FCC SAR TEST REPORT

FCC ID	**:**	**2AGOZ-P97**
Equipment	**:**	**VR Headset**
Brand Name	**:**	**META PLATFORMS TECHNOLOGIES, LLC**
Model Name	**:**	**P97**
Applicant	**:**	**Meta Platforms Technologies, LLC. 1 Hacker Way, Menlo Park, CA 94025, USA**
Manufacturer	**:**	**Meta Platforms Technologies, LLC. 1 Hacker Way, Menlo Park, CA 94025, USA**
Standard	**:**	**FCC 47 CFR Part 2 (2.1093)**

The product was received on Apr. 12, 2024 and testing was started from Apr. 19, 2024 and completed on Apr. 26, 2024. 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

Testing Laboratory
3786

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan

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History of this test report

Report No.	Version	Description	Issued Date
FA413013-01	01	Initial issue of report	May 16, 2024

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for Meta Platforms Technologies, LLC., VR Headset, P97, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary Head (Separation 0mm) Reported 1g SAR (W/kg)	Highest Simultaneous Transmission Reported 1g SAR (W/kg)
DTS	2.4GHz WLAN	0.26	0.83
NII	5GHz WLAN	0.79	0.83
6XD	6GHz WLAN	0.03	0.29
DSS	Bluetooth	0.01	0.79
DTS	nRF	< 0.01	0.83
Equipment Class	Frequency Band	Head Reported APD (mW/cm^2)	Reported PD (mW/cm^2)
6XD	6GHz WLAN	0.02	0.18
Date of Testing:		2024/04/19 ~ 2024/04/26	

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW3786 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	VR Headset
Brand Name	META PLATFORMS TECHNOLOGIES, LLC
Model Name	P97
FCC ID	2AGOZ-P97
Wireless Technology and Frequency Range	WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 6E: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz nRF:2402 MHz ~ 2478MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE nRF:GFSK
HW Version	EVT2
SW Version	5.2.1.57S
EUT Stage	Identical Prototype

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.

4.3 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

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:

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

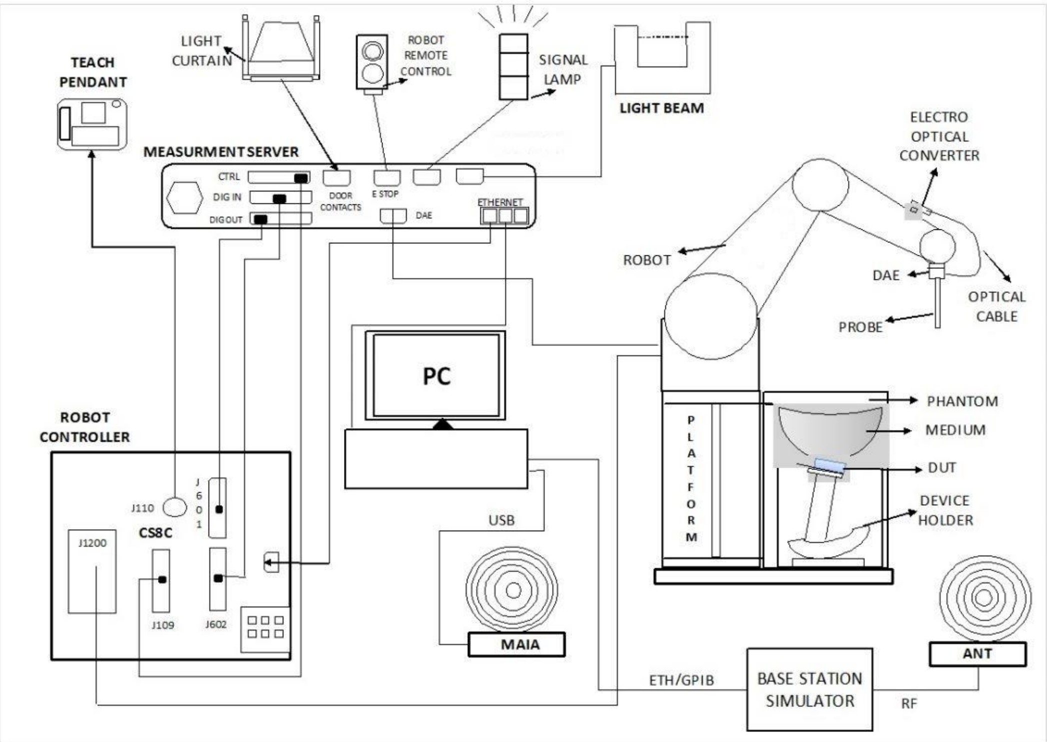
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

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.

Laboratory	EMC & Wireless Communications Laboratory		Wensan Laboratory				
Test Site Location	TW1190 No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan		TW3786 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	SAR18-HY	SAR21-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY	SAR16-HY	SAR19-HY	SAR22-HY
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	SAR17-HY	SAR20-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 Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	4 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm

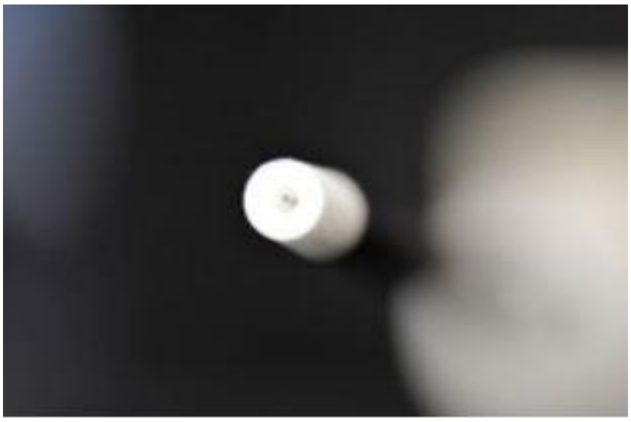
<EX3DV4 Probe>

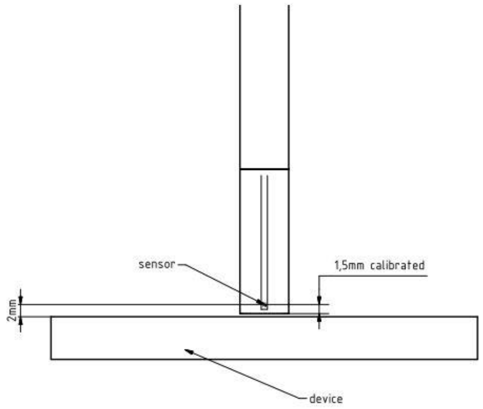
Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	4 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

6.3 EUmmWave Probe / E-Field 5G Probe

The probe design allows measurements at distances as small as 2 mm from the sensors to the surface of the device under test (DUT). The typical sensor to probe tip distance is 1.5 mm.

Frequency	750 MHz – 110 GHz
Probe Overall Length	320 mm
Probe Body Diameter	8.0 mm
Tip Length	23.0 mm
Tip Diameter	8.0 mm
Probe's two dipoles length	0.9 mm – Diode loaded
Dynamic Range	< 20 V/m - 10000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm
Distance between diode sensors and probe's tip	1.5 mm
Minimum Mechanical separation between probe tip and a Surface	0.5 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 10GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction.
Compatibility	cDASY6 + 5G-Module SW1.0 and higher





6.4 Data Acquisition Electronics (DAE)

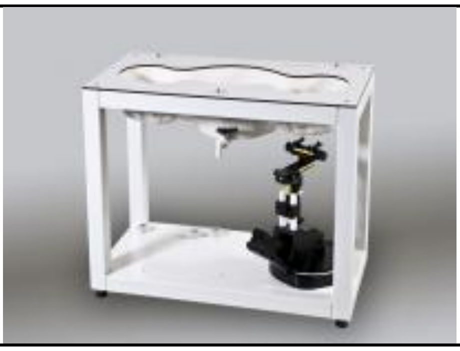
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an 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

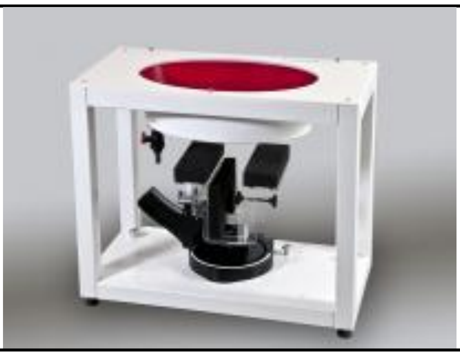
6.5 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; 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 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.

<SAM Face-Down Phantom>

Liquid Compatibility	The phantom shell is compatible with SPEAG's tissue simulating liquids both sugar and oil-based. Other liquids may be used however liquids that are corrosive, including liquids containing DGBE, must not be used as they will cause damage to the phantom and render the warranty void (see note or consult SPEAG support).	
Shell Thickness	2 ± 0.2 mm (6 mm at ear point)	
Head Shape	Standard compatible SAM head.	

6.6 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. SAR 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: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 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 <u>Zoom Scan</u>

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.

			$\leq$ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			$\leq$ 2 GHz: $\leq$ 8 mm 2 – 3 GHz: $\leq$ 5 mm*	3 – 4 GHz: $\leq$ 5 mm* 4 – 6 GHz: $\leq$ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		$\leq$ 5 mm	3 – 4 GHz: $\leq$ 4 mm 4 – 5 GHz: $\leq$ 3 mm 5 – 6 GHz: $\leq$ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	$\leq$ 4 mm	3 – 4 GHz: $\leq$ 3 mm 4 – 5 GHz: $\leq$ 2.5 mm 5 – 6 GHz: $\leq$ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		$\geq$ 30 mm	3 – 4 GHz: $\geq$ 28 mm 4 – 5 GHz: $\geq$ 25 mm 5 – 6 GHz: $\geq$ 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 <u>*reported*</u> SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

7.5 <u>Volume Scan Procedures</u>

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 <u>Power Drift Monitoring</u>

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. Spatial Averaged Power Density Measurement Procedure

A DASY Module mmWave supports “5G Scan”, a fine resolution scan performed on two different planes which is used to reconstruct the E- and H-fields as well as the power density; the average power density is derived from this measurement

8.1 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to devise under test.

8.2 5G Scan

The electric field polarization ellipses are fist computed. Then, a novel plane-to-plane reconstruction algorithm is used to obtain the phase of the measured field. The H-field and Pointing Vector are then computed. The peak spatial averaged power density psPDn+, psPDtot+ and psPDmod+ values are calculated for the user-specified averaging areas with two different averaging geometries: a circle and a rotating square. The steps in the X, Y, and Z directions are specified in terms of fractions of the signal wavelength, lambda. Area Scan Parameters extracted from section 5.1.3 of SPEAG DASY System Handbook.

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	0.125 $\left(\frac{\lambda}{8}\right)$	60/60	18×18
30	0.25 $\left(\frac{\lambda}{4}\right)$	60/60	26×26
45	0.25 $\left(\frac{\lambda}{4}\right)$	42/42	28×28
60	0.25 $\left(\frac{\lambda}{4}\right)$	32.5/32.5	28×28
90	0.25 $\left(\frac{\lambda}{4}\right)$	30/30	38×38

8.3 Power Drift Measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as
Step 1.
When the drift is larger than ± 5 %, test is repeated from step**1.**

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit(2)	D2450V2	736	Aug. 17, 2021	Aug. 14, 2024
SPEAG	5GHz System Validation Kit(2)	D5GHzV2	1006	May. 25, 2023	May. 23, 2025
SPEAG	5GHz System Validation Kit(2)	D5GHzV2	1128	Feb. 22, 2023	Feb. 20, 2025
SPEAG	6500MHz System Validation Kit	D6.5GHzV2	1083	Oct. 20, 2023	Oct. 19, 2024
SPEAG	5G Verification Source	10GHz	1052	Oct. 13, 2023	Oct. 12, 2024
SPEAG	EUmmWV Probe Tip Protection	EUmmWV4	9441	Nov. 17, 2023	Nov. 16, 2024
SPEAG	Data Acquisition Electronics	DAE4	1424	Dec. 07, 2023	Dec. 06, 2024
SPEAG	Data Acquisition Electronics	DAE4	1707	Dec. 06, 2023	Dec. 05, 2024
SPEAG	Dosimetric E-Field Probe	EX3DV4	7785	Nov. 23, 2023	Nov. 22, 2024
Testo	Hygro meter	608-H1	45196600	Nov. 02, 2023	Nov. 01, 2024
R&S	BT Base Station	CBT	101136	Oct. 22, 2023	Oct. 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.

10. System Verification

10.1 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 IEC HSL liquid tissue is used and depth was at least 15cm in the phantom for all SAR testing

<Tissue Dielectric Parameter Check Results at Flat Phantom>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	22.4	1.820	39.300	1.80	39.20	1.11	0.26	±5	2024/4/19
5250	22.5	4.770	37.200	4.71	35.95	1.27	3.48	±5	2024/4/21
5600	22.5	5.130	36.600	5.07	35.50	1.18	3.10	±5	2024/4/21
5750	22.5	5.290	36.400	5.22	35.35	1.34	2.97	±5	2024/4/21
6500	22.7	6.130	34.700	6.07	34.50	0.99	0.58	±5	2024/4/20

<Tissue Dielectric Parameter Check Results at SAM Face-Down Phantom>

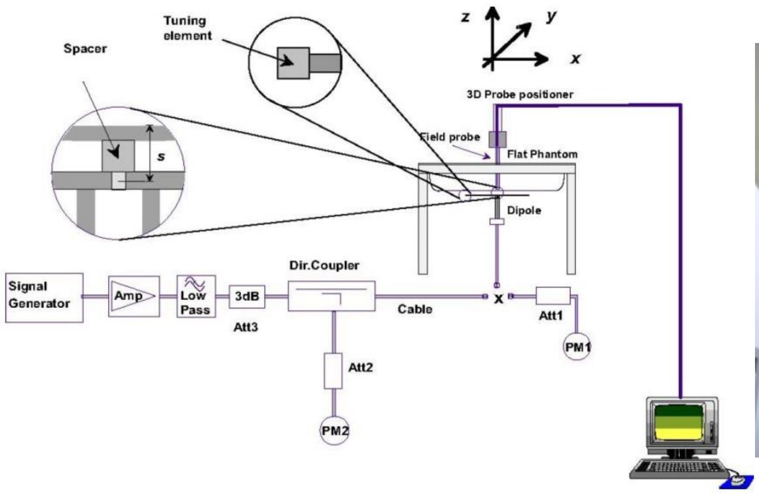
Phantom Face	Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
Right	2450	22.4	1.820	39.300	1.80	39.20	1.11	0.26	±5	2024/4/19
Left	2450	22.4	1.820	39.300	1.80	39.20	1.11	0.26	±5	2024/4/19
Right	5800	22.5	5.340	36.400	5.27	35.30	1.33	3.12	±5	2024/4/21
Left	5800	22.5	5.340	36.400	5.27	35.30	1.33	3.12	±5	2024/4/21

10.2 System Performance Check Results

<System Check Results at Flat Phantom>

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	Separation Distance (mm)	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 (%)	Test Site
2024/4/19	10	2450	50	D2450V2-736	EX3DV4 - SN7785	DAE4 Sn1707	2.550	54.200	51	-5.90	SAR-16
2024/4/21	10	5250	100	D5GHzV2-1006-5250	EX3DV4 - SN7785	DAE4 Sn1707	7.830	81.200	78.3	-3.57	SAR-16
2024/4/21	10	5600	100	D5GHzV2-1006-5600	EX3DV4 - SN7785	DAE4 Sn1707	8.560	84.700	85.6	1.06	SAR-16
2024/4/21	10	5750	100	D5GHzV2-1006-5750	EX3DV4 - SN7785	DAE4 Sn1707	7.920	80.900	79.2	-2.10	SAR-16
2024/4/20	5	6500	100	D6.5GHzV2-1083	EX3DV4 - SN7785	DAE4 Sn1707	30.400	292.000	304	4.11	SAR-16



System Performance Check Setup

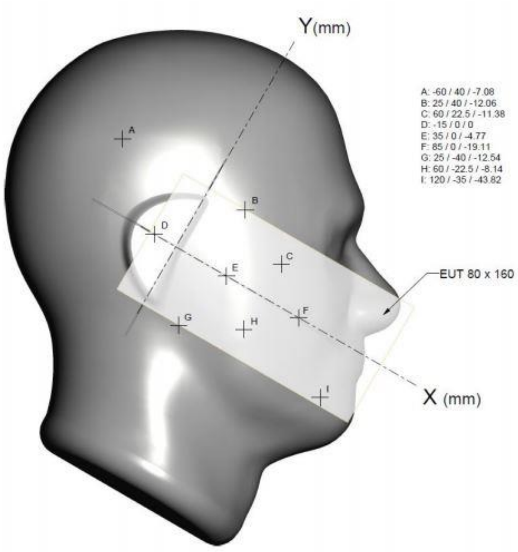
Setup Photo at Flat Phantom

<System Check Results under SAM Face-Down Phantom>

Mount SAM Face-Down Phantom System Validation Masks provided by SPEAG on both faces (Left/Right) and mark Reference Point C

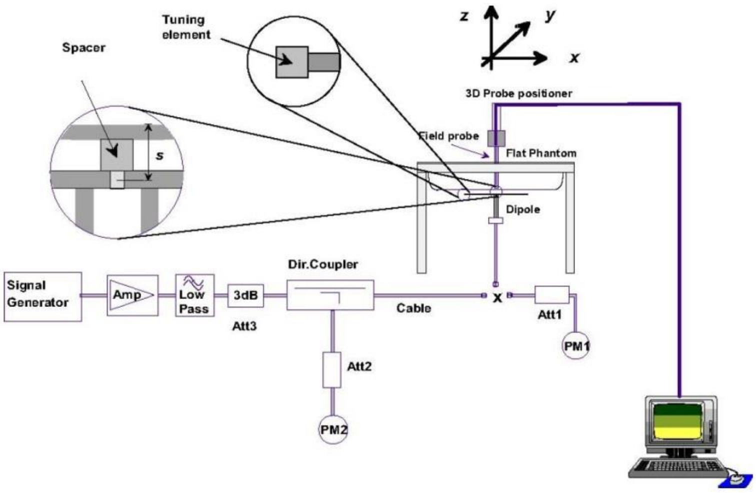
Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 0.67dB(16.7%) under the SAM Face-Down Phantom. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Separation Distance (mm)	Phantom Face	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 (%)	Test Site
2024/4/19	10	Right	2450	50	D2450V2-736	EX3DV4 - SN7785	DAE4 Sn1707	2.730	54.800	54.6	-0.36	SAR-16
2024/4/19	10	Left	2450	50	D2450V2-736	EX3DV4 - SN7785	DAE4 Sn1707	2.550	54.800	51	-6.93	SAR-16
2024/4/21	10	Right	5800	100	D5GHzV2-1128-5800	EX3DV4 - SN7785	DAE4 Sn1707	1.360	15.600	13.6	-12.82	SAR-16
2024/4/21	10	Left	5800	50	D5GHzV2-1128-5800	EX3DV4 - SN7785	DAE4 Sn1707	0.664	15.600	13.28	-14.87	SAR-16



Reference Point

Setup Photo at SAM Face-Down Phantom



System Performance Check Setup

10.3 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

Test Site	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)	Date
SAR13	10G	10GHz_1052	9441	1424	10	56.9	56.8	0.01	2024/4/23

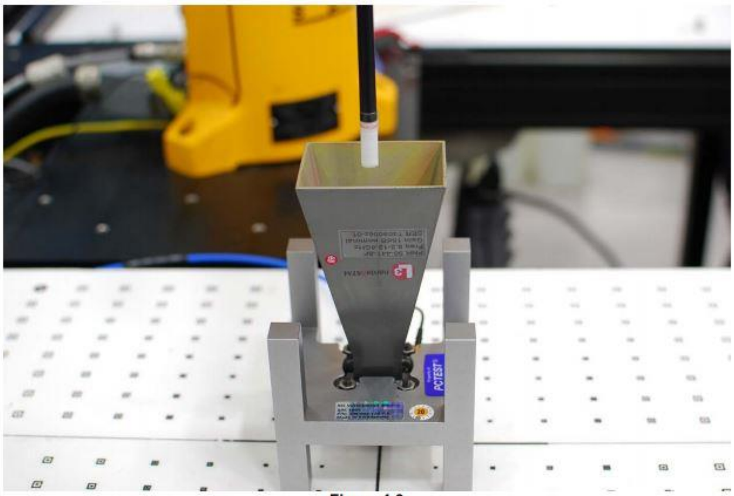


Figure 4-3
System Verification Setup Photo

System Performance Check Setup

11. WiFi/Bluetooth/nRF Output Power (Unit: dBm)

General Note:

1. For each antenna, transmit power in SISO operation is larger than (or equal to) the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode.
2. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
3. 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.
4. 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.
5. 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).
6. 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.
7. 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.
8. 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)
9. In applying the test guidance, the IEEE 802.11 mode with the maximum output power (out of all modes) should be considered for testing
10. 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
11. 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-DBS

<2.4GHz WLAN_Non-DBS & DBS>												
				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	16.90	18.00	97.78	16.65	18.00	97.79	Not Required	21.00	Not Required
		6	2437	16.60	18.00		16.24	18.00			21.00	
		11	2462	16.06	18.00		16.15	18.00			21.00	
		12	2467	13.95	15.50		13.71	15.50			18.50	
		13	2472	10.20	11.50		9.74	11.50			14.50	
	802.11g 6Mbps	1	2412	16.70	18.50	99.15	16.70	18.50	99.05		21.50	
		6	2437	19.35	20.00		18.75	20.00			23.00	
		11	2462	16.70	18.00		16.50	18.00			21.00	
		12	2467	14.40	16.00		14.50	16.00			19.00	
		13	2472	0.90	1.50		-0.20	1.50			4.50	
	802.11n-HT20 MCS0	1	2412	Not Required	17.00	Not Required	Not Required	17.00	Not Required		20.00	
		6	2437		20.00			20.00			23.00	
		11	2462		16.00			16.00			19.00	
		12	2467		13.50			13.50			16.50	
		13	2472		0.50			0.50			3.50	
	802.11ac-VHT20 MCS0	1	2412		17.00			17.00			20.00	
		6	2437		20.00			20.00			23.00	
		11	2462		16.00			16.00			19.00	
		12	2467		13.50			13.50			16.50	
		13	2472		0.50			0.50			3.50	
	802.11ax-HE20 MCS0	1	2412		17.00			17.00			20.00	
		6	2437		20.00			20.00			23.00	
		11	2462		16.00			16.00			19.00	
		12	2467		13.50			13.50			16.50	
		13	2472		0.50			0.50			3.50	

<5.2GHz WLAN_Non-DBS & DBS>												
				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	Not Required	15.50	Not Required	Not Required	15.50	Not Required	Not Required	18.50	Not Required
		40	5200		15.50			15.50			18.50	
		44	5220		15.50			15.50			18.50	
		48	5240		15.50			15.50			18.50	
	802.11n-HT20 MCS0	36	5180		16.00			16.00			19.00	
		40	5200		16.00			16.00			19.00	
		44	5220		16.00			16.00			19.00	
		48	5240		16.00			16.00			19.00	
	802.11n-HT40 MCS0	38	5190		14.00			14.00			17.00	
		46	5230		18.00			18.00			21.00	
	802.11ac-VHT20 MCS0	36	5180		16.00			16.00			19.00	
		40	5200		16.00			16.00			19.00	
		44	5220		16.00			16.00			19.00	
		48	5240		16.00			16.00			19.00	
	802.11ac-VHT40 MCS0	38	5190		14.00			14.00			17.00	
		46	5230		18.00			18.00			21.00	
	802.11ac-VHT80 MCS0	42	5210		13.00			13.00			16.00	
	802.11ax-HE20 MCS0	36	5180		16.00			16.00			19.00	
		40	5200		16.00			16.00			19.00	
		44	5220		16.00			16.00			19.00	
		48	5240		16.00			16.00			19.00	
	802.11ax-HE40 MCS0	38	5190		14.00			14.00			17.00	
		46	5230		18.00			18.00			21.00	
	802.11ax-HE80 MCS0	42	5210		13.00			13.00			16.00	

<5.3GHz WLAN_Non-DBS & DBS>

				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	Not Required	16.00	Not Required	Not Required	16.00	Not Required	Not Required	19.00	Not Required
		56	5280		16.00			16.00			19.00	
		60	5300		16.00			16.00			19.00	
		64	5320		16.00			16.00			19.00	
	802.11n-HT20 MCS0	52	5260	14.84	16.50	100.00	14.65	16.50	100.00		19.50	
		56	5280	15.02	16.50		14.65	16.50			19.50	
		60	5300	14.56	16.50		14.59	16.50			19.50	
		64	5320	14.52	16.50		14.61	16.50			19.50	
	802.11n-HT40 MCS0	54	5270	17.15	18.00	98.96	17.16	18.00	99.02		21.00	
		62	5310	12.79	14.00		12.66	14.00			17.00	
	802.11ac-VHT20 MCS0	52	5260	Not Required	16.50	Not Required	Not Required	16.50	Not Required		19.50	
		56	5280		16.50			16.50			19.50	
		60	5300		16.50			16.50			19.50	
		64	5320		16.50			16.50			19.50	
	802.11ac-VHT40 MCS0	54	5270		18.00			18.00			21.00	
		62	5310		14.00			14.00			17.00	
	802.11ac-VHT80 MCS0	58	5290		14.00			14.00			17.00	
	802.11ax-HE20 MCS0	52	5260		16.50			16.50			19.50	
		56	5280		16.50			16.50			19.50	
		60	5300		16.50			16.50			19.50	
		64	5320		16.50			16.50			19.50	
	802.11ax-HE40 MCS0	54	5270		18.00			18.00			21.00	
		62	5310		14.00			14.00			17.00	
	802.11ax-HE80 MCS0	58	5290		14.00			14.00			17.00	
	802.11ax-HE160 MCS0	50	5250		12.00			12.00			15.00	

<5.5GHz WLAN_Non-DBS>												
				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	Not Required	15.50	Not Required	Not Required	15.50	Not Required	Not Required	18.50	Not Required
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11n-HT20 MCS0	100	5500		15.50			15.50			18.50	
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11n-HT40 MCS0	102	5510		13.00			13.00			16.00	
		110	5550		17.75			17.75			20.75	
		126	5630		17.75			17.75			20.75	
		134	5670		17.00			17.00			20.00	
		142	5710		17.75			17.75			20.75	
	802.11ac-VHT20 MCS0	100	5500		15.50			15.50			18.50	
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11ac-VHT40 MCS0	102	5510		13.00			13.00			16.00	
		110	5550		17.75			17.75			20.75	
		126	5630		17.75			17.75			20.75	
		134	5670		17.00			17.00			20.00	
		142	5710		17.75			17.75			20.75	
	802.11ac-VHT80 MCS0	106	5530	10.94	12.50	99.06	10.83	12.50	99.06		15.50	
		122	5610	15.00	16.00		14.77	16.00			19.00	
		138	5690	16.04	17.75		15.80	17.75			20.75	
	802.11ac-VHT160 MCS0	114	5570	Not Required	12.00	Not Required	Not Required	12.00	Not Required		15.00	
	802.11ax-HE20 MCS0	100	5500		15.50			15.50			18.50	
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11ax-HE40 MCS0	102	5510		13.00			13.00			16.00	
		110	5550		17.75			17.75			20.75	
		126	5630		17.75			17.75			20.75	
		134	5670		17.00			17.00			20.00	
		142	5710		17.75			17.75			20.75	
	802.11ax-HE80 MCS0	106	5530		12.50			12.50			15.50	
		122	5610		16.00			16.00			19.00	
		138	5690		17.75			17.75			20.75	
	802.11ax-HE160 MCS0	114	5570		12.00			12.00			15.00	

<5.5GHz WLAN_DBS>												
				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	Not Required	15.50	Not Required	Not Required	15.50	Not Required	Not Required	18.50	Not Required
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11n-HT20 MCS0	100	5500		15.50			15.50			18.50	
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11n-HT40 MCS0	102	5510		13.00			13.00			16.00	
		110	5550		16.25			16.25			19.25	
		126	5630		16.25			16.25			19.25	
		134	5670		16.25			16.25			19.25	
		142	5710		16.25			16.25			19.25	
	802.11ac-VHT20 MCS0	100	5500		15.50			15.50			18.50	
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11ac-VHT40 MCS0	102	5510		13.00			13.00			16.00	
		110	5550		16.25			16.25			19.25	
		126	5630		16.25			16.25			19.25	
		134	5670		16.25			16.25			19.25	
		142	5710		16.25			16.25			19.25	
	802.11ac-VHT80 MCS0	106	5530	10.94	12.50	99.06	10.83	12.50	99.06		15.50	
		122	5610	14.85	16.00		14.77	16.00			19.00	
		138	5690	14.88	16.25		14.91	16.25			19.25	
	802.11ac-VHT160 MCS0	114	5570	Not Required	12.00	Not Required	Not Required	12.00	Not Required		15.00	
	802.11ax-HE20 MCS0	100	5500		15.50			15.50			18.50	
		116	5580		15.50			15.50			18.50	
		124	5620		15.50			15.50			18.50	
		132	5660		15.50			15.50			18.50	
		144	5720		15.50			15.50			18.50	
	802.11ax-HE40 MCS0	102	5510		13.00			13.00			16.00	
		110	5550		16.25			16.25			19.25	
		126	5630		16.25			16.25			19.25	
		134	5670		16.25			16.25			19.25	
		142	5710		16.25			16.25			19.25	
	802.11ax-HE80 MCS0	106	5530		12.50			12.50			15.50	
		122	5610		16.00			16.00			19.00	
		138	5690		16.25			16.25			19.25	
	802.11ax-HE160 MCS0	114	5570		12.00			12.00			15.00	

<5.8GHz WLAN_Non-DBS>												
				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	Not Required	18.00	Not Required	Not Required	18.00	Not Required	Not Required	21.00	Not Required
		157	5785		18.00			18.00			21.00	
		165	5825		18.00			18.00			21.00	
	802.11n-HT20 MCS0	149	5745		18.00			18.00			21.00	
		157	5785		18.00			18.00			21.00	
		165	5825		18.00			18.00			21.00	
	802.11n-HT40 MCS0	151	5755	16.89	18.00	98.96	16.91	18.00	99.02		21.00	
		159	5795	17.08	18.00		17.25	18.00			21.00	
	802.11ac-VHT20 MCS0	149	5745	Not Required	18.00	Not Required	Not Required	18.00	Not Required		21.00	
		157	5785		18.00			18.00			21.00	
		165	5825		18.00			18.00			21.00	
	802.11ac-VHT40 MCS0	151	5755		18.00			18.00			21.00	
		159	5795		18.00			18.00			21.00	
	802.11ac-VHT80 MCS0	155	5775		17.00			17.00			20.00	
	802.11ax-HE20 MCS0	149	5745		18.00			18.00			21.00	
		157	5785		18.00			18.00			21.00	
		165	5825		18.00			18.00			21.00	
	802.11ax-HE40 MCS0	151	5755		18.00			18.00			21.00	
		159	5795		18.00			18.00			21.00	
	802.11ax-HE80 MCS0	155	5775		17.00			17.00			20.00	

<5.8GHz WLAN_DBS>												
				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	Not Required	16.75	Not Required	Not Required	16.75	Not Required	Not Required	19.75	Not Required
		157	5785		16.75			16.75			19.75	
		165	5825		16.75			16.75			19.75	
	802.11n-HT20 MCS0	149	5745		16.75			16.75			19.75	
		157	5785		16.75			16.75			19.75	
		165	5825		16.75			16.75			19.75	
	802.11n-HT40 MCS0	151	5755		16.75			16.75			19.75	
		159	5795		16.75			16.75			19.75	
	802.11ac-VHT20 MCS0	149	5745		16.75			16.75			19.75	
		157	5785		16.75			16.75			19.75	
		165	5825		16.75			16.75			19.75	
	802.11ac-VHT40 MCS0	151	5755		16.75			16.75			19.75	
		159	5795		16.75			16.75			19.75	
	802.11ac-VHT80 MCS0	155	5775	15.29	16.75	99.06	15.26	16.75	99.06		19.75	
	802.11ax-HE20 MCS0	149	5745	Not Required	16.75	Not Required	Not Required	16.75	Not Required		19.75	
		157	5785		16.75			16.75			19.75	
		165	5825		16.75			16.75			19.75	
	802.11ax-HE40 MCS0	151	5755		16.75			16.75			19.75	
		159	5795		16.75			16.75			19.75	
	802.11ax-HE80 MCS0	155	5775		16.75			16.75			19.75	

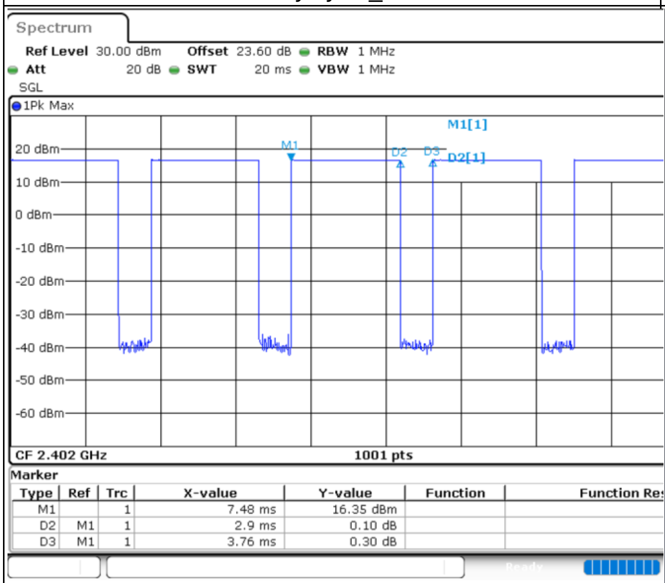
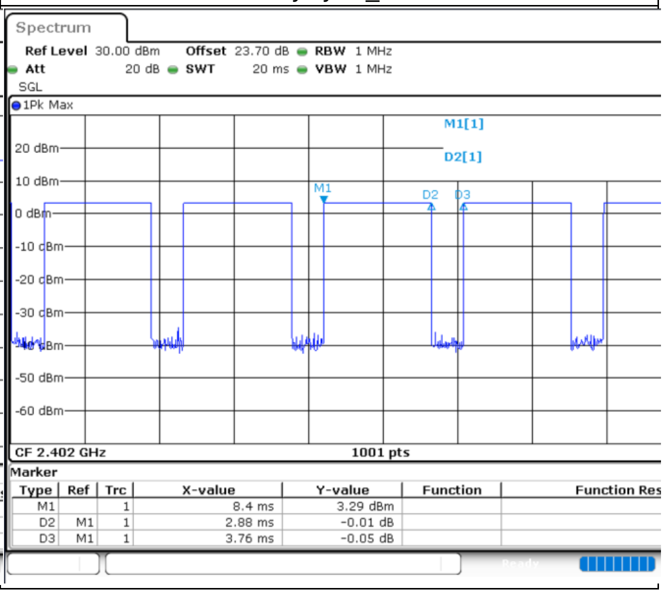
<WiFi 6E_Non-DBS & DBS>												
				Ant 0			Ant 1			Ant 0+1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
WiFi 6E	802.11a 6Mbps	1	5955	Not Required	-3.50	Not Required	Not Required	-3.50	Not Required	Not Required	-0.50	Not Required
		57	6235		-3.50			-3.50			-0.50	
		113	6515		-1.50			-1.50			1.50	
		173	6815		-3.50			-3.50			-0.50	
		229	7095		-3.00			-3.00			0.00	
	802.11ax-HE20 MCS0	1	5955		-3.00			-3.00			0.00	
		57	6235		-3.00			-3.00			0.00	
		113	6515		-1.00			-1.00			2.00	
		173	6815		-3.00			-3.00			0.00	
		229	7095		-3.00			-3.00			0.00	
	802.11ax-HE40 MCS0	3	5965		-0.50			-0.50			2.50	
		59	6245		-0.50			-0.50			2.50	
		107	6485		0.50			0.50			3.50	
		171	6805		-0.50			-0.50			2.50	
		227	7085		-0.50			-0.50			2.50	
	802.11ax-HE80 MCS0	7	5985		2.50			2.50			5.50	
		71	6305		2.50			2.50			5.50	
		103	6545		2.50			2.50			5.50	
		167	6785		2.50			2.50			5.50	
		215	7025		1.00			1.00			4.00	
	802.11ax-HE160 MCS0	15	6025	4.18	4.50	100.00	3.94	4.50	100.00		7.50	
		47	6185	3.37	4.50		3.29	4.50			7.50	
		111	6505	5.80	6.00		5.66	6.00			9.00	
		175	6825	4.07	5.50		4.58	5.50			8.50	
		207	6985	4.80	6.00		4.60	6.00			9.00	

<2.4GHz Bluetooth>

				Ant 0			Ant 1		
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	Average power (dBm)	Tune-Up Limit	Duty Cycle %
Bluetooth	BR / EDR 1Mbps	0	2402	2.69	4.00	77.13	3.09	4.00	76.60
		39	2441	2.81	4.00		3.38	4.00	
		78	2480	3.11	4.00		3.07	4.00	
	BR / EDR 2Mbps	0	2402	0.51	1.00	Not Required	0.89	1.00	Not Required
		39	2441	-0.02	1.00		0.58	1.00	
		78	2480	0.34	1.00		0.28	1.00	
	BR / EDR 3Mbps	0	2402	0.53	1.00		0.91	1.00	
		39	2441	0.03	1.00		0.54	1.00	
		78	2480	0.35	1.00		0.28	1.00	
	LE 1Mbps	0	2402	2.40	4.00		2.90	4.00	
		19	2440	2.60	4.00		3.30	4.00	
		39	2480	2.90	4.00		3.00	4.00	
	LE 2Mbps	0	2402	2.40	4.00		2.90	4.00	
		19	2440	2.50	4.00		3.30	4.00	
		39	2480	2.90	4.00		3.00	4.00	

General Note:

1. For 2.4GHz Bluetooth Ant 0 SAR testing was selected BR/EDR 1Mbps due to its highest average power and duty cycle is 77.13% considered in SAR testing, and the duty cycle would be scaled to 100% in reported SAR calculation.
2. For 2.4GHz Bluetooth Ant 1 SAR testing was selected BR/EDR 1Mbps due to its highest average power and duty cycle is 76.60% considered in SAR testing, and the duty cycle would be scaled to 100% in reported SAR calculation.

BT Duty cycle_ Ant 0	BT Duty cycle_ Ant 1
	

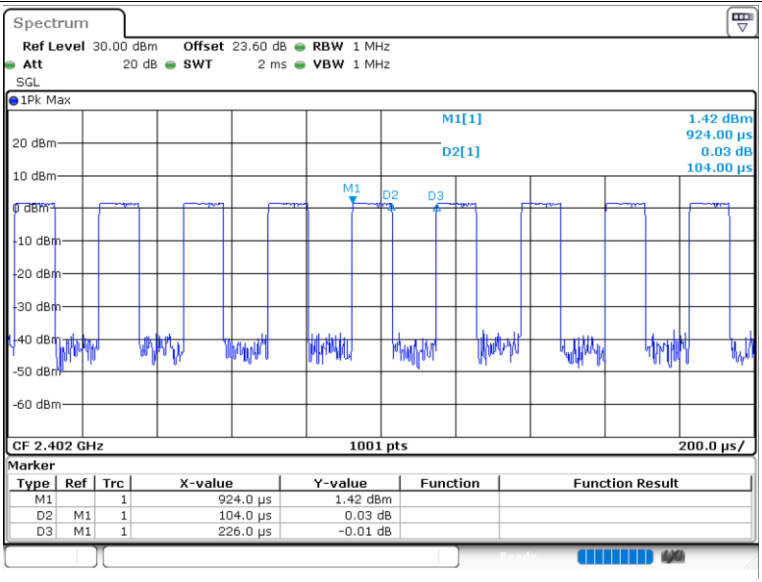
<nRF>

nRF	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
nRF	2Mbps	0	2402	3.80	5.50	46.02
		19	2440	4.40	5.50	
		38	2478	3.50	5.50	

General Note:

1. For nRF SAR, the duty cycle is 46.02% considered in SAR testing, and the duty cycle would be scaled to 100% in reported SAR calculation.

nRF Duty cycle



12. 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/Bluetooth: 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.
4. For the device RF Exposure performed under the SAM Face-Down Phantom was via approved KDB by OET.
5. The device support dual band simultaneous for 2.4GHz, 5GHz and 6GHz WLAN, Sim-Tx analysis include in section 13.

WLAN Note:

1. The Ant 0 = left ant, ant1 = right ant.
2. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
3. Per KDB 248227 D01v02r02, WLAN5.2GHz SAR testing is not required when the WLAN5.3GHz band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for WLAN5.2GHz band.
4. 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.
5. 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. For WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
7. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
8. 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 13.
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.

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

12.1 Head SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Status	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)
	WLAN2.4GHz	802.11b 1Mbps	Inner Surface	0mm	Ant 0	Non-DBS / DBS	1	2412	16.90	18.00	1.288	97.75	1.023	0.03	0.127	0.167
01	WLAN2.4GHz	802.11g 6Mbps	Inner Surface	0mm	Ant 0	Non-DBS / DBS	6	2437	19.35	20.00	1.161	99.15	1.009	-0.08	0.220	0.258
	WLAN2.4GHz	802.11b 1Mbps	Inner Surface	0mm	Ant 1	Non-DBS / DBS	1	2412	16.65	18.00	1.365	97.79	1.023	0.013	0.083	0.116
	WLAN2.4GHz	802.11g 6Mbps	Inner Surface	0mm	Ant 1	Non-DBS / DBS	6	2437	18.75	20.00	1.334	99.05	1.010	-0.1	0.152	0.205
	WLAN5GHz	802.11n-HT40 MCS0	Inner Surface	0mm	Ant 0	Non-DBS / DBS	54	5270	17.15	18.00	1.216	98.96	1.011	-0.07	0.335	0.412
02	WLAN5GHz	802.11n-HT40 MCS0	Inner Surface	0mm	Ant 1	Non-DBS / DBS	54	5270	17.16	18.00	1.213	99.02	1.010	-0.1	0.424	0.520
	WLAN5GHz	802.11ac-VHT80 MCS0	Inner Surface	0mm	Ant 0	Non-DBS	138	5690	16.04	17.75	1.483	99.06	1.009	-0.07	0.366	0.547
	WLAN5GHz	802.11ac-VHT80 MCS0	Inner Surface	0mm	Ant 0	DBS	138	5690	14.88	16.25	1.371	99.06	1.009	0.05	0.264	0.365
03	WLAN5GHz	802.11ac-VHT80 MCS0	Inner Surface	0mm	Ant 1	Non-DBS	138	5690	15.80	17.75	1.567	99.06	1.009	-0.07	0.374	0.591
	WLAN5GHz	802.11ac-VHT80 MCS0	Inner Surface	0mm	Ant 1	DBS	138	5690	14.91	16.25	1.361	99.06	1.009	-0.03	0.276	0.379
	WLAN5GHz	802.11n-HT40 MCS0	Inner Surface	0mm	Ant 0	Non-DBS	159	5795	17.08	18.00	1.236	98.96	1.011	0	0.415	0.519
	WLAN5GHz	802.11ac-VHT80 MCS0	Inner Surface	0mm	Ant 0	DBS	155	5775	15.29	16.75	1.400	99.06	1.009	0.02	0.304	0.429
04	WLAN5GHz	802.11n-HT40 MCS0	Inner Surface	0mm	Ant 1	Non-DBS	159	5795	17.25	18.00	1.189	99.02	1.010	0.05	0.656	0.787
	WLAN5GHz	802.11n-HT40 MCS0	Inner Surface	0mm	Ant 1	Non-DBS	151	5755	16.91	18.00	1.285	99.02	1.010	0.01	0.596	0.774
	WLAN5GHz	802.11ac-VHT80 MCS0	Inner Surface	0mm	Ant 1	DBS	155	5775	15.26	16.75	1.409	99.06	1.009	0.04	0.436	0.620

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Status	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	Inner Surface	0mm	Ant 0	Non-DBS / DBS	111	6505	5.80	6.00	1.047	100	1.000	-0.08	0.026	0.027	0.206	0.216
05	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 0	Non-DBS / DBS	15	6025	4.18	4.50	1.076	100	1.000	0.02	0.027	0.029	0.219	0.236
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 0	Non-DBS / DBS	47	6185	3.37	4.50	1.297	100	1.000	-0.03	0.008	0.010	0.080	0.104
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 0	Non-DBS / DBS	175	6825	4.07	5.50	1.390	100	1.000	-0.06	0.001	0.001	0.001	0.001
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 0	Non-DBS / DBS	207	6985	4.80	6.00	1.318	100	1.000	0.02	0.005	0.007	0.038	0.050
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 1	Non-DBS / DBS	111	6505	5.66	6.00	1.081	100	1.000	0.08	0.021	0.023	0.150	0.162
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 1	Non-DBS / DBS	15	6025	3.94	4.50	1.138	100	1.000	0.04	0.015	0.017	0.159	0.181
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 1	Non-DBS / DBS	47	6185	3.29	4.50	1.321	100	1.000	0.05	0.013	0.017	0.093	0.123
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 1	Non-DBS / DBS	175	6825	4.58	5.50	1.236	100	1.000	0.06	0.005	0.006	0.036	0.044
	WLAN6GHz	802.11ax-HE160 MCS0	Inner Surface	0mm	Ant 1	Non-DBS / DBS	207	6985	4.60	6.00	1.380	100	1.000	0.07	0.001	0.001	0.001	0.001

<Bluetooth SAR>

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	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	1Mbps	Inner Surface	0mm	Ant 0	78	2480	3.11	4.00	1.228	77.13	1.300	0.01	0.001	0.002
06	Bluetooth	1Mbps	Inner Surface	0mm	Ant 1	39	2441	3.38	4.00	1.154	76.6	1.309	0.02	0.004	0.006

<nRF SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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)
07	nRF	2Mbps	Inner Surface	0mm	19	2440	4.40	5.50	1.288	46.02	2.173	0.01	< 0.001	< 0.001

12.2 6GHz PD Measurement Result

Band	Mode	Test Position	Gap (mm)	Antenna	Power Status	Ch.	Freq. (MHz)	Average Power (dBm)	Grid Step (λ)	iPDn	iPD ratio (≥ -1)	Normal psPD (W/m^2)	Total psPD (W/m^2)
WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 0	Non-DBS / DBS	15	6025	4.18	0.05	3.14	2.204678439	0.747	0.767
WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	10mm	Ant 0	Non-DBS / DBS	15	6025	4.18	0.25	1.89		0.260	0.326
WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 0	Non-DBS / DBS	207	6985	4.80	0.05	1.67	-0.71749755	0.383	0.386
WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	8.59mm	Ant 0	Non-DBS / DBS	207	6985	4.80	0.25	1.97		0.304	0.324

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Status	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Duty Cycle %	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)	(1) Reported Calculated Inner Edge PD (W/m^2)
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 0	Non-DBS / DBS	111	6505	5.80	6.00	100.00	0.05	1.5535	-0.09	0.393	0.639	0.441	0.717	1.85
01	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 0	Non-DBS / DBS	15	6025	4.18	4.50	100.00	0.05	1.5535	0.18	0.747	1.249	0.767	1.283	1.78
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 0	Non-DBS / DBS	47	6185	3.37	4.50	100.00	0.05	1.5535	0.08	0.354	0.713	0.397	0.800	1.78
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 0	Non-DBS / DBS	175	6825	4.07	5.50	100.00	0.05	1.5535	-0.17	0.366	0.790	0.369	0.797	1.32
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 0	Non-DBS / DBS	207	6985	4.80	6.00	100.00	0.05	1.5535	-0.01	0.383	0.784	0.386	0.790	1.35
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 1	Non-DBS / DBS	111	6505	5.66	6.00	100.00	0.05	1.5535	0.08	0.278	0.467	0.280	0.470	0.58
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 1	Non-DBS / DBS	15	6025	3.94	4.50	100.00	0.05	1.5535	0.01	0.235	0.415	0.236	0.417	0.58
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 1	Non-DBS / DBS	47	6185	3.29	4.50	100.00	0.05	1.5535	0.03	0.252	0.517	0.254	0.521	0.46
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 1	Non-DBS / DBS	175	6825	4.58	5.50	100.00	0.05	1.5535	-0.18	0.317	0.609	0.319	0.612	0.35
	WLAN6GHz	802.11ax-HE160 MCS0	Bottom Edge	2mm	Ant 1	Non-DBS / DBS	207	6985	4.60	6.00	100.00	0.05	1.5535	0.12	0.264	0.566	0.265	0.568	0.30

General Note:

1. Based on approved KDB by OET, we followed the procedure to demonstrate PD compliance for inter edge right/left antenna exposure condition

13. Simultaneous Transmission Analysis

Non-DBS		
NO.	Simultaneous Transmission Configurations	Head
1.	WLAN2.4GHz Ant 0 + WLAN2.4GHz Ant 1	Yes
2.	WLAN5GHz Ant 0 + WLAN5GHz Ant 1 + Bluetooth Ant 0 + nRF	Yes
3.	WLAN5GHz Ant 0 + WLAN5GHz Ant 1 + Bluetooth Ant 1 + nRF	Yes
4.	WLAN6GHz Ant 0 + WLAN6GHz Ant 1 + Bluetooth Ant 0+ nRF	Yes
5.	WLAN6GHz Ant 0 + WLAN6GHz Ant 1 + Bluetooth Ant 1+ nRF	Yes

DBS		
NO.	Simultaneous Transmission Configurations	Head
1.	WLAN2.4GHz Ant 0 + WLAN2.4GHz Ant 1 + WLAN5GHz Ant 0 +nRF	Yes
2.	WLAN2.4GHz Ant 0 + WLAN2.4GHz Ant 1 + WLAN5GHz Ant 1 +nRF	Yes
3.	WLAN2.4GHz Ant 0 + WLAN2.4GHz Ant 1 + WLAN6GHz Ant 0 +nRF	Yes
4.	WLAN2.4GHz Ant 0 + WLAN2.4GHz Ant 1 + WLAN6GHz Ant 1 +nRF	Yes
5.	WLAN2.4GHz Ant 0 + WLAN5GHz Ant 0 + WLAN5GHz Ant 1 + nRF	Yes
6.	WLAN2.4GHz Ant 0 + WLAN6GHz Ant 0 + WLAN6GHz Ant 1 + nRF	Yes
7.	WLAN2.4GHz Ant 1 + WLAN5GHz Ant 0 + WLAN5GHz Ant 1 + nRF	Yes
8.	WLAN2.4GHz Ant 1 + WLAN6GHz Ant 0 + WLAN6GHz Ant 1 + nRF	Yes

General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 248227 section6.1, when antenna are spatially separated to the extent that SAR distributions do not overlap and can be treated independently, SAR compliance for simultaneous transmission is determined separately for each individual antenna, therefore, the Sim-Tx analysis only selected same antenna SAR value perform, except nRF transmitter.
3. 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.

13.1 Head Exposure Conditions

<Non-DBS>

Exposure Position	1	2	3	4	5	6	7	8	9	1+2 Summed 1g SAR (W/kg)	3+4+7+9 Summed 1g SAR (W/kg)	3+4+8+9 Summed 1g SAR (W/kg)	5+6+7+9 Summed 1g SAR (W/kg)	5+6+8+9 Summed 1g SAR (W/kg)
	WLAN2.4GHz Ant 0	WLAN2.4GHz Ant 1	WLAN5GHz Ant 0	WLAN5GHz Ant 1	WLAN6GHz Ant 0	WLAN6GHz Ant 1	Bluetooth Ant 0	Bluetooth Ant 1	nRF					
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)					
Inner Surface	0.258	0.205	0.547	0.787	0.029	0.023	0.002	0.006	0.001	**0.258**	**0.550**	**0.794**	**0.032**	**0.030**

<DBS>

Exposure Position	1	2	3	4	5	6	7	1+2+3+7 Summed 1g SAR (W/kg)	1+2+4+7 Summed 1g SAR (W/kg)	1+2+5+7 Summed 1g SAR (W/kg)	1+2+6+7 Summed 1g SAR (W/kg)	1+3+4+7 Summed 1g SAR (W/kg)	1+5+6+7 Summed 1g SAR (W/kg)	2+3+4+7 Summed 1g SAR (W/kg)	2+5+6+7 Summed 1g SAR (W/kg)
	WLAN2.4GHz Ant 0	WLAN2.4GHz Ant 1	WLAN5GHz Ant 0	WLAN5GHz Ant 1	WLAN6GHz Ant 0	WLAN6GHz Ant 1	nRF								
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)								
Inner Surface	0.258	0.205	0.429	0.620	0.029	0.023	0.001	**0.688**	**0.826**	**0.288**	**0.229**	**0.688**	**0.288**	**0.826**	**0.229**

Test Engineer： Albert Chen and Randy Lin

14. Uncertainty Assessment

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) κ 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%

Uncertainty Budget Specific Phantoms (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	13.10	N	2	1	1	6.6	6.6
Probe Calibration Drift	1.70	R	1.732	1	1	1.0	1.0
Probe Linearity	4.70	R	1.732	1	1	2.7	2.7
Broadband Signal	3.00	R	1.732	1	1	1.7	1.7
Probe Isotropy	9.60	R	1.732	1	1	5.5	5.5
Other Probe+Electronic	0.30	N	1	1	1	0.3	0.3
RF Ambient	1.80	N	1	1	1	1.8	1.8
Probe Positioning	2.90	N	1	0.29	0.29	0.8	0.8
Data Processing	8.70	N	1	1	1	8.7	8.7
Phantom and Device Errors							
Conductivity (meas.) DAK	2.50	N	1	0.78	0.71	2.0	1.8
Conductivity (temp.) BB	3.30	R	1.732	0.78	0.71	1.5	1.4
Phantom Permittivity	14.00	R	1.732	0.25	0.25	2.0	2.0
Distance DUT – TSL	2.00	N	1	2	2	4.0	4.0
Device Positioning	1.00	N	1	1	1	1.0	1.0
Device Holder	3.60	N	1	1	1	3.6	3.6
DUT Modulationm	2.40	R	1.732	1	1	1.4	1.4
Time-average SAR	1.70	R	1.732	1	1	1.0	1.0
DUT drift	2.50	N	1	1	1	2.5	2.5
Val Antenna Unc. val	0.00	N	1	1	1	0.0	0.0
Unc. Input Powerval	0.00	N	1	1	1	0.0	0.0
Correction to the SAR results							
Liquid Permittivity (mea.)	1.90	N	1	1	0.84	1.9	1.6
Temp. unc. - Permittivity	0.00	R	1.732	1	1	0.0	0.0
Combined Std. Uncertainty						14.7%	14.7%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						29.5%	29.4%

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**

15. 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)