



No.: GJWSZ2025-0014-SAR

## TEST REPORT

NAME OF SAMPLE : Oclean X Elite WiFi Smart  
Sonic Electric Toothbrush

CLIENT : Shenzhen Yunding Information  
Technology Co.,Ltd


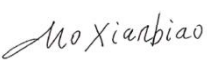

CLASSIFICATION OF TEST : N/A

FCC ID : 2AN5D-Y2089

Max. SAR (1g): : Head: **0.62** W/kg

**CVC Testing Technology (Shenzhen) Co., Ltd.**



<b>Applicant</b>	<b>Name</b> : Shenzhen Yunding Information Technology Co.,Ltd  <b>Address</b> : 28G,Building 3,Dachong Business Center (phase 3) No.18 Dachong 1st Road, Dachong Community Yuehai Street,Nanshan District,Shenzhen,Guangdong China		
<b>Manufacturer</b>	<b>Name</b> : Shenzhen Yunding Information Technology Co.,Ltd  <b>Address</b> : 28G,Building 3,Dachong Business Center (phase 3) No.18 Dachong 1st Road, Dachong Community Yuehai Street,Nanshan District,Shenzhen,Guangdong China		
<b>Equipment Under Test</b>	<b>Name</b> : Oclean X Elite WiFi Smart Sonic Electric Toothbrush  <b>Model/Type</b> : Y2089  <b>Trade mark</b> : oclean  <b>SerialNO.</b> : N/A  <b>Sampe NO.</b> : 1-1		
Date of Receipt.	2025.01.14	Date of Testing	2025.02.15
<b>Test Specification</b>		<b>Test Result</b>	
ANSI/IEEE Std. C95.1 FCC 47 CFR Part 2 (2.1093) Published RF exposure KDB procedures IEC/IEEE 62209-1528: 2020		Pass	
<b>Evaluation of Test Result</b>	The equipment under test was found to comply with the requirements of the standards applied.  <b>Seal of CVC</b> <b>Issue Date: 2025.03.08</b>		
Compiled by:  <u>Liang Jiatong</u> Name                      Signature	Reviewed by:  <u>Mo Xianbiao</u> Name                      Signature	Approved by:  <u>Dong Sanbi</u> Name                      Signature	
Abbreviations: Pass= passed                      Fail = failed                      N/A= not applicable                      EUT= equipment, sample(s) under tested			

This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC.



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**RELEASE CONTROL RECORD**

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
GJWSZ2025-0014-SAR	Original release	2025.03.08



## 1 GENERAL INFORMATION

### 1.1 GENERAL PRODUCT INFORMATION

<b>PRODUCT</b>	Oclean X Elite WiFi Smart Sonic Electric Toothbrush
<b>BRAND</b>	oclean
<b>MODEL</b>	Y2089
<b>Battery</b>	Nominaal ingangsvermogen: 5V 0.5A Nominaal ingangsvermogen: 25W; Batterijcapaciteit: 1100mAh
<b>MODULATION MODE</b>	802.11b: DSSS WLAN 2.4G 802.11g/n (HT20)/HT40: OFDM Bluetooth® GFSK, $\pi/4$ -DQPSK, 8-DPSK, LE
<b>OPERATING FREQUENCY</b>	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz to 2480 MHz
<p>Remark:</p> <ol style="list-style-type: none"><li>For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.</li><li>The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power</li><li>This is provided by the manufacturer. The laboratory is not responsible for technical data provided by the customer</li></ol>	



## 1.2 TEST Environment

Ambient conditions in the SAR laboratory:

Items	Required
Temperature (°C)	21.0
Humidity (%RH)	60

## 1.3 TEST Location

The tests and measurements refer to this report were performed by CVC Testing Technology (Shenzhen) Co., Ltd.

Lab Address:No. 1301-14&16, Guanguang Road, Xinlan Community, Guanlan Subdistrict, Longhua District, Shenzhen, Guangdong, China

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FCC(Test firm designation number: CN1363)

IC(Test firm CAB identifier number: CN0137)

CNAS(Test firm designation number: L16091)



## 1.4 TEST Standards and Limits

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	ANSI/IEEE Std. C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	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)
4	FCC KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
5	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
6	FCC KDB 447498 D04 v01	Interim General RF Exposure Guidance
7	FCC KDB 248227 D01	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

### (A). Limits for Occupational/Controlled Exposure (W/kg)

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

### (B). Limits for General Population/Uncontrolled Exposure (W/kg)

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

NOTE: Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram 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.

#### **Population/Uncontrolled Environments:**

Are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

#### **Occupational/Controlled Environments:**

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

#### **NOTE**

#### **GENERAL POPULATION/UNCONTROLLED EXPOSURE**

#### **PARTIAL BODY LIMIT**

**1.6 W/kg**



## 1.5 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Mode	Highest Reported Head SAR <sub>1g</sub> (W/kg)
2.4G WLAN	0.62
Bluetooth	0.07

**Note:**

1. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; 10-gram SAR for Product Specific 10g SAR, limit: 4.0W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992 and had been tested in accordance with the measurement methods and procedures specified in IEEE 62209-1528 2020 and FCC KDB publications.



## 2 SAR Measurement System

### 2.1 Definition of Specific Absorption Rate (SAR)

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

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:

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

SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

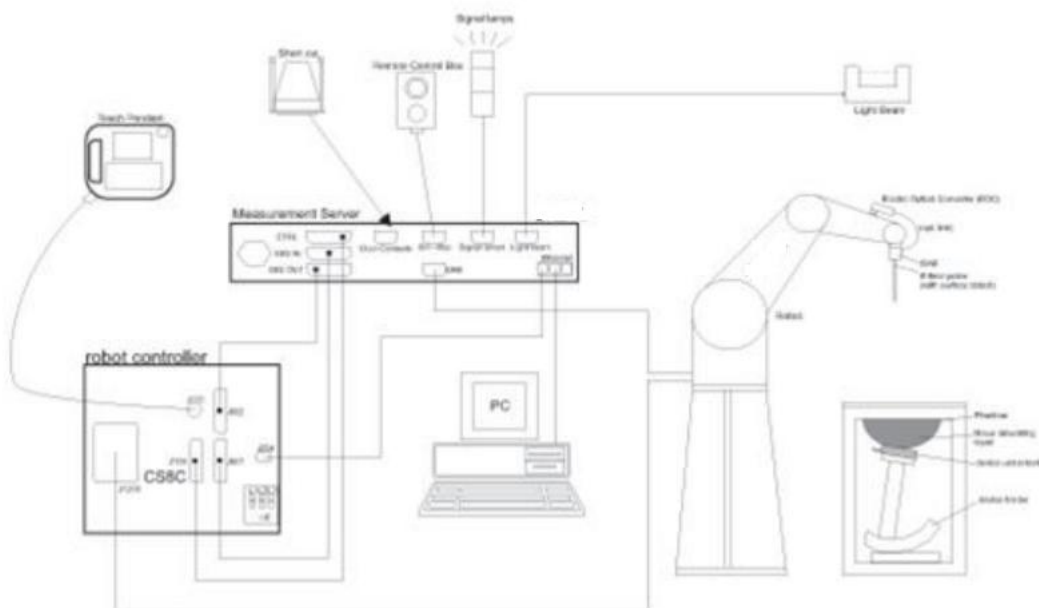
$$SAR = \frac{\sigma E^2}{\rho}$$

Where: σ is the conductivity of the tissue;

ρ is the mass density of the tissue and E is the RMS electrical field strength.

### 2.2 SAR System

DASY System Diagram:



DASY is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The DASY system consists of the following items:



- Main computer to control all the system
- 6 axis robot
- Data acquisition Electronics
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The following figure shows the system.



The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The Open SAR software computes the results to give a SAR value in a 1g or 10g mass.

### 2.3 Probe

EX3DV4 – Smallest isotropic dosimetric probe for high precision SAR measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 10 GHz with a precision of better than 30%

- Frequency range: 4 MHz – 10 GHz
- Dynamic range: 0.01 W/kg – >100 W/kg
- Tip diameter: 2.5 mm
- Scanning distance:  $\geq 1.4$  mm

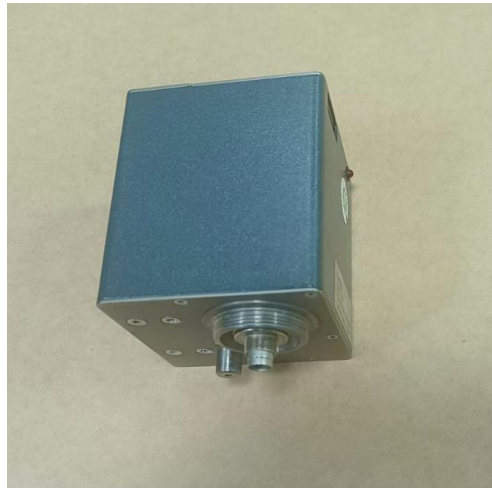


Figure 1-Speag COMOSAR Dosimetric E field Dipole

### 2.4 Data Acquisition Electronics 4 (DAE4)

High precision 3-channel differential voltmeter for use with SPEAG's field, SAR, and temperature probes. Serial optical link for communication with the DASY8 measurement server. Two-step probe touch detector for mechanical surface detection and emergency robot stop.

- Measurement range: -100 – +300 mV (16-bit resolution and two range settings: 4 mV, 400 mV)
- Input offset voltage:  $< 5 \mu\text{V}$  (with auto zero)
- Input resistance: 200 M $\Omega$
- Input bias current:  $< 50$  fA
- Battery power: >10 hours of operation (with two 9.6 V NiMH batteries)
- Dimensions (L  $\times$  W  $\times$  H): 60  $\times$  60  $\times$  68 mm
- Calibration: ISO/IEC 17025 calibration service available.



### 2.4.1 SAM-Twin Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEC/IEEE 62209-1528. It enables the dosimetric evaluation of left and right hand phone usage as well as body-mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. SAM-Twin V5.0 and higher has the same shell geometry and is manufactured from the same material as SAM-Twin V4.0 but with reinforced top structure.

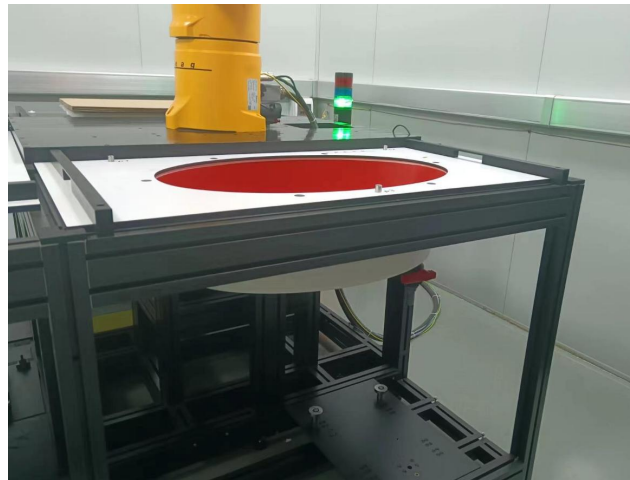
- Material: Vinyl ester, fiberglass reinforced (VE-GF)
- Shell Thickness:  $2 \pm 0.2$  mm ( $6 \pm 0.2$  mm at ear point)
- Dimensions: Length: 1000 mm  
Width: 500 mm  
Height: adjustable feet



#### 2.4.2 ELI Phantom

The ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 4 MHz to 10 GHz. ELI is fully compatible with the IEC/IEEE 62209-1528 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all of SPEAG's dosimetric probes and dipoles. The latest ELI V8.0 phantom shell has optimized pretension in the bottom surface during production, such that the phantom is more robust and with reduced sagging.

- Material: Vinyl ester, fiberglass reinforced (VE-GF)
- Shell Thickness:  $2.0 \pm 0.2$  mm (bottom plate)
- Dimensions: Major axis: 600 mm,  
Minor axis: 400 mm
- Filling Volume: approx. 30 liters.

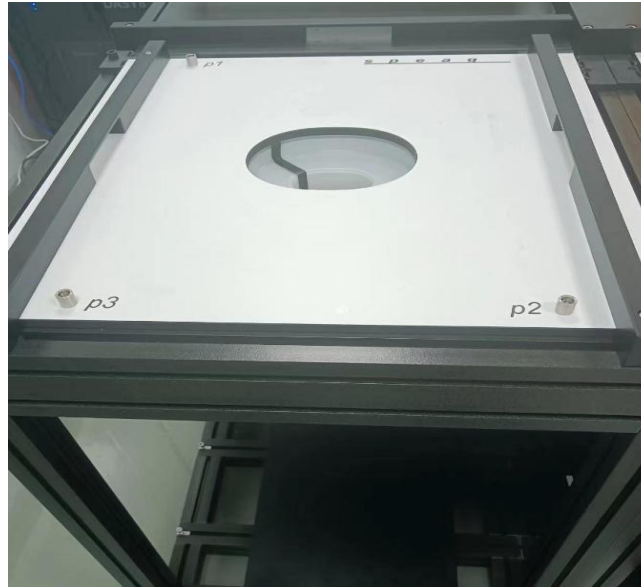




## 2.5 WRIST Phantom

The Wrist Phantom V10 is shape-compatible with the CTIA approved OTA GFPC-V1 and optimized for specific absorption rate evaluation of watches and other wireless hand accessories.

- Material: Photosensitive epoxy acrylates
- Shell Thickness:  $2 \pm 0.2$  mm
- Wrist Shape: Design compatible with CTIA forearm.



## 2.6 DEVICE Holder

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of  $\pm 0.5$  mm would produce a SAR uncertainty of  $\pm 20$  %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.





## 2.7 SYSTEM Validation Dipoles

Symmetrical dipole with  $1/4$  balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.

- Frequency: 300 MHz to 10 GHz
- Return loss: >20 dB
- Power capability: >40 W

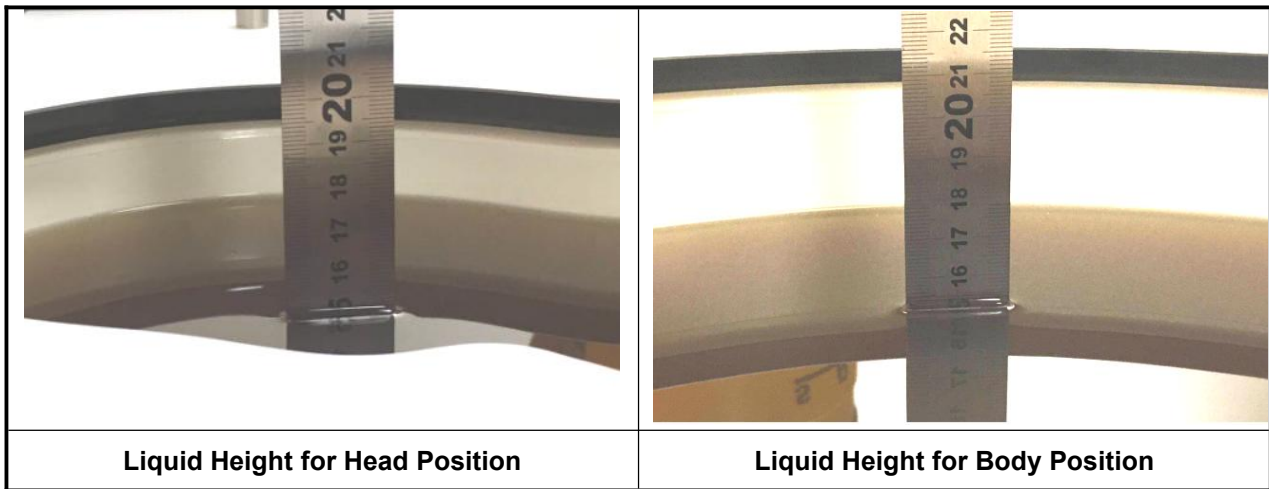




### 3 TISSUE Simulating Liquids

#### 3.1 SIMULATING Liquids Parameter Check

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. 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. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed.



The dielectric properties of the tissue simulating liquids are defined in IEC 62209-1528. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a dielectric assessment kit and a network analyzer.





## Dielectric properties of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Target Conductivity
300	45.3	0.87
450	43.5	0.87
750	41.9	0.89
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1640	40.3	1.29
1750	40.1	1.37
1800	40.0	1.40
1900	40.0	1.40
2000	40.0	1.40
2100	39.8	1.49
2300	39.5	1.67
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40
3500	37.9	2.91
4000	37.4	3.43
4500	36.8	3.94
5000	36.2	4.45
5200	36.0	4.66
5300	35.9	4.76
5500	35.6	4.96
5600	35.5	5.07
5800	35.3	5.27
6000	35.1	5.48



## 3.2 LIQUIDS Measurement Results

The measuring results for tissue simulating liquid are shown as below.

Tissue Type	Frequency (MHz)	Measured Conductivity ( $\sigma$ )	Measured Permittivity ( $\epsilon_r$ )	Target Conductivity ( $\sigma$ )	Target Permittivity ( $\epsilon_r$ )	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
H2450	2450	1.870	37.700	1.80	39.20	3.89	-3.83	Feb. 15, 2025

### Note:

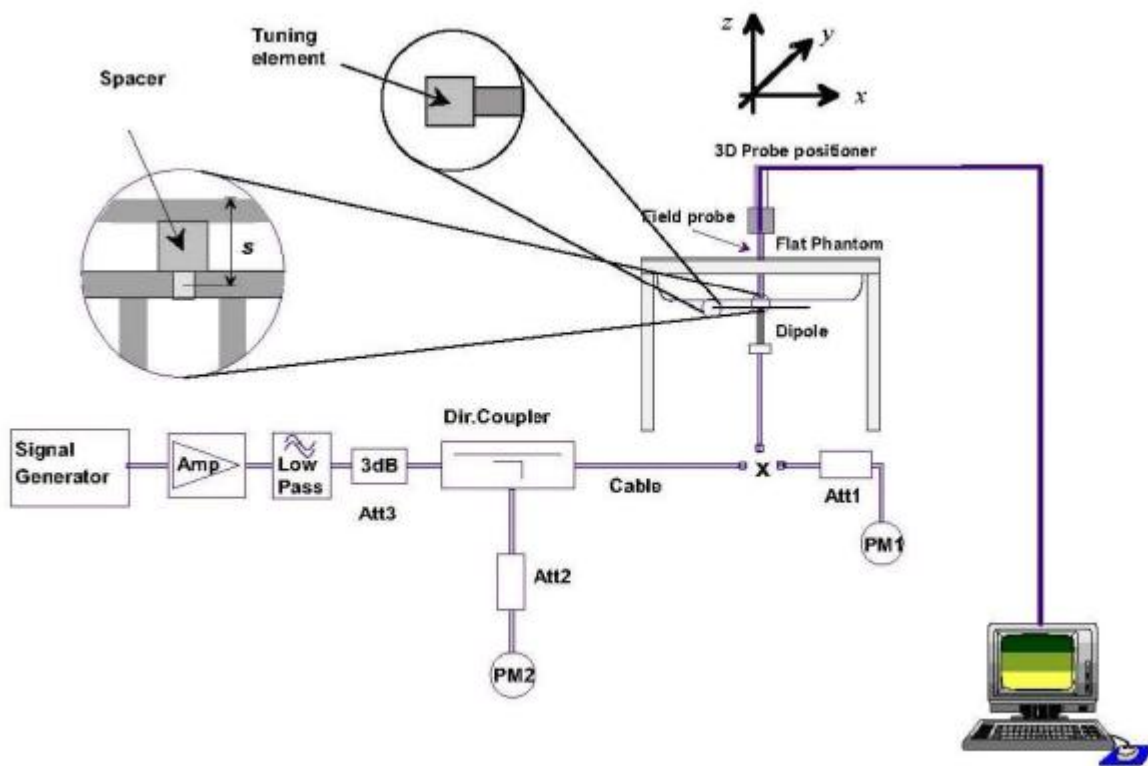
1. The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within  $\pm 5\%$  of the target values. Liquid temperature during the SAR testing must be within  $\pm 2^\circ\text{C}$ .
2. Since the maximum deviation of dielectric properties of the tissue simulating liquid is within 5%.

## 4 SAR System Validation

### 4.1 VALIDATION System

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 kit includes a dipole, and dipole device holder.

The system check verifies that the system operates within its specifications. It's performed daily or before every SAR measurement. The system check uses normal SAR measurement in the flat section of the phantom with a matched dipole at a specified distance. The system validation setup is shown as below.





## 4.2 SYSTEM Validation Result

The measuring result for system verification is tabulated as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Feb. 15, 2025	2450	51.40	13.10	52.14	1.44	1081	7628	1557

### Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.



## 5 SAR Evaluation Procedures

To evaluate the peak spatial-average SAR values with respect to 1 g or 10 g cubes, fine resolution volume scans, called zoom scans, are performed at the peak SAR locations identified during the area scan. If the cube volume within the zoom scan chosen to calculate the peak spatial-average SAR touches any boundary of the zoom-scan volume, the zoom scan shall be repeated with the center of the zoom-scan volume shifted to the new maximum SAR location. For any secondary peaks found in the area scan that are within 2 dB of the maximum peak and are not within this zoom scan, the zoom scan shall be performed for such peaks, unless the peak spatial-average SAR at the location of the maximum peak is more than 2 dB below the applicable SAR limit (i.e., 1 W/kg for a 1.6 W/kg 1 g limit, or 1.26 W/kg for a 2 W/kg 10 g limit). The zoom scan resolutions specified in the table below must be applied to the SAR measurements.

**Table 3 - Area scan parameters**

Parameter	DUT transmit frequency being tested	
	$f \leq 3 \text{ GHz}$	$3 \text{ GHz} < f \leq 10 \text{ GHz}$
Maximum distance between the measured points (geometric centre of the sensors) and the inner phantom surface ( $z_{M1}$ in Figure 20 in mm)	$5 \pm 1$	$\delta \ln(2)/2 \pm 0,5^a$
Maximum spacing between adjacent measured points in mm (see <a href="#">O.8.3.1</a> ) <sup>b</sup>	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 (a in Figure 20) <sup>c</sup>	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Tolerance in the probe angle	1°	1°
<p>a <math>\delta</math> is the penetration depth for a plane-wave incident normally on a planar half-space.</p> <p>b See Clause O.8 on how <math>\Delta x</math> and <math>\Delta y</math> may be selected for individual area scan requirements.</p> <p>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.</p>		



**Table 4 - Zoom scan parameters**

Parameter	DUT transmit frequency being tested	
	$f \leq 3 \text{ GHz}$	$3 \text{ GHz} < f \leq 10 \text{ GHz}$
Maximum distance between the closest measured points and the phantom surface ( $z_{M1}$ in Figure 20 and Table 3, in mm)	5	$\delta \ln(2)/2 \pm 0,5^a$
Maximum angle between the probe axis and the phantom surface normal ( $\alpha$ 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 ( $\Delta x$ and $\Delta y$ , in mm)	8	$24/f$ b
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell ( $\Delta z_1$ 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 ( $\Delta z_1$ 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 <a href="#">O.8.3.2</a> , in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell ( $L_n$ in <a href="#">O.8.3.2</a> in mm)	30	22
Tolerance in the probe angle	1°	1°
<p>a <math>\delta</math> is the penetration depth for a plane-wave incident normally on a planar half-space.</p> <p>b This is the maximum spacing allowed, which might not work for all circumstances.</p>		



## 6 SAR Measurement Evaluation

### 6.1 EUT Configuration and Setting

#### <Considerations Related to WLAN for Setup and Testing>

In general, various vendor specific external test software and chipset based internal test modes are typically used for SAR measurement. These chipset based test mode utilities are generally hardware and manufacturer dependent, and often include substantial flexibility to reconfigure or reprogram a device. 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. 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. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

According to KDB 248227 D01, this device has installed WLAN engineering testing software which can provide continuous transmitting RF signal. During WLAN SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

#### Initial Test Configuration

An initial test configuration is determined for OFDM transmission modes in 2.4 GHz and 5 GHz bands according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.

#### Subsequent Test Configuration

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. When the highest reported SAR for the initial test configuration according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR is not required for that subsequent test configuration.

#### SAR Test Configuration and Channel Selection

When multiple channel bandwidth configurations in a frequency band have the same specified maximum



output power, the initial test configuration is using largest channel bandwidth, lowest order modulation, lowest data rate, and lowest order 802.11 mode (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.

- 1) The channel closest to mid-band frequency is selected for SAR measurement.
- 2) 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.

### **<Considerations Related to Bluetooth for Setup and Testing>**

This device has installed Bluetooth engineering testing software which can provide continuous transmitting RF signal. During Bluetooth SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.





## 6.2 EUT Testing Position

### 6.2.1 Head mounted Device(Headset)

For this device, based on the antenna positions shown below, we would expect a low or no SAR value for antenna separation distances greater than 2.5cm from the edge. Therefore, we performed SAR tests on the Front Face, Rear Face, Left Side, Right Side and Bottom Side positions of the antenna in this report, at 0 cm separation from a flat phantom.

Based on the antenna location shown on Appendix D of this report, the SAR testing required for hotspot mode is listed as below.

Antenna	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
WLAN / BT	V	V	V	V		V



## 7 Maximum Output Power

### 7.1 Maximum Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance is shown as below.

Mode	2.4G WLAN
802.11b	17.5
802.11g	16.5
802.11n HT20	16.5
802.11n HT40	15.0

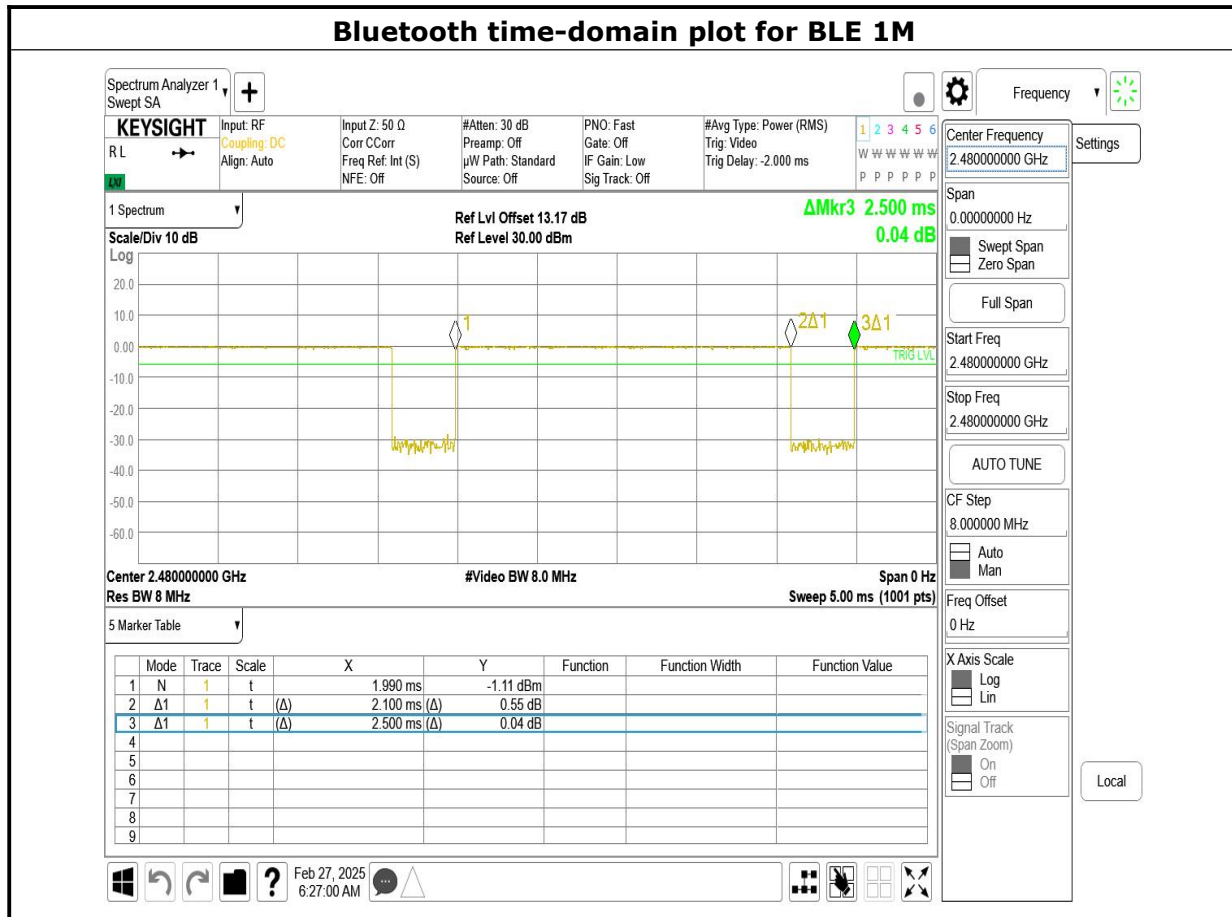
Mode	2.4G Bluetooth
BLE 1M	1.5
BLE 2M	-1.0



## 7.2 Duty Cycle

General Note:

The Bluetooth duty cycle are 84.0% for BLE 1M as folowing figure, according to Oct. 2016 TCBworkshop for Bluetooth SAR scaling need further consideration and the maximum duty cycle is 100%, thereforethe actual duty cvcle will be scaled up to 100% for Bluetooth reported SAR calculation.





### 7.3 Measured Conducted Power Result

All Rate have been tested, the Worst average power (Unit: dBm) is shown as below.

#### <WLAN 2.4G>

Mode	802.11b (1Mbps)		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	17.30	17.00	17.32
Mode	802.11g (6Mbps)		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	16.46	15.64	15.52
Mode	802.11n (HT20) (MCS0)		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	16.18	15.10	14.30
Mode	802.11n (HT40) (MCS0)		
Channel / Frequency (MHz)	3 (2422)	6 (2437)	9 (2452)
Average Power	14.79	14.62	14.23

#### <Bluetooth>

Mode	Bluetooth LE 1M		
Channel / Frequency (MHz)	0 (2402)	19 (2440)	39 (2480)
Average Power	0.39	-0.02	0.97
Mode	Bluetooth LE 2M		
Channel / Frequency (MHz)	0 (2402)	19 (2440)	39 (2480)
Average Power	-1.48	-1.34	-2.45



## 8 SAR Testing Results

### 8.1 SAR Test Reduction Considerations

#### <KDB 447498 D01, General RF Exposure Guidance>

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

- (1)  $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- (2)  $\leq 0.6$  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
- (3)  $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

#### <KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters>

- (1) For handsets operating next to ear, hotspot mode or mini-tablet configurations, 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 the reported SAR of initial test position is  $\leq 0.4$  W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is  $\leq 0.8$  W/kg or all test positions are measured.
- (2) For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg.
- (3) For WLAN MIMO mode, the power-based standalone SAR test exclusion or the sum of SAR provision in KDB 447498 to determine simultaneous transmission SAR test exclusion should be applied. Otherwise, SAR for MIMO mode will be measured with all applicable antennas transmitting simultaneously at the specified maximum output power of MIMO operation.



## 8.2 Head SAR

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Duty Cycle(%)	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
1	802.11b	-	Front Face	0	11	100	17.5	17.32	1.04	-0.01	0.594	<b>0.62</b>
	802.11b	-	Rear Face	0	11	100	17.5	17.32	1.04	0.07	0.056	0.06
	802.11b	-	Left Side	0	11	100	17.5	17.32	1.04	0.00	0.217	0.23
	802.11b	-	Right Side	0	11	100	17.5	17.32	1.04	0.14	0.072	0.08
	802.11b	-	Bottom Side	0	11	100	17.5	17.32	1.04	-0.03	0.028	0.03
	802.11b	-	Front Face	0	1	100	17.5	17.30	1.05	-0.02	0.385	0.40
	802.11b	-	Front Face	0	6	100	17.5	17.00	1.12	0.03	0.357	0.40
2	BLE 1M	-	Front Face	0	39	84	1.5	0.97	1.13	-0.03	0.052	<b>0.07</b>
	BLE 1M	-	Rear Face	0	39	84	1.5	0.97	1.13	0.01	0.012	0.02
	BLE 1M	-	Left Side	0	39	84	1.5	0.97	1.13	-0.03	0.022	0.03
	BLE 1M	-	Right Side	0	39	84	1.5	0.97	1.13	0.05	0.021	0.03
	BLE 1M	-	Bottom Side	0	39	84	1.5	0.97	1.13	-0.01	0.007	0.01
	BLE 1M	-	Front Face	0	0	84	1.5	0.39	1.29	0.02	0.033	0.05
	BLE 1M	-	Front Face	0	19	84	1.5	-0.02	1.42	0.04	0.027	0.05

**Note: The reported SAR was scaled to 84.0% transmission duty factor to determine compliance since the duty factor of the device is permanently limited to 84.0% per the manufacturer**



## 8.3 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are  $\leq 1.45$  W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is  $\leq 1.10$ , the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. 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.

Since all the measured SAR are less than 0.8 W/kg, the repeated measurement is not required.



## 9 Equipment List

Equipment	Manufacturer	Model	SN	Cal. Data	Cal. interval
System Validation Dipole	SPEAG	D450V3	1118	May. 27, 2022	3 years
System Validation Dipole	SPEAG	D750V3	1219	May. 22, 2022	3 years
System Validation Dipole	SPEAG	D850V2	1026	May. 23, 2022	3 years
System Validation Dipole	SPEAG	D1450V2	1092	May. 24, 2022	3 years
System Validation Dipole	SPEAG	D1750V2	1192	May. 24, 2022	3 years
System Validation Dipole	SPEAG	D1900V2	5d247	May. 23, 2022	3 years
System Validation Dipole	SPEAG	D2000V2	1099	May. 25, 2022	3 years
System Validation Dipole	SPEAG	D2300V2	1126	May. 25, 2022	3 years
System Validation Dipole	SPEAG	D2450V2	1081	May. 25, 2022	3 years
System Validation Dipole	SPEAG	D2600V2	1195	May. 25, 2022	3 years
System Validation Dipole	SPEAG	D3500V2	1140	May. 24, 2022	3 years
System Validation Dipole	SPEAG	D3700V2	1116	May. 24, 2022	3 years
System Validation Dipole	SPEAG	D3900V2	1087	May. 24, 2022	3 years
System Validation Dipole	SPEAG	D4900V2	1066	May. 24, 2022	3 years
System Validation Dipole	SPEAG	D5GHzV2	1353	May. 27, 2022	3 years
System Validation Dipole	SPEAG	D6.5GHz V2	1057	May. 24, 2022	3 years
Dosimetric E-Field Probe	SPEAG	EX3DV4	7628	July. 03, 2024	1 year
Data Acquisition Electronics	SPEAG	DAE4	1557	Oct. 08, 2024	1 year
Wideband Radio Communication Tester	R&S	CMW500	168558	May. 25, 2024	1 year
Wideband Radio Communication Tester	Anritsu	MT8000A	6272354169	Jan. 08, 2025	1 year
Signal Analyzer	R&S	FSV	104408	May. 22, 2024	1 year
Vector Network Analyzer	R&S	ZNB 40	101544	May. 25, 2024	1 year
Dielectric assessment Kit	SPEAG	DAK-3.5	1327	Oct. 22, 2022	N/A
Signal Generator	R&S	SMB 100B	101440	Sep. 23, 2024	1 year
Power Sensor	R&S	NRP18S-10	101843	Sep. 20, 2024	1 year
Power Sensor	R&S	NRP18S-10	101845	Sep. 20, 2024	1 year
DC Power Supply	Topward	3303D	810984	Sep. 20, 2024	1 year
Cavity Coupler	/	/	LS0300103	Jan. 08, 2025	1 year
Directional Coupler	/	SHX-DC04/12-20N	2206171042	Jan. 08, 2025	1 year
Coaxial attenuator	R&S	8491A	1424.6721k02-101845-HX	Sep. 20, 2024	1 year
Coaxial attenuator	R&S	8491A	1424.6721K02-101843-aM	Sep. 20, 2024	1 year
Digital Thermometer	LKM	DTM3000	3946	Jan. 13, 2025	1 year
temperature and humidity indicator	LINI-T	A10T	C193561473	Apr. 28, 2024	1 year
Power Amplifier Mini circuit	mini-circuits	ZVA-183W-S+	726202215	Jan. 08, 2025	1 year
PHANTOM	SPEAG	ELI V8.0	2171	N/A	N/A
System Validation Dipole	SPEAG	D450V3	1118	May. 27, 2022	3 years
System Validation Dipole	SPEAG	D750V3	1219	May. 22, 2022	3 years





## 10 Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Source of Uncertainty	Tolerance ( $\pm$ %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi Veff
<b>Measurement System Errors</b>								
Probe Calibration	$\pm 11.0\%$	Normal ( $k=2$ )	2	1	1	$\pm 5.5\%$	$\pm 5.5\%$	$\infty$
Probe Calibration Drift	$\pm 1.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.0\%$	$\pm 1.0\%$	$\infty$
Probe Linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	$\infty$
Broadband Signal	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	$\infty$
Probe Isotropy	$\pm 7.6\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 4.4\%$	$\pm 4.4\%$	$\infty$
Other Probe + Electronic	$\pm 0.7\%$	Normal	1	1	1	$\pm 0.7\%$	$\pm 0.7\%$	$\infty$
RF Ambient	$\pm 1.8\%$	Normal	1	1	1	$\pm 1.8\%$	$\pm 1.8\%$	$\infty$
Probe Positioning	$\pm 0.006\text{mm}$	Normal	1	0.14	0.14	$\pm 0.10\%$	$\pm 0.10\%$	$\infty$
Data Processing	$\pm 1.2\%$	Normal	1	1	1	$\pm 1.2\%$	$\pm 1.2\%$	$\infty$
<b>Phantom and Device Errors</b>								
Conductivity (meas.) <sup>DAK</sup>	$\pm 2.5\%$	Normal	1	0.78	0.71	$\pm 2.0\%$	$\pm 1.8\%$	100
Conductivity (temp.) <sup>BB</sup>	$\pm 3.3\%$	Rectangular	$\sqrt{3}$	0.78	0.71	$\pm 1.5\%$	$\pm 1.4\%$	$\infty$
Phantom Permittivity	$\pm 14.0\%$	Rectangular	$\sqrt{3}$	0	0	$\pm 0\%$	$\pm 0\%$	$\infty$
Distance DUT – TSL	$\pm 2.0\%$	Normal	1	2	2	$\pm 4.0\%$	$\pm 4.0\%$	$\infty$
Device Positioning	$\pm 2.4\%/\pm 2.8\%$	Normal	1	1	1	$\pm 2.8\%$	$\pm 2.8\%$	30
Device Holder	$\pm 3.4\%/\pm 3.5\%$	Normal	1	1	1	$\pm 3.5\%$	$\pm 3.5\%$	30
DUT Modulation <sup>m</sup>	$\pm 2.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.4\%$	$\pm 1.4\%$	$\infty$
Time-average SAR	$\pm 1.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.0\%$	$\pm 1.0\%$	$\infty$
DUT drift	$\pm 2.5\%$	Normal	1	1	1	$\pm 2.5\%$	$\pm 2.5\%$	30
Val Antenna Unc. <sup>val</sup>	$\pm 0.0\%$	Normal	1	1	1	$\pm 0\%$	$\pm 0\%$	
Unc. Input Power <sup>val</sup>	$\pm 0.0\%$	Normal	1	1	1	$\pm 0\%$	$\pm 0\%$	
<b>Correction to the SAR results</b>								
$C(\epsilon, \sigma)$	$\pm 1.9\%$	Normal	1	1	0.84	$\pm 1.9\%$	$\pm 1.6\%$	
SAR scaling <sup>p</sup>	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0\%$	$\pm 0\%$	
<b>Combined Standard Uncertainty (K = 1)</b>						$\pm 12.54\%$	$\pm 12.44\%$	
<b>Expanded Uncertainty (K = 2)</b>						$\pm 25.1\%$	$\pm 24.9\%$	

Uncertainty budget for frequency range 300 MHz to 3 GHz



Source of Uncertainty	Tolerance (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi Veff
<b>Measurement System Errors</b>								
Probe Calibration	±13.1%	Normal (k=2)	2	1	1	± 6.55 %	± 6.55 %	∞
Probe Calibration Drift	±1.7%	Rectangular	√3	1	1	±1.0%	±1.0%	∞
Probe Linearity	±4.7%	Rectangular	√3	1	1	±2.7%	±2.7%	∞
Broadband Signal	±2.6%	Rectangular	√3	1	1	±1.5%	±1.5%	∞
Probe Isotropy	±7.6%	Rectangular	√3	1	1	±4.4%	±4.4%	∞
Other Probe + Electronic	±1.2%	Normal	1	1	1	±1.2%	±1.2%	∞
RF Ambient	±1.8%	Normal	1	1	1	±1.8%	±1.8%	∞
Probe Positioning	±0.005mm	Normal	1	0.29	0.29	±0.15%	±0.15%	∞
Data Processing	±2.3%	Normal	1	1	1	±2.3%	±2.3%	∞
<b>Phantom and Device Errors</b>								
Conductivity (meas.) <sup>DAK</sup>	±2.5%	Normal	1	0.78	0.71	±2.0%	±1.8%	60
Conductivity (temp.) <sup>BB</sup>	±3.3%	Rectangular	√3	0.78	0.71	±1.5%	±1.4%	∞
Phantom Permittivity	±14.0%	Rectangular	√3	0.25	0.25	±2%	±2%	∞
Distance DUT – TSL	±2.0%	Normal	1	2	2	±4.0%	±4.0%	∞
Device Positioning	±2.4%/±2.8%	Normal	1	1	1	±2.8%	±2.8%	30
Device Holder	±3.4%/±3.5%	Normal	1	1	1	±3.5%	±3.5%	30
DUT Modulation <sup>m</sup>	±2.4%	Rectangular	√3	1	1	±1.4%	±1.4%	∞
Time-average SAR	±1.7%	Rectangular	√3	1	1	±1.0%	±1.0%	∞
DUT drift	±2.5%	Normal	1	1	1	±2.5%	±2.5%	30
Val Antenna Unc. <sup>val</sup>	±0.0%	Normal	1	1	1	±0%	±0%	
Unc. Input Power <sup>val</sup>	±0.0%	Normal	1	1	1	±0%	±0%	
<b>Correction to the SAR results</b>								
Deviation to Target	±1.9%	Normal	1	1	0.84	±1.9%	±1.6%	
SAR scaling <sup>p</sup>	±0.0%	Rectangular	√3	1	1	±0%	±0%	
<b>Combined Standard Uncertainty (K = 1)</b>						±12.8%	±12.7%	
<b>Expanded Uncertainty (K = 2)</b>						±26.1%	±25.9%	

Uncertainty budget for frequency range 3 GHz to 6 GHz



## 11 Appendixes

**All attachments are integral parts of this test report. This applies especially to the following appendix:**

### 11.1 Appendix A: SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

### 11.2 Appendix B: SAR Plots of SAR Measurement

### 11.3 Appendix C: Calibration Certificate for probe and Dipole

Refer the appendix Calibration Report.

### 11.4 Appendix D: Test Photos and Results



## Important

- (1) The test report is invalid without the official stamp of CVC;
- (2) Any part photocopies of the test report are forbidden without the written permission from CVC;
- (3) The test report is invalid without the signatures of Approval and Reviewer;
- (4) The test report is invalid if altered;
- (5) Objections to the test report must be submitted to CVC within 15 days.
- (6) Generally, commission test is responsible for the tested samples only.
- (7) As for the test result “-” or “N” means “not applicable”, “/” means “not test”, “P” means “pass” and “F” means “fail”

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