# FCC SAR TEST REPORT

| | | |
|---|---|---|
| **FCC ID** | : | **QXO-AP5050** |
| **Equipment** | : | **Access Point** |
| **Brand Name** | : | **Extreme Networks** |
| **Model Name** | : | **AP5050U** |
| **Applicant** | : | **Extreme Networks, Inc.<br>2121 RDU Center Drive Morrisville North Carolina United States 27560** |
| **Manufacturer** | : | **Extreme Networks, Inc.<br>2121 RDU Center Drive Morrisville North Carolina United States 27560** |
| **Standard** | : | **FCC 47 CFR Part 2 (2.1093)** |

**The product was received on Nov. 09, 2023 and testing was started from Nov. 11, 2023 and completed on Nov. 12, 2023. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Laboratory, the test report shall not be reproduced except in full.**

**Approved by: Cona Huang / Deputy Manager**

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# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FA251735-14 | 01 | Initial issue of report | Mar. 27, 2024 |
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# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for **Extreme Networks, Inc., Access Point, AP5050U**, are as follows.

| Equipment Class | Frequency Band | | Highest SAR Summary | | Highest Simultaneous Transmission 1g SAR (W/kg) | Highest Simultaneous Transmission 10g SAR (W/kg) |
|---|---|---|---|---|---|---|
| | | | Body (Separation 25mm) | Extremity (Separation 0mm) | | |
| | | | 1g SAR (W/kg) | 10g SAR (W/kg) | | |
| DTS | WLAN | 2.4GHz WLAN | 0.45 | 1.39 | 1.59 | 3.82 |
| NII | | 5GHz WLAN | 1.15 | 2.42 | 1.59 | 3.82 |
| 6SD | | 6GHz WLAN | 0.23 | 0.62 | 1.53 | 2.03 |
| DTS | 2.4GHz Band | Bluetooth | < 0.01 | < 0.01 | 1.59 | 3.82 |
| DTS | | Thread | < 0.01 | < 0.01 | 1.59 | 3.82 |

| Equipment Class | Frequency Band | | Body Reported APD (mW/cm^2) | Extremity Reported APD (mW/cm^2) | Reported PD (mW/cm^2) |
|---|---|---|---|---|---|
| 6SD | WLAN | 6GHz WLAN | 0.11 | 1.37 | 0.74 |
| Date of Testing: | | | 2023/11/11 ~ 2023/11/12 | | |

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093), Human Exposure to RF Radiation Limits (1.0 mW/cm^2=10 W/m^2) specified in FCC 47 CFR part 1.1310 and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

**Reviewed by: Jason Wang**
**Report Producer: Daisy Peng**

# 2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, the below KDB standard may not including in the TAF code without accreditation.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- IEC/IEEE 62209-1528:2020
- SPEAG DASY6 System Handbook
- SPEAG DASY6 Application Note (Interim Procedure for Device Operation at 6GHz-10GHz)

# 3. Equipment Under Test (EUT) Information

## 3.1 General Information

| Product Feature & Specification | |
|---|---|
| **Equipment Name** | Access Point |
| **Brand Name** | Extreme Networks |
| **Model Name** | AP5050U |
| **FCC ID** | QXO-AP5050 |
| **Wireless Technology and Frequency Range** | WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz<br>WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz<br>WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz<br>WLAN 6E: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz<br>Bluetooth: 2400 MHz ~ 2483.5 MHz<br>Thread: 2405 MHz ~ 2480 MHz |
| **Mode** | WLAN: 802.11a/b/g/n/ax HE20/HE40/HE80/HE160<br>Bluetooth LE<br>Thread: O-QPSK |
| **EUT Stage** | Identical Prototype |
| **Remark:**<br>1. Based on original report to adding WLAN 6E Standard Mode SAR testing and Sim-Tx analysis, other bands refer to Sporton SAR Report, Report number FA251735-12.<br>2. The EUT has three radios, the information as following table. | |

| Radio | Function (Non-beamforming mode) | | | |
|---|---|---|---|---|
| | WLAN 2.4GHz | WLAN 5GHz | WLAN 6GHz | Bluetooth / Thread |
| 1 | V | V | V | - |
| 2 | - | V | - | - |
| 3 | - | - | V | V |

| Radio | Function (Beamforming mode) | | | |
|---|---|---|---|---|
| | WLAN 2.4GHz | WLAN 5GHz | WLAN 6GHz | Bluetooth / Thread |
| 1 | V | - | - | - |
| 2 | - | V | - | - |
| 3 | - | - | V | V |

# 4. RF Exposure Limits

## 4.1 Uncontrolled Environment

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

## 4.2 Controlled Environment

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

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

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.4 | 8.0 | 20.0 |

**Limits for General Population/Uncontrolled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.08 | 1.6 | 4.0 |

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

# 5. Specific Absorption Rate (SAR)

## 5.1 Introduction

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

## 5.2 SAR Definition

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

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

SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

## 5.3 RF Exposure limit for above 6GHz

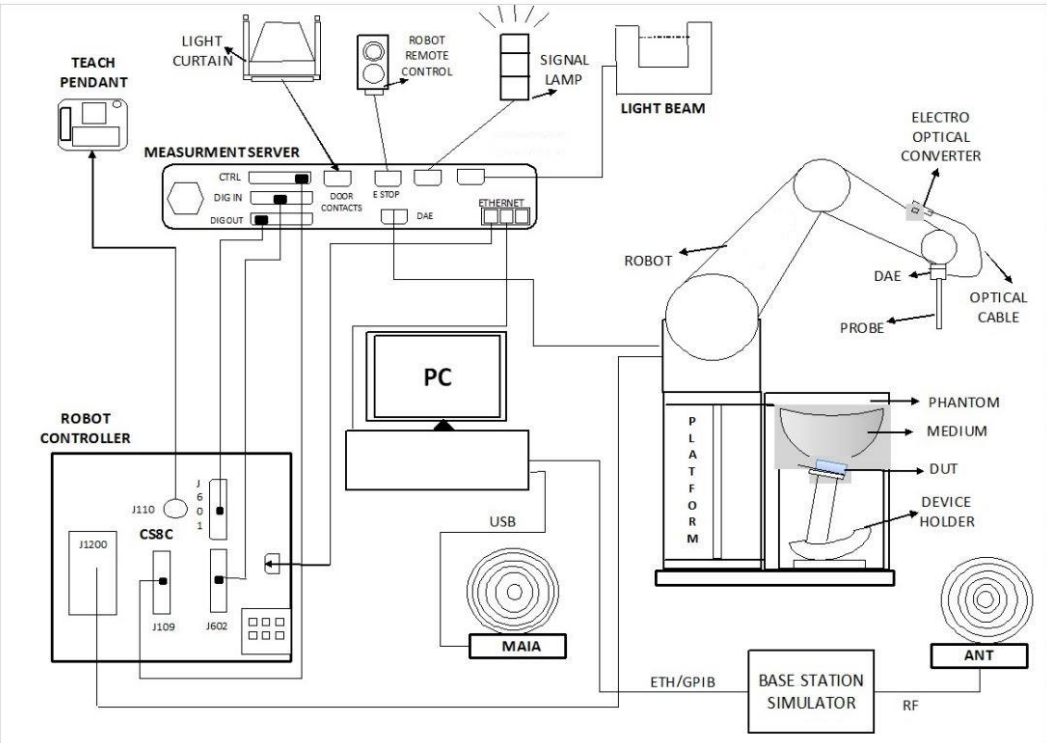
According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Peak Spatially Averaged Power Density was evaluated over a circular area of 4cm$^2$ per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm$^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| (A) Limits for Occupational/Controlled Exposures | | | | |
| 0.3-3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0-30 | 1842/f | 4.89/f | *(900/f2) | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | | | f/300 | 6 |
| 1500-100,000 | | | 5 | 6 |
| (B) Limits for General Population/Uncontrolled Exposure | | | | |
| 0.3-1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34-30 | 824/f | 2.19/f | *(180/f2) | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | f/1500 | 30 |
| 1500-100,000 | | | 1.0 | 30 |

# 6. System Description and Setup

**The DASY system used for performing compliance tests consists of the following items:**




- The DASY system in SAR Configuration is shown above
- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- 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 windows software and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## 6.1 Test Site Location

The SAR measurement facilities used to collect data are within both Sporton Lab list below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 3786) and the FCC designation No. TW1190 and TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

| Test Site | EMC & Wireless Communications Laboratory | | Wensan Laboratory | | |
|---|---|---|---|---|---|
| Test Site Location | TW1190<br>No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan | | TW3786<br>No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan | | |
| Test Site No. | SAR01-HY | SAR03-HY | SAR08-HY | SAR09-HY | SAR15-HY |
| | SAR04-HY | SAR05-HY | SAR11-HY | SAR12-HY | SAR16-HY |
| | SAR06-HY | SAR10-HY | SAR13-HY | SAR14-HY | SAR17-HY |

## 6.2 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

**<ES3DV3 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetric design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| **Frequency** | 10 MHz – 4 GHz;<br>Linearity: ±0.2 dB (30 MHz – 4 GHz) | |
| **Directivity** | ±0.2 dB in TSL (rotation around probe axis)<br>±0.3 dB in TSL (rotation normal to probe axis) | |
| **Dynamic Range** | 5 µW/g – >100 mW/g;<br>Linearity: ±0.2 dB | |
| **Dimensions** | Overall length: 337 mm (tip: 20 mm)<br>Tip diameter: 3.9 mm (body: 12 mm)<br>Distance from probe tip to dipole centers: 3.0 mm | |

**<EX3DV4 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetric design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| **Frequency** | 10 MHz – >6 GHz<br>Linearity: ±0.2 dB (30 MHz – 6 GHz) | |
| **Directivity** | ±0.3 dB in TSL (rotation around probe axis)<br>±0.5 dB in TSL (rotation normal to probe axis) | |
| **Dynamic Range** | 10 µW/g – >100 mW/g<br>Linearity: ±0.2 dB (noise: typically <1 µW/g) | |
| **Dimensions** | Overall length: 337 mm (tip: 20 mm)<br>Tip diameter: 2.5 mm (body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm | |

## 6.3 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists 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 and 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.

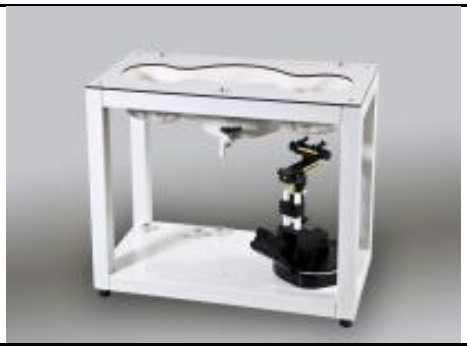
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**Fig 5.1** Photo of DAE

## 6.4 Phantom

**<SAM Twin Phantom>**

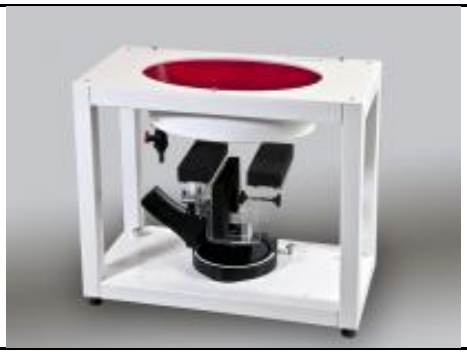
| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm;<br>Center ear point: 6 ± 0.2 mm |
| **Filling Volume** | Approx. 25 liters |
| **Dimensions** | Length: 1000 mm; Width: 500 mm; Height: adjustable feet |
| **Measurement Areas** | Left Hand, Right Hand, Flat Phantom |



The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

**<ELI Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm (sagging: <1%) |
| **Filling Volume** | Approx. 30 liters |
| **Dimensions** | Major ellipse axis: 600 mm<br>Minor axis: 400 mm |



The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

## 6.5 Device Holder

**<Mounting Device for Hand-Held Transmitter>**

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

**<Mounting Device for Laptops and other Body-Worn Transmitters>**

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

# 7. Measurement Procedures

The measurement procedures are as follows:

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

## 7.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

## 7.2 Power Reference Measurement

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

## 7.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

| | ≤ 3 GHz | > 3 GHz |
|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 ± 1 mm | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |

## 7.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

## 7.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

## 7.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

# 8. Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 6500MHz System Validation Kit | D6.5GHzV2 | 1003 | Mar. 15, 2023 | Mar. 14, 2024 |
| SPEAG | 5G Verification Source | 10GHz | 1020 | Jan. 20, 2023 | Jan. 19, 2024 |
| SPEAG | EUmmWV Probe Tip Protection | EUmmWV4 | 9441 | Nov. 18, 2022 | Nov. 17, 2023 |
| SPEAG | Data Acquisition Electronics | DAE4 | 854 | Aug. 17, 2023 | Aug. 16, 2024 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1311 | Sep. 13, 2023 | Sep. 12, 2024 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3728 | Mar. 22, 2023 | Mar. 21, 2024 |
| SPEAG | Device Holder | N/A | N/A | N/A | N/A |
| Anritsu | Signal Generator | MG3710A | 6201502524 | Sep. 27, 2023 | Sep. 26, 2024 |
| Keysight | ENA Network Analyzer | E5071C | MY46104758 | Oct. 30, 2023 | Oct. 29, 2024 |
| SPEAG | Dielectric Probe Kit | DAK-3.5 | 1126 | Sep. 19, 2023 | Sep. 18, 2024 |
| LINE SEIKI | Digital Thermometer | DTM3000-spezial | 3690 | Aug. 09, 2023 | Aug. 08, 2024 |
| Anritsu | Power Meter | ML2495A | 1419002 | Aug. 17, 2023 | Aug. 16, 2024 |
| Anritsu | Power Sensor | MA2411B | 1911176 | Aug. 18, 2023 | Aug. 17, 2024 |
| Anritsu | Spectrum Analyzer | MS2830A | 6201396378 | Jul. 10, 2023 | Jul. 09, 2024 |
| Mini-Circuits | Power Amplifier | ZVE-8G+ | 6418 | Oct. 16, 2023 | Oct. 15, 2024 |
| ATM | Dual Directional Coupler | C122H-10 | P610410z-02 | Note 1 | |
| Warison | Directional Coupler | WCOU-10-50S-10 | WR889BMC4B1 | Note 1 | |
| Woken | Attenuator 1 | WK0602-XX | N/A | Note 1 | |
| PE | Attenuator 2 | PE7005-10 | N/A | Note 1 | |
| PE | Attenuator 3 | PE7005- 3 | N/A | Note 1 | |

**General Note:**

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

# 9. System Verification

## 9.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18℃ to 25℃, measured with calibrated instruments and apparatuses, such as network analyzers and temperature probes. The temperature of the tissue-equivalent medium during SAR measurement must also be within 18℃ to 25℃ and within ± 2℃ of the temperature when the tissue parameters are characterized. The tissue dielectric measurement system must be calibrated before use. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements.
The liquid tissue depth was at least 15cm in the phantom for all SAR testing

**<Tissue Dielectric Parameter Check Results>**

| Frequency (MHz) | Liquid Temp. (℃) | Conductivity (σ) | Permittivity ($\varepsilon_r$) | Conductivity Target (σ) | Permittivity Target ($\varepsilon_r$) | Delta (σ) (%) | Delta ($\varepsilon_r$) (%) | Limit (%) | Date |
|---|---|---|---|---|---|---|---|---|---|
| 6500 | 22.5 | 6.090 | 34.600 | 6.07 | 34.50 | 0.33 | 0.29 | ±5 | 2023/11/11 |
| 6500 | 22.7 | 6.190 | 35.000 | 6.07 | 34.50 | 1.98 | 1.45 | ±5 | 2023/11/12 |

## 9.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

| Date | Frequency (MHz) | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured 1g SAR (W/kg) | Targeted 1g SAR (W/kg) | Normalized 1g SAR (W/kg) | Deviation (%) | Measured 10g SAR (W/kg) | Targeted 10g SAR (W/kg) | Normalized 10g SAR (W/kg) | Deviation (%) | Test Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2023/11/11 | 6500 | 100 | D6.5GHzV2-1003 | EX3DV4 - SN3728 | DAE4 Sn1311 | 27.200 | 297.000 | 272 | -8.42 | 4.960 | 54.500 | 49.6 | -8.99 | SAR-06 |
| 2023/11/12 | 6500 | 100 | D6.5GHzV2-1003 | EX3DV4 - SN3728 | DAE4 Sn1311 | 27.600 | 297.000 | 276 | -7.07 | 5.040 | 54.500 | 50.4 | -7.52 | SAR-06 |

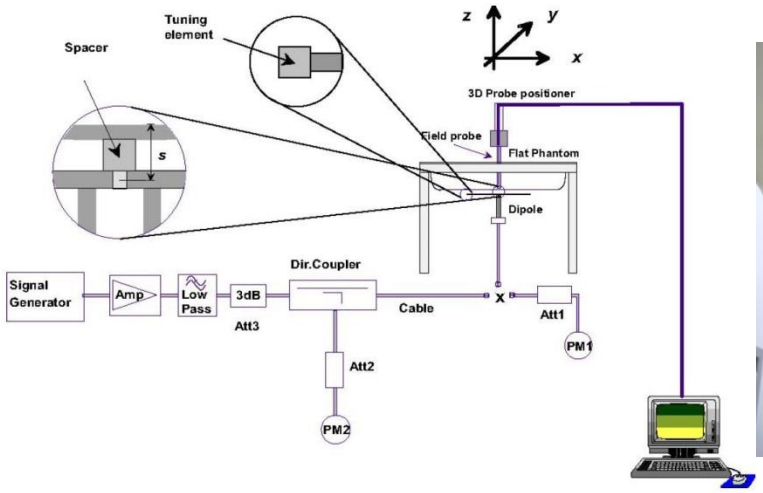



Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

## 9.1 PD System Performance Check Results

The system was verified to be within ±0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check. The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.

| Frequency (GHz) | 5G Verification Source | Probe S/N | DAE S/N | Distance (mm) | Measured 4 cm^2 (W/m^2) | Targeted 4 cm^2 (W/m^2) | Deviation (dB) | Test Site | Date |
|---|---|---|---|---|---|---|---|---|---|
| 10G | 10GHz_1020 | 9441 | 854 | 10 | 53.6 | 54.9 | -0.10 | SAR01 | 2023/11/11 |

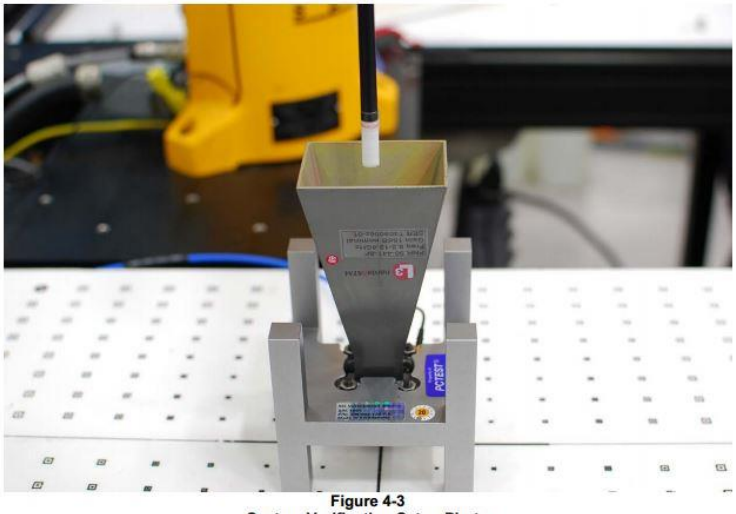


**Figure 4-3**
**System Verification Setup Photo**

System Performance Check Setup

# 10. WiFi/Bluetooth Output Power (Unit: dBm)

**General Note:**

1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, additional output power measurements were not necessary.
2. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
3. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
4. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
5. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
    a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
    b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
    c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
6. Per 201904 TCBC workshops, General principles of FCC KDB Publication 248227 D01 can be applied to determine the SAR Initial Test Configurations and test reduction for 802.11ax SAR testing. For the table below the 802.11ax maximum power is SU (non-OFDMA), and the SU maximum power also higher than RU (OFDMA)
7. In applying the test guidance, the IEEE 802.11 mode with the maximum output power (out of all modes) should be considered for testing
8. For modes with the same maximum output power, the guidance from section 5.3.2 a) of FCC KDB Publication 248227 D01 should be applied, with 802.11ax being considered as the highest 802.11 mode for the appropriate frequency bands
9. When SAR testing for 802.11ax is required
    a. If the maximum output power is highest for OFDMA scenarios, choose the tone size with the maximum number of tones and the highest maximum output power
    b. Otherwise, consider the fully allocated channel for SAR testing
    c. When SAR testing is required on RU sizes less than the fully allocated channel, use the RU number closest to the middle of the channel, choosing the higher RU number when two RUs are equidistant to the middle of the channel

**<Non-beamforming mode>**

**<Radio 1>**

**<6GHz WLAN 2TX>**

| | | | | Ant 1+2 (1) | | Ant 1+2 (2) | | Ant 1+2 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| WiFi 6E | 802.11ax-HE20 MCS0 | 1 | 5955 | 13.95 | 14.00 | 13.68 | 14.00 | 16.83 | 17.00 | 96.70 |
| | | 57 | 6235 | 13.90 | 14.00 | 13.59 | 14.00 | 16.76 | 17.00 | |
| | | 173 | 6815 | 13.96 | 14.00 | 13.01 | 14.00 | 16.52 | 17.00 | |
| | 802.11ax-HE40 MCS0 | 3 | 5965 | 13.92 | 14.00 | 13.77 | 14.00 | 16.86 | 17.00 | 93.90 |
| | | 59 | 6245 | 13.67 | 14.00 | 13.89 | 14.00 | 16.79 | 17.00 | |
| | | 171 | 6805 | 13.91 | 14.00 | 13.31 | 14.00 | 16.63 | 17.00 | |
| | 802.11ax-HE80 MCS0 | 7 | 5985 | 13.93 | 14.00 | 13.54 | 14.00 | 16.75 | 17.00 | 89.90 |
| | | 71 | 6305 | 13.85 | 14.00 | 13.83 | 14.00 | 16.85 | 17.00 | |
| | | 167 | 6785 | 13.79 | 14.00 | 13.59 | 14.00 | 16.70 | 17.00 | |
| | 802.11ax-HE160 MCS0 | 15 | 6025 | 13.96 | 14.00 | 13.80 | 14.00 | 16.89 | 17.00 | 85.30 |
| | | 47 | 6185 | 13.99 | 14.00 | 13.75 | 14.00 | 16.88 | 17.00 | |
| | | 143 | 6665 | 13.92 | 14.00 | 13.95 | 14.00 | 16.95 | 17.00 | |

## <Radio 3>

### <6GHz WLAN 1TX>

| | | | | Ant 1 | | |
|---|---|---|---|---|---|---|
| | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| WiFi 6E | 802.11ax-HE20 MCS0 | 1 | 5955 | 16.90 | 17.00 | 98.20 |
| | | 57 | 6235 | 16.81 | 17.00 | |
| | | 173 | 6815 | 16.88 | 17.00 | |
| | 802.11ax-HE40 MCS0 | 3 | 5965 | 16.75 | 17.00 | 96.50 |
| | | 59 | 6245 | 16.73 | 17.00 | |
| | | 171 | 6805 | 16.90 | 17.00 | |
| | 802.11ax-HE80 MCS0 | 7 | 5985 | 16.84 | 17.00 | 99.70 |
| | | 71 | 6305 | 16.84 | 17.00 | |
| | | 167 | 6785 | 16.88 | 17.00 | |
| | 802.11ax-HE160 MCS0 | 15 | 6025 | 16.97 | 17.00 | 99.80 |
| | | 47 | 6185 | 16.95 | 17.00 | |
| | | 143 | 6665 | 16.96 | 17.00 | |

### <6GHz WLAN 2TX>

| | | | | Ant 1+2 (1) | | Ant 1+2 (2) | | Ant 1+2 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| WiFi 6E | 802.11ax-HE20 MCS0 | 1 | 5955 | 13.87 | 14.00 | 12.11 | 14.00 | 16.09 | 17.00 | 96.60 |
| | | 57 | 6235 | 13.01 | 14.00 | 13.25 | 14.00 | 16.14 | 17.00 | |
| | | 173 | 6815 | 13.65 | 14.00 | 12.44 | 14.00 | 16.10 | 17.00 | |
| | 802.11ax-HE40 MCS0 | 3 | 5965 | 13.37 | 14.00 | 12.87 | 14.00 | 16.14 | 17.00 | 93.90 |
| | | 59 | 6245 | 13.10 | 14.00 | 13.17 | 14.00 | 16.15 | 17.00 | |
| | | 171 | 6805 | 13.74 | 14.00 | 12.30 | 14.00 | 16.09 | 17.00 | |
| | 802.11ax-HE80 MCS0 | 7 | 5985 | 13.52 | 14.00 | 12.66 | 14.00 | 16.12 | 17.00 | 89.90 |
| | | 71 | 6305 | 13.47 | 14.00 | 12.71 | 14.00 | 16.12 | 17.00 | |
| | | 167 | 6785 | 13.60 | 14.00 | 12.59 | 14.00 | 16.13 | 17.00 | |
| | 802.11ax-HE160 MCS0 | 15 | 6025 | 13.33 | 14.00 | 12.69 | 14.00 | 16.03 | 17.00 | 85.50 |
| | | 47 | 6185 | 13.40 | 14.00 | 12.85 | 14.00 | 16.14 | 17.00 | |
| | | 143 | 6665 | 13.37 | 14.00 | 12.74 | 14.00 | 16.08 | 17.00 | |

**<6GHz WLAN 4TX>**

| | | | | Ant 1+2+3+4 (1) | | Ant 1+2+3+4 (2) | | Ant 1+2+3+4 (3) | | Ant 1+2+3+4 (4) | | Ant 1+2+3+4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| WiFi 6E | 802.11ax-HE20 MCS0 | 1 | 5955 | 10.53 | 11.00 | 9.13 | 11.00 | 10.40 | 11.00 | 9.77 | 11.00 | 16.01 | 17.00 | 94.30 |
| | | 57 | 6235 | 10.39 | 11.00 | 10.01 | 11.00 | 10.74 | 11.00 | 9.15 | 11.00 | 16.13 | 17.00 | |
| | | 173 | 6815 | 10.64 | 11.00 | 9.54 | 11.00 | 10.33 | 11.00 | 9.92 | 11.00 | 16.15 | 17.00 | |
| | 802.11ax-HE40 MCS0 | 3 | 5965 | 9.55 | 11.00 | 9.27 | 11.00 | 10.08 | 11.00 | 10.05 | 11.00 | 15.77 | 17.00 | 90.90 |
| | | 59 | 6245 | 10.00 | 11.00 | 9.79 | 11.00 | 10.85 | 11.00 | 9.39 | 11.00 | 16.06 | 17.00 | |
| | | 171 | 6805 | 10.91 | 11.00 | 9.73 | 11.00 | 9.70 | 11.00 | 9.33 | 11.00 | 15.98 | 17.00 | |
| | 802.11ax-HE80 MCS0 | 7 | 5985 | 10.26 | 11.00 | 9.45 | 11.00 | 10.42 | 11.00 | 9.79 | 11.00 | 16.02 | 17.00 | 86.60 |
| | | 71 | 6305 | 10.26 | 11.00 | 9.61 | 11.00 | 10.69 | 11.00 | 9.88 | 11.00 | 16.15 | 17.00 | |
| | | 167 | 6785 | 10.84 | 11.00 | 9.99 | 11.00 | 10.17 | 11.00 | 9.31 | 11.00 | 16.13 | 17.00 | |
| | 802.11ax-HE160 MCS0 | 15 | 6025 | 10.44 | 11.00 | 9.63 | 11.00 | 10.33 | 11.00 | 9.88 | 11.00 | 16.10 | 17.00 | 85.50 |
| | | 47 | 6185 | 9.51 | 11.00 | 9.45 | 11.00 | 10.50 | 11.00 | 9.56 | 11.00 | 15.80 | 17.00 | |
| | | 143 | 6665 | 10.31 | 11.00 | 9.71 | 11.00 | 10.07 | 11.00 | 9.25 | 11.00 | 15.87 | 17.00 | |

**<Beamforming mode>**

**<Radio 3>**

**<6GHz WLAN 2TX>**

| | | | | Ant 1+2 (1) | | Ant 1+2 (2) | | Ant 1+2 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| WiFi 6E | 802.11ax-HE20 MCS0 | 1 | 5955 | 12.43 | 12.50 | 11.46 | 12.50 | 14.98 | 15.50 | 92.60 |
| | | 57 | 6235 | 12.20 | 12.50 | 11.87 | 12.50 | 15.05 | 15.50 | |
| | | 173 | 6815 | 12.48 | 12.50 | 11.44 | 12.50 | 15.00 | 15.50 | |
| | 802.11ax-HE40 MCS0 | 3 | 5965 | 11.88 | 12.50 | 12.05 | 12.50 | 14.98 | 15.50 | 96.10 |
| | | 59 | 6245 | 12.15 | 12.50 | 11.89 | 12.50 | 15.03 | 15.50 | |
| | | 171 | 6805 | 12.45 | 12.50 | 10.82 | 12.50 | 14.72 | 15.50 | |
| | 802.11ax-HE80 MCS0 | 7 | 5985 | 12.16 | 12.50 | 11.89 | 12.50 | 15.04 | 15.50 | 95.00 |
| | | 71 | 6305 | 12.32 | 12.50 | 11.54 | 12.50 | 14.96 | 15.50 | |
| | | 167 | 6785 | 12.07 | 12.50 | 11.97 | 12.50 | 15.03 | 15.50 | |
| | 802.11ax-HE160 MCS0 | 15 | 6025 | 12.28 | 12.50 | 11.85 | 12.50 | 15.08 | 15.50 | 89.90 |
| | | 47 | 6185 | 12.02 | 12.50 | 12.11 | 12.50 | 15.08 | 15.50 | |
| | | 143 | 6665 | 12.01 | 12.50 | 11.89 | 12.50 | 14.96 | 15.50 | |

**<6GHz WLAN 4TX>**

| | | | | Ant 1+2+3+4 (1) | | Ant 1+2+3+4 (2) | | Ant 1+2+3+4 (3) | | Ant 1+2+3+4 (4) | | Ant 1+2+3+4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| WiFi 6E | 802.11ax-HE20 MCS0 | 1 | 5955 | 8.18 | 8.50 | 6.54 | 8.50 | 8.18 | 8.50 | 7.64 | 8.50 | 13.70 | 14.50 | 89.70 |
| | | 57 | 6235 | 7.60 | 8.50 | 7.77 | 8.50 | 8.20 | 8.50 | 6.67 | 8.50 | 13.62 | 14.50 | |
| | | 173 | 6815 | 8.02 | 8.50 | 7.11 | 8.50 | 7.61 | 8.50 | 7.04 | 8.50 | 13.48 | 14.50 | |
| | 802.11ax-HE40 MCS0 | 3 | 5965 | 7.59 | 8.50 | 7.39 | 8.50 | 8.13 | 8.50 | 7.64 | 8.50 | 13.72 | 14.50 | 89.40 |
| | | 59 | 6245 | 7.14 | 8.50 | 7.86 | 8.50 | 8.14 | 8.50 | 6.65 | 8.50 | 13.48 | 14.50 | |
| | | 171 | 6805 | 8.09 | 8.50 | 7.10 | 8.50 | 7.06 | 8.50 | 6.59 | 8.50 | 13.27 | 14.50 | |
| | 802.11ax-HE80 MCS0 | 7 | 5985 | 7.96 | 8.50 | 7.13 | 8.50 | 7.98 | 8.50 | 7.55 | 8.50 | 13.69 | 14.50 | 95.00 |
| | | 71 | 6305 | 7.86 | 8.50 | 7.13 | 8.50 | 8.13 | 8.50 | 7.57 | 8.50 | 13.71 | 14.50 | |
| | | 167 | 6785 | 8.00 | 8.50 | 7.32 | 8.50 | 7.26 | 8.50 | 6.71 | 8.50 | 13.37 | 14.50 | |
| | 802.11ax-HE160 MCS0 | 15 | 6025 | 8.16 | 8.50 | 6.99 | 8.50 | 7.69 | 8.50 | 7.83 | 8.50 | 13.71 | 14.50 | 96.00 |
| | | 47 | 6185 | 7.44 | 8.50 | 7.31 | 8.50 | 8.30 | 8.50 | 7.53 | 8.50 | 13.68 | 14.50 | |
| | | 143 | 6665 | 8.06 | 8.50 | 7.65 | 8.50 | 7.91 | 8.50 | 7.11 | 8.50 | 13.72 | 14.50 | |

# 11. SAR Test Results

**General Note:**

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

**WLAN Note:**

1. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
2. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
3. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

**WLAN PD Note:**

1. The WiFi 6E PD was performed according 2020 TCB workshop RF Exposure 5G RFX Policies Interim Procedures.
2. First, evaluate SAR using 6-7 GHz parameters per IEC/IEEE 62209-1528:2020 and using highest SAR test configurations evaluate incident PD using the mmw near-field probe and total-field/power-density reconstruction method (2 mm closest meas. plane).
3. Per Interim Procedures. The power density results were scaled according to IEC 62479:2010 for the portion of the measurement uncertainty > 30%. Total expanded uncertainty of 2.68 dB (85.4%) was used to determine the psPD measurement scaling factor
4. The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. The WiFi 6E RF Exposure results are used for simultaneous transmission analysis with the other transmitters and total exposure ratio, the analysis can be found in this report section 12
6. Absorbed power density (APD) using a 4cm2 averaging area is reported based on SAR measurements.
7. Power density was calculated by repeated E-field measurements on two measurement planes separated by λ/4.
8. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools.
9. The measurement procedure consists of measuring the PDinc at two different distances: 2 mm (compliance distance) and λ/5. The grid extents should be large enough to fully capture the transmitted energy. The grid step should be fine enough to demonstrate that the integrated Power Density iPDn fulfill the criterion described below. Since iPD ratio between the two distances is ≥ -1dB, the grid step (0.0625) was sufficient for determining compliance at d=2mm.

$$10 \cdot log_{10} \frac{iPD_n(2mm)}{iPD_n(\lambda/5)} \geq -1$$

## 11.1 Body SAR

### <WLAN SAR>

| Plot No. | Band | Mode | Test Position | Gap (mm) | Antenna | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) | Measured APD (W/m^2) | Reported APD (W/m^2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(1) | Radio 1 | 143 | 6665 | 13.92 | 14.00 | 1.019 | 85.3 | 1.172 | -0.14 | 0.107 | 0.128 | 1.18 | 1.409 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(2) | Radio 1 | 143 | 6665 | 13.95 | 14.00 | 1.012 | 85.3 | 1.172 | -0.14 | 0.134 | 0.159 | 1.48 | 1.755 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25mm | Ant 1+2(1) | Radio 1 | 15 | 6025 | 13.96 | 14.00 | 1.009 | 85.3 | 1.172 | 0 | 0.128 | 0.151 | 1.18 | 1.396 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(2) | Radio 1 | 15 | 6025 | 13.80 | 14.00 | 1.047 | 85.3 | 1.172 | 0 | 0.148 | 0.182 | 1.41 | 1.730 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(1) | Radio 1 | 47 | 6185 | 13.99 | 14.00 | 1.002 | 85.3 | 1.172 | 0.03 | 0.126 | 0.148 | 1.39 | 1.633 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(2) | Radio 1 | 47 | 6185 | 13.75 | 14.00 | 1.059 | 85.3 | 1.172 | 0.03 | 0.129 | 0.160 | 1.42 | 1.763 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 25 mm | Ant 1+2(1) | Radio 1 | 143 | 6665 | 13.92 | 14.00 | 1.019 | 85.3 | 1.172 | 0.1 | 0.006 | 0.007 | 0.06 | 0.072 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 25 mm | Ant 1+2(2) | Radio 1 | 143 | 6665 | 13.95 | 14.00 | 1.012 | 85.3 | 1.172 | 0.1 | 0.004 | 0.005 | 0.045 | 0.053 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 25 mm | Ant 1+2(1) | Radio 1 | 143 | 6665 | 13.92 | 14.00 | 1.019 | 85.3 | 1.172 | 0 | 0.021 | 0.025 | 0.228 | 0.272 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 25 mm | Ant 1+2(2) | Radio 1 | 143 | 6665 | 13.95 | 14.00 | 1.012 | 85.3 | 1.172 | 0 | 0.022 | 0.026 | 0.243 | 0.288 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1 | Radio 3 | 15 | 6025 | 16.97 | 17.00 | 1.007 | 99.8 | 1.002 | -0.06 | 0.192 | 0.194 | 1.82 | 1.836 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1 | Radio 3 | 47 | 6185 | 16.95 | 17.00 | 1.012 | 99.8 | 1.002 | 0.07 | 0.211 | 0.214 | 2.01 | 2.037 |
| 01 | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25mm | Ant 1 | Radio 3 | 143 | 6665 | 16.96 | 17.00 | 1.009 | 99.8 | 1.002 | 0.1 | 0.228 | 0.231 | 2.17 | 2.194 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 25 mm | Ant 1 | Radio 3 | 15 | 6025 | 16.97 | 17.00 | 1.007 | 99.8 | 1.002 | -0.19 | 0.102 | 0.103 | 0.971 | 0.980 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 25 mm | Ant 1 | Radio 3 | 15 | 6025 | 16.97 | 17.00 | 1.007 | 99.8 | 1.002 | -0.04 | 0.071 | 0.072 | 0.678 | 0.684 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(1) | Radio 3 | 47 | 6185 | 13.40 | 14.00 | 1.148 | 85.5 | 1.170 | -0.08 | 0.074 | 0.099 | 0.66 | 0.887 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(2) | Radio 3 | 47 | 6185 | 12.85 | 14.00 | 1.303 | 85.5 | 1.170 | -0.08 | 0.095 | 0.145 | 0.85 | 1.296 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(1) | Radio 3 | 15 | 6025 | 13.33 | 14.00 | 1.167 | 85.5 | 1.170 | 0.17 | 0.059 | 0.081 | 0.529 | 0.722 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(2) | Radio 3 | 15 | 6025 | 12.69 | 14.00 | 1.352 | 85.5 | 1.170 | 0.17 | 0.058 | 0.092 | 0.52 | 0.823 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2(1) | Radio 3 | 143 | 6665 | 13.37 | 14.00 | 1.156 | 85.5 | 1.170 | 0.18 | 0.089 | 0.120 | 0.841 | 1.138 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25mm | Ant 1+2(2) | Radio 3 | 143 | 6665 | 12.74 | 14.00 | 1.337 | 85.5 | 1.170 | 0.18 | 0.093 | 0.145 | 0.83 | 1.298 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 25 mm | Ant 1+2(1) | Radio 3 | 47 | 6185 | 13.40 | 14.00 | 1.148 | 85.5 | 1.170 | -0.16 | 0.033 | 0.044 | 0.296 | 0.398 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 25 mm | Ant 1+2(2) | Radio 3 | 47 | 6185 | 12.85 | 14.00 | 1.303 | 85.5 | 1.170 | -0.16 | 0.035 | 0.053 | 0.313 | 0.477 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 25 mm | Ant 1+2(1) | Radio 3 | 47 | 6185 | 13.40 | 14.00 | 1.148 | 85.5 | 1.170 | -0.1 | 0.028 | 0.038 | 0.245 | 0.329 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 25 mm | Ant 1+2(2) | Radio 3 | 47 | 6185 | 12.85 | 14.00 | 1.303 | 85.5 | 1.170 | -0.1 | 0.025 | 0.038 | 0.224 | 0.342 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(1) | Radio 3 | 15 | 6025 | 10.44 | 11.00 | 1.138 | 85.5 | 1.170 | 0.14 | 0.026 | 0.035 | 0.462 | 0.615 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(2) | Radio 3 | 15 | 6025 | 9.63 | 11.00 | 1.371 | 85.5 | 1.170 | 0.14 | 0.025 | 0.040 | 0.44 | 0.706 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(3) | Radio 3 | 15 | 6025 | 10.33 | 11.00 | 1.167 | 85.5 | 1.170 | 0.14 | 0.047 | 0.064 | 0.836 | 1.141 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(4) | Radio 3 | 15 | 6025 | 9.88 | 11.00 | 1.294 | 85.5 | 1.170 | 0.14 | 0.023 | 0.035 | 0.418 | 0.633 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(1) | Radio 3 | 47 | 6185 | 9.51 | 11.00 | 1.409 | 85.5 | 1.170 | 0.13 | 0.028 | 0.046 | 0.484 | 0.798 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(2) | Radio 3 | 47 | 6185 | 9.45 | 11.00 | 1.429 | 85.5 | 1.170 | 0.13 | 0.036 | 0.060 | 0.638 | 1.067 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(3) | Radio 3 | 47 | 6185 | 10.50 | 11.00 | 1.122 | 85.5 | 1.170 | 0.13 | 0.042 | 0.055 | 0.748 | 0.982 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(4) | Radio 3 | 47 | 6185 | 9.56 | 11.00 | 1.393 | 85.5 | 1.170 | 0.13 | 0.034 | 0.055 | 0.594 | 0.968 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(1) | Radio 3 | 143 | 6665 | 10.31 | 11.00 | 1.172 | 85.5 | 1.170 | 0.09 | 0.036 | 0.049 | 0.638 | 0.875 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(2) | Radio 3 | 143 | 6665 | 9.71 | 11.00 | 1.346 | 85.5 | 1.170 | 0.09 | 0.041 | 0.065 | 0.726 | 1.143 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(3) | Radio 3 | 143 | 6665 | 10.07 | 11.00 | 1.239 | 85.5 | 1.170 | 0.09 | 0.044 | 0.064 | 0.792 | 1.148 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 25 mm | Ant 1+2+3+4(4) | Radio 3 | 143 | 6665 | 9.25 | 11.00 | 1.496 | 85.5 | 1.170 | 0.09 | 0.033 | 0.058 | 0.594 | 1.040 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 25 mm | Ant 1+2+3+4(1) | Radio 3 | 15 | 6025 | 10.44 | 11.00 | 1.138 | 85.5 | 1.170 | 0.01 | 0.011 | 0.015 | 0.198 | 0.264 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 25 mm | Ant 1+2+3+4(2) | Radio 3 | 15 | 6025 | 9.63 | 11.00 | 1.371 | 85.5 | 1.170 | 0.01 | 0.013 | 0.021 | 0.242 | 0.388 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 25 mm | Ant 1+2+3+4(1) | Radio 3 | 15 | 6025 | 10.44 | 11.00 | 1.138 | 85.5 | 1.170 | 0.08 | 0.011 | 0.015 | 0.198 | 0.264 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 25 mm | Ant 1+2+3+4(4) | Radio 3 | 15 | 6025 | 9.88 | 11.00 | 1.294 | 85.5 | 1.170 | 0.08 | 0.010 | 0.015 | 0.176 | 0.267 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 25 mm | Ant 1+2+3+4(2) | Radio 3 | 15 | 6025 | 9.63 | 11.00 | 1.371 | 85.5 | 1.170 | -0.18 | 0.010 | 0.016 | 0.176 | 0.282 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 25 mm | Ant 1+2+3+4(3) | Radio 3 | 15 | 6025 | 10.33 | 11.00 | 1.167 | 85.5 | 1.170 | -0.18 | 0.012 | 0.016 | 0.22 | 0.300 |

## 11.2 Extremity SAR

### <WLAN SAR>

| Plot No. | Band | Mode | Test Position | Gap (mm) | Antenna | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 10g SAR (W/kg) | Reported 10g SAR (W/kg) | Measured APD (W/m^2) | Reported APD (W/m^2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(1) | Radio 1 | 143 | 6665 | 13.92 | 14.00 | 1.019 | 85.3 | 1.172 | -0.1 | 0.256 | 0.306 | 6.32 | 7.545 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(2) | Radio 1 | 143 | 6665 | 13.95 | 14.00 | 1.012 | 85.3 | 1.172 | -0.1 | 0.314 | 0.372 | 7.09 | 8.406 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(1) | Radio 1 | 15 | 6025 | 13.96 | 14.00 | 1.009 | 85.3 | 1.172 | -0.07 | 0.269 | 0.318 | 6.1 | 7.215 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(2) | Radio 1 | 15 | 6025 | 13.80 | 14.00 | 1.047 | 85.3 | 1.172 | -0.16 | 0.354 | 0.434 | 7.99 | 9.806 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(1) | Radio 1 | 47 | 6185 | 13.99 | 14.00 | 1.002 | 85.3 | 1.172 | -0.04 | 0.250 | 0.294 | 7.4 | 8.693 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(2) | Radio 1 | 47 | 6185 | 13.75 | 14.00 | 1.059 | 85.3 | 1.172 | -0.04 | 0.301 | 0.374 | 6.8 | 8.442 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 0mm | Ant 1+2(1) | Radio 1 | 143 | 6665 | 13.92 | 14.00 | 1.019 | 85.3 | 1.172 | -0.09 | 0.015 | 0.018 | 0.34 | 0.406 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 0mm | Ant 1+2(2) | Radio 1 | 143 | 6665 | 13.95 | 14.00 | 1.012 | 85.3 | 1.172 | -0.09 | 0.011 | 0.013 | 0.249 | 0.295 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 0mm | Ant 1+2(1) | Radio 1 | 143 | 6665 | 13.92 | 14.00 | 1.019 | 85.3 | 1.172 | 0.09 | 0.055 | 0.066 | 1.24 | 1.480 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 0mm | Ant 1+2(2) | Radio 1 | 143 | 6665 | 13.95 | 14.00 | 1.012 | 85.3 | 1.172 | 0.09 | 0.052 | 0.062 | 1.17 | 1.387 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1 | Radio 3 | 15 | 6025 | 16.97 | 17.00 | 1.007 | 99.8 | 1.002 | 0.1 | 0.502 | 0.506 | 11 | 11.098 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1 | Radio 3 | 47 | 6185 | 16.95 | 17.00 | 1.012 | 99.8 | 1.002 | 0.01 | 0.554 | 0.562 | 12.23 | 12.396 |
| 02 | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1 | Radio 3 | 143 | 6665 | 16.96 | 17.00 | 1.009 | 99.8 | 1.002 | -0.07 | 0.612 | 0.619 | 13.5 | 13.652 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 0mm | Ant 1 | Radio 3 | 15 | 6025 | 16.97 | 17.00 | 1.007 | 99.8 | 1.002 | -0.1 | 0.267 | 0.269 | 5.89 | 5.943 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 0mm | Ant 1 | Radio 3 | 15 | 6025 | 16.97 | 17.00 | 1.007 | 99.8 | 1.002 | 0.02 | 0.187 | 0.189 | 4.13 | 4.167 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(1) | Radio 3 | 47 | 6185 | 13.40 | 14.00 | 1.148 | 85.5 | 1.170 | -0.14 | 0.213 | 0.286 | 4.17 | 5.602 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(2) | Radio 3 | 47 | 6185 | 12.85 | 14.00 | 1.303 | 85.5 | 1.170 | -0.14 | 0.275 | 0.419 | 5.38 | 8.203 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(1) | Radio 3 | 15 | 6025 | 13.33 | 14.00 | 1.167 | 85.5 | 1.170 | 0.13 | 0.171 | 0.233 | 3.34 | 4.560 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(2) | Radio 3 | 15 | 6025 | 12.69 | 14.00 | 1.352 | 85.5 | 1.170 | 0.13 | 0.168 | 0.266 | 3.29 | 5.205 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(1) | Radio 3 | 143 | 6665 | 13.37 | 14.00 | 1.156 | 85.5 | 1.170 | -0.05 | 0.219 | 0.296 | 4.85 | 6.560 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2(2) | Radio 3 | 143 | 6665 | 12.74 | 14.00 | 1.337 | 85.5 | 1.170 | -0.05 | 0.275 | 0.430 | 6.1 | 9.539 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 0mm | Ant 1+2(1) | Radio 3 | 47 | 6185 | 13.40 | 14.00 | 1.148 | 85.5 | 1.170 | -0.15 | 0.096 | 0.129 | 1.87 | 2.512 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 0mm | Ant 1+2(2) | Radio 3 | 47 | 6185 | 12.85 | 14.00 | 1.303 | 85.5 | 1.170 | -0.15 | 0.101 | 0.154 | 1.98 | 3.019 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 0mm | Ant 1+2(1) | Radio 3 | 47 | 6185 | 13.40 | 14.00 | 1.148 | 85.5 | 1.170 | 0.05 | 0.079 | 0.106 | 1.55 | 2.082 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 0mm | Ant 1+2(2) | Radio 3 | 47 | 6185 | 12.85 | 14.00 | 1.303 | 85.5 | 1.170 | 0.05 | 0.072 | 0.110 | 1.41 | 2.150 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(1) | Radio 3 | 15 | 6025 | 10.44 | 11.00 | 1.138 | 85.5 | 1.170 | 0.01 | 0.071 | 0.095 | 1.590 | 2.116 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(2) | Radio 3 | 15 | 6025 | 9.63 | 11.00 | 1.371 | 85.5 | 1.170 | 0.01 | 0.066 | 0.106 | 1.460 | 2.342 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(3) | Radio 3 | 15 | 6025 | 10.33 | 11.00 | 1.167 | 85.5 | 1.170 | 0.02 | 0.133 | 0.182 | 2.970 | 4.055 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(4) | Radio 3 | 15 | 6025 | 9.88 | 11.00 | 1.294 | 85.5 | 1.170 | 0.01 | 0.061 | 0.092 | 1.370 | 2.074 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(1) | Radio 3 | 47 | 6185 | 9.51 | 11.00 | 1.409 | 85.5 | 1.170 | 0.05 | 0.066 | 0.109 | 1.470 | 2.424 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(2) | Radio 3 | 47 | 6185 | 9.45 | 11.00 | 1.429 | 85.5 | 1.170 | 0.05 | 0.087 | 0.145 | 1.940 | 3.243 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(3) | Radio 3 | 47 | 6185 | 10.50 | 11.00 | 1.122 | 85.5 | 1.170 | 0.05 | 0.101 | 0.133 | 2.250 | 2.954 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(4) | Radio 3 | 47 | 6185 | 9.56 | 11.00 | 1.393 | 85.5 | 1.170 | 0.05 | 0.081 | 0.132 | 1.800 | 2.934 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(1) | Radio 3 | 143 | 6665 | 10.31 | 11.00 | 1.172 | 85.5 | 1.170 | 0.01 | 0.086 | 0.118 | 1.920 | 2.633 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(2) | Radio 3 | 143 | 6665 | 9.71 | 11.00 | 1.346 | 85.5 | 1.170 | 0.01 | 0.098 | 0.154 | 2.180 | 3.433 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(3) | Radio 3 | 143 | 6665 | 10.07 | 11.00 | 1.239 | 85.5 | 1.170 | 0.01 | 0.105 | 0.152 | 2.340 | 3.392 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 0mm | Ant 1+2+3+4(4) | Radio 3 | 143 | 6665 | 9.25 | 11.00 | 1.496 | 85.5 | 1.170 | 0.01 | 0.078 | 0.137 | 1.740 | 3.046 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 0mm | Ant 1+2+3+4(1) | Radio 3 | 15 | 6025 | 10.44 | 11.00 | 1.138 | 85.5 | 1.170 | -0.18 | 0.028 | 0.037 | 0.625 | 0.832 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 1 | 0mm | Ant 1+2+3+4(2) | Radio 3 | 15 | 6025 | 9.63 | 11.00 | 1.371 | 85.5 | 1.170 | -0.18 | 0.031 | 0.050 | 0.692 | 1.110 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 0mm | Ant 1+2+3+4(1) | Radio 3 | 15 | 6025 | 10.44 | 11.00 | 1.138 | 85.5 | 1.170 | 0.1 | 0.025 | 0.033 | 0.558 | 0.743 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 2 | 0mm | Ant 1+2+3+4(4) | Radio 3 | 15 | 6025 | 9.88 | 11.00 | 1.294 | 85.5 | 1.170 | 0.1 | 0.024 | 0.036 | 0.536 | 0.812 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 0mm | Ant 1+2+3+4(2) | Radio 3 | 15 | 6025 | 9.63 | 11.00 | 1.371 | 85.5 | 1.170 | -0.03 | 0.023 | 0.037 | 0.514 | 0.824 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Edge 4 | 0mm | Ant 1+2+3+4(3) | Radio 3 | 15 | 6025 | 10.33 | 11.00 | 1.167 | 85.5 | 1.170 | -0.03 | 0.029 | 0.040 | 0.648 | 0.885 |

## 11.3 6GHz PD SAR Result

| Band | Mode | Test Position | Gap (mm) | Antenna | Ch. | Freq. (MHz) | Average Power (dBm) | Grid Step (λ) | iPDn | iPD ratio (≥ -1) | Scaling Factor for Measurement Uncertainty | Normal psPD (W/m^2) | Total psPD (W/m^2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(2) | 15 | 6025 | 13.80 | 0.0625 | 3.79 | -0.88813743 | 1.5535 | 3.5 | 3.78 |
| WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 10mm | Radio 1_Ant 1+2(2) | 15 | 6025 | 13.80 | 0.25 | 4.65 | | 1.5535 | 2.09 | 2.37 |
| WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(2) | 143 | 6665 | 13.92 | 0.0625 | 3.26 | -0.95308434 | 1.5535 | 2.52 | 3.44 |
| WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 9mm | Radio 1_Ant 1+2(2) | 143 | 6665 | 13.92 | 0.25 | 4.06 | | 1.5535 | 1.46 | 1.53 |

| Plot No. | Band | Mode | Test Position | Gap (mm) | Antenna | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Grid Step (λ) | Scaling Factor for Measurement Uncertainty | Power Drift (dB) | Normal psPD (W/m^2) | Scaled Normal psPD (W/m^2) | Total psPD (W/m^2) | Scaled Total psPD (W/m^2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(1) | 15 | 6025 | 13.96 | 14.00 | 1.009 | 85.30 | 1.172 | 0.0625 | 1.5535 | -0.11 | 1.95 | 3.58 | 2.31 | 4.24 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(2) | 15 | 6025 | 13.80 | 14.00 | 1.047 | 85.30 | 1.172 | 0.0625 | 1.5535 | -0.04 | 3.5 | 6.67 | 3.78 | 7.21 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(1) | 47 | 6185 | 13.99 | 14.00 | 1.002 | 85.30 | 1.172 | 0.0625 | 1.5535 | 0.07 | 2.27 | 4.14 | 3.12 | 5.69 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(2) | 47 | 6185 | 13.75 | 14.00 | 1.059 | 85.30 | 1.172 | 0.0625 | 1.5535 | -0.14 | 2.41 | 4.65 | 3.36 | 6.48 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(1) | 143 | 6665 | 13.92 | 14.00 | 1.019 | 85.30 | 1.172 | 0.0625 | 1.5535 | 0.08 | 2.32 | 4.30 | 3.25 | 6.03 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 1_Ant 1+2(2) | 143 | 6665 | 13.95 | 14.00 | 1.012 | 85.30 | 1.172 | 0.0625 | 1.5535 | 0.04 | 2.52 | 4.64 | 3.44 | 6.34 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1 | 15 | 6025 | 16.97 | 17.00 | 1.007 | 99.80 | 1.002 | 0.0625 | 1.5535 | -0.09 | 2.42 | 3.79 | 4.16 | 6.52 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1 | 47 | 6185 | 16.95 | 17.00 | 1.012 | 99.80 | 1.002 | 0.0625 | 1.5535 | 0.08 | 2.33 | 3.67 | 4.25 | 6.69 |
| 01 | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1 | 143 | 6665 | 16.96 | 17.00 | 1.009 | 99.80 | 1.002 | 0.0625 | 1.5535 | 0.02 | 3.02 | 4.74 | 4.72 | 7.42 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2(2) | 15 | 6025 | 12.69 | 14.00 | 1.352 | 85.50 | 1.170 | 0.0625 | 1.5535 | -0.12 | 1.32 | 3.24 | 1.73 | 4.25 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2(2) | 47 | 6185 | 12.85 | 14.00 | 1.303 | 85.50 | 1.170 | 0.0625 | 1.5535 | 0.08 | 1.66 | 3.93 | 2.51 | 5.95 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2(2) | 143 | 6665 | 12.74 | 14.00 | 1.337 | 85.50 | 1.170 | 0.0625 | 1.5535 | -0.17 | 1.76 | 4.28 | 2.61 | 6.34 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2+3+4(3) | 15 | 6025 | 10.33 | 11.00 | 1.167 | 85.50 | 1.170 | 0.0625 | 1.5535 | -0.1 | 0.225 | 0.48 | 0.372 | 0.79 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2+3+4(4) | 15 | 6025 | 9.88 | 11.00 | 1.294 | 85.50 | 1.170 | 0.0625 | 1.5535 | 0.07 | 0.114 | 0.27 | 0.254 | 0.60 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2+3+4(3) | 47 | 6185 | 10.50 | 11.00 | 1.122 | 85.50 | 1.170 | 0.0625 | 1.5535 | 0 | 0.206 | 0.42 | 0.384 | 0.78 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2+3+4(4) | 47 | 6185 | 9.56 | 11.00 | 1.393 | 85.50 | 1.170 | 0.0625 | 1.5535 | -0.16 | 0.198 | 0.50 | 0.376 | 0.95 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2+3+4(3) | 143 | 6665 | 10.07 | 11.00 | 1.239 | 85.50 | 1.170 | 0.0625 | 1.5535 | 0.06 | 0.215 | 0.48 | 0.411 | 0.93 |
| | WLAN6GHz | 802.11ax-HE160 MCS0 | Front Face | 2mm | Radio 3_Ant 1+2+3+4(4) | 143 | 6665 | 9.25 | 11.00 | 1.496 | 85.50 | 1.170 | 0.0625 | 1.5535 | -0.11 | 0.276 | 0.75 | 0.421 | 1.14 |

# 12. Simultaneous Transmission Analysis

| NO. | Simultaneous Transmission Configurations | Body | Extremity |
|---|---|---|---|
| 1. | WLAN2.4GHz (Radio 1) + WLAN 5GHz (Radio 2) + Bluetooth (Radio3) | Yes | Yes |
| 2. | WLAN 5/6GHz (Radio 1) + WLAN 5GHz (Radio 2) + Bluetooth (Radio3) | Yes | Yes |
| 3. | WLAN2.4GHz (Radio 1) + WLAN 6GHz (Radio 3) + Bluetooth (Radio3) | Yes | Yes |
| 4. | WLAN2.4GHz (Radio 1) + WLAN 5GHz (Radio 2) + Thread (Radio3) | Yes | Yes |
| 5. | WLAN 5/6GHz (Radio 1) + WLAN 5GHz (Radio 2) + Thread (Radio3) | Yes | Yes |
| 6. | WLAN2.4GHz (Radio 1) + WLAN 6GHz (Radio 3) + Thread (Radio3) | Yes | Yes |

**General Note:**

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

## 12.1 Body Exposure Conditions

| Exposure Position | 1<br>Radio 1_WLAN2.4GHz Ant 1<br>1g SAR (W/kg) | 2<br>Radio 1_WLAN5GHz Ant 1<br>1g SAR (W/kg) | 3<br>Radio 2_WLAN5GHz Ant 1<br>1g SAR (W/kg) | 4<br>Radio 3_Bluetooth<br>1g SAR (W/kg) | 5<br>Radio 3_Thread<br>1g SAR (W/kg) | 1+3+4 Summed 1g SAR (W/kg) | 1+3+5 Summed 1g SAR (W/kg) | 2+3+4 Summed 1g SAR (W/kg) | 2+3+5 Summed 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Front Face at 25mm | 0.449 | | 0.550 | 0.002 | 0.001 | **1.001** | **1.000** | **0.552** | **0.551** |
| Edge 1 at 25mm | 0.030 | | 0.173 | 0.001 | 0.001 | **0.204** | **0.204** | **0.174** | **0.174** |
| Edge 2 at 25mm | 0.066 | | 0.333 | 0.001 | 0.001 | **0.400** | **0.400** | **0.334** | **0.334** |
| Edge 4 at 25mm | 0.069 | | 0.114 | 0.001 | 0.001 | **0.184** | **0.184** | **0.115** | **0.115** |

| Exposure Position | 1<br>Radio 1_WLAN2.4GHz Ant 1+2<br>1g SAR (W/kg) | 2<br>Radio 1_WLAN5G/6GHz Ant 1+2<br>1g SAR (W/kg) | 3<br>Radio 2_WLAN5GHz Ant 1+2<br>1g SAR (W/kg) | 4<br>Radio 3_Bluetooth<br>1g SAR (W/kg) | 5<br>Radio 3_Thread<br>1g SAR (W/kg) | 1+3+4 Summed 1g SAR (W/kg) | 1+3+5 Summed 1g SAR (W/kg) | 2+3+4 Summed 1g SAR (W/kg) | 2+3+5 Summed 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Front Face at 25mm | 0.324 | 0.995 | 0.535 | 0.002 | 0.001 | **0.861** | **0.860** | **1.532** | **1.531** |
| Edge 1 at 25mm | 0.052 | 0.094 | 0.275 | 0.001 | 0.001 | **0.328** | **0.328** | **0.370** | **0.370** |
| Edge 2 at 25mm | 0.044 | 0.154 | 0.401 | 0.001 | 0.001 | **0.446** | **0.446** | **0.556** | **0.556** |
| Edge 4 at 25mm | 0.044 | 0.228 | 0.110 | 0.001 | 0.001 | **0.155** | **0.155** | **0.339** | **0.339** |

| Exposure Position | 1<br>Radio 1_WLAN2.4GHz Ant 1+2+3+4<br>1g SAR (W/kg) | 2<br>Radio 1_WLAN5GHz Ant 1+2+3+4<br>1g SAR (W/kg) | 3<br>Radio 2_WLAN5GHz Ant 1+2+3+4<br>1g SAR (W/kg) | 4<br>Radio 3_Bluetooth<br>1g SAR (W/kg) | 5<br>Radio 3_Thread<br>1g SAR (W/kg) | 1+3+4 Summed 1g SAR (W/kg) | 1+3+5 Summed 1g SAR (W/kg) | 2+3+4 Summed 1g SAR (W/kg) | 2+3+5 Summed 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Front Face at 25mm | 0.436 | | 1.152 | 0.002 | 0.001 | **1.590** | **1.589** | **1.154** | **1.153** |
| Edge 1 at 25mm | 0.075 | | 0.246 | 0.001 | 0.001 | **0.322** | **0.322** | **0.247** | **0.247** |
| Edge 2 at 25mm | 0.106 | | 0.485 | 0.001 | 0.001 | **0.592** | **0.592** | **0.486** | **0.486** |
| Edge 4 at 25mm | 0.087 | | 0.224 | 0.001 | 0.001 | **0.312** | **0.312** | **0.225** | **0.225** |

## 12.2 Extremity Exposure Conditions

| Exposure Position | 1<br>Radio 1_WLAN2.4GHz Ant 1<br>10g SAR (W/kg) | 2<br>Radio 1_WLAN5GHz Ant 1<br>10g SAR (W/kg) | 3<br>Radio 2_WLAN5GHz Ant 1<br>10g SAR (W/kg) | 4<br>Radio 3_WLAN6GHz Ant 1<br>10g SAR (W/kg) | 5<br>Radio 3_Bluetooth<br>10g SAR (W/kg) | 6<br>Radio 3_Thread<br>10g SAR (W/kg) | 1+3+5 Summed 10g SAR (W/kg) | 1+3+6 Summed 10g SAR (W/kg) | 2+3+5 Summed 10g SAR (W/kg) | 2+3+6 Summed 10g SAR (W/kg) | 1+4+5 Summed 10g SAR (W/kg) | 1+4+6 Summed 10g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Front Face at 0mm | 1.393 | | 2.418 | 0.619 | 0.012 | 0.013 | **3.823** | **3.824** | **2.430** | **2.431** | **2.024** | **2.025** |
| Edge 1 at 0mm | 0.048 | | 0.055 | 0.269 | 0.001 | 0.001 | **0.104** | **0.104** | **0.056** | **0.056** | **0.318** | **0.318** |
| Edge 2 at 0mm | 0.212 | | 0.121 | 0.189 | 0.001 | 0.001 | **0.334** | **0.334** | **0.122** | **0.122** | **0.402** | **0.402** |
| Edge 4 at 0mm | 0.112 | | 0.042 | | 0.001 | 0.001 | **0.155** | **0.155** | **0.043** | **0.043** | **0.113** | **0.113** |

| Exposure Position | 1<br>Radio 1_WLAN2.4GHz Ant 1+2<br>10g SAR (W/kg) | 2<br>Radio 1_WLAN5GHz Ant 1+2<br>10g SAR (W/kg) | 3<br>Radio 2_WLAN5GHz Ant 1+2<br>10g SAR (W/kg) | 4<br>Radio 3_WLAN6GHz Ant 1+2<br>10g SAR (W/kg) | 5<br>Radio 3_Bluetooth<br>10g SAR (W/kg) | 6<br>Radio 3_Thread<br>10g SAR (W/kg) | 1+3+5 Summed 10g SAR (W/kg) | 1+3+6 Summed 10g SAR (W/kg) | 2+3+5 Summed 10g SAR (W/kg) | 2+3+6 Summed 10g SAR (W/kg) | 1+4+5 Summed 10g SAR (W/kg) | 1+4+6 Summed 10g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Front Face at 0mm | 0.701 | 1.878 | 1.892 | 0.430 | 0.012 | 0.013 | **2.605** | **2.606** | **3.782** | **3.783** | **1.143** | **1.144** |
| Edge 1 at 0mm | 0.191 | 0.501 | 0.182 | 0.154 | 0.001 | 0.001 | **0.374** | **0.374** | **0.684** | **0.684** | **0.346** | **0.346** |
| Edge 2 at 0mm | 0.111 | 0.626 | 0.301 | 0.106 | 0.001 | 0.001 | **0.413** | **0.413** | **0.928** | **0.928** | **0.218** | **0.218** |
| Edge 4 at 0mm | 0.072 | 0.412 | 0.082 | 0.110 | 0.001 | 0.001 | **0.155** | **0.155** | **0.495** | **0.495** | **0.183** | **0.183** |

| Exposure Position | 1<br>Radio 1_WLAN2.4GHz Ant 1+2+3+4<br>10g SAR (W/kg) | 2<br>Radio 1_WLAN5GHz Ant 1+2+3+4<br>10g SAR (W/kg) | 3<br>Radio 2_WLAN5GHz Ant 1+2+3+4<br>10g SAR (W/kg) | 4<br>Radio 3_WLAN6GHz Ant 1+2+3+4<br>10g SAR (W/kg) | 5<br>Radio 3_Bluetooth<br>10g SAR (W/kg) | 6<br>Radio 3_Thread<br>10g SAR (W/kg) | 1+3+5 Summed 10g SAR (W/kg) | 1+3+6 Summed 10g SAR (W/kg) | 2+3+5 Summed 10g SAR (W/kg) | 2+3+6 Summed 10g SAR (W/kg) | 1+4+5 Summed 10g SAR (W/kg) | 1+4+6 Summed 10g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Front Face at 0mm | 1.242 | | 2.303 | 0.245 | 0.012 | 0.013 | **3.557** | **3.558** | **2.315** | **2.316** | **1.499** | **1.500** |
| Edge 1 at 0mm | 0.303 | | 0.237 | 0.050 | 0.001 | 0.001 | **0.541** | **0.541** | **0.238** | **0.238** | **0.354** | **0.354** |
| Edge 2 at 0mm | 0.325 | | 0.272 | 0.050 | 0.001 | 0.001 | **0.598** | **0.598** | **0.273** | **0.273** | **0.376** | **0.376** |
| Edge 4 at 0mm | 0.249 | | 0.168 | 0.040 | 0.001 | 0.001 | **0.418** | **0.418** | **0.169** | **0.169** | **0.290** | **0.290** |

**Test Engineer：** Dennis Hsieh and Carter Jhuang

# 13. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

Declaration of Conformity:
The test results with all measurement uncertainty excluded is presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

| Uncertainty Distributions | Normal | Rectangular | Triangular | U-Shape |
|---|---|---|---|---|
| Multi-plying Factor[a] | 1/k[b] | $1/\sqrt{3}$ | $1/\sqrt{6}$ | $1/\sqrt{2}$ |

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) $\kappa$ is the coverage factor

**Standard Uncertainty for Assumed Distribution**

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty.

**Applicable for SAR Measurements:**

| Uncertainty Budget (4 MHz - 10 GHz range) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Error Description** | **Uncertainty Value (±%)** | **Probability** | **Divisor** | **(Ci) 1g** | **(Ci) 10g** | **Standard Uncertainty (1g) (±%)** | **Standard Uncertainty (10g) (±%)** |
| **Measurement System** | | | | | | | |
| Probe Calibration | 18.60 | N | 2 | 1 | 1 | 9.3 | 9.3 |
| Axial Isotropy | 4.70 | R | 1.732 | 0.7 | 0.7 | 1.9 | 1.9 |
| Hemispherical Isotropy | 9.60 | R | 1.732 | 0.7 | 0.7 | 3.9 | 3.9 |
| Linearity | 4.70 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| Modulation Response | 4.68 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| System Detection Limits | 1.00 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Boundary Effects | 2.00 | R | 1.732 | 1 | 1 | 1.2 | 1.2 |
| Readout Electronics | 0.30 | N | 1 | 1 | 1 | 0.3 | 0.3 |
| Response Time | 0.00 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| Integration Time | 2.60 | R | 1.732 | 1 | 1 | 1.5 | 1.5 |
| RF Ambient Noise | 3.00 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| RF Ambient Reflections | 3.00 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner | 0.40 | R | 1.732 | 1 | 1 | 0.2 | 0.2 |
| Probe Positioning | 6.70 | R | 1.732 | 1 | 1 | 3.9 | 3.9 |
| Post-processing | 4.00 | R | 1.732 | 1 | 1 | 2.3 | 2.3 |
| **Test Sample Related** | | | | | | | |
| Device Holder | 3.60 | N | 1 | 1 | 1 | 3.6 | 3.6 |
| Test sample Positioning | 3.03 | N | 1 | 1 | 1 | 3.0 | 3.0 |
| Power Scaling | 0.00 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| Power Drift | 5.00 | R | 1.732 | 1 | 1 | 2.9 | 2.9 |
| **Phantom and Setup** | | | | | | | |
| Phantom Uncertainty | 7.60 | R | 1.732 | 1 | 1 | 4.4 | 4.4 |
| SAR correction | 0.00 | R | 1.732 | 1 | 0.84 | 0.0 | 0.0 |
| Liquid Conductivity Repeatability | 0.03 | N | 1 | 0.78 | 0.77 | 0.0 | 0.0 |
| Liquid Conductivity (target) | 5.00 | R | 1.732 | 0.78 | 0.77 | 2.3 | 2.2 |
| Liquid Conductivity (mea.) | 2.50 | R | 1.732 | 0.78 | 0.77 | 1.1 | 1.1 |
| Temp. unc. - Conductivity | 3.68 | R | 1.732 | 0.78 | 0.77 | 1.7 | 1.6 |
| Liquid Permittivity Repeatability | 0.02 | N | 1 | 0.23 | 0.26 | 0.0 | 0.0 |
| Liquid Permittivity (target) | 5.00 | R | 1.732 | 0.23 | 0.26 | 0.7 | 0.8 |
| Liquid Permittivity (mea.) | 2.50 | R | 1.732 | 0.23 | 0.26 | 0.3 | 0.4 |
| Temp. unc. - Permittivity | 0.84 | R | 1.732 | 0.23 | 0.26 | 0.1 | 0.1 |
| **Combined Std. Uncertainty** | | | | | | 14.5% | 14.2% |
| **Coverage Factor for 95 %** | | | | | | K=2 | K=2 |
| **Expanded STD Uncertainty** | | | | | | 29.0% | 28.4% |

**Applicable for Power Density Measurements:**

| Error Description | Uncertainty Value (±dB) | Probability | Divisor | (Ci) | Standard Uncertainty (±dB) |
|---|---|---|---|---|---|
| Probe Calibration | 0.49 | N | 1 | 1 | 0.49 |
| Probe correction | 0.00 | R | 1.732 | 1 | 0.00 |
| Frequency response (BW ≤ 1 GHz) | 0.20 | R | 1.732 | 1 | 0.12 |
| Sensor cross coupling | 0.00 | R | 1.732 | 1 | 0.00 |
| Isotropy | 0.50 | R | 1.732 | 1 | 0.29 |
| Linearity | 0.20 | R | 1.732 | 1 | 0.12 |
| Probe scattering | 0.00 | R | 1.732 | 1 | 0.00 |
| Probe positioning offset | 0.30 | R | 1.732 | 1 | 0.17 |
| Probe positioning repeatability | 0.04 | R | 1.732 | 1 | 0.02 |
| Sensor mechanical offset | 0.00 | R | 1.732 | 1 | 0.00 |
| Probe spatial resolution | 0.00 | R | 1.732 | 1 | 0.00 |
| Field impedance dependance | 0.00 | R | 1.732 | 1 | 0.00 |
| Amplitude and phase drift | 0.00 | R | 1.732 | 1 | 0.00 |
| Amplitude and phase noise | 0.04 | R | 1.732 | 1 | 0.02 |
| Measurement area truncation | 0.00 | R | 1.732 | 1 | 0.00 |
| Data acquisition | 0.03 | N | 1 | 1 | 0.03 |
| Sampling | 0.00 | R | 1.732 | 1 | 0.00 |
| Field reconstruction | 2.00 | R | 1.732 | 1 | 1.15 |
| Forward transformation | 0.00 | R | 1.732 | 1 | 0.00 |
| Power density scaling | 0.00 | R | 1.732 | 1 | 0.00 |
| Spatial averaging | 0.10 | R | 1.732 | 1 | 0.06 |
| System detection limit | 0.04 | R | 1.732 | 1 | 0.02 |
| **Uncertainty terms dep endent on the DUT and environmental factors** | | | | | |
| Probe coupling with DUT | 0.00 | R | 1.732 | 1 | 0.0 |
| Modulation response | 0.40 | R | 1.732 | 1 | 0.2 |
| Integration time | 0.00 | R | 1.732 | 1 | 0.0 |
| Response time | 0.00 | R | 1.732 | 1 | 0.0 |
| Device holder influence | 0.10 | R | 1.732 | 1 | 0.1 |
| DUT alignment | 0.00 | R | 1.732 | 1 | 0.0 |
| RF ambient conditions | 0.04 | R | 1.732 | 1 | 0.0 |
| Ambient reflections | 0.04 | R | 1.732 | 1 | 0.0 |
| Immunity / secondary reception | 0.00 | R | 1.732 | 1 | 0.0 |
| Drift of the DUT | | R | 1.732 | 1 | |
| **Combined Std. Uncertainty** | | | | | 1.34 |
| **Expanded STD Uncertainty (95%)** | | | | | **2.68** |

# 14. References


[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[8] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[9] IEC/IEEE 62209-1528:2020, “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 – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)”, Oct. 2020

[10] SPEAG DASY6 System Handbook

[11] SPEAG DASY6 Application Note (Interim Procedure for Device Operation at 6GHz-10GHz)

Date: 2023-11-11

**System Check_Head_6500MHz**

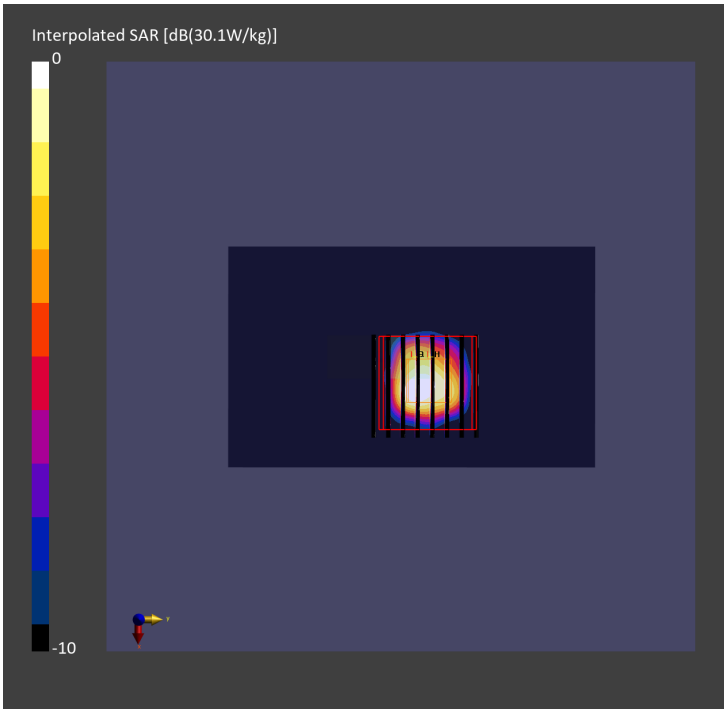
**DUT: D6.5GHzV2 - SN1003**

Communication System: CW; Frequency: 6500.000 MHz; Duty Cycle: 1:1
Medium: HSL_6G_231111 Medium parameters used: f= 6500.000 MHz; $\sigma$= 6.09 S/m; $\varepsilon_r$ = 34.6
Ambient Temperature: 23.5°C; Liquid Temperature: 22.5°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3728; ConvF(4.9, 4.9, 4.9); Calibrated: 2023-03-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1311; Calibrated: 2023-09-13
- Phantom: ELI V5.0 (20deg probe tilt); Serial: 1131; Section: Flat
- Measurement Software: 16.2.4.2524
- UID: CW, 0--

**Pin=20.0dBm/Area Scan (51.0 mm x 85.0 mm)**: Measurement Grid: 8.5 mm x 8.5 mm
SAR (1g) = 20.1 W/kg; SAR (10g) = 4.51 W/kg;

**Pin=20.0dBm/Zoom Scan (22.0 mm x 22.0 mm x 22.0 mm)**: Measurement Grid: 3.4 mm x 3.4 mm x 1.4 mm
Power Drift = 0.05 dB
SAR (1g) = 27.2 W/kg; SAR (8g) = 6.05 W/kg; SAR (10g) = 4.96 W/kg
Smallest distance from peaks to all points 3 dB below = 4.8 mm
Ratio of SAR at M2 to SAR at M1 = 54.9 %
psAPD (1.0cm2, sq) = 272 [W/m2]; psAPD (4.0cm2, sq) = 121 [W/m2]



Date: 2023-11-12

**System Check_Head_6500MHz**

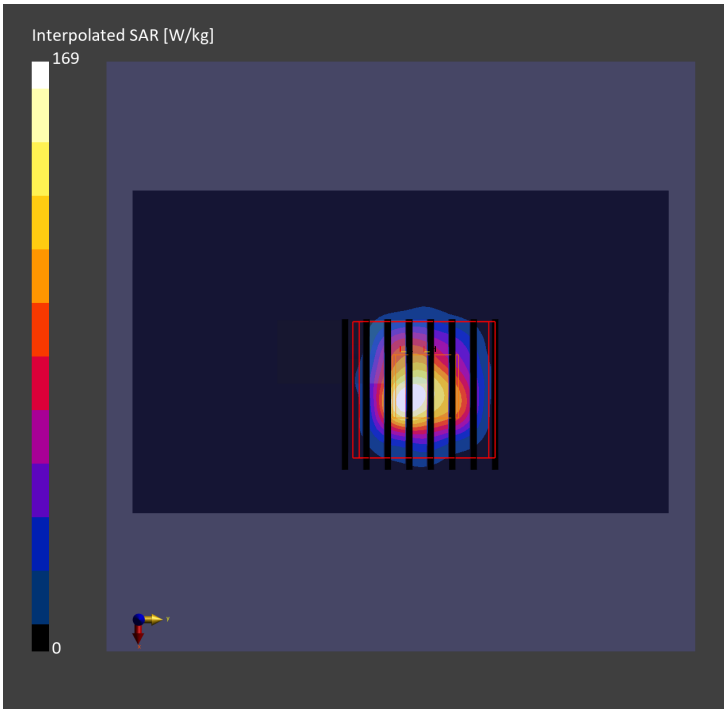
**DUT: D6.5GHzV2 - SN1003**

Communication System: CW; Frequency: 6500.000 MHz; Duty Cycle: 1:1
Medium: HSL_6G_231112 Medium parameters used: f= 6500.000 MHz; $\sigma$= 6.19 S/m; $\varepsilon_r$ = 35.0
Ambient Temperature: 23.7°C; Liquid Temperature: 22.7°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3728; ConvF(4.9, 4.9, 4.9); Calibrated: 2023-03-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1311; Calibrated: 2023-09-13
- Phantom: ELI V5.0 (20deg probe tilt); Serial: 1131; Section: Flat
- Measurement Software: 16.2.4.2524
- UID: CW, 0--

**Pin=20.0dBm/Area Scan (51.0 mm x 85.0 mm)**: Measurement Grid: 8.5 mm x 8.5 mm
SAR (1g) = 20.4 W/kg; SAR (10g) = 4.58 W/kg;

**Pin=20.0dBm/Zoom Scan (22.0 mm x 22.0 mm x 22.0 mm)**: Measurement Grid: 3.4 mm x 3.4 mm x 1.4 mm
Power Drift = 0.07 dB
SAR (1g) = 27.6 W/kg; SAR (8g) = 6.14 W/kg; SAR (10g) = 5.04 W/kg
Smallest distance from peaks to all points 3 dB below = 4.8 mm
Ratio of SAR at M2 to SAR at M1 = 54.9 %
psAPD (1.0cm2, sq) = 276 [W/m2]; psAPD (4.0cm2, sq) = 123 [W/m2]



## Measurement Report for Device

### Device Under Test Properties

| Model, Manufacturer | Dimensions [mm] | Software Version | DUT Type |
|---|---|---|---|
| Device, | 70.0 x 50.0 x 8.0 | 3.0.0.841 | 5G Verification Source |

### Exposure Conditions

| Phantom Section | Position, Test Distance [mm] | Frequency [MHz] | Conversion Factor |
|---|---|---|---|
| 5G | FRONT, 10.00 | 10000.0 | 1.0 |

### Hardware Setup

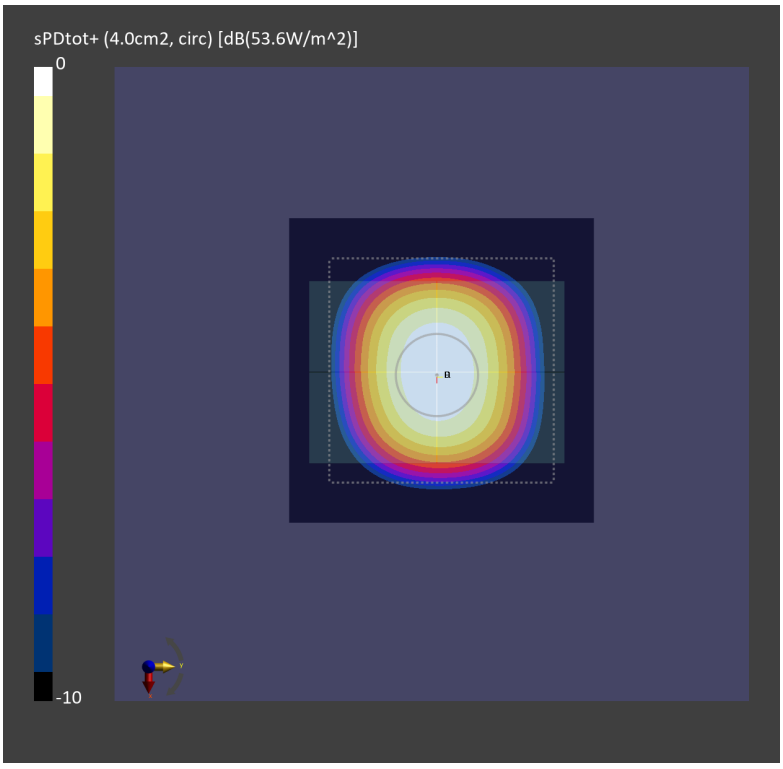
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave - xxxx | Air - | EUmmWV4 - SN9441_F1-55GHz, 2022-11-18 | DAE4 Sn854, 2023-08-17 |

### Scans Setup

| | |
|---|---|
| Scan Type | 5G Scan |
| Grid Extents [mm] | 80.0 x 80.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 10.0 |

### Measurement Results

| | |
|---|---|
| Date | 2023-11-11 |
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 53.1 |
| psPDtot+ [$W/m^2$] | 53.6 |
| $H_{max}$ [A/m] | 0.413 |
| $E_{max}$ [V/m] | 148 |
| $max_{(Stot)}$ [$W/m^2$] | 58.8 |
| Power Drift [dB] | -0.03 |



Date: 2023-11-11

**#01_WLAN6GHz_802.11ax-HE160 MCS0_Front Face_25mm_Ch143;Ant 1**

Communication System: 802.11ax; Frequency: 6665.000 MHz; Duty Cycle: 1:1.002
Medium: HSL_6G_231111 Medium parameters used: f= 6665.000 MHz; $\sigma$= 6.27 S/m; $\varepsilon_r$ = 34.7
Ambient Temperature: 23.5°C; Liquid Temperature: 22.5°C

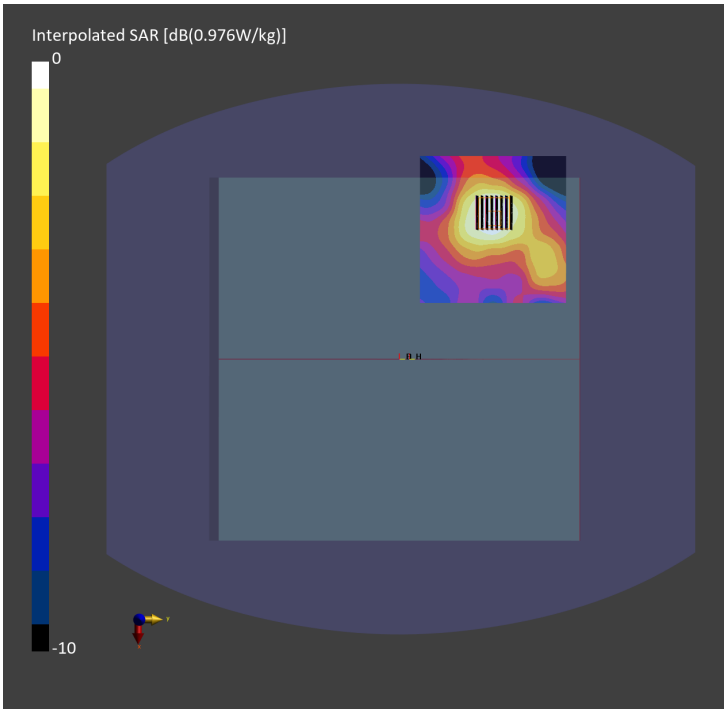
DASY6 Configuration:
- Probe: EX3DV4 - SN3728; ConvF(4.9, 4.9, 4.9); Calibrated: 2023-03-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1311; Calibrated: 2023-09-13
- Phantom: ELI V5.0 (20deg probe tilt); Serial: 1131; Section: Flat
- Measurement Software: 16.2.4.2524
- UID: WLAN, 10743-AAC

**Area Scan (102.0 mm x 102.0 mm)**: Measurement Grid: 8.5 mm x 8.5 mm

SAR (1g) = 0.222 W/kg; SAR (10g) = 0.096 W/kg;

**Zoom Scan (23.8 mm x 23.8 mm x 22.0 mm)**: Measurement Grid: 3.4 mm x 3.4 mm x 1.4 mm

Power Drift = 0.10 dB
SAR (1g) = 0.228 W/kg; SAR (8g) = 0.109 W/kg; SAR (10g) = 0.099 W/kg
Smallest distance from peaks to all points 3 dB below = 11.9 mm
Ratio of SAR at M2 to SAR at M1 = 54.1 %
psAPD (1.0cm2, sq) = 2.28 [W/m2]; psAPD (4.0cm2, sq) = 2.17 [W/m2]



Date: 2023-11-12

**#02_WLAN6GHz_802.11ax-HE160 MCS0_Front Face_0mm_Ch143;Ant 1**

Communication System: 802.11ax; Frequency: 6665.000 MHz; Duty Cycle: 1:1.002
Medium: HSL_6G_231112 Medium parameters used: f= 6665.000 MHz; $\sigma$= 6.41 S/m; $\varepsilon_r$ = 34.8
Ambient Temperature: 23.7°C; Liquid Temperature: 22.7°C

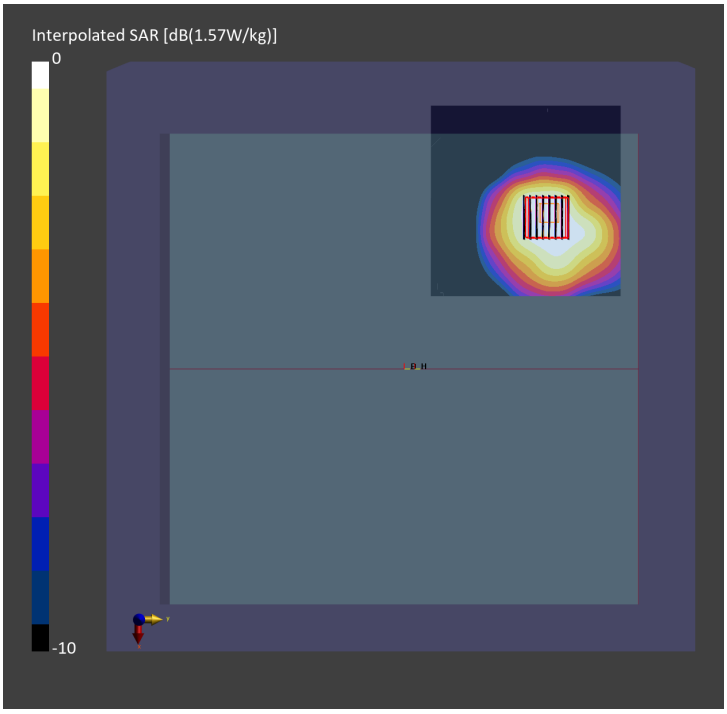
DASY6 Configuration:
- Probe: EX3DV4 - SN3728; ConvF(4.9, 4.9, 4.9); Calibrated: 2023-03-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1311; Calibrated: 2023-09-13
- Phantom: ELI V5.0 (20deg probe tilt); Serial: 1131; Section: Flat
- Measurement Software: 16.2.4.2524
- UID: WLAN, 10743-AAC

**Area Scan (102.0 mm x 102.0 mm)**: Measurement Grid: 8.5 mm x 8.5 mm

SAR (1g) = 1.34 W/kg; SAR (10g) = 0.587 W/kg;

**Zoom Scan (23.8 mm x 23.8 mm x 22.0 mm)**: Measurement Grid: 3.4 mm x 3.4 mm x 1.4 mm

Power Drift = -0.07 dB
SAR (1g) = 1.53 W/kg; SAR (8g) = 0.674 W/kg; SAR (10g) = 0.612 W/kg
Smallest distance from peaks to all points 3 dB below = 8.3 mm
Ratio of SAR at M2 to SAR at M1 = 51.6 %
psAPD (1.0cm2, sq) = 15.3 [W/m2]; psAPD (4.0cm2, sq) = 13.5 [W/m2]



## Measurement Report for Device

### Device Under Test Properties

| Model, Manufacturer | Dimensions [mm] | Software Version | DUT Type |
|---|---|---|---|
| Device, | 250.0 x 250.0 x 70.0 | 3.0.0.841 | Ruter |

### Exposure Conditions

| Phantom Section | Position, Test Distance [mm] | Frequency [MHz] | Conversion Factor |
|---|---|---|---|
| 5G | FRONT FACE, 2.00 | 6665.0 | 1.0 |

### Hardware Setup

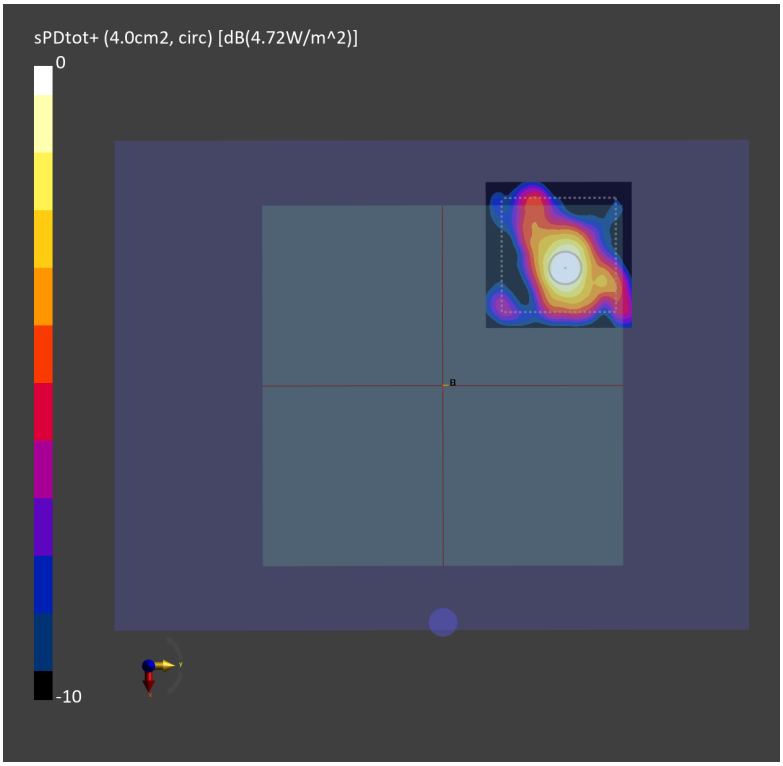
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave - xxxx | Air - | EUmmWV4 - SN9441_F1-55GHz, 2022-11-18 | DAE4 Sn854, 2023-08-17 |

### Scans Setup

| Scan Type | 5G Scan |
|---|---|
| Grid Extents [mm] | 100.0 x 100.0 |
| Grid Steps [lambda] | 0.0625 x 0.0625 |
| Sensor Surface [mm] | 2.0 |

### Measurement Results

| Date | 2023-11-11 |
|---|---|
| Avg. Area [$cm^2$] | 4.00 |
| psPDn+ [$W/m^2$] | 3.02 |
| psPDtot+ [$W/m^2$] | 4.72 |
| $H_{max}$ [A/m] | 0.189 |
| $E_{max}$ [V/m] | 55.8 |
| $max_{(Stot)}$ [$W/m^2$] | 9.50 |
| IPDn | 4.39 |
| Power Drift [dB] | 0.02 |



**Calibration Laboratory of**
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**Zeughausstrasse 43, 8004 Zurich, Switzerland**

**S** Schweizerischer Kalibrierdienst
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**Accreditation No.: SCS 0108**

**Client** **Sporton**
**Taoyuan City, Taiwan**

**Certificate No: D6.5GHzV2-1003_Mar23**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D6.5GHzV2 - SN:1003 |
| Calibration procedure(s) | QA CAL-22.v7<br>Calibration Procedure for SAR Validation Sources between 3-10 GHz |
| Calibration date: | March 15, 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 | 01-Apr-22 (No. 217-03526) | Apr-23 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 04-Apr-22 (No. 217-03527) | Apr-23 |
| Mismatch combination | SN: 84224 / 360D | 26-Apr-22 (No. 217-03545) | Apr-23 |
| 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 |
| 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: March 16, 2023

**Calibration Laboratory of**
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**Accreditation No.: SCS 0108**

## Glossary:

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

## Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range Of 4 MHz To 10 GHz)", October 2020.

## Additional Documentation:

b) DASY System Handbook

## Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.
- *The absorbed power density (APD):* The absorbed power density is evaluated according to Samaras T, Christ A, Kuster N, "*Compliance assessment of the epithelial or absorbed power density above 6 GHz using SAR measurement systems*", Bioelectromagnetics, 2021 (submitted). The additional evaluation uncertainty of 0.55 dB (rectangular distribution) is considered.

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | 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 | 34.3 ± 6 % | 6.02 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 | 29.7 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **297 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 | **66.5 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 | **54.5 W/kg ± 24.4 % (k=2)** |

## Appendix

## Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 54.7 Ω - 2.8 jΩ |
| Return Loss | - 25.7 dB |

## APD (Absorbed Power Density)

| **APD averaged over 1 cm²** | Condition | |
|---|---|---|
| APD measured | 100 mW input power | 296 W/m² |
| APD measured | normalized to 1W | **2960 W/m² ± 29.2 % (k=2)** |

| **APD averaged over 4 cm²** | condition | |
|---|---|---|
| APD measured | 100 mW input power | 133 W/m² |
| APD measured | normalized to 1W | **1330 W/m² ± 28.9 % (k=2)** |

*The reported APD values have been derived using the psSAR1g and psSAR8g.

## General Antenna Parameters and Design

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

## Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |

# DASY6 Validation Report for Head TSL

**Measurement Report for D6.5GHz-1003, UID 0 -, Channel 6500 (6500.0MHz)**

**Device under Test Properties**

| Name, Manufacturer | Dimensions [mm] | IMEI | DUT Type |
|---|---|---|---|
| D6.5GHz | 16.0 x 6.0 x 300.0 | SN: 1003 | - |

**Exposure Conditions**

| Phantom Section, TSL | Position, Test Distance [mm] | Band | Group, UID | Frequency [MHz] | Conversion Factor | TSL Cond. [S/m] | TSL Permittivity |
|---|---|---|---|---|---|---|---|
| Flat, HSL | 5.00 | Band | CW, | 6500 | 5.50 | 6.02 | 34.3 |

**Hardware Setup**

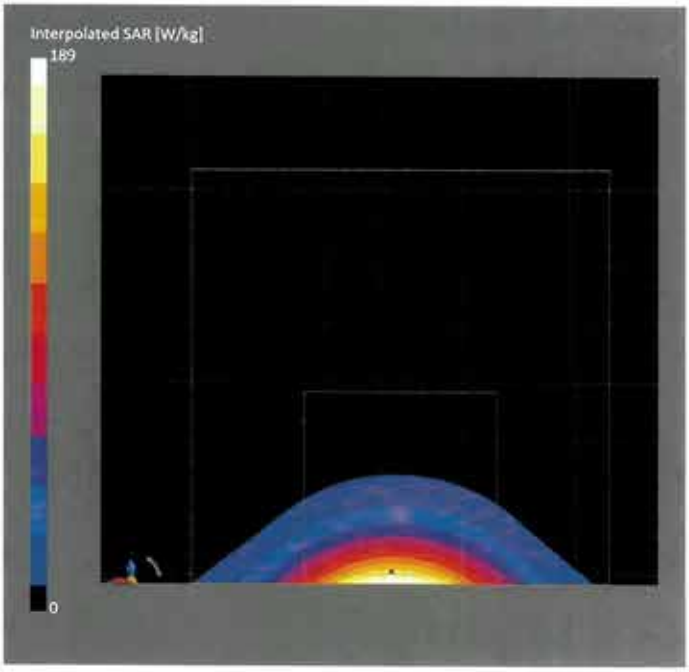
| Phantom | TSL | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| MFP V8.0 Center - 1182 | HBBL600-10000V6 | EX3DV4 - SN7405, 2022-06-02 | DAE4 Sn908, 2022-06-27 |

**Scan Setup**

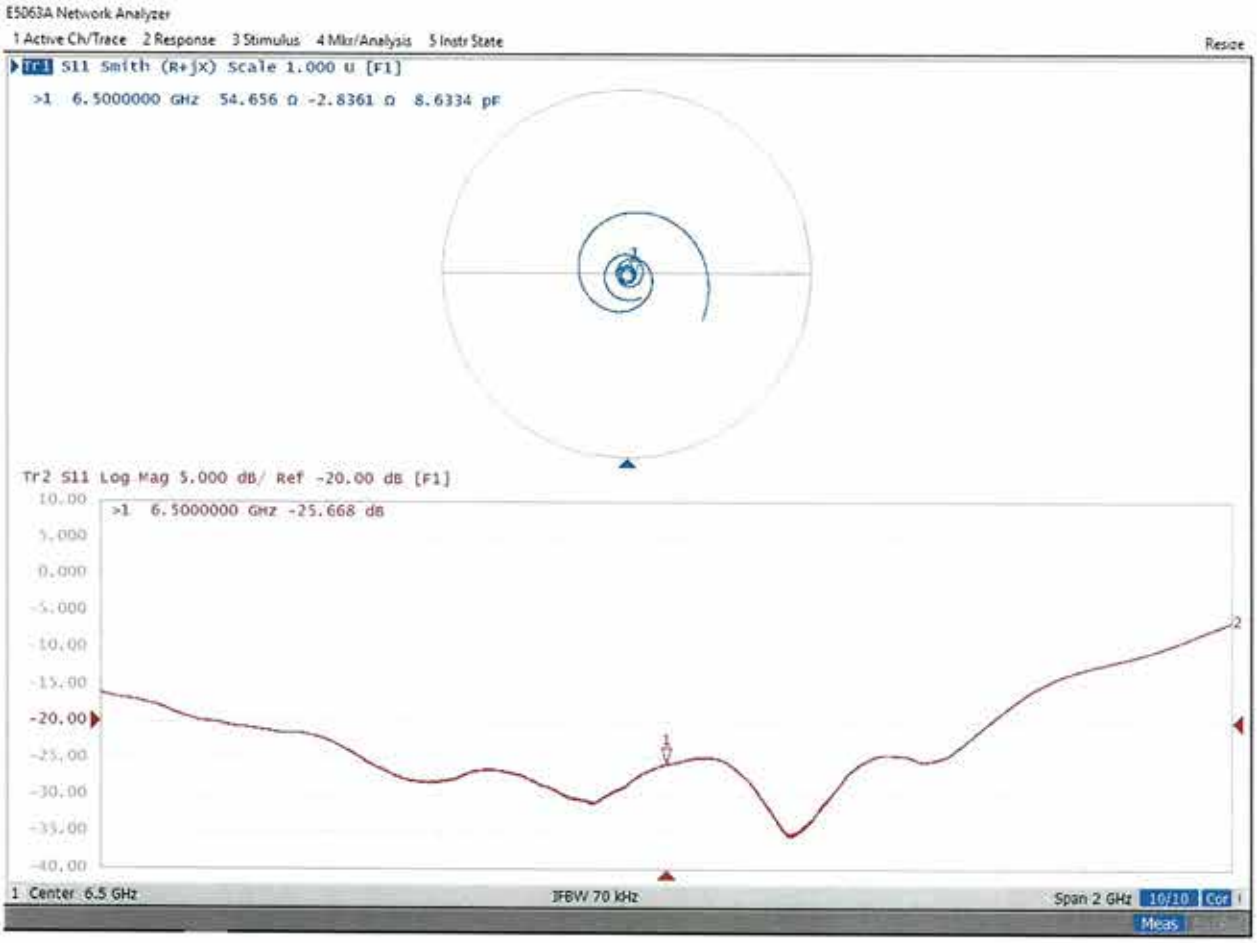
| | Zoom Scan |
|---|---|
| Grid Extents [mm] | 22.0 x 22.0 x 22.0 |
| Grid Steps [mm] | 3.4 x 3.4 x 1.4 |
| Sensor Surface [mm] | 1.4 |
| Graded Grid | Yes |
| Grading Ratio | 1.4 |
| MAIA | N/A |
| Surface Detection | VMS + 6p |
| Scan Method | Measured |

**Measurement Results**

| | Zoom Scan |
|---|---|
| Date | 2023-03-15, 12:03 |
| psSAR1g [W/Kg] | 29.7 |
| psSAR8g [W/Kg] | 6.66 |
| psSAR10g [W/Kg] | 5.46 |
| Power Drift [dB] | 0.01 |
| Power Scaling | Disabled |
| Scaling Factor [dB] | |
| TSL Correction | No correction |
| M2/M1 [%] | 55.0 |
| Dist 3dB Peak [mm] | 4.7 |



## Impedance Measurement Plot for Head TSL



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**Accreditation No.: SCS 0108**

**Client** **Sporton**

**Certificate No: 5G-Veri10-1020_Jan23/2**

# CALIBRATION CERTIFICATE (Replacement of No: 5G-Veri10-1020_Jan23)

| | |
|---|---|
| Object | 5G Verification Source 10 GHz - SN: 1020 |
| Calibration procedure(s) | QA CAL-45.v4<br>Calibration procedure for sources in air above 6 GHz |
| Calibration date: | January 20, 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 |
|---|---|---|---|
| Reference Probe EUmmWV3 | SN: 9374 | 2023-01-03(No. EUmmWV3-9374_Jan23) | Jan-24 |
| DAE4ip | SN: 1602 | 2022-06-27 (No. DAE4ip-1602_Jun22) | Jun-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMF100A | SN: 100184 | 19-May-22 (in house check Nov-22) | In house check: Nov-23 |
| Power sensor R&S NRP18S-10 | SN: 101258 | 31-May-22 (in house check Nov-22) | In house check: Nov-23 |

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

Issued: March 16, 2023

## Glossary

CW Continuous wave

## Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45, Calibration procedure for sources in air above 6 GHz.
- IEC/IEEE 63195-1, "Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz)", May 2022

## 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 + $\lambda/4$) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-field-maxima and the averaged (1cm$^2$ and 4cm$^2$) 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/m$^2$) averaged over the surface area of 1 cm$^2$ and 4cm$^2$ 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%.

## Measurement Conditions

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

| DASY Version | DASY8 Module mmWave | V3.2 |
|---|---|---|
| Phantom | 5G Phantom | |
| Distance Horn Aperture - plane | 10 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 | *Prad*[1] *(mW)* | Max E-field (V/m) | Uncertainty (k = 2) | Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m²) | | Uncertainty (k = 2) |
|---|---|---|---|---|---|---|
| | | | | 1 cm² | 4 cm² | |
| 10 mm | 86.1 | **152** | 1.27 dB | **59.4** | **54.9** | 1.28 dB |

| Distance Horn Aperture to Measured Plane | *Prad*[1] *(mW)* | Max E-field (V/m) | Uncertainty (k = 2) | Power Density psPDn+, psPDtot+, psPDmod+ (W/m²) | | Uncertainty (k = 2) |
|---|---|---|---|---|---|---|
| | | | | 1 cm² | 4 cm² | |
| 10 mm | 86.1 | **152** | 1.27 dB | **59.2, 59.5, 59.6** | **54.6, 54.9, 55.2** | 1.28 dB |

### Square Averaging

| Distance Horn Aperture to Measured Plane | *Prad*[1] *(mW)* | Max E-field (V/m) | Uncertainty (k = 2) | Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m²) | | Uncertainty (k = 2) |
|---|---|---|---|---|---|---|
| | | | | 1 cm² | 4 cm² | |
| 10 mm | 86.1 | **152** | 1.27 dB | **59.4** | **54.8** | 1.28 dB |

| Distance Horn Aperture to Measured Plane | *Prad*[1] *(mW)* | Max E-field (V/m) | Uncertainty (k = 2) | Power Density psPDn+, psPDtot+, psPDmod+ (W/m²) | | Uncertainty (k = 2) |
|---|---|---|---|---|---|---|
| | | | | 1 cm² | 4 cm² | |
| 10 mm | 86.1 | **152** | 1.27 dB | **59.2, 59.5, 59.6** | **54.5, 54.9, 55.1** | 1.28 dB |

### Max Power Density

| Distance Horn Aperture to Measured Plane | *Prad*[1] *(mW)* | Max E-field (V/m) | Uncertainty (k = 2) | Max Power Density Sn, Stot, \|Stot\| (W/m²) | Uncertainty (k = 2) |
|---|---|---|---|---|---|
| 10 mm | 86.1 | 152 | 1.27 dB | **60.9, 61.2, 61.3** | 1.28 dB |

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

# 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: 1020 | - |

### 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

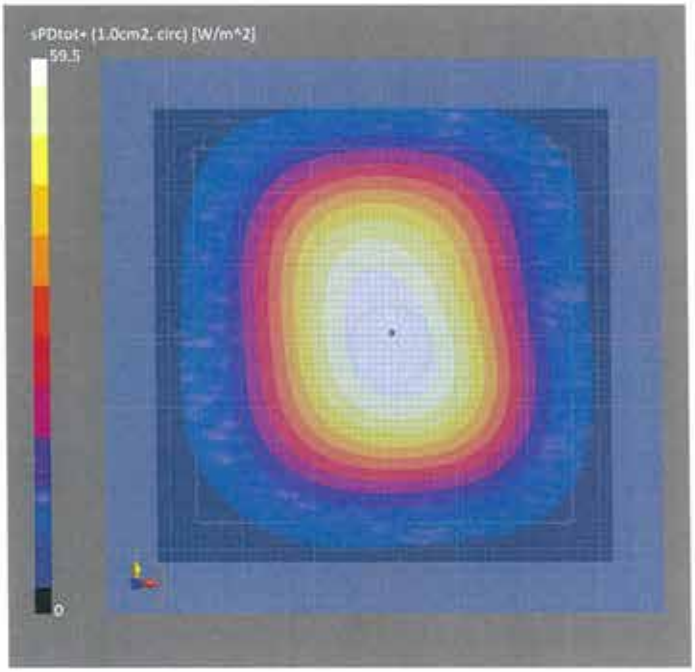
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-55GHz, 2023-01-03 | DAE4ip Sn1602, 2022-06-27 |

### Scan Setup

| | 5G Scan |
|---|---|
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

### Measurement Results

| | 5G Scan |
|---|---|
| Date | 2023-01-20, 09:26 |
| Avg. Area [cm²] | 1.00 |
| Avg. Type | Circular Averaging |
| psPDn+ [W/m²] | 59.2 |
| psPDtot+ [W/m²] | 59.5 |
| psPDmod+ [W/m²] | 59.6 |
| Max(Sn) [W/m²] | 60.9 |
| Max(Stot) [W/m²] | 61.2 |
| Max(\|Stot\|) [W/m²] | 61.3 |
| $E_{max}$ [V/m] | 152 |
| Power Drift [dB] | -0.01 |



# 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: 1020 | - |

### 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

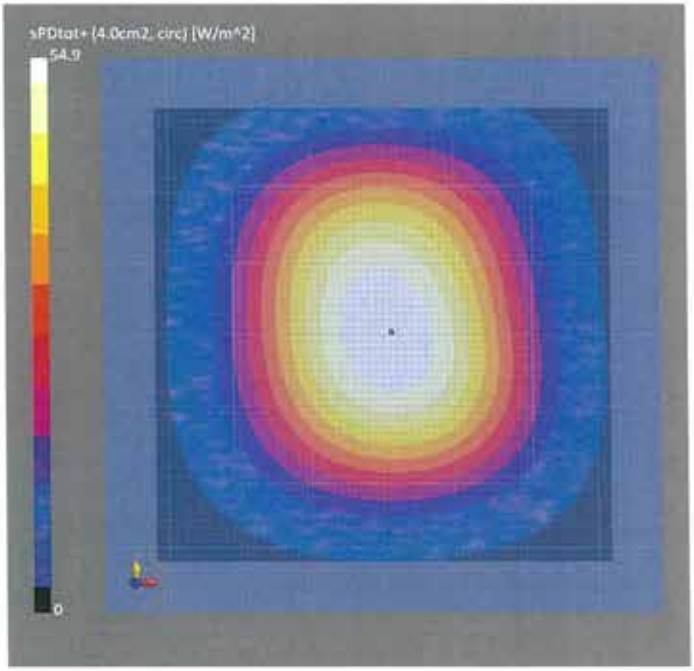
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-55GHz, 2023-01-03 | DAE4ip Sn1602, 2022-06-27 |

### Scan Setup

| | 5G Scan |
|---|---|
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

### Measurement Results

| | 5G Scan |
|---|---|
| Date | 2023-01-20, 09:26 |
| Avg. Area [cm²] | 4.00 |
| Avg. Type | Circular Averaging |
| psPDn+ [W/m²] | 54.6 |
| psPDtot+ [W/m²] | 54.9 |
| psPDmod+ [W/m²] | 55.2 |
| Max(Sn) [W/m²] | 60.9 |
| Max(Stot) [W/m²] | 61.2 |
| Max(\|Stot\|) [W/m²] | 61.3 |
| $E_{max}$ [V/m] | 152 |
| Power Drift [dB] | -0.01 |



# 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: 1020 | - |

### 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

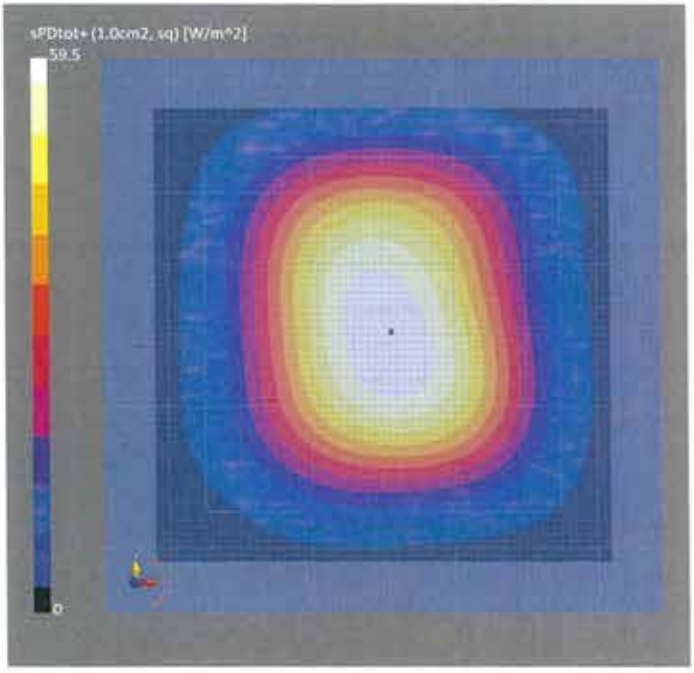
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-55GHz, 2023-01-03 | DAE4ip Sn1602, 2022-06-27 |

### Scan Setup

| | 5G Scan |
|---|---|
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

### Measurement Results

| | 5G Scan |
|---|---|
| Date | 2023-01-20, 09:26 |
| Avg. Area [cm²] | 1.00 |
| Avg. Type | Square Averaging |
| psPDn+ [W/m²] | 59.2 |
| psPDtot+ [W/m²] | 59.5 |
| psPDmod+ [W/m²] | 59.6 |
| Max(Sn) [W/m²] | 60.9 |
| Max(Stot) [W/m²] | 61.2 |
| Max(\|Stot\|) [W/m²] | 61.3 |
| $E_{max}$ [V/m] | 152 |
| Power Drift [dB] | -0.01 |



# 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: 1020 | - |

### 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

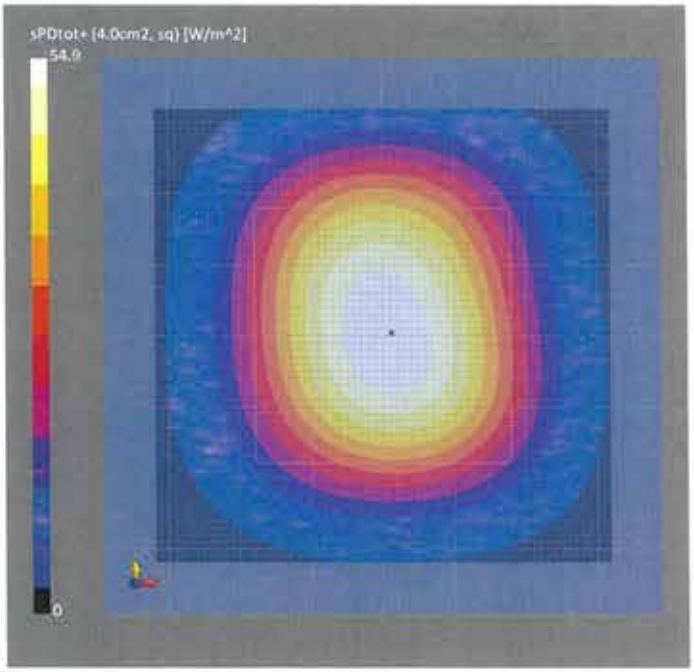
| Phantom | Medium | Probe, Calibration Date | DAE, Calibration Date |
|---|---|---|---|
| mmWave Phantom - 1002 | Air | EUmmWV3 - SN9374_F1-55GHz, 2023-01-03 | DAE4ip Sn1602, 2022-06-27 |

### Scan Setup

| | 5G Scan |
|---|---|
| Sensor Surface [mm] | 10.0 |
| MAIA | MAIA not used |

### Measurement Results

| | 5G Scan |
|---|---|
| Date | 2023-01-20, 09:26 |
| Avg. Area [cm²] | 4.00 |
| Avg. Type | Square Averaging |
| psPDn+ [W/m²] | 54.5 |
| psPDtot+ [W/m²] | 54.9 |
| psPDmod+ [W/m²] | 55.1 |
| Max(Sn) [W/m²] | 60.9 |
| Max(Stot) [W/m²] | 61.2 |
| Max(\|Stot\|) [W/m²] | 61.3 |
| $E_{max}$ [V/m] | 152 |
| Power Drift [dB] | -0.01 |



**Calibration Laboratory of**
Schmid & Partner
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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** Sporton

**Certificate No** EUmm-9441_Nov22

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EUmmWV4 - SN:9441 |
| 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 | November 18, 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. 20A1037915) | 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: November 21, 2022

## 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 $\vartheta = 0$ ($f \leq 900$ 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 warrantied 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, $R_p$, inductance L and capacitors C, $C_p$).
- *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.

# Parameters of Probe: EUmmWV4 - SN:9441

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Unc ($k = 2$) |
|---|---|---|---|
| Norm ($\mu V/(V/m)^2$) | 0.02268 | 0.02681 | ±10.1% |
| DCP (mV) [B] | 105.0 | 105.0 | ±4.7% |
| Equivalent Sensor Angle | -59.9 | 33.8 | |

## 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 | −0.11 | −0.11 | ±0.43 |
| 1.8 | 140.4 | −0.01 | 0.00 | ±0.43 |
| 2.0 | 133.0 | 0.14 | 0.16 | ±0.43 |
| 2.2 | 124.8 | −0.05 | −0.04 | ±0.43 |
| 2.5 | 123.0 | 0.08 | 0.12 | ±0.43 |
| 3.5 | 256.2 | −0.14 | −0.15 | ±0.43 |
| 3.7 | 249.8 | 0.08 | 0.05 | ±0.43 |
| | | | | |
| 6.6 | 76.1 | 0.00 | −0.12 | ±0.98 |
| 8.0 | 68.3 | 0.03 | 0.00 | ±0.98 |
| 10.0 | 67.5 | 0.16 | 0.17 | ±0.98 |
| 15.0 | 55.3 | 0.42 | 0.45 | ±0.98 |
| | | | | |
| 26.6 | 114.9 | 0.16 | 0.14 | ±0.98 |
| 30.0 | 121.2 | 0.23 | 0.22 | ±0.98 |
| 35.0 | 119.8 | 0.41 | 0.42 | ±0.98 |
| 40.0 | 105.8 | 0.51 | 0.52 | ±0.98 |
| | | | | |
| 50.0 | 60.5 | 0.32 | 0.35 | ±0.98 |
| 55.0 | 75.8 | 0.04 | 0.02 | ±0.98 |
| 60.0 | 80.0 | 0.22 | 0.21 | ±0.98 |
| 65.0 | 77.7 | 0.13 | 0.20 | ±0.98 |
| 70.0 | 73.8 | 0.22 | 0.23 | ±0.98 |
| 75.0 | 73.2 | −0.05 | −0.11 | ±0.98 |
| | | | | |
| 75.0 | 80.8 | 0.22 | 0.21 | ±0.98 |
| 80.0 | 79.9 | −0.23 | −0.17 | ±0.98 |
| 85.0 | 47.6 | −0.27 | −0.26 | ±0.98 |
| 90.0 | 72.3 | −0.02 | −0.01 | ±0.98 |
| 92.0 | 72.0 | 0.12 | 0.11 | ±0.98 |
| 95.0 | 66.6 | 0.24 | 0.19 | ±0.98 |
| 97.0 | 57.0 | 0.28 | 0.20 | ±0.98 |
| 100.0 | 55.0 | 0.29 | 0.22 | ±0.98 |
| 105.0 | 53.0 | −0.13 | −0.13 | ±0.98 |
| 110.0 | 61.1 | −0.25 | −0.19 | ±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.

# Parameters of Probe: EUmmWV4 - SN:9441

## 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 | 142.7 | ±2.5% | ±4.7% |
| | | Y | 0.00 | 0.00 | 1.00 | | 77.4 | | |
| 10352 | Pulse Waveform (200Hz, 10%) | X | 1.89 | 60.00 | 14.15 | 10.00 | 6.0 | ±1.3% | ±9.6% |
| | | Y | 1.87 | 60.00 | 14.68 | | 6.0 | | |
| 10353 | Pulse Waveform (200Hz, 20%) | X | 1.31 | 60.00 | 12.95 | 6.99 | 12.0 | ±0.9% | ±9.6% |
| | | Y | 2.00 | 64.00 | 15.00 | | 12.0 | | |
| 10354 | Pulse Waveform (200Hz, 40%) | X | 0.79 | 60.00 | 11.62 | 3.98 | 23.0 | ±1.2% | ±9.6% |
| | | Y | 0.78 | 60.00 | 12.55 | | 23.0 | | |
| 10355 | Pulse Waveform (200Hz, 60%) | X | 0.47 | 60.00 | 10.90 | 2.22 | 27.0 | ±1.0% | ±9.6% |
| | | Y | 0.56 | 60.00 | 11.46 | | 27.0 | | |
| 10387 | QPSK Waveform, 1 MHz | X | 1.03 | 60.00 | 11.41 | 1.00 | 22.0 | ±1.9% | ±9.6% |
| | | Y | 1.17 | 60.00 | 11.38 | | 22.0 | | |
| 10388 | QPSK Waveform, 10 MHz | X | 1.26 | 60.00 | 11.65 | 0.00 | 22.0 | ±0.7% | ±9.6% |
| | | Y | 1.46 | 60.00 | 11.52 | | 22.0 | | |
| 10396 | 64-QAM Waveform, 100 kHz | X | 2.13 | 61.74 | 14.44 | 3.01 | 17.0 | ±0.8% | ±9.6% |
| | | Y | 2.14 | 60.00 | 13.41 | | 17.0 | | |
| 10399 | 64-QAM Waveform, 40 MHz | X | 2.10 | 60.00 | 12.20 | 0.00 | 19.0 | ±0.9% | ±9.6% |
| | | Y | 2.26 | 60.00 | 12.15 | | 19.0 | | |
| 10414 | WLAN CCDF, 64-QAM, 40 MHz | X | 3.18 | 60.00 | 12.66 | 0.00 | 12.0 | ±0.7% | ±9.6% |
| | | Y | 3.39 | 60.00 | 12.58 | | 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.

# Parameters of Probe: EUmmWV4 - SN:9441

## 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 | −0.02 | −0.15 | ±0.2 |
| 0.9 | 100.0 | −0.06 | −0.03 | ±0.2 |
| 0.9 | 500.0 | 0.02 | 0.00 | ±0.2 |
| 0.9 | 1000.0 | 0.03 | 0.04 | ±0.2 |
| 0.9 | 1500.0 | 0.01 | 0.03 | ±0.2 |
| 0.9 | 2100.0 | 0.01 | 0.02 | ±0.2 |

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

| | Sensor X | Sensor Y |
|---|---|---|
| R (Ω) | 47.01 | 100.21 |
| $R_p$ (Ω) | 54.53 | 111.39 |
| L (nH) | 0.06034 | 0.11804 |
| C (pF) | 0.4933 | 0.3029 |
| $C_p$ (pF) | 0.1272 | 0.0654 |

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

| | Sensor X | Sensor Y |
|---|---|---|
| R (Ω) | 36.60 | 25.54 |
| $R_p$ (Ω) | 171.72 | 107.61 |
| L (nH) | 0.08332 | 0.05281 |
| C (pF) | 0.0520 | 0.0890 |
| $C_p$ (pF) | 0.0601 | 0.0937 |

## Sensor Model Parameters

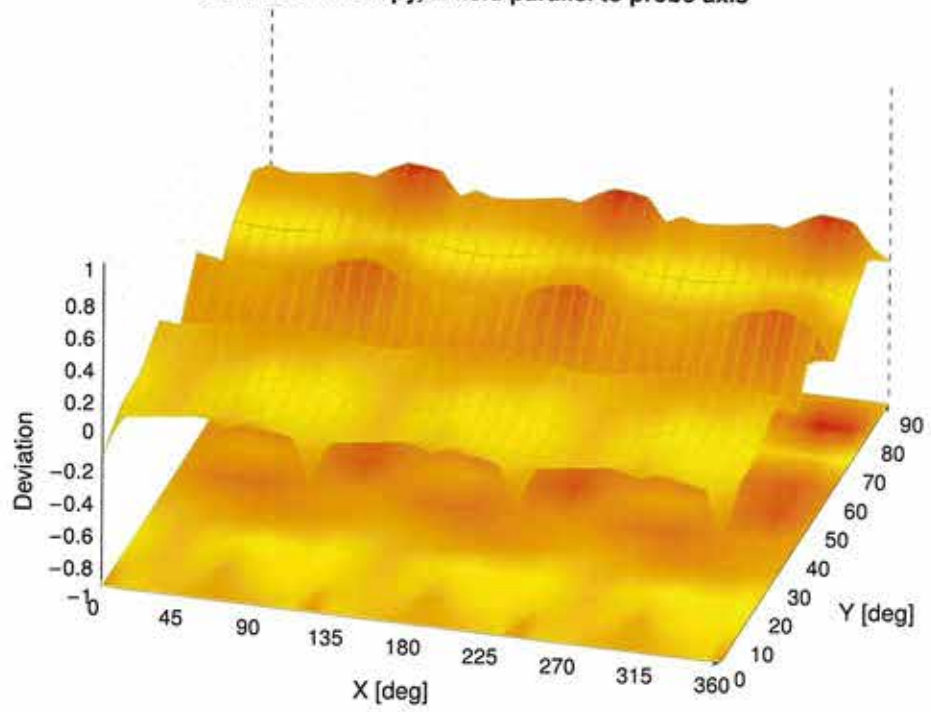
| | C1 fF | C2 fF | $\alpha$ $V^{-1}$ | T1 $ms\,V^{-2}$ | T2 $ms\,V^{-1}$ | T3 ms | T4 $V^{-2}$ | T5 $V^{-1}$ | T6 |
|---|---|---|---|---|---|---|---|---|---|
| x | 35.1 | 255.74 | 33.75 | 0.92 | 3.69 | 5.01 | 0.00 | 0.95 | 1.01 |
| y | 34.2 | 247.13 | 33.39 | 0.92 | 3.61 | 5.01 | 0.00 | 1.46 | 1.00 |

## Other Probe Parameters

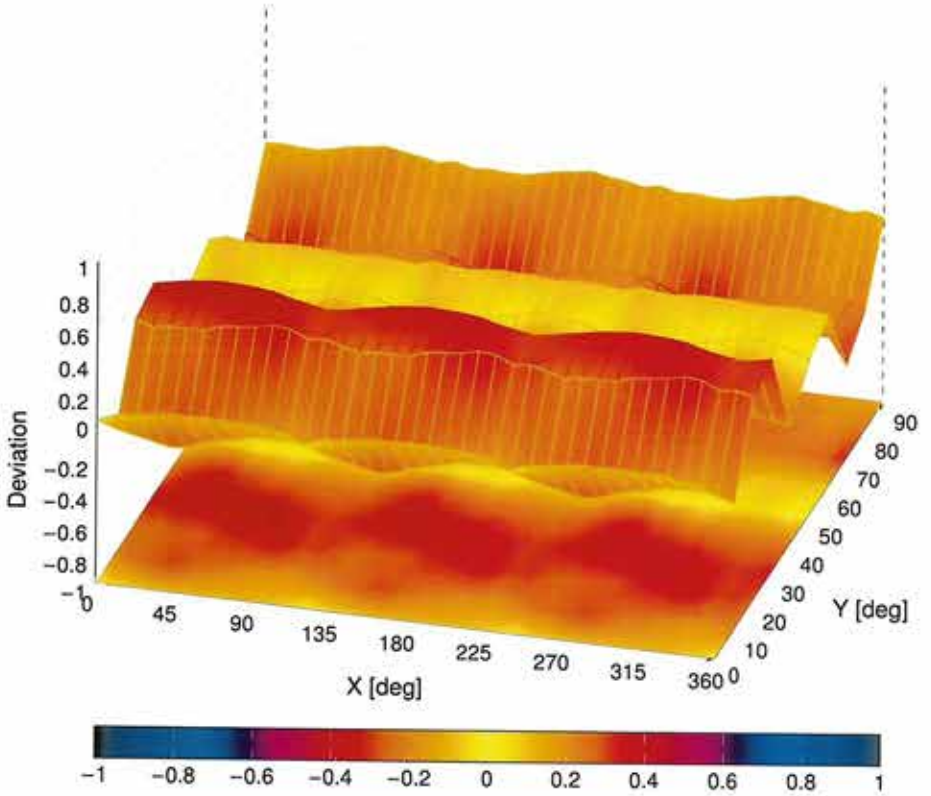
| | |
|---|---|
| Sensor Arrangement | Rectangular |
| Connector Angle | -141.2° |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 320 mm |
| Probe Body Diameter | 8 mm |
| Tip Length | 23 mm |
| Tip Diameter | 8.0 mm |
| Probe Tip to Sensor X Calibration Point | 1.5 mm |
| Probe Tip to Sensor Y Calibration Point | 1.5 mm |

## 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 ±0.29 dB
Parallel to the field propagation ($\psi = 0° - 90°$) at 60 GHz: deviation within ±0.41 dB

# Appendix: Modulation Calibration Parameters

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^E$ $k = 2$ |
|---|---|---|---|---|---|
| 0 | | CW | CW | 0.00 | ±4.7 |
| 10010 | CAB | SAR Validation (Square, 100 ms, 10 ms) | Test | 10.00 | ±9.6 |
| 10011 | CAC | UMTS-FDD (WCDMA) | WCDMA | 2.91 | ±9.6 |
| 10012 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) | WLAN | 1.87 | ±9.6 |
| 10013 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | WLAN | 9.46 | ±9.6 |
| 10021 | DAC | GSM-FDD (TDMA, GMSK) | GSM | 9.39 | ±9.6 |
| 10023 | DAC | GPRS-FDD (TDMA, GMSK, TN 0) | GSM | 9.57 | ±9.6 |
| 10024 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1) | GSM | 6.56 | ±9.6 |
| 10025 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0) | GSM | 12.62 | ±9.6 |
| 10026 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1) | GSM | 9.55 | ±9.6 |
| 10027 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2) | GSM | 4.80 | ±9.6 |
| 10028 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3) | GSM | 3.55 | ±9.6 |
| 10029 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2) | GSM | 7.78 | ±9.6 |
| 10030 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH1) | Bluetooth | 5.30 | ±9.6 |
| 10031 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH3) | Bluetooth | 1.87 | ±9.6 |
| 10032 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5) | Bluetooth | 1.16 | ±9.6 |
| 10033 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1) | Bluetooth | 7.74 | ±9.6 |
| 10034 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3) | Bluetooth | 4.53 | ±9.6 |
| 10035 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5) | Bluetooth | 3.83 | ±9.6 |
| 10036 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH1) | Bluetooth | 8.01 | ±9.6 |
| 10037 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH3) | Bluetooth | 4.77 | ±9.6 |
| 10038 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH5) | Bluetooth | 4.10 | ±9.6 |
| 10039 | CAB | CDMA2000 (1xRTT, RC1) | CDMA2000 | 4.57 | ±9.6 |
| 10042 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate) | AMPS | 7.78 | ±9.6 |
| 10044 | CAA | IS-91/EIA/TIA-553 FDD (FDMA, FM) | AMPS | 0.00 | ±9.6 |
| 10048 | CAA | DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24) | DECT | 13.80 | ±9.6 |
| 10049 | CAA | DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12) | DECT | 10.79 | ±9.6 |
| 10056 | CAA | UMTS-TDD (TD-SCDMA, 1.28 Mcps) | TD-SCDMA | 11.01 | ±9.6 |
| 10058 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3) | GSM | 6.52 | ±9.6 |
| 10059 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps) | WLAN | 2.12 | ±9.6 |
| 10060 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps) | WLAN | 2.83 | ±9.6 |
| 10061 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps) | WLAN | 3.60 | ±9.6 |
| 10062 | 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 | 9.09 | ±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 | 10.12 | ±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 | 9.62 | ±9.6 |
| 10073 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps) | WLAN | 9.94 | ±9.6 |
| 10074 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps) | WLAN | 10.30 | ±9.6 |
| 10075 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps) | WLAN | 10.77 | ±9.6 |
| 10076 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps) | WLAN | 10.94 | ±9.6 |
| 10077 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps) | WLAN | 11.00 | ±9.6 |
| 10081 | CAB | CDMA2000 (1xRTT, RC3) | CDMA2000 | 3.97 | ±9.6 |
| 10082 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate) | AMPS | 4.77 | ±9.6 |
| 10090 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-4) | GSM | 6.56 | ±9.6 |
| 10097 | CAC | UMTS-FDD (HSDPA) | WCDMA | 3.98 | ±9.6 |
| 10098 | CAC | UMTS-FDD (HSUPA, Subtest 2) | WCDMA | 3.98 | ±9.6 |
| 10099 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-4) | GSM | 9.55 | ±9.6 |
| 10100 | CAF | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | LTE-FDD | 5.67 | ±9.6 |
| 10101 | CAF | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM) | LTE-FDD | 6.42 | ±9.6 |
| 10102 | CAF | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM) | LTE-FDD | 6.60 | ±9.6 |
| 10103 | CAH | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | LTE-TDD | 9.29 | ±9.6 |
| 10104 | CAH | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM) | LTE-TDD | 9.97 | ±9.6 |
| 10105 | CAH | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM) | LTE-TDD | 10.01 | ±9.6 |
| 10108 | CAH | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | LTE-FDD | 5.80 | ±9.6 |
| 10109 | CAH | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM) | LTE-FDD | 6.43 | ±9.6 |
| 10110 | CAH | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK) | LTE-FDD | 5.75 | ±9.6 |
| 10111 | CAH | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM) | LTE-FDD | 6.44 | ±9.6 |

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^E$ $k = 2$ |
|---|---|---|---|---|---|
| 10112 | CAH | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM) | LTE-FDD | 6.59 | ±9.6 |
| 10113 | CAH | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM) | LTE-FDD | 6.62 | ±9.6 |
| 10114 | CAD | IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK) | WLAN | 8.10 | ±9.6 |
| 10115 | CAD | IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM) | WLAN | 8.46 | ±9.6 |
| 10116 | CAD | IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM) | WLAN | 8.15 | ±9.6 |
| 10117 | CAD | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | WLAN | 8.07 | ±9.6 |
| 10118 | CAD | IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM) | WLAN | 8.59 | ±9.6 |
| 10119 | CAD | IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM) | WLAN | 8.13 | ±9.6 |
| 10140 | CAF | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM) | LTE-FDD | 6.49 | ±9.6 |
| 10141 | CAF | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM) | LTE-FDD | 6.53 | ±9.6 |
| 10142 | CAF | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10143 | CAF | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM) | LTE-FDD | 6.35 | ±9.6 |
| 10144 | CAF | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM) | LTE-FDD | 6.65 | ±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 | 6.72 | ±9.6 |
| 10149 | CAF | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM) | LTE-FDD | 6.42 | ±9.6 |
| 10150 | CAF | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM) | LTE-FDD | 6.60 | ±9.6 |
| 10151 | CAH | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK) | LTE-TDD | 9.28 | ±9.6 |
| 10152 | CAH | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM) | LTE-TDD | 9.92 | ±9.6 |
| 10153 | CAH | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM) | LTE-TDD | 10.05 | ±9.6 |
| 10154 | CAH | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK) | LTE-FDD | 5.75 | ±9.6 |
| 10155 | CAH | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM) | LTE-FDD | 6.43 | ±9.6 |
| 10156 | CAH | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK) | LTE-FDD | 5.79 | ±9.6 |
| 10157 | CAH | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM) | LTE-FDD | 6.49 | ±9.6 |
| 10158 | CAH | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM) | LTE-FDD | 6.62 | ±9.6 |
| 10159 | CAH | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM) | LTE-FDD | 6.56 | ±9.6 |
| 10160 | CAF | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK) | LTE-FDD | 5.82 | ±9.6 |
| 10161 | CAF | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM) | LTE-FDD | 6.43 | ±9.6 |
| 10162 | CAF | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM) | LTE-FDD | 6.58 | ±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 | CAF | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10170 | CAF | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10171 | AAF | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM) | LTE-FDD | 6.49 | ±9.6 |
| 10172 | CAH | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10173 | CAH | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10174 | CAH | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10175 | CAH | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK) | LTE-FDD | 5.72 | ±9.6 |
| 10176 | CAH | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10177 | CAJ | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10178 | CAH | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10179 | CAH | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10180 | CAH | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10181 | CAF | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK) | LTE-FDD | 5.72 | ±9.6 |
| 10182 | CAF | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM) | LTE-FDD | 6.52 | ±9.6 |
| 10183 | AAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10184 | CAF | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK) | LTE-FDD | 5.73 | ±9.6 |
| 10185 | CAF | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM) | LTE-FDD | 6.51 | ±9.6 |
| 10186 | AAF | 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 | AAG | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM) | LTE-FDD | 6.50 | ±9.6 |
| 10193 | CAD | IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK) | WLAN | 8.09 | ±9.6 |
| 10194 | CAD | IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM) | WLAN | 8.12 | ±9.6 |
| 10195 | CAD | IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM) | WLAN | 8.21 | ±9.6 |
| 10196 | CAD | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK) | WLAN | 8.10 | ±9.6 |
| 10197 | CAD | IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM) | WLAN | 8.13 | ±9.6 |
| 10198 | CAD | IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM) | WLAN | 8.27 | ±9.6 |
| 10219 | CAD | IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK) | WLAN | 8.03 | ±9.6 |
| 10220 | CAD | IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM) | WLAN | 8.13 | ±9.6 |
| 10221 | CAD | IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM) | WLAN | 8.27 | ±9.6 |
| 10222 | CAD | 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 | 8.08 | ±9.6 |

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^E$ $k=2$ |
|---|---|---|---|---|---|
| 10225 | CAC | UMTS-FDD (HSPA+) | WCDMA | 5.97 | ±9.6 |
| 10226 | CAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM) | LTE-TDD | 9.49 | ±9.6 |
| 10227 | CAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM) | LTE-TDD | 10.26 | ±9.6 |
| 10228 | CAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK) | LTE-TDD | 9.22 | ±9.6 |
| 10229 | CAE | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10230 | CAE | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10231 | CAE | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK) | LTE-TDD | 9.19 | ±9.6 |
| 10232 | CAH | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10233 | CAH | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10234 | CAH | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10235 | CAH | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10236 | CAH | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10237 | CAH | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10238 | CAG | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM) | LTE-TDD | 9.48 | ±9.6 |
| 10239 | CAG | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM) | LTE-TDD | 10.25 | ±9.6 |
| 10240 | CAG | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK) | LTE-TDD | 9.21 | ±9.6 |
| 10241 | CAC | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM) | LTE-TDD | 9.82 | ±9.6 |
| 10242 | CAC | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM) | LTE-TDD | 9.86 | ±9.6 |
| 10243 | CAC | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK) | LTE-TDD | 9.46 | ±9.6 |
| 10244 | CAE | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM) | LTE-TDD | 10.06 | ±9.6 |
| 10245 | CAE | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM) | LTE-TDD | 10.06 | ±9.6 |
| 10246 | CAE | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK) | LTE-TDD | 9.30 | ±9.6 |
| 10247 | CAH | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM) | LTE-TDD | 9.91 | ±9.6 |
| 10248 | CAH | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM) | LTE-TDD | 10.09 | ±9.6 |
| 10249 | CAH | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK) | LTE-TDD | 9.29 | ±9.6 |
| 10250 | CAH | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM) | LTE-TDD | 9.81 | ±9.6 |
| 10251 | CAH | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM) | LTE-TDD | 10.17 | ±9.6 |
| 10252 | CAH | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK) | LTE-TDD | 9.24 | ±9.6 |
| 10253 | CAG | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM) | LTE-TDD | 9.90 | ±9.6 |
| 10254 | CAG | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM) | LTE-TDD | 10.14 | ±9.6 |
| 10255 | CAG | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK) | LTE-TDD | 9.20 | ±9.6 |
| 10256 | CAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | LTE-TDD | 9.96 | ±9.6 |
| 10257 | CAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM) | LTE-TDD | 10.08 | ±9.6 |
| 10258 | CAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK) | LTE-TDD | 9.34 | ±9.6 |
| 10259 | CAE | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM) | LTE-TDD | 9.98 | ±9.6 |
| 10260 | CAE | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM) | LTE-TDD | 9.97 | ±9.6 |
| 10261 | CAE | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK) | LTE-TDD | 9.24 | ±9.6 |
| 10262 | CAH | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM) | LTE-TDD | 9.83 | ±9.6 |
| 10263 | CAH | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM) | LTE-TDD | 10.16 | ±9.6 |
| 10264 | CAH | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK) | LTE-TDD | 9.23 | ±9.6 |
| 10265 | CAH | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM) | LTE-TDD | 9.92 | ±9.6 |
| 10266 | CAH | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM) | LTE-TDD | 10.07 | ±9.6 |
| 10267 | CAH | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | LTE-TDD | 9.30 | ±9.6 |
| 10268 | CAG | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM) | LTE-TDD | 10.06 | ±9.6 |
| 10269 | CAG | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM) | LTE-TDD | 10.13 | ±9.6 |
| 10270 | CAG | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK) | LTE-TDD | 9.58 | ±9.6 |
| 10274 | CAC | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10) | WCDMA | 4.87 | ±9.6 |
| 10275 | CAC | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4) | WCDMA | 3.96 | ±9.6 |
| 10277 | CAA | PHS (QPSK) | PHS | 11.81 | ±9.6 |
| 10278 | CAA | PHS (QPSK, BW 884 MHz, Rolloff 0.5) | PHS | 11.81 | ±9.6 |
| 10279 | CAA | PHS (QPSK, BW 884 MHz, Rolloff 0.38) | PHS | 12.18 | ±9.6 |
| 10290 | AAB | CDMA2000, RC1, SO55, Full Rate | CDMA2000 | 3.91 | ±9.6 |
| 10291 | AAB | CDMA2000, RC3, SO55, Full Rate | CDMA2000 | 3.46 | ±9.6 |
| 10292 | AAB | CDMA2000, RC3, SO32, Full Rate | CDMA2000 | 3.39 | ±9.6 |
| 10293 | AAB | CDMA2000, RC3, SO3, Full Rate | CDMA2000 | 3.50 | ±9.6 |
| 10295 | AAB | CDMA2000, RC1, SO3, 1/8th Rate 25 fr. | CDMA2000 | 12.49 | ±9.6 |
| 10297 | AAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK) | LTE-FDD | 5.81 | ±9.6 |
| 10298 | AAE | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK) | LTE-FDD | 5.72 | ±9.6 |
| 10299 | AAE | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM) | LTE-FDD | 6.39 | ±9.6 |
| 10300 | AAE | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM) | LTE-FDD | 6.60 | ±9.6 |
| 10301 | AAA | IEEE 802.16e WiMAX (29:18, 5 ms, 10 MHz, QPSK, PUSC) | WiMAX | 12.03 | ±9.6 |
| 10302 | AAA | IEEE 802.16e WiMAX (29:18, 5 ms, 10 MHz, QPSK, PUSC, 3 CTRL symbols) | WiMAX | 12.57 | ±9.6 |
| 10303 | AAA | IEEE 802.16e WiMAX (31:15, 5 ms, 10 MHz, 64QAM, PUSC) | WiMAX | 12.52 | ±9.6 |
| 10304 | AAA | IEEE 802.16e WiMAX (29:18, 5 ms, 10 MHz, 64QAM, PUSC) | WiMAX | 11.86 | ±9.6 |
| 10305 | AAA | IEEE 802.16e WiMAX (31:15, 10 ms, 10 MHz, 64QAM, PUSC, 15 symbols) | WiMAX | 15.24 | ±9.6 |
| 10306 | AAA | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 64QAM, PUSC, 18 symbols) | WiMAX | 14.67 | ±9.6 |

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^E$ $k=2$ |
|---|---|---|---|---|---|
| 10307 | AAA | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, QPSK, PUSC, 18 symbols) | WiMAX | 14.49 | ±9.6 |
| 10308 | AAA | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 16QAM, PUSC) | WiMAX | 14.46 | ±9.6 |
| 10309 | AAA | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 16QAM, AMC 2x3, 18 symbols) | WiMAX | 14.58 | ±9.6 |
| 10310 | AAA | IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, QPSK, AMC 2x3, 18 symbols) | WiMAX | 14.57 | ±9.6 |
| 10311 | AAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK) | LTE-FDD | 6.06 | ±9.6 |
| 10313 | AAA | iDEN 1:3 | iDEN | 10.51 | ±9.6 |
| 10314 | AAA | iDEN 1:6 | iDEN | 13.48 | ±9.6 |
| 10315 | AAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle) | WLAN | 1.71 | ±9.6 |
| 10316 | AAB | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle) | WLAN | 8.36 | ±9.6 |
| 10317 | AAD | IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle) | WLAN | 8.36 | ±9.6 |
| 10352 | AAA | Pulse Waveform (200Hz, 10%) | Generic | 10.00 | ±9.6 |
| 10353 | AAA | Pulse Waveform (200Hz, 20%) | Generic | 6.99 | ±9.6 |
| 10354 | AAA | Pulse Waveform (200Hz, 40%) | Generic | 3.98 | ±9.6 |
| 10355 | AAA | Pulse Waveform (200Hz, 60%) | Generic | 2.22 | ±9.6 |
| 10356 | AAA | Pulse Waveform (200Hz, 80%) | Generic | 0.97 | ±9.6 |
| 10387 | AAA | QPSK Waveform, 1 MHz | Generic | 5.10 | ±9.6 |
| 10388 | AAA | QPSK Waveform, 10 MHz | Generic | 5.22 | ±9.6 |
| 10396 | AAA | 64-QAM Waveform, 100 kHz | Generic | 6.27 | ±9.6 |
| 10399 | AAA | 64-QAM Waveform, 40 MHz | Generic | 6.27 | ±9.6 |
| 10400 | AAE | IEEE 802.11ac WiFi (20 MHz, 64-QAM, 99pc duty cycle) | WLAN | 8.37 | ±9.6 |
| 10401 | AAE | IEEE 802.11ac WiFi (40 MHz, 64-QAM, 99pc duty cycle) | WLAN | 8.60 | ±9.6 |
| 10402 | AAE | IEEE 802.11ac WiFi (80 MHz, 64-QAM, 99pc duty cycle) | WLAN | 8.53 | ±9.6 |
| 10403 | AAB | CDMA2000 (1xEV-DO, Rev. 0) | CDMA2000 | 3.76 | ±9.6 |
| 10404 | AAB | CDMA2000 (1xEV-DO, Rev. A) | CDMA2000 | 3.77 | ±9.6 |
| 10406 | AAB | CDMA2000, RC3, SO32, SCH0, Full Rate | CDMA2000 | 5.22 | ±9.6 |
| 10410 | AAH | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4) | LTE-TDD | 7.82 | ±9.6 |
| 10414 | AAA | WLAN CCDF, 64-QAM, 40 MHz | Generic | 8.54 | ±9.6 |
| 10415 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle) | WLAN | 1.54 | ±9.6 |
| 10416 | AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | WLAN | 8.23 | ±9.6 |
| 10417 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle) | WLAN | 8.23 | ±9.6 |
| 10418 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule) | WLAN | 8.14 | ±9.6 |
| 10419 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule) | WLAN | 8.19 | ±9.6 |
| 10422 | AAC | IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK) | WLAN | 8.32 | ±9.6 |
| 10423 | AAC | IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM) | WLAN | 8.47 | ±9.6 |
| 10424 | AAC | IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM) | WLAN | 8.40 | ±9.6 |
| 10425 | AAC | IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK) | WLAN | 8.41 | ±9.6 |
| 10426 | AAC | IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM) | WLAN | 8.45 | ±9.6 |
| 10427 | AAC | IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM) | WLAN | 8.41 | ±9.6 |
| 10430 | AAE | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1) | LTE-FDD | 8.28 | ±9.6 |
| 10431 | AAE | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1) | LTE-FDD | 8.38 | ±9.6 |
| 10432 | AAD | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1) | LTE-FDD | 8.34 | ±9.6 |
| 10433 | AAD | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1) | LTE-FDD | 8.34 | ±9.6 |
| 10434 | AAB | W-CDMA (BS Test Model 1, 64 DPCH) | WCDMA | 8.60 | ±9.6 |
| 10435 | AAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.82 | ±9.6 |
| 10447 | AAE | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%) | LTE-FDD | 7.56 | ±9.6 |
| 10448 | AAE | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%) | LTE-FDD | 7.53 | ±9.6 |
| 10449 | AAD | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%) | LTE-FDD | 7.51 | ±9.6 |
| 10450 | AAD | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%) | LTE-FDD | 7.48 | ±9.6 |
| 10451 | AAB | W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%) | WCDMA | 7.59 | ±9.6 |
| 10453 | AAE | Validation (Square, 10 ms, 1 ms) | Test | 10.00 | ±9.6 |
| 10456 | AAC | IEEE 802.11ac WiFi (160 MHz, 64-QAM, 99pc duty cycle) | WLAN | 8.63 | ±9.6 |
| 10457 | AAB | UMTS-FDD (DC-HSDPA) | WCDMA | 6.62 | ±9.6 |
| 10458 | AAA | CDMA2000 (1xEV-DO, Rev. B, 2 carriers) | CDMA2000 | 6.55 | ±9.6 |
| 10459 | AAA | CDMA2000 (1xEV-DO, Rev. B, 3 carriers) | CDMA2000 | 8.25 | ±9.6 |
| 10460 | AAB | UMTS-FDD (WCDMA, AMR) | WCDMA | 2.39 | ±9.6 |
| 10461 | AAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.82 | ±9.6 |
| 10462 | AAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.30 | ±9.6 |
| 10463 | AAC | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.56 | ±9.6 |
| 10464 | AAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.82 | ±9.6 |
| 10465 | AAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.32 | ±9.6 |
| 10466 | AAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.57 | ±9.6 |
| 10467 | AAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.82 | ±9.6 |
| 10468 | AAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.32 | ±9.6 |
| 10469 | AAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.56 | ±9.6 |
| 10470 | AAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.82 | ±9.6 |
| 10471 | AAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.32 | ±9.6 |

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc$^E$ $k=2$ |
|---|---|---|---|---|---|
| 10472 | AAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.57 | ±9.6 |
| 10473 | AAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.82 | ±9.6 |
| 10474 | AAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.32 | ±9.6 |
| 10475 | AAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.57 | ±9.6 |
| 10477 | AAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.32 | ±9.6 |
| 10478 | AAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.57 | ±9.6 |
| 10479 | AAC | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.74 | ±9.6 |
| 10480 | AAC | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.18 | ±9.6 |
| 10481 | AAC | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.45 | ±9.6 |
| 10482 | AAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.71 | ±9.6 |
| 10483 | AAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.39 | ±9.6 |
| 10484 | AAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.47 | ±9.6 |
| 10485 | AAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.59 | ±9.6 |
| 10486 | AAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.38 | ±9.6 |
| 10487 | AAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.60 | ±9.6 |
| 10488 | AAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.70 | ±9.6 |
| 10489 | AAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.31 | ±9.6 |
| 10490 | AAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.54 | ±9.6 |
| 10491 | AAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.74 | ±9.6 |
| 10492 | AAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.41 | ±9.6 |
| 10493 | AAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.55 | ±9.6 |
| 10494 | AAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.74 | ±9.6 |
| 10495 | AAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.37 | ±9.6 |
| 10496 | AAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.54 | ±9.6 |
| 10497 | AAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.67 | ±9.6 |
| 10498 | AAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.40 | ±9.6 |
| 10499 | AAC | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.68 | ±9.6 |
| 10500 | AAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.67 | ±9.6 |
| 10501 | AAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.44 | ±9.6 |
| 10502 | AAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.52 | ±9.6 |
| 10503 | AAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.72 | ±9.6 |
| 10504 | AAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.31 | ±9.6 |
| 10505 | AAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.54 | ±9.6 |
| 10506 | AAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.74 | ±9.6 |
| 10507 | AAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.36 | ±9.6 |
| 10508 | AAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.55 | ±9.6 |
| 10509 | AAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.99 | ±9.6 |
| 10510 | AAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.49 | ±9.6 |
| 10511 | AAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.51 | ±9.6 |
| 10512 | AAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 7.74 | ±9.6 |
| 10513 | AAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.42 | ±9.6 |
| 10514 | AAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.45 | ±9.6 |
| 10515 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle) | WLAN | 1.58 | ±9.6 |
| 10516 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle) | WLAN | 1.57 | ±9.6 |
| 10517 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle) | WLAN | 1.58 | ±9.6 |
| 10518 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle) | WLAN | 8.23 | ±9.6 |
| 10519 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle) | WLAN | 8.39 | ±9.6 |
| 10520 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle) | WLAN | 8.12 | ±9.6 |
| 10521 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle) | WLAN | 7.97 | ±9.6 |
| 10522 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle) | WLAN | 8.45 | ±9.6 |
| 10523 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle) | WLAN | 8.08 | ±9.6 |
| 10524 | AAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle) | WLAN | 8.27 | ±9.6 |
| 10525 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS0, 99pc duty cycle) | WLAN | 8.36 | ±9.6 |
| 10526 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS1, 99pc duty cycle) | WLAN | 8.42 | ±9.6 |
| 10527 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS2, 99pc duty cycle) | WLAN | 8.21 | ±9.6 |
| 10528 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS3, 99pc duty cycle) | WLAN | 8.36 | ±9.6 |
| 10529 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS4, 99pc duty cycle) | WLAN | 8.36 | ±9.6 |
| 10531 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS6, 99pc duty cycle) | WLAN | 8.43 | ±9.6 |
| 10532 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS7, 99pc duty cycle) | WLAN | 8.29 | ±9.6 |
| 10533 | AAC | IEEE 802.11ac WiFi (20 MHz, MCS8, 99pc duty cycle) | WLAN | 8.38 | ±9.6 |
| 10534 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS0, 99pc duty cycle) | WLAN | 8.45 | ±9.6 |
| 10535 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS1, 99pc duty cycle) | WLAN | 8.45 | ±9.6 |
| 10536 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS2, 99pc duty cycle) | WLAN | 8.32 | ±9.6 |
| 10537 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS3, 99pc duty cycle) | WLAN | 8.44 | ±9.6 |
| 10538 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS4, 99pc duty cycle) | WLAN | 8.54 | ±9.6 |
| 10540 | AAC | IEEE 802.11ac WiFi (40 MHz, MCS6, 99pc duty cycle) | WLAN | 8.39 | ±9.6 |