TESTING LABORATORY
CERTIFICATE#4323.01

SAR REPORT

For

Shanghai Ratta Smart Technology Co.,Ltd.

Room 301, Building No.1,168 Jixin Road, Minhang, Shanghai, China

FCC ID: 2AQZ9-A5X

IC: 24370-A5X

Report Type:	**Product Type:**
Original Report	SuperNote

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Report Number:	RSHA210121001-20C
Report Date:	2021-06-07
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Attestation of Test Results			
EUT Information	EUT Description	SuperNote	
	Model Name	A5 X	
	Serial Number	RSHA210121001	
	Test Date	2021-06-06	
MODE		Max. SAR Level(s) Reported(W/kg)	Limit
WLAN2.4GHz		0.05 W/kg 1g Body SAR	1.6
WLAN5.2GHz		0.91 W/kg 1g Body SAR	1.6
WLAN5.8GHz		0.62 W/kg 1g Body SAR	1.6
Bluetooth		0.04 W/kg 1g Body SAR	1.6
Applicable Standards	**FCC 47 CFR part 2.1093** Radiofrequency radiation exposure evaluation: portable devices		
	RSS-102 Issue 5 March 2015 Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).		
	IEEE1528:2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques		
	IEC 62209-2:2010 Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices-Human models, instrumentation, and procedures-Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)		
	KDB procedures KDB 447498 D01 General RF Exposure Guidance v06 KDB 648474 D04 Handset SAR v01r03 KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 KDB 865664 D02 RF Exposure Reporting v01r02		

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 **FCC 47 CFR part 2.1093/RSS-102 Issue 5 March 2015** and has been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and RF exposure KDB procedures.

The results and statements contained in this report pertain only to the device(s) evaluated.

Revision History

Revision	Report Number	Issue Date	Description	Author/ Revised by
1.0	RSHA210121001-20C	2021-06-07	Original Report	Bard Liu

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EUT DESCRIPTION

This report has been prepared on behalf of **Shanghai Ratta Smart Technology Co.,Ltd.** and their **SuperNote**, Model: **A5 X** or the EUT (Equipment under Test) as referred to in the rest of this report.

All measurement and test data in this report was gathered from production sample serial number:* **RSHA210121001 *(Assigned by BACL, Kunshan).The EUT supplied by the applicant was received on* ***2021-01-21****.*

Technical Specification

Product Type	SuperNote
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	FPC Antenna
Body-Worn Accessories:	None
Face-Head Accessories:	None
Operation Mode :	WLAN2.4G/WLAN 5G Bluetooth
Frequency Band:	WLAN(2.4G): 2412-2462MHz(802.11b/g/n-HT20),2422-2452MHz(802.11n-HT40) WLAN (5.2G): 5150-5250 MHz, WLAN (5.8G): 5725-5850 MHz Bluetooth: 2402-2480 MHz
Conducted RF Power:	WLAN (2.4G): 13.31dBm WLAN (5.2G): 12.84dBm WLAN (5.8G): 9.65dBm Bluetooth(BDR/EDR):4.89dBm BLE(1M):2.38 dBm BLE(1M):2.45 dBm
Dimensions (L*W*H):	24.5 cm (H) x 17.8 cm (W) x 0.7 cm (D)
Power Source:	DC 5V from Adapter and DC 3.8V from Battery
Normal Operation:	Body Supported

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.

CE:

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, 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 Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

SAR Limits

FCC Limit

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

CE Limit

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 10 g of tissue)	2.0	10
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 ofindividual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that maybe incurred by people who are aware of the potential for exposure (i.e. as a result of employmentor occupation).

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

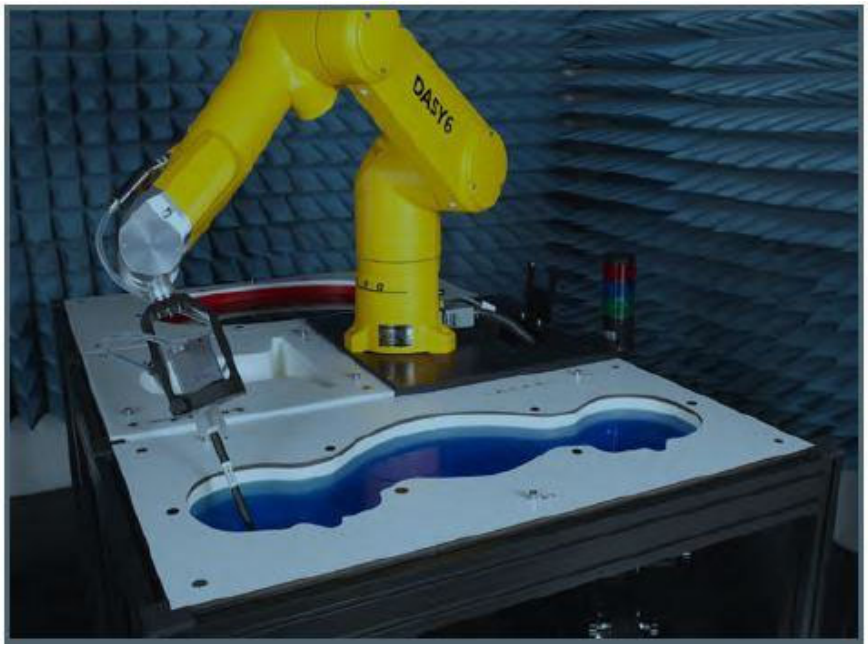
FACILITIES

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on theNo.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code:4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifierCN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted testsite criteria set forth in ANSI C63.4-2014.

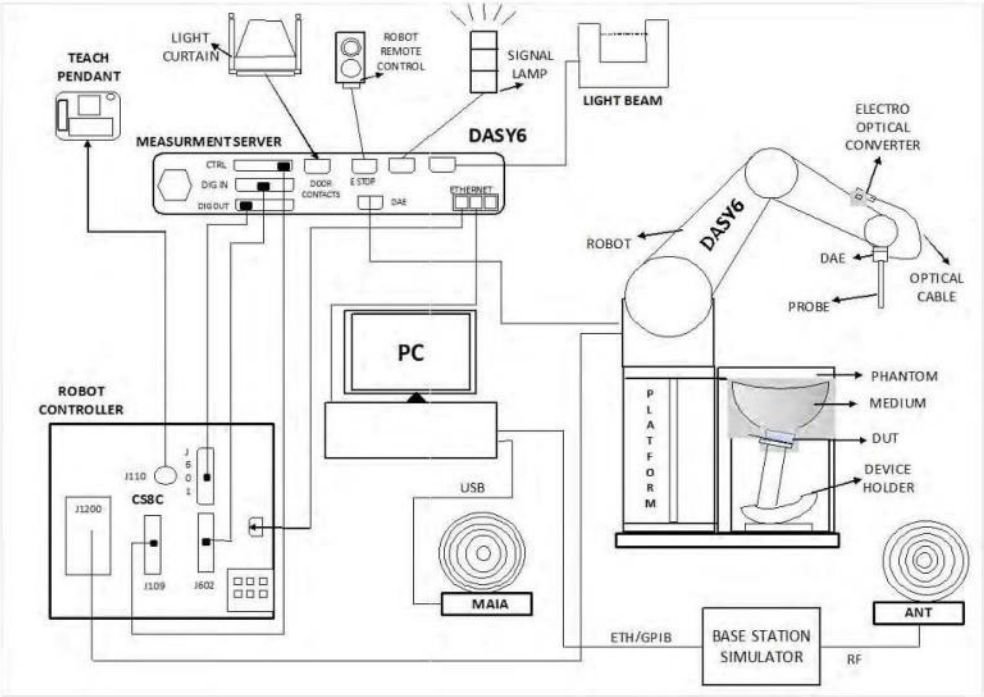
DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY6 from Schmid& Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:



DASY6 System Description

The DASY6 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.

DASY6 Measurement Server

The DASY6 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 DASY6 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

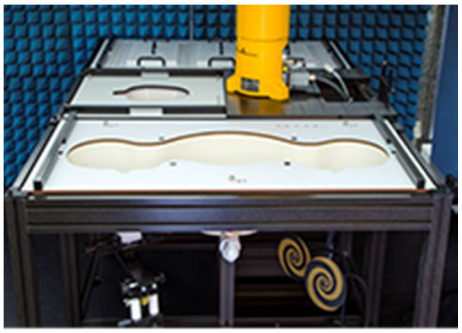
The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through 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 DASY6) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm. The phantom has three measurement areas: 1) Left Head, 2) Right Head, and 3) Flat Section. For larger devices, the use of the ELI-Phantom (shown behind DASY6) is required. For devices such as glasses with a wireless link, the Face Down Phantom is the most suitable (between the SAM Twin and ELI phantoms).

When the phantom is mounted inside allocated slot of the DASY6 platform, phantom reference points can be taught directly in the DASY5 V5.2 software. When the DASY6 platform is used to mount the

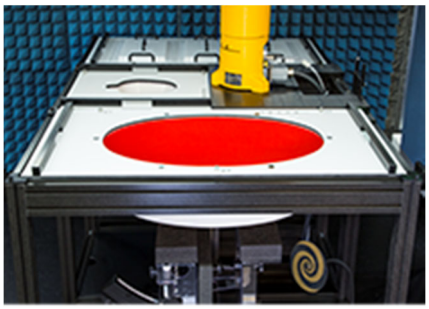
Phantom, some of the phantom teaching points cannot be reached by the robot in DASY5 V5.2. A special tool called P1a-P2aX-Former is provided to transform two of the three points, P1 and P2, to reachable locations. To use these new teaching points, a revised phantom configuration file is required.
In 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.

ELI Phantom



The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI is fully compatible with the latest draft of the standard IEC 62209-2 and the use of all known tissue simulating liquids. ELI has been optimized for performance and can be integrated into a SPEAG standard phantom table. A cover is provided to prevent evaporation of water and changes in liquid parameters. 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 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 ELI phantom

Robots

The DASY6 system uses the high-precision industrial robots TX60L, TX90XL, and RX160L from St aubli
SA (France). The TX robot family - the successor of the well-known RX robot family - continues to
offer the features important for DASY6 applications:

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

The robots are controlled by the Staubli CS8c robot controllers. All information regarding the use andmaintenance of the robot arm and the robot controller is provided

Area Scans

Area scans are defined prior to the measurementprocess being executed with a user definedvariable spacing between each measurementpoint (integral) allowing low uncertaintymeasurements to be conducted. Scans defined for FCC applications utilize a 15mm2 step integral, with 1.5mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the DASY6 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m^3 is used to represent the head and body tissue density and not the phantomliquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10g cube is 21.5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 7 x7 x 7 (5mmx5mmx5mm) providing a volume of 30 mm in the X & Y & Z axis.

Recommended Tissue Dielectric Parameters for Head and Body

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the EN 62209-1:2016

Recommended Tissue Dielectric Parameters for Head liquid

Table A.3 – Dielectric properties of the head tissue-equivalent liquid

Frequency MHz	Relative permittivity ε_r	Conductivity (σ) S/m
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
1 450	40,5	1,20
1 500	*40,4*	*1,23*
1 640	*40,2*	*1,31*
1 750	*40,1*	*1,37*
1 800	40,0	1,40
1 900	40,0	1,40
2 000	40,0	1,40
2 100	*39,8*	*1,49*
2 300	*39,5*	*1,67*
2 450	39,2	1,80
2 600	*39,0*	*1,96*
3 000	38,5	2,40
3 500	*37,9*	*2,91*
4 000	*37,4*	*3,43*
4 500	*36,8*	*3,94*
5 000	*36,2*	*4,45*
5 200	*36,0*	*4,66*
5 400	*35,8*	*4,86*
5 600	*35,5*	*5,07*
5 800	*35,3*	*5,27*
6 000	*35,1*	*5,48*

NOTE For convenience, permittivity and conductivity values at those frequencies which are not part of the original data provided by Drossos et al. [33] or the extension to 5 800 MHz are provided (i.e. the values shown *in italics*). These values were linearly interpolated between the values in this table that are immediately above and below those values, except the values at 6 000 MHz that were linearly extrapolated from the values at 3 000 MHz and 5 800 MHz.

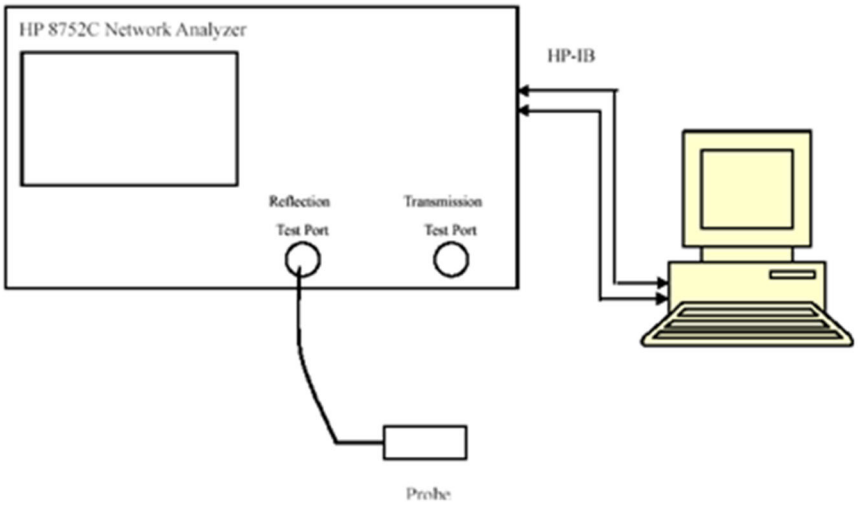
EQUIPMENT LIST AND CALIBRATION

Equipment's List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	N/A	N/A
DASY6 Measurement Server	DASY6 6.0.31	N/A	N/A	N/A
Data Acquisition Electronics	DAE4	527	2020/07/9	2021/07/8
E-Field Probe	EX3DV4	7557	2020/10/03	2021/10/02
Mounting Device	MD4HHTV5	SD 000 H01 KA	N/A	N/A
Twin-SAM Phantom	QD 000 P41 AA	1963	N/A	N/A
Dipole,2450MHz	D2450V2	970	2018/06/26	2021/06/25
Dipole,5GHz	D5GHzV2	1296	2019/10/03	2022/10/02
Simulated Tissue LiquidHead	HBBL600-6000V6	180611-3	Each Time	
Network Analyzer	8753B	3625A00809	2020/12/13	2021/12/12
Dielectric Assessment Kit	DAK-3.5	SM DAK 300AB	N/A	N/A
Signal Generator	N5182B	MY53051592	2020/12/13	2021/12/12
Power Meter	E4419B	GB43312421	2020/08/04	2021/08/03
Power Amplifier	5S1G4	71377	N/A	N/A
Directional Coupler	4242-10	3307	N/A	N/A
Attenuator	3dB	5402	N/A	N/A
Attenuator	10dB	AU 3842	N/A	N/A
Signal Analyzer	FSV40	101116	2020-07-22	2021-07-21

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency (MHz)	LiquidType	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		σ (S/m)	εr	σ (S/m)	εr	σ (S/m)	εr	
2450	Simulated Tissue 2450 MHz Head	1.876	38.117	1.80	39.20	4.22	-2.76	±5
2412	Simulated Tissue 2450 MHz Head	1.833	38.279	1.76	39.26	4.15	-2.50	±5
2437	Simulated Tissue 2450 MHz Head	1.862	38.177	1.79	39.22	4.02	-2.66	±5
2462	Simulated Tissue 2450 MHz Head	1.889	38.063	1.81	39.18	4.36	-2.85	±5
2402	Simulated Tissue 2450 MHz Head	1.822	38.327	1.76	39.27	3.52	-2.40	±5
2441	Simulated Tissue 2450 MHz Head	1.866	38.160	1.79	39.21	4.25	-2.68	±5
2480	Simulated Tissue 2450 MHz Head	1.911	37.983	1.83	39.16	4.43	-3.01	±5

Frequency (MHz)	LiquidType	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		σ (S/m)	εr	σ (S/m)	εr	σ (S/m)	εr	
5250	Simulated Tissue 5250 MHz Head	4.626	36.729	4.71	35.90	-1.78	2.31	±5
5180	Simulated Tissue 5250 MHz Head	4.544	36.887	4.64	36.02	-2.07	2.41	±5
5200	Simulated Tissue 5250 MHz Head	4.564	36.841	4.66	36.00	-2.06	2.34	±5
5240	Simulated Tissue 5250 MHz Head	4.614	36.748	4.70	35.96	-1.83	2.19	±5

**Liquid Verification above was performed on 2021-06-06*

Frequency (MHz)	LiquidType	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		σ (S/m)	ε_r	σ (S/m)	ε_r	σ (S/m)	ε_r	
5800	Simulated Tissue 5800 MHz Head	5.274	35.518	5.27	35.30	0.08	0.62	±5
5745	Simulated Tissue 5800 MHz Head	5.209	35.632	5.21	35.36	-0.02	0.77	±5
5785	Simulated Tissue 5800 MHz Head	5.257	35.553	5.25	35.32	0.13	0.66	±5
5825	Simulated Tissue 5800 MHz Head	5.303	35.467	5.30	35.28	0.06	0.53	±5

Liquid Verification above was performed on 2021-06-06

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.

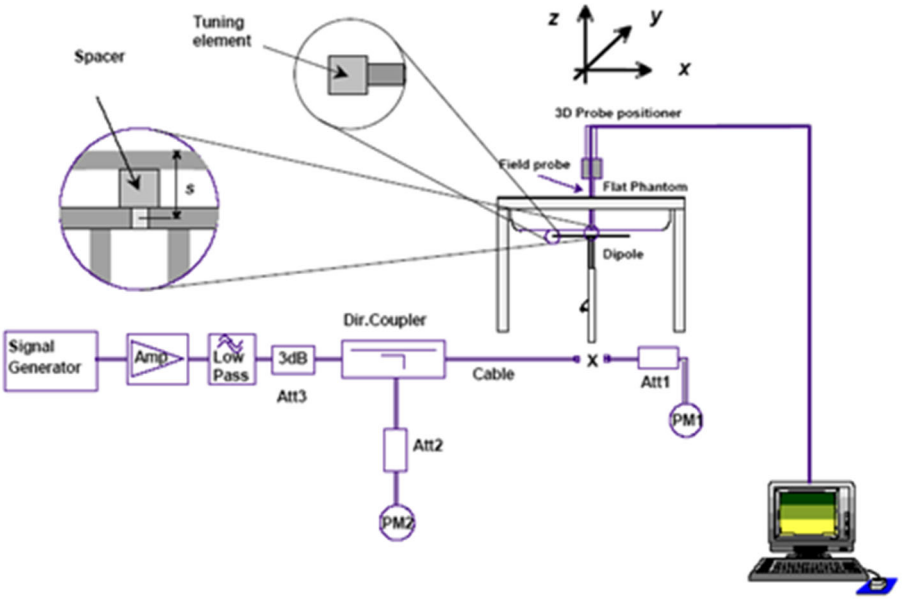
The spacing distance*s* in the System Verification Setup Block Diagram is given by the following:

a) s = 15 mm ± 0,2 mm for 300 MHz ≤ f ≤ 1 000 MHz;

b) s = 10 mm ± 0,2 mm for 1 000 MHz < f ≤ 3 000 MHz;

c) s = 10 mm ± 0,2 mm for 3 000 MHz < f ≤ 6 000 MHz.

System Verification Setup Block Diagram



System Accuracy Check Results

Date	Frequency Band	Liquid Type	Input Power (mW)	Measured SAR(W/kg)		Normalized to 1g SAR (W/kg)	Target Value (W/kg)	Delta (%)	Tolerance (%)
2021/06/06	2450	Head	250	1g	13.50	54	53.30	1.31	±10
2021/06/06	5250	Head	100	1g	7.73	77.3	79.20	-2.40	±10
2021/06/06	5800	Head	100	1g	8.50	85	79.9	6.38	±10

Note: The SAR values above are normalized to 1 Watt forward power

SAR SYSTEM VALIDATION DATA

System Check_Head_2450MHz

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:970

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.876 S/m; ε_r = 38.117; ρ = 1000 kg/m^3

DASY5 Configuration:

- Probe: EX3DV4 - SN7557;ConvF(7.23, 7.23, 7.23); Calibrated: 11/5/2020,
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn527; Calibrated: 7/9/2020
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2095
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 17.7 W/kg

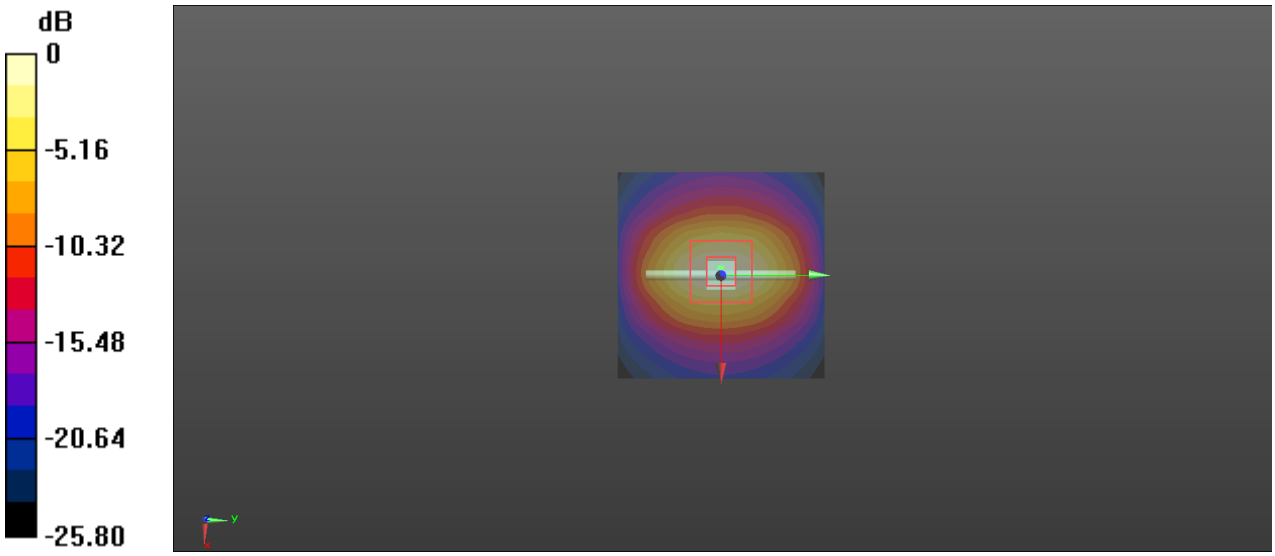
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.68 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.35 W/kg

Maximum value of SAR (measured) = 17.8 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

System Check_Head_5250MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1296

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5250 MHz; σ = 4.626 S/m; ε_r = 36.729; ρ = 1000 kg/m^3

DASY5 Configuration:

- Probe: EX3DV4 - SN7557;ConvF(5.38, 5.38, 5.38); Calibrated: 11/5/2020,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn527; Calibrated: 7/9/2020
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2095
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7437)

Pin=100mW/Area Scan (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 19.5 W/kg

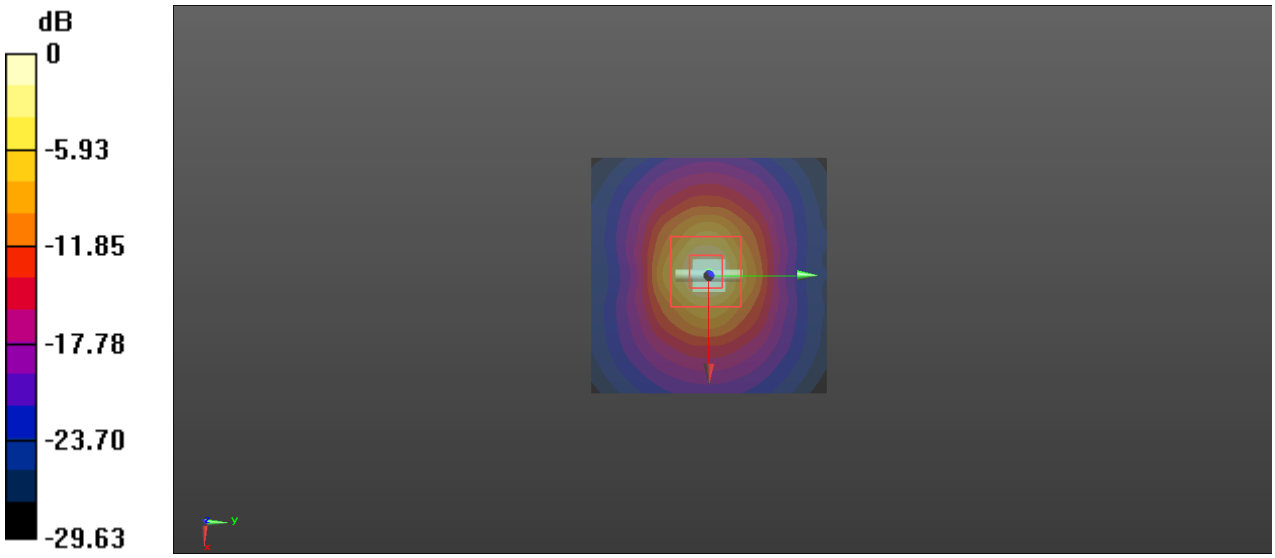
Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.40 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 32.6 W/kg

SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.21 W/kg

Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 19.5 W/kg = 12.90 dBW/kg

System Check_Head_5800MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1296

Communication System: UID 0, CW (0); Frequency: 5800 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5800 MHz; σ = 5.274 S/m; ε_r = 35.518; ρ = 1000 kg/m^3

DASY5 Configuration:

- Probe: EX3DV4 - SN7557;ConvF(4.73, 4.73, 4.73); Calibrated: 11/5/2020,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn527; Calibrated: 7/9/2020
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2095
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7437)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 21.6 W/kg

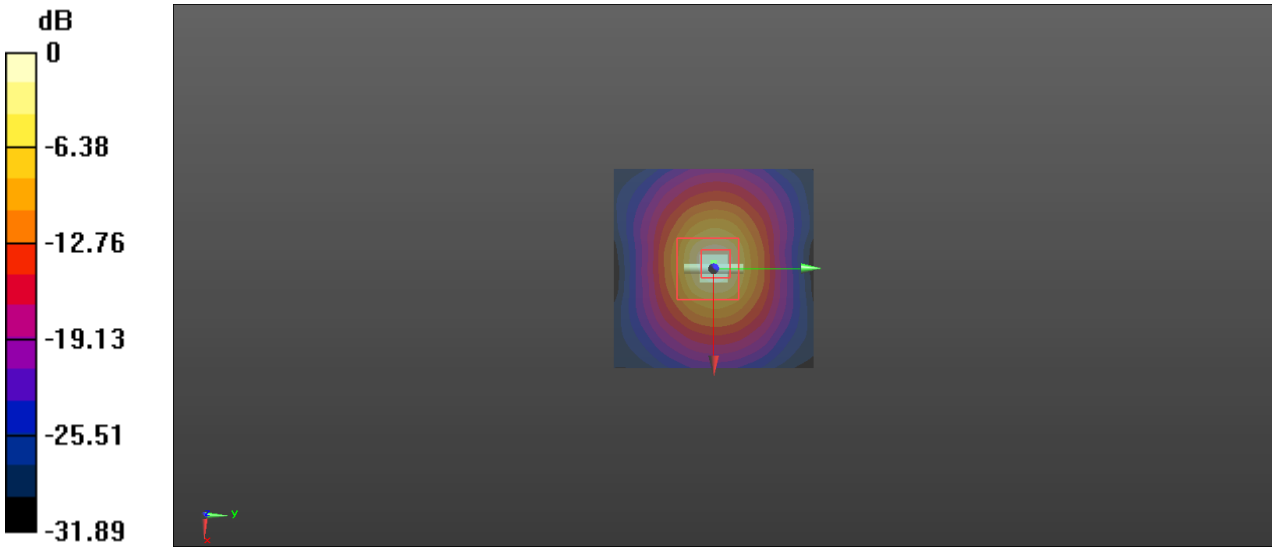
Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.15 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 40.2 W/kg

SAR(1 g) = 8.5 W/kg; SAR(10 g) = 2.37 W/kg

Maximum value of SAR (measured) = 21.8 W/kg



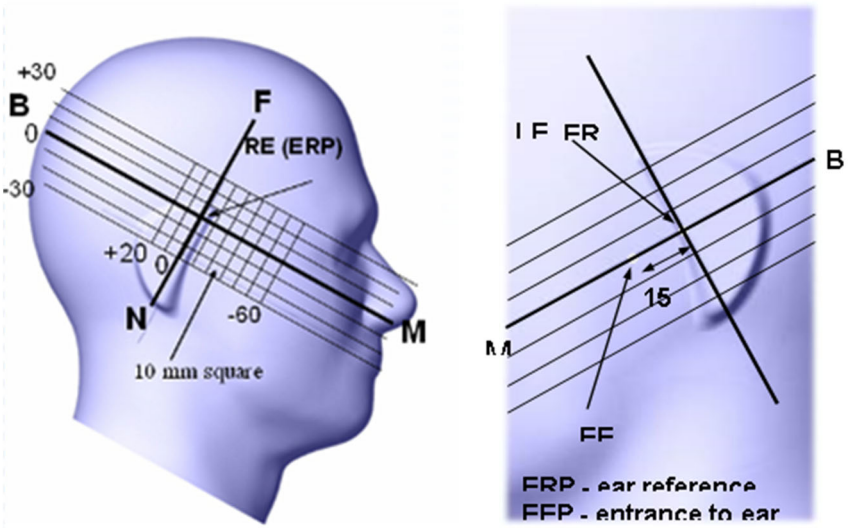
0 dB = 21.6 W/kg = 13.34 dBW/kg

EUT TEST STRATEGY AND METHODOLOGY

Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point". The "test device reference point" should be located at the same level as the center of the earpiece region. The "vertical centerline" should bisect the front surface of the handset at its top and bottom edges. A "ear reference point" is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the "phantom reference plane" defined by the three lines joining the center of each "ear reference point" (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane". This is called the "initial ear position". While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:



Cheek/Touch Position

The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

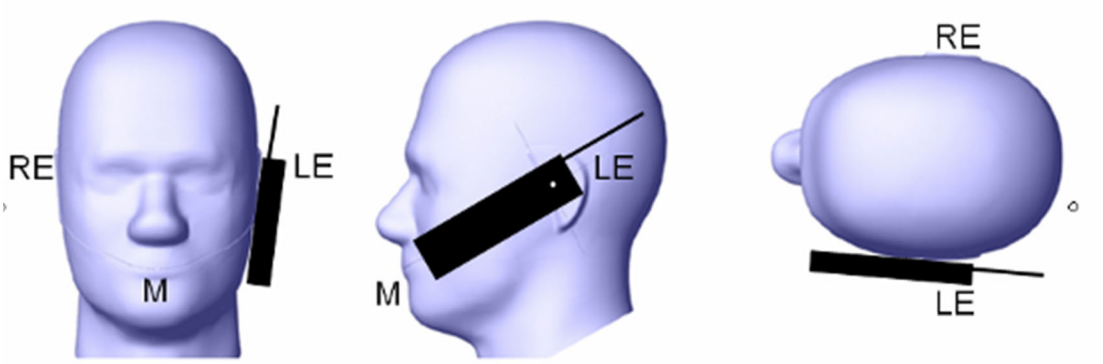
This test position is established:

When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.

(or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek /Touch Position



Ear/Tilt Position

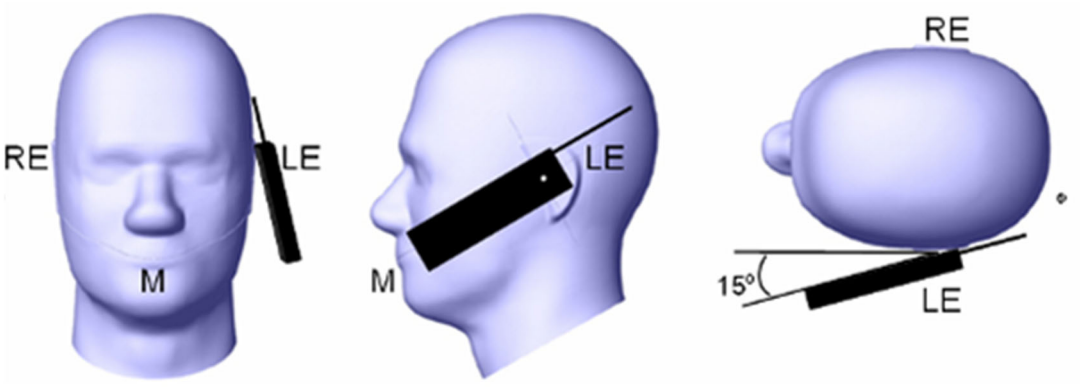
With the handset aligned in the "Cheek/Touch Position":

15) If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the "test device reference point" until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tilt/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear /Tilt 15o Position



Test positions for body-worn and other configurations

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

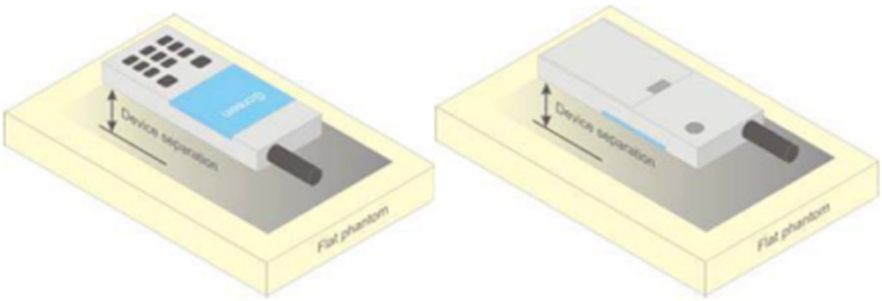


Figure 5 – Test positions for body-worn devices

Test Distance for SAR Evaluation

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:

15) 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

Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

Test Procedure

The RF output of the transmitter was connected to the input of the Power Meter

WLAN

Radio Configuration

The power measurement was configured by the Power Meter.

Wi-Fi

For 802.11b, 802.11g and 802.11n-HT20 mode, 13 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	/	/
6	2437	/	/
7	2442	/	/

For 802.11b, 802.11g, 802.11n-HT20 mode, EUT was tested with Channel 1, 6 and 11

For 802.11n-HT40 mode, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2422	6	2447
2	2427	7	2452
3	2432	/	/
4	2437	/	/
5	2442	/	/

For 802.11a/802.11ac20/n20 mode Channel 36, 40, 48 were tested.
802.11n40/802.11ac40 mode Channel 38, 46 were tested.
802.11ac80 mode Channel 42 was tested.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

For 802.11a/802.11ac20/n20 mode Channel 149, 157, 165 were tested.
802.11n40/802.11ac40 mode Channel 151, 159 were tested.
802.11ac80 mode Channel 155 was tested.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	159	5795
151	5755	161	5805
153	5765	165	5825
155	5775	/	/
157	5785	/	/

Maximum Target Output Power

Max Target Power(dBm)			
Mode/Band	**Channel**		
	Low	**Middle**	**High**
WLAN(2.4G)	13.5	13.5	13.5
Bluetooth	4.0	5.0	5.0
BLE	3.0	3.0	3.0
WLAN(5.2G)	13.0	13.0	13.0
WLAN(5.8G)	9.7	9.7	9.7

Test Results:

WLAN 2.4GHz:

Mode	Channel frequency (MHz)	Data Rate	Average power (dBm)
802.11b	2412	1Mbps	12.43
	2437		13.15
	2462		13.31
802.11g	2412	6Mbps	10.94
	2437		11.38
	2462		11.67
802.11n-HT20	2412	MCS0	10.99
	2437		11.44
	2462		11.96
802.11n-HT40	2422	MCS0	5.84
	2437		6.23
	2452		6.39

WLAN 5.2GHz:

Mode	Channel frequency (MHz)	Data Rate	Average power (dBm)
802.11a	5180	6Mbps	12.84
	5200		12.43
	5240		12.44
802.11ac20	5180	MCS0	12.15
	5200		11.95
	5240		12.09
802.11n-HT20	5180	MCS0	12.20
	5200		11.89
	5240		12.17
802.11ac40	5190	MCS0	11.39
	5230		11.09
802.11n-HT40	5190	MCS0	11.12
	5230		11.05
802.11ac80	5210	MCS0	10.11

WLAN 5.8GHz:

Mode	Channel frequency (MHz)	Data Rate	Average power (dBm)
802.11a	5745	6Mbps	9.65
	5785		9.60
	5825		9.25
802.11ac20	5745	MCS0	9.49
	5785		9.30
	5825		8.74
802.11n-HT20	5745	MCS0	9.33
	5785		9.25
	5825		8.63
802.11ac40	5755	MCS0	9.11
	5795		8.37
802.11n-HT40	5755	MCS0	9.15
	5795		8.12
802.11ac80	5775	MCS0	8.17

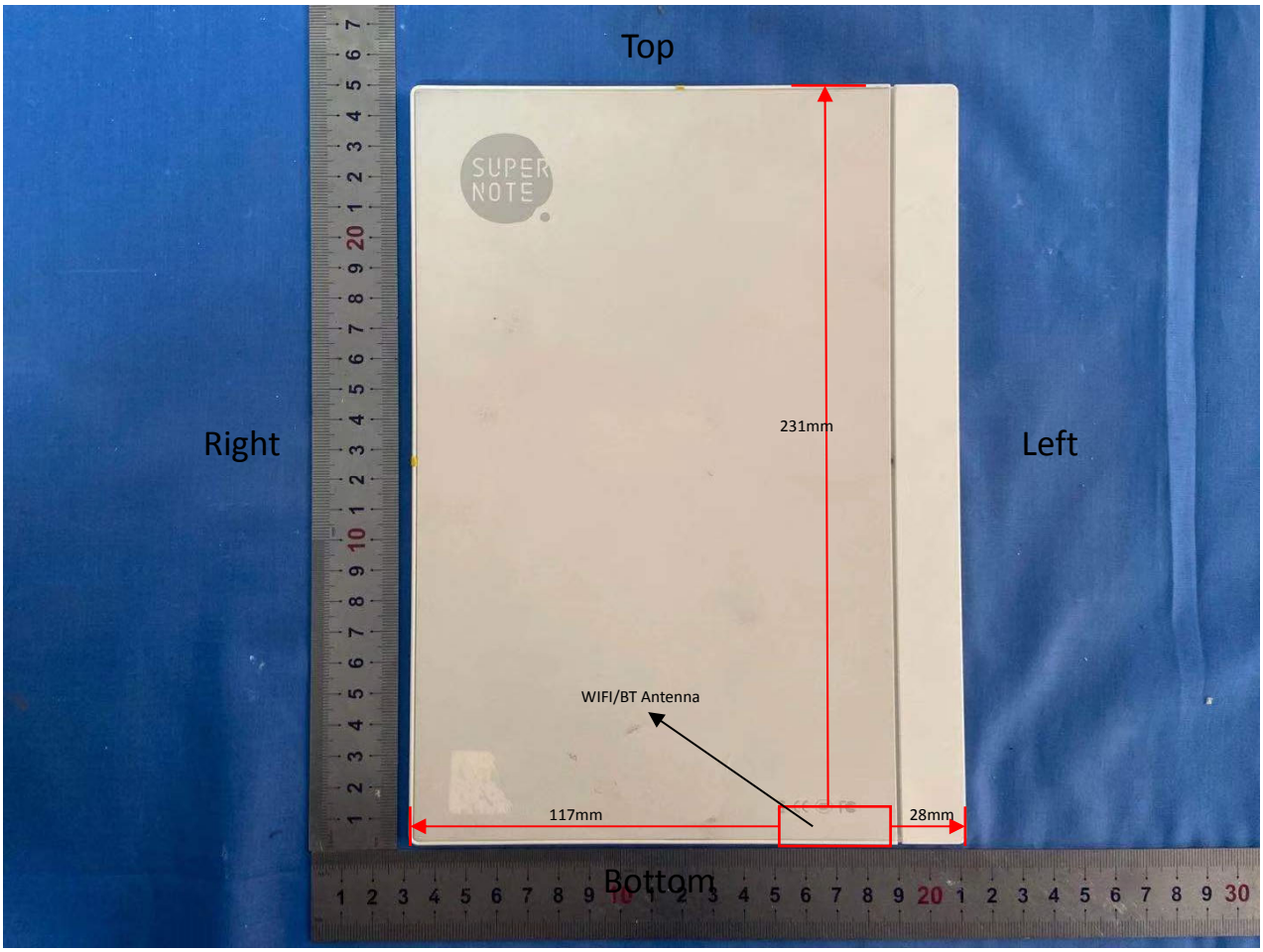
Bluetooth:

Mode	Average Power (dBm)		
	Low	Middle	High
BDR(GFSK)	1.80	2.95	3.26
EDR(π/4-DQPSK)	2.82	4.23	4.62
EDR(8-DPSK)	3.20	4.49	4.89

Mode	Channel frequency (MHz)	Average power (dBm)
BLE(1M)	2402	1.07
	2440	2.19
	2480	2.38
BLE(2M)	2402	1.15
	2440	2.33
	2480	2.45

STANDALONE SAR TEST EXCLUSION CONSIDERATIONS

Antennas Location:



Antenna Distance To Edge

Antenna Distance To Edge(mm)						
Antenna	**Front**	**Back**	**Left**	**Right**	**Top**	**Bottom**
WLAN/ BT	<5	<5	28	117	231	<5

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power(e.r.i.p.) source-based, time-averaged output power. For controlled use devices where the 8W/kg for gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by 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 5mm,the exemption limits for a separation distance of 5mm 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

Position	Distance (mm)	Mode	Frequency (MHz)	Max Pavg (dBm)+Gain (dBi)	Max Pavg (mW)	Test exclusion Threshold (mW)	SAR test Exclusion
Front/Back/ Bottom	0	WLAN 2.4G	2462	16.16	41.30	3.98	No
		WLAN 5.2G	5240	15.60	36.31	1.24	No
		WLAN 5.8G	5825	12.36	17.22	1	No
		Bluetooth BDR/EDR	2480	7.6	5.75	3.94	No
Left	28	WLAN 2.4G	2462	16.16	41.30	52.06	YES
		WLAN 5.2G	5240	15.60	36.31	46.06	YES
		WLAN 5.8G	5825	12.36	17.22	41.13	YES
		Bluetooth BDR/EDR	2480	7.6	5.75	49.92	YES
Right	117	WLAN 2.4G	2462	16.16	41.30	308.78	YES
		WLAN 5.2G	5240	15.60	36.31	150.8	YES
		WLAN 5.8G	5825	12.36	17.22	107.2	YES
		Bluetooth BDR/EDR	2480	7.6	5.75	308.46	YES
Top	231	WLAN 2.4G	2462	16.16	41.30	308.78	YES
		WLAN 5.2G	5240	15.60	36.31	150.8	YES
		WLAN 5.8G	5825	12.36	17.22	107.2	YES
		Bluetooth BDR/EDR	2480	7.6	5.75	308.46	YES

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed diametric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	22.5-23.1℃
Relative Humidity:	67%
Test Date:	2021/06/06

The testing was performed by Bard Liu.

WLAN2.4G:

Band	EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	Scaled Factor (dBm)	Meas. (W/Kg)	Scaled SAR (W/Kg)	Limit (W/Kg)	Plot
WLAN2.4G	Body Front(0mm)	2462	802.11b 1Mbps	13.31	13.5	1.045	0.028	0.030	1.6	/
WLAN2.4G	Body Back(0mm)	2462	802.11b 1Mbps	13.31	13.5	1.045	0.047	0.049	1.6	1#
WLAN2.4G	Body Back(0mm)	2412	802.11b 1Mbps	12.43	13.5	1.279	0.036	0.046	1.6	/
WLAN2.4G	Body Back(0mm)	2437	802.11b 1Mbps	13.15	13.5	1.084	0.036	0.039	1.6	/
WLAN2.4G	Body Bottom(0mm)	2462	802.11b 1Mbps	13.31	13.5	1.045	0.031	0.033	1.6	/

WLAN5.2G:

Band	EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	Scaled Factor (dBm)	Meas. (W/Kg)	Scaled SAR (W/Kg)	Limit (W/Kg)	Plot
WLAN5.2G	Body Front(0mm)	5180	802.11a 6Mbps	12.84	13	1.038	0.359	0.372	1.6	/
WLAN5.2G	Body Back(0mm)	5180	802.11a 6Mbps	12.84	13	1.038	0.498	0.517	1.6	/
WLAN5.2G	Body Back(0mm)	5200	802.11a 6Mbps	12.43	13	1.140	0.802	0.914	1.6	2#
WLAN5.2G	Body Back(0mm)	5240	802.11a 6Mbps	12.44	13	1.138	0.752	0.855	1.6	/
WLAN5.2G	Body Bottom(0mm)	5180	802.11a 6Mbps	12.84	13	1.038	0.562	0.583	1.6	/

WLAN5.8G:

Band	EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	Scaled Factor (dBm)	Meas. (W/Kg)	Scaled SAR (W/Kg)	Limit (W/Kg)	Plot
WLAN5.8G	Body Front(0mm)	5745	802.11a 6Mbps	9.65	9.7	1.012	0.456	0.461	1.6	/
WLAN5.8G	Body Back(0mm)	5745	802.11a 6Mbps	9.65	9.7	1.012	0.612	0.619	1.6	3#
WLAN5.8G	Body Back(0mm)	5785	802.11a 6Mbps	9.6	9.7	1.023	0.547	0.560	1.6	/
WLAN5.8G	Body Back(0mm)	5825	802.11a 6Mbps	9.25	9.7	1.109	0.407	0.451	1.6	/
WLAN5.8G	Body Bottom(0mm)	5745	802.11a 6Mbps	9.65	9.7	1.012	0.271	0.274	1.6	/

Bluetooth:

Band	EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	Scaled Factor (dBm)	Meas. (W/Kg)	Scaled SAR (W/Kg)	Limit (W/Kg)	Plot
Bluetooth	Body Front(0mm)	2480	8-DPSK	4.89	5	1.026	0.010	0.011	1.6	/
Bluetooth	Body Back(0mm)	2480	8-DPSK	4.89	5	1.026	0.019	0.020	1.6	/
Bluetooth	Body Back(0mm)	2402	8-DPSK	3.20	5	1.514	0.025	0.038	1.6	4#
Bluetooth	Body Back(0mm)	2441	8-DPSK	4.49	5	1.125	0.019	0.022	1.6	/
Bluetooth	Body Bottom(0mm)	2480	8-DPSK	4.89	5	1.026	0.022	0.023	1.6	/

Note:

1. When the 1 - g SAR is ≤ 0. 8W/kg, testing for other channels are optional.
2. The EUT transmit and receive through the same antenna while testing SAR.
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. For modes that peak SAR is too low to evaluate, a SAR value 0.01W/kg is considered as their Scaled SAR.

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 IEEE1528-2013 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	R	√3	1	1	2.7	2.7
Detection limits	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambientconditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Device holder uncertainty	6.3	N	1	1	1	6.3	6.3
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Liquid conductivity target)	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid conductivity meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity target)	5.0	R	√3	0.6	0.49	1.7	1.4
Liquid permittivity meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Combined standard uncertainty		RSS				12.2	12.0
Expanded uncertainty 95 % confidence interval)						24.3	23.9

Measurement uncertainty evaluation for IEC62209-2 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Linearity	4.7	R	√3	1	1	2.7	2.7
Modulation Response	0.0	R	√3	1	1	0.0	0.0
Detection limits	1.0	R	√3	1	1	0.6	0.6
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambient conditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Test sample related							
Device holder Uncertainty	6.3	N	1	1	1	6.3	6.3
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Power scaling	4.5	R	√3	1	1	2.6	2.6
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.9	N	1	1	0.84	1.1	0.9
Liquid conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Temp. unc. - Conductivity	1.7	R	√3	0.78	0.71	0.8	0.7
Temp. unc. - Permittivity	0.3	R	√3	0.23	0.26	0.0	0.0
Combined standard uncertainty		RSS				12.2	12.1
Expanded uncertainty 95 % confidence interval)						24.5	24.2

APPENDIX B EUT PHOTO AND EUT TEST POSITION PHOTOS

Please Refer to the Attachment.

APPENDIX C SAR PLOTS OF SAR MEASUREMENT

Test Plot 1#_ WLAN 2.4GHz_802.11b 1Mbps_Back_0mm_Ch11

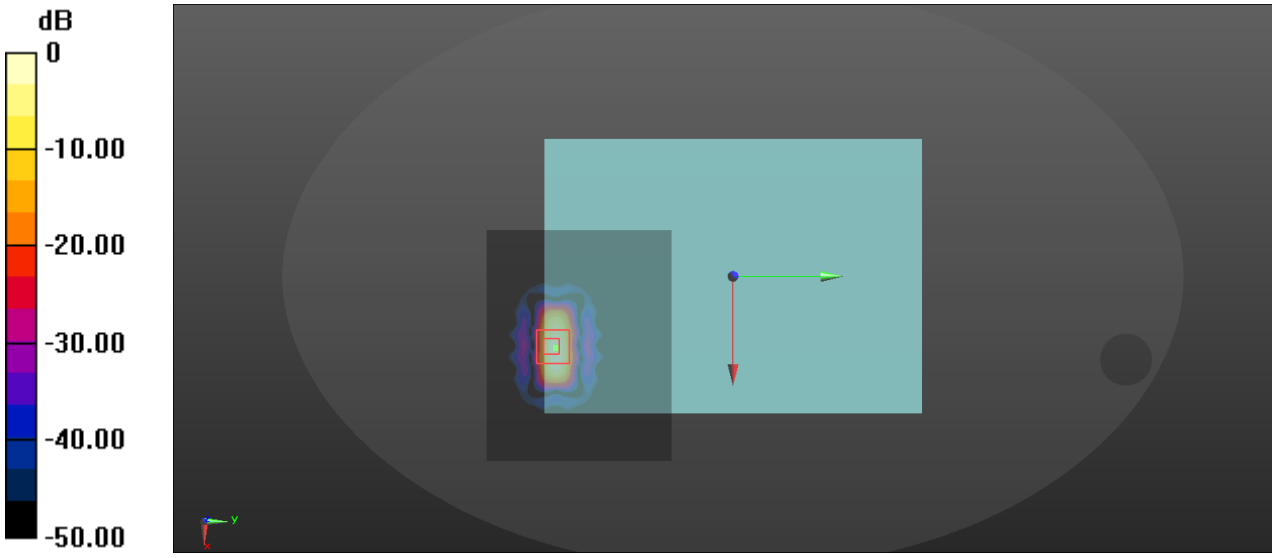
Communication System: UID 0, WIFI2.4G (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.822 S/m; ε_r = 38.276; ρ = 1000 kg/m^3

DASY5 Configuration:

- Probe: EX3DV4 - SN7557;ConvF(7.23, 7.23, 7.23); Calibrated: 11/5/2020,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn527; Calibrated: 7/9/2020
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2095
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7437)

Area Scan (101x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0681 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.2130 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.134 W/kg
SAR(1 g) = 0.047 W/kg; SAR(10 g) = 0.013 W/kg
Maximum value of SAR (measured) = 0.0683 W/kg



0 dB = 0.0681 W/kg = -11.67 dBW/kg

Test Plot 2#_WLAN 5.2GHz_802.11a 6Mbps_Back_0mm_Ch40

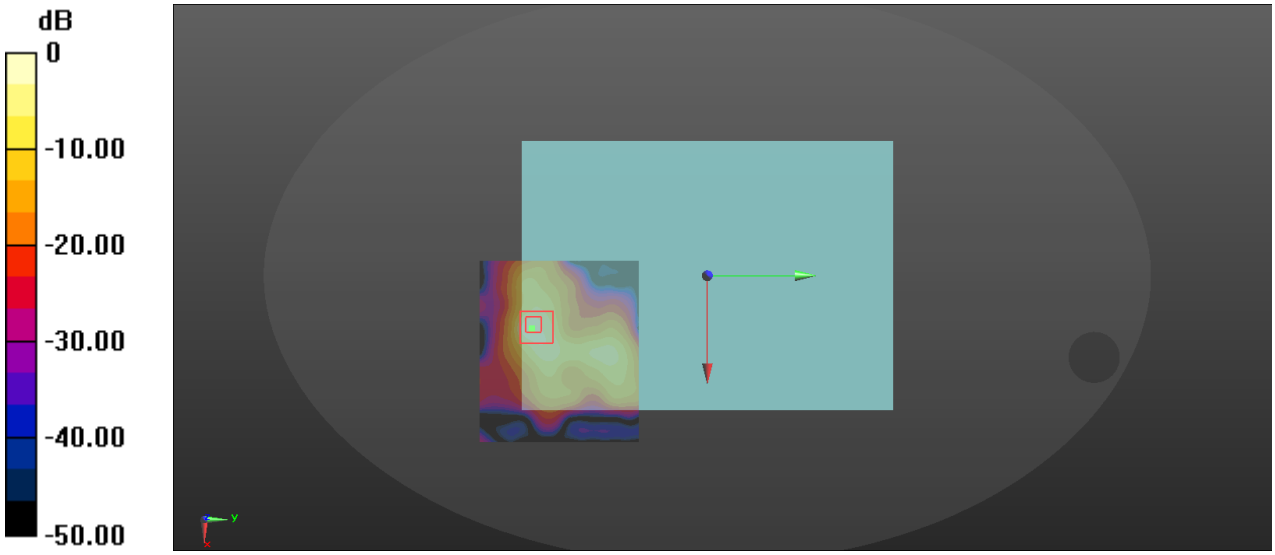
Communication System: UID 0, WIFI 5G (0); Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 4.564 S/m; ε_r = 36.841; ρ = 1000 kg/m^3

DASY5 Configuration:

- Probe: EX3DV4 - SN7557;ConvF(5.38, 5.38, 5.38); Calibrated: 11/5/2020,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn527; Calibrated: 7/9/2020
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2095
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7437)

Area Scan (81x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.17 W/kg

Zoom Scan (5x5x4)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0.6970 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 4.30 W/kg
SAR(1 g) = 0.802 W/kg; SAR(10 g) = 0.193 W/kg
Maximum value of SAR (measured) = 2.35 W/kg



0 dB = 1.17 W/kg = 0.68 dBW/kg

Test Plot 3#_WLAN 5.8GHz_802.11a 6Mbps_Back_0mm_Ch149

Communication System: UID 0, WIFI 5G (0); Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5745 MHz; σ = 5.209 S/m; ε_r = 35.632; ρ = 1000 kg/m^3

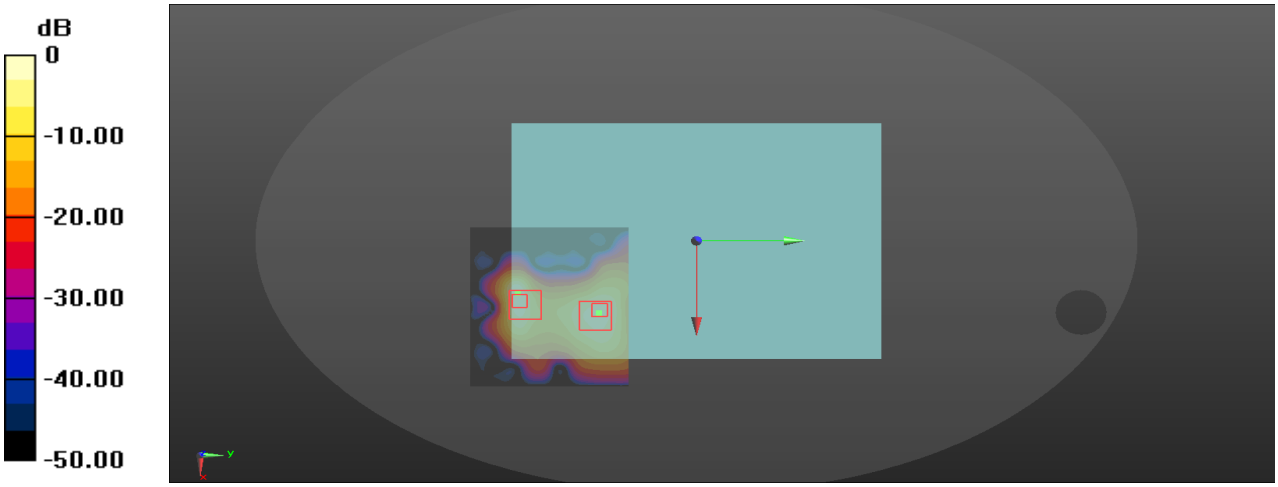
DASY5 Configuration:

- Probe: EX3DV4 - SN7557;ConvF(4.73, 4.73, 4.73); Calibrated: 11/5/2020,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn527; Calibrated: 7/9/2020
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2095
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7437)

Area Scan (81x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.91 W/kg

Zoom Scan (6x6x4)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0.6560 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.71 W/kg
SAR(1 g) = 0.612 W/kg; SAR(10 g) = 0.164 W/kg
Maximum value of SAR (measured) = 1.89 W/kg

Zoom Scan (6x6x4)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0.6560 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.23 W/kg
SAR(1 g) = 0.464 W/kg; SAR(10 g) = 0.170 W/kg
Maximum value of SAR (measured) = 1.16 W/kg



0 dB = 1.91 W/kg = 2.81 dBW/kg

Test Plot 4#_BT_Back_0mm_Ch0

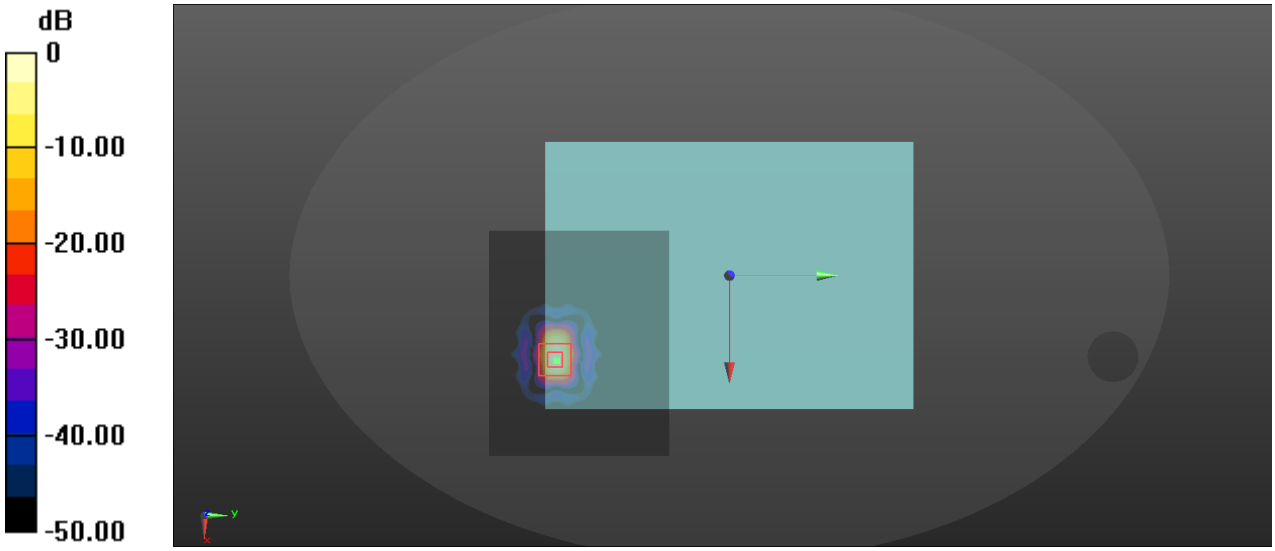
Communication System: UID 0, Bluetooth (0); Frequency: 2402 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2402 MHz; σ = 1.822 S/m; ε_r = 38.327; ρ = 1000 kg/m^3

DASY5 Configuration:

- Probe: EX3DV4 - SN7557;ConvF(7.23, 7.23, 7.23); Calibrated: 11/5/2020,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn527; Calibrated: 7/9/2020
- Phantom: ELI V8.0; Type: QD OVA 004 Ax; Serial: 2095
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7437)

Area Scan (101x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0114 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.0370 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.0130 W/kg
SAR(1 g) = 0.0254 W/kg; SAR(10 g) = 0.0101 W/kg
Maximum value of SAR (measured) = 0.0104 W/kg



0 dB = 0.0114 W/kg = -19.43 dBW/kg

APPENDIX D CALIBRATION CERTIFICATES

Please Refer to the Attachment.

Declarations

1: BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

5: This report cannot be reproduced except in full, without prior written approval of the Company.

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