TEST REPORT

Applicant Name : Vuzix Corporation
Address : FCC: 25 Hendrix Rd, West Henrietta, New York, United States 14586
ISEDC: 25 Hendrix Road West Henrietta NY 14586 United States Of America (Excluding The States Of Alaska
Report Number : SZNS220630-29398E-SA
FCC ID: 2AA9D-492
IC: 11503A-492

Test Standard (s)

FCC 47 CFR part 2.1093**;** RSS-102 Issue 5 Amendment 1 (February 2, 2021)

Sample Description

Product Type: Shield
Model No.: 492
Multiple Model(s) No.: N/A
Trade Mark: Vuzix
Date Received: 2022/06/30
Date of Test: 2022/08/05-2022/08/06
Report Date: 2022/08/26

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Lance Li
EMC Engineer

Approved By:

Candy Li
EMC Engineer

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<table>
<tr><th colspan="4">Attestation of Test Results</th></tr>
<tr><th colspan="2">MODE</th><th>Max. SAR Level(s) Reported(W/kg)</th><th>Limit (W/kg)</th></tr>
<tr><td>WIFI 2.4G</td><td>1g Head SAR</td><td>0.87</td><td rowspan="6">1.6</td></tr>
<tr><td>WIFI 5.2G</td><td>1g Head SAR</td><td>0.93</td></tr>
<tr><td>WIFI 5.3G</td><td>1g Head SAR</td><td>1.06</td></tr>
<tr><td>WIFI 5.6G</td><td>1g Head SAR</td><td>1.06</td></tr>
<tr><td>WIFI 5.8G</td><td>1g Head SAR</td><td>0.92</td></tr>
<tr><td>Bluetooth</td><td>1g Head SAR</td><td>0.01</td></tr>
<tr><td rowspan="6">Applicable Standards</td><td colspan="3">FCC 47 CFR part 2.1093
Radiofrequency radiation exposure evaluation: portable devices</td></tr>
<tr><td colspan="3">RSS-102 Issue 5 Amendment 1 (February 2, 2021)
Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).</td></tr>
<tr><td colspan="3">Safety Code 6 Health Canada’s Radiofrequency Exposure Guidelines
Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz</td></tr>
<tr><td colspan="3">RF Exposure Procedures: TCB Workshop April 2019</td></tr>
<tr><td colspan="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)</td></tr>
<tr><td colspan="3">KDB procedures
KDB 447498 D01 General RF Exposure Guidance v06
KDB 447498 D04 Interim General RF Exposure Guidance v01
KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02 RF Exposure Reporting v01r02
KDB 248227 D01 802 11 Wi-Fi SAR v02r02</td></tr>
<tr><td colspan="4">Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in Safety Code 6 Health Canada’s Radiofrequency Exposure Guidelines and has been tested in accordance with the measurement procedures specified in IEC/IEEE 62209-1528:2020 and RF exposure KDB procedures.
The results and statements contained in this report pertain only to the device(s) evaluated.</td></tr>
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZNS220630-29398E-SA	Original Report	2022/08/26

EUT DESCRIPTION

This report has been prepared on behalf of ***Vuzix Corporation*** and their product ***Shield***, Model: ***492***, FCC ID: ***2AA9D-492, IC: 11503A-4982*** or the EUT (Equipment under Test) as referred to in the rest of this report.

Technical Specification

HVIN:	492
FVIN:	492
Device Type:	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Proximity sensor for SAR reduction:	None
Face-Head Accessories:	None
Operation Mode :	Bluetooth, BLE, 2.4G WLAN, 5G WLAN
Frequency Band:	Bluetooth: 2402~2480MHz BLE 1M: 2402-2480MHz 2.4G Wi-Fi: 2412-2462MHz 5G Wi-Fi: 5150-5250MHz; 5250-5350MHz ; 5470-5725MHz ; 5725-5850MHz Note: frequency range 5600-5650MHz can`t be use in Canada
Power Source:	Rechargeable Battery
Normal Operation:	head-mounted

REFERENCE, STANDARDS, AND GUIDELINES

FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

IC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ISS-102 for an uncontrolled environment. According to the Safety Code 6 Health Canada’s Radiofrequency Exposure Guidelines, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

SAR Limits

FCC Limit(1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	**1.60**	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

IC Limit(1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	**1.60**	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual 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).

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC) & 2 W/kg (CE) applied to the EUT.

FACILITIES

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358,the FCC Designation No.: CN1189.
Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01 .

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

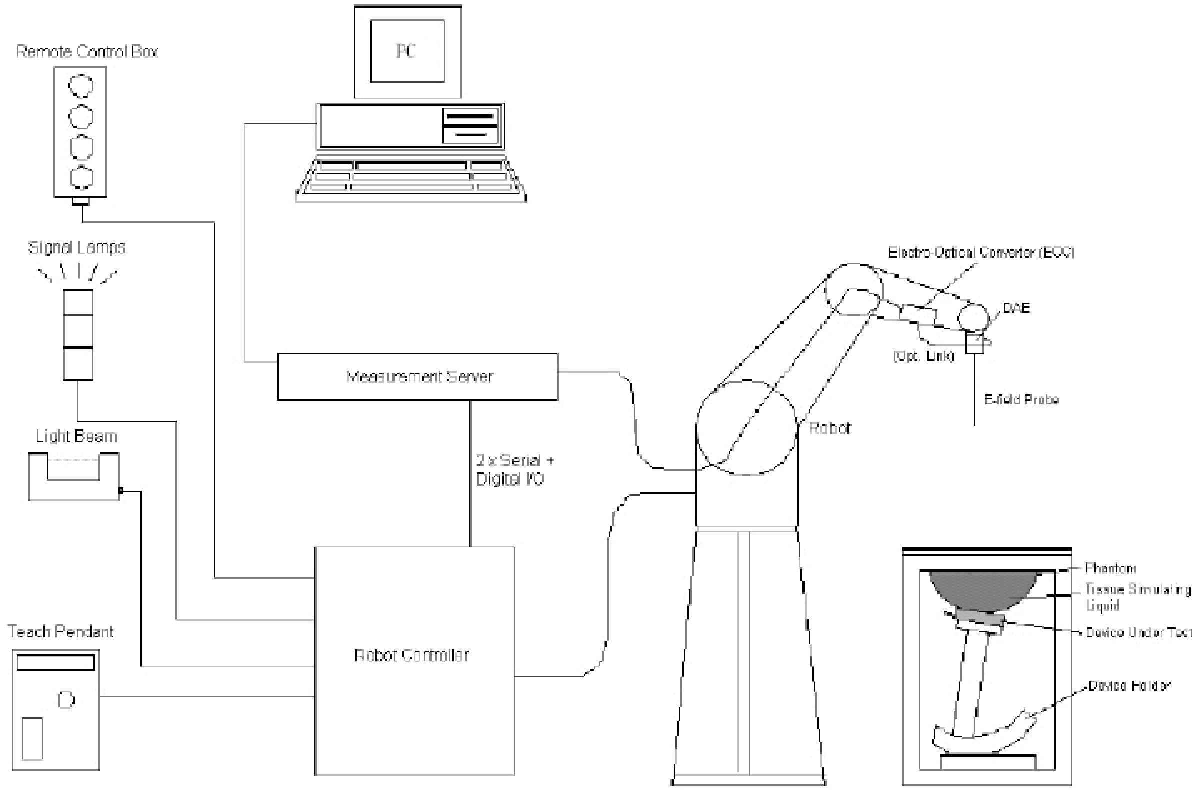
The test site has been registered with ISED Canada under ISED Canada Registration Number CN0016.

DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:

DASY5 System Description

The DASY5 system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal application, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 professional operating system and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

DASY5 Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with a 400 MHz Intel ULV Celeron, 128 MB chip-disk and 128 MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16-bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluations of field measurements and surface detection, controls robot movements, and handles safety operations. The PC operating system cannot interfere with these time-critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program- controlled robot movements. Furthermore, the measurement server is equipped with an expansion port, which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Connection of devices from any other supplier could seriously damage the measurement server.

Data Acquisition Electronics

The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder 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.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 E-Field Probes

Frequency	10 MHz to > 6 GHz Linearity: ±0.2 dB (30 MHz to 6 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μW/g to > 100 mW/g Linearity: ±0.2 dB (noise: typically < 1 μW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

SAM Twin Phantom

The SAM Twin Phantom (shown in front of DASY5) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm..

When the phantom is mounted inside allocated slot of the DASY5 platform, phantom reference points can be taught directly in the DASY5 V5.2 software. When the DASY5 platform is used to mount the

Phantom, some of the phantom teaching points cannot be reached by the robot in DASY5 V5.2. A special tool called P1a-P2aX-Former is provided to transform two of the three points, P1 and P2, to reachable locations. To use these new teaching points, a revised phantom configuration file is required.
In addition to our standard broadband liquids, the phantom can be used with the following tissue simulating liquids:

Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.
DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).

Do not use other organic solvents without previously testing the solvent resistivity of the phantom.
Approximately 25 liters of liquid is required to fill the SAM Twin phantom.

Calibration Frequency Points for EX3DV4 E-Field Probes SN: 7441 Calibrated: 2022/05/16

Calibration Frequency Point(MHz)	Frequency Range(MHz)		Conversion Factor		
	From	To	X	Y	Z
750 Head	650	850	10.04	10.04	10.04
900 Head	850	1000	9.61	9.61	9.61
1450 Head	1350	1550	8.52	8.52	8.52
1750 Head	1650	1850	8.32	8.32	8.32
1900 Head	1850	1950	7.94	7.94	7.94
2000 Head	1950	2100	7.99	7.99	7.99
2300 Head	2200	2400	7.78	7.78	7.78
2450 Head	2400	2550	7.54	7.54	7.54
2600 Head	2550	2700	7.30	7.30	7.30
5250 Head	5140	5360	5.35	5.35	5.35
5600 Head	5490	5700	4.85	4.85	4.85
5750 Head	5700	5860	4.83	4.83	4.83

Area Scans

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

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

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

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

Zoom Scan (Cube Scan Averaging)

Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	3 GHz < $f \leq 10$ GHz
Maximum distance between the closest measured points and the phantom surface (z_{M1} in Figure 20 and Table 3, in mm)	5	$\delta \ln(2)/2$ [a]
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Maximum spacing between measured points in the x- and y-directions (Δx and Δy, in mm)	8	$24 / f$ [b]
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	5	$10 / (f - 1)$
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	4	$12 / f$
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2 / \Delta z_1$ in Figure 20)	1,5	1,5
Minimum edge length of the zoom scan volume in the x- and y-directions (L_z in O.8.3.2, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell (L_h in O.8.3.2 in mm)	30	22
Tolerance in the probe angle	1°	1°

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

[b] This is the maximum spacing allowed, which might not work for all circumstances.

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEC 62209-1528-2020

Recommended Tissue Dielectric Parameters for Head

Table 2 – Dielectric properties of the tissue-equivalent medium

Frequency MHz	Real part of the complex relative permittivity, ε_r'	Conductivity, σ S/m	Penetration depth (E-field), δ mm
4	*55,0*	*0,75*	293,0
13	*55,0*	*0,75*	165,5
30	55,0	0,75	112,8
150	52,3	0,76	62,0
300	45,3	0,87	46,1
450	43,5	0,87	43,0
750	*41,9*	*0,89*	39,8
835	41,5	0,90	39,0
900	41,5	0,97	36,2
1 450	40,5	1,20	28,6
1 800	40,0	1,40	24,3
1 900	40,0	1,40	24,3
1 950	40,0	1,40	24,3
2 000	40,0	1,40	24,3
2 100	*39,8*	*1,49*	22,8
2 450	39,2	1,80	18,7
2 600	*39,0*	*1,96*	17,2
3 000	38,5	2,40	14,0
3 500	*37,9*	*2,91*	11,4
4 000	*37,4*	*3,43*	10,0
4 500	*36,8*	*3,94*	9,7

Frequency MHz	Real part of the complex relative permittivity, ε_r'	Conductivity, σ S/m	Penetration depth (E-field), δ mm
5 000	*36,2*	*4,45*	1,5
5 200	*36,0*	*4,66*	8,4
5 400	*35,8*	*4,86*	8,1
5 600	*35,5*	*5,07*	7,5
5 800	35,3	5,27	7,3
6 000	*35,1*	*5,48*	7,0
6 500	*34,5*	*6,07*	6,7
7 000	*33,9*	*6,65*	6,4
7 500	*33,3*	*7,24*	6,1
8 000	*32,7*	*7,84*	5,9
8 500	*32,1*	*8,46*	5,3
9 000	*31,6*	*9,08*	4,8
9 500	*31,0*	*9,71*	4,4
10 000	*30,4*	*10,40*	4,0

NOTE For convenience, permittivity and conductivity values are linearly interpolated for frequencies that are not a part of the original data from Drossos et al. [2]. They are shown in italics in Table 2. The italicized values are linearly interpolated (below 5800 MHz) or extrapolated (above 5800 MHz) from the non-italicized values that are immediately above and below these values.

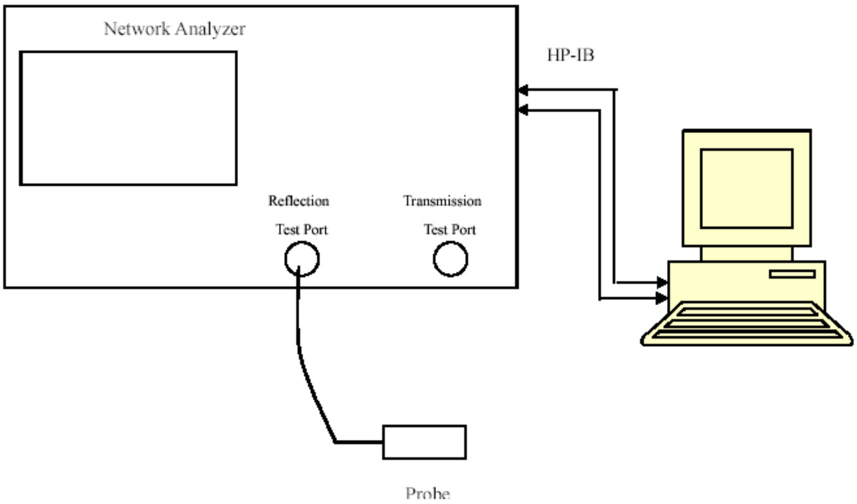
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.4	N/A	NCR	NCR
DASY5 Measurement Server	DASY5 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1211	2022/03/01	2023/02/28
E-Field Probe	EX3DV4	7441	2022/05/16	2023/05/15
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V5.0	1744	NCR	NCR
Dipole,2450MHz	D2450V2	751	2020/10/13	2023/10/12
Dipole,5GHz	D5GHZV2	1301	2020/01/10	2023/01/09
Simulated Tissue Liquid Head	HBBL600-10000V6	SL AAH U16 BC	Each Time	
Network Analyzer	8753D	3410A08288	2022/7/05	2023/7/04
Dielectric Assessment Kit	DAK-3.5	1320	NCR	NCR
Signal Generator	SMB100A	108362	2021/12/24	2022/12/23
USB wideband power sensor	U2021XA	MY52350001	2021/12/24	2022/12/23
Power Amplifier	CBA 1G-070	T44328	2021/12/24	2022/12/23
Linear Power Amplifier	AS0860-40/45	1060913	2021/12/24	2022/12/23
Directional Coupler	4223-20	3.113.277	2021/12/24	2022/12/23
6dB Attenuator	8493B 6dB Attenuator	2708A 04769	2021/12/24	2022/12/23

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	Ơ (S/m)	ε_r	Ơ (S/m)	$\Delta\varepsilon_r$	ΔƠ	
2402	Simulated Tissue Liquid Head	39.641	1.792	39.26	1.78	0.97	0.67	±5
2412	Simulated Tissue Liquid Head	39.221	1.780	39.28	1.77	-0.15	0.56	±5
2437	Simulated Tissue Liquid Head	39.326	1.833	39.22	1.79	0.27	2.4	±5
2441	Simulated Tissue Liquid Head	39.257	1.798	39.22	1.79	0.09	0.45	±5
2450	Simulated Tissue Liquid Head	39.870	1.841	39.20	1.80	1.71	2.28	±5
2462	Simulated Tissue Liquid Head	39.389	1.866	39.17	1.82	0.56	2.53	±5
2480	Simulated Tissue Liquid Head	39.054	1.847	39.18	1.81	-0.32	2.04	±5

**Liquid Verification was performed on 2022/08/05.*

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	Ơ (S/m)	ε_r	Ơ (S/m)	$\Delta\varepsilon_r$	ΔƠ	
5190	Simulated Tissue Liquid Head	36.904	4.614	36.02	4.65	2.45	-0.77	±5
5230	Simulated Tissue Liquid Head	36.305	4.667	35.96	4.70	0.96	-0.7	±5
5250	Simulated Tissue Liquid Head	36.955	4.682	35.95	4.71	2.8	-0.59	±5
5270	Simulated Tissue Liquid Head	36.860	4.674	35.93	4.71	2.59	-0.76	±5
5310	Simulated Tissue Liquid Head	36.322	4.665	35.85	4.72	1.32	-1.17	±5

**Liquid Verification was performed on 2022/08/05.*

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	Ơ(S/m)	ε_r	Ơ(S/m)	$\Delta\varepsilon_r$	ΔƠ	
5510	Simulated Tissue Liquid Head	35.750	5.008	35.65	4.97	0.28	0.76	±5
5550	Simulated Tissue Liquid Head	35.978	5.098	35.53	5.05	1.26	0.95	±5
5600	Simulated Tissue Liquid Head	35.886	5.114	35.50	5.07	1.09	0.87	±5
5670	Simulated Tissue Liquid Head	35.289	5.232	35.40	5.17	-0.31	1.2	±5

**Liquid Verification was performed on 2022/08/05.*

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	Ơ (S/m)	ε_r	Ơ (S/m)	$\Delta\varepsilon_r$	ΔƠ	
5755	Simulated Tissue Liquid Head	35.317	5.166	35.36	5.21	-0.12	-0.84	±5
5795	Simulated Tissue Liquid Head	35.435	5.250	35.30	5.27	0.38	-0.38	±5
5800	Simulated Tissue Liquid Head	35.528	5.250	35.30	5.27	0.65	-0.38	±5

**Liquid Verification was performed on 2022/08/06.*

System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

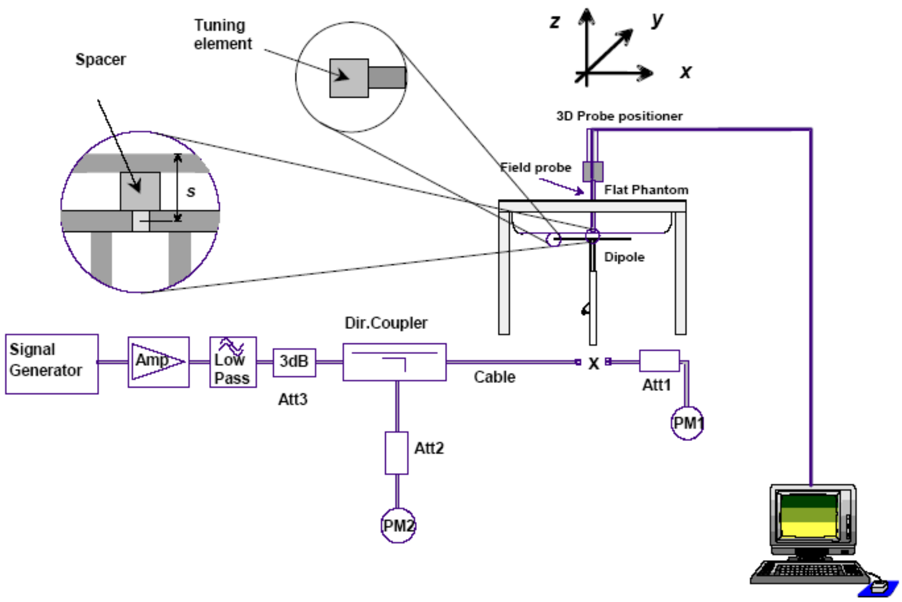
The spacing distances in the **System Verification Setup Block Diagram** is given by the following:

a) s = 15 mm ± 0.2 mm for 300 MHz ≤ f ≤ 1000 MHz;

b) s = 10 mm ± 0.2 mm for 1000 MHz < f ≤ 6000 MHz;

c) s = 5 mm ± 0.1 mm for 6000 MHz < f ≤ 10000 MHz.

System Verification Setup Block Diagram



System Accuracy Check Results

Date	Frequency Band	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/kg)	Delta (%)	Tolerance (%)
2022/08/05	2450 MHz	Head	100	1g	5.43	54.3	53	2.453	±10
2022/08/05	5250 MHz	Head	100	1g	8.28	82.8	80.7	2.602	±10
2022/08/05	5600 MHz	Head	100	1g	8.48	84.8	85.1	-0.353	±10
2022/08/06	5800 MHz	Head	100	1g	7.98	7.98	80.2	-0.499	±10

*The SAR values above are normalized to 1 Watt forward power.

SAR SYSTEM VALIDATION DATA

System Performance 2450MHz

DUT: D2450V2; Type: 2450 MHz; Serial: 751

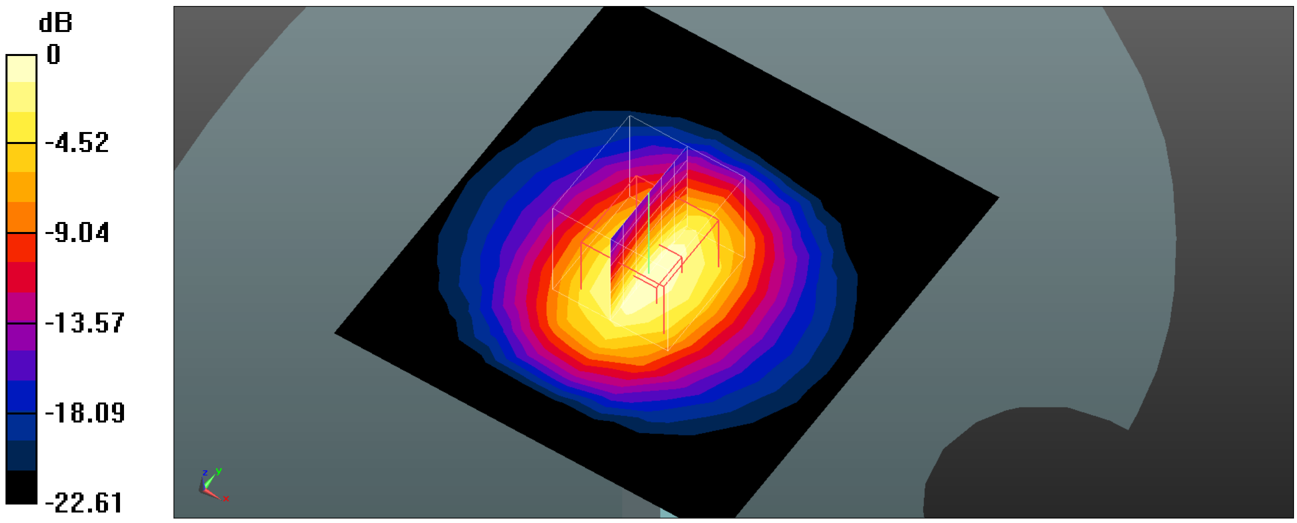
Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.841 S/m; ε_r = 39.87; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4- SN7441; ConvF(7.54, 7.54, 7.54); Calibrated: 2022/05/16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1211; Calibrated: 2022/03/01
- Phantom: Twin SAM; Type: QD000P40CD; Serial: 1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Cheek at 2450MHz/d=10mm, Pin=100mw/Area Scan (101x111x1): Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 5.98 W/kg

System Performance Cheek at 2450MHz/d=10mm, Pin=100mw/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.67 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 6.17 W/kg
SAR(1 g) = 5.43 W/kg; SAR(10 g) = 2.45 W/kg
Maximum value of SAR (measured) = 5.68 W/kg



0 dB = 5.68 W/kg = 7.54 dBW/kg

System Performance 5250 MHz Head

DUT: Dipole 5GHz Type: D5GHZV2; Serial: 1301

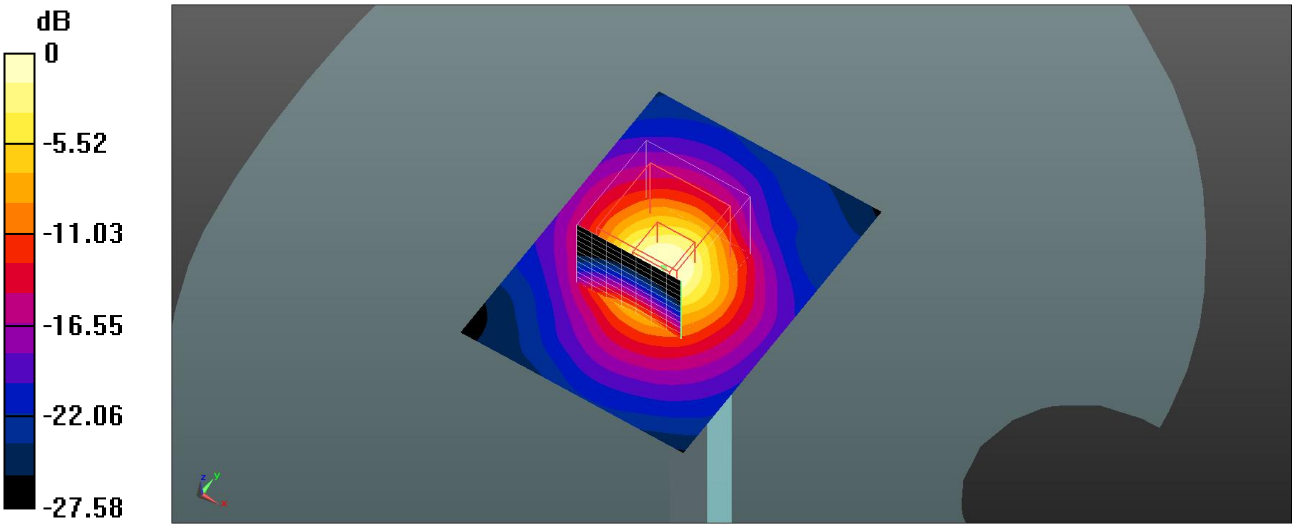
Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5250 MHz; σ = 4.682 S/m; ε_r = 36.955; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4- SN7441; ConvF(5.35, 5.35, 5.35); Calibrated: 2022/05/16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1211; Calibrated: 2022/03/01
- Phantom: Twin SAM; Type: QD000P40CD; Serial: 1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Head 5250MHz Pin=100mW/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.9 W/kg

Head 5250MHz Pin=100mW/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 70.82 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 28.8 W/kg
SAR(1 g) = 8.28 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 16.3 W/kg



0 dB = 16.3 W/kg = 12.12 dBW/kg

System Performance 5600 MHz Head

DUT: Dipole 5GHz Type: D5GHZV2; Serial: 1301

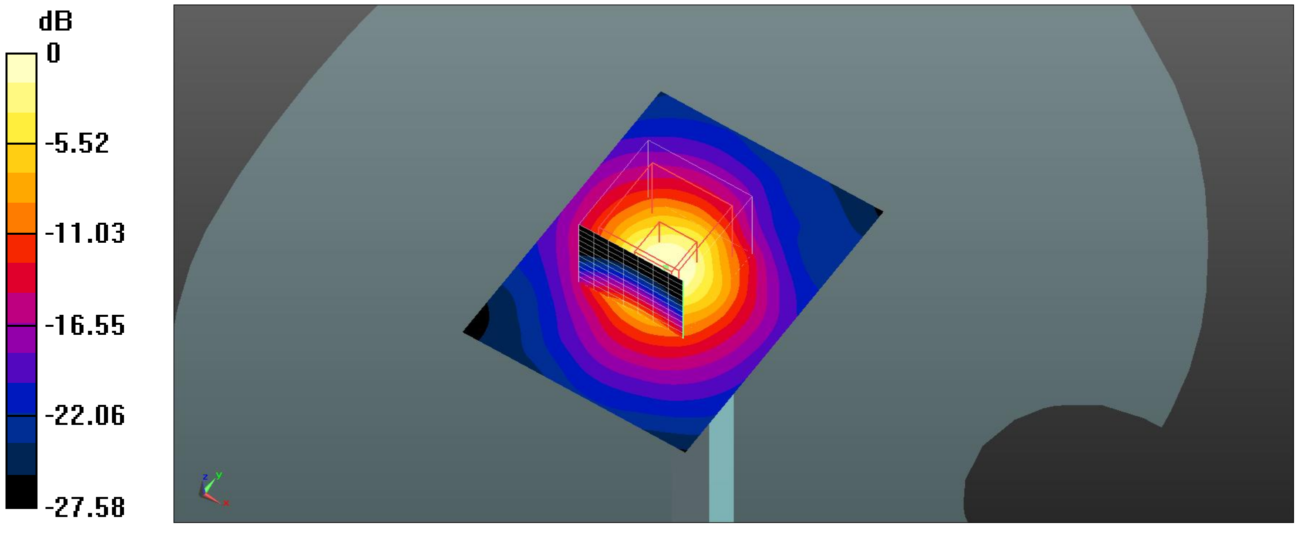
Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.114 S/m; ε_r = 35.886; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4- SN7441; ConvF(4.85, 4.85, 4.85); Calibrated: 2022/05/16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1211; Calibrated: 2022/03/01
- Phantom: Twin SAM; Type: QD000P40CD; Serial: 1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Head 5600MHz Pin=100mW/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 18.3 W/kg

Head 5600MHz Pin=100mW/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 78.05 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 8.48 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 17.8 W/kg



0 dB = 17.8 W/kg = 12.50 dBW/kg

System Performance 5800 MHz

DUT: Dipole 5GHz Type: D5GHZV2; Serial: 1301

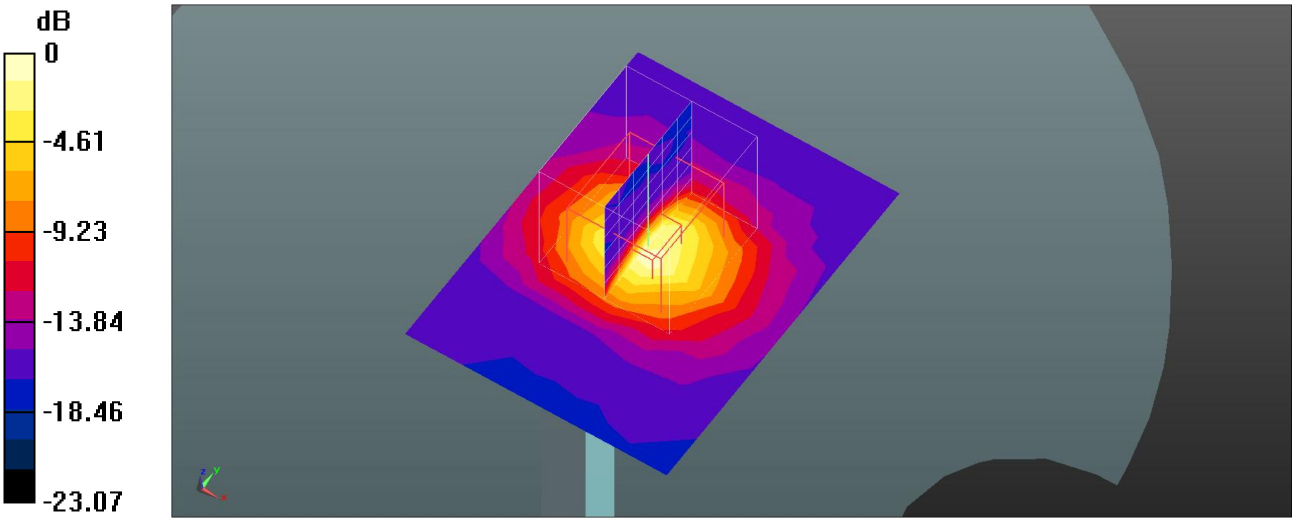
Communication System: UID 0, CW (0); Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.25 S/m; ε_r = 35.528; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4- SN7441; ConvF(4.83, 4.83, 4.83); Calibrated: 2022/05/16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1211; Calibrated: 2022/03/01
- Phantom: Twin SAM; Type: QD000P40CD; Serial: 1744
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Cheek at 5800MHz/d=10mm, Pin=100mw/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.9 W/kg

System Performance Cheek at 5800MHz/d=10mm, Pin=100mw/Zoom Scan (8x8x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 38.15 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 20.6 W/kg
SAR(1 g) = 7.98 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 9.83 W/kg



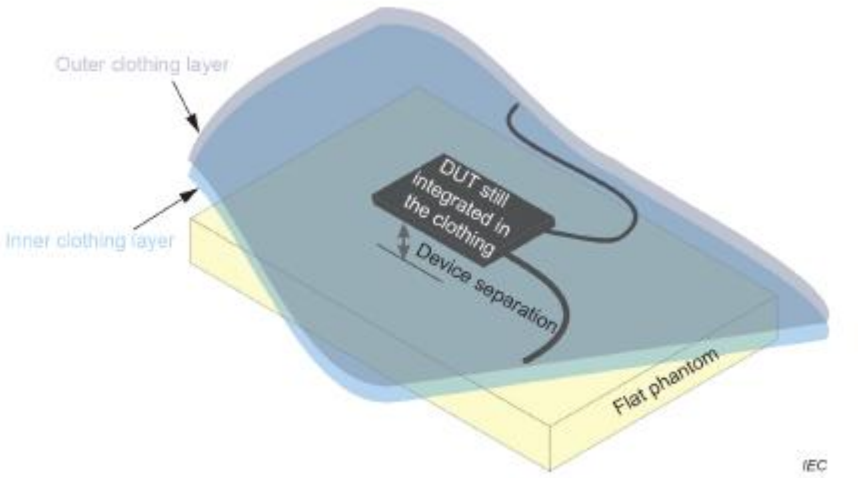
0 dB = 9.83 W/kg = 9.93 dBW/kg

EUT TEST STRATEGY AND METHODOLOGY

Test positions for Clothing-integrated device

A typical example of a clothing-integrated device is a wireless communication device integrated into a jacket to provide voice communications through an embedded speaker and microphone. This category also includes head-mounted devices with integrated wireless communication devices.

To assess this type of device, the following applies.



Test Distance for SAR Evaluation

Devices integrated in head-mounted devices may be tested using the SAM phantom or specific phantoms.For this case the EUT(Equipment Under Test) is set 0mm away from the phantom, the test distance is 0mm.

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or radiating structures of the EUT, the horizontal grid spacing was 15 mm x 15 mm, and the SAR distribution was determined by integrated grid of 1.5mm x 1.5mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the “Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

CONDUCTED OUTPUT POWER MEASUREMENT

Maximum Target Output Power

Max Target Power(dBm)			
Mode/Band	Channel		
	Low	Middle	High
WLAN 2.4G(802.11b)	17.0	17.0	17.0
WLAN 2.4G(802.11g)	15.0	15.0	15.0
WLAN 2.4G(802.11n)	15.0	15.0	15.0
WLAN 5.2G(802.11a)	15.5	15.5	15.5
WLAN 5.2G(802.11n20)	15.5	15.5	15.5
WLAN 5.2G(802.11n40)	16.0	/	16.0
WLAN 5.2G(802.11ac20)	15.5	15.5	15.5
WLAN 5.2G(802.11ac40)	16.0	/	16.0
WLAN 5.2G(802.11ac80)	/	15.0	/
WLAN 5.3G(802.11a)	15.0	15.0	15.0
WLAN 5.3G(802.11n20)	14.5	14.5	14.5
WLAN 5.3G(802.11n40)	15.5	/	15.5
WLAN 5.3G(802.11ac20)	14.5	14.5	14.5
WLAN 5.3G(802.11ac40)	15.0	/	15.0
WLAN 5.3G(802.11ac80)	/	14.5	/
WLAN 5.6G(802.11a)	16.0	16.0	16.0
WLAN 5.6G(802.11n20)	16.0	16.0	16.0
WLAN 5.6G(802.11n40)	16.5	16.5	16.5
WLAN 5.6G(802.11ac20)	15.5	15.5	15.5
WLAN 5.6G(802.11ac40)	16.5	16.5	16.5
WLAN 5.6G(802.11ac80)	15.5	/	15.5
WLAN 5.8G(802.11a)	15.5	15.5	15.5
WLAN 5.8G(802.11n20)	15.5	15.5	15.5
WLAN 5.8G(802.11n40)	16.0	/	16.0
WLAN 5.8G(802.11ac20)	15.5	15.5	15.5
WLAN 5.8G(802.11ac40)	16.0	/	16.0
WLAN 5.8G(802.11ac80)	/	15.5	/
Bluetooth(BDR)	12.5	12.5	12.5
Bluetooth(EDR)	11.5	11.5	11.5
BLE 1M	8.0	7.0	8.0
BLE 2M	7.0	7.0	8.0

Test Results:

Wi-Fi 2.4G:

Mode	Channel frequency (MHz)	Data Rate	Conducted Output Power(dBm)
802.11b	2412	1Mbps	16.47
	2437		16.52
	2462		16.36
802.11g	2412	6Mbps	14.71
	2437		14.63
	2462		14.64
802.11n HT20	2412	MCS0	14.50
	2437		14.42
	2462		14.50
802.11n HT40	2422	MCS0	14.56
	2437		14.72
	2452		14.76

Wi-Fi 5.2G:

Mode	Channel frequency	Data Rate	RF Output Power(dBm)
802.11a	5180	6Mbps	15.22
	5200		15.08
	5240		14.56
802.11n HT20	5180	MCS0	15.15
	5200		15.09
	5240		14.43
802.11n HT40	5190	MCS0	15.74
	5230		15.46
802.11AC20	5180	MCS0	15.08
	5200		14.96
	5240		14.50
802.11AC40	5190	MCS0	15.71
	5230		15.33
802.11AC80	5210	MCS0	14.95

Wi-Fi 5.3G:

Mode	Channel frequency (MHz)	Data Rate	Conducted Output Power(dBm)
802.11a	5260	6Mbps	14.49
	5280		14.38
	5320		14.55
802.11n20	5260	MCS0	14.48
	5280		14.22
	5320		14.28
802.11n40	5270	MCS0	15.03
	5310		14.96
802.11ac20	5260	MCS0	14.37
	5280		14.27
	5320		14.35
802.11ac40	5270	MCS0	14.88
	5310		14.88
802.11ac80	5290	MCS0	14.27

Wi-Fi 5.6G:

Mode	Channel frequency (MHz)	Data Rate	Conducted Output Power(dBm)
802.11a	5500	6Mbps	15.57
	5580		15.05
	5700		14.63
802.11n20	5500	MCS0	15.56
	5580		14.78
	5700		14.54
802.11n40	5510	MCS0	16.19
	5550		15.70
	5670		15.09
802.11ac20	5500	MCS0	15.49
	5580		14.80
	5700		14.65
802.11ac40	5510	MCS0	16.09
	5550		15.69
	5670		15.10
802.11ac80	5530	MCS0	15.26
	5610		14.74

Wi-Fi 5.8G:

Mode	Channel frequency (MHz)	Data Rate	Conducted Output Power(dBm)
802.11a	5745	6Mbps	14.93
	5785		15.49
	5825		15.15
802.11n HT20	5745	MCS0	14.66
	5785		15.31
	5825		15.06
802.11n HT40	5755	MCS0	15.55
	5795		15.90
802.11AC20	5745	MCS0	14.71
	5785		15.32
	5825		15.03
802.11AC40	5755	MCS0	15.52
	5795		15.88
802.11AC80	5775	MCS0	15.07

Bluetooth:

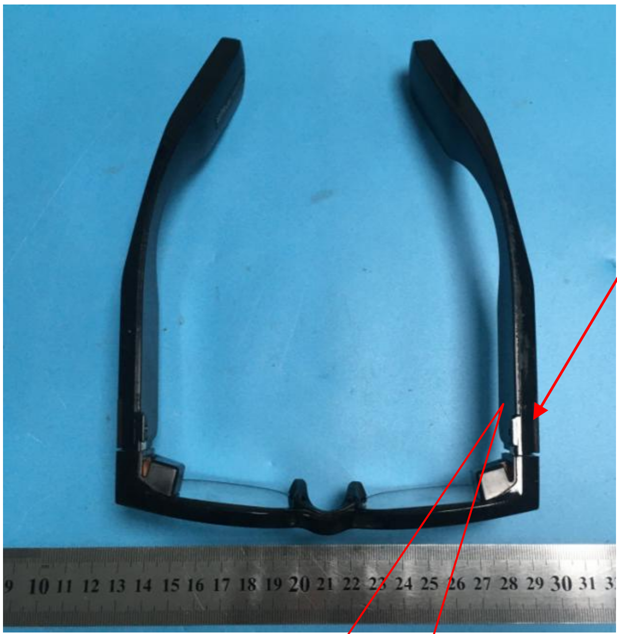
Mode	Channel frequency (MHz)	Conducted Output Power(dBm)
BDR(GFSK)	2402	12.42
	2441	11.98
	2480	11.31
EDR(π/4-DQPSK)	2402	11.30
	2441	10.87
	2480	10.84
EDR(8DPSK)	2402	11.46
	2441	11.00
	2480	11.02
BLE_1M	2402	7.04
	2440	5.61
	2480	7.51
BLE_2M	2402	6.02
	2440	5.74
	2480	7.58

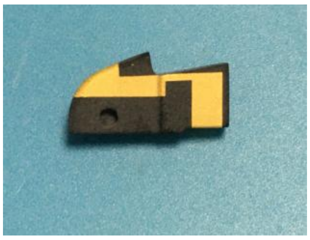
Duty cycle

Test Mode	Channel	Duty Cycle [%]
Bluetooth	2441	76.96
BLE_1M	2440	61.90
BLE_2M	2440	33.33
11B	2437	99.03
11G	2437	97.93
11N20SISO	2437	97.93
11N40SISO	2437	94.90
11A	5200	98.16
	5280	98.16
	5580	98.16
	5785	98.16
11N20SISO	5200	98.03
	5280	98.08
	5580	98.03
	5785	98.08
11N40SISO	5190	96.17
	5270	96.17
	5550	96.06
	5755	96.17
11AC20SISO	5200	97.99
	5280	97.99
	5580	97.99
	5785	98.04
11AC40SISO	5190	96.10
	5270	96.09
	5550	96.09
	5755	96.09
11AC80SISO	5210	92.53
	5290	92.31
	5530	92.49
	5775	92.31

Standalone SAR test exclusion considerations

Antennas Location:



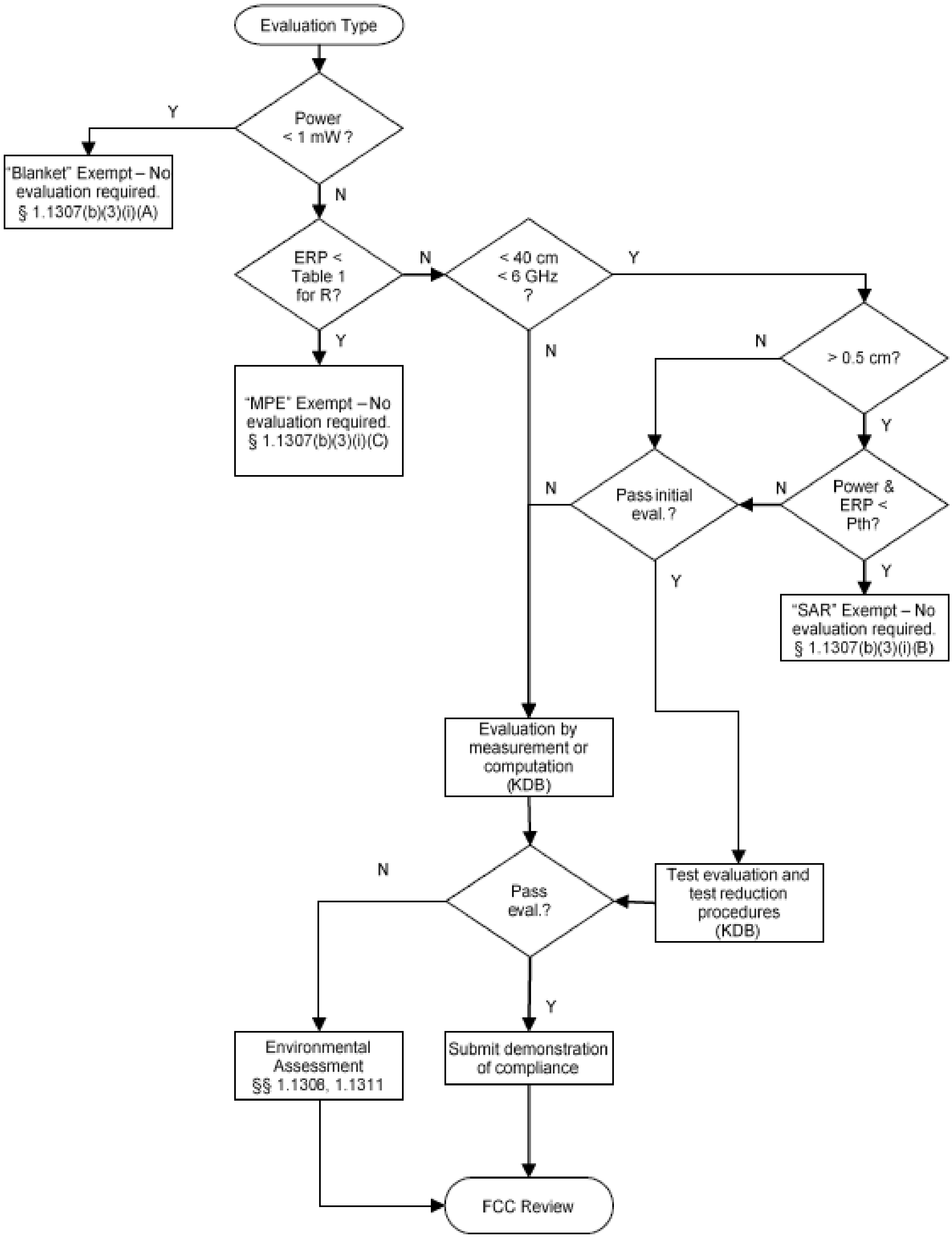


WLAN&BT Antenna

This front (In-side) Side touch to Phantom for SAR test

Standalone SAR test exclusion considerations(KDB):

General Sequence for Determination of Procedure (exemption or evaluation) to Establish Compliance with Exposure Limits for a Single RF Source:



Mode	Frequency (MHz)	Max Target Power (dBm)	Antenna gain (dBi)	P_{Max} (dBm)	P_{Max} (mW)	Distance (mm)	P_{th} (mW)	SAR Test Exclusion?
WLAN	2462	17.0	1.5	17.0	50.12	< 5	2.73	No
WLAN	5240	16.0	1.4	16.0	39.81	< 5	1.49	No
WLAN	5320	15.5	1.4	15.5	35.48	< 5	1.47	No
WLAN	5700	16.5	1.4	16.5	44.67	< 5	1.40	No
WLAN	5825	16.0	1.4	16.0	39.81	< 5	1.37	No
Bluetooth	2480	12.5	1.5	12.5	17.78	< 5	2.72	No

Note:
1. ERP= Max Target Power+ Antenna gain-2.15
2. P_{Max} refers to the greater value in the Max Target Power and ERP.
3. The formula for calculating P_{th} is given below, with distances ranging from 20cm to 40cm.

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

4. The formula for calculating P_{th} is given below, with distances ranging from 0.5cm to 40cm.

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

where

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

and *f* is in GHz, *d* is the separation distance (cm), and ERP_{20cm} is per Formula (Note 3).
5. When the separation distance is less than 0.5cm, 0.5cm is used as the calculation distance

Standalone SAR test exclusion for the EUT Edge considerations
[RSS-102 Issue 5 Amendment 1 (February 2, 2021)]

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Standalone SAR test exclusion for the EUT Edge considerations (RSS-102)

Antenna	Frequency (MHz)	Max Target Power (dBm)	Antenna gain (dBi)	P_{Max} (dBm)	P_{Max} (mW)	Distance (mm)	P_{th} (mW)	SAR Test Exclusion?
WLAN	2462	17.0	1.5	18.50	70.79	< 5	4	No
WLAN	5240	16.0	1.4	17.40	54.95	< 5	1	No
WLAN	5320	15.5	1.4	16.90	48.98	< 5	1	No
WLAN	5700	16.5	1.4	17.90	61.66	< 5	1	No
WLAN	5825	16.0	1.4	17.40	54.95	< 5	1	No
Bluetooth	2480	12.5	1.5	14.00	25.12	< 5	4	No

Note:
1. EIRP= Max Target Power+ Antenna gain.
2. P_{Max} refers to the greater value in the Max Target Power and EIRP.

Corrected SAR Evaluation

IEC/IEEE 62209-1528:2020

7.8.2 SAR correction formula

From Douglas et al. ([28], [29]), a linear relationship was found between the percentage change in SAR (denoted ΔSAR) and the percentage change in the permittivity and conductivity from the target values in Table 2 (denoted $\Delta\varepsilon_r$ and $\Delta\sigma$, respectively). This linear relationship agrees with the results of Kuster and Balzano [30] and Bit-Babik et al. [31]. The relationship is given by:

$$\Delta SAR = c_\varepsilon \Delta\varepsilon_r + c_\sigma \Delta\sigma \tag{8}$$

where

c_ε = $\partial(\Delta SAR)/\partial(\Delta\varepsilon)$ is the coefficient representing the sensitivity of SAR to permittivity where SAR is normalized to output power;

c_σ = $\partial(\Delta SAR)/\partial(\Delta\sigma)$ is the coefficient representing the sensitivity of SAR to conductivity, where SAR is normalized to output power.

The values of c_ε and c_σ have a simple relationship with frequency that can be described using polynomial equations. For dipole antennas at frequencies from 4 MHz to 6 GHz, the 1 g averaged SAR c_ε and c_σ are given by

$$c_\varepsilon = -7{,}854\times10^{-4} f^3 + 9{,}402\times10^{-3} f^2 - 2{,}742\times10^{-2} f - 0{,}202\,6 \tag{9}$$

$$c_\sigma = 9{,}804\times10^{-3} f^3 - 8{,}661\times10^{-2} f^2 + 2{,}981\times10^{-2} f + 0{,}782\,9 \tag{10}$$

where f is the frequency in GHz. Above 6 GHz, the sensitivity is non-varying with frequency due to the small penetration depth; the values of c_ε = −0,198 and c_σ = 0 shall be used.

For frequencies from 4 MHz to 6 GHz, the 10 g averaged SAR c_ε and c_σ are given by:

$$c_\varepsilon = 3{,}456\times10^{-3} f^3 - 3{,}531\times10^{-2} f^2 + 7{,}675\times10^{-2} f - 0{,}186\,0 \tag{11}$$

$$c_\sigma = 4{,}479\times10^{-3} f^3 - 1{,}586\times10^{-2} f^2 - 0{,}197\,2 f + 0{,}771\,7 \tag{12}$$

Calibrate Date	Liquid Type	Frequency (MHz)	C_{ε}	$\triangle\varepsilon_r$	C_{δ}	$\triangle_{\delta}$	△SAR (%)
2022/08/05	Head	2402	-0.225	0.97	0.491	0.67	0.111
		2412	-0.225	-0.15	0.489	0.56	0.308
		2437	-0.225	0.27	0.483	2.4	1.098
		2441	-0.225	0.09	0.482	0.45	0.197
		2450	-0.225	1.71	0.480	2.28	0.71
		2462	-0.225	0.56	0.478	2.53	1.083
		2480	-0.225	-0.32	0.474	2.04	1.039
		5190	-0.201	2.45	-0.025	-0.77	-0.473
		5230	-0.201	0.96	-0.028	-0.7	-0.173
		5250	-0.201	2.8	-0.029	-0.59	-0.546
		5270	-0.201	2.59	-0.030	-0.76	-0.498
		5310	-0.201	1.32	-0.033	-1.17	-0.227
		5510	-0.200	0.28	-0.042	0.76	-0.088
		5550	-0.199	1.26	-0.043	0.95	-0.292
		5600	-0.199	1.09	-0.045	0.87	-0.256
		5670	-0.199	-0.31	-0.045	1.2	0.008
2022/08/06	Head	5755	-0.199	-0.12	-0.045	-0.84	0.062
		5795	-0.199	0.38	-0.045	-0.38	-0.059
		5800	-0.199	0.65	-0.045	-0.38	-0.112

Note:

1. According to **Notice 2012-DRS0529**, if the correction △SAR has a negative sign, **the measured SAR result should be corrected**, and has a positive sign, the measured SAR result shall not be corrected.
2. **Scaled SAR = Correct SAR*(1-△SAR%)**

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	22.3-23.2 ℃	22.5-23.4 ℃
Relative Humidity:	42-53%	45-56%
ATM Pressure:	101.5 kPa	101.3 kPa
Test Date:	2022/08/05	2022/08/06

Testing was performed by Seven Liang, Jacky Yang.

WLAN 2.4G:

Test Mode	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg), Limited=1.6 W/kg					
					Scaled Factor	Duty cycle (%)	Meas.	Scaled SAR	Correct SAR	Plot
802.11b	Front to Phantom (0mm)	2412	16.47	17.0	1.130	99.03	0.764	0.87	0.87	1#
		2437	16.52	17.0	1.117	99.03	0.697	0.79	0.79	2#
		2462	16.36	17.0	1.159	99.03	0.662	0.77	0.77	3#

WLAN 5.2G:

Test Mode	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg), Limited=1.6 W/kg					
					Scaled Factor	Duty cycle (%)	Meas.	Scaled SAR	Correct SAR	Plot
802.11n40	Front to Phantom (0mm)	5190	15.74	16.0	1.062	96.17	0.73	0.81	0.81	4#
		5230	15.46	16.0	1.132	96.17	0.786	0.93	0.93	5#

WLAN 5.3G:

Test Mode	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg), Limited=1.6 W/kg					
					Scaled Factor	Duty cycle (%)	Meas.	Scaled SAR	Correct SAR	Plot
802.11n40	Front to Phantom (0mm)	5270	15.03	15.5	1.114	96.17	0.852	0.99	0.99	6#
		5310	14.96	15.5	1.132	96.17	0.9	1.06	1.06	7#

WLAN 5.6G:

Test Mode	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg), Limited=1.6 W/kg					
					Scaled Factor	Duty cycle (%)	Meas.	Scaled SAR	Correct SAR	Plot
802.11n40	Front to Phantom (0mm)	5510	16.19	16.5	1.074	96.06	0.867	0.97	0.97	8#
		5550	15.70	16.5	1.202	96.06	0.867	1.09	1.09	9#
		5670	15.09	16.5	1.384	96.06	0.733	1.06	1.06	10#

WLAN 5.8G:

Test Mode	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg), Limited=1.6 W/kg					
					Scaled Factor	Duty cycle (%)	Meas.	Scaled SAR	Correct SAR	Plot
802.11n40	Front to Phantom (0mm)	5755	15.55	16.0	1.109	96.17	0.797	0.92	0.92	11#
		5795	15.90	16.0	1.023	96.17	0.845	0.90	0.90	12#

Bluetooth:

Test Mode	EUT Position	Frequency (MHz)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg), Limited=1.6 W/kg					
					Scaled Factor	Duty cycle (%)	Meas.	Scaled SAR	Correct SAR	Plot
GFSK	Front to Phantom (0mm)	2402	12.42	12.5	1.019	76.96	0.005	0.01	0.01	13#
		2441	11.98	12.5	1.127	76.96	0.005	0.01	0.01	14#
		2480	11.31	12.5	1.315	76.96	0.005	0.01	0.01	15#

Note:
1. Based on the Notice 2016-DRS001 requirements, the low, mid and high frequency channels for the configuration with the highest SAR value must be tested regardless of the SAR value measured.
2. 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, OFDM SAR is not required.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
4. 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 80211b/g/n mode is use for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.
5. According to IEC/IEEE 62209-1528:2020, If the correction ΔSAR has a positive sign, the measured SAR results shall not be corrected.
6. According 2016 Oct. TCB, for SAR testing of WLAN and Bluetooth signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)".
7. According to IEC/IEEE 62209-1528 section 7.2.4.1.12, only Front Side touch to head for use with normal condition.
8. The electrical properties of the equipment were not damaged during the test

2.4GHz 802.11g/n OFDM SAR Test Exclusion Consideration:

Modulation Mode	P_{avg} (dBm)	P_{avg} (mW)	Reported SAR (W/Kg)	Adjusted SAR (W/kg)	Limit (W/Kg)	SAR Test Exclusion
802.11b(DSSS)	17.0	50.119	0.66	/	/	/
802.11g(OFDM)	15.0	31.623	/	0.42	1.2	Yes
802.11n20(OFDM)	15.0	31.623	/	0.42	1.2	Yes
802.11n40(OFDM)	15.0	31.623	/	0.42	1.2	Yes

Note:

According to section 5.2.2 of KDB 248227 D01, 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, SAR is not required for 2.4 GHz OFDM conditions.

SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results

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

Note: The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

The Highest Measured SAR Configuration in Each Frequency Band

SAR probe calibration point	Frequency Band	Freq.(MHz)	EUT Position	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
				Original	Repeated	
5250MHz (5140-5360MHz)	5.3G WLAN	5270	Front to Phantom (0mm)	0.900	0.891	1.01
5600 (5490-5700MHz)	5.6G WLAN	5550	Front to Phantom (0mm)	0.867	0.850	1.02
5800 (5700-5860MHz)	5.8G WLAN	5795	Front to Phantom (0mm)	0.845	0.836	1.01

Note:

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.
2. The measured SAR results **do not** have to be scaled to the maximum tune-up tolerance to determine if repeated measurements are required.
3. SAR measurement variability must be assessed for each frequency band, which is determined by the **SAR probe calibration point and tissue-equivalent medium** used for the device measurements..

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities		
Transmitter Combination	**Simultaneous?**	**Hotspot?**
2.4G WLAN + 5G WLAN	×	×
2.4G WLAN + Bluetooth	×	×
5G WLAN + Bluetooth	×	×

This portable device has no Simultaneous Transmission

SAR Plots

Please Refer to the Attachment.

APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

Measurement uncertainty evaluation for IEC/IEEE 62209-1528:2020 SAR test

$$\Delta SAR = LIN + ISO + DAE + AMB + \frac{2}{\delta}\Delta_{xyz} + DAT + 2DIS + H + D_{xyz} + MOD + RF_{\text{drift}}$$

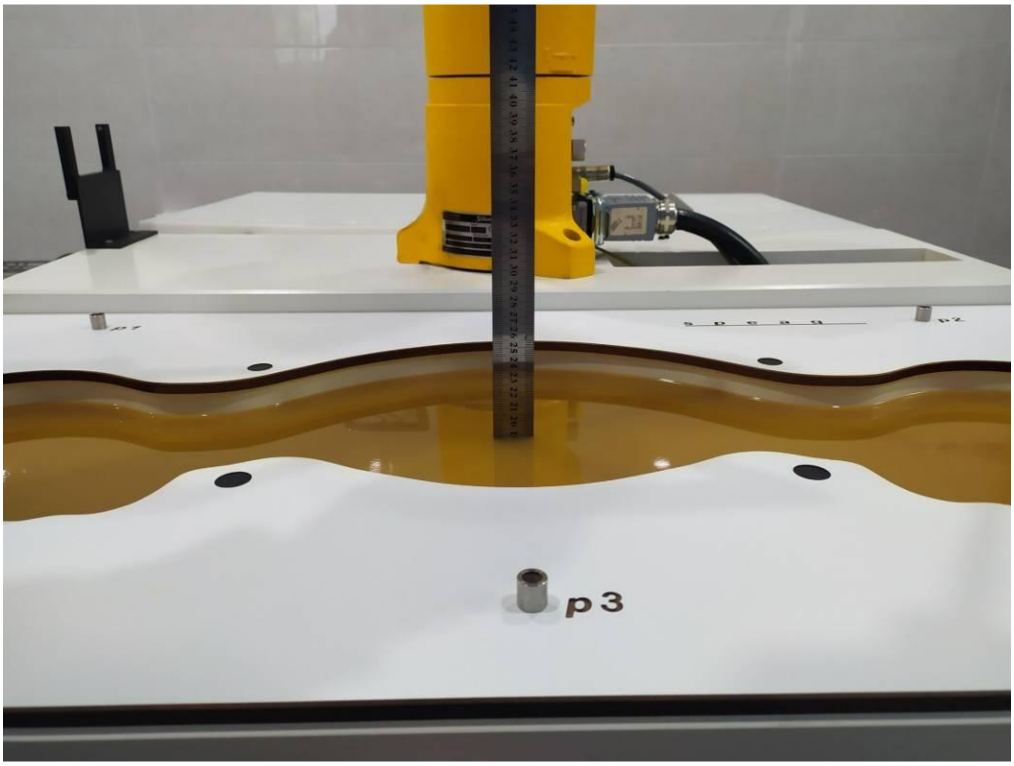
Symbol	Input quantity X_i (source of uncertainty)	Ref.	Prob Dist.[a] PDF_i	Unc. $a(x_i)$	Div.[a] q_i	$u(x_i)=a(x_i)/q_i$	c_i	$u(y)=c_i \cdot u(x_i)$	v_i
	Measurement system errors								
CF	Probe calibration	8.4.1.1	N (k=2)	6.55	2	3.3	1	3.3	∞
CF_{drift}	Probe calibration drift	8.4.1.2	R	1.0	√3	0.6	1	0.6	∞
LIN	Probe linearity and detection limit	8.4.1.3	R	4.7	√3	3.3	1	3.3	∞
BBS	Boundary signal	8.4.1.4	R	1.0	√3	0.6	1	0.6	∞
ISO	Probe isotropy	8.4.1.5	R	9.6	√3	5.5	1	5.5	∞
DAE	Other probe and data acquistion errors	8.4.1.6	N	1.0	1	1.0	1	1.0	∞
AMB	RF ambient and noise	8.4.1.7	N	1.0	1	1.0	1	1.0	∞
Δ_{xyz}	Probe positioning errors	8.4.1.8	N	0.8	1	0.8	2/δ	0.9	∞
DAT	Data processing errors	8.4.1.9	N	2.0	1	2.0	1	2.0	∞
	Phantom and device(DUT or validation antenna)errors								
$LIQ(\sigma)$	Measurement of phantom conductivity(σ)	8.4.2.1	N	2.5	1	2.5	1	2.5	∞
$LIQ(Tc)$	Temperature effects(medium)	8.4.2.2	R	0.1	√3	0.05	1	0.05	∞
EPS	Shell permittivity	8.4.2.3	R	4.0	√3	2.3	$c_i = \begin{cases} 0 & f \leq 3\ \text{GHz} \\ 0{,}25 & 3\ \text{GHz} < f \leq 6\ \text{GHz} \\ 0{,}5 & 6\ \text{GHz} < f \leq 10\ \text{GHz} \end{cases}$	0	∞
DIS	Distance between the radiating element of the DUT and the phantom medium	8.4.2.4	N	5.0	1	5.0	2	10.0	∞
D_{xyz}	Repeatability of positioning the DUT or source against the phantom	8.4.2.5	N	2.8	1	2.8	1	2.8	5
H	Device holder effects	8.4.2.5	N	6.3	1	6.3	1	6.3	∞
MOD	Effect of operating mode on	8.4.2.7	R	9.0	√3	5.2	1	5.2	∞
TAS	Time-average SAR	8.4.2.8	R	2.0	√3	1.1	1	1.1	∞
RF_{drift}	Variation in SAR due to drift in output of DUT	8.4.2.9	N	1.0	1	1.0	1	1.0	∞
VAL	Validation antenna uncertainty(validation measurement only)	8.4.2.10	N	5.0	1	5.0	1	5.0	∞
P_{in}	Uncertainty in accepted power(validation measurement only)	8.4.2.11	N	5.0	1	5.0	1	5.0	∞
	Corrections to the SAR result(if applied)								
$C(\varepsilon',\sigma)$	Phantom deviation from target(ε',σ)	8.4.3.1	N	1.9	1	1.9	1	1.9	∞
$C(R)$	SAR scaling	8.4.3.2	R	4.0	√3	2.3	1	2.3	∞
$u(\Delta SAR)$	Combined uncertainty		RSS	7.4	1	7.4	1	7.4	∞
U	Expanded uncertainty and effective degrees of freedom		K=2	7.4	1	7.4	U =K	14.8	$v$eff

a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned.

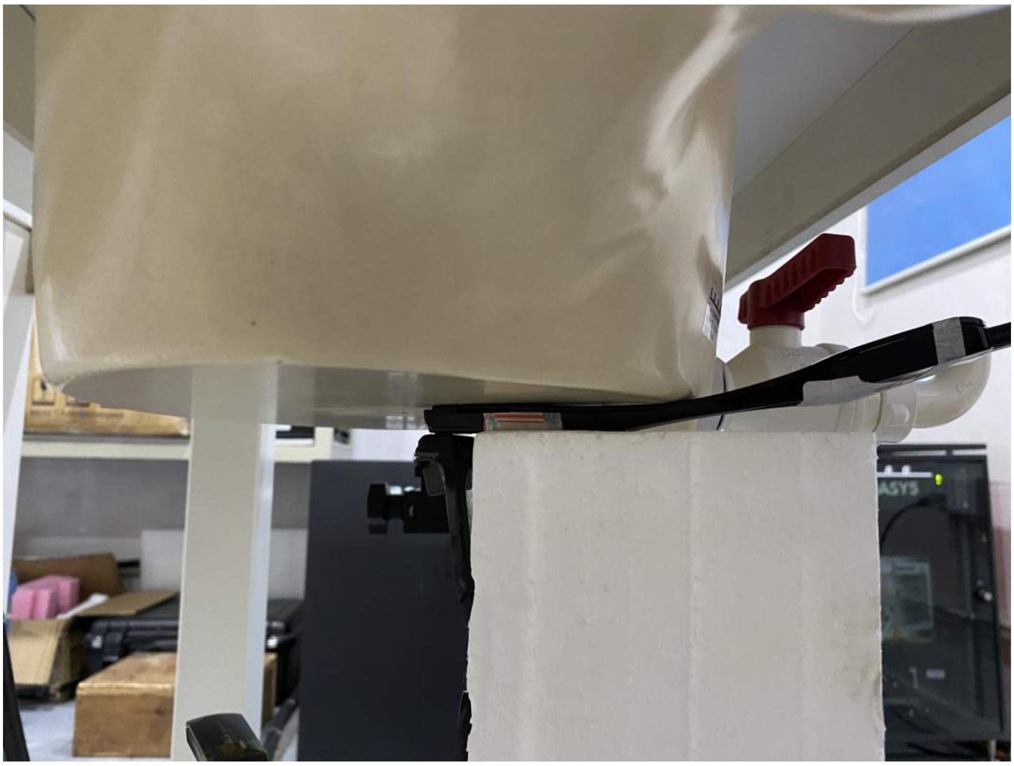
APPENDIX B EUT TEST POSITION PHOTOS

Liquid depth ≥ 15cm

Phantom Type: Twin SAM Phantom ; Type: QD000 P40 CD; Serial: 1744



Front to Phantom(0mm)



APPENDIX C PROBE CALIBRATION CERTIFICATES

Please Refer to the Attachment.

APPENDIX D DIPOLE CALIBRATION CERTIFICATES

Please Refer to the Attachment.

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