RF Exposure Test Report

APPLICANT	:	YEAHER INC.
PRODUCT NAME	:	Portable Computer
MODEL NAME	:	N172S, N172L, N172B
BRAND NAME	:	N/A
FCC ID	:	2BEMH-N172S
STANDARD(S)	:	FCC 47 CFR Part 2 (2.1093) IEC TR 63170:2018 IEEE 1528-2013 IEC/IEEE 62209-1528:2020
RECEIPT DATE	:	2024-10-08
TEST DATE	:	2024-10-23 to 2024-11-21
ISSUE DATE	:	2024-11-22

Edited by: Xie Yiyun (Rapporteur)

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Change History		
Version	**Date**	**Reason for Change**
1.0	2024-11-22	First edition

1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) and power density found during testing as bellows:

Frequency Band		Highest SAR Summary		
		Body (Gap 0mm)	APD	Scaled PD
		1g SAR (W/kg)	Body (mW/cm^2)	4cm^2 psPD (mW/cm^2)
WLAN	2.4GHz WLAN	0.393	N/A	N/A
	5GHz WLAN	1.187	N/A	N/A
	6GHz WLAN	0.791	0.333	0.3
2.4GHz Band	Bluetooth	0.043	N/A	N/A

Highest Simultaneous Transmission SAR_{1g} (W/Kg):	1.58	Limit (W/kg): 1.6

Highest Simultaneous Transmission with Multiple transmitters	Total Exposure Radio
SAR & Power Density	0.284

Note:

1. This device is compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits (1.6 W/kg for 1g SAR, 1.0 mW/cm^2 for iPD and APD in 4cm^2) specified in FCC 47 CFR Part 1 (1.1310) and IEEE C95.1-1991), and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528, IEEE 1528-2013, TCBC workshop notes, IEC TR 63170 and FCC KDB publications.
2. When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

2 Technical Information

Note: Provide by applicant.

2.1 Applicant and Manufacturer Information

Applicant:	YEAHER INC.
Applicant Address:	51 Steel Dr,Unit A, New Castle,Delaware,19720
Manufacturer:	Nimo Direct Inc.
Manufacturer Address:	51 Steel Dr,Unit A, New Castle,Delaware,19720

2.2 Equipment under Test (EUT) Description

Product Name:	Portable Computer
EUT No.:	1#
Hardware Version:	V10
Software Version:	V9.08
Operation Frequency:	WLAN 2.4GHz: 2412 MHz ~ 2462 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz WLAN 6.2GHz (U-NII-5): 5925 MHz ~ 6425 MHz WLAN 6.7GHz (U-NII-6): 6425 MHz ~ 6525 MHz WLAN 6.5GHz (U-NII-7): 6525 MHz ~ 6875 MHz WLAN 7.0GHz (U-NII-8): 6875 MHz ~ 7125 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Modulation Mode:	802.11b: DSSS 802.11a/g/n-HT20/HT40/ac-VHT20/40/80: OFDM 802.11ax-HEW20/40/80/160: OFDMA BR+EDR: GFSK (1Mbps), π/4-DQPSK (2Mbps), 8-DPSK (3Mbps) Bluetooth LE: GFSK (1Mbps, 2Mbps)
Antenna Type:	WLAN: FPC Antenna Bluetooth: FPC Antenna
SIM Cards Description:	N/A

Note:

1. There are three models in this report, N172S, N172L and N172B, they are different from the model name and head bow size. The N172S for the main test models.

2. Declaration of Conformity
   The WLAN/Bluetooth output power test results in the report were provided by the customer, and the test laboratory is not responsible for the accuracy of the information.
3. For a more detailed description, please refer to specification or user manual supplied by the applicant and/or manufacturer.

2.3 Environment of Test Site

Temperature:	18°C ~25°C
Humidity:	35%~75% RH

Test Frequency:	WLAN 2.4GHz; WLAN 5GHz; WLAN 6GHz; Bluetooth
Operation Mode:	Call established
Power Level:	WLAN 2.4GHz/5GHz/6GHz/Bluetooth refer to annex E

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the Factory. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset.
The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 35 dB.

3 Specific Absorption Rate (SAR)

3.1 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 or controlled and general population or uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational or controlled exposure limits are higher than the limits for general population or uncontrolled.

3.2 SAR Definition

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

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

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

SAR measurement can be either related to the temperature elevation in tissue by

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

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

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

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

4 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.

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

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for head and trunk)	1.6 W/kg
Spatial Peak SAR (10g cube tissue for limbs)	4.0 W/kg
Spatial Peak SAR (1g cube tissue for whole body)	0.08 W/kg

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

Note:

1. Occupational/Uncontrolled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).
2. 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.

4.2 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. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

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5 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method Determination /Remark
FCC 47 CFR Part 2 (2.1093)	Radio Frequency Radiation Exposure Evaluation: Portable Devices	No deviation
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)	No deviation
IEC TR 63170:2018	Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz	No deviation
IEEE 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	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
KDB 248227 D01v02r02	SAR Measurement Procedures for 802.11 Transmitters	No deviation
KDB 616217 D04 v01r01	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers	No deviation
KDB 865664 D02v01r02	RF Exposure Reporting	No deviation
KDB 941225 D06v02r01	SAR Evaluation Procedures For Portable Devices With Wireless Router Capabilities	No deviation
Note: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.		

6 SAR Measurement System

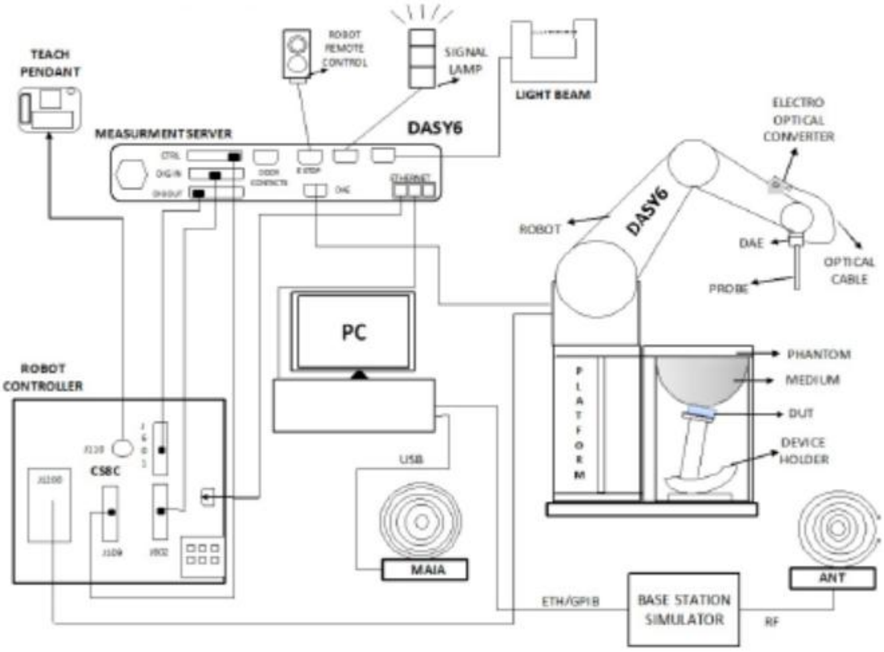


Fig.6.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software.
- A data acquisition electronic (DAE) attached to the robot arm extension.
- A dosimetric probe equipped with an optical surface detector system.
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals.
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning.
- A computer operating Windows XP.
- DASY software.
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom.
- A device holder.
- Tissue simulating liquid.
- Dipole for evaluating the proper functioning of the system.

Component details are described in the following sub-sections.

6.1 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.

➢ **E-Field Probe Specification**

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	**Fig 6.2 Photo of EX3DV4**

6.2 EUmmWave Probe

The probe designed allows measurement at distances as small as 2mm from the sensor to the surface of EUT. The typical senor to the tip of probe is 1.5mm.

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
Two dipoles' Length of Probe	0.9 mm – Diode located
Dynamic Range	＜20 V/m – 10000 V/m with PRE-10 (min ＜50 V/m – 3000 V/m)
Linearity	＜0.2 dB
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 measurement of mm-Wave transmitters operating above 10 GHz in ＜ 2mm distance from device (free-space) power density H-field and far-field analysis using total field reconstruction.
Compatibility	cDASY 6 + 5G Module SW1.0 and higher

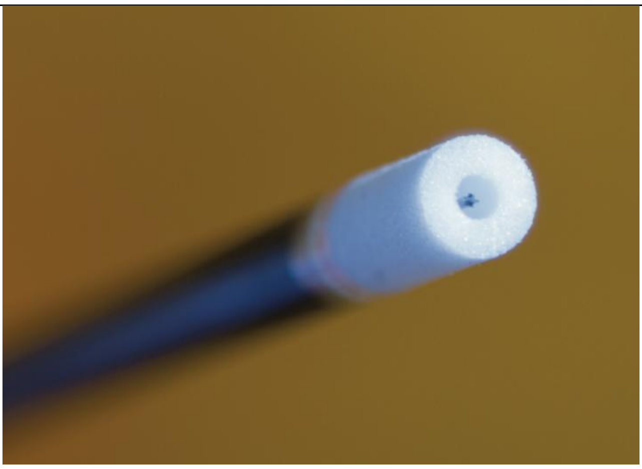
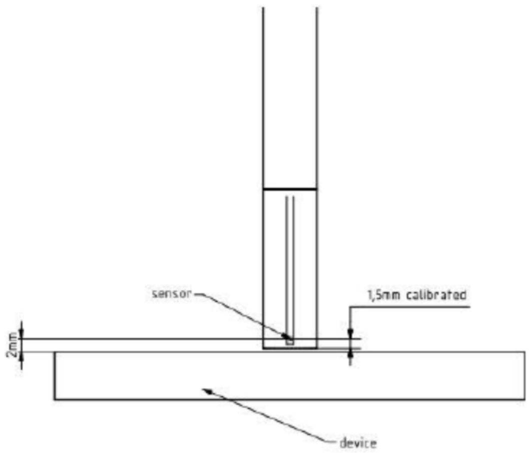


Fig 6.3 Photo of EUmmWave Probe



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 bits 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 6.4 Photo of DAE

6.4 Robot

The SPEAG DASY system uses the high precision robots (DASY6: TX60XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY6: CS8c) from Stäubliis used. The Stäublirobot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; nobelt drives)
- Jerk-free straight movements
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Fig. 6.5 Photo of Robot

6.5 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DAS 6: 400MHz, Intel Celeron), chip-disk (DASY6: 128 MB), RAM (DASY6: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig. 6.6 Photo of Server for DASY6

6.6 Light Beam Unit

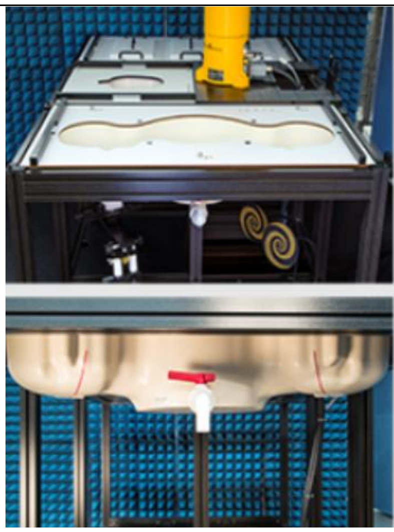
The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Fig. 6.7 Photo of Light Beam

6.7 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%) Center ear point: 6 ± 0.2 mm	 **Fig. 6.8 Photo of SAM Phantom**
Filling Volume **Dimensions**	Approx. 25 liters Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Head, Right Head, 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.

6.8 Data storage and Evaluation

- **Data Storage**

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verifications of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

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

- **Data Evaluation**

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

Probe Parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion	$ConvF_i$
	- Diode compression point	dcp_i
Device Parameters:	- Frequency	f
	- Crest	cf
Media Parameters:	- Conductivity	σ
	- Density	ρ

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

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

The formula for each channel can be given as:

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

WithV_i = compensated signal of channel i, (i = x, y, z)
U_i= input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp^i= diode compression point (DASY parameter)
From the compensated input signals, the primary field data for each channel can be evaluated:

E- Field Probes: $E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$

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

WithV_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$= senor sensitivity of channel i, (i = x, y, z), µV/ (V/m) ^{2}
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency (GHz)
E_i = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m
The RSS value of the field components gives the total field strength (Hermitian magnitude):

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

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

With SAR = local specific absorption rate in mW/g
Etot= total field strength in V/m
σ = conductivity in (mho/m) or (Siemens/m)
ρ= equipment tissue density in g/cm3
Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

6.9 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Num.	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	805	2021.12.17	2024.12.16
SPEAG	5000MHz System Validation Kit	D5GHzV2	1176	2021.12.19	2024.12.18
SPEAG	D6.5GHz System Validation Kit	D6.5GHzV2	1054	2021.11.01	2024.10.31
SPEAG	5G Verification Source	10GHz	1019	2023.12.03	2026.12.02
SPEAG	DOSIMETRIC ASSESSMENT SYSTEM Software	DASY52	52.10.4.1527	NCR	NCR
SPEAG	DOSIMETRIC ASSESSMENT SYSTEM Software	cDASY6 SAR	16.0.0.116	NCR	NCR
SPEAG	DOSIMETRIC ASSESSMENT SYSTEM Software	cDASY6 mmWave	V2.0.2.34	NCR	NCR
SPEAG	Dosimetric E-Field Probe	EX3DV4	7608	2024.03.21	2025.03.20
SPEAG	EUmmWave Probe	EUmmMV4	9602	2024.03.12	2025.03.11
SPEAG	Data Acquisition Electronics	DAE4	1643	2024.03.27	2025.03.26
SPEAG	ELI Phantom	QD OVA004Ax	N/A	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	MAX Signal Analyzer	N9020A	MY52091436	2024.05.30	2025.05.29
Agilent	Network Analyzer	E5071B	MY42404762	2024.01.25	2025.01.24
SPEAG	Dielectric Assessment KIT	DAK-3.5	1279	2024.03.18	2025.03.17
mini-circuits	Amplifier	ZHL-42W+	608501717	NCR	NCR
mini-circuits	Amplifier	ZVE-8G+	754401735	NCR	NCR
Agilent	Signal Generator	N5182B	MY53050509	2024.09.11	2025.09.10
R&S	Power Senor	NRP8S	103215	2024.01.25	2025.01.24
Agilent	Power Meter	E4416A	MY45102093	2024.09.11	2025.09.10
R&S	Power Sensor	NRP8S	103240	2024.01.25	2025.01.24
Anritsu	Power Meter	E4418B	GB43318055	2024.05.30	2025.05.29
Agilent	Dual Directional Coupler	778D	50422	NA	NA
MCL	Attenuation	351-218-010	N/A	NA	NA
R&S	Spectrum Analyzer	N9030A	MY54170556	2023.10.07	2024.10.06
KTJ	Thermo meter	TA298	N/A	2023.11.22	2024.11.21
SPEAG	Tissue Simulating Liquids	HBBL600-10000V6		24H	

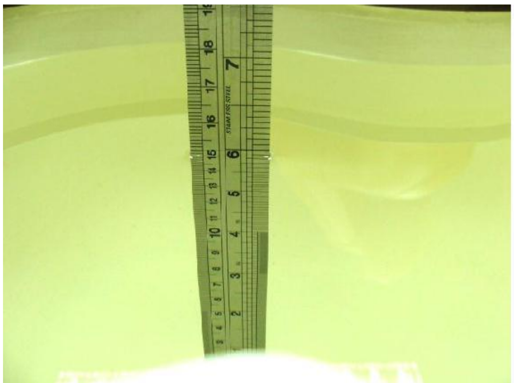
Note:

1. The calibration certificate of DASY can be referred to Annex F of this report.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Speag.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
6. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
7. N.C.R means No Calibration Requirement.

7 Tissue Simulating Liquids

➢ **Description of Tissue Simulation Liquids**

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 7.1, for body SAR testing, the liquid height from the centre of the flat phantom to liquid top surface is larger than 15 cm, which is shown in Fig. 7.2.



. Fig 7.1 Photo of Liquid Height for Head SAR **Fig 7.2 Photo of Liquid Height for Body SAR**

➢ **Target Dielectric Properties of the Tissue-equivalent Liquid Material**

The relative permittivity and conductivity of the tissue material should be within ±5% of the values given in the table below recommended by the FCC OET 65 supplement C.

Frequency	Head Tissue Simulating Media	
(MHz)	ε_r (F/m)	σ (S/m)
6000	35.07	5.48
6500	34.46	6.07
7000	33.88	6.65

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

The dielectric parameters of liquids were verified prior to the SAR evaluation using a Speag Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Table 1: Dielectric Performance of Tissue Simulating Liquid

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Conductivity Target (σ)	Delta (σ) (%)	Limit (%)	Date
2450	HSL	22.5	1.823	1.80	1.28	±5	2024.10.23
5250	HSL	22.5	4.684	4.71	-0.55	±5	2024.10.24
5750	HSL	22.5	5.284	5.22	1.23	±5	2024.10.28
6500	HSL	22.3	6.220	6.07	2.47	±5	2024.10.31

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Permittivity (εr)	Permittivity Target (εr)	Delta (εr) (%)	Limit (%)	Date
2450	HSL	22.5	38.922	39.20	-0.71	±5	2024.10.23
5250	HSL	22.5	35.729	35.95	-0.61	±5	2024.10.24
5750	HSL	22.5	35.109	35.35	-0.68	±5	2024.10.28
6500	HSL	22.3	34.630	34.46	0.49	±5	2024.10.31

Note:

According to April 2019 TCB Workshop that FCC has permitted the use of single head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests.

8 SAR System Verification

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

8.1 SAR System Performance Check

➢ **System Validation**

According to FCC KDB 865664 D02, SAR system verification is required to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles are used with the required tissue-equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point must be validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media. A tabulated summary of the system validation status, measurement frequencies, SAR probes, calibrated signal type(s) and tissue dielectric parameters has been included.

➢ **Purpose of System Performance Check**

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

➢ **System Setup**

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

Fig 8.1 Photo of Dipole Setup

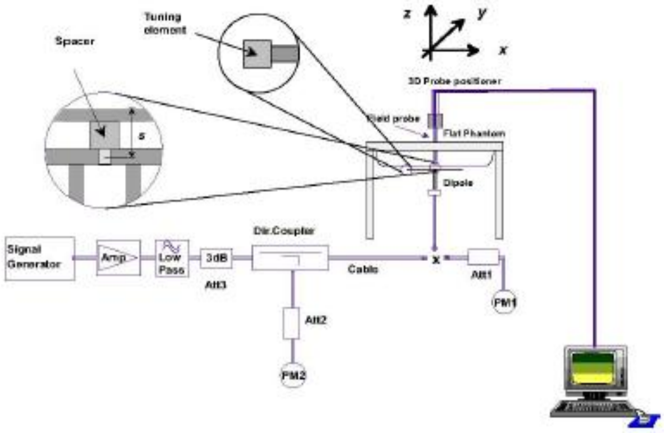


Fig 8.2 System Setup for System Evaluation

- **System Verification 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 as below indicates the system performance check can meet the variation criterion and the plots can be referred to Annex C of this report.

Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N
2450	HSL	250	D2450V2-805	7608	1643
5250	HSL	100	D5GHzV2-1176-5250	7608	1643
5750	HSL	100	D5GHzV2-1176-5750	7608	1643
6500	HSL	100	D6.5GHzV2-1054-6500	7608	1643

Frequency (MHz)	Tissue Type	Conductivity (σ)	Permittivity (εr)	CW Signal Validation		
				Sensitivity	Probe Linearity	Probe Isotropy
750	HSL	0.851	42.43	PASS	PASS	PASS
835	HSL	0.898	41.88	PASS	PASS	PASS
1750	HSL	1.386	39.91	PASS	PASS	PASS
1800	HSL	1.449	41.26	PASS	PASS	PASS
1900	HSL	1.435	39.65	PASS	PASS	PASS
2000	HSL	1.451	39.42	PASS	PASS	PASS
2300	HSL	1.764	38.99	PASS	PASS	PASS
2450	HSL	1.863	38.85	PASS	PASS	PASS
2600	HSL	1.973	38.58	PASS	PASS	PASS

3400	HSL	2.88	38.10	PASS	PASS	PASS
3500	HSL	2.91	37.90	PASS	PASS	PASS
3700	HSL	3.05	37.70	PASS	PASS	PASS
3900	HSL	3.15	37.50	PASS	PASS	PASS
4100	HSL	3.25	37.20	PASS	PASS	PASS
4200	HSL	3.34	37.00	PASS	PASS	PASS
4400	HSL	3.58	36.70	PASS	PASS	PASS
4600	HSL	3.70	36.60	PASS	PASS	PASS
4800	HSL	3.82	36.40	PASS	PASS	PASS
4900	HSL	3.96	36.20	PASS	PASS	PASS
5250	HSL	4.528	35.32	PASS	PASS	PASS
5600	HSL	4.905	34.89	PASS	PASS	PASS
5750	HSL	5.077	34.28	PASS	PASS	PASS
6500	HSL	6.07	34.46	PASS	PASS	PASS

Frequency (MHz)	Tissue Type	Conductivity (σ)	Permittivity (εr)	Modulation Signal Validation		
				Mod. Type	Duty Factor	PAR
750	HSL	0.851	42.43	N/A	N/A	N/A
835	HSL	0.898	41.88	GMSK	PASS	N/A
1750	HSL	1.386	39.91	N/A	N/A	N/A
1800	HSL	1.449	41.26	N/A	N/A	N/A
1900	HSL	1.435	39.65	GMSK	PASS	N/A
2000	HSL	1.451	39.42	GMSK	PASS	N/A
2300	HSL	1.764	38.99	OFDM	PASS	PASS
2450	HSL	1.863	38.85	OFDM	PASS	PASS
2600	HSL	1.973	38.58	TDD	PASS	N/A
3400	HSL	2.88	38.10	OFDM	PASS	PASS
3500	HSL	2.91	37.90	OFDM	PASS	PASS
3700	HSL	3.05	37.70	OFDM	PASS	PASS
3900	HSL	3.15	37.50	OFDM	PASS	PASS
4100	HSL	3.25	37.20	OFDM	PASS	PASS
4200	HSL	3.34	37.00	OFDM	PASS	PASS
4400	HSL	3.58	36.70	OFDM	PASS	PASS
4600	HSL	3.70	36.60	OFDM	PASS	PASS
4800	HSL	3.82	36.40	OFDM	PASS	PASS
4900	HSL	3.96	36.20	OFDM	PASS	PASS
5250	HSL	4.528	35.32	OFDM	N/A	PASS

5600	HSL	4.905	34.89	OFDM	N/A	PASS
5750	HSL	5.077	34.28	OFDM	N/A	PASS
6500	HSL	6.07	34.46	OFDM	N/A	PASS

<Validation Results>

Date	Freq. (MHz)	Tissue Type	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2024.10.23	2450	HSL	12.86	52.30	51.44	-1.64
2024.10.24	5250	HSL	8.05	76.70	80.5	4.95
2024.10.28	5750	HSL	8.41	78.70	84.1	6.86
2024.10.31	6500	HSL	30.60	288.00	311	7.99

Date	Freq. (MHz)	Tissue Type	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2024.10.23	2450	HSL	6.51	23.90	26.04	8.95
2024.10.24	5250	HSL	2.29	22.10	22.9	3.62
2024.10.28	5750	HSL	2.32	22.50	23.2	3.11
2024.10.31	6500	HSL	5.37	53.10	53.7	1.13

Date	Fre. (MHz)	Tissue Type	Measured $4cm^2$ APD (W/m^2)	Targeted $4cm^2$ APD (W/m^2)	Normalized $4cm^2$ APD (W/m^2)	Deviation (%)
2024.10.31	6500	HSL	135.00	1310.00	1350	3.05

Note: System checks the specific test data please see Annex C.

8.2 PD System Verification Source

➢ **General description**

The EUT is replaced by a calibrated source, the same spatial resolution, measurement region and test separation used in the calibration was applied to system check. Through visual inspection into the measured power density distribution, both the spatially (shape) and numerically (level) have no noticeable difference. The measurement results should be within ±10% of the calibrated targets.

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	0.25 ($\frac{\lambda}{4}$)	120/120	16 × 16
30	0.25 ($\frac{\lambda}{4}$)	60/60	24 × 24
60	0.25 ($\frac{\lambda}{4}$)	32.5/32.5	26 × 26
90	0.25 ($\frac{\lambda}{4}$)	30/30	36 × 36

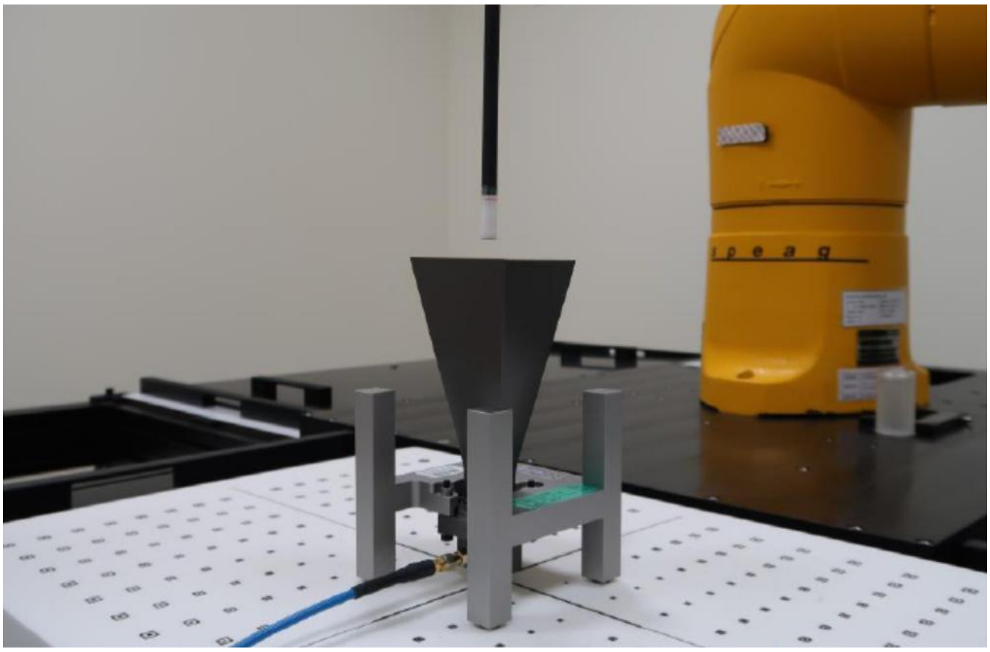


Fig 8.3 Photos of Verification Setup

➢ **Validation Results**

After system check testing, the results of power density will be compared with the reference value derived from the certificate report. The deviation of system check should be within ±10%.

<Validation Setup>

Frequency (GHz)	6.5G Verification Source	Probe S/N	DAE S/N
10	10GHz-SN 1019	9602	1643

<Validation Results>

Date	Frequency (GHz)	Test Distance (mm)	Measured 4cm^2 $pS_{tot}avg$ (W/m^2)	Targeted 4cm^2 $pS_{tot}avg$ (W/m^2)	Deviation (%)
2024.11.01	10	5.5	47.6	44.8	6.3
2024.11.20	10	5.5	47.8	44.8	6.7
2024.11.21	10	5.5	46.1	44.8	2.9

Note: System checks the specific test data please see Annex C.

9 EUT Testing Position

According to KDB 616217 D04, SAR measurement is required for the bottom surface of the keyboard of the laptop PC and positioned against the flat phantom. The required minimum test separation distance for incorporating transmitters and antennas into laptop computer display is determined with the display screen opened at an angle of 90° to the keyboard compartment.

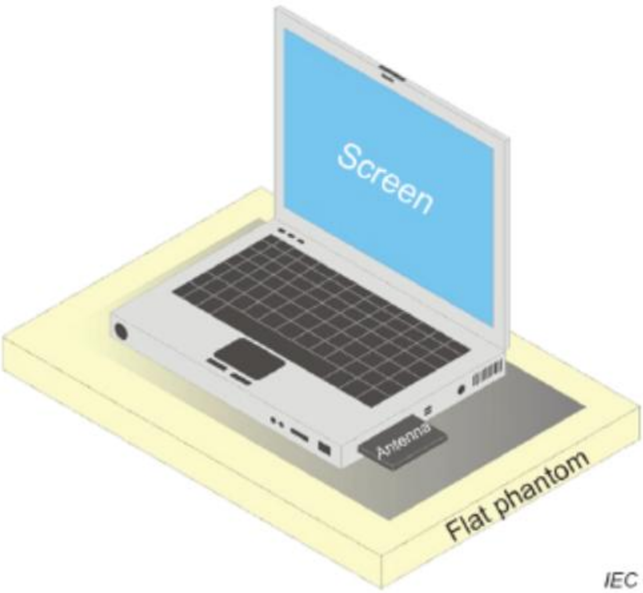


Fig.9.1 Illustration for Body Position

10 Measurement Procedures

The measurement procedures are as bellows:

<Conducted power measurement>

- For WWAN power measurement, use base station simulator to configure EUT WWAN transition in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- Read the WWAN RF power level from the base station simulator.
- For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
- Connect EUT RF port through RF cable to the power meter or spectrum analyzer, and measure WLAN/BT output power.

<Conducted power measurement>

- 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.
- Place the EUT in positions as Annex B demonstrates.
- Set scan area, grid size and other setting on the DASY software.
- Measure SAR results for the highest power channel on each testing position.
- Find out the largest SAR result on these testing positions of each band.
- Measure SAR results for other channels in worst SAR testing position if the Reported SAR or 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:

- Power reference measurement.
- Area scan.
- Zoom scan.
- Power drift measurement.

10.1 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 10 g 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 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

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

10.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement 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.

10.3 Area Scan & Zoom Scan Procedures

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a10mm^2 step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing.

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m^3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10 g cube 21,5mm.The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 5x5x7 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 30mm in the Z axis.

10.4 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Sheppard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1g and 10g cubes, the extrapolation distance should not be larger than 5 mm.

10.5 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.

11 Power Density Measurement Procedure

➢ **Computation of the Electric Field Polarization Ellipse**

For the numerical description of an arbitrarily oriented ellipse in three-dimensional space, five parameters are needed: the semi-major axis (a), the semi-minor axis (b), two angles describing the orientation of the normal vector of the ellipse (ϕ ,θ), and one angle describing the tilt of the semi-major axis (Ψ). For the two extreme cases, i.e. circular and linear polarizations, three parameters only (a, ϕ and θ) are sufficient for the description of the incident field.

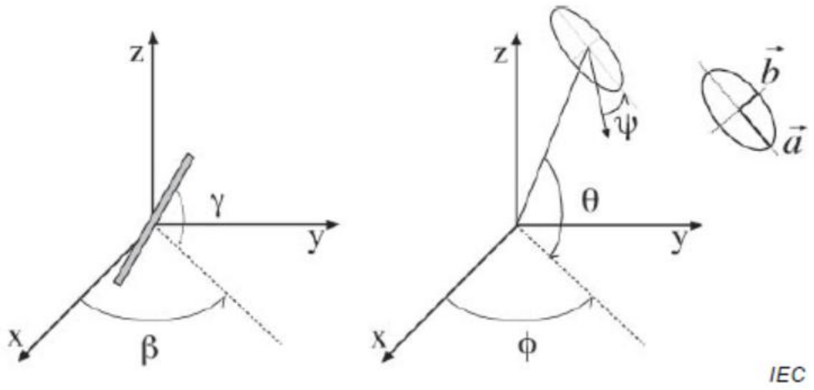


Fig 11.1 Illustration of the angles used for the numerical description of the sensor and the orientation of an ellipse in 3-D space

For the construction of the ellipse parameters from measured data, the problem can be reformulated as a nonlinear search problem. The semi-major and semi-minor axes of an elliptical field can be express as functions of the three angles (φ, θ and Ψ). The parameters can be uniquely determined towards minimizing the error based on least-squares for the given set of angles and the measured data. In this way, the numbers of three parameters is reduced from five to three, which means that least three sensors readings are necessary to gain sufficient information for the reconstruction of ellipse parameters. However, to suppress the noise and increase the reconstruction accuracy, it is desirable to have an over determined system of equations. The solution to use a probe consisting of two sensors angled byγ_1 and γ_2 toward the probe axis and to perform measurements at three angular positions of the probe, i.e. at β_1, β_2 and β_3, results in over determination of two. If there is a need for more information or increased accuracy, more rotation angles can be added.

The reconstruction of ellipse parameters can be separated into linear and non-linear parts that are best solved by the givens algorithm combined with a downhill simplex algorithm. To minimize the mutual coupling, sensor angles are set with a 90° shift ($\gamma_1=\gamma_2+90°$), and, to simplify, the first rotation angle of the probe (β_1) can be set to 0°.

- **Total Field and Power Flux Density Reconstruction**

Computation of the power density in general requires knowledge of the electric and magnetic field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible, as they are constrained by Maxi well's equations. The SPEAG have developed a reconstruction approach based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-Field polarization ellipse information obtained with the EUmmWV2 probe. This reconstruction algorithm, together with the ability of the probe to measure extremely close to the source without perturbing the field, permits reconstruction of the E-field and H-field, as well as of the power density, on measurement planes located as near as λ /5 away.

- **Power Flux Density Averaging**

The average of the reconstructed power density is evaluated over a circular area in each measurement plane. The area of the circle is defined by the user; the default is 1cm2. The computed peak average value is displayed in the box at the top right. Note that the average is evaluated only for grid points where the averaging circle is completely filed with values; for points at the edge where the averaging circle is only partly filled with values, the average power density is set to zero. Two average power density values are computed.

12 SAR Measurement Procedure

12.1 Test Procedure

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEC/IEEE 62209-1528:2020.

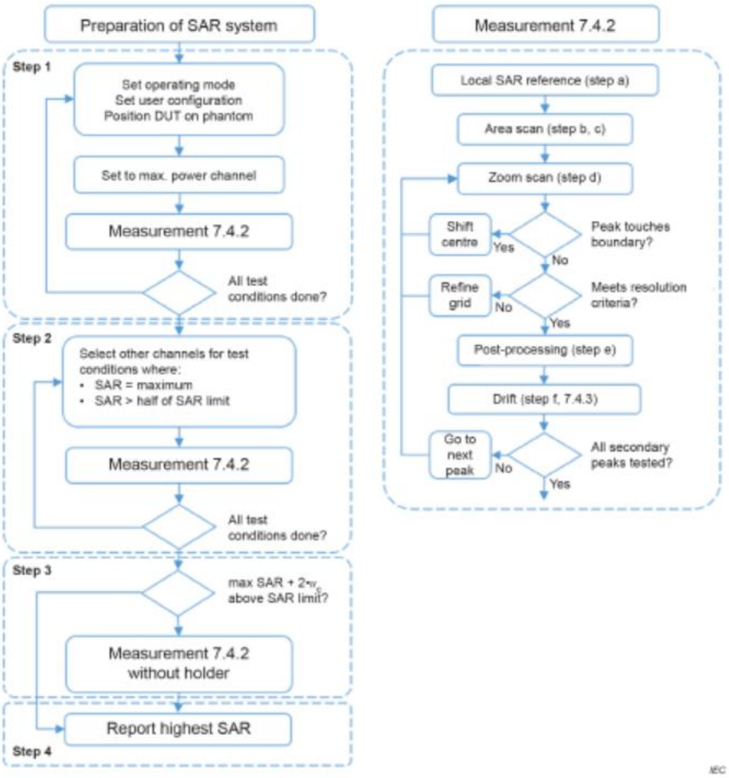


Fig 12.1 Block diagram of the tests to be performed

The SAR test procedure shall be performed for each test configuration should follows the requirements specified in IEC/IEEE 62209-1528. The Following steps are used for each test position shown in fig 12.1：

1. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface.

2. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.

12.2 Scanning Requirements

➢ **Area Scan Parameters**

Measure the two-dimensional SAR distribution within the phantom (i.e. the area scan). Table 1 provides the measurement parameters required for the area scan.

Table 1 Area scan parameters

Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	3 GHz < $f \leq 10$ GHz
Maximum distance between the measured points (geometric centre of the sensors) and the inner phantom surface (z_{M1} in Figure 20 in mm)	5 ± 1	$\delta \ln(2)/2 \pm 0,5$ [a]
Maximum spacing between adjacent measured points in mm (see O.8.3.1)[b]	20, or half of the corresponding zoom scan length, whichever is smaller	$60/f$, or half of the corresponding zoom scan length, whichever is smaller
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)[c]	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Tolerance in the probe angle	1°	1°

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

[b] See Clause O.8 on how Δx and Δy may be selected for individual area scan requirements.

[c] The probe angle relative to the phantom surface normal is restricted due to the degradation in the measurement accuracy in fields with steep spatial gradients. The measurement accuracy decreases with increasing probe angle and increasing frequency. This is the reason for the tighter probe angle restriction at frequencies above 3 GHz.

1. The area over which the SAR measurement is performed shall cover at least an area larger than the projection of the DUT, including its antenna. For some DUTs, the area projected onto the phantom can be relatively large, such that the probe might not reach all points. In this case, rotated phantoms may be used, and the area may be assessed by multiple overlapping area scans. The measurement resolution and spatial resolution for interpolation shall be selected to allow identification of the local peak locations to within one-half of the linear dimension of the corresponding side of the zoom-scan volume.
2. For the flat phantom, the boundary of the measurement area shall not be closer than 20 mm from the phantom side walls.

- **Zoom Scan Parameters**

Measure the three-dimensional SAR distribution at each of the local maxima locations identified in step c) (i.e. the zoom scan).

Table 2 Zoom scan parameters

Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	3 GHz < $f \leq 10$ GHz
Maximum distance between the closest measured points and the phantom surface (z_{M1} in Figure 20 and Table 3, in mm)	5	δ ln(2)/2 [a]
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Maximum spacing between measured points in the x- and y-directions (Δx and Δy, in mm)	8	$24/f$ [b]
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	5	$10/(f-1)$
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	4	$12/f$
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2/\Delta z_1$ in Figure 20)	1,5	1,5
Minimum edge length of the zoom scan volume in the x- and y-directions (L_z in O.8.3.2, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell (L_h in O.8.3.2 in mm)	30	22
Tolerance in the probe angle	1°	1°
[a] δ is the penetration depth for a plane-wave incident normally on a planar half-space. [b] This is the maximum spacing allowed, which might not work for all circumstances.		

1. For frequencies at or below 3 GHz, the following procedure shall be applied (see Table 2).
    a. The minimum size of the zoom scan volume shall be 30 mm by 30 mm by 30 mm.
    b. The horizontal grid step shall be 8 mm or less.
    c. The grid step in the vertical direction shall be 5 mm, or less if uniform spacing is used.
    d. If variable spacing is used in the vertical direction, the maximum spacing between the two closest measured points to the phantom shell (M1 and M2, see Figure 20 of IEC/IEEE 62209-1528 section 7.4.2) shall be 4 mm or less, and the spacing between the farther points shall increase by a factor of 1.5 or less.
    e. For other parameters, see Table 4.
2. For frequencies above 3 GHz, the following procedure shall be applied.

   a. The minimum size of the zoom scan volume may be reduced to 22 mm by 22 mm by 22 mm.
   b. The horizontal grid step shall be (24 / f [GHz]) mm or less.
   c. If uniform spacing in the vertical direction is used, the grid step in the vertical direction shall be (10 / (f [GHz] − 1)) mm or less.
   d. If variable spacing is used in the vertical direction, the maximum spacing between the two measured points closest to the phantom shell shall be (12 / f [GHz]) mm or less, and the spacing between farther points shall increase by a factor of 1.5 or less.
3. If the highest SAR 1 g or 10 g cube is touching the boundary of a zoom-scan volume, the entire zoom scan shall be repeated with the new centre located at the maximum psSAR location indicated by the preceding zoom scan measurement. It is also acceptable to expand the zoom scan during measurement until the 1 g or 10 g cube is no longer touching the boundary of the zoom-scan volume.
4. If the zoom scan measured as specified in the preceding paragraphs complies with both i) and ii), or if the psSAR is below 0.1 W/kg, no additional measurements are needed.
   a. The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak shall be larger than the horizontal grid steps in both x- and y-directions (Δ x, Δ y). This shall be checked for the measured zoom scan plane conformal to the phantom at the distance zM1. The minimum distance shall be recorded in the SAR test report.
   b. ii) The ratio of the SAR at the second measured point (M2) to the SAR at the closest measured point (M1) at the x-y location of the measured maximum SAR value shall be at least 30 % (Figure 20). This ratio (in %) shall be recorded in the SAR test report.

12.3 Description of Interpolation/Extrapolation Scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

12.4 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

13 SAR Test Configuration

<WLAN 2.4GHz>

1. SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
   a. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
   b. When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.
2. 2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for
3. 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test configuration Procedures should be followed.
4. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
5. Justification for test configurations for WLAN per KDB Publication 248227 D02DR02-41929 for
6. 2.4 GHz WI-FI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSSSAR.
7. A fixed level power reduction is applied for WiFi when handset operates "held to the body" condition or "held to the ear" condition, the power reduction triggered by audio receiver detection and call establish status.
8. Per KDB 248227 D01v02r02, In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. SAR is not required for the following 2.4 GHz OFDM conditions:
   a. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
   b. 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.

<WLAN 5GHz>

A) U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following：

1. When the same maximum output power is specified for both bands, begin SAR measurement in U- NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
2. When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
3. The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50.
4. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

B) U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures. When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

C) OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

1. The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
2. If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
3. If multiple configurations have the same specified maximum output power, largest channel band width and lowest order modulation, the lowest data rate configuration among these configurations is selected.
4. When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n. After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.
5. The channel closest to mid-band frequency is selected for SAR measurement.
6. For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for

SAR measurement.

D) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the sametransmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction Vapplies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 bandare supported, the highest maximum output power transmission mode configuration and maximumoutput power channel across the bands must be used to determine SAR test reduction, accordingto the initial test configuration and subsequent test configuration requirements. In applying theinitial test configuration and subsequent test configuration procedures, the 802.11 transmissionconfiguration with the highest specified maximum output power and the channel within a testconfiguration with the highest measured maximum output power should be clearly distinguished toapply the procedures.

14 Conducted Output Power

Remark: The output power of WLAN/Bluetooth was recorded in annex E of this report.

15 Antenna Location

➢ **EUT Antenna Locations**

The location of antenna was recorded in annex B
Main ANT: WLAN 2.4GHz/5GHz/6GHz AUX ANT: WLAN 2.4GHz/5GHz/6GHz; Bluetooth

➢ **Body SAR Measurement Position**

Antenna	Bottom of Keyboard	Back of Screen
Main ANT	Yes	No
AUX ANT	Yes	No

MORLAB Shenzhen Morlab Communications Technology Co., Ltd.
FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.cn E-mail: service@morlab.cn

16 RF Exposure Test Results

16.1 Test Guidance

1. 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:
   a. ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   b. ≤ 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
   c. ≤ 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 KDB248227 D01v02r02, a Wi-Fi device must be 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 for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies required for operations in the U.S. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. Unless it is permitted by specific KDB procedures or continuous transmission is specifically restricted by the device, the reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. When a device is not capable of sustaining continuous transmission or the output can become nonlinear, and it is limited by hardware design and unable to transmit at higher than 85% duty factor, a periodic duty factor within 15% of the maximum duty factor the device is capable of transmitting should be used. The reported SAR must be scaled to the maximum transmission duty factor to determine compliance. Descriptions of the procedures applied to establish the specific duty factor used for SAR testing are required in SAR reports to support the test results.
4. Evaluate SAR / APD with DASY6 Module SAR V16.0 or higher. The configurations to be tested

are defined in the relevant Knowledge Database (KDB). The 4cm[2] psSAR and absorbed psPD are reported.

16.2 Body SAR Data

- **WLAN 2.4GHz/5GHz Body SAR**

Plot No.	Band/Mode	Test Position	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Meas. SAR1g (W/kg)	Reported SAR1g (W/kg)
Main ANT									
	WLAN 2.4GHz / 802.11b	Bottom Face	1	20.84	21.50	1.164	0.02	0.234	0.273
AUX ANT									
	WLAN 2.4GHz / 802.11b	Bottom Face	1	20.48	21.00	1.127	0.05	0.048	0.054
MIMO									
1#	WLAN 2.4GHz / 802.11n40	Bottom Face	3	21.89	22.50	1.151	0.1	0.304	0.393
Main ANT									
	WLAN 5.2GHz / 802.11a	Bottom Face	36	15.35	16.00	1.161	-0.01	0.512	0.664
AUX ANT									
	WLAN 5.2GHz / 802.11a	Bottom Face	36	15.50	16.00	1.122	0.06	0.801	1.004
	WLAN 5.2GHz / 802.11a	Bottom Face	40	15.00	15.50	1.122	0.01	0.911	1.142
2#	WLAN 5.2GHz / 802.11a	Bottom Face	48	14.39	15.00	1.151	0.08	0.926	1.187
MIMO									
	WLAN 5.2GHz / 802.11ac40	Bottom Face	38	18.13	19.00	1.222	-0.02	0.841	1.093
	WLAN 5.2GHz / 802.11ac40	Bottom Face	46	17.31	18.00	1.172	-0.08	0.894	1.114
Main ANT									
	WLAN 5.8GHz / 802.11ac80	Bottom Face	155	16.74	17.50	1.191	0.07	0.683	0.919
AUX ANT									
	WLAN 5.8GHz / 802.11ac80	Bottom Face	155	16.61	17.50	1.227	0.09	0.469	0.650
MIMO									
3#	WLAN 5.8GHz / 802.11ac80	Bottom Face	155	19.69	20.50	1.205	0.01	0.813	1.106

➢ **Bluetooth Body SAR**

Plot No.	Band/Mode	Test Position	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Meas. SAR1g (W/kg)	Reported SAR1g (W/kg)
AUX ANT									
4#	Bluetooth/DH5	Bottom Face	0	11.10	12.00	1.230	0.1	0.032	0.043

➢ **WLAN 6GHz Body SAR**

Plot No.	Band	Mode	Test Position	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Meas. SAR1g (W/kg)	Reported SAR1g (W/kg)	Meas. APD 4cm² (W/m²)
Main ANT											
5#	U-NII-5	802.11ax80	Bottom	7	9.49	10.00	1.125	0.01	0.298	0.371	0.556
AUX ANT											
	U-NII-5	802.11ax80	Bottom	39	10.56	11.50	1.242	0.04	0.143	0.197	0.412
MIMO											
	U-NII-5	802.11ax80	Bottom	39	12.99	13.50	1.125	-0.02	0.212	0.264	0.556
Main ANT											
	U-NII-6	802.11ax80	Bottom	103	10.55	11.50	1.245	0.05	0.285	0.395	2.020
AUX ANT											
	U-NII-6	802.11ax80	Bottom	103	9.97	10.50	1.130	0	0.124	0.156	0.936
MIMO											
6#	U-NII-6	802.11ax80	Bottom	103	13.28	14.00	1.180	-0.08	0.380	0.500	1.740
Main ANT											
	U-NII-7	802.11ax80	Bottom	151	10.75	11.50	1.189	0	0.494	0.654	2.460
AUX ANT											
	U-NII-7	802.11ax80	Bottom	151	10.91	11.50	1.146	0.1	0.558	0.712	3.330
MIMO											
7#	U-NII-7	802.11ax80	Bottom	151	13.84	14.50	1.164	0.13	0.610	0.791	1.500
Main ANT											
	U-NII-8	802.11ax80	Bottom	199	9.92	10.50	1.143	-0.03	0.294	0.372	1.710
AUX ANT											
8#	U-NII-8	802.11ax80	Bottom	199	10.37	11.00	1.156	0.15	0.617	0.790	2.070
MIMO											
	U-NII-8	802.11ax80	Bottom	199	13.16	14.00	1.213	-0.08	0.555	0.745	1.825

Note:

1. Per KDB 447498 D01v06, for each exposure position, if the highest output channel Reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.

2. Additional WLAN SAR testing was performed for simultaneous transmission analysis.
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥0.8W/kg.
4. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
5. The WLAN 2.4GHz 802.11b Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.004 and WLAN 2.4GHz 802.11n40 with 1.124.
6. The WLAN 5GHz 802.11a Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.17(CH 36 & CH 40) /1.114(CH 48),WLAN 5GHz 802.11ac40 with 1.064 (CH38)/1.063(CH 46) and WLAN 5GHz 802.11ac80 with 1.129.
7. The WLAN 6GHz 802.11ax-HEW 80 Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.107(U-NII-5 /U-NII-8) /1.114(U-NII-6 /U-NII-7).
8. There is a protrusion less than 5mm on the bottom of this device, the 0mm distance with its thickness was tested and maximum scaled SAR is less than 1.2W/kg on 1-g.
9. The EUT was directly contact the phantom under SAR measurement.

16.3 Repeated SAR Assessment

➢ **General Note**

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

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

Plot No.	Band/Mode	Test Position	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Meas. SAR1g (W/kg)	Reported SAR1g (W/kg)
AUX ANT									
OR.	WLAN 5.2GHz / 802.11a	Bottom Face	48	14.39	15.00	1.151	0.08	0.926	1.187
1st	WLAN 5.2GHz / 802.11a	Bottom Face	48	14.39	15.00	1.151	0.06	0.832	1.067
MIMO									
OR.	WLAN 5.2GHz / 802.11ac40	Bottom Face	46	17.31	18.00	1.172	-0.08	0.894	1.114
1st	WLAN 5.2GHz / 802.11ac40	Bottom Face	46	17.31	18.00	1.172	-0.07	0.833	1.038
MIMO									
OR.	WLAN 5.8GHz / 802.11ac80	Bottom Face	155	19.69	20.50	1.205	0.01	0.813	1.106
1st	WLAN 5.8GHz / 802.11ac80	Bottom Face	155	19.69	20.50	1.205	0.05	0.757	1.030

16.4 PD Test Results

- **General Note**

1. The reported PD is the measured Total PD value adjusted for maximum tune-up tolerance.
   d. 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.
   e. For PD testing of WLAN signal with non-100% duty cycle, the measured PD is scaled-up by the duty cycle scaling factor which is equal to "1 / (duty cycle)".
   f. For WLAN: Reported PD (W/m^2)= Measured Total PD (W/m^2) * Duty Cycle scaling factor * Tune-up scaling factor.
2. According to the equipment user manual that the most conservative test distance of 2mm was applied to PD measurement and the REC (field reconstruction) component of the uncertainty budget for a given E-field is valid only for d ≥λ /5mm.
3. According to TCBC workshop in April 2021 that in addition to tune-up tolerance scaling, adjust measured results per amount that measurement uncertainty exceeds 30% (e.g. per methods of IEC 62479:2010). Total expanded uncertainty of 2.68dB which was converted to 85% was used to determining the psPD measurement scaling factor.
4. The duty cycle scaling factor of 1.000 should be calculated the final power density.
5. According to TCBC workshop in October 2018 that $4cm^2$ averaging area may now be considered.
6. RF exposure compliance with PD is demonstrated for various radio configurations using below equation:

   *Final PD = Mea. $psPD_{tot+}$ * tune-up factor * duty cycle factor * Uncertainty Factor*

   Where Uncertainty factor = 1 + (actual expanded uncertainty – 30%)
7. The final psPD should be scaled to the uncertainty factor of 1.55.
8. The measurement procedure consists of measuring the PDinc at two different distances: d = 2 mm (compliance distance) and d =λ / 5. The same grid extents and grid steps should be used for both measurements. 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 varies by less than 1 dB between the d = 2 mm and d =λ / 5 measurements. We recommend using as first approximation a grid step L_{grid} that is a function of the distance to the transmitting structure and not larger than:

$$l_{grid} = \begin{cases} 1.25d & for\, d < \lambda/5 \\ \lambda/4 & for\, d \geq \lambda/5 \end{cases}$$

- **PD Test Results**

Band	Mode	Exposure Position	Gap (mm)	Ant.	Ch.	Grip Step (λ)	iPDn (W/m²)	iPDn Ratio (<1dB)	Total psPDtot+ (W/m²)
U-NII-5	802.11ax-HEW80	Bottom	2	Main	7	0.0625	0.012	0.792	0.369
U-NII-5	802.11ax-HEW80	Bottom	9.61	Main	7	0.0625	0.010		0.247
U-NII-5	802.11ax-HEW80	Bottom	2	AUX	39	0.0625	0.315	0.574	1.338
U-NII-5	802.11ax-HEW80	Bottom	9.45	AUX	39	0.0625	0.276		1.061
U-NII-5	802.11ax-HEW80	Bottom	2	MIMO	39	0.0625	0.386	0.720	1.258
U-NII-5	802.11ax-HEW80	Bottom	9.68	MIMO	39	0.0625	0.327		0.843
U-NII-6	802.11ax-HEW80	Bottom	2	Main	103	0.0625	0.085	0.782	0.230
U-NII-6	802.11ax-HEW80	Bottom	9.27	Main	103	0.0625	0.071		0.187
U-NII-6	802.11ax-HEW80	Bottom	2	AUX	103	0.0625	0.088	0.694	0.250
U-NII-6	802.11ax-HEW80	Bottom	9.28	AUX	103	0.0625	0.075		0.174
U-NII-6	802.11ax-HEW80	Bottom	2	MIMO	103	0.0625	0.085	0.602	0.265
U-NII-6	802.11ax-HEW80	Bottom	9.31	MIMO	103	0.0625	0.074		0.185

Plots No.	Band	Exposure Position	Exposure Position	Ch.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	psPDtot+ over 4cm² (W/m²)	
								Mea.	Scaled
Main ANT									
	U-NII-5	802.11ax-HEW80	Front of Keyborad	7	9.49	10	1.125	0.071	0.137
	U-NII-5	802.11ax-HEW80	Bottom of Keyborad	7	9.49	10	1.125	0.191	0.369
	U-NII-5	802.11ax-HEW80	Edge 1	7	9.49	10	1.125	0.085	0.164
	U-NII-5	802.11ax-HEW80	Edge 2	7	9.49	10	1.125	0.035	0.068
	U-NII-5	802.11ax-HEW80	Edge 3	7	9.49	10	1.125	0.018	0.035
	U-NII-5	802.11ax-HEW80	Edge 4	7	9.49	10	1.125	0.031	0.060
AUX ANT									
	U-NII-5	802.11ax-HEW80	Front of Keyborad	39	10.56	11.5	1.242	0.088	0.187
9#	U-NII-5	802.11ax-HEW80	Bottom of Keyborad	39	10.56	11.5	1.242	0.628	1.338
	U-NII-5	802.11ax-HEW80	Edge 1	39	10.56	11.5	1.242	0.081	0.173
	U-NII-5	802.11ax-HEW80	Edge 2	39	10.56	11.5	1.242	0.033	0.070
	U-NII-5	802.11ax-HEW80	Edge 3	39	10.56	11.5	1.242	0.018	0.038
	U-NII-5	802.11ax-HEW80	Edge 4	39	10.56	11.5	1.242	0.036	0.077
MIMO									
	U-NII-5	802.11ax-HEW80	Front of Keyborad	39	12.99	13.5	1.125	0.063	0.122
	U-NII-5	802.11ax-HEW80	Bottom of Keyborad	39	12.99	13.5	1.125	0.652	1.258

	U-NII-5	802.11ax-HEW80	Edge 1	39	12.99	13.5	1.125	0.066	0.127
	U-NII-5	802.11ax-HEW80	Edge 2	39	12.99	13.5	1.125	0.041	0.079
	U-NII-5	802.11ax-HEW80	Edge 3	39	12.99	13.5	1.125	0.016	0.031
	U-NII-5	802.11ax-HEW80	Edge 4	39	12.99	13.5	1.125	0.030	0.058
Main ANT									
	U-NII-6	802.11ax-HEW80	Front of Keyborad	103	10.55	11.5	1.245	0.050	0.107
	U-NII-6	802.11ax-HEW80	Bottom of Keyborad	103	10.55	11.5	1.245	0.107	0.230
	U-NII-6	802.11ax-HEW80	Edge 1	103	10.55	11.5	1.245	0.052	0.112
	U-NII-6	802.11ax-HEW80	Edge 2	103	10.55	11.5	1.245	0.035	0.075
	U-NII-6	802.11ax-HEW80	Edge 3	103	10.55	11.5	1.245	0.011	0.024
	U-NII-6	802.11ax-HEW80	Edge 4	103	10.55	11.5	1.245	0.033	0.071
AUX ANT									
	U-NII-6	802.11ax-HEW80	Front of Keyborad	103	9.97	10.5	1.130	0.062	0.121
	U-NII-6	802.11ax-HEW80	Bottom of Keyborad	103	9.97	10.5	1.130	0.128	0.250
	U-NII-6	802.11ax-HEW80	Edge 1	103	9.97	10.5	1.130	0.059	0.115
	U-NII-6	802.11ax-HEW80	Edge 2	103	9.97	10.5	1.130	0.046	0.090
	U-NII-6	802.11ax-HEW80	Edge 3	103	9.97	10.5	1.130	0.021	0.041
	U-NII-6	802.11ax-HEW80	Edge 4	103	9.97	10.5	1.130	0.046	0.090
MIMO									
	U-NII-6	802.11ax-HEW80	Front of Keyborad	103	13.28	14	1.180	0.067	0.137
10#	U-NII-6	802.11ax-HEW80	Bottom of Keyborad	103	13.28	14	1.180	0.130	0.265
	U-NII-6	802.11ax-HEW80	Edge 1	103	13.28	14	1.180	0.060	0.122
	U-NII-6	802.11ax-HEW80	Edge 2	103	13.28	14	1.180	0.035	0.071
	U-NII-6	802.11ax-HEW80	Edge 3	103	13.28	14	1.180	0.011	0.022
	U-NII-6	802.11ax-HEW80	Edge 4	103	13.28	14	1.180	0.040	0.082
Main ANT									
	U-NII-7	802.11ax-HEW80	Front of Keyborad	151	10.75	11.5	1.189	0.099	0.203
	U-NII-7	802.11ax-HEW80	Bottom of Keyborad	151	10.75	11.5	1.189	1.250	2.565
	U-NII-7	802.11ax-HEW80	Edge 1	151	10.75	11.5	1.189	0.125	0.257
	U-NII-7	802.11ax-HEW80	Edge 2	151	10.75	11.5	1.189	0.052	0.107
	U-NII-7	802.11ax-HEW80	Edge 3	151	10.75	11.5	1.189	0.037	0.076
	U-NII-7	802.11ax-HEW80	Edge 4	151	10.75	11.5	1.189	0.067	0.137
AUX ANT									
	U-NII-7	802.11ax-HEW80	Front of Keyborad	151	10.91	11.5	1.146	0.088	0.174
	U-NII-7	802.11ax-HEW80	Bottom of Keyborad	151	10.91	11.5	1.146	1.330	2.631
	U-NII-7	802.11ax-HEW80	Edge 1	151	10.91	11.5	1.146	0.117	0.231
	U-NII-7	802.11ax-HEW80	Edge 2	151	10.91	11.5	1.146	0.043	0.085
	U-NII-7	802.11ax-HEW80	Edge 3	151	10.91	11.5	1.146	0.028	0.055

	U-NII-7	802.11ax-HEW80	Edge 4	151	10.91	11.5	1.146	0.045	0.089
MIMO									
	U-NII-7	802.11ax-HEW80	Front of Keyborad	151	13.84	14.5	1.164	0.111	0.223
11#	U-NII-7	802.11ax-HEW80	Bottom of Keyborad	151	13.84	14.5	1.164	1.440	2.895
	U-NII-7	802.11ax-HEW80	Edge 1	151	13.84	14.5	1.164	0.119	0.239
	U-NII-7	802.11ax-HEW80	Edge 2	151	13.84	14.5	1.164	0.047	0.094
	U-NII-7	802.11ax-HEW80	Edge 3	151	13.84	14.5	1.164	0.036	0.072
	U-NII-7	802.11ax-HEW80	Edge 4	151	13.84	14.5	1.164	0.074	0.149
Main ANT									
	U-NII-8	802.11ax-HEW80	Front of Keyborad	199	9.92	10.5	1.143	0.080	0.157
	U-NII-8	802.11ax-HEW80	Bottom of Keyborad	199	9.92	10.5	1.143	0.497	0.975
	U-NII-8	802.11ax-HEW80	Edge 1	199	9.92	10.5	1.143	0.107	0.210
	U-NII-8	802.11ax-HEW80	Edge 2	199	9.92	10.5	1.143	0.041	0.080
	U-NII-8	802.11ax-HEW80	Edge 3	199	9.92	10.5	1.143	0.028	0.055
	U-NII-8	802.11ax-HEW80	Edge 4	199	9.92	10.5	1.143	0.032	0.063
AUX ANT									
	U-NII-8	802.11ax-HEW80	Front of Keyborad	199	10.37	11	1.156	0.101	0.200
	U-NII-8	802.11ax-HEW80	Bottom of Keyborad	199	10.37	11	1.156	0.668	1.325
	U-NII-8	802.11ax-HEW80	Edge 1	199	10.37	11	1.156	0.118	0.234
	U-NII-8	802.11ax-HEW80	Edge 2	199	10.37	11	1.156	0.051	0.101
	U-NII-8	802.11ax-HEW80	Edge 3	199	10.37	11	1.156	0.031	0.061
	U-NII-8	802.11ax-HEW80	Edge 4	199	10.37	11	1.156	0.042	0.083
MIMO									
	U-NII-8	802.11ax-HEW80	Front of Keyborad	199	13.16	14	1.213	0.122	0.254
12#	U-NII-8	802.11ax-HEW80	Bottom of Keyborad	199	13.16	14	1.213	1.440	2.998
	U-NII-8	802.11ax-HEW80	Edge 1	199	13.16	14	1.213	0.127	0.264
	U-NII-8	802.11ax-HEW80	Edge 2	199	13.16	14	1.213	0.048	0.100
	U-NII-8	802.11ax-HEW80	Edge 3	199	13.16	14	1.213	0.032	0.067
	U-NII-8	802.11ax-HEW80	Edge 4	199	13.16	14	1.213	0.039	0.081

Note:

The WLAN 6GHz 802.11ax-HEW 80 Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.107(U-NII-5 /U-NII-8) /1.114(U-NII-6 /U-NII-7).

17 Simultaneous Transmission Analysis

17.1 Simultaneous Transmission Consideration

No.	Simultaneous Transmission Consideration	Body Exposure Condition
1	WLAN 2.4GHz (Main ANT)+Bluetooth (AUX ANT)	Yes
2	WLAN 5GHz (SISO/MIMO)+Bluetooth (AUX ANT)	Yes
3	WLAN 6GHz (Main ANT)+Bluetooth (AUX ANT)	Yes
4	WLAN 2.4GHz(SISO/MIMO)+WLAN 5GHz(SISO/MIMO)	Yes

Note:

1. Simultaneous transmission SAR evaluation is not required for Bluetooth (AUX ANT) and WLAN 2.4GHz (AUX ANT), because the software mechanism have been incorporated to guarantee that the WLAN 2.4GHz (AUX ANT) and Bluetooth (AUX ANT) transmitters would not simultaneously operate.
2. Per KDB 447498D01v06, simultaneous transmission SAR evaluation procedures is as followed:
   Step 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.
   Step 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.
   Step 3: If the ratio of SAR to peak separation distance is ≤ 0.04, Simultaneous SAR measurement is not required.
   Step 4: If the ratio of SAR to peak separation distance is > 0.04, Simultaneous SAR measurement is required and simultaneous transmission SAR value is calculated.
   (The ratio is determined by: $(SAR_1 + SAR_2)$ ^ 1.5 / $R_i \le 0.04$,
   R_i is the separation distance between the peak SAR locations for the antenna pair in mm.

17.2 Simultaneous Transmission Exposure Evaluation

➢ **SAR Simultaneous Transmission Evaluation for WLAN 2.4GHz/6GHz (Main ANT)+Bluetooth (AUX ANT)**

WWAN Band	Exposure Position	1	2	3	1+3 1g SAR Summation (W/kg)	2+3 1g SAR Summation (W/kg)
		WLAN 2.4GHz (Main ANT)	WLAN 6GHz (Main ANT)	Bluetooth (AUX ANT)		
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
N/A	Bottom	0.273	0.791	0.043	0.316	0.834

➢ **SAR Simultaneous Transmission Evaluation for WLAN 5GHz (SISO/MIMO)+Bluetooth (AUX ANT)**

WWAN Band	Exposure Position	1	2	1+2 1g SAR Summation (W/kg)
		WLAN 5GHz (SISO/MIMO)	Bluetooth (AUX ANT)	
		1g SAR (W/kg)	1g SAR (W/kg)	
N/A	Bottom	1.187	0.043	1.230

➢ **SAR Simultaneous Transmission Evaluation for WLAN 2.4GHz (SISO/MIMO)+WLAN 5GHz (SISO/MIMO)**

WWAN Band	Exposure Position	1	2	1+2 1g SAR Summation (W/kg)
		WLAN 5GHz (SISO/MIMO)	WLAN 2.4GHz (SISO/MIMO)	
		1g SAR (W/kg)	1g SAR (W/kg)	
N/A	Bottom	1.187	0.393	1.580

17.3 Total Exposure Radio Analysis

The fields generated by the antennas can be correlated or uncorrelated. At different frequencies, fields are always uncorrelated, and the aggregate power density contributions can be summed according to spatially averaged values of corresponding sources at any point in space, r, to determine the total exposure ratio (TER). Assuming I sources, the TER at each point in space is equal to

$$\mathrm{TER}^{\mathrm{uncorr}}(\mathrm{r}) = \sum_{\mathrm{i}=1}^{\mathrm{I}} \mathrm{ER}_{\mathrm{i}} = \sum_{\mathrm{i}=1}^{\mathrm{I}} \frac{\mathrm{S}_{\mathrm{av,i}}(\mathrm{r}, \mathrm{f}_{\mathrm{i}})}{\mathrm{S}_{\mathrm{lim}}(\mathrm{f}_{\mathrm{i}})}$$

Where S_{av},i is the power density for the source I operating at a frequency fi and Slim is the power density limit as specified by the relevant standard.

Exposure from transmitters operating above and below 6GHz, where 6GHz denotes the transmission frequency where the basic restrictions change from being defined in terms of SAR to being defined in terms of power density, therefore uncorrelated and the TER is determined as

$$\mathrm{TER}^{\mathrm{uncorr}}(\mathrm{r}) = \sum_{\mathrm{i}=1}^{\mathrm{I}} \mathrm{ER}_{\mathrm{i}} = \sum_{\mathrm{i}=1}^{\mathrm{I}} \frac{\mathrm{S}_{\mathrm{av,i}}(\mathrm{r}, \mathrm{f}_{\mathrm{i}})}{\mathrm{S}_{\mathrm{lim}}(\mathrm{f}_{\mathrm{i}})}$$

According to the FCC guidance in TCBC workshop and IEC TR 63170, the total exposure ratio calculated by taking ratio of maximum reported SAR divided by SAR limit and adding it to maximum measured power density by its limit. Numerical sum of the ratios should be less 1. Therefore the simultaneous transmission should be follows:

$$TER = \sum_{n=1}^{N} \frac{\mathrm{SAR}_n}{\mathrm{SAR}_{n,limit}} + \sum_{n=1}^{N} \frac{\mathrm{S}_{m,avg}}{\mathrm{S}_{m,limit}} < 1$$

For transmitters operating above 6000 MHz, it is necessary to perform an assessment against the PD (basic restriction up to 10 GHz and reference levels beyond). The exposure ratio for the m-th transmitter is given by:

$$max\left[\frac{SAR_m}{SAR_{limit}}, \frac{APD_m}{APD_{limit}}\right] \qquad 5925\ MHz < f_m \leq 10\ GHz$$

Where:

- SAR_m is the SAR value for the n-th transmitter/test frequency.
- SAR_{limit} is the basic restriction limit that is applicable to the n-th transmitter/test frequency.
- APD_m is the APD value for the m-th transmitter/test frequency.
- $APDlimit$ is the basic restriction limit that is applicable for the m-th transmitter/test frequency.

➢ **Total Exposure Ratio**

Exposure Position		Power Density (mW/cm^2)	Max.Reported SAR (W/kg)	Total Exposure Ratio
		Wi-Fi 6E (Main ANT)	Bluetooth (AUX ANT)	
Body	Reported Exposure	0.257	0.043	0.284
	Ratio to Limit	1.0	1.6	

Note: The simultaneous transmission analysis of PD results is based on the final PD value.

18 Measurement Uncertainty

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 A 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 below Table.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor	1/k(b)	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

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.

DASY6/8 Uncertainty Budget (Frequency Range: 300MHz ~ 3GHz)								
Symbol	**Error Description**	**Uncert. Value (±%)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**Standard Uncertainty (1g) (±%)**	**Standard Uncertainty (10g) (±%)**
Measurement System Erros								
CF	Probe calibration	12.0	N	2	1	1	6.0	6.0
CF_{drift}	Probe calibration Drift	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
LIN	Probe Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
BBS	Broadband Signal	3.0	R	$\sqrt{3}$	1	1	1.7	1.7
ISO	Probe Isotropy	7.6	R	$\sqrt{3}$	1	1	4.4	4.4
DAE	Other Probe+Electronic	0.7	N	1	1	1	0.7	0.7
AMB	RF Ambient	1.8	N	1	1	1	1.8	1.8
$▲_{sys}$	Probe positioning	0.006mm	N	1	0.14	0.14	0.1	0.1
DAT	Data Processing	1.2	N	1	1	1	1.2	1.2
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.) DAK	2.5	N	1	0.78	0.71	2.0	1.8
$LIQ(T_\sigma)$	Conductivity (temp.) BB	3.3	R	$\sqrt{3}$	0.78	0.71	1.5	1.4
EPS	Phantom Permittivity	14.0	R	$\sqrt{3}$	0	0	0	0
DIS	Distance DUT - TSL	2.0	N	1	2	2	4.0	4.0
D_{xyz}	Device Positioning	1.0	N	1	1	1	1.0	1.0
H	Device Holder	3.6	N	1	1	1	3.6	3.6
MOD	DUT Modulation m	2.4	R	$\sqrt{3}$	1	1	1.4	1.4
TAS	Time-average SAR	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
RF_{drift}	DUT Drift	2.5	N	1	1	1	2.5	2.5
VAL	Val Antenna Unc. val	0.0	N	1	1	1	0.0	0.0
RF_{in}	Unc. Input Power val	0.0	N	1	1	1	0.0	0.0
Correction to the SAR Results								
C(ε,σ)	Deviation to Target	1.9	N	1	1	0.84	1.9	1.6
C(R)	SAR Scaling p	0.0	R	$\sqrt{3}$	1	1	0.0	0.0
u(▲SAR)	**Combined Standard Uncertainty**						10.9	10.9
U	**Expanded Standard Uncertainty**						21.9	21.8

DASY6/8 Uncertainty Budget (Frequency Range: 3GHz ~ 6GHz)								
Symbol	**Error Description**	**Uncert. Value (±%)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**Standard Uncertainty (1g) (±%)**	**Standard Uncertainty (10g) (±%)**
Measurement System Erros								
CF	Probe calibration	13.1	N	2	1	1	6.55	6.55
CF_{drift}	Probe calibration Drift	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
LIN	Probe Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
BBS	Broadband Signal	2.6	R	$\sqrt{3}$	1	1	1.5	1.5
ISO	Probe Isotropy	7.6	R	$\sqrt{3}$	1	1	4.4	4.4
DAE	Other Probe+Electronic	1.2	N	1	1	1	1.2	1.2
AMB	RF Ambient	1.8	N	1	1	1	1.8	1.8
$▲_{sys}$	Probe positioning	0.005mm	N	1	0.29	0.29	0.15	0.15
DAT	Data Processing	2.3	N	1	1	1	2.3	2.3
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.) DAK	2.5	N	1	0.78	0.71	2.0	1.8
LIQ($T_σ$)	Conductivity (temp.) BB	3.4	R	$\sqrt{3}$	0.78	0.71	1.5	1.4
EPS	Phantom Permittivity	14.0	R	$\sqrt{3}$	0.25	0.25	2.0	2.0
DIS	Distance DUT - TSL	2.0	N	1	2	2	4.0	4.0
D_{xyz}	Device Positioning	1.0	N	1	1	1	1.0	1.0
H	Device Holder	3.6	N	1	1	1	3.6	3.6
MOD	DUT Modulation m	2.4	R	$\sqrt{3}$	1	1	1.4	1.4
TAS	Time-average SAR	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
RF_{drift}	DUT Drift	2.5	N	1	1	1	2.5	2.5
VAL	Val Antenna Unc. val	0.0	N	1	1	1	0.0	0.0
RF_{in}	Unc. Input Power val	0.0	N	1	1	1	0.0	0.0
Correction to the SAR Results								
C(ε,σ)	Deviation to Target	1.9	N	1	1	0.84	1.9	1.6
C(R)	SAR Scaling p	0.0	R	$\sqrt{3}$	1	1	0.0	0.0
u(▲SAR)	**Combined Standard Uncertainty**						11.6	11.5
U	**Expanded Standard Uncertainty**						23.3	23.0

DASY6/8 Uncertainty Budget (Frequency Range: 6GHz ~ 10GHz)								
Symbol	**Error Description**	**Uncert. Value (±%)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**Standard Uncertainty (1g) (±%)**	**Standard Uncertainty (10g) (±%)**
Measurement System Erros								
CF	Probe calibration	18.6	N	2	1	1	9.3	9.3
CF_{drift}	Probe calibration Drift	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
LIN	Probe Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
BBS	Broadband Signal	2.8	R	$\sqrt{3}$	1	1	1.6	1.6
ISO	Probe Isotropy	7.6	R	$\sqrt{3}$	1	1	4.4	4.4
DAE	Other Probe+Electronic	1.2	N	1	1	1	2.4	2.4
AMB	RF Ambient	1.8	N	1	1	1	1.8	1.8
▲sys	Probe positioning	0.005mm	N	1	0.50	0.50	0.25	0.25
DAT	Data Processing	3.5	N	1	1	1	3.5	3.5
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.) DAK	2.5	N	1	0.78	0.71	2.0	1.8
$LIQ(T_σ)$	Conductivity (temp.) BB	2.4	R	$\sqrt{3}$	0.78	0.71	1.1	1.0
EPS	Phantom Permittivity	14.0	R	$\sqrt{3}$	0.5	0.5	4.0	4.0
DIS	Distance DUT - TSL	2.0	N	1	2	2	4.0	4.0
D_{xyz}	Device Positioning	1.0	N	1	1	1	1.0	1.0
H	Device Holder	3.6	N	1	1	1	3.6	3.6
MOD	DUT Modulation[m]	2.4	R	$\sqrt{3}$	1	1	1.4	1.4
TAS	Time-average SAR	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
RF_{drift}	DUT Drift	2.5	N	1	1	1	2.5	2.5
VAL	Val Antenna Unc.[val]	0.0	N	1	1	1	0.0	0.0
RF_{in}	Unc. Input Power[val]	0.0	N	1	1	1	0.0	0.0
Correction to the SAR Results								
C(ε,σ)	Deviation to Target	1.9	N	1	1	0.84	1.9	1.6
C(R)	SAR Scaling[p]	0.0	R	$\sqrt{3}$	1	1	0.0	0.0
u(▲SAR)	**Combined Standard Uncertainty**						14.2	13.9
U	**Expanded Standard Uncertainty**						28.4	27.9

DASY6/8 Uncertainty Budget for psSAR / psAPD Assessment (Frequency Range: 6GHz ~ 10GHz)								
Symbol	**Error Description**	**Uncert. Value (±%)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**Standard Uncertainty (1g) (±%)**	**Standard Uncertainty (10g) (±%)**
psSAR	Module SAR V16.0 (Table 6.3.3)	14.2/13.9	N	1	1	1	14.2	13.9
PDC	Power Density Conversion	13.5	R	$\sqrt{3}$	1	1	7.8	7.8
u(▲SAR)	**Combined Standard Uncertainty**						16.2	15.9
U	**Expanded Standard Uncertainty in dB**						32.4 ±1.2dB	31.9 ±1.2dB

Error Description	**Uncertainty (±dB)**	**Probability Distribution**	**Divisor**	***ci***	**Standard Uncertainty (±dB)**	ν_i **or** ν_{eff}
Uncertainty terms dependent on the measurement system						
Probe calibration	0.49	N	1	1	0.49	∞
Probe correction	0	R	1.732	1	0	∞
Frequency response	0.20	R	1.732	1	0.12	∞
Sensor cross coupling	0	R	1.732	1	0	∞
Isotropy	0.50	R	1.732	1	0.29	∞
Linearity	0.20	R	1.732	1	0.12	∞
Probe scattering	0	R	1.732	1	0	∞
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	R	1.732	1	0	∞
Probe spatial resolution	0	R	1.732	1	0	∞
Field impedance dependance	0	R	1.732	1	0	∞
Amplitude and phase drift	0	R	1.732	1	0	∞
Amplitude and phase noise	0.04	R	1.732	1	0.02	∞
Measurement area truncation	0	R	1.732	1	0	∞
Data acquisition	0.03	R	1.732	1	0.03	∞
Sampling	0	R	1.732	1	0	∞
Field reconstruction	2.0	R	1.732	1	1.15	∞
Forward transformation	0	R	1.732	1	0	∞
Power density scaling	-	R	1.732	1	-	∞
Spatial averaging	0.10	R	1.732	1	0.06	∞
System Detection Limits	0.04	R	1.732	1	0.02	∞
Uncertainty terms dependent on the DUT and environmental factors						
Probe coupling with DUT	0	R	1.732	1	0	∞
Modulation response	0.40	R	1.732	1	0.23	∞
Integration time	0	R	1.732	1	0	∞
Response time	0	R	1.732	1	0	∞

Device holder influence	0.10	R	1.732	1	0.06	∞
DUT alignment	0	R	1.732	1	0	∞
RF ambient	0.04	R	1.732	1	0.02	∞
Ambient reflections	0.04	R	1.732	1	0.02	∞
Immunity / secondary reception	0	R	1.732	1	0	∞
Drift of the DUT	-	R	1.732	1	-	∞
Combined standard uncertainty					1.34 dB	∞
Coverage Factor for 95%					K=2	N/A
Expanded standard uncertainty					2.68 dB	

PD Uncertainty Budget for Frequency Range 6 – 10GHz

19 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of FCC, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested. Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

Annex A General Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

The FCC designation number is CN1192, the test firm registration number is 226174.

Note:

The main report is end here and the other Annex (B,C,D,E,F) will be submitted separately.

****** END OF MAIN REPORT ******