 DASY6 MEASUREMENT SYSTEM

### 2.1.1 System Description

The iPD tests are carried out on the DASY 6 measurement system.

The iPD specific information is detailed below. As the system shares many component parts with the SAR system a complete description of both measurement methodologies is included in this report.

The DASY6 system for performing compliance tests consists of the following items:

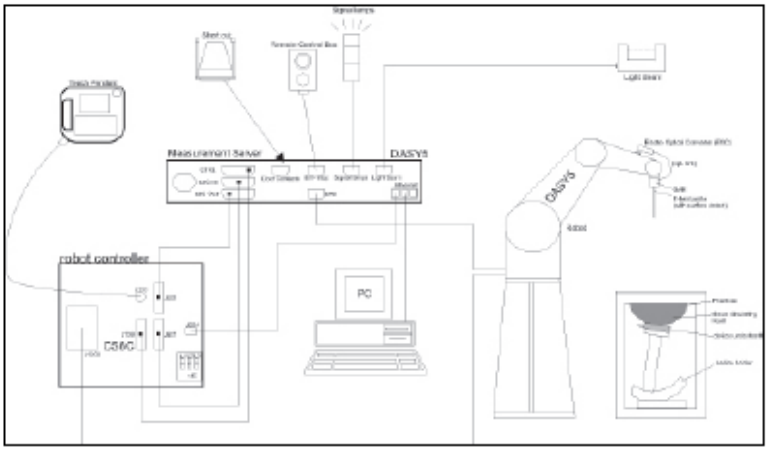


**Figure 1 - System Description Diagram**

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

An isotropic field probe optimized and calibrated for the targeted measurement.

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

The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.

The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.

A computer running the DASY6 software to display and interact with the robot and information.

There is a remote control and a teach pendant as well as additional circuitry for robot safety such as warning lamps, etc. The phantom, the device holder and other accessories according to the targeted measurement.

### 2.1.2 Probe Specification

The probes used by the DASY system are isotropic E-field probes, constructed with a symmetric design and a triangular core. The probes have built-in shielding against static charges and are contained within a PEEK enclosure material. These probes are specially designed and calibrated for use in liquids with high permittivity. The frequency range of the probes are from 6 MHz to 6 GHz.

### 2.1.3 Data Acquisition Electronics

The data acquisition electronics (DAE4 or DAE3) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

### 2.1.4 SAR Evaluation Description

The cDASY6 software includes all numerical procedures necessary to evaluate the spatial peak SAR values.

**Fast Area Scan:**

The Fast Area Scan provides an easy, time efficient and accurate way to define the optimal power reference location. The location of the power reference and power drift measurements for the subsequent Area, Fast Volume and Zoom Scans will be automatically set at the maximum of the Fast Area Scan.

**Area Scan:**

Area Scans are used to determine the peak location of the measured field before doing a finer measurement around the hotspot. Peak location can be found accurately even on coarse grids using the advanced interpolation routines implemented in cDASY6 Module SAR. Area Scans measure a two dimensional volume covering the full device under test area. cDASY6 Module SAR uses Fast Averaged SAR algorithm to compute the 1g and 10g of simulated tissue from the Area Scan.

**Fast Volume Scans:**

Fast Volume Scans are 3D scans used to assess the peak spatial SAR values within an averaging volume containing 1g and 10g of simulated tissue. It is compatible with any phantom. For regular phantoms, the measurement grid is generated by projecting a plane onto the phantom surface as for Area and Zoom scans. For specific phantoms, the measurement grid is generated by a conformal offset to the phantom surface at the desired distances. The grid extents can be set by the end user to cover the DUT dimensions or the whole measurable area of the phantom.

**Zoom Scan:**

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. Zoom scans measure a three dimensional volume (cube). The bottom face of the cube is Centreed on the maximum of the preceding Area Scan in the same measurement group. For maxima at border of the phantom, the zoom scan can be enabled to automattically extend in order to ensure correct evaluation of peak spatial SAR.

Zoom Scans can be performed in two different modes:

Smart Mode: the grid settings are adjusted on the fly based on the distribution being measured to fulfill to the IEC 62209-2 Amendment 1 criteria on grid resolution.

Custom Mode: the user specifies the grid settings to be used. In both modes, Zoom Scans are always anchored to the peak location of the preceding Fast Area / Area / Fast Volume Scan.

### 2.1.5 DASY 6 Absorbed Power Density evaluation.

The DASY 6 measurement system will output the absorbed power density result values by default from version 16.0 of DASY software onwards. All the measurement details described in this section are utilised to collect the required data which is the converted automatically within the software and displayed for frequencies above 5.9 GHz.

## 2.2 DASY 6 mmWave PD Module

### 2.2.1 Measurement system

A DASY 6 measurement system equipped with the DASY 6 mmWave module was used to carry out the peak spatially averaged power density (psPD) measurements. It consists of a 6-axis industrial robot and controller that provides a highly accurate positioning system, a PC for the system control software, a near field probe (EUmmWVx), a probe alignment sensor and the 5G phantom. The high accuracy positioning system places the near field probe at the key location points of the maximum electromagnetic field.

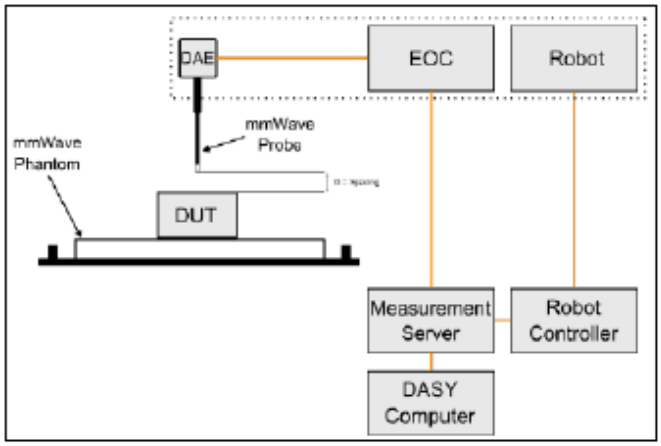


**Figure 2 - Typical measurement setup for PD measurement with DASY 6**

### 2.2.2 EUmmWVx E-field probe details

The EUmmWVx probe utilises two dipole elements that are specifically arranged to allow for the generation of pseudo-vector data.

| | |
|---|---|
| **Frequency Range** | 750 MHz – 110 GHz |
| **Dynamic Range** | <20 V/m – 10'000 V/m with PRE-10 (min <20 V/m – 2000 V/m) |
| **Position Precision** | <0.2 mm (DASY6) |
| **Dimensions** | Overall length: 320 mm (tip: 20 mm)<br>Tip and body diameter: encapsulation 8 mm (internal sensor <1mm)<br>Distance from probe tip to sensor Y cal point:1.5 mm<br>Distance from probe tip to sensor X cal point:1.5 mm |
| **Applications** | E-field measurements of 5G devices and other mm-wave transmitters operating above 10GHz in <2 mm distance from device (free-space)<br>Power density, H-field, and far-field analysis using total field reconstruction. |
| **Compatibility** | cDASY6 + 5G-Module SW1.0 and higher |

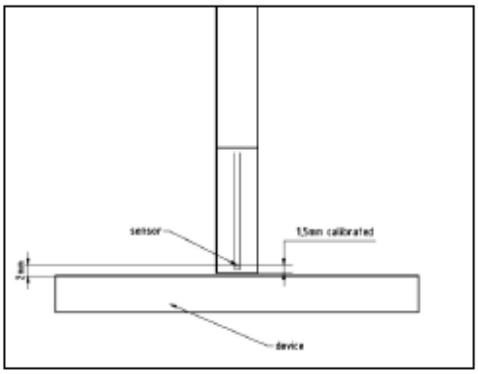


**Figure 3 - Diagram of the distance sensor to the EUT surface**

### 2.2.3 Peak spatially averaged power density assessment based on E-field measurements.

Power density was determined for both the electric and magnetic fields within a small distance from the transmitting source. In general, the magnitude and phase of two components of either E-field or H-field are needed on a sufficiently large surface to characterise their total distributions. Despite this being the case, a solution based on the direct measurement of the E and H field can be used to compute power density. The measurement approach to achieve this is given below.

a) The local E-field is measured at a reference point on the measurement surface where the field is well above the system noise floor. This reference point is re-visited at the end of the measurement routine and re-measured to determine and assess the power drift of the EUT.

b) The electric field on the measurement surface was scanned using instructions provided by the test system manufacturer. The spatial resolution of the measurement can depend on the measured field characteristic and measurement methodology used by the test system. The planar scan step size is configured to be λ/4.

c) DASY6 uses a reconstruction algorithm to calculate the H-field from the measured E-field. As the power density calculation requires amplitude and phase, reconstruction algorithms can also be used to obtain field information from the measured E-field data, for example phase information from the amplitude if only the amplitude is measured. Three measurements per point on two measurement planes separated by λ/4 are carried out in order for the H-field and phase data to be reconstructed.

d) Using the equation below the total peak spatially averaged power density (psPD) distribution on the evaluation surface can be determined. The applicable regulatory requirements specify the spatial averaging area A. A circular shape is used.

$$psPD = \frac{1}{2A_{av}} \iint_{A_{av}} \| Re\{E \times H^*\} \| \, dA$$

e) The final quantity used to determine compliance against the applicable limits is the maximum spatial average on the evaluation.

f) Following the measurement of the power drift as described in step a) the drift was assessed. If the drift deviated by more than 5% then the power density test and drift measurements shall be repeated.

### 2.2.4 Reconstruction Algorithm

Computation of the PD in general requires knowledge of the electric (E-) and magnetic (H-) field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible, as they are constrained by Maxwell's equations.

The test system utilises a reconstruction approach based on the Gerchberg-Saxton algorithm which benefits from the availability of the E-field polarization ellipse information obtained with the EUmmWVx probe. This reconstruction algorithm, together with the ability of the probe to measure extremely close to the source without perturbing the field, permits reconstruction of the E- and H-fields and the PD on measurement planes located as near as $\lambda/2\pi$.

### 2.2.5 Standalone PD limit

The following formula provides the reference levels for local exposure to electromagnetic fields from >6 GHz to 300GHz for general public as referenced in ICNIRP 2020:

$$55/f_G^{\,0.177}$$

The FCC Oct 2020 TCB workshop states their own incident power density limit of 1mW/cm$^2$ plane-wave equivalent, averaged over 4 cm$^2$ as reflected in FCC 47 CFR 1.1310.

### 2.2.6 Exposure Ratio

The following formulas used to calculate the exposure ratio of SAR, APD and iPD respectively as referenced in ICNIRP 2020:

$$\text{SAR} \quad \sum_{i=100\ \text{kHz}}^{300\ \text{GHz}} \frac{\text{SAR}_i}{\text{SAR}_{\text{BR}}} \leq 1.$$

$$\text{APD} \quad \sum_{i>6\ \text{GHz}}^{30\ \text{GHz}} \frac{S_{\text{ab},4\text{cm},i}}{S_{\text{ab},4\text{cm,BR}}} \leq 1.$$

$$\text{iPD} \quad \sum_{i>6\ \text{GHz}}^{30\ \text{GHz}} \left( \frac{S_{\text{inc},4\text{cm},i}}{S_{\text{inc},4\text{cm,RL},i}} \right) \leq 1.$$

### 2.2.7 Total Exposure Ratio (TER)

The total exposure ratio is the sum of local specific absorption rate (SAR), local absorbed power density (APD) and local incident power density (iPD) referenced in ICNIRP 2020:

where, $SAR_i$ and $SAR_{BR}$ are the local SAR level at frequency *i* and the local SAR basic restriction given in ICNIRP 2020. $S_{ab,4cm,i}$ and $S_{ab,4cm,BR}$ are the 4cm² absorbed power density level at frequency *i* and the 4cm² absorbed power density basic restriction given in ICNIRP 2020. $S_{inc,4cm,i}$ and $S_{inc,4cm,RL,i}$ are the local 4cm² incident power density at frequency *i* and the local 4cm² incident power density reference level at frequency *i* given in ICNIRP 2020.

$$\sum_{i=100\ \mathrm{kHz}}^{6\ \mathrm{GHz}} \frac{\mathrm{SAR}_i}{\mathrm{SAR}_{\mathrm{BR}}} + \sum_{i>6\ \mathrm{GHz}}^{30\ \mathrm{GHz}} \frac{\mathrm{S}_{\mathrm{ab,4cm},i}}{\mathrm{S}_{\mathrm{ab,4cm,BR}}} + \sum_{i>6\ \mathrm{GHz}}^{30\ \mathrm{GHz}} \left( \frac{\mathrm{S}_{\mathrm{inc,4cm},i}}{\mathrm{S}_{\mathrm{inc,4cm,RL},i}} \right) \leq 1$$

TER is applied when simultaneous transmission of the different types of measurement is tested, and basic restriction limits cannot be applied. The TER of the applicable measurements is calculated and summed up to not exceed 1.

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## SECTION 3

## TEST EQUIPMENT USED

## 3.1 TEST EQUIPMENT USED

The following test equipment was used at TÜV SÜD Product Service:

| Instrument Description | Manufacturer | Model Type | TE Number | Cal Period (months) | Calibration Due Date |
|---|---|---|---|---|---|
| Thermohygrometer | R.S Components | 1364 | 6352 | 12 | 11-April-2024 |
| Laptop Device Holder | Speag | mmWave | 6450 | - | TU |
| Measurement server | Speag | DASY 6 Measurement Server | 5337 | - | TU |
| Mounting Platform | Speag | MP6C-TX90XL Mounting Platform Extended | 4702 | - | TU |
| Robot | Speag | TX90 XL Stäubli Robot | 5340 | - | TU |
| 10GHz Verification Source | Speag | 5G Verification Source 10GHz | 6449 | 12 | 27-Oct-2023 |
| Signal Generator: 10MHz to 20GHz | Rohde & Schwarz | SMR20 | 3745 | 12 | 29-Jun-2024 |
| Directional Coupler | Hewlett Packard | 11692D | 452 | - | TU |
| EXA Signal Analyser | Keysight Technologies | N9010B | 4968 | 12 | 19-Jan-2024 |
| Attenuator (30dB) | Weinschel | 46-30-34 | 2776 | 12 | 09-Aug-2024 |
| Attenuator (10dB) | Aaren | AT40A-4041-D18-10 | 5493 | 12 | 18-Apr-2024 |
| Amplifier | Mini-Circuits | ZVE-3W-183+ | 6540 | - | TU |
| Power Meter | Rohde & Schwarz | NRX | 6535 | 12 | 05-Apr-2024 |
| Power Sensor | Rohde & Schwarz | NRP18S | 6534 | 12 | 17-Apr-2025 |
| Power Sensor | Rohde & Schwarz | NRP18S | 6533 | 12 | 17-Apr-2025 |
| Data Acquisition | Speag | DAE4ip | 6500 | 12 | 03-April-2023 |
| Dosimetric SAR Probe | Speag | EX3DV4 | 4700 | 12 | 15-Dec-2023 |
| PD probe | Speag | EUmmWV4 | 6353 | 12 | 25-Oct-2023 |

TU - Traceability Unscheduled

Note 1, the calibration dates for the relevant batches of TSL can be found in the fluid parameter tables within this report.

## 3.2 TEST SOFTWARE

The following software was used to control the TÜV SÜD Product Service DASY System.

| Instrument | Version Number |
|---|---|
| DASY system | cDASY6 Module mmWave V3.2.0.1840 |

### 3.3 TEST VERIFICATION

#### 3.3.1 System Performance Check Results

Prior to formal testing a system performance check in DASY Module mmWave was performed with the verification source available at 10 GHz in accordance with IEC/IEEE 63195.
The results can be seen below.

System performance / Validation results

| Date | Frequency (MHz) | Medium | Measured psPDtot+ (W/m²) | Target psPDtot+ (W/m²) | Percentage Deviation from Target (%) |
|---|---|---|---|---|---|
| 31-August-2023 | 10000 | Air | 52.9 | 50.10 | 5.3 |

*Normalised to a forward power of 1W

### 3.4 TEST CONDITIONS

#### 3.4.1 Test Laboratory Conditions

Ambient temperature: Within +18°C to +25°C.
The actual temperature during the testing ranged from 21.10°C to 21.20°C.
The actual humidity during the testing ranged from 14.40% to 14.62% RH.

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### 3.5 MEASUREMENT UNCERTAINTY

DASY6 Uncertainty Budget for iPD

| Symbol | Error Description | Value dB | Probability distribution | Divisor | $c_i$ | $u_i(y)$ dB | $(u_i(y))^2$ | $v_i$ or $v_{eff}$ | ui^4(y) |
|---|---|---|---|---|---|---|---|---|---|
| **Uncertainty terms dependent on the measurement system** | | | | | | | | | |
| CAL | Calibration | 0.49 | normal 1 | 1.000 | 1 | 0.49 | 0.240 | ∞ | 0 |
| COR | Probe correction | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| FRS | Frequency response (BW ≤ 1 GHz) | 0.20 | rectangular | 1.732 | 1 | 0.12 | 0.013 | ∞ | 0 |
| SCC | Sensor cross coupling | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| ISO | Isotropy | 0.50 | rectangular | 1.732 | 1 | 0.29 | 0.083 | ∞ | 0 |
| LIN | Linearity | 0.20 | rectangular | 1.732 | 1 | 0.12 | 0.013 | ∞ | 0 |
| PSC | Probe scattering | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| PPO | Probe positioning offset | 0.30 | rectangular | 1.732 | 1 | 0.17 | 0.030 | ∞ | 0 |
| PPR | Probe positioning repeatability | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| SMO | Sensor mechanical offset | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| PSR | Probe spatial resolution | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| FLD | Field impedance dependence | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| APD | Amplitude and phase drift | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| APN | Amplitude and phase noise | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| TR | Measurement area truncation | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| DAQ | Data acquisition | 0.03 | normal 1 | 1.000 | 1 | 0.03 | 0.001 | ∞ | 0 |
| SMP | Sampling | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| REC | Field reconstruction | 0.60 | rectangular | 1.732 | 1 | 0.35 | 0.120 | ∞ | 0 |
| TRA | FTE/MEO | 0.70 | rectangular | 1.732 | 1 | 0.40 | 0.163 | ∞ | 0 |
| SCA | Power density scaling | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| SAV | Spatial averaging | 0.10 | rectangular | 1.732 | 1 | 0.06 | 0.003 | ∞ | 0 |
| SDL | System detection limit | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| **Uncertainty terms dependent on the DUT and environmental factors** | | | | | | | | | |
| PC | Probe coupling with DUT | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| MOD | Modulation response | 0.40 | rectangular | 1.732 | 1 | 0.23 | 0.053 | ∞ | 0 |
| IT | Integration time | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| RT | Response time | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| DH | Device holder influence | 0.10 | rectangular | 1.732 | 1 | 0.06 | 0.003 | ∞ | 0 |
| DA | DUT alignment | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| REF | Reflections in laboratory | 0.10 | rectangular | 1.732 | 1 | 0.06 | 0.003 | ∞ | 0 |
| TEM | Laboratory temperature | 0.10 | rectangular | 1.732 | 1 | 0.06 | 0.003 | ∞ | 0 |
| AC | RF ambient conditions | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| AR | Ambient reflections | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| MSI | Immunity / secondary reception | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| DRI | Drift of the DUT | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| $u_c(F_S)$ | Combined Standard Uncertainty (w/ FTE/MEO) | - | normal | - | - | 0.86 | 0.734 | ∞ | 0 |
| $U(F_S)$ | Expanded Uncertainty (w/ FTE/MEO) | - | normal k = | 2.00 | - | 1.7 | - | ∞ | - |

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DASY6 mmWave Uncertainty Budget - System Performance Check

| Symbol | Error Description | Value dB | Probability distribution | Divisor | $c_i$ | $u_i(y)$ dB | $(u_i(y))^2$ dB | $v_i$ or $v_{eff}$ | ui^4(y) |
|---|---|---|---|---|---|---|---|---|---|
| **Uncertainty terms dependent on the measurement system** | | | | | | | | | |
| *CAL* | Calibration Repeatability | 0.21 | normal 1 | 1.000 | 1 | 0.21 | 0.044 | ∞ | 0 |
| *COR* | Probe correction | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *FRS* | Frequency response (BW ≤ 1 GHz) | 0.20 | rectangular | 1.732 | 0 | 0.00 | 0.000 | ∞ | 0 |
| *SCC* | Sensor cross coupling | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *ISO* | Isotropy | 0.30 | rectangular | 1.732 | 1 | 0.17 | 0.030 | ∞ | 0 |
| *LIN* | Linearity | 0.20 | rectangular | 1.732 | 1 | 0.12 | 0.013 | ∞ | 0 |
| *PSC* | Probe scattering | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *PPO* | Probe positioning offset | 0.11 | rectangular | 1.732 | 1 | 0.06 | 0.004 | ∞ | 0 |
| *PPR* | Probe positioning repeatability | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| *SMO* | Sensor mechanical offset | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *PSR* | Probe spatial resolution | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *FLD* | Field impedance dependence | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *APD* | Amplitude and phase drift | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *APN* | Amplitude and phase noise | 0.04 | rectangular | 1.732 | 0 | 0.00 | 0.000 | ∞ | 0 |
| *TR* | Measurement area truncation | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *DAQ* | Data acquisition | 0.03 | normal 1 | 1.000 | 1 | 0.03 | 0.001 | ∞ | 0 |
| *SMP* | Sampling | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *REC* | Field reconstruction | 0.60 | rectangular | 1.732 | 0.3 | 0.10 | 0.011 | ∞ | 0 |
| *TRA* | Forward transformation | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *SCA* | Power density scaling | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *SAV* | Spatial averaging | 0.10 | rectangular | 1.732 | 0 | 0.00 | 0.000 | ∞ | 0 |
| *SDL* | System detection limit | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| **Uncertainty terms dependent on the DUT and environmental factors** | | | | | | | | | |
| *PC* | Probe coupling with DUT | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *MOD* | Modulation response | 0.40 | rectangular | 1.732 | 0 | 0.00 | 0.000 | ∞ | 0 |
| *IT* | Integration time | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *RT* | Response time | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *DH* | Device holder influence | 0.10 | rectangular | 1.732 | 0 | 0.00 | 0.000 | ∞ | 0 |
| *REF* | Reflections in laboratory | 0.10 | rectangular | 1.732 | 1 | 0.06 | 0.003 | ∞ | 0 |
| *TEM* | Laboratory temperature | 0.10 | rectangular | 1.732 | 1 | 0.06 | 0.003 | ∞ | 0 |
| *DA* | DUT alignment | 0.00 | rectangular | 1.732 | 1 | 0.00 | 0.000 | ∞ | 0 |
| *AC* | RF ambient conditions | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| *AR* | Ambient reflections | 0.04 | rectangular | 1.732 | 1 | 0.02 | 0.001 | ∞ | 0 |
| *MSI* | Immunity / secondary reception | 0.00 | rectangular | 1.732 | 0 | 0.00 | 0.000 | ∞ | 0 |
| *DRI* | Drift of the DUT | 0.10 | rectangular | 1.732 | 1 | 0.06 | 0.003 | ∞ | 0 |
| $u_c(F_S)$ | Combined Standard Uncertainty (w/ FTE/MEO) | - | normal | - | - | 0.34 | 0.115 | ∞ | 0 |
| $U(F_S)$ | Expanded Uncertainty (w/ FTE/MEO) | - | normal k = | 2.00 | - | 0.7 | | ∞ | - |

### 3.5.1 Decision Rule

Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2007, Clause 4.4.3 and 4.5.1. (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8."

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## SECTION 4

## ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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## 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

UKAS TESTING 0141

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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ANNEX A

PROBE CALIBRATION REPORT

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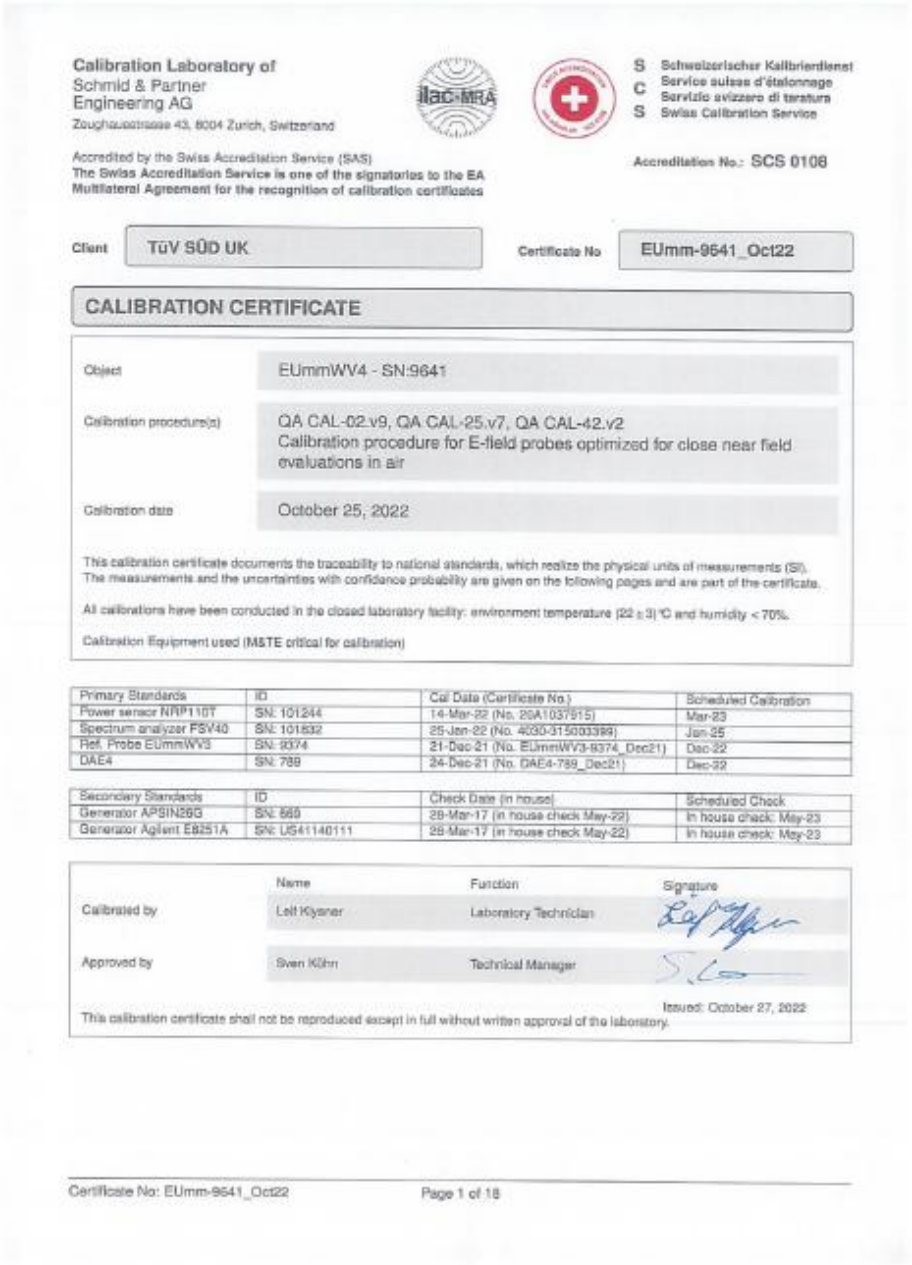

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: SCS 0108

Client: TÜV SÜD UK

Certificate No: EUmm-9641_Oct22

**CALIBRATION CERTIFICATE**

| | |
|---|---|
| Object | EUmmWV4 - SN:9641 |
| Calibration procedure(s) | QA CAL-02.v9, QA CAL-25.v7, QA CAL-42.v2<br>Calibration procedure for E-field probes optimized for close near field evaluations in air |
| Calibration date | October 25, 2022 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power sensor NRP110T | SN: 101244 | 14-Mar-22 (No. 20A1037515) | Mar-23 |
| Spectrum analyzer FSV40 | SN: 101832 | 25-Jan-22 (No. 4030-315003399) | Jan-25 |
| Ref. Probe EUmmWV3 | SN: 9374 | 21-Dec-21 (No. EUmmWV3-9374_Dec21) | Dec-22 |
| DAE4 | SN: 789 | 24-Dec-21 (No. DAE4-789_Dec21) | Dec-22 |

| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Generator APSIN26G | SN: 669 | 28-Mar-17 (in house check May-22) | In house check: May-23 |
| Generator Agilent E8251A | SN: US41140111 | 28-Mar-17 (in house check May-22) | In house check: May-23 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by | Leif Klysner | Laboratory Technician | |
| Approved by | Sven Kühn | Technical Manager | |

Issued: October 27, 2022

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

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TÜV SÜD

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Accreditation No.: SCS 0108

**Glossary**

| | |
|---|---|
| NORMx,y | sensitivity in free space |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A, B, C, D | modulation dependent linearization parameters |
| Polarization $\varphi$ | $\varphi$ rotation around probe axis |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle | information used in DASY system to align probe sensor X to the robot coordinate system |
| Sensor Angles | sensor deviation from the probe axis, used to calculate the field orientation and polarization |
| $\vec{k}$ | is the wave propagation direction |

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

a) IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005

**Methods Applied and Interpretation of Parameters:**

- *NORMx,y*: Assessed for E-field polarization $\vartheta = 0$ ($f \le 900$MHz in TEM-cell; $f > 1800$MHz: R22 waveguide). For frequencies > 6 GHz, the far field in front of waveguide horn antennas is measured for a set of frequencies in various waveguide bands up to 110 GHz.
- *DCPx,y*: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal. DCP does not depend on frequency nor media.
  Note: As the field is measured with a diode detector sensor, it is warranted that the probe response is linear ($E^2$) below the documented lowest calibrated value.
- *PAR*: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- The frequency sensor model parameters are determined prior to calibration based on a frequency sweep (sensor model involving resistors R, $R_0$, inductance L and capacitors C, $C_0$).
- *Ax,y; Bx,y; Cx,y; Dx,y; VRx,y*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).
- *Equivalent Sensor Angle*: The two probe sensors are mounted in the same plane at different angles. The angles are assessed using the information gained by determining the *NORMx* (no uncertainty required).
- *Spherical isotropy (3D deviation from isotropy)*: In a locally homogeneous field realized using an open waveguide / horn setup.

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TÜV SÜD

EUmmWV4 - SN:9641 October 25, 2022

## Parameters of Probe: EUmmWV4 - SN:9641

### Basic Calibration Parameters

| | Sensor X | Sensor Y | Unc (k = 2) |
|---|---|---|---|
| Norm (μV/(V/m)$^2$) | 0.01922 | 0.02182 | ±10.1% |
| DCP (mV) [B] | 107.0 | 105.0 | ±4.7% |
| Equivalent Sensor Angle | -61.1 | 35.0 | |

### Calibration Results for Frequency Response (750 MHz – 110 GHz)

| Frequency MHz | Target E-Field V/m | Deviation Sensor X dB | Deviation Sensor Y dB | Unc (k = 2) dB |
|---|---|---|---|---|
| 0.75 | 77.2 | -0.35 | -0.49 | ±0.43 |
| 1.8 | 140.4 | -0.04 | -0.04 | ±0.43 |
| 2.0 | 133.0 | 0.13 | 0.14 | ±0.43 |
| 2.2 | 124.8 | -0.05 | -0.03 | ±0.43 |
| 2.5 | 123.0 | 0.10 | 0.14 | ±0.43 |
| 3.5 | 256.2 | -0.09 | -0.09 | ±0.43 |
| 3.7 | 249.8 | 0.05 | 0.01 | ±0.43 |
| | | | | |
| 5.6 | 76.1 | 0.12 | 0.01 | ±0.98 |
| 6.0 | 68.3 | 0.05 | 0.06 | ±0.98 |
| 10.0 | 67.5 | 0.19 | 0.19 | ±0.98 |
| 15.0 | 66.3 | 0.31 | 0.27 | ±0.98 |
| | | | | |
| 26.6 | 114.9 | -0.44 | -0.46 | ±0.98 |
| 30.0 | 121.2 | -0.42 | -0.42 | ±0.98 |
| 35.0 | 119.8 | -0.28 | -0.24 | ±0.98 |
| 40.0 | 105.8 | -0.15 | -0.11 | ±0.98 |
| | | | | |
| 50.0 | 60.5 | 0.42 | 0.28 | ±0.98 |
| 55.0 | 75.8 | -0.11 | -0.05 | ±0.98 |
| 60.0 | 80.0 | 0.01 | 0.01 | ±0.98 |
| 65.0 | 77.7 | -0.09 | -0.02 | ±0.98 |
| 70.0 | 73.8 | -0.06 | -0.04 | ±0.98 |
| 75.0 | 73.2 | -0.18 | -0.23 | ±0.98 |
| | | | | |
| 75.0 | 80.8 | 0.09 | 0.07 | ±0.98 |
| 80.0 | 79.9 | -0.21 | -0.21 | ±0.98 |
| 85.0 | 47.6 | -0.31 | -0.35 | ±0.98 |
| 90.0 | 72.3 | -0.23 | -0.24 | ±0.98 |
| 92.0 | 72.0 | -0.17 | -0.17 | ±0.98 |
| 95.0 | 66.6 | -0.12 | -0.09 | ±0.98 |
| 97.0 | 57.0 | -0.07 | -0.03 | ±0.98 |
| 100.0 | 55.0 | -0.03 | 0.02 | ±0.98 |
| 105.0 | 53.0 | -0.16 | -0.12 | ±0.98 |
| 110.0 | 61.1 | 0.14 | -0.00 | ±0.98 |

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

[B] Linearization parameter uncertainty for maximum specified field strength.

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## Parameters of Probe: EUmmWV4 - SN:9641

### Calibration Results for Modulation Response

| UID | Communication System Name | | A dB | B dB$\sqrt{\mu V}$ | C | D dB | VR mV | Max dev. | Max Unc[E] k = 2 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.00 | 0.00 | 1.00 | 0.00 | 133.7 | ±0.8% | ±4.7% |
| | | Y | 0.00 | 0.00 | 1.00 | | 88.1 | | |
| 10352 | Pulse Waveform (200Hz, 10%) | X | 3.65 | 60.72 | 15.40 | 10.00 | 6.0 | ±1.4% | ±9.6% |
| | | Y | 3.49 | 61.83 | 16.76 | | 6.0 | | |
| 10353 | Pulse Waveform (200Hz, 20%) | X | 3.00 | 62.66 | 14.96 | 6.99 | 12.0 | ±1.3% | ±9.6% |
| | | Y | 2.75 | 63.47 | 16.36 | | 12.0 | | |
| 10354 | Pulse Waveform (200Hz, 40%) | X | 1.55 | 62.90 | 13.78 | 3.98 | 23.0 | ±2.0% | ±9.6% |
| | | Y | 1.25 | 66.18 | 13.98 | | 23.0 | | |
| 10355 | Pulse Waveform (200Hz, 60%) | X | 0.85 | 66.00 | 11.77 | 2.22 | 37.0 | ±1.4% | ±9.6% |
| | | Y | 0.76 | 66.00 | 13.07 | | 37.0 | | |
| 10387 | QPSK Waveform, 1 MHz | X | 1.26 | 66.00 | 12.31 | 1.00 | 22.0 | ±1.4% | ±9.6% |
| | | Y | 1.25 | 66.00 | 12.49 | | 22.0 | | |
| 10388 | QPSK Waveform, 10 MHz | X | 1.27 | 66.00 | 11.90 | 0.00 | 22.0 | ±0.8% | ±9.6% |
| | | Y | 1.31 | 66.00 | 12.15 | | 22.0 | | |
| 10396 | 64-QAM Waveform, 100 kHz | X | 3.81 | 66.79 | 16.51 | 3.01 | 17.0 | ±0.8% | ±9.6% |
| | | Y | 20.00 | 87.32 | 23.08 | | 17.0 | | |
| 10399 | 64-QAM Waveform, 40 MHz | X | 2.08 | 66.00 | 12.40 | 0.00 | 19.0 | ±0.9% | ±9.6% |
| | | Y | 2.04 | 66.00 | 12.68 | | 19.0 | | |
| 10414 | WLAN CCDF, 64-QAM, 40MHz | X | 3.27 | 66.00 | 12.83 | 0.00 | 12.0 | ±0.8% | ±9.6% |
| | | Y | 3.08 | 66.00 | 13.13 | | 12.0 | | |

Note: For details on UID parameters see Appendix

[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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## Parameters of Probe: EUmmWV4 - SN:9641

### Calibration Results for Linearity Response

| Frequency GHz | Target E-Field V/m | Deviation Sensor X dB | Deviation Sensor Y dB | Unc (k = 2) dB |
|---|---|---|---|---|
| 0.9 | 50.0 | -0.05 | 0.06 | ±0.2 |
| 0.9 | 100.0 | -0.03 | 0.09 | ±0.2 |
| 0.9 | 500.0 | -0.00 | -0.02 | ±0.2 |
| 0.9 | 1000.0 | 0.02 | -0.00 | ±0.2 |
| 0.9 | 1500.0 | 0.01 | 0.00 | ±0.2 |
| 0.9 | 2100.0 | -0.00 | -0.00 | ±0.2 |

### Sensor Frequency Model Parameters (750 MHz – 55 GHz)

| | Sensor X | Sensor Y |
|---|---|---|
| R (Ω) | 60.44 | 47.42 |
| $R_p$ (Ω) | 65.50 | 50.59 |
| L (nH) | 0.07194 | 0.05239 |
| C (pF) | 0.3841 | 0.6284 |
| $C_p$ (pF) | 0.1132 | 0.1490 |

### Sensor Frequency Model Parameters (55 GHz – 110 GHz)

| | Sensor X | Sensor Y |
|---|---|---|
| R (Ω) | 18.09 | 40.41 |
| $R_p$ (Ω) | 101.84 | 205.86 |
| L (nH) | 0.05623 | 0.11734 |
| C (pF) | 0.0744 | 0.0372 |
| $C_p$ (pF) | 0.0855 | 0.0427 |

### Sensor Model Parameters

| | C1 fF | C2 fF | α $V^{-1}$ | T1 $ms\,V^{-2}$ | T2 $ms\,V^{-1}$ | T3 ms | T4 $V^{-2}$ | T5 $V^{-1}$ | T6 |
|---|---|---|---|---|---|---|---|---|---|
| x | 58.1 | 492.44 | 33.52 | 0.00 | 10.00 | 5.01 | 0.00 | 1.96 | 1.01 |
| y | 59.5 | 424.21 | 32.97 | 0.00 | 10.00 | 5.04 | 2.00 | 2.00 | 1.01 |

### Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Rectangular |
| Connector Angle | 164.5° |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 320 mm |
| Probe Body Diameter | 8 mm |
| Tip Length | 23 mm |
| Tip Diameter | 8.0 mm |
| Probe Tip to Sensor X Calibration Point | 1.5 mm |
| Probe Tip to Sensor Y Calibration Point | 1.5 mm |

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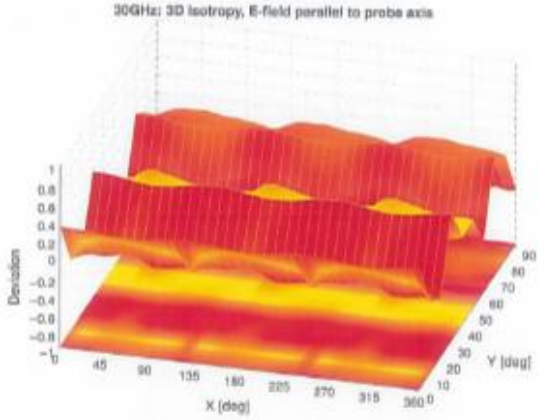
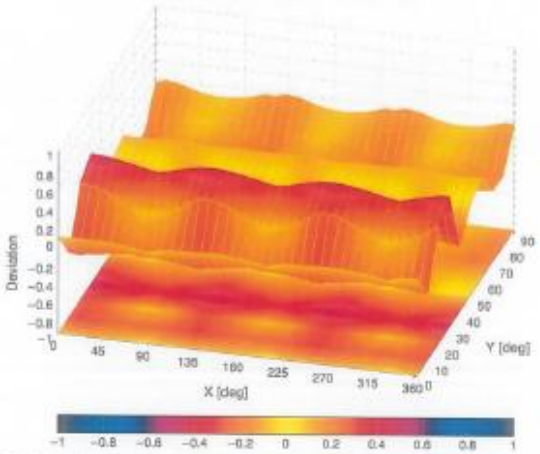
Deviation from Isotropy in Air

30GHz: 3D Isotropy, E-field parallel to probe axis




60GHz: 3D Isotropy, E-field parallel to probe axis




Probe Isotropy for $E_{tot}$: probe rotated $\phi = 0°$ to 360°, tilted from field propagation direction $\vec{k}$
Parallel to the field propagation ($\psi = 0° - 90°$) at 30 GHz: deviation within ±0.43 dB
Parallel to the field propagation ($\psi = 0° - 90°$) at 60 GHz: deviation within ±0.37 dB

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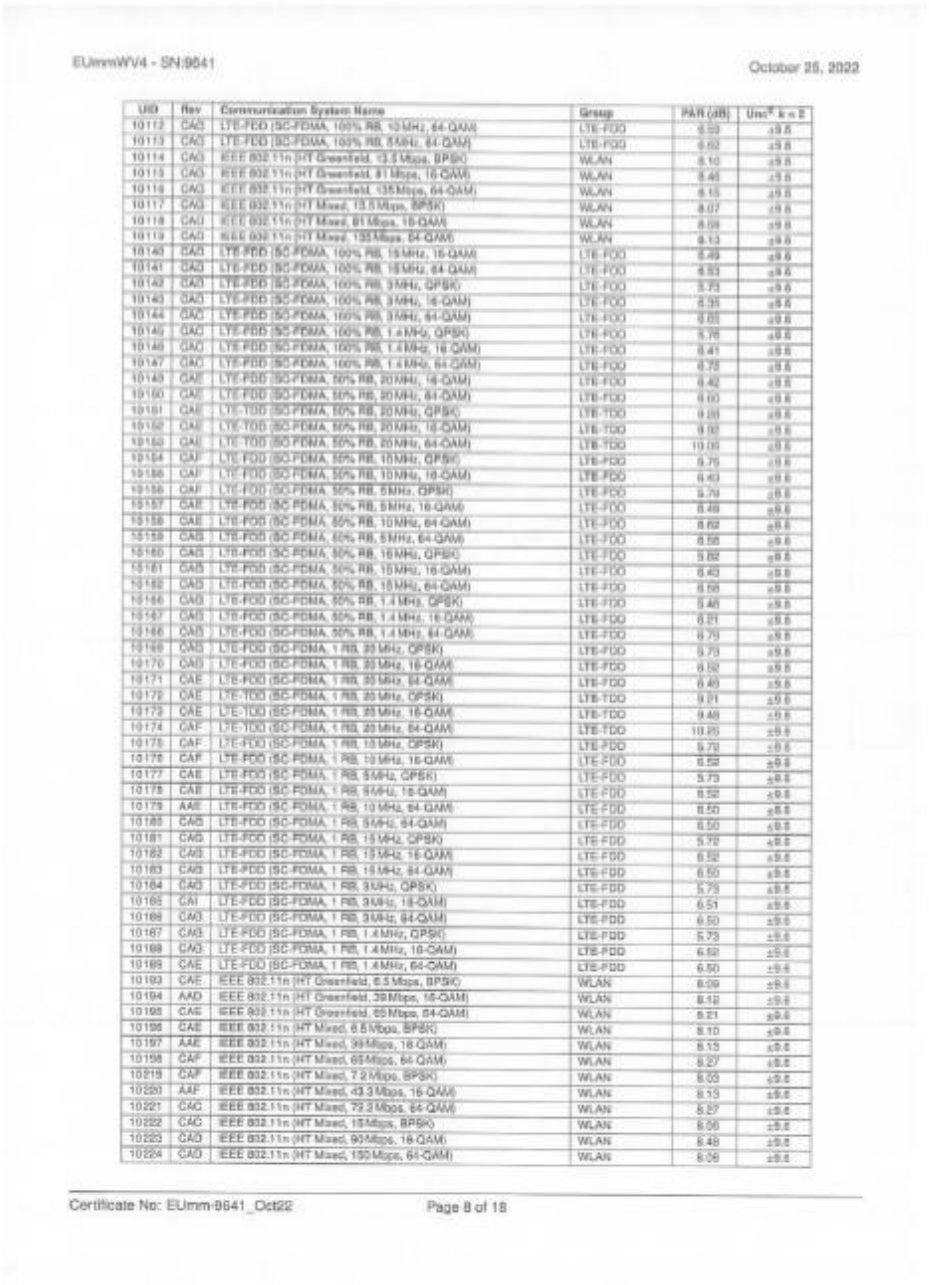
## Appendix: Modulation Calibration Parameters

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^{E}$ k = 2 |
|---|---|---|---|---|---|
| 0 | | CW | CW | 0.00 | ±4.7 |
| 10010 | CAA | SAR Validation (Square, 100 ms, 10 ms) | Test | 10.00 | ±9.6 |
| 10011 | CAG | UMTS-FDD (WCDMA) | WCDMA | 2.51 | ±9.6 |
| 10012 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) | WLAN | 1.87 | ±9.6 |
| 10013 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | WLAN | 0.46 | ±9.6 |
| 10021 | DAC | GSM-FDD (TDMA, GMSK) | GSM | 9.39 | ±9.6 |
| 10023 | DAC | GPRS-FDD (TDMA, GMSK, TN 0) | GSM | 9.57 | ±9.6 |
| 10024 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1) | GSM | 6.56 | ±9.6 |
| 10025 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0) | GSM | 13.62 | ±9.6 |
| 10026 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1) | GSM | 9.55 | ±9.6 |
| 10027 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2) | GSM | 4.80 | ±9.6 |
| 10028 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3) | GSM | 3.55 | ±9.6 |
| 10029 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2) | GSM | 7.78 | ±9.6 |
| 10030 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH1) | Bluetooth | 5.30 | ±9.6 |
| 10031 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH3) | Bluetooth | 1.87 | ±9.6 |
| 10032 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5) | Bluetooth | 1.16 | ±9.6 |
| 10033 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1) | Bluetooth | 7.74 | ±9.6 |
| 10034 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3) | Bluetooth | 4.55 | ±9.6 |
| 10035 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5) | Bluetooth | 3.83 | ±9.6 |
| 10036 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH1) | Bluetooth | 8.01 | ±9.6 |
| 10037 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH3) | Bluetooth | 4.77 | ±9.6 |
| 10038 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH5) | Bluetooth | 4.10 | ±9.6 |
| 10039 | CAB | CDMA2000 (1xRTT, RC1) | CDMA2000 | 4.57 | ±9.6 |
| 10042 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate) | AMPS | 7.78 | ±9.6 |
| 10044 | CAA | IS-91/EIA/TIA-553 FDD (FDMA, FM) | AMPS | 0.00 | ±9.6 |
| 10048 | CAA | DECT (TDD, TDMA/FDM, QPSK, Full Slot, 24) | DECT | 13.80 | ±9.6 |
| 10049 | CAA | DECT (TDD, TDMA/FDM, QPSK, Double Slot, 12) | DECT | 10.79 | ±9.6 |
| 10058 | CAA | UMTS-TDD (TD-SCDMA, 1.28 Mcps) | TD-SCDMA | 11.01 | ±9.6 |
| 10059 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3) | GSM | 8.52 | ±9.6 |
| 10059 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps) | WLAN | 2.13 | ±9.6 |
| 10060 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps) | WLAN | 2.65 | ±9.6 |
| 10061 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps) | WLAN | 3.60 | ±9.6 |
| 10062 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps) | WLAN | 8.68 | ±9.6 |
| 10063 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps) | WLAN | 8.63 | ±9.6 |
| 10064 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps) | WLAN | 9.05 | ±9.6 |
| 10065 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps) | WLAN | 9.00 | ±9.6 |
| 10066 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps) | WLAN | 9.38 | ±9.6 |
| 10067 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps) | WLAN | 10.13 | ±9.6 |
| 10068 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps) | WLAN | 10.24 | ±9.6 |
| 10069 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps) | WLAN | 10.56 | ±9.6 |
| 10071 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps) | WLAN | 9.83 | ±9.6 |
| 10072 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps) | WLAN | 9.82 | ±9.6 |
| 10073 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps) | WLAN | 9.94 | ±9.6 |
| 10074 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps) | WLAN | 10.30 | ±9.6 |
| 10075 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps) | WLAN | 10.77 | ±9.6 |
| 10076 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps) | WLAN | 10.94 | ±9.6 |
| 10077 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps) | WLAN | 11.00 | ±9.6 |
| 10081 | CAB | CDMA2000 (1xRTT, RC3) | CDMA2000 | 3.97 | ±9.6 |
| 10082 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate) | AMPS | 4.77 | ±9.6 |
| 10095 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-4) | GSM | 8.55 | ±9.6 |
| 10097 | CAC | UMTS-FDD (HSDPA) | WCDMA | 3.98 | ±9.6 |
| 10098 | DAC | UMTS-FDD (HSUPA, Subtest 2) | WCDMA | 3.98 | ±9.6 |
| 10099 | CAC | EDGE-FDD (TDMA, 8PSK, TN 0-4) | GSM | 9.55 | ±9.6 |
| 10100 | CAC | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | LTE-FDD | 5.67 | ±9.6 |
| 10101 | CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM) | LTE-FDD | 6.42 | ±9.6 |
| 10102 | CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM) | LTE-FDD | 6.60 | ±9.6 |
| 10103 | DAC | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | LTE-TDD | 9.29 | ±9.6 |
| 10104 | CAE | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM) | LTE-TDD | 9.97 | ±9.6 |
| 10105 | CAE | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM) | LTE-TDD | 10.01 | ±9.6 |
| 10108 | CAE | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | LTE-FDD | 5.80 | ±9.6 |
| 10109 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM) | LTE-FDD | 6.43 | ±9.6 |
| 10110 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK) | LTE-FDD | 5.75 | ±9.6 |
| 10111 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM) | LTE-FDD | 6.44 | ±9.6 |



EUmmWV4 - SN:9641 October 26, 2022

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^{E}$ k = 2 |
|---|---|---|---|---|---|
| 10112 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM) | LTE-FDD | 6.99 | ±9.6 |
| 10113 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM) | LTE-FDD | 6.92 | ±9.6 |
| 10114 | CAG | IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK) | WLAN | 8.10 | ±9.6 |
| 10115 | CAG | IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM) | WLAN | 8.46 | ±9.6 |
| 10116 | CAG | IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM) | WLAN | 8.15 | ±9.6 |
| 10117 | CAG | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | WLAN | 8.07 | ±9.6 |
| 10118 | CAG | IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM) | WLAN | 8.09 | ±9.6 |
| 10119 | CAG | IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM) | WLAN | 8.13 | ±9.6 |
| 10140 | CAG | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM) | LTE-FDD | 6.49 | ±9.6 |
| 10141 | CAG | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM) | LTE-FDD | 6.93 | ±9.6 |
| 10142 | CAG | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10143 | CAG | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM) | LTE-FDD | 6.35 | ±9.6 |
| 10144 | CAG | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM) | LTE-FDD | 6.83 | ±9.6 |
| 10145 | CAG | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK) | LTE-FDD | 5.76 | ±9.6 |
| 10146 | CAG | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | LTE-FDD | 6.41 | ±9.6 |
| 10147 | CAG | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM) | LTE-FDD | 6.78 | ±9.6 |
| 10148 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM) | LTE-FDD | 6.42 | ±9.6 |
| 10150 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM) | LTE-FDD | 6.80 | ±9.6 |
| 10151 | CAE | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK) | LTE-TDD | 9.28 | ±9.6 |
| 10152 | CAE | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM) | LTE-TDD | 9.92 | ±9.6 |
| 10153 | CAE | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM) | LTE-TDD | 10.09 | ±9.6 |
| 10154 | CAF | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK) | LTE-FDD | 5.75 | ±9.6 |
| 10155 | CAF | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM) | LTE-FDD | 6.40 | ±9.6 |
| 10156 | CAF | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK) | LTE-FDD | 5.79 | ±9.6 |
| 10157 | CAE | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM) | LTE-FDD | 6.49 | ±9.6 |
| 10158 | CAE | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM) | LTE-FDD | 6.82 | ±9.6 |
| 10159 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM) | LTE-FDD | 6.56 | ±9.6 |
| 10160 | CAG | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK) | LTE-FDD | 5.82 | ±9.6 |
| 10161 | CAG | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM) | LTE-FDD | 6.40 | ±9.6 |
| 10162 | CAG | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM) | LTE-FDD | 6.56 | ±9.6 |
| 10166 | CAG | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK) | LTE-FDD | 5.46 | ±9.6 |
| 10167 | CAG | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM) | LTE-FDD | 6.21 | ±9.6 |
| 10168 | CAG | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM) | LTE-FDD | 6.79 | ±9.6 |
| 10169 | CAG | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10170 | CAG | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10171 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM) | LTE-FDD | 6.49 | ±9.6 |
| 10172 | CAE | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10173 | CAE | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10174 | CAF | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10175 | CAF | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK) | LTE-FDD | 5.72 | ±9.6 |
| 10176 | CAF | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10177 | CAE | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10178 | CAE | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10179 | AAE | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10180 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10181 | CAG | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK) | LTE-FDD | 5.72 | ±9.6 |
| 10182 | CAG | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10183 | CAG | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10184 | CAG | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10185 | CAI | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM) | LTE-FDD | 6.51 | ±9.6 |
| 10186 | CAG | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10187 | CAG | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10188 | CAG | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10189 | CAE | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10193 | CAE | IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK) | WLAN | 8.09 | ±9.6 |
| 10194 | AAD | IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM) | WLAN | 8.12 | ±9.6 |
| 10195 | CAE | IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM) | WLAN | 8.21 | ±9.6 |
| 10196 | CAE | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK) | WLAN | 8.10 | ±9.6 |
| 10197 | AAE | IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM) | WLAN | 8.15 | ±9.6 |
| 10198 | CAF | IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM) | WLAN | 8.27 | ±9.6 |
| 10219 | CAF | IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK) | WLAN | 8.03 | ±9.6 |
| 10220 | AAF | IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM) | WLAN | 8.15 | ±9.6 |
| 10221 | CAG | IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM) | WLAN | 8.27 | ±9.6 |
| 10222 | CAC | IEEE 802.11n (HT Mixed, 15 Mbps, BPSK) | WLAN | 8.06 | ±9.6 |
| 10223 | CAD | IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM) | WLAN | 8.48 | ±9.6 |
| 10224 | CAD | IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM) | WLAN | 8.06 | ±9.6 |

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|---|---|---|---|---|---|
| 10335 | CAC | UMTS-FDD (HSPA+) | WCDMA | 3.97 | ±9.6 |
| 10336 | CAC | LTE-TDD (SC-FDMA, 1 RB, 1.4MHz, 16-QAM) | LTE-TDD | 9.49 | ±9.6 |
| 10337 | CAC | LTE-TDD (SC-FDMA, 1 RB, 1.4MHz, 64-QAM) | LTE-TDD | 10.26 | ±9.6 |
| 10338 | CAC | LTE-TDD (SC-FDMA, 1 RB, 1.4MHz, QPSK) | LTE-TDD | 9.22 | ±9.6 |
| 10339 | CAC | LTE-TDD (SC-FDMA, 1 RB, 3MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10340 | CAC | LTE-TDD (SC-FDMA, 1 RB, 3MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10341 | CAC | LTE-TDD (SC-FDMA, 1 RB, 3MHz, QPSK) | LTE-TDD | 9.19 | ±9.6 |
| 10342 | CAD | LTE-TDD (SC-FDMA, 1 RB, 5MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10343 | CAD | LTE-TDD (SC-FDMA, 1 RB, 5MHz, 64-QAM) | LTE-TDD | 10.26 | ±9.6 |
| 10344 | CAD | LTE-TDD (SC-FDMA, 1 RB, 5MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10345 | CAD | LTE-TDD (SC-FDMA, 1 RB, 10MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10346 | CAD | LTE-TDD (SC-FDMA, 1 RB, 10MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10347 | CAD | LTE-TDD (SC-FDMA, 1 RB, 10MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10348 | CAB | LTE-TDD (SC-FDMA, 1 RB, 15MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10349 | CAB | LTE-TDD (SC-FDMA, 1 RB, 15MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10350 | CAB | LTE-TDD (SC-FDMA, 1 RB, 15MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10351 | CAD | LTE-TDD (SC-FDMA, 50% RB, 1.4MHz, 16-QAM) | LTE-TDD | 9.82 | ±9.6 |
| 10352 | CAD | LTE-TDD (SC-FDMA, 50% RB, 1.4MHz, 64-QAM) | LTE-TDD | 9.86 | ±9.6 |
| 10353 | CAD | LTE-TDD (SC-FDMA, 50% RB, 1.4MHz, QPSK) | LTE-TDD | 9.46 | ±9.6 |
| 10354 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3MHz, 16-QAM) | LTE-TDD | 10.06 | ±9.6 |
| 10355 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3MHz, 64-QAM) | LTE-TDD | 10.06 | ±9.6 |
| 10356 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3MHz, QPSK) | LTE-TDD | 9.30 | ±9.6 |
| 10357 | CAD | LTE-TDD (SC-FDMA, 50% RB, 5MHz, 16-QAM) | LTE-TDD | 9.51 | ±9.6 |
| 10358 | CAD | LTE-TDD (SC-FDMA, 50% RB, 5MHz, 64-QAM) | LTE-TDD | 10.09 | ±9.6 |
| 10359 | CAD | LTE-TDD (SC-FDMA, 50% RB, 5MHz, QPSK) | LTE-TDD | 9.29 | ±9.6 |
| 10360 | CAD | LTE-TDD (SC-FDMA, 50% RB, 10MHz, 16-QAM) | LTE-TDD | 9.81 | ±9.6 |
| 10361 | CAF | LTE-TDD (SC-FDMA, 50% RB, 10MHz, 64-QAM) | LTE-TDD | 10.17 | ±9.6 |
| 10362 | CAF | LTE-TDD (SC-FDMA, 50% RB, 10MHz, QPSK) | LTE-TDD | 9.34 | ±9.6 |
| 10363 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15MHz, 16-QAM) | LTE-TDD | 9.80 | ±9.6 |
| 10364 | CAB | LTE-TDD (SC-FDMA, 50% RB, 15MHz, 64-QAM) | LTE-TDD | 10.14 | ±9.6 |
| 10365 | CAB | LTE-TDD (SC-FDMA, 50% RB, 15MHz, QPSK) | LTE-TDD | 9.35 | ±9.6 |
| 10366 | CAD | LTE-TDD (SC-FDMA, 100% RB, 1.4MHz, 16-QAM) | LTE-TDD | 9.98 | ±9.6 |
| 10367 | CAD | LTE-TDD (SC-FDMA, 100% RB, 1.4MHz, 64-QAM) | LTE-TDD | 10.08 | ±9.6 |
| 10368 | CAD | LTE-TDD (SC-FDMA, 100% RB, 1.4MHz, QPSK) | LTE-TDD | 9.34 | ±9.6 |
| 10369 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3MHz, 16-QAM) | LTE-TDD | 9.98 | ±9.6 |
| 10370 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3MHz, 64-QAM) | LTE-TDD | 9.97 | ±9.6 |
| 10371 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3MHz, QPSK) | LTE-TDD | 9.24 | ±9.6 |
| 10372 | CAD | LTE-TDD (SC-FDMA, 100% RB, 5MHz, 16-QAM) | LTE-TDD | 9.83 | ±9.6 |
| 10373 | CAD | LTE-TDD (SC-FDMA, 100% RB, 5MHz, 64-QAM) | LTE-TDD | 10.16 | ±9.6 |
| 10374 | CAD | LTE-TDD (SC-FDMA, 100% RB, 5MHz, QPSK) | LTE-TDD | 9.23 | ±9.6 |
| 10375 | CAD | LTE-TDD (SC-FDMA, 100% RB, 10MHz, 16-QAM) | LTE-TDD | 9.92 | ±9.6 |
| 10376 | CAF | LTE-TDD (SC-FDMA, 100% RB, 10MHz, 64-QAM) | LTE-TDD | 10.07 | ±9.6 |
| 10377 | CAF | LTE-TDD (SC-FDMA, 100% RB, 10MHz, QPSK) | LTE-TDD | 9.30 | ±9.6 |
| 10378 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15MHz, 16-QAM) | LTE-TDD | 10.09 | ±9.6 |
| 10379 | CAB | LTE-TDD (SC-FDMA, 100% RB, 15MHz, 64-QAM) | LTE-TDD | 10.13 | ±9.6 |
| 10380 | CAB | LTE-TDD (SC-FDMA, 100% RB, 15MHz, QPSK) | LTE-TDD | 9.08 | ±9.6 |
| 10274 | CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10) | WCDMA | 4.87 | ±9.6 |
| 10275 | CAD | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4) | WCDMA | 3.86 | ±9.6 |
| 10277 | CAD | PHS (QPSK) | PHS | 11.81 | ±9.6 |
| 10278 | CAD | PHS (QPSK, BW 884 MHz, Rolloff 0.5) | PHS | 11.81 | ±9.6 |
| 10279 | CAD | PHS (QPSK, BW 884 MHz, Rolloff 0.38) | PHS | 12.18 | ±9.6 |
| 10293 | CAG | CDMA2000, RC1, SO55, Full Rate | CDMA2000 | 3.91 | ±9.6 |
| 10291 | CAG | CDMA2000, RC3, SO55, Full Rate | CDMA2000 | 3.46 | ±9.6 |
| 10292 | CAG | CDMA2000, RC3, SO32, Full Rate | CDMA2000 | 3.39 | ±9.6 |
| 10293 | CAG | CDMA2000, RC3, SO3, Full Rate | CDMA2000 | 3.50 | ±9.6 |
| 10295 | CAG | CDMA2000, RC1, SO3, 1.8ms Rate 25 fr. | CDMA2000 | 12.49 | ±9.6 |
| 10297 | CAF | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK) | LTE-FDD | 5.81 | ±9.6 |
| 10298 | CAF | LTE-FDD (SC-FDMA, 50% RB, 3MHz, QPSK) | LTE-FDD | 5.72 | ±9.6 |
| 10299 | CAF | LTE-FDD (SC-FDMA, 50% RB, 3MHz, 16-QAM) | LTE-FDD | 6.39 | ±9.6 |
| 10300 | CAG | LTE-FDD (SC-FDMA, 50% RB, 3MHz, 64-QAM) | LTE-FDD | 6.60 | ±9.6 |
| 10301 | CAC | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC) | WiMAX | 12.03 | ±9.6 |
| 10302 | CAB | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3CTRL) | WiMAX | 12.57 | ±9.6 |
| 10303 | CAB | IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC) | WiMAX | 12.52 | ±9.6 |
| 10304 | CAA | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC) | WiMAX | 11.86 | ±9.6 |
| 10305 | CAA | IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC) | WiMAX | 15.24 | ±9.6 |
| 10306 | CAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC) | WiMAX | 14.57 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | Unc^M k = 2 |
|---|---|---|---|---|---|
| 10307 | AAB | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, QPSK, PUSC) | WiMAX | 14.49 | ±9.6 |
| 10308 | AAB | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 16QAM, PUSC) | WiMAX | 14.48 | ±9.6 |
| 10309 | AAB | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 16QAM,AMC 2x3) | WiMAX | 14.58 | ±9.6 |
| 10310 | AAB | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, QPSK, AMC 2x3) | WiMAX | 14.57 | ±9.6 |
| 10311 | AAB | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK) | LTE-FDD | 8.08 | ±9.6 |
| 10313 | AAD | iDEN 1:3 | iDEN | 10.51 | ±9.6 |
| 10314 | AAD | iDEN 1:6 | iDEN | 13.48 | ±9.6 |
| 10315 | AAD | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc dc) | WLAN | 1.71 | ±9.6 |
| 10316 | AAD | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10317 | AAA | IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10350 | AAA | Pulse Waveform (200 Hz, 10%) | Generic | 10.00 | ±9.6 |
| 10353 | AAA | Pulse Waveform (200 Hz, 20%) | Generic | 6.99 | ±9.6 |
| 10354 | AAA | Pulse Waveform (200 Hz, 40%) | Generic | 3.98 | ±9.6 |
| 10355 | AAA | Pulse Waveform (200 Hz, 60%) | Generic | 2.22 | ±9.6 |
| 10356 | AAA | Pulse Waveform (200 Hz, 80%) | Generic | 0.97 | ±9.6 |
| 10387 | AAA | QPSK Waveform, 1 MHz | Generic | 5.10 | ±9.6 |
| 10388 | AAA | QPSK Waveform, 10 MHz | Generic | 5.20 | ±9.6 |
| 10396 | AAA | 64-QAM Waveform, 100 kHz | Generic | 8.27 | ±9.6 |
| 10399 | AAA | 64-QAM Waveform, 40 MHz | Generic | 8.27 | ±9.6 |
| 10400 | AAD | IEEE 802.11ac WiFi (20 MHz, 64-QAM, 99pc dc) | WLAN | 8.37 | ±9.6 |
| 10401 | AAA | IEEE 802.11ac WiFi (40 MHz, 64-QAM, 99pc dc) | WLAN | 8.60 | ±9.6 |
| 10402 | AAA | IEEE 802.11ac WiFi (80 MHz, 64-QAM, 99pc dc) | WLAN | 8.61 | ±9.6 |
| 10403 | AAB | CDMA2000 (1xEV-DO, Rev. 0) | CDMA2000 | 3.70 | ±9.6 |
| 10404 | AAB | CDMA2000 (1xEV-DO, Rev. A) | CDMA2000 | 3.77 | ±9.6 |
| 10405 | AAD | CDMA2000, RC3, SO32, SCH0, Full Rate | CDMA2000 | 5.39 | ±9.6 |
| 10410 | AAA | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Sub=3,4,7,8,9) | LTE-TDD | 7.82 | ±9.6 |
| 10414 | AAA | WLAN CCDF, 64-QAM, 40 MHz | Generic | 8.54 | ±9.6 |
| 10415 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc dc) | WLAN | 1.54 | ±9.6 |
| 10416 | AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc dc) | WLAN | 8.23 | ±9.6 |
| 10417 | AAA | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc dc) | WLAN | 8.23 | ±9.6 |
| 10418 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc, Long) | WLAN | 8.14 | ±9.6 |
| 10419 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc, Short) | WLAN | 8.19 | ±9.6 |
| 10420 | AAA | IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK) | WLAN | 8.52 | ±9.6 |
| 10423 | AAA | IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM) | WLAN | 8.47 | ±9.6 |
| 10424 | AAE | IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM) | WLAN | 8.40 | ±9.6 |
| 10425 | AAE | IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK) | WLAN | 8.41 | ±9.6 |
| 10426 | AAE | IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM) | WLAN | 8.45 | ±9.6 |
| 10427 | AAB | IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM) | WLAN | 8.41 | ±9.6 |
| 10430 | AAB | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1) | LTE-FDD | 8.28 | ±9.6 |
| 10431 | AAC | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1) | LTE-FDD | 8.39 | ±9.6 |
| 10432 | AAB | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1) | LTE-FDD | 8.34 | ±9.6 |
| 10433 | AAC | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1) | LTE-FDD | 8.34 | ±9.6 |
| 10434 | AAG | W-CDMA (BS Test Model 1, 64 DPCH) | WCDMA | 8.60 | ±9.6 |
| 10435 | AAA | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Sub) | LTE-TDD | 7.82 | ±9.6 |
| 10447 | AAA | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%) | LTE-FDD | 7.56 | ±9.6 |
| 10448 | AAA | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%) | LTE-FDD | 7.53 | ±9.6 |
| 10449 | AAC | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Clping 44%) | LTE-FDD | 7.51 | ±9.6 |
| 10450 | AAA | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%) | LTE-FDD | 7.48 | ±9.6 |
| 10451 | AAA | W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%) | WCDMA | 7.59 | ±9.6 |
| 10453 | AAC | Validation (Square, 10 ms, 1 ms) | Test | 10.00 | ±9.6 |
| 10456 | AAC | IEEE 802.11ac WiFi (160 MHz, 64-QAM, 99pc dc) | WLAN | 8.60 | ±9.6 |
| 10457 | AAC | UMTS-FDD (DC-HSDPA) | WCDMA | 6.62 | ±9.6 |
| 10458 | AAC | CDMA2000 (1xEV-DO, Rev. B, 2 carriers) | CDMA2000 | 6.05 | ±9.6 |
| 10459 | AAC | CDMA2000 (1xEV-DO, Rev. B, 3 carriers) | CDMA2000 | 8.25 | ±9.6 |
| 10460 | AAC | UMTS-FDD (WCDMA, AMR) | WCDMA | 3.39 | ±9.6 |
| 10461 | AAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Sub) | LTE-TDD | 7.82 | ±9.6 |
| 10462 | AAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.30 | ±9.6 |
| 10463 | AAD | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.56 | ±9.6 |
| 10464 | AAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Sub) | LTE-TDD | 7.82 | ±9.6 |
| 10465 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.32 | ±9.6 |
| 10466 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.57 | ±9.6 |
| 10467 | AAA | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Sub) | LTE-TDD | 7.82 | ±9.6 |
| 10468 | AAF | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.32 | ±9.6 |
| 10469 | AAD | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.56 | ±9.6 |
| 10470 | AAD | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Sub) | LTE-TDD | 7.82 | ±9.6 |
| 10471 | AAC | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.32 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | Unc* k = 2 |
|---|---|---|---|---|---|
| 10472 | AAC | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.57 | ±9.6 |
| 10473 | AAA | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Sub) | LTE-TDD | 7.82 | ±9.6 |
| 10474 | AAC | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.32 | ±9.6 |
| 10475 | AAD | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.57 | ±9.6 |
| 10477 | AAC | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.32 | ±9.6 |
| 10478 | AAC | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.57 | ±9.6 |
| 10479 | AAC | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Sub) | LTE-TDD | 7.74 | ±9.6 |
| 10480 | AAA | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.18 | ±9.6 |
| 10481 | AAA | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.45 | ±9.6 |
| 10482 | AAA | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Sub) | LTE-TDD | 7.71 | ±9.6 |
| 10483 | AAA | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, Sub) | LTE-TDD | 8.39 | ±9.6 |
| 10484 | AAB | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.47 | ±9.6 |
| 10485 | AAB | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Sub) | LTE-TDD | 7.59 | ±9.6 |
| 10486 | AAB | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.36 | ±9.6 |
| 10487 | AAC | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.60 | ±9.6 |
| 10488 | AAC | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Sub) | LTE-TDD | 7.70 | ±9.6 |
| 10489 | AAC | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.31 | ±9.6 |
| 10490 | AAF | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.54 | ±9.6 |
| 10491 | AAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Sub) | LTE-TDD | 7.74 | ±9.6 |
| 10492 | AAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.41 | ±9.6 |
| 10493 | AAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.66 | ±9.6 |
| 10494 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Sub) | LTE-TDD | 7.74 | ±9.6 |
| 10495 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.57 | ±9.6 |
| 10496 | AAE | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.64 | ±9.6 |
| 10497 | AAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Sub) | LTE-TDD | 7.67 | ±9.6 |
| 10498 | AAE | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.40 | ±9.6 |
| 10499 | AAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.68 | ±9.6 |
| 10500 | AAF | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Sub) | LTE-TDD | 7.67 | ±9.6 |
| 10501 | AAF | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.44 | ±9.6 |
| 10502 | AAB | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.59 | ±9.6 |
| 10503 | AAB | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Sub) | LTE-TDD | 7.72 | ±9.6 |
| 10504 | AAB | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.31 | ±9.6 |
| 10505 | AAC | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.54 | ±9.6 |
| 10506 | AAC | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Sub) | LTE-TDD | 7.74 | ±9.6 |
| 10507 | AAC | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.38 | ±9.6 |
| 10508 | AAF | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.55 | ±9.6 |
| 10509 | AAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Sub) | LTE-TDD | 7.99 | ±9.6 |
| 10510 | AAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.49 | ±9.6 |
| 10511 | AAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.51 | ±9.6 |
| 10512 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Sub) | LTE-TDD | 7.74 | ±9.6 |
| 10513 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Sub) | LTE-TDD | 8.49 | ±9.6 |
| 10514 | AAE | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Sub) | LTE-TDD | 8.45 | ±9.6 |
| 10515 | AAE | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc dc) | WLAN | 1.58 | ±9.6 |
| 10516 | AAE | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc dc) | WLAN | 1.57 | ±9.6 |
| 10517 | AAF | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc dc) | WLAN | 1.58 | ±9.6 |
| 10518 | AAF | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc dc) | WLAN | 8.03 | ±9.6 |
| 10519 | AAF | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc dc) | WLAN | 8.39 | ±9.6 |
| 10520 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc dc) | WLAN | 8.12 | ±9.6 |
| 10521 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc dc) | WLAN | 7.97 | ±9.6 |
| 10522 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc dc) | WLAN | 8.45 | ±9.6 |
| 10523 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc dc) | WLAN | 8.08 | ±9.6 |
| 10524 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc dc) | WLAN | 8.27 | ±9.6 |
| 10525 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS0, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10526 | AAF | IEEE 802.11ac WiFi (20 MHz, MCS1, 99pc dc) | WLAN | 8.42 | ±9.6 |
| 10527 | AAF | IEEE 802.11ac WiFi (20 MHz, MCS2, 99pc dc) | WLAN | 8.21 | ±9.6 |
| 10528 | AAF | IEEE 802.11ac WiFi (20 MHz, MCS3, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10529 | AAF | IEEE 802.11ac WiFi (20 MHz, MCS4, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10531 | AAF | IEEE 802.11ac WiFi (20 MHz, MCS5, 99pc dc) | WLAN | 8.43 | ±9.6 |
| 10532 | AAF | IEEE 802.11ac WiFi (20 MHz, MCS7, 99pc dc) | WLAN | 8.29 | ±9.6 |
| 10533 | AAE | IEEE 802.11ac WiFi (20 MHz, MCS8, 99pc dc) | WLAN | 8.38 | ±9.6 |
| 10534 | AAE | IEEE 802.11ac WiFi (40 MHz, MCS0, 99pc dc) | WLAN | 8.45 | ±9.6 |
| 10535 | AAE | IEEE 802.11ac WiFi (40 MHz, MCS1, 99pc dc) | WLAN | 8.45 | ±9.6 |
| 10536 | AAF | IEEE 802.11ac WiFi (40 MHz, MCS2, 99pc dc) | WLAN | 8.32 | ±9.6 |
| 10537 | AAF | IEEE 802.11ac WiFi (40 MHz, MCS3, 99pc dc) | WLAN | 8.44 | ±9.6 |
| 10538 | AAF | IEEE 802.11ac WiFi (40 MHz, MCS4, 99pc dc) | WLAN | 8.54 | ±9.6 |
| 10540 | AAA | IEEE 802.11ac WiFi (40 MHz, MCS6, 99pc dc) | WLAN | 8.39 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^{k=2}$ k = 2 |
|---|---|---|---|---|---|
| 10541 | AAA | IEEE 802.11ac WiFi (40 MHz, MCS7, 99pc dc) | WLAN | 0.46 | ±9.6 |
| 10542 | AAA | IEEE 802.11ac WiFi (40 MHz, MCS8, 99pc dc) | WLAN | 0.65 | ±9.6 |
| 10543 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS9, 99pc dc) | WLAN | 0.69 | ±9.6 |
| 10544 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS0, 99pc dc) | WLAN | 0.47 | ±9.6 |
| 10545 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS1, 99pc dc) | WLAN | 0.55 | ±9.6 |
| 10546 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS2, 99pc dc) | WLAN | 0.56 | ±9.6 |
| 10547 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS3, 99pc dc) | WLAN | 0.49 | ±9.6 |
| 10548 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS4, 99pc dc) | WLAN | 0.57 | ±9.6 |
| 10550 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS5, 99pc dc) | WLAN | 0.58 | ±9.6 |
| 10551 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS6, 99pc dc) | WLAN | 0.50 | ±9.6 |
| 10552 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS7, 99pc dc) | WLAN | 0.42 | ±9.6 |
| 10553 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS8, 99pc dc) | WLAN | 0.45 | ±9.6 |
| 10554 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS9, 99pc dc) | WLAN | 0.46 | ±9.6 |
| 10555 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS0, 99pc dc) | WLAN | 0.47 | ±9.6 |
| 10556 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS1, 99pc dc) | WLAN | 0.50 | ±9.6 |
| 10557 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS2, 99pc dc) | WLAN | 0.52 | ±9.6 |
| 10558 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS3, 99pc dc) | WLAN | 0.61 | ±9.6 |
| 10560 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS4, 99pc dc) | WLAN | 0.70 | ±9.6 |
| 10561 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS5, 99pc dc) | WLAN | 0.66 | ±9.6 |
| 10562 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS6, 99pc dc) | WLAN | 0.68 | ±9.6 |
| 10563 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS7, 99pc dc) | WLAN | 0.77 | ±9.6 |
| 10564 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS8, 99pc dc) | WLAN | 0.85 | ±9.6 |
| 10565 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS9, 99pc dc) | WLAN | 0.86 | ±9.6 |
| 10566 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 1 Mbps, 99pc dc) | WLAN | 0.48 | ±9.6 |
| 10567 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc dc) | WLAN | 0.13 | ±9.6 |
| 10568 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc dc) | WLAN | 0.56 | ±9.6 |
| 10569 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc dc) | WLAN | 0.57 | ±9.6 |
| 10570 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc dc) | WLAN | 0.10 | ±9.6 |
| 10571 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc dc) | WLAN | 0.10 | ±9.6 |
| 10572 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc dc) | WLAN | 0.10 | ±9.6 |
| 10573 | AAC | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc dc) | WLAN | 1.99 | ±9.6 |
| 10574 | AAC | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc dc) | WLAN | 1.98 | ±9.6 |
| 10575 | AAC | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc dc) | WLAN | 1.98 | ±9.6 |
| 10576 | AAC | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc dc) | WLAN | 1.98 | ±9.6 |
| 10577 | AAC | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc dc) | WLAN | 0.59 | ±9.6 |
| 10578 | AAD | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc dc) | WLAN | 0.60 | ±9.6 |
| 10579 | AAD | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc dc) | WLAN | 0.70 | ±9.6 |
| 10580 | AAD | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc dc) | WLAN | 0.49 | ±9.6 |
| 10581 | AAD | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc dc) | WLAN | 0.36 | ±9.6 |
| 10582 | AAD | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc dc) | WLAN | 0.76 | ±9.6 |
| 10583 | AAD | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc dc) | WLAN | 0.35 | ±9.6 |
| 10584 | AAD | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc dc) | WLAN | 0.67 | ±9.6 |
| 10585 | AAD | IEEE 802.11ah WiFi 5 GHz (OFDM, 6 Mbps, 99pc dc) | WLAN | 0.59 | ±9.6 |
| 10586 | AAD | IEEE 802.11ah WiFi 5 GHz (OFDM, 9 Mbps, 99pc dc) | WLAN | 0.60 | ±9.6 |
| 10587 | AAD | IEEE 802.11ah WiFi 5 GHz (OFDM, 12 Mbps, 99pc dc) | WLAN | 0.70 | ±9.6 |
| 10588 | AAD | IEEE 802.11ah WiFi 5 GHz (OFDM, 18 Mbps, 99pc dc) | WLAN | 0.49 | ±9.6 |
| 10589 | AAA | IEEE 802.11ah WiFi 5 GHz (OFDM, 24 Mbps, 99pc dc) | WLAN | 0.36 | ±9.6 |
| 10590 | AAA | IEEE 802.11ah WiFi 5 GHz (OFDM, 36 Mbps, 99pc dc) | WLAN | 0.76 | ±9.6 |
| 10591 | AAA | IEEE 802.11ah WiFi 5 GHz (OFDM, 48 Mbps, 99pc dc) | WLAN | 0.35 | ±9.6 |
| 10592 | AAA | IEEE 802.11ah WiFi 5 GHz (OFDM, 54 Mbps, 99pc dc) | WLAN | 0.67 | ±9.6 |
| 10593 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS0, 99pc dc) | WLAN | 0.63 | ±9.6 |
| 10594 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS1, 99pc dc) | WLAN | 0.79 | ±9.6 |
| 10595 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS2, 99pc dc) | WLAN | 0.84 | ±9.6 |
| 10596 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS3, 99pc dc) | WLAN | 0.74 | ±9.6 |
| 10597 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS4, 99pc dc) | WLAN | 0.74 | ±9.6 |
| 10598 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS5, 99pc dc) | WLAN | 0.71 | ±9.6 |
| 10599 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS6, 99pc dc) | WLAN | 0.72 | ±9.6 |
| 10600 | AAA | IEEE 802.11n (HT Mixed, 20 MHz, MCS7, 99pc dc) | WLAN | 0.80 | ±9.6 |
| 10601 | AAA | IEEE 802.11n (HT Mixed, 40 MHz, MCS0, 99pc dc) | WLAN | 0.79 | ±9.6 |
| 10602 | AAA | IEEE 802.11n (HT Mixed, 40 MHz, MCS1, 99pc dc) | WLAN | 0.88 | ±9.6 |
| 10603 | AAA | IEEE 802.11n (HT Mixed, 40 MHz, MCS2, 99pc dc) | WLAN | 0.82 | ±9.6 |
| 10604 | AAA | IEEE 802.11n (HT Mixed, 40 MHz, MCS3, 99pc dc) | WLAN | 0.94 | ±9.6 |
| 10605 | AAA | IEEE 802.11n (HT Mixed, 40 MHz, MCS4, 99pc dc) | WLAN | 0.93 | ±9.6 |
| 10606 | AAA | IEEE 802.11n (HT Mixed, 40 MHz, MCS5, 99pc dc) | WLAN | 0.76 | ±9.6 |
| 10607 | AAA | IEEE 802.11n (HT Mixed, 40 MHz, MCS6, 99pc dc) | WLAN | 0.97 | ±9.6 |
| 10608 | AAC | IEEE 802.11n (HT Mixed, 40 MHz, MCS7, 99pc dc) | WLAN | 0.82 | ±9.6 |
| 10657 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS0, 99pc dc) | WLAN | 0.64 | ±9.6 |
| 10658 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS1, 99pc dc) | WLAN | 0.77 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | Unc* k = 2 |
|---|---|---|---|---|---|
| 10609 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS2, 90pc dc) | WLAN | 8.67 | ±9.6 |
| 10610 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS3, 90pc dc) | WLAN | 8.78 | ±9.6 |
| 10611 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS4, 90pc dc) | WLAN | 8.70 | ±9.6 |
| 10612 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS5, 90pc dc) | WLAN | 8.77 | ±9.6 |
| 10613 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS6, 90pc dc) | WLAN | 8.94 | ±9.6 |
| 10614 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS7, 90pc dc) | WLAN | 8.59 | ±9.6 |
| 10615 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS8, 90pc dc) | WLAN | 8.62 | ±9.6 |
| 10616 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS0, 90pc dc) | WLAN | 8.62 | ±9.6 |
| 10617 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS1, 90pc dc) | WLAN | 8.61 | ±9.6 |
| 10618 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS2, 90pc dc) | WLAN | 8.68 | ±9.6 |
| 10619 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS3, 90pc dc) | WLAN | 8.66 | ±9.6 |
| 10620 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS4, 90pc dc) | WLAN | 8.67 | ±9.6 |
| 10621 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS5, 90pc dc) | WLAN | 8.77 | ±9.6 |
| 10622 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS6, 90pc dc) | WLAN | 8.66 | ±9.6 |
| 10623 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS7, 90pc dc) | WLAN | 8.62 | ±9.6 |
| 10624 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS8, 90pc dc) | WLAN | 8.96 | ±9.6 |
| 10625 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS9, 90pc dc) | WLAN | 8.96 | ±9.6 |
| 10626 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS0, 90pc dc) | WLAN | 8.85 | ±9.6 |
| 10627 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS1, 90pc dc) | WLAN | 8.86 | ±9.6 |
| 10628 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS2, 90pc dc) | WLAN | 8.71 | ±9.6 |
| 10629 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS3, 90pc dc) | WLAN | 8.85 | ±9.6 |
| 10630 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS4, 90pc dc) | WLAN | 8.79 | ±9.6 |
| 10631 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS5, 90pc dc) | WLAN | 8.81 | ±9.6 |
| 10632 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS6, 90pc dc) | WLAN | 8.74 | ±9.6 |
| 10633 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS7, 90pc dc) | WLAN | 8.83 | ±9.6 |
| 10634 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS8, 90pc dc) | WLAN | 8.90 | ±9.6 |
| 10635 | AAC | IEEE 802.11ac WiFi (80 MHz, MCS9, 90pc dc) | WLAN | 8.81 | ±9.6 |
| 10636 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS0, 90pc dc) | WLAN | 8.83 | ±9.6 |
| 10637 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS1, 90pc dc) | WLAN | 8.79 | ±9.6 |
| 10638 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS2, 90pc dc) | WLAN | 8.86 | ±9.6 |
| 10639 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS3, 90pc dc) | WLAN | 8.85 | ±9.6 |
| 10640 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS4, 90pc dc) | WLAN | 8.98 | ±9.6 |
| 10641 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS5, 90pc dc) | WLAN | 9.05 | ±9.6 |
| 10642 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS6, 90pc dc) | WLAN | 9.05 | ±9.6 |
| 10643 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS7, 90pc dc) | WLAN | 8.89 | ±9.6 |
| 10644 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS8, 90pc dc) | WLAN | 9.05 | ±9.6 |
| 10645 | AAC | IEEE 802.11ac WiFi (160 MHz, MCS9, 90pc dc) | WLAN | 9.11 | ±9.6 |
| 10646 | AAC | LTE-TDD (SC-FDMA, 1 RB, 5MHz, QPSK, UL Sub=2,7) | LTE-TDD | 11.96 | ±9.6 |
| 10647 | AAC | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Sub=2,7) | LTE-TDD | 11.96 | ±9.6 |
| 10648 | AAC | CDMA2000 (1x Advanced) | CDMA2000 | 3.46 | ±9.6 |
| 10652 | AAC | LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%) | LTE-TDD | 6.91 | ±9.6 |
| 10653 | AAC | LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%) | LTE-TDD | 7.43 | ±9.6 |
| 10654 | AAC | LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%) | LTE-TDD | 6.96 | ±9.6 |
| 10655 | AAC | LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%) | LTE-TDD | 7.21 | ±9.6 |
| 10656 | AAC | Pulse Waveform (200 Hz, 10%) | Test | 10.00 | ±9.6 |
| 10659 | AAC | Pulse Waveform (200 Hz, 20%) | Test | 6.99 | ±9.6 |
| 10660 | AAC | Pulse Waveform (200 Hz, 40%) | Test | 3.98 | ±9.6 |
| 10661 | AAC | Pulse Waveform (200 Hz, 60%) | Test | 2.22 | ±9.6 |
| 10662 | AAC | Pulse Waveform (200 Hz, 80%) | Test | 0.97 | ±9.6 |
| 10670 | AAC | Bluetooth Low Energy | Bluetooth | 2.19 | ±9.6 |
| 10671 | AAD | IEEE 802.11ax (20 MHz, MCS0, 90pc dc) | WLAN | 9.08 | ±9.6 |
| 10672 | AAD | IEEE 802.11ax (20 MHz, MCS1, 90pc dc) | WLAN | 8.57 | ±9.6 |
| 10673 | AAD | IEEE 802.11ax (20 MHz, MCS2, 90pc dc) | WLAN | 8.78 | ±9.6 |
| 10674 | AAD | IEEE 802.11ax (20 MHz, MCS3, 90pc dc) | WLAN | 8.74 | ±9.6 |
| 10675 | AAD | IEEE 802.11ax (20 MHz, MCS4, 90pc dc) | WLAN | 8.50 | ±9.6 |
| 10676 | AAD | IEEE 802.11ax (20 MHz, MCS5, 90pc dc) | WLAN | 8.77 | ±9.6 |
| 10677 | AAD | IEEE 802.11ax (20 MHz, MCS6, 90pc dc) | WLAN | 8.73 | ±9.6 |
| 10678 | AAD | IEEE 802.11ax (20 MHz, MCS7, 90pc dc) | WLAN | 8.78 | ±9.6 |
| 10679 | AAD | IEEE 802.11ax (20 MHz, MCS8, 90pc dc) | WLAN | 8.56 | ±9.6 |
| 10680 | AAD | IEEE 802.11ax (20 MHz, MCS9, 90pc dc) | WLAN | 8.50 | ±9.6 |
| 10681 | AAD | IEEE 802.11ax (20 MHz, MCS10, 90pc dc) | WLAN | 8.62 | ±9.6 |
| 10682 | AAF | IEEE 802.11ax (20 MHz, MCS11, 90pc dc) | WLAN | 8.85 | ±9.6 |
| 10683 | AAA | IEEE 802.11ax (20 MHz, MCS0, 99pc dc) | WLAN | 8.42 | ±9.6 |
| 10684 | AAC | IEEE 802.11ax (20 MHz, MCS1, 99pc dc) | WLAN | 8.25 | ±9.6 |
| 10685 | AAC | IEEE 802.11ax (20 MHz, MCS2, 99pc dc) | WLAN | 8.33 | ±9.6 |
| 10686 | AAC | IEEE 802.11ax (20 MHz, MCS3, 99pc dc) | WLAN | 8.25 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | $U_{lab}$ k = 2 |
|---|---|---|---|---|---|
| 10687 | AAE | IEEE 802.11ax (20 MHz, MCS4, 99pc dc) | WLAN | 8.48 | ±9.6 |
| 10688 | AAE | IEEE 802.11ax (20 MHz, MCS5, 99pc dc) | WLAN | 8.29 | ±9.6 |
| 10689 | AAD | IEEE 802.11ax (20 MHz, MCS6, 99pc dc) | WLAN | 8.05 | ±9.6 |
| 10690 | AAE | IEEE 802.11ax (20 MHz, MCS7, 99pc dc) | WLAN | 8.20 | ±9.6 |
| 10691 | AAB | IEEE 802.11ax (20 MHz, MCS8, 99pc dc) | WLAN | 8.25 | ±9.6 |
| 10692 | AAA | IEEE 802.11ax (20 MHz, MCS9, 99pc dc) | WLAN | 8.25 | ±9.6 |
| 10693 | AAA | IEEE 802.11ax (20 MHz, MCS10, 99pc dc) | WLAN | 8.20 | ±9.6 |
| 10694 | AAA | IEEE 802.11ax (20 MHz, MCS11, 99pc dc) | WLAN | 8.67 | ±9.6 |
| 10695 | AAA | IEEE 802.11ax (40 MHz, MCS0, 99pc dc) | WLAN | 8.78 | ±9.6 |
| 10696 | AAA | IEEE 802.11ax (40 MHz, MCS1, 99pc dc) | WLAN | 8.91 | ±9.6 |
| 10697 | AAA | IEEE 802.11ax (40 MHz, MCS2, 99pc dc) | WLAN | 8.61 | ±9.6 |
| 10698 | AAA | IEEE 802.11ax (40 MHz, MCS3, 99pc dc) | WLAN | 8.89 | ±9.6 |
| 10699 | AAA | IEEE 802.11ax (40 MHz, MCS4, 99pc dc) | WLAN | 8.82 | ±9.6 |
| 10700 | AAA | IEEE 802.11ax (40 MHz, MCS5, 99pc dc) | WLAN | 8.70 | ±9.6 |
| 10701 | AAA | IEEE 802.11ax (40 MHz, MCS6, 99pc dc) | WLAN | 8.66 | ±9.6 |
| 10702 | AAA | IEEE 802.11ax (40 MHz, MCS7, 99pc dc) | WLAN | 8.70 | ±9.6 |
| 10703 | AAA | IEEE 802.11ax (40 MHz, MCS8, 99pc dc) | WLAN | 8.82 | ±9.6 |
| 10704 | AAA | IEEE 802.11ax (40 MHz, MCS9, 99pc dc) | WLAN | 8.66 | ±9.6 |
| 10705 | AAA | IEEE 802.11ax (40 MHz, MCS10, 99pc dc) | WLAN | 8.89 | ±9.6 |
| 10706 | AAC | IEEE 802.11ax (40 MHz, MCS11, 99pc dc) | WLAN | 8.66 | ±9.6 |
| 10707 | AAC | IEEE 802.11ax (40 MHz, MCS0, 99pc dc) | WLAN | 8.33 | ±9.6 |
| 10708 | AAC | IEEE 802.11ax (40 MHz, MCS1, 99pc dc) | WLAN | 8.66 | ±9.6 |
| 10709 | AAC | IEEE 802.11ax (40 MHz, MCS2, 99pc dc) | WLAN | 8.33 | ±9.6 |
| 10710 | AAC | IEEE 802.11ax (40 MHz, MCS3, 99pc dc) | WLAN | 8.29 | ±9.6 |
| 10711 | AAC | IEEE 802.11ax (40 MHz, MCS4, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10712 | AAC | IEEE 802.11ax (40 MHz, MCS5, 99pc dc) | WLAN | 8.67 | ±9.6 |
| 10713 | AAC | IEEE 802.11ax (40 MHz, MCS6, 99pc dc) | WLAN | 8.33 | ±9.6 |
| 10714 | AAC | IEEE 802.11ax (40 MHz, MCS7, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10715 | AAC | IEEE 802.11ax (40 MHz, MCS8, 99pc dc) | WLAN | 8.48 | ±9.6 |
| 10716 | AAC | IEEE 802.11ax (40 MHz, MCS9, 99pc dc) | WLAN | 8.30 | ±9.6 |
| 10717 | AAC | IEEE 802.11ax (40 MHz, MCS10, 99pc dc) | WLAN | 8.48 | ±9.6 |
| 10718 | AAC | IEEE 802.11ax (40 MHz, MCS11, 99pc dc) | WLAN | 8.24 | ±9.6 |
| 10719 | AAC | IEEE 802.11ax (80 MHz, MCS0, 99pc dc) | WLAN | 8.81 | ±9.6 |
| 10720 | AAC | IEEE 802.11ax (80 MHz, MCS1, 99pc dc) | WLAN | 8.87 | ±9.6 |
| 10721 | AAC | IEEE 802.11ax (80 MHz, MCS2, 99pc dc) | WLAN | 8.78 | ±9.6 |
| 10722 | AAC | IEEE 802.11ax (80 MHz, MCS3, 99pc dc) | WLAN | 8.58 | ±9.6 |
| 10723 | AAC | IEEE 802.11ax (80 MHz, MCS4, 99pc dc) | WLAN | 8.70 | ±9.6 |
| 10724 | AAC | IEEE 802.11ax (80 MHz, MCS5, 99pc dc) | WLAN | 8.90 | ±9.6 |
| 10725 | AAC | IEEE 802.11ax (80 MHz, MCS6, 99pc dc) | WLAN | 8.74 | ±9.6 |
| 10726 | AAC | IEEE 802.11ax (80 MHz, MCS7, 99pc dc) | WLAN | 8.72 | ±9.6 |
| 10727 | AAC | IEEE 802.11ax (80 MHz, MCS8, 99pc dc) | WLAN | 8.66 | ±9.6 |
| 10728 | AAC | IEEE 802.11ax (80 MHz, MCS9, 99pc dc) | WLAN | 8.63 | ±9.6 |
| 10729 | AAC | IEEE 802.11ax (80 MHz, MCS10, 99pc dc) | WLAN | 8.64 | ±9.6 |
| 10730 | AAC | IEEE 802.11ax (80 MHz, MCS11, 99pc dc) | WLAN | 8.67 | ±9.6 |
| 10731 | AAC | IEEE 802.11ax (80 MHz, MCS0, 99pc dc) | WLAN | 8.42 | ±9.6 |
| 10732 | AAC | IEEE 802.11ax (80 MHz, MCS1, 99pc dc) | WLAN | 8.46 | ±9.6 |
| 10733 | AAC | IEEE 802.11ax (80 MHz, MCS2, 99pc dc) | WLAN | 8.40 | ±9.6 |
| 10734 | AAC | IEEE 802.11ax (80 MHz, MCS3, 99pc dc) | WLAN | 8.25 | ±9.6 |
| 10735 | AAC | IEEE 802.11ax (80 MHz, MCS4, 99pc dc) | WLAN | 8.33 | ±9.6 |
| 10736 | AAC | IEEE 802.11ax (80 MHz, MCS5, 99pc dc) | WLAN | 8.27 | ±9.6 |
| 10737 | AAC | IEEE 802.11ax (80 MHz, MCS6, 99pc dc) | WLAN | 8.36 | ±9.6 |
| 10738 | AAC | IEEE 802.11ax (80 MHz, MCS7, 99pc dc) | WLAN | 8.42 | ±9.6 |
| 10739 | AAC | IEEE 802.11ax (80 MHz, MCS8, 99pc dc) | WLAN | 8.29 | ±9.6 |
| 10740 | AAC | IEEE 802.11ax (80 MHz, MCS9, 99pc dc) | WLAN | 8.48 | ±9.6 |
| 10741 | AAC | IEEE 802.11ax (80 MHz, MCS10, 99pc dc) | WLAN | 8.40 | ±9.6 |
| 10742 | AAC | IEEE 802.11ax (80 MHz, MCS11, 99pc dc) | WLAN | 8.43 | ±9.6 |
| 10743 | AAC | IEEE 802.11ax (160 MHz, MCS0, 90pc dc) | WLAN | 8.94 | ±9.6 |
| 10744 | AAC | IEEE 802.11ax (160 MHz, MCS1, 90pc dc) | WLAN | 9.16 | ±9.6 |
| 10745 | AAC | IEEE 802.11ax (160 MHz, MCS2, 90pc dc) | WLAN | 8.93 | ±9.6 |
| 10746 | AAC | IEEE 802.11ax (160 MHz, MCS3, 90pc dc) | WLAN | 9.11 | ±9.6 |
| 10747 | AAC | IEEE 802.11ax (160 MHz, MCS4, 90pc dc) | WLAN | 9.04 | ±9.6 |
| 10748 | AAC | IEEE 802.11ax (160 MHz, MCS5, 90pc dc) | WLAN | 8.93 | ±9.6 |
| 10749 | AAC | IEEE 802.11ax (160 MHz, MCS6, 90pc dc) | WLAN | 8.90 | ±9.6 |
| 10750 | AAC | IEEE 802.11ax (160 MHz, MCS7, 90pc dc) | WLAN | 8.79 | ±9.6 |
| 10751 | AAC | IEEE 802.11ax (160 MHz, MCS8, 90pc dc) | WLAN | 8.82 | ±9.6 |
| 10752 | AAC | IEEE 802.11ax (160 MHz, MCS9, 90pc dc) | WLAN | 8.81 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | Unc^E k = 2 |
|---|---|---|---|---|---|
| 10783 | AAC | IEEE 802.11ax (160MHz, MCS10, 90pc dc) | WLAN | 8.01 | ±9.6 |
| 10784 | AAC | IEEE 802.11ax (160MHz, MCS11, 90pc dc) | WLAN | 8.04 | ±9.6 |
| 10785 | AAC | IEEE 802.11ax (160MHz, MCS0, 90pc dc) | WLAN | 8.64 | ±9.6 |
| 10786 | AAC | IEEE 802.11ax (160MHz, MCS1, 90pc dc) | WLAN | 8.77 | ±9.6 |
| 10787 | AAC | IEEE 802.11ax (160MHz, MCS2, 90pc dc) | WLAN | 8.77 | ±9.6 |
| 10788 | AAC | IEEE 802.11ax (160MHz, MCS3, 90pc dc) | WLAN | 8.69 | ±9.6 |
| 10789 | AAC | IEEE 802.11ax (160MHz, MCS4, 90pc dc) | WLAN | 8.58 | ±9.6 |
| 10790 | AAC | IEEE 802.11ax (160MHz, MCS5, 90pc dc) | WLAN | 8.49 | ±9.6 |
| 10791 | AAC | IEEE 802.11ax (160MHz, MCS6, 90pc dc) | WLAN | 8.54 | ±9.6 |
| 10792 | AAC | IEEE 802.11ax (160MHz, MCS7, 90pc dc) | WLAN | 8.49 | ±9.6 |
| 10793 | AAC | IEEE 802.11ax (160MHz, MCS8, 90pc dc) | WLAN | 8.53 | ±9.6 |
| 10794 | AAC | IEEE 802.11ax (160MHz, MCS9, 90pc dc) | WLAN | 8.54 | ±9.6 |
| 10795 | AAC | IEEE 802.11ax (160MHz, MCS10, 90pc dc) | WLAN | 8.54 | ±9.6 |
| 10796 | AAC | IEEE 802.11ax (160MHz, MCS11, 90pc dc) | WLAN | 8.51 | ±9.6 |
| 10797 | AAC | 5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 7.99 | ±9.6 |
| 10798 | AAC | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.01 | ±9.6 |
| 10769 | AAC | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.01 | ±9.6 |
| 10770 | AAC | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.02 | ±9.6 |
| 10771 | AAC | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.02 | ±9.6 |
| 10772 | AAC | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.03 | ±9.6 |
| 10773 | AAC | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.03 | ±9.6 |
| 10774 | AAC | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.02 | ±9.6 |
| 10775 | AAC | 5G NR (CP-OFDM, 50% RB, 5 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.51 | ±9.6 |
| 10776 | AAC | 5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.50 | ±9.6 |
| 10777 | AAC | 5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.50 | ±9.6 |
| 10778 | AAC | 5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.54 | ±9.6 |
| 10779 | AAC | 5G NR (CP-OFDM, 50% RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.42 | ±9.6 |
| 10780 | AAC | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.38 | ±9.6 |
| 10781 | AAC | 5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.38 | ±9.6 |
| 10782 | AAC | 5G NR (CP-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.43 | ±9.6 |
| 10783 | AAC | 5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.51 | ±9.6 |
| 10784 | AAC | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.29 | ±9.6 |
| 10785 | AAC | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.40 | ±9.6 |
| 10786 | AAC | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.35 | ±9.6 |
| 10787 | AAC | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.44 | ±9.6 |
| 10788 | AAC | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.39 | ±9.6 |
| 10789 | AAC | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.37 | ±9.6 |
| 10790 | AAC | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.39 | ±9.6 |
| 10791 | AAC | 5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.83 | ±9.6 |
| 10792 | AAC | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.93 | ±9.6 |
| 10793 | AAC | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.98 | ±9.6 |
| 10794 | AAC | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.92 | ±9.6 |
| 10795 | AAC | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.84 | ±9.6 |
| 10796 | AAC | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.82 | ±9.6 |
| 10797 | AAC | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.01 | ±9.6 |
| 10798 | AAC | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.89 | ±9.6 |
| 10799 | AAC | 5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.93 | ±9.6 |
| 10801 | AAC | 5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.89 | ±9.6 |
| 10802 | AAC | 5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.87 | ±9.6 |
| 10803 | AAE | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 7.93 | ±9.6 |
| 10805 | AAD | 5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.34 | ±9.6 |
| 10806 | AAD | 5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.37 | ±9.6 |
| 10809 | AAD | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.34 | ±9.6 |
| 10810 | AAD | 5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.34 | ±9.6 |
| 10812 | AAD | 5G NR (CP-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.35 | ±9.6 |
| 10817 | AAD | 5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.36 | ±9.6 |
| 10818 | AAD | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.34 | ±9.6 |
| 10819 | AAD | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.33 | ±9.6 |
| 10820 | AAD | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.30 | ±9.6 |
| 10821 | AAD | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.41 | ±9.6 |
| 10822 | AAD | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.41 | ±9.6 |
| 10823 | AAD | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.38 | ±9.6 |
| 10824 | AAD | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.39 | ±9.6 |
| 10825 | AAD | 5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.41 | ±9.6 |
| 10827 | AAD | 5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.42 | ±9.6 |
| 10828 | AAE | 5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.43 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | Unc^E k = 2 |
|---|---|---|---|---|---|
| 10829 | AAD | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.40 | ±9.6 |
| 10830 | AAD | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.63 | ±9.6 |
| 10831 | AAD | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.73 | ±9.6 |
| 10832 | AAD | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.74 | ±9.6 |
| 10833 | AAD | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.70 | ±9.6 |
| 10834 | AAD | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.75 | ±9.6 |
| 10835 | AAD | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.76 | ±9.6 |
| 10836 | AAE | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.66 | ±9.6 |
| 10837 | AAD | 5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.68 | ±9.6 |
| 10838 | AAD | 5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.75 | ±9.6 |
| 10840 | AAD | 5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.67 | ±9.6 |
| 10841 | AAD | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 7.71 | ±9.6 |
| 10843 | AAD | 5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.49 | ±9.6 |
| 10844 | AAD | 5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.34 | ±9.6 |
| 10845 | AAD | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.41 | ±9.6 |
| 10864 | AAD | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.34 | ±9.6 |
| 10865 | AAD | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.38 | ±9.6 |
| 10856 | AAD | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.37 | ±9.6 |
| 10857 | AAD | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.35 | ±9.6 |
| 10858 | AAD | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.38 | ±9.6 |
| 10859 | AAD | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.34 | ±9.6 |
| 10860 | AAD | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.41 | ±9.6 |
| 10861 | AAD | 5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.40 | ±9.6 |
| 10863 | AAD | 5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.41 | ±9.6 |
| 10864 | AAE | 5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.37 | ±9.6 |
| 10865 | AAD | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 60 kHz) | 5G NR FR1 TDD | 8.41 | ±9.6 |
| 10866 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10868 | AAD | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.69 | ±9.6 |
| 10869 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 5.76 | ±9.6 |
| 10870 | AAD | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 5.69 | ±9.6 |
| 10871 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 6.75 | ±9.6 |
| 10872 | AAD | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 6.52 | ±9.6 |
| 10873 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 6.61 | ±9.6 |
| 10874 | AAD | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 6.65 | ±9.6 |
| 10875 | AAD | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 7.78 | ±9.6 |
| 10876 | AAD | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 8.39 | ±9.6 |
| 10877 | AAD | 5G NR (CP-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 7.98 | ±9.6 |
| 10878 | AAD | 5G NR (CP-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 8.41 | ±9.6 |
| 10879 | AAD | 5G NR (CP-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 8.12 | ±9.6 |
| 10880 | AAD | 5G NR (CP-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 8.38 | ±9.6 |
| 10881 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 5.75 | ±9.6 |
| 10883 | AAD | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 5.66 | ±9.6 |
| 10883 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 6.67 | ±9.6 |
| 10884 | AAD | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 6.53 | ±9.6 |
| 10885 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 6.61 | ±9.6 |
| 10886 | AAD | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 6.65 | ±9.6 |
| 10887 | AAD | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 7.78 | ±9.6 |
| 10888 | AAD | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 8.35 | ±9.6 |
| 10889 | AAD | 5G NR (CP-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 8.02 | ±9.6 |
| 10890 | AAD | 5G NR (CP-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 8.40 | ±9.6 |
| 10891 | AAD | 5G NR (CP-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 8.13 | ±9.6 |
| 10892 | AAD | 5G NR (CP-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 8.41 | ±9.6 |
| 10897 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10898 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.67 | ±9.6 |
| 10899 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.67 | ±9.6 |
| 10900 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10901 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10902 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10903 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10904 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10905 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10906 | AAD | 5G NR (DFT-s-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.68 | ±9.6 |
| 10907 | AAD | 5G NR (DFT-s-OFDM, 50% RB, 5 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.78 | ±9.6 |
| 10908 | AAD | 5G NR (DFT-s-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.93 | ±9.6 |
| 10909 | AAD | 5G NR (DFT-s-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.96 | ±9.6 |
| 10910 | AAD | 5G NR (DFT-s-OFDM, 50% RB, 20 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.83 | ±9.6 |

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| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^{E}$ k = 2 |
|---|---|---|---|---|---|
| 10911 | AAD | 5G NR (OFT-s-OFDM, 50% RB, 25 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.93 | ±9.6 |
| 10912 | AAD | 5G NR (OFT-s-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10913 | AAD | 5G NR (OFT-s-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10914 | AAD | 5G NR (OFT-s-OFDM, 50% RB, 50 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.85 | ±9.6 |
| 10915 | AAD | 5G NR (OFT-s-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.80 | ±9.6 |
| 10916 | AAD | 5G NR (OFT-s-OFDM, 50% RB, 80 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.87 | ±9.6 |
| 10917 | AAD | 5G NR (OFT-s-OFDM, 50% RB, 100 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10918 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.88 | ±9.6 |
| 10919 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.86 | ±9.6 |
| 10920 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.87 | ±9.6 |
| 10921 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10922 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.82 | ±9.6 |
| 10923 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10924 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10925 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.85 | ±9.6 |
| 10926 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10927 | AAD | 5G NR (OFT-s-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 5.84 | ±9.6 |
| 10928 | AAD | 5G NR (OFT-s-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.52 | ±9.6 |
| 10929 | AAD | 5G NR (OFT-s-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.52 | ±9.6 |
| 10930 | AAD | 5G NR (OFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.52 | ±9.6 |
| 10931 | AAD | 5G NR (OFT-s-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.51 | ±9.6 |
| 10932 | AAB | 5G NR (OFT-s-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.51 | ±9.6 |
| 10933 | AAA | 5G NR (OFT-s-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.51 | ±9.6 |
| 10934 | AAA | 5G NR (OFT-s-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.51 | ±9.6 |
| 10935 | AAA | 5G NR (OFT-s-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.51 | ±9.6 |
| 10936 | AAC | 5G NR (OFT-s-OFDM, 50% RB, 5 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.95 | ±9.6 |
| 10937 | AAB | 5G NR (OFT-s-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.77 | ±9.6 |
| 10938 | AAB | 5G NR (OFT-s-OFDM, 50% RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.95 | ±9.6 |
| 10939 | AAB | 5G NR (OFT-s-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.82 | ±9.6 |
| 10940 | AAB | 5G NR (OFT-s-OFDM, 50% RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.89 | ±9.6 |
| 10941 | AAB | 5G NR (OFT-s-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.83 | ±9.6 |
| 10942 | AAB | 5G NR (OFT-s-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.85 | ±9.6 |
| 10943 | AAB | 5G NR (OFT-s-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.95 | ±9.6 |
| 10944 | AAB | 5G NR (OFT-s-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.81 | ±9.6 |
| 10945 | AAB | 5G NR (OFT-s-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.89 | ±9.6 |
| 10946 | AAC | 5G NR (OFT-s-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.83 | ±9.6 |
| 10947 | AAB | 5G NR (OFT-s-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.87 | ±9.6 |
| 10948 | AAB | 5G NR (OFT-s-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.94 | ±9.6 |
| 10949 | AAB | 5G NR (OFT-s-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.87 | ±9.6 |
| 10950 | AAB | 5G NR (OFT-s-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.94 | ±9.6 |
| 10951 | AAB | 5G NR (OFT-s-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1 FDD | 5.92 | ±9.6 |
| 10952 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz) | 5G NR FR1 FDD | 8.25 | ±9.6 |
| 10953 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz) | 5G NR FR1 FDD | 8.15 | ±9.6 |
| 10954 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz) | 5G NR FR1 FDD | 8.23 | ±9.6 |
| 10955 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz) | 5G NR FR1 FDD | 8.42 | ±9.6 |
| 10956 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz) | 5G NR FR1 FDD | 8.14 | ±9.6 |
| 10957 | AAC | 5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz) | 5G NR FR1 FDD | 8.31 | ±9.6 |
| 10958 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz) | 5G NR FR1 FDD | 9.01 | ±9.6 |
| 10959 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz) | 5G NR FR1 FDD | 9.33 | ±9.6 |
| 10960 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz) | 5G NR FR1 TDD | 9.32 | ±9.6 |
| 10961 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz) | 5G NR FR1 TDD | 9.36 | ±9.6 |
| 10962 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz) | 5G NR FR1 TDD | 9.40 | ±9.6 |
| 10963 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz) | 5G NR FR1 TDD | 9.59 | ±9.6 |
| 10964 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.29 | ±9.6 |
| 10965 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.37 | ±9.6 |
| 10966 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.58 | ±9.6 |
| 10967 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.42 | ±9.6 |
| 10968 | AAB | 5G NR DL (CP-OFDM, TM 3.1, 100 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.49 | ±9.6 |
| 10972 | AAB | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 11.59 | ±9.6 |
| 10973 | AAB | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 9.06 | ±9.6 |
| 10974 | AAB | 5G NR (CP-OFDM, 100% RB, 100 MHz, 256-QAM, 30 kHz) | 5G NR FR1 TDD | 10.28 | ±9.6 |
| 10978 | AAA | ULLA BDR | ULLA | 2.23 | ±9.6 |
| 10979 | AAA | ULLA HDR4 | ULLA | 7.02 | ±9.6 |
| 10980 | AAA | ULLA HDR8 | ULLA | 8.89 | ±9.6 |
| 10981 | AAA | ULLA HDRp4 | ULLA | 1.50 | ±9.6 |
| 10982 | AAA | ULLA HDRp8 | ULLA | 1.44 | ±9.6 |

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EUmmWV4 - SN:9641 October 25, 2022

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc[E] k = 2 |
|---|---|---|---|---|---|
| 10983 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 40 MHz, 64-QAM, 15 kHz) | 5G NR FR1 TDD | 9.31 | ±9.6 |
| 10984 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 50 MHz, 64-QAM, 15 kHz) | 5G NR FR1 TDD | 9.42 | ±9.6 |
| 10985 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 40 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.64 | ±9.6 |
| 10986 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 50 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.80 | ±9.6 |
| 10987 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 60 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.83 | ±9.6 |
| 10988 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 70 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.88 | ±9.6 |
| 10989 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 80 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.93 | ±9.6 |
| 10990 | AAA | 5G NR DL (CP-OFDM, TM 3.1, 90 MHz, 64-QAM, 30 kHz) | 5G NR FR1 TDD | 9.92 | ±9.6 |

[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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ANNEX B

VALIDATION SOURCE
CALIBRATION REPORTS

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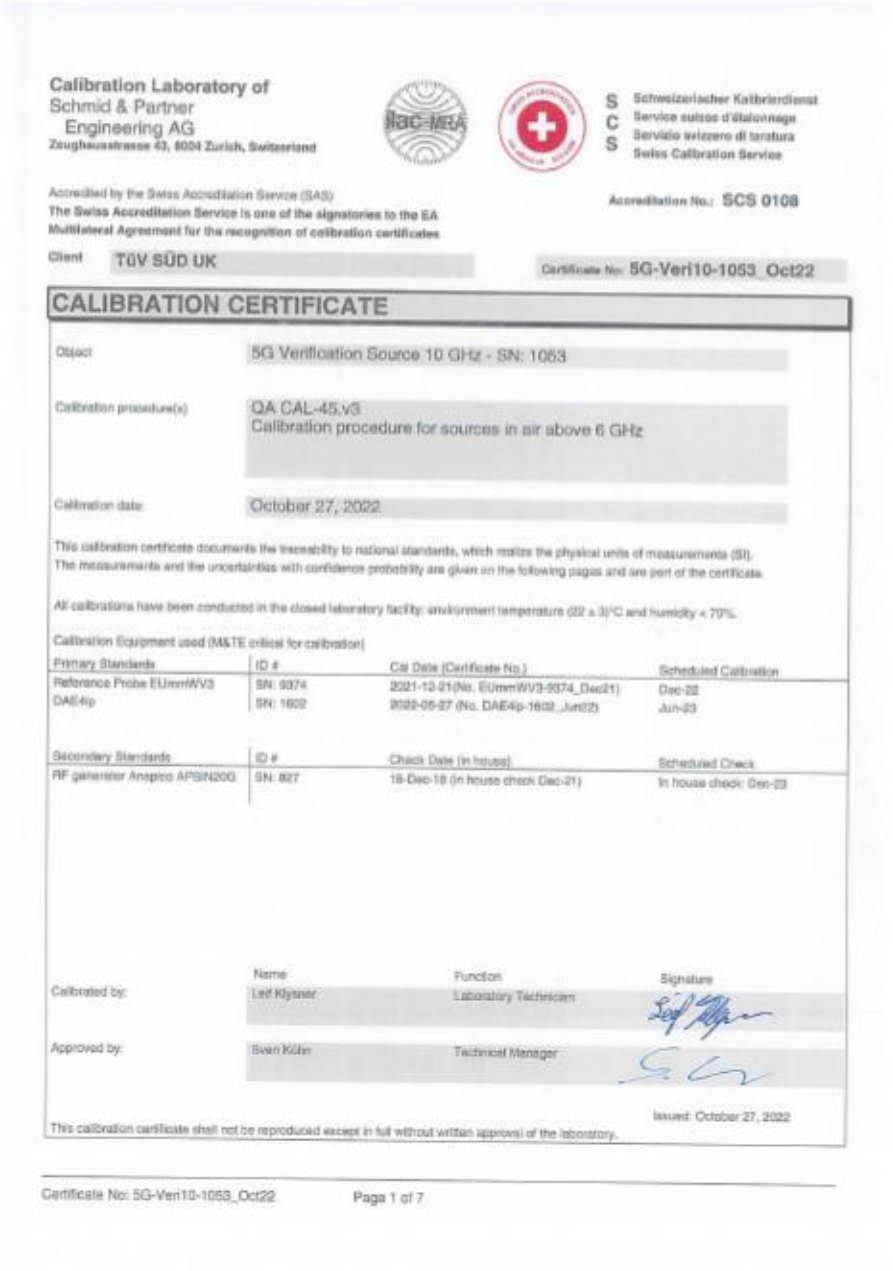

Calibration Laboratory of
Schmid & Partner
Engineering AG
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Servizio svizzero di taratura
Swiss Calibration Service

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

Accreditation No.: SCS 0108

Client: TÜV SÜD UK

Certificate No: 5G-Veri10-1053_Oct22

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | 5G Verification Source 10 GHz - SN: 1053 |
| Calibration procedure(s) | QA CAL-45.v3<br>Calibration procedure for sources in air above 6 GHz |
| Calibration date | October 27, 2022 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Reference Probe EUmmWV3 | SN: 9374 | 2021-12-21 (No. EUmmWV3-9374_Dec21) | Dec-22 |
| DAE4ip | SN: 1602 | 2022-06-27 (No. DAE4ip-1602_Jun22) | Jun-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator Anapico APSIN20G | SN: 827 | 18-Dec-18 (in house check Dec-21) | In house check: Dec-23 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Leif Klysner | Laboratory Technician | |
| Approved by: | Sven Kühn | Technical Manager | |

Issued: October 27, 2022

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

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Accreditation No.: SCS 0108

**Glossary**

CW Continuous wave

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

- Internal procedure QA CAL-45-5Gsources
- IEC TR 63170 ED1, "Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz", January 2018

**Methods Applied and Interpretation of Parameters**

- *Coordinate System:* z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and horn flange.
- *Measurement Conditions: (1) 10 GHz:* The radiated power is the forward power to the horn antenna minus ohmic and mismatch loss. The forward power is measured prior and after the measurement with a power sensor. During the measurements, the horn is directly connected to the cable and the antenna ohmic and mismatch losses are determined by far-field measurements. *(2) 30, 45, 60 and 90 GHz:* The verification sources are switched on for at least 30 minutes. Absorbers are used around the probe cub and at the ceiling to minimize reflections.
- *Horn Positioning:* The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- *E- field distribution:* E field is measured in two x-y-plane (10mm, 10mm + λ/4) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-field-maxima and the averaged (1cm² and 4cm²) power density values at 10mm in front of the horn.
- *Field polarization:* Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

**Calibrated Quantity**

- Local peak E-field (V/m) and average of peak spatial components of the poynting vector (W/m²) averaged over the surface area of 1 cm² and 4cm² at the nominal operational frequency of the verification source. Both square and circular averaging results are listed.

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

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## Measurement Conditions

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

| DASY Version | DASY8 Module mmWave | V3.0 |
|---|---|---|
| Phantom | 5G Phantom | |
| Distance Horn Aperture - plane | 10 mm | |
| XY Scan Resolution | dx, dy = 7.5 mm | |
| Number of measured planes | 2 (10mm, 10mm + λ/4) | |
| Frequency | 10 GHz ± 10 MHz | |

## Calibration Parameters, 10 GHz

### Circular Averaging

| Distance Horn Aperture to Measured Plane | $P_{rad}$[1] (mW) | Max E-field (V/m) | Uncertainty (k = 2) | Avg Power Density Avg ($psPD_{1cm^2}$, $psPD_{4cm^2}$, $psPD_{mod,1}$) ($W/m^2$) | | Uncertainty (k = 2) |
|---|---|---|---|---|---|---|
| | | | | 1 $cm^2$ | 4 $cm^2$ | |
| 10 mm | 86.1 | 147 | 1.27 dB | 54.1 | 50.1 | 1.28 dB |

### Square Averaging

| Distance Horn Aperture to Measured Plane | $P_{rad}$[1] (mW) | Max E-field (V/m) | Uncertainty (k = 2) | Avg Power Density Avg ($psPD_{1cm^2}$, $psPD_{4cm^2}$, $psPD_{mod,1}$) ($W/m^2$) | | Uncertainty (k = 2) |
|---|---|---|---|---|---|---|
| | | | | 1 $cm^2$ | 4 $cm^2$ | |
| 10 mm | 86.1 | 147 | 1.27 dB | 54.2 | 50.1 | 1.28 dB |

[1] Assessed ohmic and mismatch loss plus numerical offset: 0.55 dB

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## DASY Report

**Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)**

**Device under Test Properties**

| Name, Manufacturer | Dimensions [mm] | IMEI | DUT Type |
|---|---|---|---|
| 5G Verification Source 10 GHz | 100.0 x 100.0 x 172.0 | SN: 1053 | - |

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 90 - | 10.0 mm | Validation band | CW | 10000.0, 10000 | 1.0 |

**Hardware Setup**

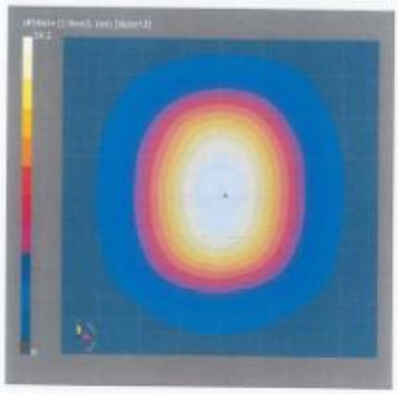
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-55GHz, 2021-12-21 | DAE4ip Sn1602, 2022-06-27 |

**Scan Setup**

| | 5G Scan |
|---|---|
| Grid Extents [mm] | 120.0 x 120.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

**Measurement Results**

| | 5G Scan |
|---|---|
| Date | 2022-10-27, 10:18 |
| Avg. Area [cm²] | 1.00 |
| psPDn+ [W/m²] | 54.0 |
| psPDtot+ [W/m²] | 54.1 |
| psPDmod+ [W/m²] | 54.2 |
| $E_{max}$ [V/m] | 147 |
| Power Drift [dB] | 0.03 |



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## DASY Report

**Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)**

**Device under Test Properties**

| Name, Manufacturer | Dimensions [mm] | IMEI | DUT Type |
|---|---|---|---|
| 5G Verification Source 10 GHz | 100.0 x 100.0 x 172.0 | SN: 1053 | - |

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G - | 10.0 mm | Validation band | CW | 10000.0, 10000 | 1.0 |

**Hardware Setup**

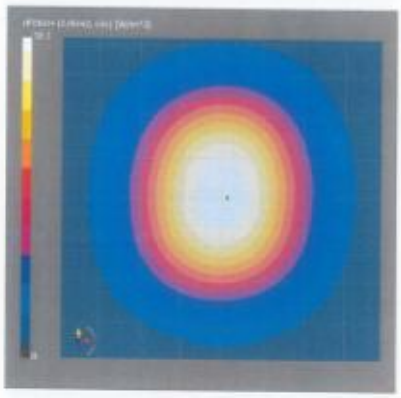
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Data |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-53GHz, 2021-12-21 | DAE4ip Sn1602, 2022-06-27 |

**Scan Setup**

| | 5G Scan |
|---|---|
| Grid Extents [mm] | 120.0 x 120.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

**Measurement Results**

| | 5G Scan |
|---|---|
| Date | 2022-10-27, 10:10 |
| Avg. Area [cm²] | 4.00 |
| psPD1+ [W/m²] | 49.0 |
| psPDtot+ [W/m²] | 50.1 |
| psPDmod+ [W/m²] | 50.3 |
| $S_{max}$ [V/m] | 147 |
| Power Drift [dB] | 0.03 |



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## DASY Report

**Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)**

**Device under Test Properties**

| Name, Manufacturer | Dimensions [mm] | IMEI | DUT Type |
|---|---|---|---|
| 5G Verification Source 10 GHz | 100.0 x 100.0 x 172.0 | SN: 1053 | - |

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G - | 10.0 mm | Validation band | CW | 10000.0, 10000 | 1.0 |

**Hardware Setup**

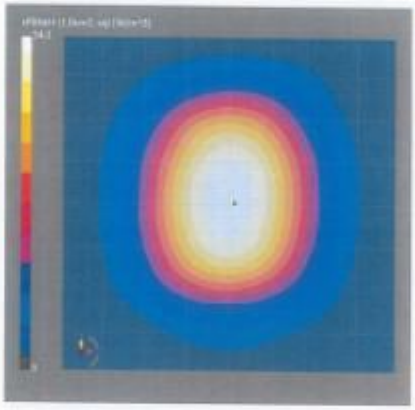
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-55GHz, 2021-12-21 | DAE4ip Sn1602, 2022-06-27 |

**Scan Setup**

| | 5G Scan |
|---|---|
| Grid Extents [mm] | 120.0 x 120.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

**Measurement Results**

| | 5G Scan |
|---|---|
| Date | 2022-10-27, 10:18 |
| Avg. Area [cm²] | 1.00 |
| psPGN+ [W/m²] | 54.1 |
| psPGtot+ [W/m²] | 54.2 |
| psPGmod+ [W/m²] | 54.4 |
| Emax [V/m] | 147 |
| Power Drift [dB] | 0.03 |



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## DASY Report

**Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)**

**Device under Test Properties**

| Name, Manufacturer | Dimensions [mm] | IMEI | DUT Type |
|---|---|---|---|
| 5G Verification Source 10 GHz | 100.0 x 100.0 x 172.0 | SN: 1053 | - |

**Exposure Conditions**

| Phantom Section | Position, Test Distance [mm] | Band | Group, | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5G - | 10.0 mm | Validation band | CW | 10000.0, 10000 | 1.0 |

**Hardware Setup**

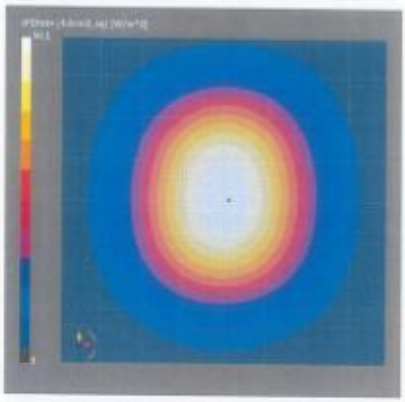
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-55GHz, 2023-12-21 | DAE4p Sn1602, 2022-06-27 |

**Scan Setup**

| | 5G Scan |
|---|---|
| Grid Extents [mm] | 120.0 x 120.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

**Measurement Results**

| | 5G Scan |
|---|---|
| Date | 2022-10-27, 10:18 |
| Avg. Area [cm²] | 4.00 |
| psPDn+ [W/m²] | 49.9 |
| psPDnk+ [W/m²] | 50.1 |
| psPDmod+ [W/m²] | 50.2 |
| $E_{max}$ [V/m] | 147 |
| Power Drift [dB] | 0.03 |



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# ANNEX C

# TEST RESULTS

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**Measurement Report for Siemens IPC MD-57A, BACK, U-NII-7, IEEE 802.11ax (160MHz, MCS0, 99pc duty cycle), Channel 175 (6825.0 MHz)**

## Device Under Test Properties

| Model, Manufacturer | Dimensions [mm] | IMEI | DUT Type |
|---|---|---|---|
| Siemens IPC MD-57A, | 650.0 x 270.0 x 22.0 | | Laptop |

## Exposure Conditions

| Phantom Section | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor |
|---|---|---|---|---|---|
| 5C | BACK, 2.00 | U-NII-7 | WLAN, 10755-AAC | 6825.0, 175 | 1.0 |

## Hardware Setup

| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave - 1112 | Air - | EUmmWV4 - SN9641_F1-55GHz, 2022-10-25 | DAE4ip Sn1705, 2023-04-06 |

## Scans Setup

| Scan Type | 5C Scan |
|---|---|
| Grid Extents [mm] | 100.0 x 100.0 |
| Grid Steps [lambda] | 0.046470891566959054 x 0.046470891566959054 |
| Sensor Surface [mm] | 2.0 |
| MAIA | Y |

## Measurement Results

| Scan Type | 5C Scan |
|---|---|
| Date | 2023-09-01, 16:40 |
| Avg. Area [cm²] | 1.00 |
| psFDn+ [W/m²] | 0.005 |
| psFDtot+ [W/m²] | 0.158 |
| psFDmod+ [W/m²] | 0.914 |
| $E_{max}$ [V/m] | 95.7 |
| Power Drift [dB] | 2.14 |

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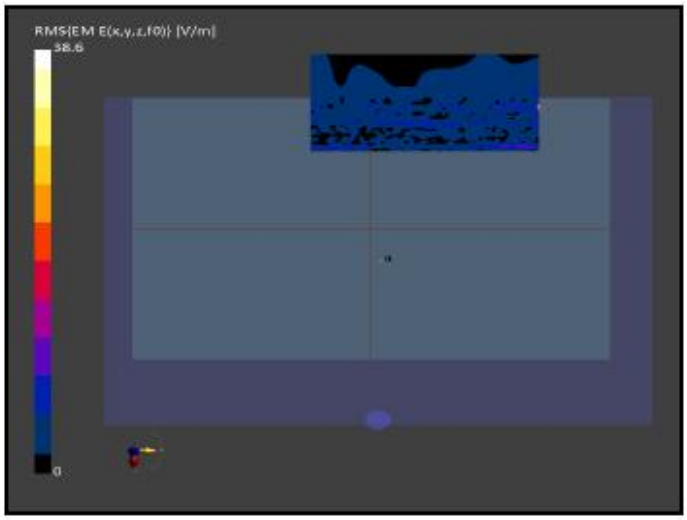


**Figure 4**

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**ANNEX D**

**PHOTOGRAPHS**

**Photograph of EUT**

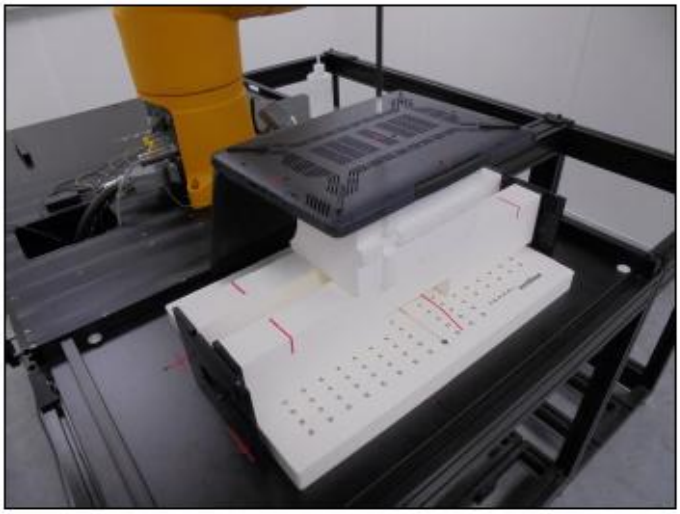

**Figure 5 - EUT in test position**


**Figure 6 - Top of EUT**

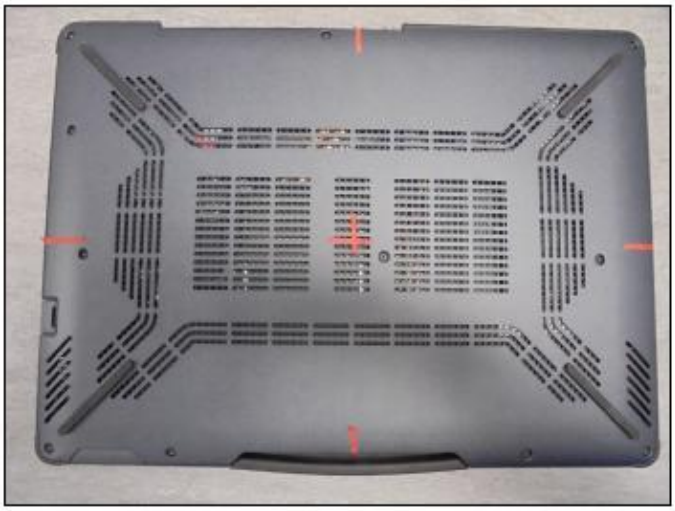

Figure 7 - Rear of EUT