TEST REPORT

Applicant:	OnePlus Technology (Shenzhen) Co., Ltd.
Address:	18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China
Equipment Type:	Watch
Model Name:	OPWWE234
Brand Name:	ONEPLUS
FCC ID:	2ABZ2-OPWWE234
Test Standard:	FCC 47 CFR Part 2.1093 (refer section 3.1)
Maximum SAR:	Front of Face (1 g@10mm): 0.34 W/kg Extremity (10 g@0mm): 0.69 W/kg
Sample Arrival Date:	Apr. 29, 2024
Test Date:	Jun. 04, 2024 - Jun. 05, 2024
Date of Issue:	Jun. 17, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Lining **Checked by:** Xu Rui **Approved by:** Tolan Tu

(Testing Director)

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jun. 17, 2024	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION 4
1.1 Test Laboratory 4
1.2 Test Location 4
1.3 Test Environment Condition 4
2 PRODUCT INFORMATION 5
2.1 Applicant Information 5
2.2 Manufacturer Information 5
2.3 General Description for Equipment under Test (EUT) 5
2.4 Ancillary Equipment 5
2.5 Technical Information 6
3 SUMMARY OF TEST RESULT 7
3.1 Test Standards 7
3.2 Device Category and SAR Limit 8
3.3 Test Result Summary 9
3.4 Test Uncertainty 10
4 MEASUREMENT SYSTEM 11
4.1 Specific Absorption Rate (SAR) Definition 11
4.2 DASY SAR System 12
5 SYSTEM VERIFICATION 19
5.1 Purpose of System Check 19
5.2 System Check Setup 19
6 TEST POSITION CONFIGURATIONS 20
6.1 Front-of-face device 20
6.2 Limb-worn device 20

7 MEASUREMENT PROCEDURE 21
7.1 Measurement Process Diagram 21
7.2 SAR Scan General Requirement 22
7.3 Measurement Procedure 23
7.4 Area & Zoom Scan Procedure 23
8 CONDUCTED RF OUPUT POWER 24
8.1 WIFI 24
8.2 Bluetooth 26
9 TEST EXCLUSION CONSIDERATION 27
9.1 Antenna location sketch 27
9.2 SAR Test Exclusion Consideration Table 28
10 TEST RESULT 30
10.1 Bluetooth SAR 30
10.2 WIFI 2.4GHz 31
10.3 WIFI 5GHz 32
10.4 NFC SAR 33
11 SAR Measurement Variability 35
12 SIMULTANEOUS TRANSMISSION 36
12.1 Simultaneous Transmission Mode Consider 36
12.2 Sum SAR of Simultaneous Transmission 37
13 TEST EQUIPMENTS LIST 38
ANNEX A SIMULATING LIQUID VERIFICATION RESULT 39
ANNEX B SYSTEM CHECK RESULT 40
ANNEX C TEST DATA 49
ANNEX D EUT EXTERNAL PHOTOS 69
ANNEX E SAR TEST SETUP PHOTOS 69
ANNEX F CALIBRATION REPORT 69
ANNEX F TUNE-UP PROCEDURE 69

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

1.3 Test Environment Condition

Ambient Temperature	18℃ to 25℃
Ambient Relative Humidity	30% to 70%

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	OnePlus Technology (Shenzhen) Co., Ltd.
Address	18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China

2.2 Manufacturer Information

Manufacturer	OnePlus Technology (Shenzhen) Co., Ltd.
Address	18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China

2.3 General Description for Equipment under Test (EUT)

EUT Name	Watch
Model Name Under Test	OPWWE234
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	XK919
Software Version	OPWWE234_11_A.85
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	OPPO
	Model No.	BLW013
	Capacity	500 mAh
	Rated Voltage	3.89 V
	Limit Charge Voltage	4.48 V

2.5 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20) 5G WIFI 802.11a, 802.11n(HT20) U-NII-1/2A/2C/3 GPS, GLONASS, Galileo, BDS, NFC

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	2.4G WLAN, 5G WLAN, Bluetooth	
Frequency Range	802.11b/g /n(HT20)	2412 ~ 2462 MHz
	802.11a/ /n(HT20)	5150 ~ 5250 MHz
		5250 ~ 5350 MHz
		5470 ~ 5725 MHz
		5725 ~ 5850 MHz
	Bluetooth	2402 ~ 2480 MHz
Antenna Type	WLAN: PIFA Antenna Bluetooth: PIFA Antenna	
Exposure Category	General Population/Uncontrolled exposure	
Product Type	Portable Device	
EUT Type	☒ Production unit	☐ Identical prototype

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1093	Radiofrequency radiation exposure evaluation: portable devices
2	ANSI C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	IEEE Std. 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
4	KDB 447498 D04 v01	447498 D04 Interim General RF Exposure Guidance v01
5	KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
6	KDB 865664 D02 v01r02	RF Exposure Reporting
7	KDB 248227 D01 v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

3.2 Device Category and SAR Limit

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user.

Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

Table of Exposure Limits:

Body Position	SAR Value (W/Kg)	
	General Population/ Uncontrolled Exposure	Occupational/ ControlledExposure
Whole-Body SAR (averaged over the entire body)	0.08	0.4
Partial-Body SAR (averaged over any 1 gram of tissue)	1.60	8.0
SAR for hands, wrists, feet and ankles (averaged over any 10 grams of tissue)	4.0	20.0

NOTE:

General Population/Uncontrolled Exposure: Locations where there is the exposure of individuals who have no knowledge or control of their exposure. 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.

Occupational/Controlled Exposure: Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, 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.

3.3 Test Result Summary

3.3.1 Highest SAR Values

Equipment Class	Band	Maximum Scaled SAR (W/kg)		Maximum Report SAR (W/kg)	
		Front of Face(10mm)	Extremity (0mm)	Front of Face(10mm)	Extremity (0mm)
		1g SAR	10g SAR	1g SAR	10g SAR
DTS	2.4G WLAN	**0.34**	**0.69**	**0.34**	**0.69**
NII	5.3G WLAN	0.03	0.13		
	5.6G WLAN	0.07	0.39		
	5.8G WLAN	0.05	0.47		
DSS	Bluetooth	0.20	0.37		
Limit (W/kg)		1.6	4.0	1.6	4.0
Verdict		PASS			

3.3.2 Highest Simultaneous Transmission SAR Values

Equipment Class	Maximum Scaled SAR (W/kg)	
	Front of Face(10mm)	Extremity (0mm)
DTS	0.34	0.69
NII	0.27	0.85
DSS	0.27	0.85
Note: The highest simultaneous SAR please refer section 12.2		

3.4 Test Uncertainty

According to KDB 865664 D01, When the highest measured 1 g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis is not required in SAR reports submitted for equipment approval.

The maximum 1 g SAR for the EUT in this report is 0.339 W/kg, which is lower than 1.5 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.
The maximum 10 g SAR for the EUT in this report is 0.688 W/kg, which is lower than 3.75 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.

4 MEASUREMENT SYSTEM

4.1 Specific Absorption Rate (SAR) Definition

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:

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

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

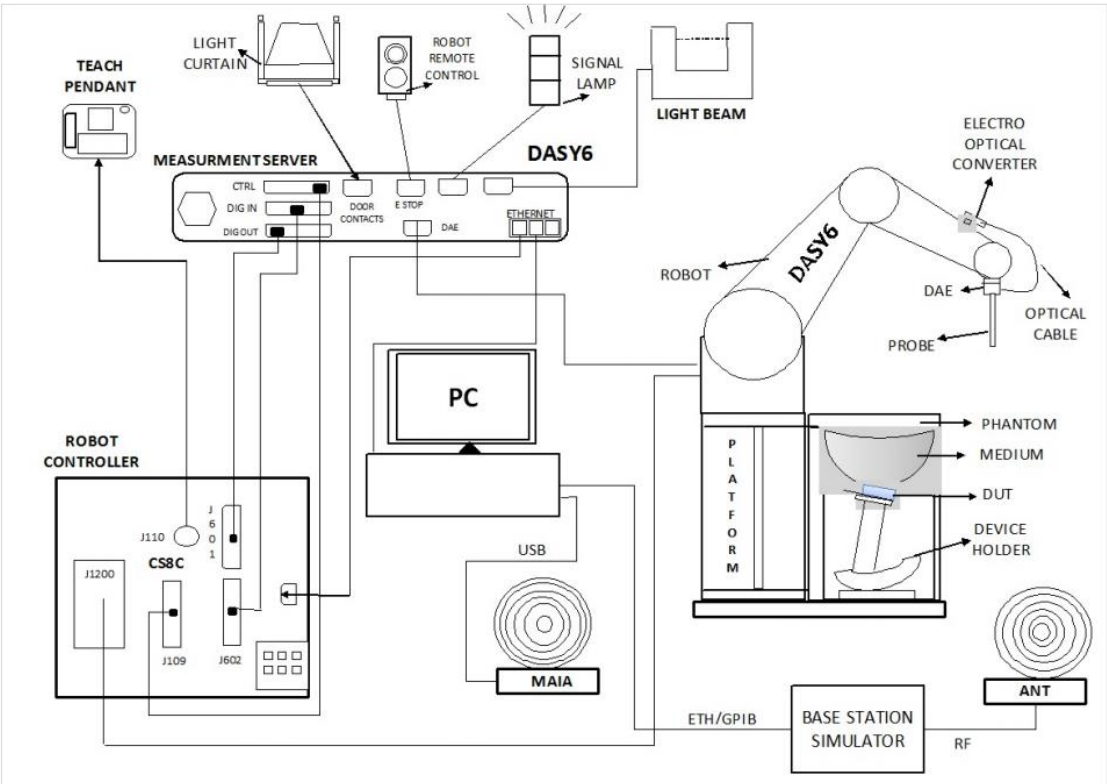
$$\mathbf{SAR} = \frac{\sigma \mathrm{E}^2}{\rho}$$

Where: σ is the conductivity of the tissue,

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

4.2 DASY SAR System

4.2.1 DASY SAR System Diagram

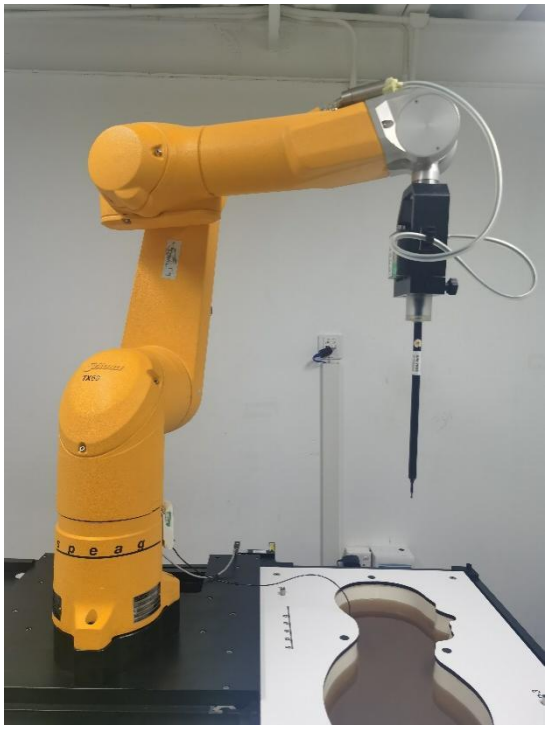


The DASY system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

4.2.2 Robot

The Dasy SAR system uses the high precision robots. Symmetrical design with triangular core Built-in optical fiber for surface detection system For the 6-axis controller system, Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents). The robot series have many features that are important for our application:

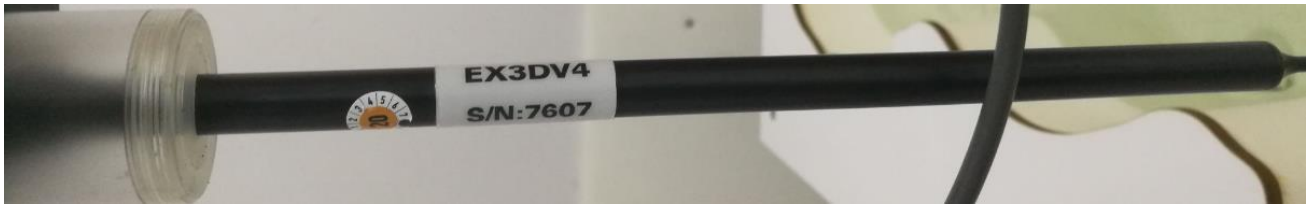


- High precision
  (repeatability ±0.02 mm)
- High reliability
  (industrial design)
- Low maintenance costs
  (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements
  (brush less synchron motors; no stepper motors)
- Low ELF interference
  (motor control _elds shielded via the closed metallic construction shields)

4.2.3 E-Field Probe

The probe is specially designed and calibrated for use in liquids with high permittivities for the measurements the Specific Dosimetric E-Field Probe EX3DV4-SN:7607 with following specifications is used.

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
Calibration	ISO/IEC 17025 calibration service available
Frequency	4 MHz to 10 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ; ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic range	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 9 mm) Tip diameter: 2.5 mm (Body: 10 mm) Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (EX3DV4)

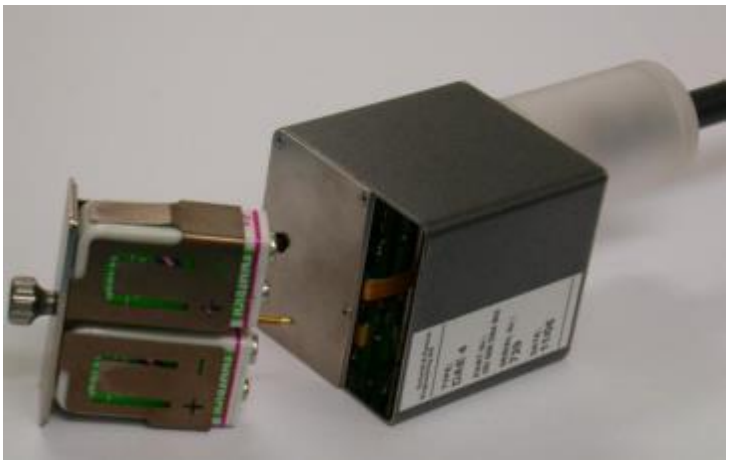


E-Field Probe Calibration Process

Probe calibration is realized, in compliance with IEC/IEEE 62209-1528 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the IEC/IEEE 62209-1528 annexe technique using reference guide at the five frequencies.

4.2.4 Data Acquisition Electronics

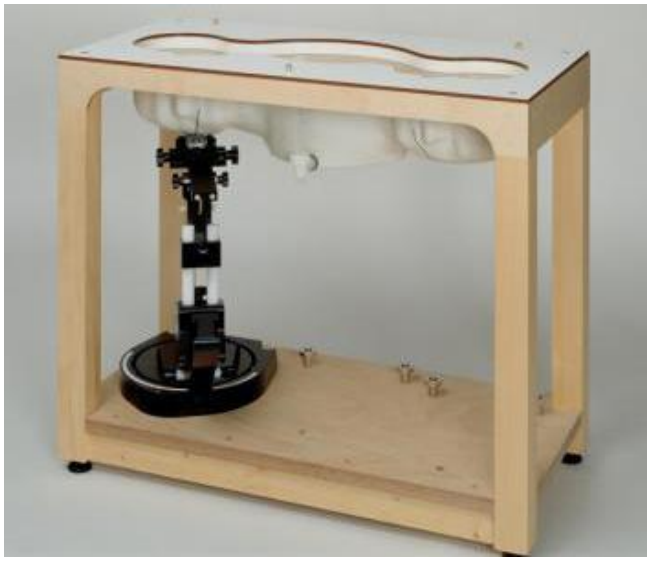
The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an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



- Input Impedance: 200MOhm
- The Inputs: Symmetrical and Floating
- Commom Mode Rejection: Above 80dB

4.2.5 Phantoms

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.



- Left head
- Right head
- Flat phantom

Photo of Phantom SN1859

Serial Number	Material	Length	Height
SN 1859 SAM2	Vinylester, glass fiber reinforced	1000	500

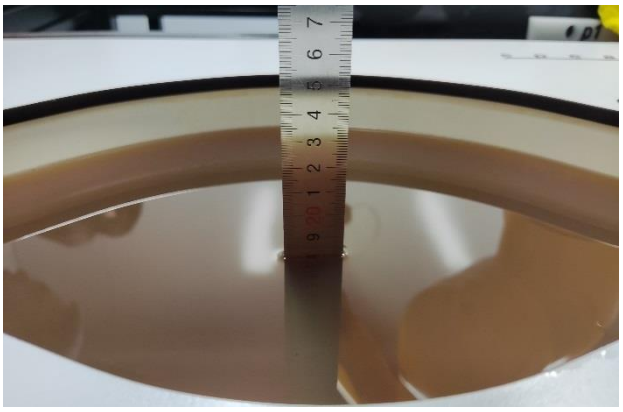
4.2.6 Device Holder

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. 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. This device holder is used for standard mobile phones or PDA"s only. If necessary an additional support of polystyrene material is used. Larger DUT"s (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values. Therefore those devices are normally only tested at the flat part of the SAM.

The positioning system allows obtaining cheek and tilting position with a very good accuracy. Incompliance with CENELEC, the tilt angle uncertainty is lower than 1°.

4.2.7 Simulating Liquid

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%.

Head Liquid Depth	Body Liquid Depth
	

The following table gives the recipes for tissue simulating liquid.

TSL	Manufacturer / Model	Freq Range (MHz)	Main Ingredients
Head WideBand	SPEAG HBBL600-10000V6	600-10000	Ethanediol, Sodium petroleum sulfonate, Hexylene Glycol / 2-Methyl-pentane-2.4-diol, Alkoxylated alcohol

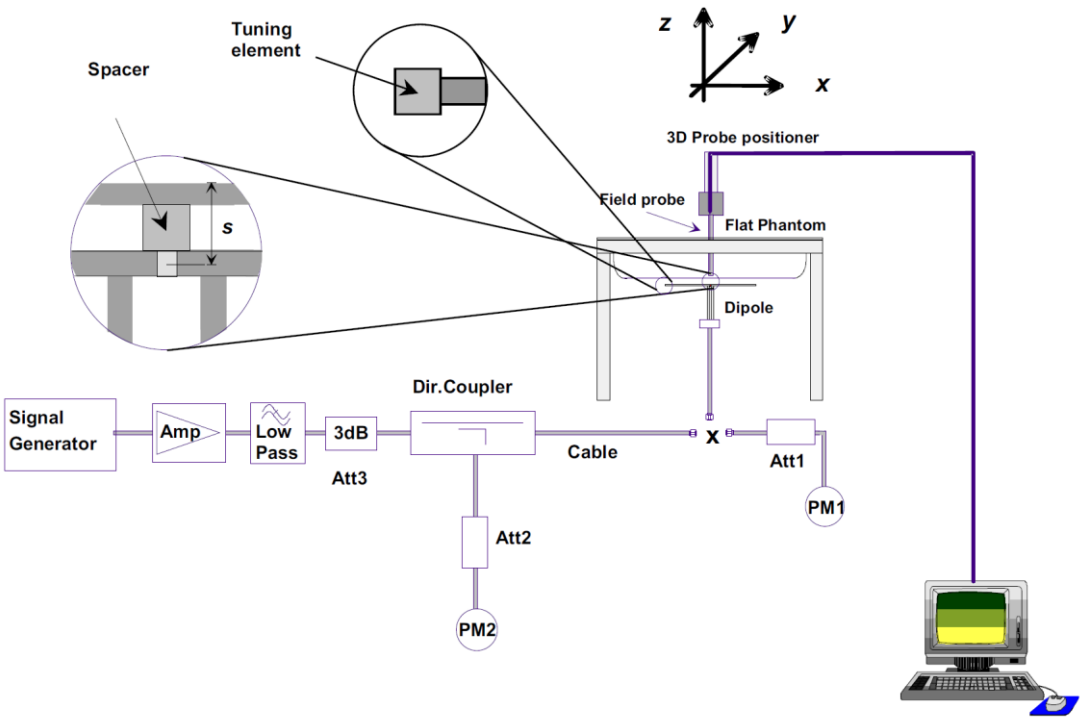
5 SYSTEM VERIFICATION

5.1 Purpose of System 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.

5.2 System Check 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:



6 TEST POSITION CONFIGURATIONS

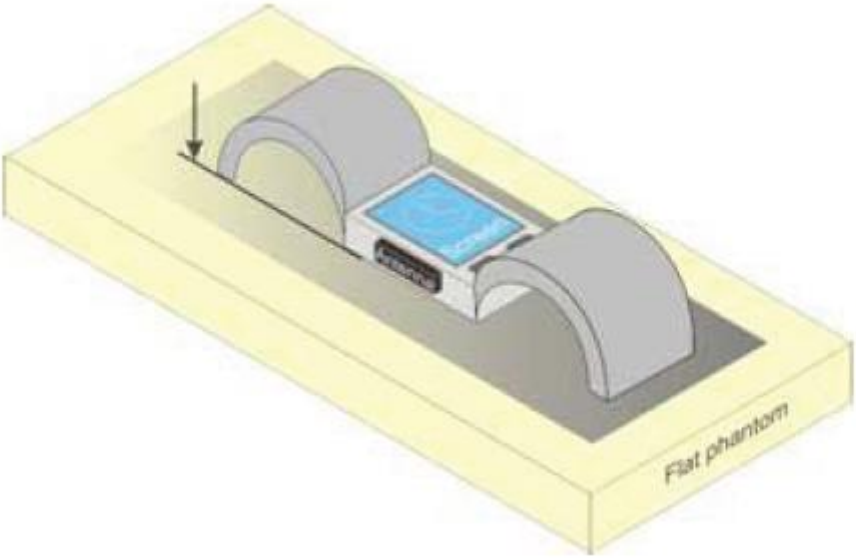
6.1 Front-of-face device

In these cases the device under test shall be positioned at the distance to the phantom surface that corresponds to the intended use as specified by the manufacturer in the user instructions. If the intended use is not specified, a separation distance of 25 mm between the phantom surface and the device shall be used.

This distance corresponds to the 95 % percentile of the nose protrusion distance obtained in the anthropomorphic survey of Gordon et al.

6.2 Limb-worn device

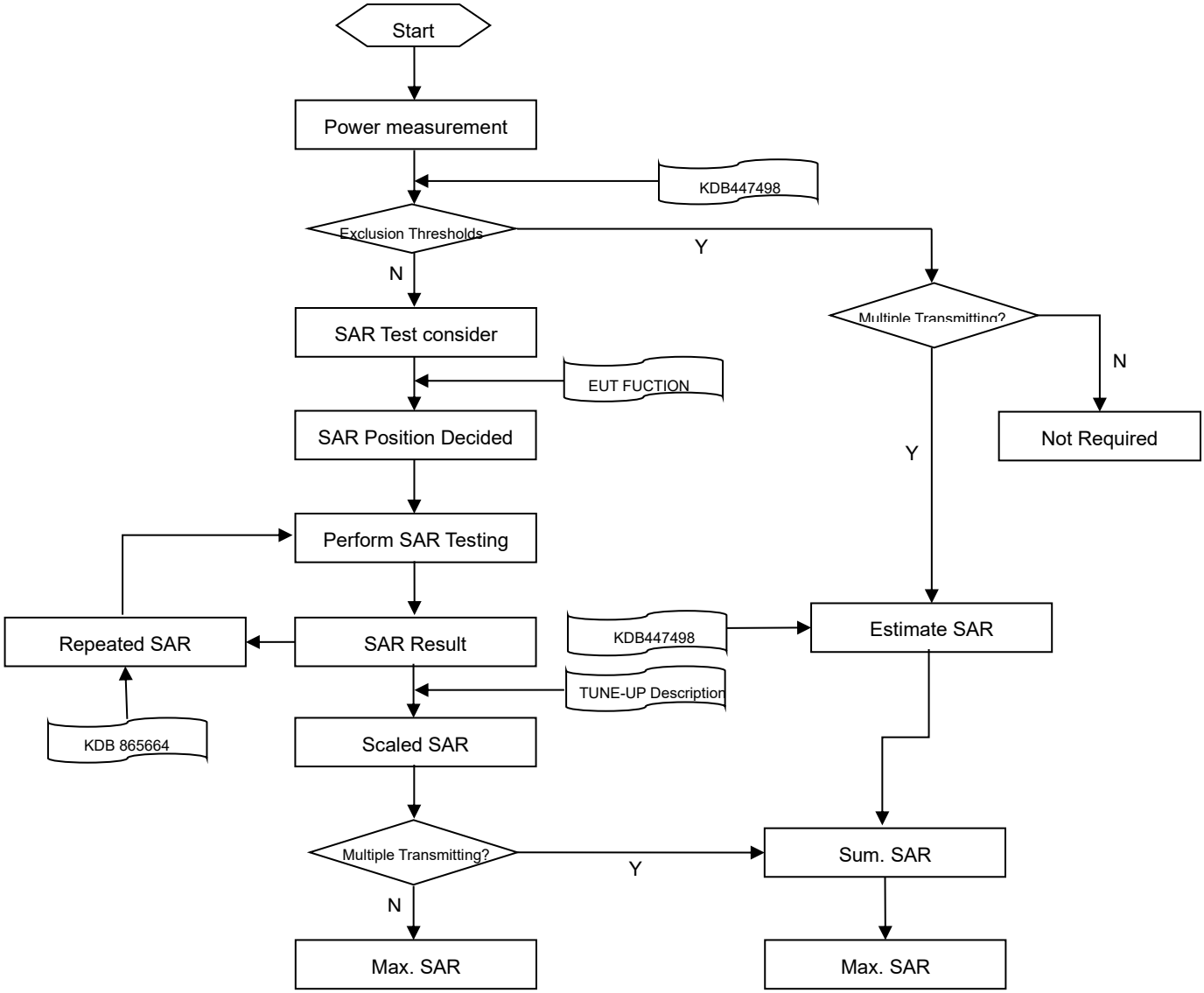
A limb-worn device is a unit whose intended use includes being strapped to the arm or leg of the user while transmitting (except in idle mode). It is similar to a body-worn device. Therefore, the test positions of 6.1.4.4 also apply. The strap shall be opened so that it is divided into two parts as shown in Figure 10. The device shall be positioned directly against the phantom surface with the strap straightened as much as possible and the back of the device towards the phantom.
If the strap cannot normally be opened to allow placing in direct contact with the phantom surface, it may be necessary to break the strap of the device but ensuring to not damage the antenna.



Test position for limb-worn devices

7 MEASUREMENT PROCEDURE

7.1 Measurement Process Diagram



7.2 SAR Scan General Requirement

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Boththe 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 IEEE Std 1528-2013.

<table>
<tr><th colspan="3"></th><th>≤3GHz</th><th>>3GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5±1 mm</td><td>½·δ·ln(2)±0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30°±1°</td><td>20°±1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx Area , Δy Area</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3–4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx Zoom , Δy Zoom</td><td>≤ 2 GHz: ≤ 8 mm
2 –3 GHz: ≤ 5 mm*</td><td>3–4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="6">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2" rowspan="3">uniform grid: Δz Zoom (n)</td><td rowspan="3">≤ 5 mm</td><td>3–4 GHz: ≤ 4 mm</td></tr>
<tr><td>4–5 GHz: ≤ 3 mm</td></tr>
<tr><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="3">graded grid</td><td rowspan="2">Δz Zoom (1): between 1st two points closest to phantom surface</td><td rowspan="3">≤ 4 mm</td><td>3–4 GHz: ≤ 3 mm</td></tr>
<tr><td>4–5 GHz: ≤ 2.5 mm</td></tr>
<tr><td>Δz Zoom (n>1): between subsequent points</td><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td colspan="2">≤ 1.5·Δz Zoom (n-1)</td></tr>
<tr><td rowspan="3">Minimum zoom scan volume</td><td colspan="2" rowspan="3">x, y, z</td><td rowspan="3">≥30 mm</td><td>3–4 GHz: ≥ 28 mm</td></tr>
<tr><td>4–5 GHz: ≥ 25 mm</td></tr>
<tr><td>5–6 GHz: ≥ 22 mm</td></tr>
</table>

Note:

1. δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
2. * When zoom scan is required and the reported SAR from the area scan based 1 g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

7.3 Measurement Procedure

The following steps are used for each test position

a. 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
b. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
c. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
d. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 *32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

7.4 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.
When the 1 g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

8 CONDUCTED RF OUPUT POWER

8.1 WIFI

8.1.1 2.4G WIFI

Band (GHz)	Mode	Channel	Freq. (MHz)	Conducted Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
2.4 (2.4~2.4835)	802.11b	1	2412	16.01	18.00	Yes
		6	2437	**16.28**	18.00	Yes
		11	2462	15.60	17.50	Yes
	802.11g	1	2412	15.12	17.00	No
		6	2437	15.41	17.00	No
		11	2457	11.63	13.50	No
	802.11n(HT20)	1	2462	14.10	16.00	No
		6	2412	14.48	16.00	No
		11	2437	9.98	11.50	No

Note: According KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions. 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.

Adjusted SAR = Report SAR * (max power (OFDM)/ max power (DSSS)) = 0.339 * (56.23mW/63.10mW) = 0.302 W/Kg, so the 2.4G OFDM SAR test is not required.

8.1.2 5G WIFI

Band (GHz)	Mode	Channel	Freq. (MHz)	Conducted Power (dBm)	Tune-up Power Limit (dBm)	SAR Test Require.
5.2 (5.15~5.25)	802.11a	36	5180	15.86	17.00	No
		44	5220	15.67	17.00	No
		48	5240	15.55	17.00	No
	802.11n(HT20)	36	5180	15.79	17.00	No
		44	5220	15.62	17.00	No
		48	5240	15.38	17.00	No
5.3 (5.25~5.35)	802.11a	52	5260	16.81	17.00	Yes
		60	5300	16.64	17.00	Yes
		64	5320	16.59	17.00	Yes
	802.11n(HT20)	52	5260	16.58	17.00	No
		60	5300	16.43	17.00	No
		64	5320	16.54	17.00	No
5.6 (5.47~5.725)	802.11a	100	5500	16.01	17.00	Yes
		116	5580	15.92	17.00	Yes
		140	5700	15.67	17.00	Yes
	802.11n(HT20)	100	5500	15.96	17.00	No
		116	5580	15.69	17.00	No
		140	5700	15.52	17.00	No
5.8 (5.725~5.85)	802.11a	149	5745	15.93	17.00	Yes
		157	5785	15.95	17.00	Yes
		165	5825	15.83	17.00	Yes
	802.11n(HT20)	149	5745	15.94	17.00	No
		157	5785	15.78	17.00	No
		165	5825	15.84	17.00	No

Note: 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, each band is tested independently for SAR.

8.2 Bluetooth

Mode	GFSK			π/4-DQPSK		
Channel	0	39	78	0	39	78
Frequency (MHz)	2402	2441	2480	2402	2441	2480
Conducted Power (dBm)	14.52	**15.15**	14.90	9.82	10.69	9.45
Tune-Up Limit (dBm)	16.0	16.00	16.00	10.50	11.00	10.50
SAR Test Require	Yes	Yes	Yes	NO	NO	NO
Mode	8-DPSK			/		
Channel	0	39	78	/	/	/
Frequency (MHz)	2402	2441	2480	/	/	/
Conducted Power (dBm)	9.85	10.74	10.40	/	/	/
Tune-Up Limit (dBm)	10.50	11.00	10.50	/	/	/
SAR Test Require	NO	NO	NO	/	/	/
Mode	BLE-1Mbps			BLE-2Mbps		
Channel	0	19	39	1	19	38
Frequency (MHz)	2402	2440	2480	2404	2440	2478
Conducted Power (dBm)	9.22	10.17	9.21	9.29	10.18	9.28
Tune-Up Limit (dBm)	10.50	10.50	10.50	10.50	10.50	10.50
SAR Test Require	NO	NO	NO	NO	NO	NO
Note: Since Bluetooth BR mode is the maximum output power mode，SAR measurements were performed with test software using DH5 modulation, and SAR measurement is not required for the EDR and LE. When the secondary mode is ≤ ¼ dB higher than the primary mode.						

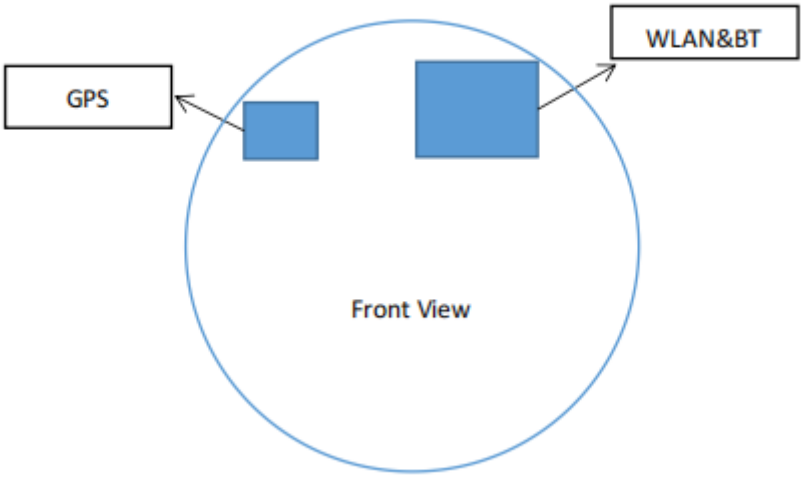
The Bluetooth duty cycle is 76.61 % as following figure, according to 2016 Oct. TCB workshop for Bluetooth SAR scaling need further consideration and the maximum duty cycle is 100%, therefore the actual duty cycle will be scaled up to 100% for Bluetooth reported SAR calculation.

Duty Cycle

Bluetooth-GFSK

9 TEST EXCLUSION CONSIDERATION

9.1 Antenna location sketch



Antenna	Support Bands
WLAN /Bluetooth	WLAN 2.4G; WLAN 5G; Bluetooth

9.2 SAR Test Exclusion Consideration Table

According with FCC KDB 447498 D04, Appendix B, The SAR-based exemption formula applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold Pth (mW), this Device SAR test configurations consider as following :

Band	Mode	Max. Peak Power		Test Position Configurations	
		dBm	mW	Front of Face	Extremity
WLAN 2.4 G	Distance to User			10mm	0mm
	802.11b	18.00	63.10	Yes	Yes
	802.11g	17.50	56.23	No	No
	802.11n(HT20)	17.00	50.12	No	No
WLAN 5 G	802.11a	17.00	50.12	Yes	Yes
	802.11n(HT20)	17.00	50.12	No	No
Bluetooth	Distance to User			10mm	0mm
	BT	16.00	39.81	Yes	Yes

Note:

1. Maximum power is the source-based time-average power and represents the maximum RF output power including tune-up tolerance among production units
2. Per KDB 447498 D04, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. Per KDB 447498 D04, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
4. Per KDB 447498 D04, for separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive), the threshold Pth (mW) is given by Following:

$$P_{th}(mW) = \begin{cases} ERP_{20cm}(d/20cm)^x & d \le 20cm \\ ERP_{20cm} & 20cm < d \le 40cm \end{cases}$$

where

$$x = -log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right)$$

a. f(GHz) is the RF channel transmit frequency in GHz
b. d is the separation distance (cm), The result is rounded to one decimal place for comparison
c. ERP_{20cm} are determined by:

$$ERP_{20cm}(mW) = f(x) = \begin{cases} 2040f & 0.3GHz \le f < 1.5GHz \\ 3060 & 1.5GHz \le f \le 6GHz \end{cases}$$

5. Per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA /HSUPA /DC-HSDPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.
6. Per KDB 248227 D01, choose the highest output power channel to test SAR and determine further SAR exclusion.8. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate

7. Per KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions.
   a. When KDB Publication 447498 D04 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.
8. Per KDB 248227 D01 SAR is not required for the following U-NII-1 and U-NII-2A bands conditions.
   a. 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, each band is tested independently for SAR.
   b. 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, each band is tested independently for SAR.

10 TEST RESULT

10.1 Bluetooth SAR

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Front of Face													
DH5	Front Side	10	39	2441	-0.09	0.126	15.15	16.00	1.216	76.61	1.305	**0.200**	1#
		10	0	2402	-0.15	0.106	14.52	16.00	1.406	76.61	1.305	0.194	/
		10	78	2480	-0.07	0.115	14.90	16.00	1.288	76.61	1.305	0.193	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Extremity													
DH5	Back Side	0	39	2441	0.16	0.235	15.15	16.00	1.216	76.61	1.305	**0.373**	2#
		0	0	2402	-0.18	0.177	14.52	16.00	1.406	76.61	1.305	0.325	/
		0	78	2480	0.00	0.192	14.90	16.00	1.288	76.61	1.305	0.323	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

10.2WIFI 2.4GHz

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Front of Face													
802.11b	Front Side	10	6	2437	-0.10	0.225	16.28	18.00	1.486	98.69	1.013	**0.339**	3#
		10	1	2412	0.02	0.203	16.01	18.00	1.581	98.69	1.013	0.325	/
		10	11	2462	0.19	0.188	15.60	17.50	1.549	98.69	1.013	0.295	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Extremity													
802.11b	Back Side	0	6	2437	-0.09	0.457	16.28	18.00	1.486	98.69	1.013	**0.688**	4#
		0	1	2412	-0.11	0.345	16.01	18.00	1.581	98.69	1.013	0.553	/
		0	11	2462	0.18	0.332	15.60	17.50	1.549	98.69	1.013	0.521	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

10.3WIFI 5GHz

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Front of Face													
802.11a	Front Side	10	52	5260	-0.04	0.027	16.81	17.00	1.045	93.02	1.075	**0.030**	5#
		10	60	5300	-0.11	0.021	16.64	17.00	1.086	93.02	1.075	0.025	/
		10	64	5320	0.03	0.023	16.59	17.00	1.099	93.02	1.075	0.027	/
802.11a	Front Side	10	100	5500	0.09	0.049	16.01	17.00	1.256	93.02	1.075	**0.066**	6#
		10	116	5580	-0.13	0.036	15.92	17.00	1.282	93.02	1.075	0.050	/
		10	140	5700	-0.03	0.042	15.67	17.00	1.358	93.02	1.075	0.061	/
802.11a	Front Side	10	157	5785	0.06	0.037	15.95	17.00	1.274	93.02	1.075	**0.051**	7#
		10	149	5745	-0.13	0.031	15.93	17.00	1.279	93.02	1.075	0.043	/
		10	165	5825	-0.07	0.027	15.83	17.00	1.309	93.02	1.075	0.038	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Extremity													
802.11a	Back Side	0	52	5260	0.15	0.111	16.81	17.00	1.045	93.02	1.075	**0.125**	8#
		0	60	5300	-0.12	0.102	16.64	17.00	1.086	93.02	1.075	0.119	/
		0	64	5320	-0.09	0.105	16.59	17.00	1.099	93.02	1.075	0.124	/
802.11a	Back Side	0	100	5500	0.00	0.287	16.01	17.00	1.256	93.02	1.075	**0.388**	9#
		0	116	5580	-0.10	0.253	15.92	17.00	1.282	93.02	1.075	0.349	/
		0	140	5700	0.05	0.261	15.67	17.00	1.358	93.02	1.075	0.381	/
802.11a	Back Side	0	157	5785	-0.06	0.345	15.95	17.00	1.274	93.02	1.075	**0.472**	10#
		0	149	5745	-0.02	0.311	15.93	17.00	1.279	93.02	1.075	0.428	/
		0	165	5825	0.09	0.297	15.83	17.00	1.309	93.02	1.075	0.418	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

10.4NFC SAR

1. According to the 2022.04 TCBC Workshop meeting, the power threshold is ≤ 100MHz, refer to P6s.

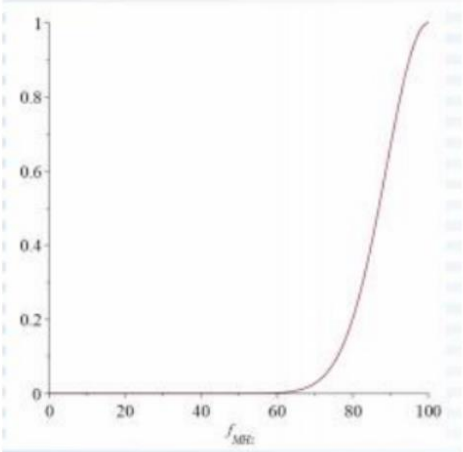
$$P_{7X}(d_{mm}, f_{MHz}) := \begin{cases} P_{6S}(d_{mm}, f_{MHz}) & f_{MHz} \le 100 \\ P_{6to7}(d_{mm}, f_{MHz}) & 100 < f_{MHz} \le 300 \\ P_{7}(d_{mm}, f_{MHz}) & 300 < f_{MHz} \end{cases}$$

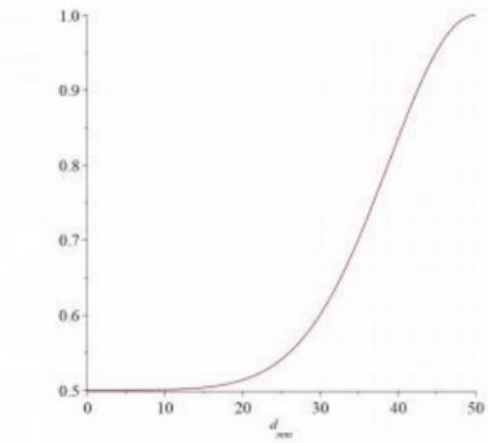
2. For portable products, when using a distance of ≤ 50mm, such as mobile phone NFC, P6s is calculated with the following formula calculate.

$$S_f(f_{MHz}) \cdot P_{431a}(d_{mm}, f_{MHz}) + (1 - S_f(f_{MHz})) \cdot S_d(d_{mm}) P_{431b1}(50., 100.) \cdot \left(1. + log10\left(\frac{100.}{f_{MHz}}\right)\right) \qquad d_{mm} \le 50 \text{ and } f_{MHz} \le 100$$

3. The smoothing functions Sf and Sd in P6s calculate the limits based on KDB 447498 V06 and are calculated as follows.

$$S_f(f_{MHz}) := exp\left(-10 \frac{(f_{MHz} - f_{max})^2}{\Delta f^2}\right) \qquad S_d(d_{mm}) := 0.5 + 0.5 \cdot exp\left(-10 \frac{(d_{mm} - d_{max})^2}{\Delta d^2}\right)$$





d≤50mm				
f Max(MHz)	100		d Max(mm)	50
f MHz	13.56		d(mm)	5
△f(MHz)	100		△d	50
$S_f(f_{MHz})$	0.000568861		S_d（dmm）	0.50015177
P6s(mW)	443.1257378			
Note: SAR testing is required when the distance is 5mm and the power is greater than 443.13mW.				

4. According to the ANSI C63.10 clause 11.12.2.2:

The value of maximum peak output power is according to the method described in ANSI C63.10 clause 11.12.2.2 General procedure for conducted measurements in restricted bands:

a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the ERP level (see guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the ERP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the ERP of all chains in linear terms (e.g., Watts, mW).

e) Convert the resultant ERP level to an equivalent electric field strength using the following relationship: E = ERP - 20log D + 104.8

where:

E = electric field strength in dBμV/m,

ERP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

Mode	f (MHz)	Max. E-Field strength (dBuV/m)	D (m)	Ground reflection factor (dB)	ERP (dBm)
NFC (13.56MHz)	13.56	55.15	3	6	-34.11
Note: 1. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz). 2.EIRP= 55.15+20*Log(3) - 104.8 + 6 =-34.11 (dBm)					

According to the FCC KDB 447498 D04

Estimated SAR: SAR test =1.6 · Pant / Pth [W/kg]

Estimated SAR	1.6 ·Pant / Pth [W/kg]		
Pmeas.(dBm)	-34.11	Pmeas.(mW)	0.00039
Pth.(mW)	443.13		
NFC Estimated 1g SAR [W/kg]	＜0.001		

11 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 ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 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.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3. 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, perform a second repeated measurement.

If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated Note:

For 1g SAR, the highest measured 1g SAR is 0.225 < 0.8 W/kg, repeated measurement is not required.

For 10g SAR, the highest measured 10g SAR is 0.457 < 2.0 W/kg, repeated measurement is not required.

12 SIMULTANEOUS TRANSMISSION

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR 1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR 1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR 1g is greater than the SAR limit (SAR 1g 1.6 W/kg), SAR test exclusion is determined by the SAR to Peak Location Ratio (SPLSR).

12.1 Simultaneous Transmission Mode Consider

No.	Simultaneous Transmission Configurations	Portable	
		Front of Face	Extremity
1	WLAN 5GHz + BT	Yes	Yes

Note:

1. The Antenna supports TX/RX function for 2.4G WLAN and Bluetooth and can’t simultaneous transmission at same time.
2. 2.4G WLAN and 5G WLAN does not support simultaneous transmission at same time.

12.2 Sum SAR of Simultaneous Transmission

12.2.1 Highest Front of Face SAR Bluetooth and 5GWLAN

Simultaneous Mode	Mode	Max. 1g SAR (W/kg)	1g Sum SAR (W/kg)	SPLSR (Yes/No)	Limit
Front of Face					
Bluetooth + 5G WLAN	Bluetooth	0.200	0.266	No	1.6
	5G WLAN	0.066			

12.2.2 Highest Extremity SAR Bluetooth and 5GWLAN

Simultaneous Mode	Mode	Max. 10g SAR (W/kg)	10g Sum SAR (W/kg)	SPLSR (Yes/No)	Limit
Extremity					
Bluetooth + 5G WLAN	Bluetooth	0.373	0.845	No	4.0
	5G WLAN	0.472			

12.2.3 Highest Total Exposure Ratio of Simultaneous Transmission

NFC multi-transmit requires the use of the TER formula:

$$TER = \sum_{k=1}^{N_S}\left(\frac{SAR_k}{SAR_{\lim}}\right) + \sum_{k=1}^{N_f}\left(\frac{MPE_{field,\,k}}{MPE_{field,\,\lim}}\right)^2 + \sum_{k=1}^{N_{PD}}\left(\frac{MPE_{PD,\,k}}{MPE_{PD,\,\lim}}\right)$$

The maximum SAR value for Simultaneous Transmission is 0.845 [W/kg], SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds. Therefore, the worst TER =(0.845+0.001/4.0) = 0.212 ＜ 1, the NFC SAR transmit simultaneously conformance for FCC requirement.

13 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No./Version	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
Test Software	Speag	DASY6	16.0.0.116	N/A	N/A
2450MHz Validation Dipole	Speag	D2450V2	SN: 1062	2021/07/05	2024/07/05
5GHz Validation Dipole	Speag	D5GHzV2	SN: 1333	2021/09/14	2024/09/14
Data Acquisition Electronicsr	Speag	DAE4	SN: 1710	2024/01/03	2025/01/03
E-Field Probe	Speag	EX3DV4	SN: 7607	2023/07/04	2024/07/04
Signal Generator	R&S	SMB100A	177746	2024/04/24	2025/04/24
Power Meter	R&S	NRVD-B2	835843/014	2023/09/05	2024/09/05
Power Sensor	R&S	NRV-Z4	100381	2023/09/05	2024/09/05
Power Sensor	R&S	NRV-Z2	100211	2023/09/05	2024/09/05
Network Analyzer	Agilent	E5071C	MY46103472	2023/11/14	2024/11/14
Thermometer	Elitech	RC-4	EF5238001628	2023/10/09	2024/10/09
Thermometer	Elitech	RC-4HC	EF7239002652	2023/11/17	2024/11/17
Power Amplifier	SATIMO	6552B	22374	N/A	N/A
Dielectric Probe Kit	Speag	DAK3.5	SN: 1312	N/A	N/A
Phantom	Speag	SAM	SN: 1859	N/A	N/A
Attenuator	COM-MW	ZA-S1-31	1305003187	N/A	N/A
Directional coupler	AA-MCS	AAMCS-UDC	000272	N/A	N/A

Note: For dipole antennas, BALUN has adopted 3 years as calibration intervals, and on annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss in within 20% of calibrated measurement.
4. Impedance (real or imaginary parts) in within 5 Ohms of calibrated measurement.

ANNEX A SIMULATING LIQUID VERIFICATION RESULT

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SCLMP Dielectric Probe Kit.

Head Liquid

Date	Fre. (MHz)	Meas. Conductivity (σ) (S/m)	Meas. Permittivity (ε)	Target Conductivity(σ) (S/m)	Target Permittivity (ε)	Conductivity Tolerance (%)	Permittivity Tolerance (%)
2024.06.04	2450	1.80	39.57	1.80	39.20	0.00	0.94
2024.06.04	5300	4.81	35.29	4.76	35.87	1.05	-1.62
2024.06.05	5600	5.06	35.27	5.07	35.53	-0.20	-0.73
2024.06.05	5800	5.27	34.96	5.27	35.30	0.00	-0.96
Note: The tolerance limit of Conductivity and Permittivity is± 5%.							

ANNEX B SYSTEM CHECK RESULT

Head liquid 1g

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Dipole 1g SAR (W/kg)	Tolerance (%)
2024.06.04	Head	2450	100	5.360	53.60	5.360	-1.11
2024.06.04	Head	5300	100	7.860	78.60	7.860	-3.91
2024.06.05	Head	5600	100	8.350	83.50	8.350	-0.12
2024.06.05	Head	5800	100	7.920	79.20	7.920	-3.77
Note: The tolerance limit of System validation ±10%.							

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %(for 1 g).

Head liquid 10g

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Dipole 10g SAR (W/kg)	Tolerance (%)
2024.06.04	Head	2450	100	2.450	24.50	25.20	-2.78
2024.06.04	Head	5300	100	2.290	22.90	23.40	-2.14
2024.06.05	Head	5600	100	2.410	24.10	23.80	1.26
2024.06.05	Head	5800	100	2.260	22.60	23.10	-2.16
Note: The tolerance limit of System validation ±10%.							

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %(for 10 g).

System Performance Check Data (2450MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
D2450V2, SPEAG	40.0 x 8.0 x 8.0	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL		D2450	CW, 0--	2450.0, 2450	7.47	1.8	39.6	22.3	21.4

Hardware Setup

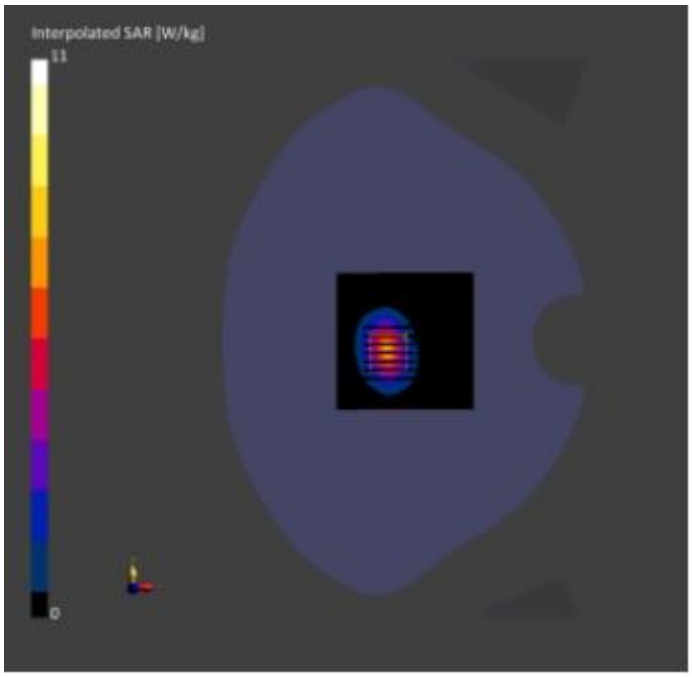
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	8.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	5.35	5.36
psSAR10g [W/kg]	2.42	2.45
Power Drift [dB]	0.15	0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		80.6
Dist 3dB Peak [mm]		9.0


Interpolated SAR [W/kg]
11
0

System Performance Check Data (5300MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
D5GHZV2, SPEAG	10.0 x 10.0 x 3.0	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL		D5GHz	CW, 0--	5300.0, 5300	5.41	4.81	35.3	22.3	21.4

Hardware Setup

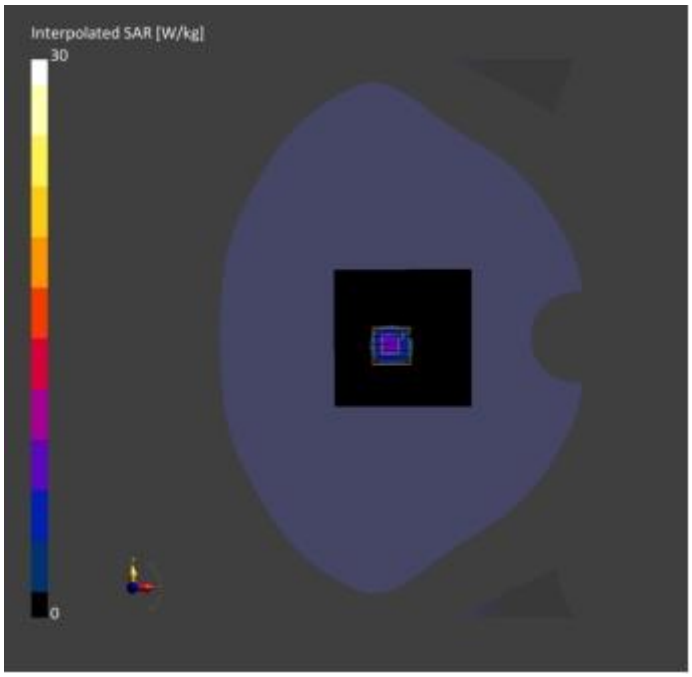
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	7.38	7.86
psSAR10g [W/kg]	2.11	2.29
Power Drift [dB]	0.03	-0.08
Power Scaling Scaling Factor [dB]	Disabled	Disabled
TSL Correction	No correction	No correction
M2/M1 [%]		74.5
Dist 3dB Peak [mm]		7.8


Interpolated SAR [W/kg]
30
0

System Performance Check Data (5600MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
D5GHzV2, SPEAG	10.0 x 10.0 x 3.0	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL		D5GHz	CW, 0--	5600.0, 5600	4.58	5.06	35.3	22.2	21.5

Hardware Setup

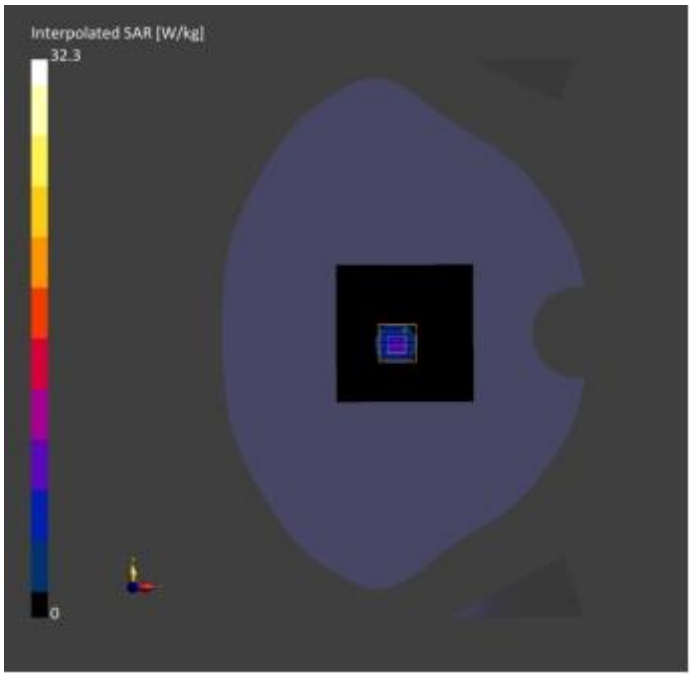
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-05	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-05	2024-06-05
psSAR1g [W/kg]	8.13	8.35
psSAR10g [W/kg]	2.19	2.41
Power Drift [dB]	0.05	-0.11
Power Scaling Scaling Factor [dB]	Disabled	Disabled
TSL Correction	No correction	No correction
M2/M1 [%]		69.8
Dist 3dB Peak [mm]		7.9


Interpolated SAR [W/kg]
32.3
0

System Performance Check Data (5800MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
D5GHzV2, SPEAG	10.0 x 10.0 x 3.0	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL		D5GHz	CW, 0--	5800.0, 5800	4.78	5.27	35	22.5	21.2

Hardware Setup

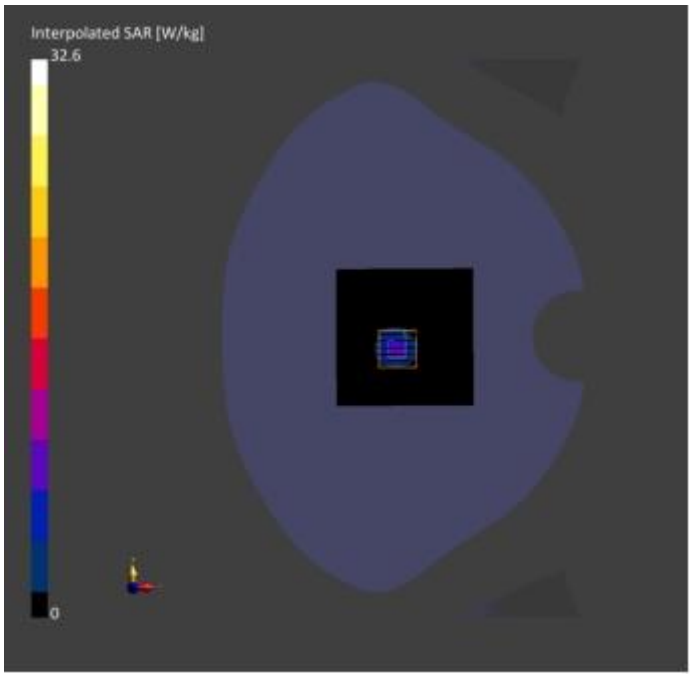
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-05	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-05	2024-06-05
psSAR1g [W/kg]	7.65	7.92
psSAR10g [W/kg]	2.14	2.26
Power Drift [dB]	-0.03	0.11
Power Scaling Scaling Factor [dB]	Disabled	Disabled
TSL Correction	No correction	No correction
M2/M1 [%]		68.5
Dist 3dB Peak [mm]		8.1


Interpolated SAR [W/kg]
32.6
0

ANNEX C TEST DATA

Meas.1 Body Plane with Front Side 10mm on 39 Channel in Bluetooth Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	FRONT, 10.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2441.0, 39	7.47	1.79	39.6	22.3	21.4

Hardware Setup

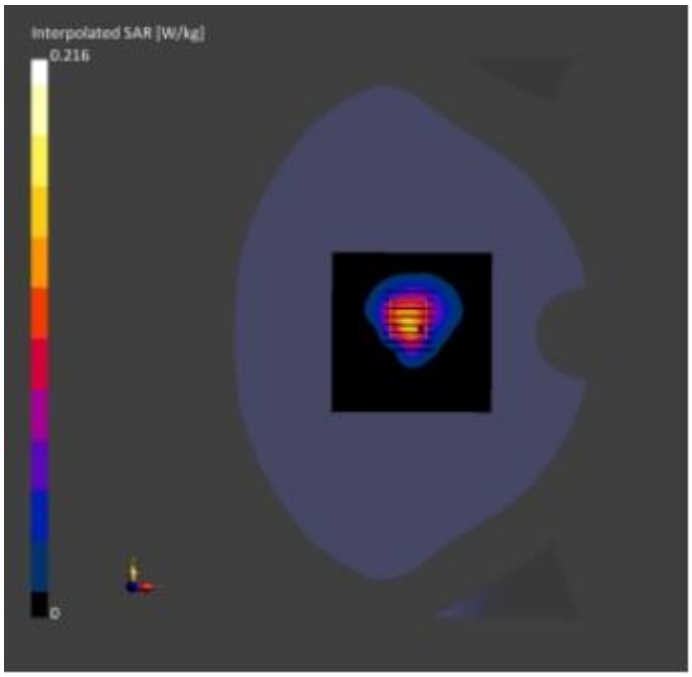
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	96.0 x 96.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	0.122	0.126
psSAR10g [W/kg]	0.062	0.068
Power Drift [dB]	0.02	-0.09
Power Scaling Scaling Factor [dB]	Disabled	Disabled
TSL Correction	No correction	No correction
M2/M1 [%]		57.6
Dist 3dB Peak [mm]		8.6


Interpolated SAR [W/kg]
0.216
0

Meas.2 Body Plane with Back Side 0mm on 39 Channel in Bluetooth Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	BACK, 0.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2441.0, 39	7.47	1.79	39.6	22.3	21.4

Hardware Setup

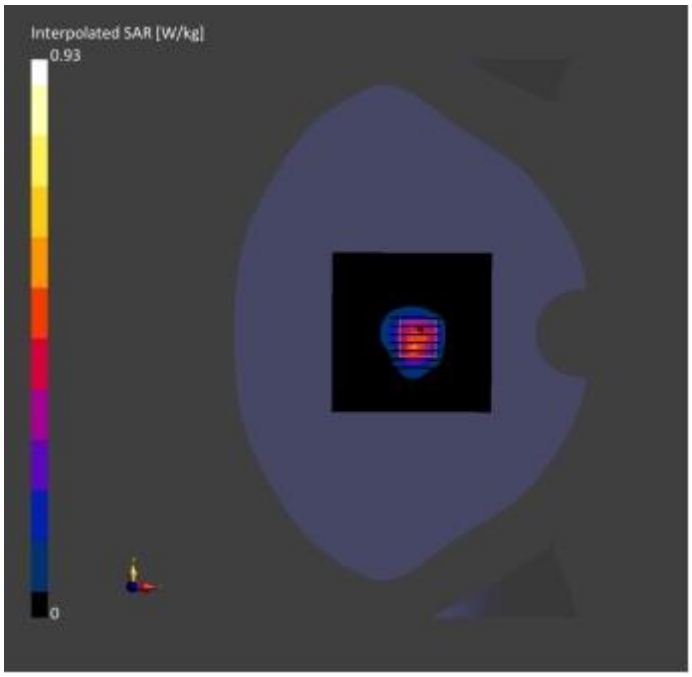
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	96.0 x 96.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	0.443	0.499
psSAR10g [W/kg]	0.210	0.235
Power Drift [dB]	-0.10	0.16
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		56.2
Dist 3dB Peak [mm]		7.6


Interpolated SAR [W/kg]
0.93
0

Meas.3 Body Plane with Front Side 10mm on 6 Channel in IEEE802.11b Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	FRONT, 10.00	WLAN 2.4GHz	WLAN, 10012-CAB	2437.0, 6	7.47	1.79	39.6	22.3	21.4

Hardware Setup

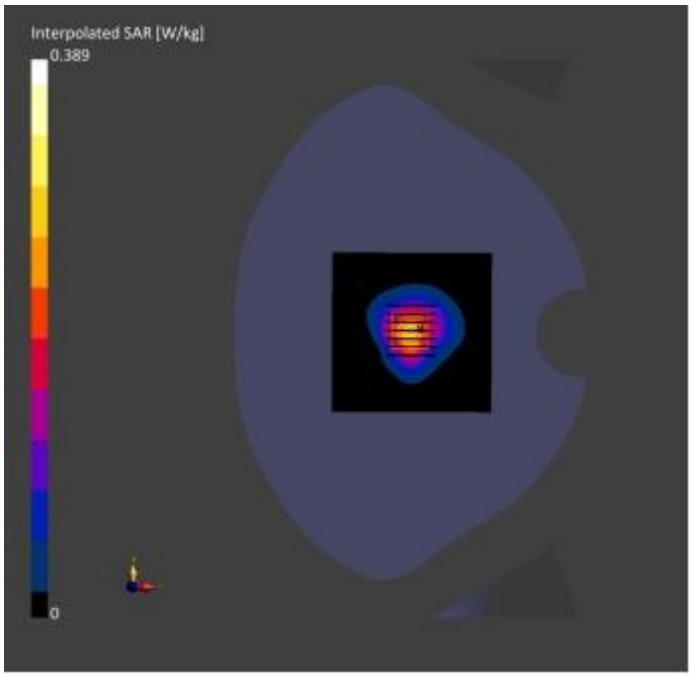
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	96.0 x 96.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	0.222	0.225
psSAR10g [W/kg]	0.115	0.122
Power Drift [dB]	-0.03	-0.10
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		58.0
Dist 3dB Peak [mm]		10.8


Interpolated SAR [W/kg]
0.389
0

Meas.4 Body Plane with Back Side 0mm on 6 Channel in IEEE802.11b Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	BACK, 0.00	WLAN 2.4GHz	WLAN, 10012-CAB	2437.0, 6	7.47	1.79	39.6	22.3	21.4

Hardware Setup

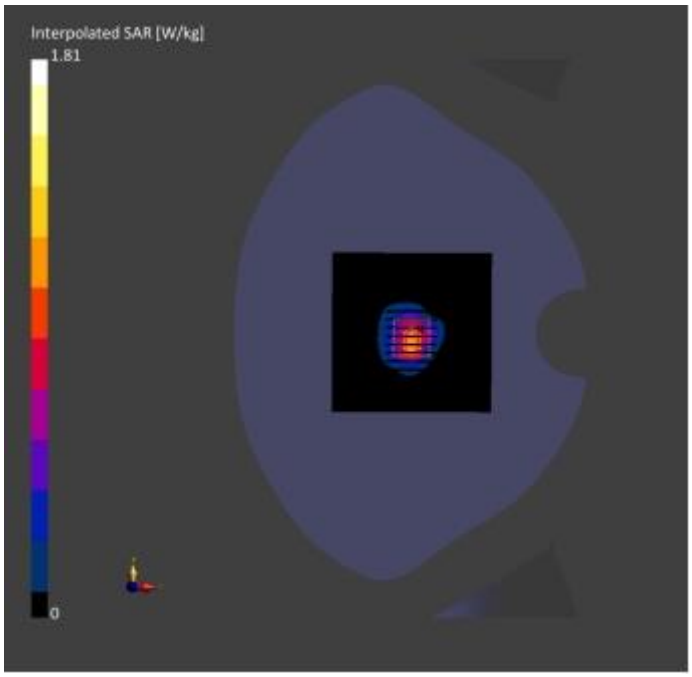
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	96.0 x 96.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	0.894	0.974
psSAR10g [W/kg]	0.410	0.457
Power Drift [dB]	0.03	-0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		52.7
Dist 3dB Peak [mm]		8.5


Interpolated SAR [W/kg]
1.81
0

Meas.5 Body Plane with Front Side 10mm on 52 Channel in IEEE802.11a Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	FRONT, 10.00	WLAN 5GHz	WLAN, 10062-CAE	5260.0, 52	5.41	4.72	35.8	22.3	21.4

Hardware Setup

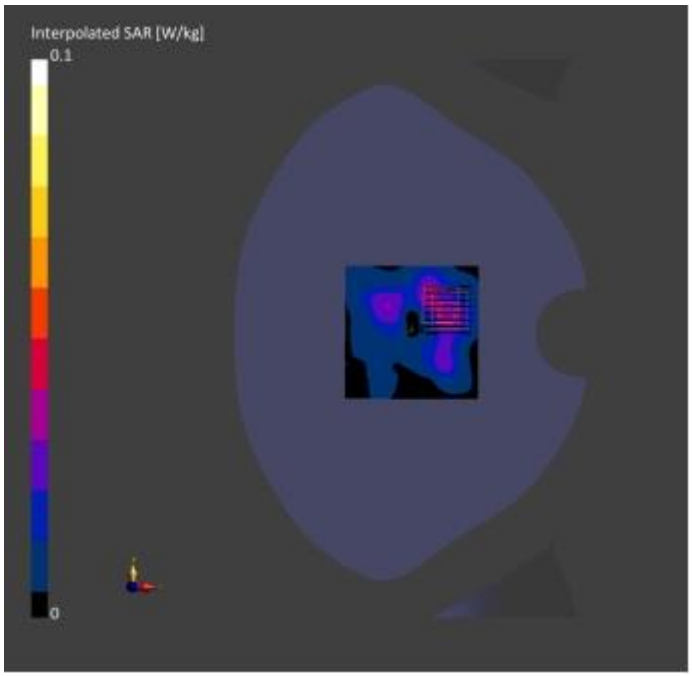
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	0.028	0.027
psSAR10g [W/kg]	0.012	0.012
Power Drift [dB]	0.05	-0.04
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		59.8
Dist 3dB Peak [mm]		> 12.0


Interpolated SAR [W/kg]
0.1
0

Meas.6 Body Plane with Front Side 10mm on 100 Channel in IEEE802.11a Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	FRONT, 10.00	WLAN 5GHz	WLAN, 10062-CAD	5500.0, 100	4.58	4.90	36.4	22.2	21.5

Hardware Setup

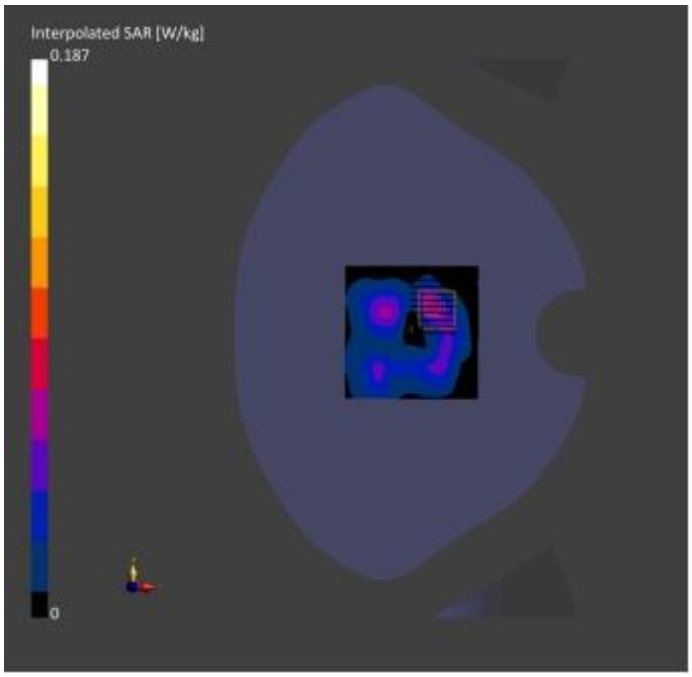
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-05	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-05	2024-06-05
psSAR1g [W/kg]	0.053	0.049
psSAR10g [W/kg]	0.019	0.018
Power Drift [dB]	-0.09	0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		57.1
Dist 3dB Peak [mm]		7.2


Interpolated SAR [W/kg]
0.187
0

Meas.7 Body Plane with Front Side 10mm on 157 Channel in IEEE802.11a Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	FRONT, 10.00	WLAN 5GHz	WLAN, 10062-CAE	5785.0, 157	4.78	5.24	35.2	22.5	21.2

Hardware Setup

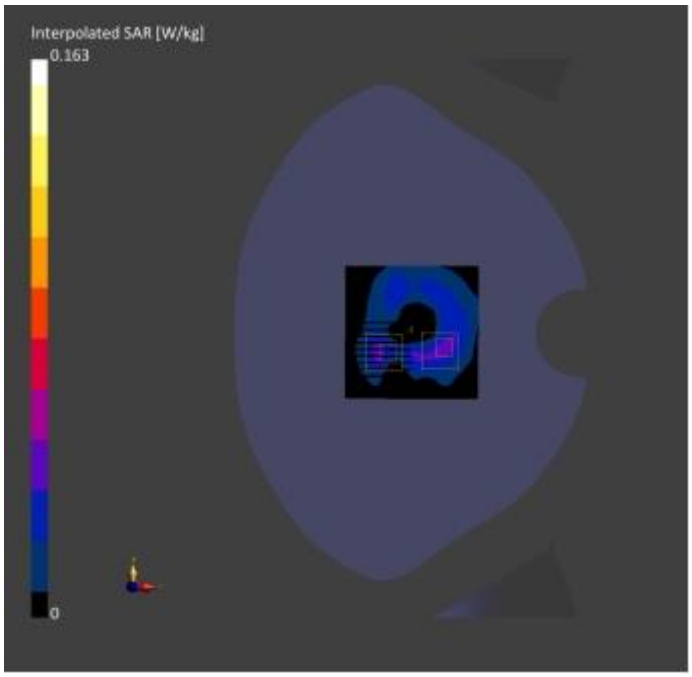
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-05	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-05	2024-06-05
psSAR1g [W/kg]	0.035	0.037
psSAR10g [W/kg]	0.013	0.013
Power Drift [dB]	0.08	0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		57.9
Dist 3dB Peak [mm]		7.9


Interpolated SAR [W/kg]
0.163
0

Meas.8 Body Plane with Back Side 0mm on 52 Channel in IEEE802.11a Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10062-CAD	5260.0, 52	5.41	4.72	35.8	22.3	21.4

Hardware Setup

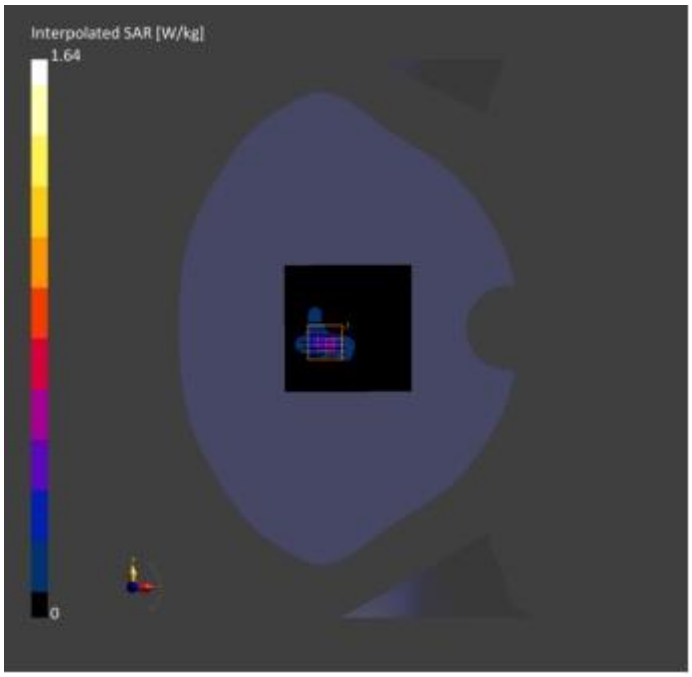
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-04	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-04	2024-06-04
psSAR1g [W/kg]	0.375	0.377
psSAR10g [W/kg]	0.113	0.111
Power Drift [dB]	0.03	0.15
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		54.8
Dist 3dB Peak [mm]		4.0


Interpolated SAR [W/kg]
1.64
0

Meas.9 Body Plane with Back Side 0mm on 100 Channel in IEEE802.11a Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10062-CAD	5500.0, 100	4.58	4.90	36.4	22.2	21.5

Hardware Setup

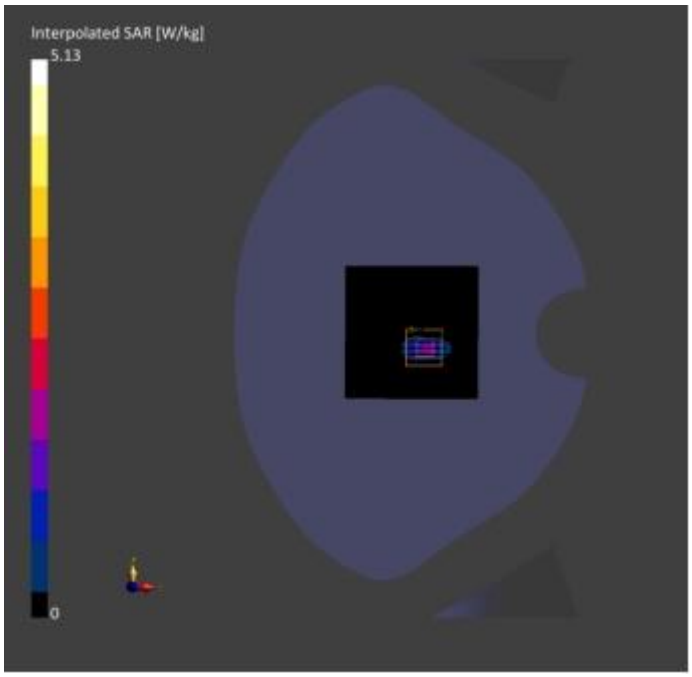
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-05	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-05	2024-06-05
psSAR1g [W/kg]	1.11	1.17
psSAR10g [W/kg]	0.281	0.287
Power Drift [dB]	0.10	0.00
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		52.9
Dist 3dB Peak [mm]		4.1


Interpolated SAR [W/kg]
5.13
0

Meas.10 Body Plane with Back Side 0mm on 157 Channel in IEEE802.11a Mode

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
OPWWE234	50.0 x 50.0 x 10.0	Smart watch

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [℃]	Liquid Temperature [℃]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10062-CAE	5785.0, 157	4.78	5.24	35.2	22.5	21.2

Hardware Setup

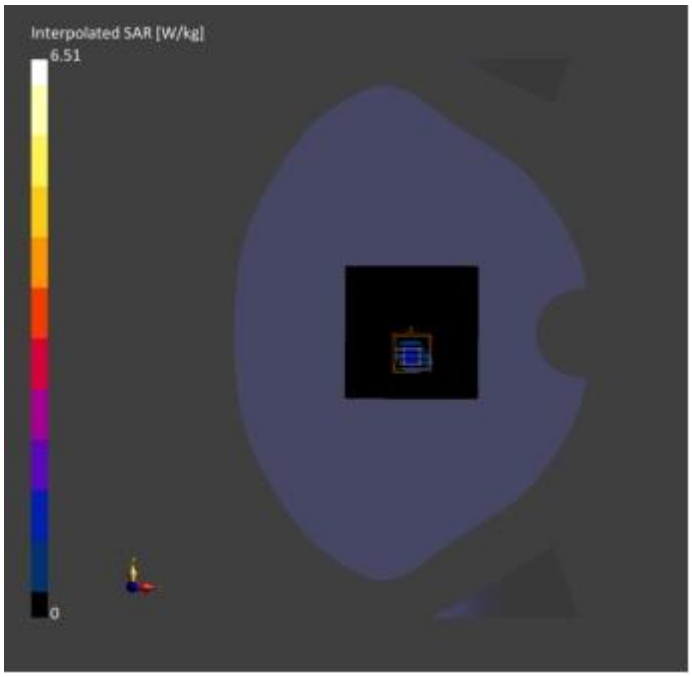
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V5.0 (30deg probe tilt) - 1859	HBBL-600-10000 2024-06-05	EX3DV4 - SN7607, 2023-07-04	DAE4 Sn1710, 2024-01-03

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-05	2024-06-05
psSAR1g [W/kg]	0.993	1.45
psSAR10g [W/kg]	0.296	0.345
Power Drift [dB]	-0.11	-0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		51.5
Dist 3dB Peak [mm]		4.8


Interpolated SAR [W/kg]
6.51
0

ANNEX D EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2450087-AW.pdf”.

ANNEX E SAR TEST SETUP PHOTOS

Please refer the document “BL-SZ2450087-AS.pdf”.

ANNEX F CALIBRATION REPORT

Please refer the document “BL-SZ2450087-AC.pdf”.

ANNEX F TUNE-UP PROCEDURE

Please refer the document “BL-SZ2450087-AT Tune-up Procedure.pdf”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--