Certificate #4312.01

SAR TEST REPORT

Product Name:	Cordless Wi-Fi IP Phone
Trade Mark:	GRANDSTREAM
Model No. / HVIN:	WP826
Report Number:	2402199699SAR-1
Test Standards:	FCC 47 CFR Part 2 §2.1093 ANSI/IEEE C95.1-1992 IEEE Std 1528-2013 RSS-102 Issue 6 RSS-102.SAR.MEAS Issue 1 IEC/IEEE 62209-1528:2020
FCC ID:	YZZWP826
IC:	11964A-WP826
Test Result:	PASS
Date of Issue:	April 29, 2024

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
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Prepared by: Curry Xue, Test Engineer

Reviewed by: Robben Chen, Assistant Manager

Approved by: Billy Li, Technical Director

Date: April 29, 2024

UnionTrust Laboratories UnionTrust *Certified*

Version

Version No.	Date	Description
V1.0	April 29, 2024	Original Report

CONTENTS

1. GENERAL INFORMATION

1.1. STATEMENT OF COMPLIANCE

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

Equipment Class	Band	Highest Reported Head SAR_{1g} (W/kg)	Highest Reported Body-worn SAR_{1g} (1.0 cm Gap) (W/kg)
DTS	**2.4GHz WLAN**	0.19	0.18
NII	**U-NII-1 & U-NII-2A WLAN**	0.19	0.45
	U-NII-2C WLAN	0.68	1.34
	U-NII-3 WLAN	0.43	0.71
DSS	**Bluetooth**	0.04	0.04

1.2. CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.3. EUT INFORMATION

1.3.1. General Description of EUT

Product Name:	Cordless Wi-Fi IP Phone
Trade Mark:	GRANDSTREAM
Model No.:	WP826
FCC ID:	YZZWP826
IC:	11964A-WP826
DUT Stage:	Identical Prototype
Sample Received Date:	March 1, 2024
Sample Tested Date:	March 26, 2024 to March 30, 2024

1.3.2. Description of Accessories

Adapter (1)	
Model No.:	DCT12W050200US-A2
Input:	100-240V~50/60Hz 0.3 A max.
Output:	5.0V⎓2.0A
DC Cable	1.5 Meter, Unshielded without ferrite

Adapter (2)	
Model No.:	GQ12-050200-AU
Input:	100-240V~50/60Hz 0.4 A Max
Output:	5.0V⎓2.0A
DC Cable	1.5 Meter, Unshielded without ferrite

Battery	
Model No.:	UGS-03
Battery Type:	Lithium-ion
Rated Voltage:	3.7 Vdc
Limited Charge Voltage:	4.2 Vdc
Rated Capacity:	3000 mAh

Others
Charging base
Handset Belt Clip

1.3.3. EUT Tx Frequency Bands

RF Type	Band(s)	Tx Frequency Range (Unit: MHz)
WLAN	**2.4 GHz:**	2412 - 2462
	U-NII-1:	5180 - 5240
	U-NII-2A:	5260 - 5320
	U-NII-2C:	5500 - 5720
	U-NII-3:	5745 - 5825
Bluetooth	**2.4 GHz:**	2402 - 2480

1.3.4. Wireless Technologies

2.4G WLAN	802.11b 802.11g 802.11n-HT20/HT40 802.11ax-HE20/HE40
5G WLAN	802.11a 802.11n-HT20/HT40 802.11ac-VHT20/VHT40 802.11ax-HE20/HE40
Bluetooth	BR+EDR LE 2LE LE code
Antenna Type	PIFA Antenna

1.4. MAXIMUM CONDUCTED POWER

The maximum conducted average power including tune-up tolerance is shown as below.

➢ **2.4GHz WLAN**

Mode	Maximum Conducted Power (dBm)
802.11b	18.0
802.11g	14.5
802.11n-HT20	14.5
802.11n-HT40	15.0
802.11ax-HE20	12.5
802.11ax-HE40	16.0

➢ **5GHz WLAN**

Mode	Maximum Conducted Power (dBm)			
	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
802.11a	16.0	16.0	15.5	14.0
802.11n-HT20	16.5	16.5	15.5	14.0
802.11n-HT40	18.0	17.5	15.5	14.0
802.11ac-VHT20	16.5	16.5	15.5	14.0
802.11ac-VHT40	18.0	17.5	15.5	14.0
802.11ax-HE20	16.5	16.5	15.5	14.0
802.11ax-HE40	18.5	18.0	15.5	14.0

➢ **Bluetooth**

Mode	Modulation	Maximum Conducted Power (dBm)
BR + EDR	GFSK	7.5
	π/4-DQPSK	7.0
	8-DPSK	7.0
LE	GFSK	3.5
2LE	GFSK	1.0
LE code(S=2)	GFSK	3.5
LE code(S=8)	GFSK	5.0

1.5. OTHER INFORMATION

None.

1.6. TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

All SAR tests were sub-contracted at CVC Testing Technology (Shenzhen) Co., Ltd.

Address: No. 1301, Guanguang Road, Xinlan Community, Guanlan Street, Longhua District,Shenzhen City, Guangdong Province, People’s Republic of China
Post Code：518110 Tel：0755-23763060-8805
FAX：0755-23763060 E-mail：sz-kf@cvc.org.cn

1.7. TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

Shenzhen UnionTrust Quality and Technology Co., Ltd.

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

CVC Testing Technology (Shenzhen) Co., Ltd.

CNAS-Lab Code: L16091

A2LA-Lab Certificate No.: 5473.03

ISED Wireless Device Testing Laboratories
CAB identifier: CN0137

1.8. GUIDANCE STANDARD

The tests documented in this report were performed in accordance with FCC 47 CFR Part 2 §2.1093, IEEE Std 1528-2013, ANSI/IEEE C95.1-1992, the following FCC Published RF exposure KDB procedures:

KDB 865664 D01 v01r04
KDB 865664 D02 v01r02
KDB 248227 D01 v02r02
KDB 447498 D01 v06

2. SPECIFIC ABSORPTION RATE (SAR)

2.1. INTRODUCTION

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling, by appropriate techniques, to produce specific absorption rates (SARs) as averaged over the whole-body, any 1 g or any 10 g of tissue (defined as a tissue volume in the shape of a cube). All SAR values are to be averaged over any six-minute period. When portable device was used within 20 cm of the user's body, SAR evaluation of the device will be required. The SAR limit in chapter 2.3.

2.2. SAR DEFINITION

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

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

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

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

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

2.3. SAR LIMITS

Limits for Occupational/Controlled Exposure (W/kg)

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

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

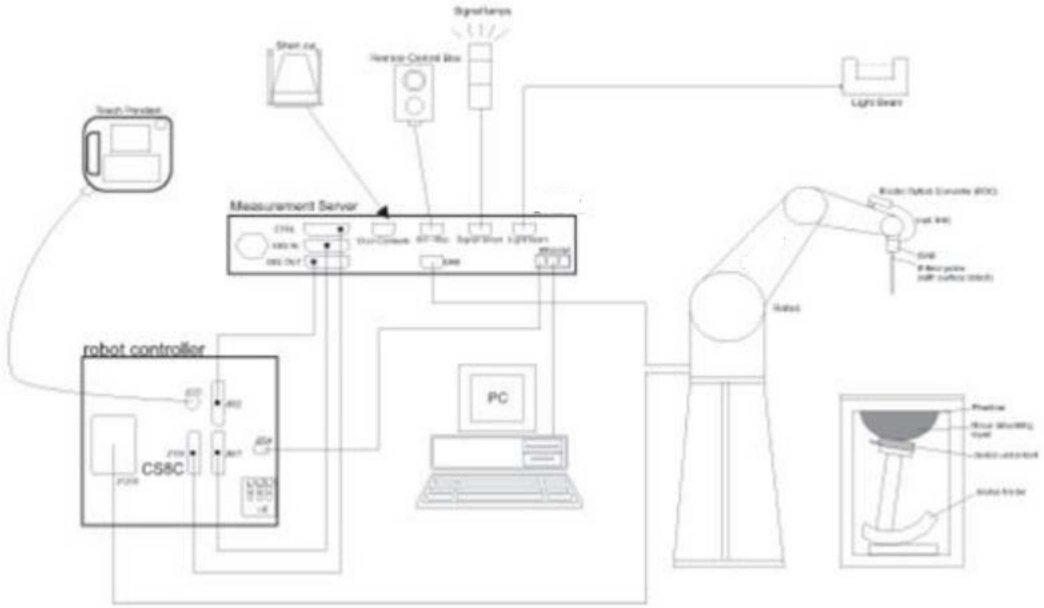
Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Note:

1) Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.
2) At frequencies above 6.0 GHz, SAR limits are not applicable and MPE limits for power density should be applied at 5 cm or more from the transmitting device.
3) The SAR limit is specified in FCC 47 CFR Part 2 §2.1093, ANSI/IEEE C95.1-1992.

3. SAR MEASUREMENT SYSTEM

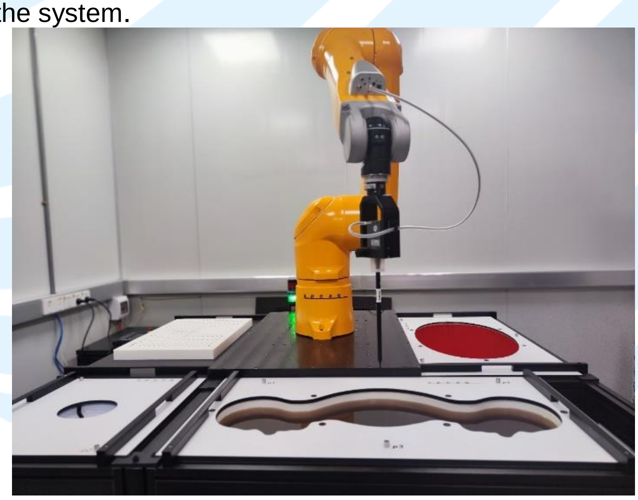
3.1. SPEAG DASY SYSTEM



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

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

The following figure shows the system.



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

3.1.1. Probe

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

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

Speag COMOSAR Dosimetric E field Dipole

3.1.2. Date Acquisition Electronics 4 (DAE4)

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

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

3.1.3. SAM-Twin Phantom

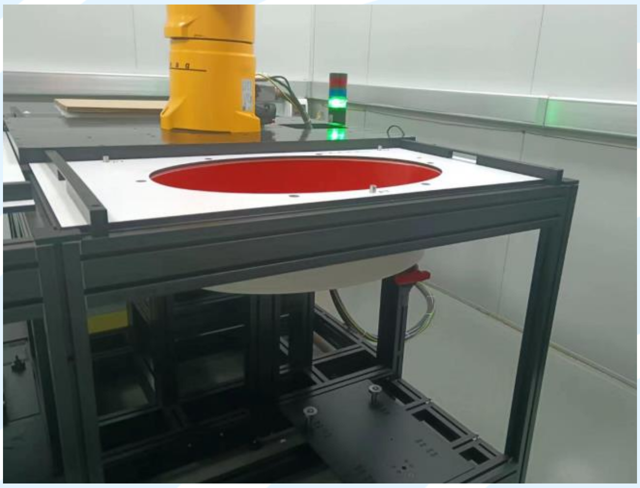
The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEC/IEEE 62209-1528. It enables the dosimetric evaluation of left and right hand phone usage as well as body-mounted usage at the flat phantom region. A cover prevents evaporation of the liquid.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

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

3.1.4. ELI Phantom

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

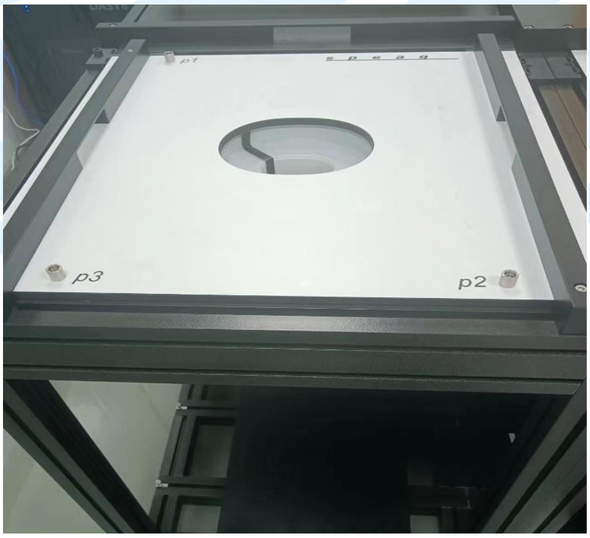
- Material:Vinyl ester, fiberglass reinforced (VE-GF)
- Shell Thickness:2.0 ± 0.2 mm (bottom plate)
- Dimensions:Major axis: 600 mm,
Minor axis: 400 mm
- Filling Volume:approx. 30 liters.



3.1.5. Wrist Phantom

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

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



3.1.6. Device Holder

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

3.1.7. System Validation Dipoles

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

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

3.2. SAR SCAN PROCEDURE

3.2.1. SAR Reference Measurement (drift)

Prior to the SAR test, local SAR shall be measured at a stationary reference point where the SAR exceeds the lower detection limit of the measurement system.

3.2.2. Area Scan

Measurement procedures for evaluating the SAR of wireless device start with a coarse measurement grid to determine the approximate location of the local peak SAR values. This is known as the area-scan procedure. All antennas and radiating structures that may contribute to the measured SAR or influence the SAR distribution must be included in the area scan. The area scan measurement resolution must enable the extrapolation algorithms of the SAR system to correctly identify the peak SAR location(s) for subsequent zoom scan measurements to correctly determine the 1-g SAR. Area scans are performed at a constant distance from the phantom surface, determined by the measurement frequencies. When a measured peak is closer than ½ the zoom scan volume dimension (x, y) from the edge of the area scan region, unless the entire peak and gram-averaging volume are both captured within the zoom scan volume, the area scan must be repeated by shifting and expanding the area scan region to ensure all peaks are away from the area scan boundary. The area scan resolutions specified in the table below must be applied to the SAR measurements.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 mm ± 1 mm	½·δ·ln(2) mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scans spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

3.2.3. Zoom Scan

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

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</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="3">Maximum zoom Scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: ΔZ_{Zoom}(n)</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>ΔZ_{Zoom}(1): between 1^{ST} two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>ΔZ_{Zoom}(n>1): between subsequent points</td><td colspan="2">≤ 1.5·ΔZ_{Zoom}(n-1) mm</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

3.2.4. SAR Drift Measurement

The local SAR (or conducted power) shall be measured at exactly the same location as in 3.2.1 section. The absolute value of the measurement drift (the difference between the SAR measured in 3.2.1 and 3.2.4 section) shall be recorded. The SAR drift shall be kept within ± 5%.

3.3. EQUIPMENT LIST

Equipment	Manufacturer	Model	SN	Cal. Data	Cal. interval
System Validation Dipole	SPEAG	D2450V2	1081	May. 25, 2022	3 years
System Validation Dipole	SPEAG	D5GHzV2	1353	May. 27, 2022	3 years
Dosimetric E-Field Probe	SPEAG	EX3DV4	7738	Dec. 13, 2023	1 year
Data Acquisition Electronics	SPEAG	DAE4	1725	Oct. 26, 2023	1 year
Wideband Radio Communication Tester	R&S	CMW500	168558	May. 26, 2023	1 year
Signal Analyzer	R&S	FSV	104408	May. 22, 2023	1 year
Vector Network Analyzer	R&S	ZNB 40	101544	May. 26, 2023	1 year
Signal Generator	R&S	SMB 100B	101440	Sep. 21, 2023	1 year
Power Sensor	R&S	NRP18S-10	101843	Sep. 25, 2023	1 year
Power Sensor	R&S	NRP18S-10	101845	Sep. 25, 2023	1 year
DC Power Supply	Topward	3303D	810984	Sep. 25, 2023	1 year
Cavity Coupler	/	/	LS0300103	Jan. 17, 2024	1 year
Directional Couper	/	SHX-DC04/12-20N	2206171042	Jan. 17, 2024	1 year
Coaxial attenuator	R&S	8491A	1424.6721k02-101845-HX	Sep. 25, 2023	1 year
Coaxial attenuator	R&S	8491A	1424.6721K02-101843-aM	Sep. 25, 2023	1 year
Digital Thermometer	LKM	DTM3000	3946	Jan. 15, 2024	1 year
Power Amplifier Mini circuit	mini-circuits	ZVA-183W-S+	726202215	Jan. 10, 2024	1 year
PHANTOM	SPEAG	ELI V8.0	2171	N/A	N/A
PHANTOM	SPEAG	SAM-Twin V8.0	2097	N/A	N/A

3.4. MEASUREMENT UNCERTAINTY

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

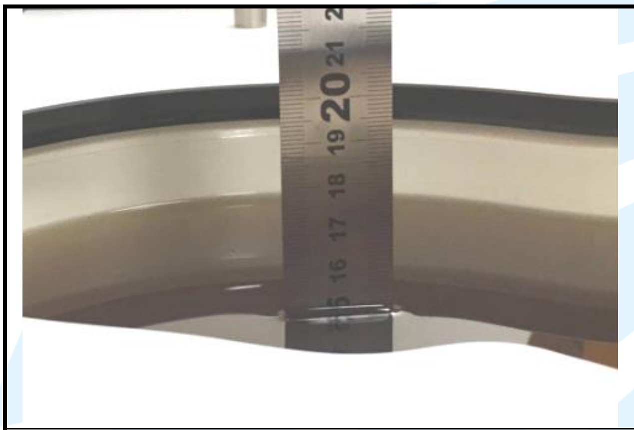
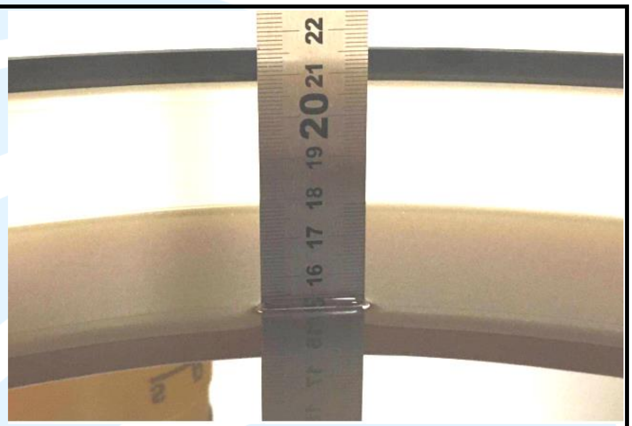
Uncertainty Component		Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	vi
Measurement System									
1	**Probe Calibration**	5.8	N	1	1	1	5.8	5.8	∞
2	**Axial isotropy**	3.5	R	$\sqrt{3}$	0.7	0.7	1.41	1.41	∞
3	**Hemispherical Isotropy**	5.9	R	$\sqrt{3}$	0.7	0.7	2.38	2.38	∞
4	**Boundary Effect**	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
5	**Probe Linearity**	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
6	**System Detection Limits**	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
7	**Modulation response**	0.0	R	1	1	1	0.00	0.00	
8	**Readout Electronics**	0.5	N	1	1	1	0.50	0.50	∞
9	**Response Time**	0.0	R	$\sqrt{3}$	1	1	0.00	0.00	∞
10	**Integration Time**	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
11	**RF ambient Conditions - Noise**	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
12	**RF ambient Conditions - Reflections**	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
13	**Probe Position Mechanical tolerance**	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
14	**Probe Position with respect to Phantom Shell**	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
15	**Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation**	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
	Dipole								
16	**Deviation of experimental dipole**	4	N	1	1	1	4.00	4.00	N-1

17	**Dipole axis to liquid distance**	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
18	**Input Power and SAR drit measurement**	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and Tissue Parameters									
20	**Phantom Uncertainty (Shape and thickness tolerances)**	4.0	R	$\sqrt{3}$	1	1	2.31	2.31	∞
21	**SAR correction for deviation(in permittivity and conductivity)**	2.0	N	1	1	0.84	2.00	1.68	∞
22	**Liquid conductivity (temperature uncertainty)**	2.5	R	1	0.78	0.71	1.95	1.78	∞
23	**Liquid conductivity - measurement uncertainty**	4.0	N	1	0.23	0.26	0.92	1.04	M
24	**Liquid permittivity (temperature uncertainty)**	2.5	R	1	0.78	0.71	1.95	1.78	∞
25	**Liquid permittivity - measurement uncertainty**	5.0	N	1	0.23	0.26	1.15	1.30	M
Combined Standard Uncertainty		-	RSS	-			10.20	10.11	-
Expanded uncertainty (Confidence interval of 95 %)		-	K=2	-			20.40	20.22	-

3.5. TISSUE DIELECTRIC PARAMETER MEASUREMENT & SYSTEM VERIFICATION

3.5.1. Simulating Liquids Parameter Check

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

	
Liquid Height for Head Position	**Liquid Height for Body Position**

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

Dielectric properties of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Target Conductivity
300	45.3	0.87
450	43.5	0.87
750	41.9	0.89
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1640	40.3	1.29
1750	40.1	1.37
1800	40.0	1.40
1900	40.0	1.40
2000	40.0	1.40
2100	39.8	1.49
2300	39.5	1.67
2450	39.2	1.80
2600	39.0	1.96

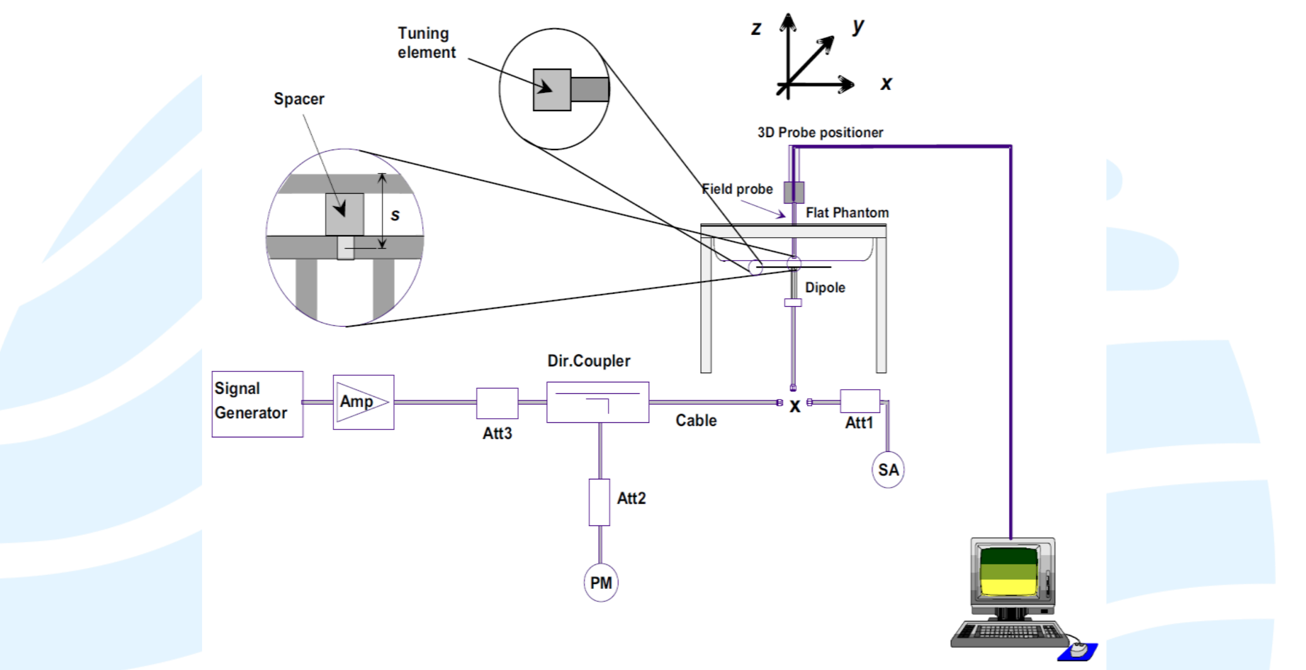
3000	38.5	2.40
3500	37.9	2.91
4000	37.4	3.43
4500	36.8	3.94
5000	36.2	4.45
5200	36.0	4.66
5300	35.9	4.76
5500	35.6	4.96
5600	35.5	5.07
5800	35.3	5.27
6000	35.1	5.48

3.5.2. System Check Description

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System kit includes a dipole, and dipole device holder.

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

System Verification Setup



3.5.3. Tissue Verification

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

Test Date	Tissue Type	Frequency (MHz)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
Mar. 26, 2024	Head	2450	1.840	40.100	1.80	39.20	2.22	2.30
Mar. 26, 2024	Head	2412	1.810	40.100	1.77	39.27	2.43	2.11
Mar. 26, 2024	Head	2480	1.860	40.000	1.83	39.16	1.53	2.15
Mar. 26, 2024	Head	5200	4.360	35.700	4.66	36.00	-6.44	-0.83
Mar. 26, 2024	Head	5190	4.350	35.700	4.65	36.01	-6.43	-0.86
Mar. 26, 2024	Head	5300	4.470	35.500	4.76	35.90	-6.09	-1.11
Mar. 27, 2024	Head	5500	4.680	35.200	4.96	35.60	-5.65	-1.12
Mar. 27, 2024	Head	5580	4.770	35.100	5.05	35.52	-5.51	-1.18
Mar. 26, 2024	Head	5600	4.790	35.000	5.07	35.50	-5.52	-1.41
Mar. 26, 2024	Head	5700	4.890	34.900	5.17	35.40	-5.42	-1.41
Mar. 26, 2024	Head	5755	4.950	34.800	5.23	35.34	-5.26	-1.53
Mar. 26, 2024	Head	5800	5.000	34.700	5.27	35.30	-5.12	-1.70

Note:
The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ± 5% of the target values. The variation of the liquid temperature must be within ± 2 °C during the test.

3.5.4. System Verification

The measuring result for system verification is tabulated as below.

Test Date	Tissue Type	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Mar. 26, 2024	Head	2450	51.40	12.40	49.60	-3.50	1081	7738	1725
Mar. 26, 2024	Head	5200	77.80	7.44	74.40	-4.37	1353	7738	1725
Mar. 26, 2024	Head	5300	79.60	7.88	78.80	-1.01	1353	7738	1725
Mar. 27, 2024	Head	5500	84.10	8.82	88.20	4.88	1353	7738	1725
Mar. 26, 2024	Head	5600	82.10	8.74	87.40	6.46	1353	7738	1725
Mar. 26, 2024	Head	5800	80.40	8.48	84.80	5.47	1353	7738	1725

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

4. SAR MEASUREMENT EVALUATION

4.1. EUT CONFIGURATION AND SETTING

4.1.1. WLAN Configuration and Testing

In general, various vendor specific external test software and chipset based internal test modes are typically used for SAR measurement. These chipset-based test mode utilities are generally hardware and manufacturer dependent, and often include substantial flexibility to reconfigure or reprogram a device. A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

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

Initial Test Configuration

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

Subsequent Test Configuration

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

SAR Test Configuration and Channel Selection

When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is using largest channel bandwidth, lowest order modulation, lowest data rate, and lowest order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n). After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following.
1) The channel closest to mid-band frequency is selected for SAR measurement.
2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

Test Reduction for U-NII-1 (5.2 GHz) and U-NII-2A (5.3 GHz) Bands

For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following.

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition).

2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

4.2. EUT TESTING POSITION

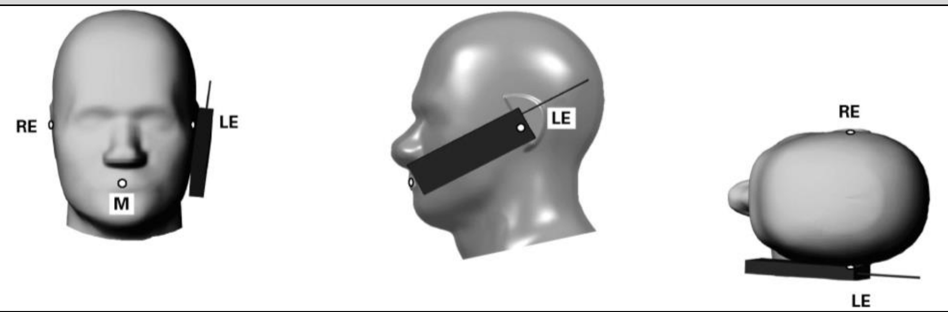
4.2.1. Head Exposure Conditions

RF Exposure Conditions	Test Position	Separation Distance	SAR test exclusion
Head	Right Cheek	0 cm	N/A
	Right Tilted		
	Left Cheek		
	Left Tilted		

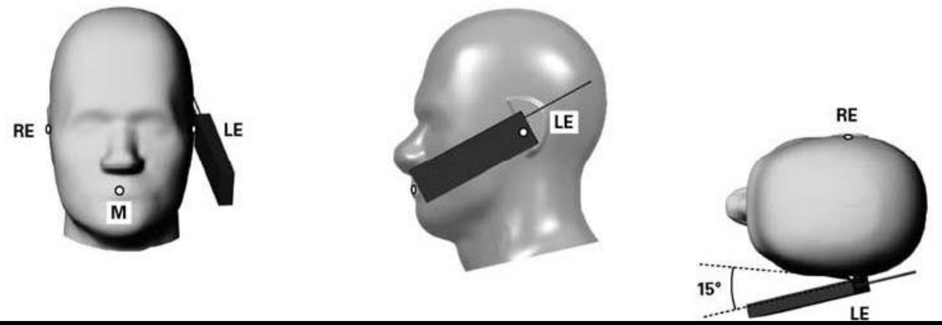
Note:

1) Head exposure for voice mode of handset is limited to next to the ear exposure conditions.
2) Devices that are designed to transmit next to the ear must be tested using the SAM phantom.
3) Other head exposure conditions, for example, in-front-of the face, should be tested using a flat phantom according to the required published RF exposure KDB procedures.
4) When data mode operates in next to the ear configurations, either data alone or in conjunction with voice transmissions, SAR evaluation is required for such use conditions.
5) When device supports VoIP, SAR evaluation for head Exposure Conditions using the most appropriate wireless data mode configurations is required.

Cheek Position



Tilted Position



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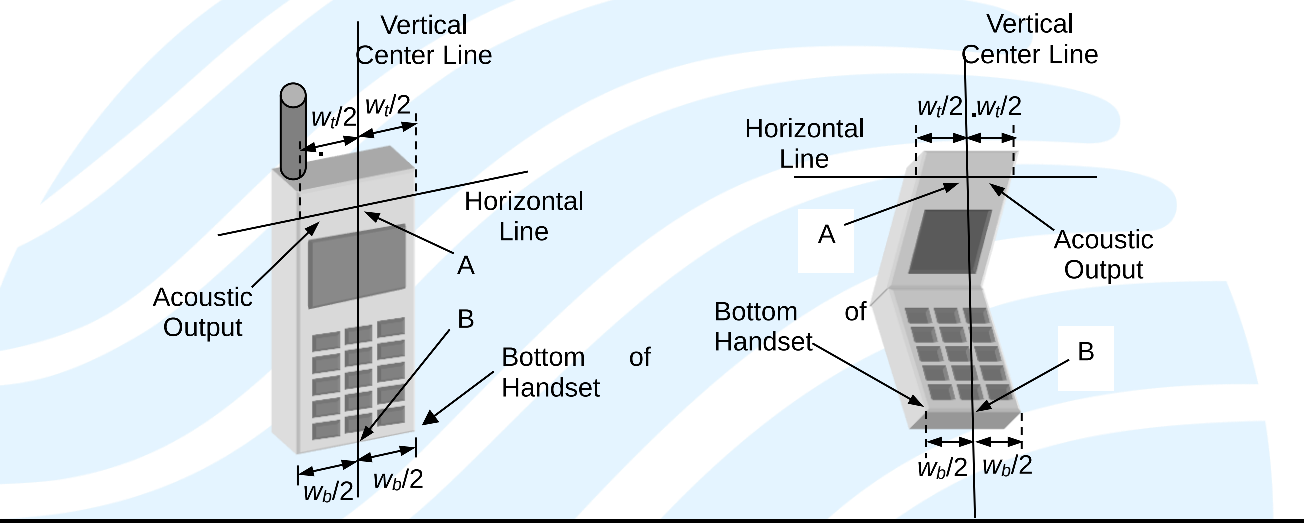
Define two imaginary lines on the handset

1) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width wt of the handset at the level of the acoustic output, and the midpoint of the width wb of the bottom of the handset.
2) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
3) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

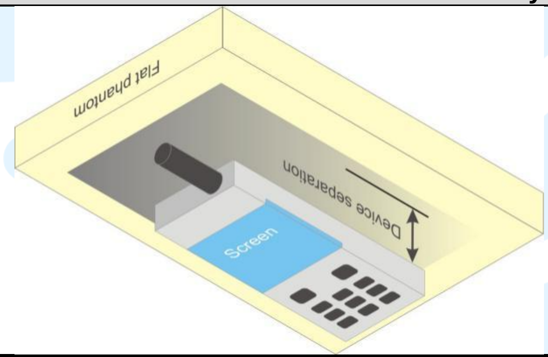
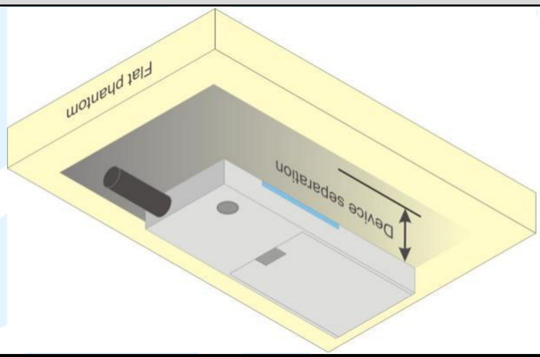
Handset Vertical and Horizontal Reference Lines



4.2.2. Body-worn Accessory Exposure Conditions

RF Exposure Conditions	Test Position	Separation Distance	SAR test exclusion
Body-worn	Front Face	0 ~ 2.5 cm	N/A
	Rear Face		

Note:
1) Body-worn accessories that do not contain metallic or conductive components may be tested according to worst-case exposure configurations, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. All body-worn accessories containing metallic components are tested in conjunction with the host device.
2) Body-worn accessory SAR compliance is based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, and according to the relevant voice and/or data mode transmissions and operations. If a body-worn accessory supports voice only operations in its normal and expected use conditions, testing of data mode for body-worn compliance is not required.
3) A conservative minimum test separation distance for supporting off-the-shelf body-worn accessories that may be acquired by users of consumer handsets should be used to test for body-worn accessory SAR compliance. This distance is determined by the handset manufacturer according to the typical body-worn accessories users may acquire at the time of equipment certification, but not more than 2.5 cm, to enable users to purchase aftermarket body-worn accessories with the required minimum separation.
4) Devices that are designed to operate on the body of users using lanyards and straps or without requiring additional body-worn accessories must be tested for SAR compliance using a conservative minimum test separation distance ≤ 5 mm to support compliance.
5) When device supports VoIP, SAR evaluation for body-worn accessory Exposure Conditions using the most appropriate wireless data mode configurations is required.
6) Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories.
7) When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for the body-worn accessory with a headset attached to the handset.

Body Worn Position	
	

4.3. MEASURED CONDUCTED POWER RESULT

4.3.1. Conducted Power of WLAN

The measuring conducted average power is shown as below.

Band	Mode	Channel	Frequency (MHz)	Average Power (dBm)
2.4GHz	802.11b	1	2412	17.44
		6	2437	17.41
		11	2462	16.66
	802.11g	1	2412	13.72
		6	2437	14.03
		11	2462	14.11
	802.11n-HT20	1	2412	13.71
		6	2437	13.95
		11	2462	14.08
	802.11n-HT40	3	2422	13.92
		6	2437	14.39
		9	2452	13.91
	802.11ax-HE20	1	2412	11.76
		6	2437	12.04
		11	2462	12.04
	802.11ax-HE40	3	2422	14.82
		6	2437	15.38
		9	2452	14.88

Mode	Band	Channel	Frequency (MHz)	Average Power (dBm)
802.11a	U-NII-1	36	5180	15.68
		44	5220	14.77
		48	5240	14.76
	U-NII-2A	52	5260	15.64
		60	5300	15.23
		64	5320	14.89
	U-NII-2C	100	5500	15.20
		116	5580	14.44
		140	5700	13.67
		144	5720	13.45
	U-NII-3	149	5745	13.50
		157	5785	13.29
		165	5825	12.86

Mode	Band	Channel	Frequency (MHz)	Average Power (dBm)
802.11n-HT20	U-NII-1	36	5180	16.10
		44	5220	15.01
		48	5240	15.03
	U-NII-2A	52	5260	15.84
		60	5300	15.41
		64	5320	15.05
	U-NII-2C	100	5500	15.19
		116	5580	14.54
		140	5700	13.78
		144	5720	13.50
	U-NII-3	149	5745	13.64
		157	5785	13.37
		165	5825	12.94

Mode	Band	Channel	Frequency (MHz)	Average Power (dBm)
802.11n-HT40	U-NII-1	38	5190	17.45
		46	5230	16.98
	U-NII-2A	54	5270	17.25
		62	5310	16.99
	U-NII-2C	102	5510	14.95
		110	5550	14.49
		134	5670	14.44
		142	5710	13.47
	U-NII-3	151	5755	13.59
		159	5795	13.10

Mode	Band	Channel	Frequency (MHz)	Average Power (dBm)
802.11ac-VHT20	U-NII-1	36	5180	15.90
		44	5220	14.94
		48	5240	14.96
	U-NII-2A	52	5260	15.80
		60	5300	15.39
		64	5320	15.05
	U-NII-2C	100	5500	15.19
		116	5580	14.51
		140	5700	13.78
		144	5720	13.54
	U-NII-3	149	5745	13.50
		157	5785	13.37
		165	5825	12.87

Mode	Band	Channel	Frequency (MHz)	Average Power (dBm)
802.11ac-VHT40	U-NII-1	38	5190	17.48
		46	5230	17.00
	U-NII-2A	54	5270	17.23
		62	5310	16.96
	U-NII-2C	102	5510	14.93
		110	5550	14.40
		134	5670	14.38
		142	5710	13.46
	U-NII-3	151	5755	13.59
		159	5795	13.08

Mode	Band	Channel	Frequency (MHz)	Average Power (dBm)
802.11ax-HE20	U-NII-1	36	5180	15.92
		44	5220	14.88
		48	5240	14.91
	U-NII-2A	52	5260	15.80
		60	5300	15.40
		64	5320	15.02
	U-NII-2C	100	5500	15.22
		116	5580	14.58
		140	5700	13.78
		144	5745	13.58
	U-NII-3	149	5745	13.65
		157	5785	13.42

		165	5825	12.95

Mode	Band	Channel	Frequency (MHz)	Average Power (dBm)
802.11ax-HE40	U-NII-1	38	5190	17.80
		46	5230	17.19
	U-NII-2A	54	5270	17.38
		62	5310	17.10
	U-NII-2C	102	5510	15.08
		110	5550	14.58
		134	5670	14.51
		142	5710	13.56
	U-NII-3	151	5755	13.70
		159	5795	13.20

4.3.2. Conducted Power of BT

Mode	Modulation	Channel	Frequency (MHz)	Average Power (dBm)
BR + EDR	GFSK	0	2402	6.42
		39	2441	6.51
		78	2480	6.77
	π/4-DQPSK	0	2402	5.96
		39	2441	6.04
		78	2480	6.27
	8-DPSK	0	2402	5.95
		39	2441	6.05
		78	2480	6.28

Mode	Modulation	Channel	Frequency (MHz)	Average Power (dBm)
LE	GFSK	0	2402	3.22
		19	2440	3.12
		39	2480	3.02
2LE	GFSK	0	2402	0.29
		19	2440	0.18
		39	2480	0.07
LE code(S=2)	GFSK	0	2402	2.89
		19	2440	2.79
		39	2480	2.71
LE code(S=8)	GFSK	0	2402	4.58
		19	2440	4.44
		39	2480	4.35

4.4. SAR TESTING RESULTS

4.4.1. SAR Test Reduction Considerations

KDB 447498 D01 General RF Exposure Guidance

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

a) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
b) ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
c) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 248227 D01 Wi-Fi SAR

a) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is <= 0.4 W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is <= 0.8 W/kg or all test positions are measured.
b) For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is <= 0.8 W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is <= 1.2 W/kg.
c) For WLAN 5 GHz, the initial test configuration was selected according to the transmission mode with the highest maximum output power. When the reported SAR of initial test configuration is > 0.8 W/kg, SAR is required for the subsequent highest measured output power channel until the reported SAR result is <= 1.2 W/kg or all required channels are measured. For other transmission modes, SAR is not required when the highest reported SAR for initial test configuration is adjusted by the ratio of subsequent test configuration to initial test configuration specified maximum output power and it is <= 1.2 W/kg.
d) For WLAN MIMO mode, the power-based standalone SAR test exclusion or the sum of SAR provision in KDB 447498 to determine simultaneous transmission SAR test exclusion should be applied. Otherwise, SAR for MIMO mode will be measured with all applicable antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

4.4.2. SAR Results for Head Exposure Condition

Plot No.	Band	Mode	Test Position	Channel	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)
	2.4GHz	802.11b	Right Cheek	1	18.0	17.44	-0.04	0.15	1.14	0.17
1	2.4GHz	802.11b	Right Tilted	1	18.0	17.44	0.00	0.17	1.14	**0.19**
	2.4GHz	802.11b	Left Cheek	1	18.0	17.44	0.08	0.151	1.14	0.17
	2.4GHz	802.11b	Left Tilted	1	18.0	17.44	0.03	0.141	1.14	0.16
	U-NII-1 & U-NII-2A	802.11ax HE40	Right Cheek	38	18.5	17.80	0.02	0.131	1.17	0.15
2	U-NII-1 & U-NII-2A	802.11ax HE40	Right Tilted	38	18.5	17.80	-0.16	0.158	1.17	**0.19**
	U-NII-1 & U-NII-2A	802.11ax HE40	Left Cheek	38	18.5	17.80	0.05	0.139	1.17	0.16
	U-NII-1 & U-NII-2A	802.11ax HE40	Left Tilted	38	18.5	17.80	0.14	0.117	1.17	0.14
	U-NII-2C	802.11a	Right Cheek	100	15.5	15.20	0.02	0.585	1.07	0.63
3	U-NII-2C	802.11a	Right Tilted	100	15.5	15.20	0.00	0.631	1.07	**0.68**
	U-NII-2C	802.11a	Left Cheek	100	15.5	15.20	-0.06	0.47	1.07	0.50
	U-NII-2C	802.11a	Left Tilted	100	15.5	15.20	0.00	0.488	1.07	0.52
	U-NII-3	802.11ax HE40	Right Cheek	151	14.0	13.70	-0.03	0.356	1.07	0.38
4	U-NII-3	802.11ax HE40	Right Tilted	151	14.0	13.70	-0.01	0.405	1.07	**0.43**
	U-NII-3	802.11ax HE40	Left Cheek	151	14.0	13.70	0.11	0.342	1.07	0.37
	U-NII-3	802.11ax HE40	Left Tilted	151	14.0	13.70	-0.02	0.375	1.07	0.40
	2.4GHz	BT_BR_DH5	Right Cheek	78	7.5	6.77	-0.07	0.032	1.18	0.04
5	2.4GHz	BT_BR_DH5	Right Tilted	78	7.5	6.77	-0.03	0.037	1.18	**0.04**
	2.4GHz	BT_BR_DH5	Left Cheek	78	7.5	6.77	0.01	0.03	1.18	0.04
	2.4GHz	BT_BR_DH5	Left Tilted	78	7.5	6.77	0.04	0.032	1.18	0.04

4.4.3. SAR Results for Body-worn Exposure Condition (Separation Distance is 1.0 cm)

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)	Note
	2.4GHz	802.11b	Front Face	1	1	18.0	17.44	-0.06	0.079	1.14	0.09	--
	2.4GHz	802.11b	Rear Face	1	1	18.0	17.44	0.00	0.142	1.14	0.16	--
	2.4GHz	802.11b	Left Side	1	1	18.0	17.44	-0.04	0.068	1.14	0.08	--
	2.4GHz	802.11b	Right Side	1	1	18.0	17.44	0.08	0.082	1.14	0.09	--
6	2.4GHz	802.11b	Top Side	1	1	18.0	17.44	-0.08	0.158	1.14	**0.18**	--
	U-NII-1 & U-NII-2A	802.11ax HE40	Front Face	1	38	18.5	17.80	0.05	0.051	1.17	0.06	--
7	U-NII-1 & U-NII-2A	802.11ax HE40	Rear Face	1	38	18.5	17.80	-0.18	0.379	1.17	**0.45**	--
	U-NII-1 & U-NII-2A	802.11ax HE40	Left Side	1	38	18.5	17.80	-0.02	0.145	1.17	0.17	--
	U-NII-1 & U-NII-2A	802.11ax HE40	Right Side	1	38	18.5	17.80	0.00	0.031	1.17	0.04	--
	U-NII-1 & U-NII-2A	802.11ax HE40	Top Side	1	38	18.5	17.80	-0.04	0.228	1.17	0.27	--
	U-NII-2C	802.11a	Front Face	1	100	15.5	15.20	-0.02	0.141	1.07	0.15	--
8	U-NII-2C	802.11a	Rear Face	1	100	15.5	15.20	-0.08	1.25	1.07	**1.34**	--
	U-NII-2C	802.11a	Rear Face	1	100	15.5	15.20	-0.08	1.22	1.07	1.31	Repeated
	U-NII-2C	802.11a	Left Side	1	100	15.5	15.20	0.04	0.586	1.07	0.63	--
	U-NII-2C	802.11a	Right Side	1	100	15.5	15.20	0.06	0.089	1.07	0.10	--
	U-NII-2C	802.11a	Top Side	1	100	15.5	15.20	-0.09	0.636	1.07	0.68	--
	U-NII-2C	802.11a	Rear Face	1	116	15.0	14.44	-0.07	1.24	1.14	1.41	--
	U-NII-2C	802.11a	Rear Face	1	140	14.0	13.67	0.00	0.82	1.08	0.88	--
	U-NII-3	802.11ax HE40	Front Face	1	151	14.0	13.70	0.03	0.119	1.07	0.13	--
9	U-NII-3	802.11ax HE40	Rear Face	1	151	14.0	13.70	-0.03	0.663	1.07	0.71	--
	U-NII-3	802.11ax HE40	Left Side	1	151	14.0	13.70	-0.08	0.301	1.07	0.32	--
	U-NII-3	802.11ax HE40	Right Side	1	151	14.0	13.70	0.01	0.069	1.07	0.07	--
	U-NII-3	802.11ax HE40	Top Side	1	151	14.0	13.70	-0.16	0.339	1.07	0.36	--
	2.4GHz	BT_BR_DH5	Front Face	1	78	7.5	6.77	-0.05	0.016	1.18	0.02	--
	2.4GHz	BT_BR_DH5	Rear Face	1	78	7.5	6.77	0.04	0.028	1.18	0.03	--
	2.4GHz	BT_BR_DH5	Left Side	1	78	7.5	6.77	0.19	0.011	1.18	0.01	--
	2.4GHz	BT_BR_DH5	Right Side	1	78	7.5	6.77	0.00	0.02	1.18	0.02	--
10	2.4GHz	BT_BR_DH5	Top Side	1	78	7.5	6.77	0.08	0.034	1.18	**0.04**	--

4.5. SAR MEASUREMENT VARIABILITY

4.5.1. Repeated Measurement

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.
4) 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 measurement.

Band	Mode	Test Position	Separation Distance (cm)	Channel	Original Measured SAR-1g (W/kg)	1st Repeated SAR-1g (W/kg)	L/S Ratio	2nd Repeated SAR-1g (W/kg)	L/S Ratio	3rd Repeated SAR-1g (W/kg)	L/S Ratio
Body Exposure Condition											
U-NII-2C	802.11a	Rear Face	1	100	1.25	1.22	1.0246	N/A	N/A	N/A	N/A

4.6. SIMULTANEOUS MULTI-BAND TRANSMISSION EVALUATION

4.6.1. Simultaneous Transmission SAR Test Exclusion Considerations

a) Sum of SAR

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 SAR1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR1g is greater than the SAR limit (SAR1g 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

b) SAR to Peak Location Separation Ratio

The simultaneous transmitting antennas in each operating mode and exposure condition combination are considered one pair at a time to determine the SPLSR.

$$SPLSR = (SAR_1 + SAR_2)^{1.5}/R_i$$

The ratio is rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion. When 10-g SAR applies, the ratio must be ≤ 0.10.
SAR_1 and SAR_2 are the highest reported or estimated SAR values for each antenna in the pair, and R_i is the separation distance in mm between the peak SAR locations for the antenna pair

$$peak\ location\ separation\ distance = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

Where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the area or zoom scans.
When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna. Due to curvatures on the SAM phantom, when SAR is estimated for one of the antennas in an antenna pair, the measured peak SAR location will be translated onto the test device to determine the peak location separation for the antenna pair.
When SAR is estimated for both antennas, the peak location separation should be determined by the closest physical separation of the antennas, according to the feed-point or geometric center of the antennas.

c) Volume Scan

When the SPLSR is <= 0.04 for 1-g SAR and <= 0.10 for 10-g SAR, the simultaneous transmission SAR is not required. Otherwise, the enlarged zoom scan and volume scan post-processing procedures will be performed.

4.6.2. Simultaneous Transmission Possibilities

The simultaneous transmission possibilities for this device are listed as below.

1) The 2.4G WLAN and 5G WLAN cannot transmit simultaneously.
2) The WLAN and Bluetooth cannot transmit simultaneously, so there is no co-location test requirement for WLAN and Bluetooth.

*** End of Report ***

APPENDIX A. SAR PLOTS OF SYSTEM VERIFICATION

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

APPENDIX B. SAR PLOTS OF SAR MEASUREMENT

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

APPENDIX C. CALIBRATION CERTIFICATE FOR PROBE AND DIPOLE

The calibration certificates are shown as follows.

APPENDIX D. PHOTOGRAPHS OF EUT AND SETUP

The photographs of EUT and setup are shown as follows.