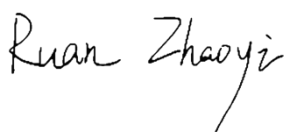


TEST REPORT

Applicant: Realtek Semiconductor Corp.
Address: No. 2, Innovation Road II, Hsinchu Science Park,
Hsinchu 300, Taiwan
Equipment Type: 11ax RTL8852CE Combo module
Model Name: RTL8852CE
Brand Name: N/A
FCC ID: TX2-RTL8852CE
Test Standard: FCC 47 CFR Part 2.1093
(refer section 3.1)
Maximum SAR: Body 2.4GHz(1 g): 0.12 W/kg
Body 5GHz(1 g): 0.43 W/kg
Body 6GHz(1 g): 0.34 W/kg
Limbs 2.4GHz(10 g): 0.05 W/kg
Limbs 5GHz(10 g): 0.18 W/kg
Limbs 6GHz(10 g): 0.11 W/kg
Sample Arrival Date: Jan. 16, 2023
Test Date: Jan. 30, 2023 - Feb. 09, 2023
Date of Issue: Mar. 23, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Ruan Zhaoyi**Checked by:** Xu Rui**Approved by:** Tolan Tu
(Testing Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Mar. 23, 2023</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

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

1.2 Test Location

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

1.3 Test Environment Condition

Ambient Temperature	18°C to 25°C
Ambient Relative Humidity	30% to 70%

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Realtek Semiconductor Corp.
Address	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

2.2 Manufacturer Information

Manufacturer	Realtek Semiconductor Corp.
Address	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

2.3 General Description for Equipment under Test (EUT)

EUT Name	11ax RTL8852CE Combo module
Model Name Under Test	RTL8852CE
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.3.1 Host Information:

Product Name	Notebook Computer
Model Name	ThinkBook 16 G4+ ARA
Brand Name	Lenovo

2.3.2 Antenna Information:

Antenna Port	Model Name	Antenna Manufacturer	Antenna Type	Antenna Gain (dBi)								
				2.4 GHz	5.15 - 5.25 GHz	5.25 - 5.35 GHz	5.47 - 5.725 GHz	5.725 - 5.895 GHz	5.925 - 6.425 GHz	6.425 - 6.525 GHz	6.525 - 6.875 GHz	6.875 - 7.125 GHz
Main Antenna	F-0G-XZ-0299-000-K0	SPEED	PIFA	2.67	3.51	3.35	4.14	4.14	4.08	4.02	4.02	4.03
Auxiliary Antenna	F-0G-XZ-0299-000-K0		PIFA	2.97	3.14	3.02	3.21	3.90	4.11	3.98	3.98	3.98
Main Antenna	2.00005169	ZhongTian	PIFA	2.67	3.51	3.35	4.14	4.14	4.08	4.02	4.02	4.03
Auxiliary Antenna	2.00005169		PIFA	2.97	3.14	3.02	3.21	3.90	4.11	3.98	3.98	3.98

2.4 Ancillary Equipment

Note: Not application.

2.5 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/40), VHT20/40 and 802.11ax(HE20/40) 5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80/160) and 802.11ax(HE20/40/80/160), U-NII-1/2A/2C/3/4 6G WIFI 802.11ax(HE20/40/80/160), U-NII-5/6/7/8
-----------------------------------	---

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

Operating Mode	2.4G WLAN, 5G WLAN, 6G WLAN, Bluetooth	
Frequency Range	802.11b/g	2412 MHz ~ 2472 MHz
	802.11n(HT20/HT40)	2412 MHz ~ 2472 MHz
	VHT20/VHT40	2412 MHz ~ 2472 MHz
	802.11ax(HE20/HE40)	2412 MHz ~ 2472 MHz
	802.11a	5150 MHz ~ 5250 MHz
		5250 MHz ~ 5350 MHz
		5470 MHz ~ 5725 MHz
		5725 MHz ~ 5850 MHz
		5850 MHz ~ 5895 MHz
	802.11n(HT20/HT40)	5150 MHz ~ 5250 MHz
		5250 MHz ~ 5350 MHz
		5470 MHz ~ 5725 MHz
		5725 MHz ~ 5850 MHz
		5850 MHz ~ 5895 MHz
	802.11ac(VHT20/VHT40/VHT80)	5150 MHz ~ 5250 MHz
		5250 MHz ~ 5350 MHz
		5470 MHz ~ 5725 MHz
		5725 MHz ~ 5850 MHz
		5850 MHz ~ 5895 MHz
	802.11ax(HE20/HE40/HE80)	5150 MHz ~ 5250 MHz
		5250 MHz ~ 5350 MHz
		5470 MHz ~ 5725 MHz
		5725 MHz ~ 5850 MHz
		5850 MHz ~ 5895 MHz
	802.11ac(VHT160)/ax(HE160)	5150 MHz ~ 5250 MHz
		5470 MHz ~ 5725 MHz
		5850 MHz ~ 5895 MHz
	802.11ax(HE20/HE40/HE80/HE160)	5925 MHz ~ 6425 MHz
		6425 MHz ~ 6525 MHz
		6525 MHz ~ 6875 MHz

		6875 MHz ~ 7125 MHz
	Bluetooth	2402 MHz ~ 2480 MHz
Antenna Type	WLAN: PIFA Antenna Bluetooth: PIFA Antenna	
Hotspot Function	N/A	
Exposure Category	General Population/Uncontrolled exposure	
EUT Type	Portable Device	
Product	Type	
	☒ Production unit	☐ Identical prototype

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1093	Radiofrequency radiation exposure evaluation: portable devices
2	ANSI C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	FCC KDB 447498 D04 v01	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
4	FCC KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
5	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
6	KDB 248227 D01 v02r02	SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters
7	KDB 616217 D04v01r02	SAR for laptop and tablets
8	IEC/IEEE 62209- 1528:2020	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)

3.2 Device Category and SAR Limit

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

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

Table of Exposure Limits:

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

NOTE:

General Population/Uncontrolled Exposure: Locations where there is the exposure of individuals who have no knowledge or control of their exposure. General population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Occupational/Controlled Exposure: Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure. In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

3.3 Test Result Summary

3.3.1 Highest SAR (1 g Value)

Equipment Class	Band	Antenna	Maximum Scaled SAR (W/kg)	Maximum Report SAR (W/kg)
			Body (0mm)	Body (0mm)
DTS	2.4G WLAN	Aux.	0.12	0.43
	2.4G WLAN	Main	0.09	
U-NII-2A	5.3G WLAN	Aux.	0.35	
	5.3G WLAN	Main	0.33	
U-NII-2C	5.6G WLAN	Aux.	0.40	
	5.6G WLAN	Main	0.39	
U-NII-3	5.8G WLAN	Aux.	0.24	
	5.8G WLAN	Main	0.43	
U-NII-4	5.9G WLAN	Aux.	0.29	
	5.9G WLAN	Main	0.38	
U-NII-5/6/7/8	6G WLAN	Aux.	0.20	
	6G WLAN	Main	0.34	
DSSS	Bluetooth	Aux.	0.07	
Limit (W/kg)			1.60	
Verdict			Pass	

3.3.2 Highest SAR (10 g Value)

Equipment Class	Band	Antenna	Maximum Scaled SAR (W/kg)	Maximum Report SAR (W/kg)	
			Limbs (0mm)	Limbs (0mm)	
DTS	2.4G WLAN	Aux.	0.05	0.18	
	2.4G WLAN	Main	0.04		
U-NII-2A	5.3G WLAN	Aux.	0.16		
	5.3G WLAN	Main	0.16		
U-NII-2C	5.6G WLAN	Aux.	0.15		
	5.6G WLAN	Main	0.14		
U-NII-3	5.8G WLAN	Aux.	0.16		
	5.8G WLAN	Main	0.18		
U-NII-4	5.9G WLAN	Aux.	0.15		
	5.9G WLAN	Main	0.17		
U-NII-5/6/7/8	6G WLAN	Aux.	0.06		
	6G WLAN	Main	0.11		
DSSS	Bluetooth	Aux.	0.02		
Limit (W/kg)			4.00		
Verdict			Pass		

3.3.3 Highest Simultaneous Transmission SAR Values (1 g Value)

Equipment Class	Maximum Report SAR (W/kg)	SPLSR
	Body (0mm)	
	1g SAR	
DTS	0.55	N/A
NII	0.83	N/A
DSS	0.50	N/A
Limit (W/Kg)	1.60	N/A
Verdict	Pass	Pass

Note: The simultaneous transmission SAR detail please refer to section 12.

3.3.4 Highest Simultaneous Transmission SAR Values (10 g Value)

Equipment Class	Maximum Report SAR (W/kg)	SPLSR
	Limbs (0mm)	
	10g SAR	
DTS	0.23	N/A
NII	0.35	N/A
DSS	0.20	N/A
Limit (W/Kg)	4.00	N/A
Verdict	Pass	Pass

Note: The simultaneous transmission SAR detail please refer to section 12.

3.4 Test Uncertainty

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

The maximum 1 g SAR for the EUT in this report is 0.43 W/kg, which is lower than 1.5 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.

The maximum 10 g SAR for the EUT in this report is 0.18 W/kg, which is lower than 3.75 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.

4 MEASUREMENT SYSTEM

4.1 Specific Absorption Rate (SAR) Definition

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

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

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

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

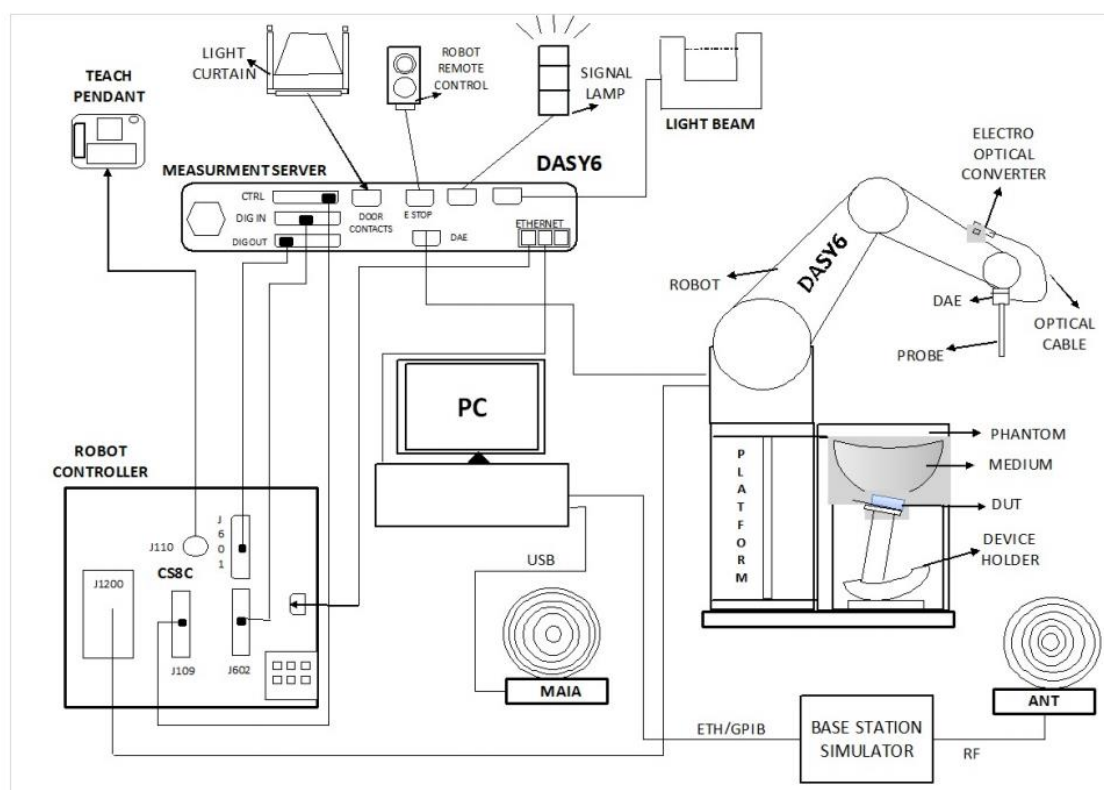
$$SAR = \frac{\sigma E^2}{\rho}$$

Where: σ is the conductivity of the tissue,

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

4.2 DASY SAR System

4.2.1 DASY SAR System Diagram

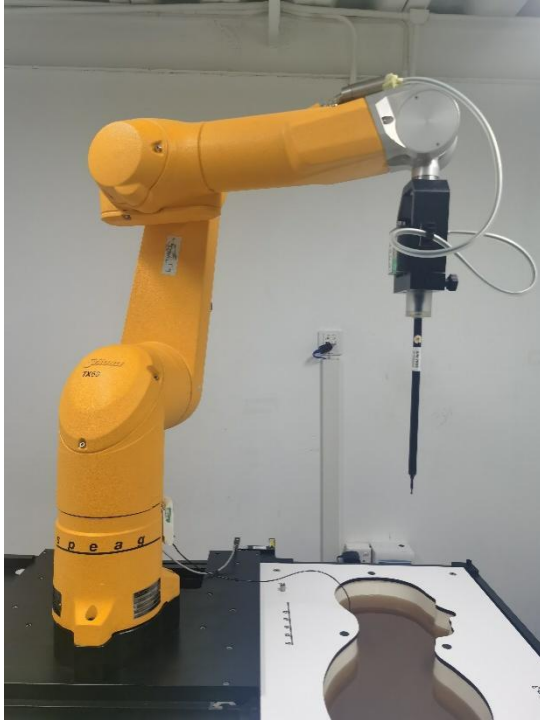


The DASY system for performing compliance tests consists of the following items:

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

4.2.2 Robot

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



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

4.2.3 E-Field Probe

The probe is specially designed and calibrated for use in liquids with high permittivities for the measurements the Specific Dosimetric E-Field Probe EX3DV4-SN:7607&EX3DV4-SN:7664 with following specifications is used.

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



E-Field Probe Calibration Process

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

4.2.4 Data Acquisition Electronics

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



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

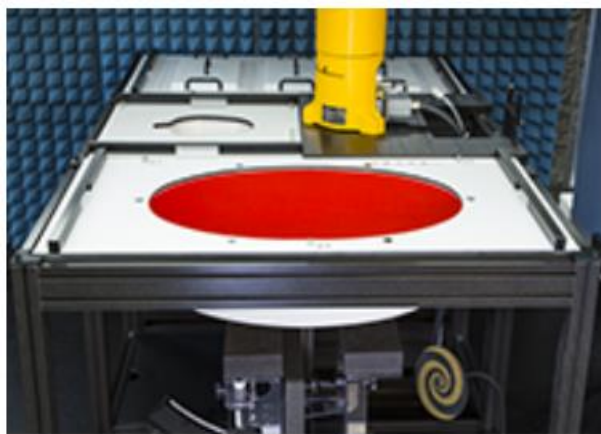
4.2.5 Phantoms

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



- Left hand
- Right hand
- Flat phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of below 10 GHz. ELI V8.0 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI V8.0 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.



• Flat phantom

Photo of Phantom SN2159



Serial Number	Shell Thickness (mm)	Major ellipse axis (mm)	Minor axis(mm)
SN 2159 ELI V8.0	2.0 ± 0.2	600	400

4.2.6 Device Holder

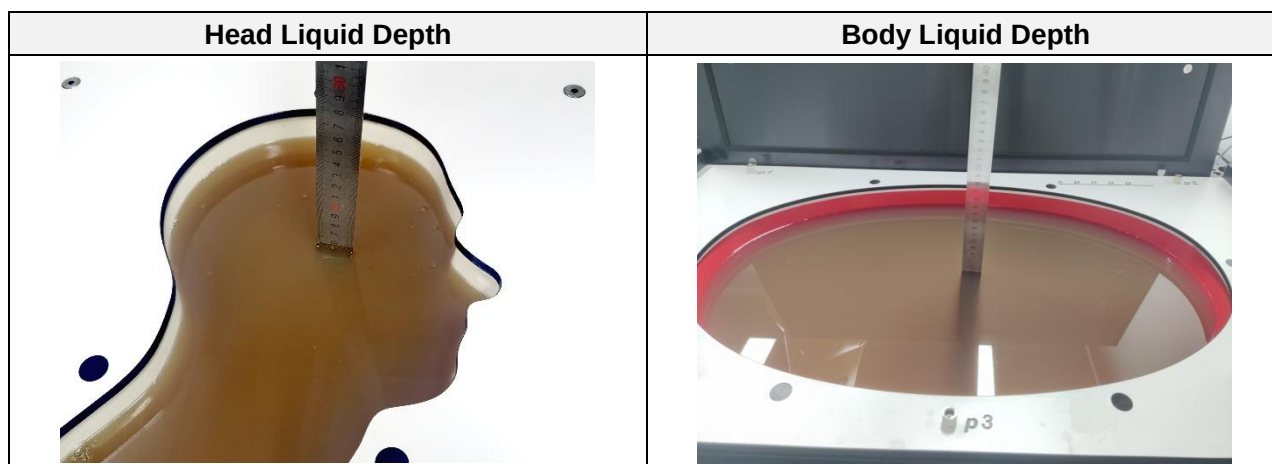
The DASY device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65° . The bottom plate contains three pair of bolts for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



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

4.2.7 Simulating Liquid

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



The following table gives the recipes for tissue simulating liquid and the theoretical Conductivity/Permittivity.

The following table gives the recipes for tissue simulating liquid.

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

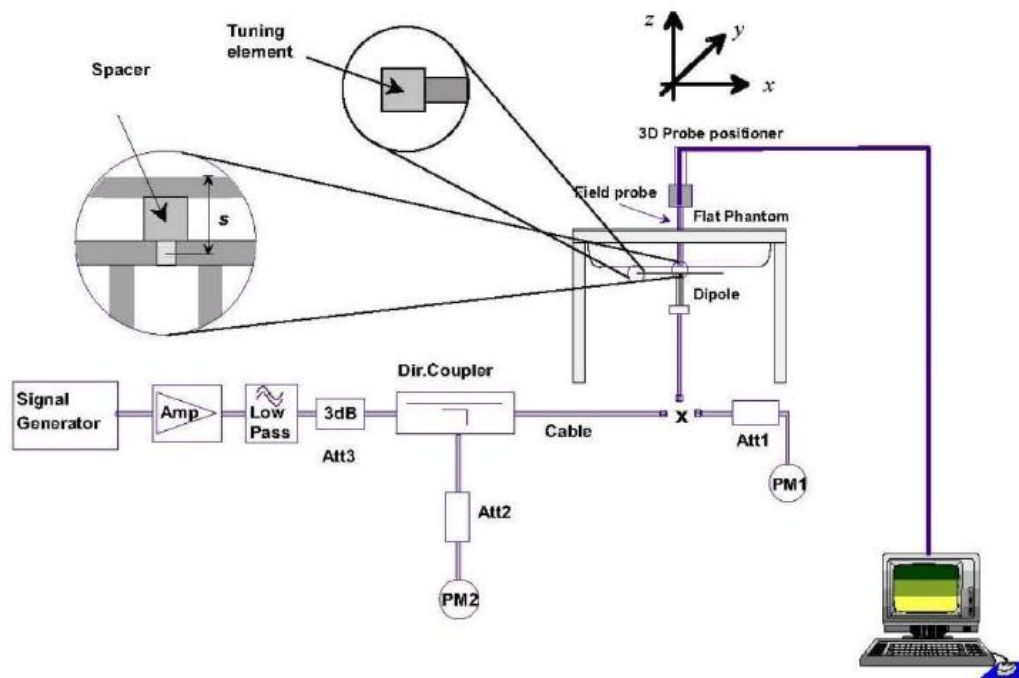
5 SYSTEM VERIFICATION

5.1 Purpose of System Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

5.2 System Check Setup

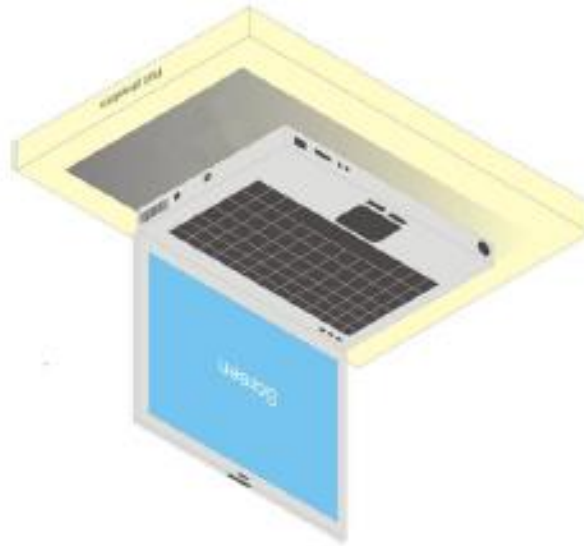
In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



6 TEST POSITION CONFIGURATIONS

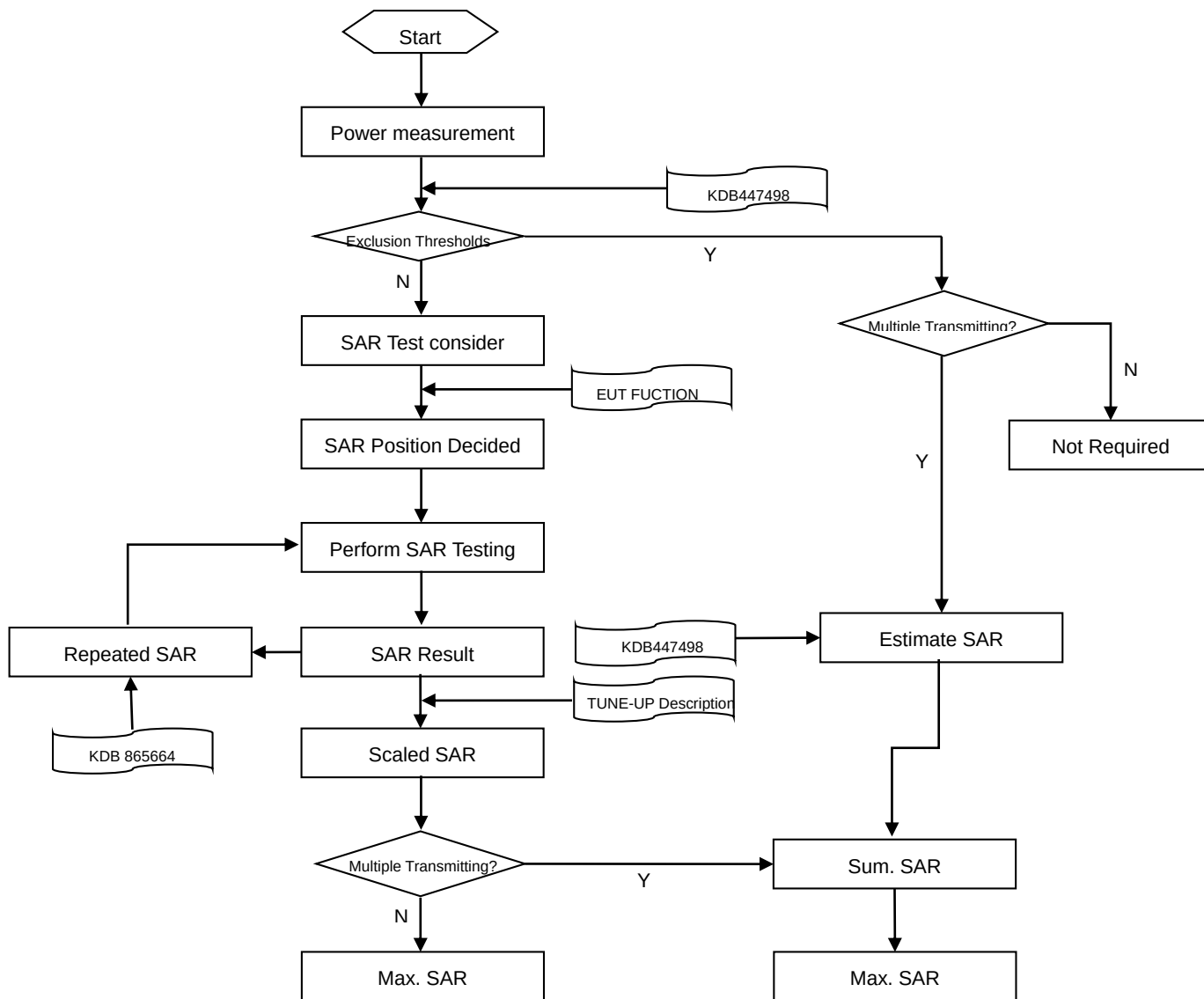
6.1 Laptop Exposure Condition

This DUT should consider one position which is bottom of laptop touching with phantom 0 mm air gap and the screen portion of the device shall be an open position at a 90° angle.



7 MEASUREMENT PROCEDURE

7.1 Measurement Process Diagram



7.2 SAR Scan General Requirement

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1 g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013.

			≤3GHz	>3GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5±1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30°±1°	20°±1°
Maximum area scan 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.	
Maximum zoom scan spatial resolution: Δx Zoom , Δy Zoom			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3–4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: Δz Zoom (n)		≤ 5 mm	3–4 GHz: ≤ 4 mm
				4–5 GHz: ≤ 3 mm
				5–6 GHz: ≤ 2 mm
	graded grid	Δz Zoom (1): between 1st two points closest to phantom surface	≤ 4 mm	3–4 GHz: ≤ 3 mm
				4–5 GHz: ≤ 2.5 mm
		Δz Zoom (n>1): between subsequent points	≤ 1.5·Δz Zoom (n-1)	
Minimum zoom scan volume	x, y, z		≥30 mm	3–4 GHz: ≥ 28 mm
				4–5 GHz: ≥ 25 mm
				5–6 GHz: ≥ 22 mm

Note:

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

7.3 Measurement Procedure

The following steps are used for each test position

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

7.4 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.

When the 1 g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

7.5 Interim Procedures for WLAN 6E

Interim procedures for FCC radio frequency (RF) exposure evaluations of U-NII 6-7 GHz band portable devices have been made available during the TCB workshop in April 2021. The procedure is summarized below:

- a. Evaluate SAR / APD with DASY6 Module SAR V16.0 or higher. The configurations to be tested are defined in the relevant Knowledge Database (KDB). The psSAR and absorbed psPD are reported.
- b. 2. For the configuration with the highest SAR, evaluate the incident power density with DASY6 Module mmWave V2.4.2 or higher. The incident psPD must be adjusted per amount that the measurement uncertainty exceeds 30% before it is included in the test report.

8 CONDUCTED RF OUPUT POWER

8.1 WIFI

8.1.1 2.4G WIFI (Main Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
2.4 (2.4~2.4835)	802.11b	1	2412	15.50	16.00	Yes
		6	2437	15.49	16.00	Yes
		10	2457	15.42	16.00	No
		11	2462	15.35	16.00	Yes
		12	2467	15.24	16.00	No
		13	2472	12.35	13.00	No
	802.11g	1	2412	15.46	16.00	No
		2	2417	15.31	16.00	No
		6	2437	15.59	16.00	No
		10	2457	15.69	16.00	No
		11	2462	15.62	16.00	No
		12	2467	15.50	16.00	No
		13	2472	15.49	16.00	No
	802.11n(HT20)	1	2412	15.50	16.00	No
		2	2417	15.74	16.00	No
		6	2437	15.57	16.00	No
		10	2457	15.66	16.00	No
		11	2462	15.84	16.00	No
		12	2467	15.86	16.00	No
		13	2472	10.61	11.00	No
	802.11n(HT40)	3	2422	15.74	16.00	No
		6	2437	15.92	16.00	No
		9	2452	15.73	16.00	No
		10	2457	15.73	16.00	No
		11	2462	15.38	16.00	No
	VHT20	1	2412	15.43	16.00	No
		2	2417	15.70	16.00	No
		6	2437	15.51	16.00	No
		10	2457	15.41	16.00	No
		11	2462	15.71	16.00	No
		12	2467	15.52	16.00	No
		13	2472	10.51	11.00	No
	VHT40	3	2422	15.47	16.00	No

		6	2437	15.71	16.00	No
		9	2452	15.60	16.00	No
		10	2457	15.52	16.00	No
		11	2462	15.27	16.00	No
	802.11ax(HE20)	1	2412	15.62	16.00	No
		2	2417	15.60	16.00	No
		6	2437	15.72	16.00	No
		10	2457	15.56	16.00	No
		11	2462	15.62	16.00	No
		12	2467	15.51	16.00	No
		13	2472	10.59	11.00	No
	802.11ax(HE40)	3	2422	15.40	16.00	No
		6	2437	15.28	16.00	No
		9	2452	15.58	16.00	No
		10	2457	15.41	16.00	No
		11	2462	15.32	16.00	No

Note: According KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Adjusted SAR = Report SAR * (max power (OFDM)/ max power (DSSS)) = 0.094 * (39.81mW/39.81mW) = 0.094 W/Kg, so the 2.4G OFDM SAR test is not required.

8.1.2 2.4G WIFI (Aux. Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
2.4 (2.4~2.4835)	802.11b	1	2412	15.39	16.00	Yes
		6	2437	15.79	16.00	Yes
		10	2457	15.66	16.00	No
		11	2462	15.59	16.00	Yes
		12	2467	15.55	16.00	No
		13	2472	12.25	13.00	No
	802.11g	1	2412	15.59	16.00	No
		2	2417	15.62	16.00	No
		6	2437	15.64	16.00	No
		10	2457	15.78	16.00	No
		11	2462	15.74	16.00	No
		12	2467	15.64	16.00	No
		13	2472	15.62	16.00	No
	802.11n(HT20)	1	2412	15.64	16.00	No
		2	2417	15.64	16.00	No
		6	2437	15.85	16.00	No
		10	2457	15.91	16.00	No
		11	2462	15.73	16.00	No
		12	2467	15.65	16.00	No
		13	2472	10.35	11.00	No
	802.11n(HT40)	3	2422	15.88	16.00	No
		6	2437	15.89	16.00	No
		9	2452	15.84	16.00	No
		10	2457	15.75	16.00	No
		11	2462	15.44	16.00	No
	VHT20	1	2412	15.37	16.00	No
		2	2417	15.31	16.00	No
		6	2437	15.55	16.00	No
		10	2457	15.73	16.00	No
		11	2462	15.55	16.00	No
		12	2467	15.64	16.00	No
		13	2472	10.13	11.00	No
	VHT40	3	2422	15.53	16.00	No
		6	2437	15.68	16.00	No
		9	2452	15.46	16.00	No
		10	2457	15.46	16.00	No

		11	2462	15.28	16.00	No
	802.11ax(HE20)	1	2412	15.72	16.00	No
		2	2417	15.79	16.00	No
		6	2437	15.56	16.00	No
		10	2457	15.56	16.00	No
		11	2462	15.31	16.00	No
		12	2467	15.31	16.00	No
		13	2472	10.24	11.00	No
	802.11ax(HE40)	3	2422	15.59	16.00	No
		6	2437	15.60	16.00	No
		9	2452	15.80	16.00	No
		10	2457	15.77	16.00	No
		11	2462	15.20	16.00	No

Note: According KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Adjusted SAR = Report SAR * (max power (OFDM)/ max power (DSSS)) = $0.123 * (39.81\text{mW}/39.81\text{mW}) = 0.123$ W/Kg, so the 2.4G OFDM SAR test is not required.

8.1.3 2.4G WIFI (MIMO)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
2.4 (2.4~2.4835)	802.11b	1	2412	18.44	19.00	No
		6	2437	18.53	19.00	No
		10	2457	18.43	19.00	No
		11	2462	18.32	19.00	No
		12	2467	15.25	16.00	No
		13	2472	8.65	9.00	No
	802.11g	1	2412	18.60	19.00	No
		2	2417	18.53	19.00	No
		6	2437	18.60	19.00	No
		10	2457	18.55	19.00	No
		11	2462	18.34	19.00	No
		12	2467	18.40	19.00	No
		13	2472	13.25	14.00	No
	802.11n(HT20)	1	2412	18.64	19.00	No
		2	2417	18.88	19.00	No
		6	2437	18.69	19.00	No
		10	2457	18.74	19.00	No
		11	2462	18.70	19.00	No
		12	2467	18.72	19.00	No
		13	2472	8.38	9.00	No
	802.11n(HT40)	3	2422	18.77	19.00	No
		6	2437	18.77	19.00	No
		9	2452	17.88	18.00	No
		10	2457	17.72	18.00	No
		11	2462	15.70	16.00	No
	VHT20	1	2412	18.40	19.00	No
		2	2417	18.57	19.00	No
		6	2437	18.50	19.00	No
		10	2457	18.57	19.00	No
		11	2462	18.59	19.00	No
		12	2467	18.43	19.00	No
		13	2472	8.07	9.00	No
	VHT40	3	2422	18.52	19.00	No
		6	2437	18.47	19.00	No
		9	2452	17.62	18.00	No
		10	2457	17.43	18.00	No

		11	2462	15.44	16.00	No
	802.11ax(HE20)	1	2412	18.45	19.00	No
		2	2417	18.37	19.00	No
		6	2437	18.57	19.00	No
		10	2457	18.64	19.00	No
		11	2462	18.63	19.00	No
		12	2467	18.57	19.00	No
		13	2472	8.13	9.00	No
	802.11ax(HE40)	3	2422	18.59	19.00	No
		6	2437	18.50	19.00	No
		9	2452	17.89	18.00	No
		10	2457	17.42	18.00	No
		11	2462	15.59	16.00	No

Note: For WiFi SAR testing was performed on single antenna RF power in SISO mode that is larger to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission used more conservative "Max. (main ant) + Max. (aux. ant) " method to determine SAR compliance. When the sum of 1-g SISO transmission SAR measurement is <1.6 W/kg, MIMO SAR test is not required.

8.1.4 5G WIFI (Main Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
5.2 (5.15~5.25)	802.11a	36	5180	15.43	16.00	No
		40	5200	15.49	16.00	No
		48	5240	15.42	16.00	No
	802.11n(HT20)	36	5180	15.51	16.00	No
		40	5200	15.67	16.00	No
		48	5240	15.65	16.00	No
	802.11n(HT40)	38	5190	15.49	16.00	No
		46	5230	15.64	16.00	No
	802.11ac(VHT20)	36	5180	15.62	16.00	No
		40	5200	15.57	16.00	No
		48	5240	15.37	16.00	No
	802.11ac(VHT40)	38	5190	15.50	16.00	No
		46	5230	15.59	16.00	No
	802.11ac(VHT80)	42	5210	15.37	16.00	No
	802.11ac(VHT160)	50	5250	11.34	11.50	No
	802.11ax(HE20)	36	5180	15.41	16.00	No
		40	5200	15.53	16.00	No
		48	5240	15.43	16.00	No
	802.11ax(HE40)	38	5190	15.35	16.00	No
		46	5230	15.60	16.00	No
	802.11ax(HE80)	42	5210	15.28	16.00	No
	802.11ax(HE160)	50	5250	11.18	11.50	No
5.3 (5.25~5.35)	802.11a	52	5260	15.67	16.00	No
		60	5300	15.87	16.00	No
		64	5320	15.64	16.00	No
	802.11n(HT20)	52	5260	15.43	16.00	No
		60	5300	15.49	16.00	No
		64	5320	15.35	16.00	No
	802.11n(HT40)	54	5270	15.38	16.00	Yes
		62	5310	15.12	16.00	Yes
	802.11ac(VHT20)	52	5260	15.73	16.00	No
		60	5300	15.71	16.00	No
		64	5320	15.54	16.00	No
	802.11ac(VHT40)	54	5270	15.45	16.00	No
		62	5310	15.44	16.00	No
	802.11ac(VHT80)	58	5290	13.89	14.50	No
	802.11ax(HE20)	52	5260	15.54	16.00	No
		60	5300	15.52	16.00	No
		64	5320	15.31	16.00	No

	802.11ax(HE40)	54	5270	15.56	16.00	No
		62	5310	15.27	16.00	No
	802.11ax(HE80)	58	5290	13.78	14.50	No
5.6 (5.47~5.725)	802.11a	100	5500	15.81	16.00	No
		116	5580	15.76	16.00	No
		140	5700	14.45	16.00	No
		144	5720	14.54	16.00	No
	802.11n(HT20)	100	5500	15.65	16.00	No
		116	5580	15.52	16.00	No
		140	5700	14.07	15.00	No
		144	5720	14.21	16.00	No
	802.11n(HT40)	102	5510	15.64	16.00	No
		110	5550	15.86	16.00	No
		134	5670	15.46	16.00	No
		142	5710	15.89	16.00	No
	802.11ac(VHT20)	100	5500	15.41	16.00	No
		116	5580	15.51	16.00	No
		140	5700	14.21	15.00	No
		144	5720	14.03	15.00	No
	802.11ac(VHT40)	102	5510	15.86	16.00	No
		110	5550	15.41	16.00	No
		134	5670	15.47	15.50	No
		142	5710	15.88	16.00	No
	802.11ac(VHT80)	106	5530	15.60	16.00	Yes
		122	5610	15.79	16.00	Yes
		138	5690	15.74	16.00	Yes
	802.11ac(VHT160)	114	5570	11.44	12.00	No
	802.11ax(HE20)	100	5500	15.56	16.00	No
		116	5580	15.51	16.00	No
		140	5700	14.29	15.00	No
		144	5720	14.03	15.00	No
	802.11ax(HE40)	102	5510	15.65	16.00	No
		110	5550	15.49	16.00	No
		134	5670	15.50	16.00	No
		142	5710	15.91	16.00	No
	802.11ax(HE80)	106	5530	15.67	16.00	No
		122	5610	15.89	16.00	No
		138	5690	15.87	16.00	No
	802.11ac(HE160)	114	5570	11.41	12.00	No
5.8 (5.725~5.85)	802.11a	149	5745	15.65	16.00	No
		157	5785	15.64	16.00	No
		165	5825	15.87	16.00	No
	802.11n(HT20)	149	5745	15.46	16.00	No

		157	5785	15.43	16.00	No
		165	5825	15.84	16.00	No
	802.11n(HT40)	151	5755	15.54	16.00	No
		159	5795	15.89	16.00	No
	802.11ac(VHT20)	149	5745	15.41	16.00	No
		157	5785	15.81	16.00	No
		165	5825	15.78	16.00	No
	802.11ac(VHT40)	151	5755	15.45	16.00	No
		159	5795	15.87	16.00	No
	802.11ac(VHT80)	155	5775	15.75	16.00	Yes
	802.11ax(HE20)	149	5745	15.41	16.00	No
		157	5785	15.79	16.00	No
		165	5825	15.52	16.00	No
	802.11ax(HE40)	151	5755	15.43	16.00	No
		159	5795	15.94	16.00	No
	802.11ax(HE80)	155	5775	15.48	16.00	No
5.9 (5.805~5.895)	802.11a	169	5845	15.56	16.00	No
		173	5865	15.64	16.00	No
		177	5885	15.73	16.00	No
	802.11n(HT20)	169	5845	15.70	16.00	No
		173	5865	15.56	16.00	No
		177	5885	15.55	16.00	No
	802.11n(HT40)	167	5835	15.87	16.00	No
		175	5875	15.41	16.00	No
	802.11ac(VHT20)	169	5845	15.76	16.00	No
		173	5865	15.71	16.00	No
		177	5885	15.81	16.00	No
	802.11ac(VHT40)	167	5835	15.45	16.00	No
		175	5875	15.67	16.00	No
	802.11ac(VHT80)	171	5855	15.64	16.00	No
	802.11ac(VHT160)	163	5815	15.08	16.00	Yes
	802.11ax(HE20)	169	5845	15.87	16.00	No
		173	5865	15.79	16.00	No
		177	5885	15.34	16.00	No
	802.11ax(HE40)	167	5835	15.84	16.00	No
		175	5875	15.64	16.00	No
	802.11ax(HE80)	171	5855	15.64	16.00	No
	802.11ax(HE160)	163	5815	15.42	16.00	No
Note: When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.						

8.1.5 5G WIFI (Aux. Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
5.2 (5.15~5.25)	802.11a	36	5180	15.54	16.00	No
		40	5200	15.74	16.00	No
		48	5240	15.27	16.00	No
	802.11n(HT20)	36	5180	15.64	16.00	No
		40	5200	15.81	16.00	No
		48	5240	15.56	16.00	No
	802.11n(HT40)	38	5190	15.46	16.00	No
		46	5230	15.43	16.00	No
	802.11ac(VHT20)	36	5180	15.37	16.00	No
		40	5200	15.49	16.00	No
		48	5240	15.34	16.00	No
	802.11ac(VHT40)	38	5190	15.67	16.00	No
		46	5230	15.36	16.00	No
	802.11ac(VHT80)	42	5210	15.34	16.00	No
	802.11ac(VHT160)	50	5250	10.80	11.50	No
	802.11ax(HE20)	36	5180	15.37	16.00	No
		40	5200	15.43	16.00	No
		48	5240	15.44	16.00	No
	802.11ax(HE40)	38	5190	15.64	16.00	No
		46	5230	15.64	16.00	No
	802.11ax(HE80)	42	5210	15.34	16.00	No
	802.11ax(HE160)	50	5250	10.83	11.50	No
5.3 (5.25~5.35)	802.11a	52	5260	15.64	16.00	No
		60	5300	15.78	16.00	No
		64	5320	15.78	16.00	No
	802.11n(HT20)	52	5260	15.57	16.00	No
		60	5300	15.45	16.00	No
		64	5320	15.65	16.00	No
	802.11n(HT40)	54	5270	15.58	16.00	Yes
		62	5310	15.57	16.00	Yes
	802.11ac(VHT20)	52	5260	15.29	16.00	No
		60	5300	15.41	16.00	No
		64	5320	15.34	16.00	No
	802.11ac(VHT40)	54	5270	15.56	16.00	No
		62	5310	15.67	16.00	No
	802.11ac(VHT80)	58	5290	13.84	14.50	No
	802.11ax(HE20)	52	5260	15.54	16.00	No
		60	5300	15.43	16.00	No
		64	5320	15.44	16.00	No

	802.11ax(HE40)	54	5270	15.56	16.00	No
		62	5310	15.46	16.00	No
	802.11ax(HE80)	58	5290	13.43	14.50	No
5.6 (5.47~5.725)	802.11a	100	5500	15.84	16.00	No
		116	5580	15.64	16.00	No
		140	5700	15.87	16.00	No
		144	5720	14.26	16.00	No
	802.11n(HT20)	100	5500	15.41	16.00	No
		116	5580	15.54	16.00	No
		140	5700	13.87	15.00	No
		144	5720	14.03	16.00	No
	802.11n(HT40)	102	5510	15.31	16.00	No
		110	5550	15.43	16.00	No
		134	5670	15.68	16.00	No
		142	5710	14.03	16.00	No
	802.11ac(VHT20)	100	5500	15.64	16.00	No
		116	5580	15.69	16.00	No
		140	5700	13.89	15.00	No
		144	5720	13.79	15.00	No
	802.11ac(VHT40)	102	5510	15.56	16.00	No
		110	5550	15.45	16.00	No
		134	5670	13.89	15.50	No
		142	5710	14.02	16.00	No
	802.11ac(VHT80)	106	5530	15.85	16.00	Yes
		122	5610	15.48	16.00	Yes
		138	5690	16.00	16.00	Yes
	802.11ac(VHT160)	114	5570	11.45	12.00	No
	802.11ax(HE20)	100	5500	15.56	16.00	No
		116	5580	15.65	16.00	No
		140	5700	13.89	15.00	No
		144	5720	13.98	15.00	No
	802.11ax(HE40)	102	5510	15.65	16.00	No
		110	5550	15.64	16.00	No
		134	5670	15.68	16.00	No
		142	5710	14.13	16.00	No
	802.11ax(HE80)	106	5530	15.84	16.00	No
		122	5610	15.76	16.00	No
		138	5690	14.13	16.00	No
	802.11ac(HE160)	114	5570	11.29	12.00	No
5.8 (5.725~5.85)	802.11a	149	5745	15.75	16.00	No
		157	5785	15.74	16.00	No
		165	5825	15.45	16.00	No
	802.11n(HT20)	149	5745	15.41	16.00	No

		157	5785	15.71	16.00	No
		165	5825	15.39	16.00	No
	802.11n(HT40)	151	5755	15.57	16.00	No
		159	5795	15.65	16.00	No
	802.11ac(VHT20)	149	5745	15.34	16.00	No
		157	5785	15.64	16.00	No
		165	5825	15.84	16.00	No
	802.11ac(VHT40)	151	5755	15.45	16.00	No
		159	5795	15.65	16.00	No
	802.11ac(VHT80)	155	5775	15.46	16.00	Yes
	802.11ax(HE20)	149	5745	15.56	16.00	No
		157	5785	15.89	16.00	No
		165	5825	15.79	16.00	No
	802.11ax(HE40)	151	5755	15.35	16.00	No
		159	5795	15.64	16.00	No
	802.11ax(HE80)	155	5775	15.73	16.00	No
5.9 (5.805~5.895)	802.11a	169	5845	15.34	16.00	No
		173	5865	15.53	16.00	No
		177	5885	15.64	16.00	No
	802.11n(HT20)	169	5845	15.51	16.00	No
		173	5865	15.48	16.00	No
		177	5885	15.60	16.00	No
	802.11n(HT40)	167	5835	15.29	16.00	No
		175	5875	15.65	16.00	No
	802.11ac(VHT20)	169	5845	15.84	16.00	No
		173	5865	15.76	16.00	No
		177	5885	15.72	16.00	No
	802.11ac(VHT40)	167	5835	15.75	16.00	No
		175	5875	15.34	16.00	No
	802.11ac(VHT80)	171	5855	15.52	16.00	No
	802.11ac(VHT160)	163	5815	15.34	16.00	Yes
	802.11ax(HE20)	169	5845	15.46	16.00	No
		173	5865	15.35	16.00	No
		177	5885	15.34	16.00	No
	802.11ax(HE40)	167	5835	15.49	16.00	No
		175	5875	15.39	16.00	No
	802.11ax(HE80)	171	5855	15.37	16.00	No
	802.11ax(HE160)	163	5815	15.49	16.00	No
Note: When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.						

8.1.6 5G WIFI (MIMO)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
5.2 (5.15~5.25)	802.11a	36	5180	18.50	19.00	No
		40	5200	18.59	19.00	No
		48	5240	18.36	19.00	No
	802.11n(HT20)	36	5180	18.60	19.00	No
		40	5200	18.56	19.00	No
		48	5240	18.60	19.00	No
	802.11n(HT40)	38	5190	17.37	18.00	No
		46	5230	18.47	19.00	No
	802.11ac(VHT20)	36	5180	18.62	19.00	No
		40	5200	18.41	19.00	No
		48	5240	18.43	19.00	No
	802.11ac(VHT40)	38	5190	17.21	18.00	No
		46	5230	18.45	19.00	No
	802.11ac(VHT80)	42	5210	15.99	16.00	No
	802.11ac(VHT160)	50	5250	12.01	12.50	No
	802.11ax(HE20)	36	5180	18.69	19.00	No
		40	5200	18.82	19.00	No
		48	5240	18.57	19.00	No
	802.11ax(HE40)	38	5190	17.50	18.00	No
		46	5230	18.64	19.00	No
	802.11ax(HE80)	42	5210	15.89	16.00	No
	802.11ax(HE160)	50	5250	12.16	12.50	No
5.3 (5.25~5.35)	802.11a	52	5260	18.68	19.00	No
		60	5300	18.64	19.00	No
		64	5320	18.57	19.00	No
	802.11n(HT20)	52	5260	18.70	19.00	No
		60	5300	18.73	19.00	No
		64	5320	18.69	19.00	No
	802.11n(HT40)	54	5270	18.28	19.00	No
		62	5310	17.56	18.00	No
	802.11ac(VHT20)	52	5260	18.63	19.00	No
		60	5300	18.68	19.00	No
		64	5320	18.76	19.00	No
	802.11ac(VHT40)	54	5270	18.76	19.00	No
		62	5310	17.82	18.00	No
	802.11ac(VHT80)	58	5290	13.87	14.50	No
	802.11ax(HE20)	52	5260	18.65	19.00	No
		60	5300	18.77	19.00	No
		64	5320	18.54	19.00	No

	802.11ax(HE40)	54	5270	18.73	19.00	No
		62	5310	17.52	18.00	No
	802.11ax(HE80)	58	5290	13.77	14.50	No
5.6 (5.47~5.725)	802.11a	100	5500	18.70	19.00	No
		116	5580	18.71	19.00	No
		140	5700	17.86	19.00	No
		144	5720	18.88	19.00	No
	802.11n(HT20)	100	5500	18.64	19.00	No
		116	5580	18.74	19.00	No
		140	5700	16.14	16.50	No
		144	5720	18.61	19.00	No
	802.11n(HT40)	102	5510	17.94	19.00	No
		110	5550	18.71	19.00	No
		134	5670	17.87	19.00	No
		142	5710	18.57	19.00	No
	802.11ac(VHT20)	100	5500	18.59	19.00	No
		116	5580	18.68	19.00	No
		140	5700	16.16	16.50	No
		144	5720	18.60	19.00	No
	802.11ac(VHT40)	102	5510	17.93	19.00	No
		110	5550	18.62	19.00	No
		134	5670	17.91	19.00	No
		142	5710	18.78	19.00	No
	802.11ac(VHT80)	106	5530	16.68	18.00	No
		122	5610	17.29	18.00	No
		138	5690	18.68	19.00	No
	802.11ac(VHT160)	114	5570	12.78	13.00	No
	802.11ax(HE20)	100	5500	18.65	19.00	No
		116	5580	18.67	19.00	No
		140	5700	16.16	16.50	No
		144	5720	18.68	19.00	No
	802.11ax(HE40)	102	5510	18.06	19.00	No
		110	5550	18.67	19.00	No
		134	5670	18.11	19.00	No
		142	5710	18.70	19.00	No
	802.11ax(HE80)	106	5530	16.72	17.00	No
		122	5610	17.25	18.00	No
		138	5690	18.74	19.00	No
	802.11ac(HE160)	114	5570	12.83	13.00	No
5.8 (5.725~5.85)	802.11a	149	5745	18.52	19.00	No
		157	5785	18.79	19.00	No
		165	5825	18.71	19.00	No
	802.11n(HT20)	149	5745	18.65	19.00	No

		157	5785	18.68	19.00	No
		165	5825	18.62	19.00	No
	802.11n(HT40)	151	5755	18.58	19.00	No
		159	5795	18.67	19.00	No
	802.11ac(VHT20)	149	5745	18.60	19.00	No
		157	5785	18.71	19.00	No
		165	5825	18.64	19.00	No
	802.11ac(VHT40)	151	5755	18.40	19.00	No
		159	5795	18.75	19.00	No
	802.11ac(VHT80)	155	5775	18.91	19.00	No
	802.11ax(HE20)	149	5745	18.71	19.00	No
		157	5785	18.70	19.00	No
		165	5825	18.68	19.00	No
	802.11ax(HE40)	151	5755	18.56	19.00	No
		159	5795	18.66	19.00	No
	802.11ax(HE80)	155	5775	18.55	19.00	No
5.9 (5.805~5.895)	802.11a	169	5845	16.62	17.00	No
		173	5865	16.64	17.00	No
		177	5885	16.53	17.00	No
	802.11n(HT20)	169	5845	16.51	17.00	No
		173	5865	16.75	17.00	No
		177	5885	16.61	17.00	No
	802.11n(HT40)	167	5835	18.48	19.00	No
		175	5875	18.46	19.00	No
	802.11ac(VHT20)	169	5845	16.54	17.00	No
		173	5865	16.75	17.00	No
		177	5885	16.59	17.00	No
	802.11ac(VHT40)	167	5835	18.45	19.00	No
		175	5875	18.50	19.00	No
	802.11ac(VHT80)	171	5855	18.83	19.00	No
	802.11ac(VHT160)	163	5815	15.39	16.00	No
	802.11ax(HE20)	169	5845	16.56	17.00	No
		173	5865	16.59	17.00	No
		177	5885	16.47	17.00	No
	802.11ax(HE40)	167	5835	18.69	19.00	No
		175	5875	18.54	19.00	No
	802.11ax(HE80)	171	5855	18.60	19.00	No
	802.11ax(HE160)	163	5815	15.53	16.00	No
Note: For WiFi SAR testing was performed on single antenna RF power in SISO mode that is larger to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission used more conservative "Max. (main ant) + Max. (aux. ant) " method to determine SAR compliance. When the sum of 1-g SISO transmission SAR measurement is <1.6 W/kg, MIMO SAR test is not required.						

8.1.7 6G WIFI (Main Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
6 (5.925~7.125)	802.11ax(HE20)	1	5955	7.06	7.50	No
		49	6195	6.89	7.50	No
		93	6415	6.90	7.50	No
		97	6435	6.80	7.50	No
		105	6475	6.98	7.50	No
		113	6515	6.63	7.50	No
		117	6535	6.73	7.50	No
		149	6695	7.36	7.50	No
		181	6855	6.72	7.50	No
		185	6875	7.14	7.50	No
		189	6895	7.15	7.50	No
		209	6995	6.76	7.50	No
		229	7095	7.20	7.50	No
		233	7115	7.23	7.50	No
	802.11ax(HE40)	3	5965	9.59	10.50	No
		51	6205	9.91	10.50	No
		91	6405	9.74	10.50	No
		99	6445	10.02	10.50	No
		107	6485	9.70	10.50	No
		115	6525	9.73	10.50	No
		123	6565	9.92	10.50	No
		147	6685	10.11	10.50	No
		187	6885	9.93	10.50	No
		195	6925	10.47	10.50	No
		211	7005	9.52	10.50	No
		227	7085	10.22	10.50	No
	802.11ax(HE80)	7	5985	12.55	13.00	No
		55	6225	12.57	13.00	No
		87	6385	12.22	13.00	No
		103	6465	12.78	13.00	No
		119	6545	12.64	13.00	No
		135	6625	12.82	13.00	No
		151	6705	12.73	13.00	No
		167	6785	12.93	13.00	No
		183	6865	12.39	13.00	No
		199	6945	12.92	13.00	No
		215	7025	12.54	13.00	No
	802.11ax(HE160)	15	6025	13.10	13.50	Yes
		47	6185	13.27	13.50	Yes

		79	6345	13.24	13.50	Yes
		111	6505	13.34	13.50	Yes
		143	6665	13.04	13.50	Yes
		175	6825	13.28	13.50	Yes
		207	6985	13.30	13.50	Yes

Note: When multiple channel bandwidth configurations in a frequency band have the same maximum tune-up output power, the test configuration is determined by applying the following steps sequentially.

1) The largest channel bandwidth configuration is selected between the multiple configurations in a frequency band with the same maximum tune-up output power.

8.1.8 6G WIFI (Aux. Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
6 (5.925~7.125)	802.11ax(HE20)	1	5955	6.94	7.50	No
		49	6195	6.87	7.50	No
		93	6415	6.84	7.50	No
		97	6435	6.66	7.50	No
		105	6475	6.70	7.50	No
		113	6515	6.85	7.50	No
		117	6535	6.75	7.50	No
		149	6695	7.28	7.50	No
		181	6855	6.64	7.50	No
		185	6875	6.78	7.50	No
		189	6895	6.75	7.50	No
		209	6995	6.72	7.50	No
		229	7095	7.22	7.50	No
		233	7115	7.25	7.50	No
	802.11ax(HE40)	3	5965	9.99	10.50	No
		51	6205	9.67	10.50	No
		91	6405	9.82	10.50	No
		99	6445	10.02	10.50	No
		107	6485	9.78	10.50	No
		115	6525	9.97	10.50	No
		123	6565	9.66	10.50	No
		147	6685	9.77	10.50	No
		187	6885	9.69	10.50	No
		195	6925	10.21	10.50	No
		211	7005	9.46	10.50	No
		227	7085	9.98	10.50	No
	802.11ax(HE80)	7	5985	12.53	13.00	No
		55	6225	12.35	13.00	No
		87	6385	12.22	13.00	No
		103	6465	12.62	13.00	No
		119	6545	12.86	13.00	No
		135	6625	12.40	13.00	No
		151	6705	12.73	13.00	No
		167	6785	12.87	13.00	No
		183	6865	12.61	13.00	No
		199	6945	12.54	13.00	No
		215	7025	12.28	13.00	No
	802.11ax(HE160)	15	6025	13.27	13.50	Yes
		47	6185	13.20	13.50	Yes

		79	6345	13.00	13.50	Yes
		111	6505	13.04	13.50	Yes
		143	6665	13.22	13.50	Yes
		175	6825	13.40	13.50	Yes
		207	6985	13.17	13.50	Yes

Note: When multiple channel bandwidth configurations in a frequency band have the same maximum tune-up output power, the test configuration is determined by applying the following steps sequentially.

1) The largest channel bandwidth configuration is selected between the multiple configurations in a frequency band with the same maximum tune-up output power.

8.1.9 6G WIFI (MIMO)

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
6 (5.925~7.125)	802.11ax(HE20)	1	5955	3.70	4.50	No
		49	6195	3.38	4.50	No
		93	6415	3.58	4.50	No
		97	6435	3.87	4.50	No
		105	6475	3.65	4.50	No
		113	6515	3.65	4.50	No
		117	6535	3.84	4.50	No
		149	6695	3.89	4.50	No
		181	6855	3.52	4.50	No
		185	6875	3.78	4.50	No
		189	6895	3.64	4.50	No
		209	6995	3.39	4.50	No
		229	7095	4.26	4.50	No
		233	7115	4.34	4.50	No
	802.11ax(HE40)	3	5965	7.22	7.50	No
		51	6205	7.06	7.50	No
		91	6405	6.93	7.50	No
		99	6445	6.86	7.50	No
		107	6485	6.98	7.50	No
		115	6525	7.15	7.50	No
		123	6565	7.03	7.50	No
		147	6685	6.64	7.50	No
		179	6845	6.82	7.50	No
		187	6885	6.76	7.50	No
		195	6925	7.18	7.50	No
		211	7005	6.97	7.50	No
		227	7085	7.08	7.50	No
	802.11ax(HE80)	7	5985	9.48	10.00	No
		55	6225	9.46	10.00	No
		87	6385	9.55	10.00	No
		103	6465	9.58	10.00	No
		119	6545	9.26	10.00	No
		135	6625	9.35	10.00	No
		151	6705	9.10	10.00	No
		167	6785	9.36	10.00	No
		183	6865	9.30	10.00	No
		199	6945	9.50	10.00	No
		215	7025	9.86	10.00	No
	802.11ax(HE160)	15	6025	12.11	12.50	No

		47	6185	11.79	12.50	No
		79	6345	11.85	12.50	No
		111	6505	11.89	12.50	No
		143	6665	12.07	12.50	No
		175	6825	12.07	12.50	No
		207	6985	7.54	8.00	No

Note: For WiFi SAR testing was performed on single antenna RF power in SISO mode that is larger to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission used more conservative "Max. (main ant) + Max. (aux. ant) " method to determine SAR compliance. When the sum of 1-g SISO transmission SAR measurement is <1.6 W/kg, MIMO SAR test is not required.

8.2 Bluetooth

8.2.1 Bluetooth (Aux. Antenna)

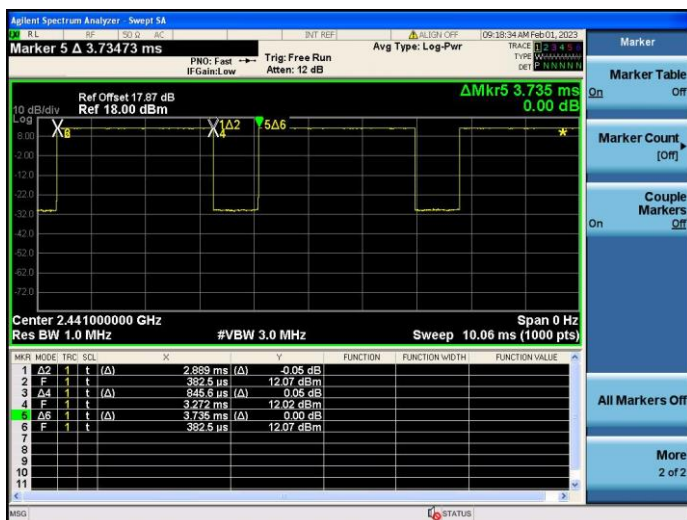
Mode	GFSK			$\pi/4$ -DQPSK		
Channel	0	39	78	0	39	78
Frequency (MHz)	2402	2441	2480	2402	2441	2480
Average Power (dBm)	11.97	12.09	11.91	9.07	9.26	9.19
Tune-Up Limit (dBm)	12.50	12.50	12.50	10.00	10.00	10.00
SAR Test Require	Yes	Yes	Yes	No	No	No
Mode	8-DPSK			/		
Channel	0	39	78	/	/	/
Frequency (MHz)	2402	2441	2480	/	/	/
Average Power (dBm)	9.39	8.95	9.07	/	/	/
Tune-Up Limit (dBm)	10.00	10.00	10.00	/	/	/
SAR Test Require	No	No	No	/	/	/
Mode	BLE-1Mbps			BLE-2Mbps		
Channel	0	19	39	0	19	39
Frequency (MHz)	2402	2440	2480	2402	2440	2480
Average Power (dBm)	12.08	12.18	11.70	12.28	12.38	12.24
Tune-Up Limit (dBm)	12.50	12.50	12.50	12.50	12.50	12.50
SAR Test Require	No	No	No	No	No	No

Note: Since Bluetooth BR mode is the maximum output power mode, SAR measurements were performed with test software using DH5 modulation, and SAR measurement is not required for the EDR and LE. When the secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode.

The Bluetooth duty cycle is 77.35 % as following figure, according to 2016 Oct. TCB workshop for Bluetooth SAR scaling need further consideration and the maximum duty cycle is 100%, therefore the actual duty cycle will be scaled up to 100% for Bluetooth reported SAR calculation.

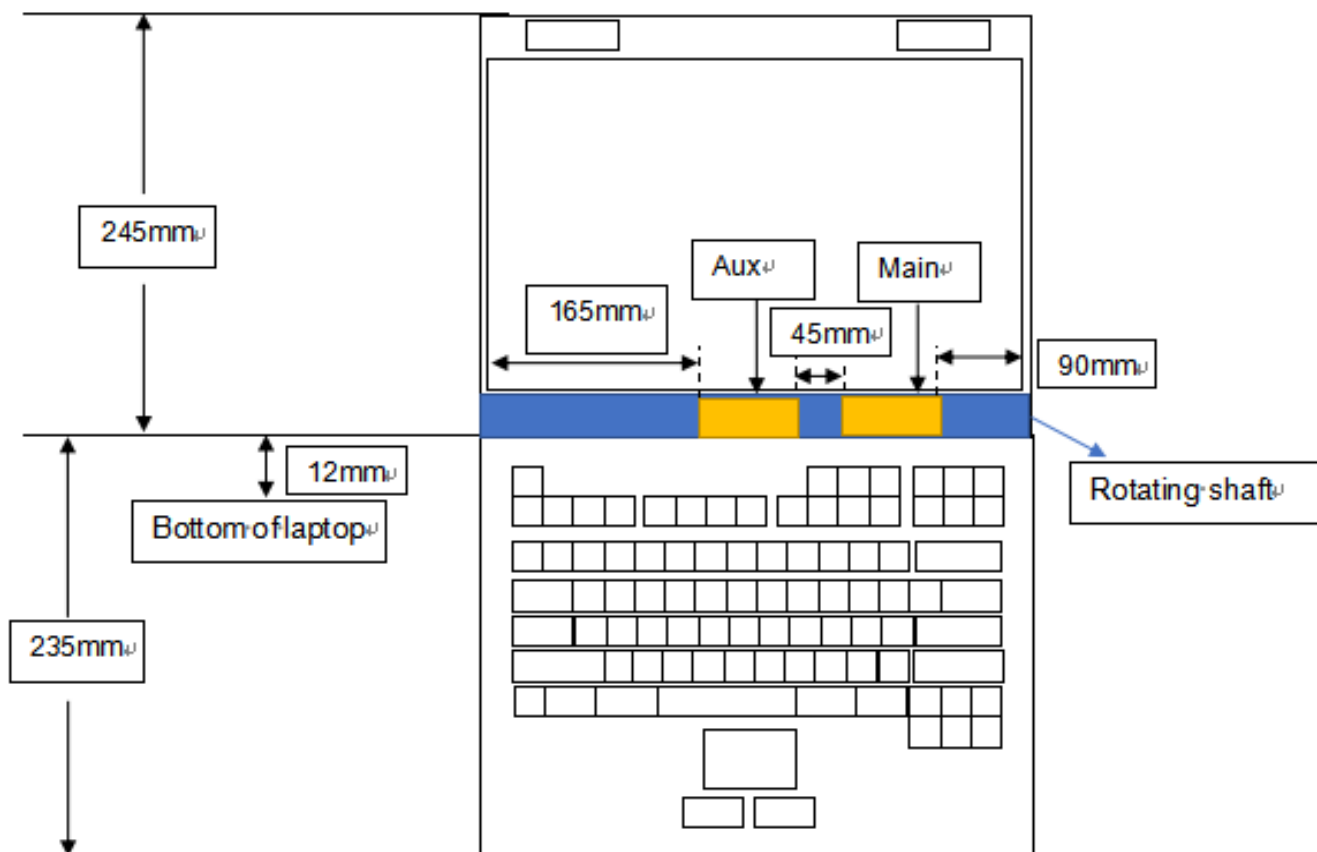
Duty Cycle

Bluetooth-GFSK



9 TEST EXCLUSION CONSIDERATION

9.1 Laptop Mode antenna location sketch



Antenna	Support Bands
Antenna Aux.	BT、WLAN 2.4/5/6G
Antenna Main	WLAN 2.4/5/6G

9.2 SAR Test Consideration Table

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

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). The following table shows the power threshold from 5mm to 50mm.

Power Thresholds (mW)					
Frequency (MHz)	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	39 mW	65 mW	88 mW	110 mW	129 mW
450	22 mW	44 mW	67 mW	89 mW	112 mW
835	9 mW	25 mW	44 mW	66 mW	90 mW
1900	3 mW	12 mW	26 mW	44 mW	66 mW
2450	3 mW	10 mW	22 mW	38 mW	59 mW
3600	2 mW	8 mW	18 mW	32 mW	49 mW
5800	1 mW	6 mW	14 mW	25 mW	40 mW
Frequency (MHz)	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	148 mW	166 mW	184 mW	201 mW	217 mW
450	135 mW	158 mW	180 mW	203 mW	226 mW
835	116 mW	145 mW	175 mW	207 mW	240 mW
1900	92 mW	122 mW	157 mW	195 mW	236 mW
2450	83 mW	111 mW	143 mW	179 mW	219 mW
3600	71 mW	96 mW	125 mW	158 mW	195 mW
5800	58 mW	80 mW	106 mW	136 mW	169 mW

9.2.1 Laptop mode SAR Test Consideration

This host is a notebook computer, under normal use the RF exposure scenarios are shown in the table below:

RF exposure Position	RF exposure scenarios
Bottom Side	Body
Back Side of Monitor	Limbs
Left Edge	Limbs
Right Edge	Limbs
Front Edge	Limbs

Main Antenna Body RF exposure scenarios

Main Antenna						
Test Position Configurations	Mode	WLAN 2.4GHz	U-NII-2A	U-NII-2C	U-NII-3	U-NII-4
Calculated Frequency(MHz)		2462	5320	5710	5825	5885
Bottom Side	Distance to User (mm)	12				
	Max. Peak Power (dBm)	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	14.46	9.03	8.65	8.55	8.46
	SAR Test Required	Yes	Yes	Yes	Yes	Yes

Main Antenna Limbs RF exposure scenarios

Main Antenna						
Test Position Configurations	Mode	WLAN 2.4GHz	U-NII-2A	U-NII-2C	U-NII-3	U-NII-4
Calculated Frequency(MHz)		2462	5320	5710	5825	5885
Back Side of Monitor	Distance to User (mm)	5				
	Max. Peak Power (dBm)	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	6.83	3.69	3.48	3.43	3.38
	SAR Test Required	Yes	Yes	Yes	Yes	Yes
Left Edge	Distance to User (mm)	155				
	Max. Peak Power (dBm)	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	4709.54	4512.92	4495.28	4490.33	4486.10
	SAR Test Required	No	No	No	No	No
Right Edge	Distance to User (mm)	135				
	Max. Peak Power (dBm)	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	3620.68	3390.24	3369.83	3364.10	3359.22
	SAR Test Required	No	No	No	No	No
Front Edge	Distance to User (mm)	235				
	Max. Peak Power (dBm)	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	10398.21	10682.59	10709.09	10716.57	10722.96
	SAR Test Required	No	No	No	No	No

Note: The combination of test distance and 1-g SAR measurements required for body exposure are more rigorous; therefore, separate 10-g extremity SAR evaluation is replaced.

Aux. Antenna Body RF exposure scenarios

Aux. Antenna							
Test Position Configurations	Mode	Bluetooth	WLAN 2.4GHz	U-NII-2A	U-NII-2C	U-NII-3	U-NII-4
Calculated Frequency(MHz)		2480	2462	5320	5710	5825	5885
Bottom Side	Distance to User (mm)	12					
	Max. Peak Power (dBm)	12.50	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	17.78	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	14.40	14.46	9.03	8.65	8.55	8.46
	SAR Test Required	Yes	Yes	Yes	Yes	Yes	Yes

Aux. Antenna Limbs RF exposure scenarios

Aux. Antenna							
Test Position Configurations	Mode	Bluetooth	WLAN 2.4GHz	U-NII-2A	U-NII-2C	U-NII-3	U-NII-4
Calculated Frequency(MHz)		2480	2462	5320	5710	5825	5885
Back Side of Monitor	Distance to User (mm)	5					
	Max. Peak Power (dBm)	12.50	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	17.78	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	6.79	6.83	3.69	3.48	3.43	3.38
	SAR Test Required	Yes	Yes	Yes	Yes	Yes	Yes
Left Edge	Distance to User (mm)	200					
	Max. Peak Power (dBm)	12.50	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	17.78	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	7650.00	7650.00	7650.00	7650.00	7650.00	7650.00
	SAR Test Required	No	No	No	No	No	No
Right Edge	Distance to User (mm)	90					
	Max. Peak Power (dBm)	12.50	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	17.78	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	1671.48	1673.60	1464.30	1446.44	1441.45	1437.20
	SAR Test Required	No	No	No	No	No	No
Front Edge	Distance to User (mm)	235					
	Max. Peak Power (dBm)	12.50	16.00	16.00	16.00	16.00	16.00
	Max. Peak Power (mW)	17.78	39.81	39.81	39.81	39.81	39.81
	Exclusion Threshold (mW)	10400.86	10398.21	10682.59	10709.09	10716.57	10722.96
	SAR Test Required	No	No	No	No	No	No

Note: The combination of test distance and 1-g SAR measurements required for body exposure are more rigorous; therefore, separate 10-g extremity SAR evaluation is replaced.

Note:

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

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

where

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

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

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

5. Per KDB 248227 D01, choose the highest output power channel to test SAR and determine further SAR exclusion.8. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate
6. Per KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions.
 - a. When KDB Publication 447498 D04 SAR test exclusion applies to the OFDM configuration.
 - b. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
7. Per KDB 248227 D01 SAR is not required for the following U-NII-1 and U-NII-2A bands conditions.
 - a. When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.
 - b. When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.
8. For Limbs SAR, SAR test exemption considered by applying a factor of 2.5 to the applicable power level thresholds.

10 TEST RESULT

1. The reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)".
 - c. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Absorbed power density (APD) using a 4cm² averaging area is reported based on SAR measurements.
3. Per KDB 447498 D04, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 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
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
4. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg

10.1 Bluetooth (Aux. Antenna)

10.1.1 Bluetooth Body SAR

Mode	Antenna Manufa cturer	Test State	Anten na	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body																
DH5	SPEED	Laptop	Aux.	Bottom Side	0	0	2402	-0.06	0.028	11.97	12.50	1.130	77.35	1.293	0.041	/
					0	39	2441	-0.01	0.039	12.09	12.50	1.099	77.35	1.293	0.055	/
					0	78	2480	-0.07	0.049	11.91	12.50	1.146	77.35	1.293	0.073	1#
	ZhongTi anXun				0	39	2441	-0.08	0.045	12.09	12.50	1.099	77.35	1.293	0.064	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.																

10.1.2 Bluetooth Limbs SAR

Mode	Antenna Manufa cturer	Test State	Anten na	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Limbs																
DH5	SPEED	Laptop	Aux.	Back Side of Monitor	0	0	2402	0.02	0.008	11.97	12.50	1.130	77.35	1.293	0.012	/
					0	39	2441	0.02	0.005	12.09	12.50	1.099	77.35	1.293	0.007	/
					0	78	2480	-0.15	0.014	11.91	12.50	1.146	77.35	1.293	0.021	14#
	ZhongTi anXun				0	39	2441	0.04	0.006	12.09	12.50	1.099	77.35	1.293	0.009	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.																

10.2WIFI 2.4GHz

10.2.1 WIFI 2.4GHz Body SAR

Mode	Antenna Manufa cturer	Test State	Anten na	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body																
802.11b	SPEED	Laptop	Main	Bottom Side	0	1	2412	0.12	0.080	15.50	16.00	1.122	99.72	1.003	0.090	/
	ZhongTi anXun				0	1	2412	-0.10	0.081	15.50	16.00	1.122	99.72	1.003	0.091	/
					0	6	2437	-0.02	0.082	15.49	16.00	1.125	99.72	1.003	0.092	/
					0	11	2462	-0.13	0.081	15.35	16.00	1.161	99.72	1.003	0.094	2#
	SPEED		Aux.		0	1	2412	0.17	0.064	15.39	16.00	1.151	99.72	1.003	0.074	/
					0	6	2437	-0.02	0.096	15.79	16.00	1.050	99.72	1.003	0.101	/
	0				11	2462	-0.10	0.112	15.59	16.00	1.099	99.72	1.003	0.123	3#	
	ZhongTi anXun				0	6	2437	-0.10	0.107	15.79	16.00	1.050	99.72	1.003	0.113	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.																

10.2.2 WIFI 2.4GHz Limbs SAR

Mode	Antenna Manufa cturer	Test State	Anten na	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Limbs																
802.11b	SPEED	Laptop	Main	Back Side of Monitor	0	1	2412	0.04	0.030	15.50	16.00	1.122	99.72	1.003	0.034	/
					0	6	2437	0.08	0.032	15.49	16.00	1.125	99.72	1.003	0.036	/
					0	11	2462	-0.10	0.036	15.35	16.00	1.161	99.72	1.003	0.042	15#
	ZhongTi anXun		Aux.		0	1	2412	0.11	0.028	15.50	16.00	1.122	99.72	1.003	0.032	/
	SPEED				0	6	2437	0.16	0.029	15.79	16.00	1.050	99.72	1.003	0.031	/
					0	1	2412	0.18	0.031	15.39	16.00	1.151	99.72	1.003	0.036	/
					ZhongTi anXun	0	6	2437	-0.07	0.036	15.79	16.00	1.050	99.72	1.003	0.038
	0					11	2462	0.11	0.041	15.59	16.00	1.099	99.72	1.003	0.045	16#
	Note: Refer to ANNEX C for the detailed test data for each test configuration.															

10.3 WIFI 5GHz

10.3.1 WIFI 5GHz Body SAR

Fre. Band	Mode	Antenna Manufacter	Test State	Antenna	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body																	
U-NII-2A	802.11n40	SPEED	Laptop	Main	Bottom	0	54	5270	0.12	0.278	15.38	16.00	1.153	97.44	1.026	0.329	4#
		0				62	5310	-0.10	0.260	15.12	16.00	1.225	97.44	1.026	0.327	/	
		0				54	5270	0.00	0.193	15.38	16.00	1.153	97.44	1.026	0.228	/	
		SPEED		Aux.		0	54	5270	-0.16	0.309	15.58	16.00	1.102	97.44	1.026	0.349	5#
		0				62	5310	0.14	0.243	15.57	16.00	1.104	97.44	1.026	0.275	/	
		0				54	5270	0.11	0.295	15.58	16.00	1.102	97.44	1.026	0.333	/	
U-NII-2C	802.11ac80	SPEED	Laptop	Main	Bottom	0	106	5530	-0.09	0.337	15.60	16.00	1.096	94.87	1.054	0.389	6#
		0				122	5610	0.01	0.251	15.79	16.00	1.050	94.87	1.054	0.278	/	
		0				138	5690	0.16	0.330	15.74	16.00	1.062	94.87	1.054	0.369	/	
		0				122	5610	0.07	0.315	15.79	16.00	1.050	94.87	1.054	0.348	/	
		SPEED		Aux.		0	138	5690	-0.14	0.187	16.00	16.00	1.000	94.87	1.054	0.197	/
		0				106	5530	0.01	0.368	15.85	16.00	1.035	94.87	1.054	0.402	7#	
		0				122	5610	-0.13	0.316	15.48	16.00	1.127	94.87	1.054	0.375	/	
		0				138	5690	0.06	0.273	16.00	16.00	1.000	94.87	1.054	0.288	/	
U-NII-3	802.11ac80	SPEED	Laptop	Main	Bottom	0	155	5775	0.02	0.382	15.75	16.00	1.059	94.87	1.054	0.427	8#
		0				155	5775	0.01	0.270	15.75	16.00	1.059	94.87	1.054	0.301	/	
		Aux.		0		155	5775	-0.12	0.199	15.46	16.00	1.132	94.87	1.054	0.238	9#	
				0		155	5775	-0.16	0.185	15.46	16.00	1.132	94.87	1.054	0.221	/	
U-NII-4	802.11ac160	SPEED	Laptop	Main	Bottom	0	163	5815	-0.12	0.279	15.08	16.00	1.236	91.57	1.092	0.377	10#
		0				163	5815	0.14	0.219	15.08	16.00	1.236	91.57	1.092	0.296	/	
		Aux.		0		163	5815	-0.07	0.206	15.34	16.00	1.164	91.57	1.092	0.262	/	
				0		163	5815	-0.14	0.229	15.34	16.00	1.164	91.57	1.092	0.291	11#	
Note: Refer to ANNEX C for the detailed test data for each test configuration.																	

10.3.2 WIFI 5GHz Limbs SAR

Fre. Band	Mode	Antenna Manufacter	Test State	Antenna	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Limbs																	
U-NII-2A	802.11n40	SPEED	Laptop	Main	Back Side of Monitor	0	54	5270	-0.11	0.134	15.38	16.00	1.153	97.44	1.026	0.159	17#
		0				62	5310	0.16	0.110	15.12	16.00	1.225	97.44	1.026	0.138	/	
		0				54	5270	-0.02	0.072	15.38	16.00	1.153	97.44	1.026	0.085	/	
		Aux.		0		54	5270	0.19	0.145	15.58	16.00	1.102	97.44	1.026	0.164	18#	
				0		62	5310	0.18	0.130	15.57	16.00	1.104	97.44	1.026	0.147	/	
				0		54	5270	-0.08	0.121	15.58	16.00	1.102	97.44	1.026	0.137	/	
U-NII-2C	802.11ac80	SPEED	Laptop	Main	Back Side of Monitor	0	122	5610	0.13	0.084	15.79	16.00	1.050	94.87	1.054	0.093	/
		0				106	5530	0.08	0.102	15.60	16.00	1.096	94.87	1.054	0.118	/	
		0				122	5610	0.06	0.127	15.79	16.00	1.050	94.87	1.054	0.140	19#	
		0				138	5690	-0.07	0.077	15.74	16.00	1.062	94.87	1.054	0.086	/	
		Aux.		0		138	5690	-0.17	0.087	16.00	16.00	1.000	94.87	1.054	0.092	/	
				0		106	5530	-0.19	0.134	15.85	16.00	1.035	94.87	1.054	0.146	20#	
				0		122	5610	-0.11	0.115	15.48	16.00	1.127	94.87	1.054	0.137	/	
				0		138	5690	-0.15	0.098	16.00	16.00	1.000	94.87	1.054	0.103	/	
U-NII-3	802.11ac80	SPEED	Laptop	Main	Back Side of Monitor	0	155	5775	0.14	0.163	15.75	16.00	1.059	94.87	1.054	0.182	21#
		0				155	5775	0.15	0.115	15.75	16.00	1.059	94.87	1.054	0.128	/	
		Aux.		0		155	5775	0.18	0.134	15.46	16.00	1.132	94.87	1.054	0.160	22#	
				0		155	5775	0.10	0.099	15.46	16.00	1.132	94.87	1.054	0.118	/	
U-NII-4	802.11ac160	SPEED	Laptop	Main	Back Side of Monitor	0	163	5815	-0.11	0.129	15.08	16.00	1.236	91.57	1.092	0.174	23#
		0				163	5815	-0.17	0.092	15.08	16.00	1.236	91.57	1.092	0.124	/	
		Aux.		0		163	5815	0.02	0.116	15.34	16.00	1.164	91.57	1.092	0.147	24#	
				0		163	5815	0.18	0.087	15.34	16.00	1.164	91.57	1.092	0.111	/	
Note: Refer to ANNEX C for the detailed test data for each test configuration.																	

10.4 WIFI 6GHz

10.4.1 WIFI 6GHz Body SAR

Mode	Antenna Manufa cturer	Test State	Anten na	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body																
802.11 ax160	SPEED	Laptop	Main	Bottom Side	0	15	6025	0.08	0.171	13.10	13.50	1.096	91.32	1.095	0.205	/
					0	47	6185	0.04	0.296	13.27	13.50	1.054	91.32	1.095	0.342	12#
					0	79	6345	0.02	0.236	13.24	13.50	1.062	91.32	1.095	0.274	/
					0	111	6505	-0.08	0.136	13.34	13.50	1.038	91.32	1.095	0.155	/
					0	143	6665	-0.12	0.202	13.04	13.50	1.112	91.32	1.095	0.246	/
					0	175	6825	0.06	0.180	13.28	13.50	1.052	91.32	1.095	0.207	/
					0	207	6985	-0.02	0.076	13.30	13.50	1.047	91.32	1.095	0.087	/
	ZhongTi anXun	Laptop	Aux.	Bottom Side	0	111	6505	0.06	0.102	13.34	13.50	1.038	91.32	1.095	0.116	/
	SPEED				0	175	6825	-0.11	0.071	13.40	13.50	1.023	91.32	1.095	0.080	/
	ZhongTi anXun				0	15	6025	0.14	0.089	13.27	13.50	1.054	91.32	1.095	0.103	/
					0	47	6185	0.13	0.130	13.20	13.50	1.072	91.32	1.095	0.153	/
					0	79	6345	0.09	0.149	13.00	13.50	1.122	91.32	1.095	0.183	/
					0	111	6505	-0.06	0.153	13.04	13.50	1.112	91.32	1.095	0.186	/
					0	143	6665	-0.10	0.167	13.22	13.50	1.067	91.32	1.095	0.195	13#
					0	175	6825	-0.08	0.155	13.40	13.50	1.023	91.32	1.095	0.174	/
					0	207	6985	-0.11	0.138	13.17	13.50	1.079	91.32	1.095	0.163	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.																

10.4.2 WIFI 6GHz Limbs SAR

Mode	Antenna Manufa cturer	Test State	Anten na	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle (%)	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Limbs																
802.11 ax160	SPEED	Laptop	Main	Back Side of Monitor	0	15	6025	-0.16	0.054	13.10	13.50	1.096	91.32	1.095	0.065	/
					0	47	6185	-0.18	0.091	13.27	13.50	1.054	91.32	1.095	0.105	25#
					0	79	6345	0.12	0.062	13.24	13.50	1.062	91.32	1.095	0.073	/
					0	111	6505	-0.15	0.032	13.34	13.50	1.038	91.32	1.095	0.036	/
					0	143	6665	-0.01	0.046	13.04	13.50	1.112	91.32	1.095	0.056	/
					0	175	6825	-0.02	0.035	13.28	13.50	1.052	91.32	1.095	0.040	/
					0	207	6985	0.06	0.015	13.30	13.50	1.047	91.32	1.095	0.017	/
	ZhongTi anXun	Laptop	Main		0	111	6505	0.06	0.021	13.34	13.50	1.038	91.32	1.095	0.024	/
	SPEED				0	175	6825	-0.13	0.023	13.40	13.50	1.023	91.32	1.095	0.026	/
	ZhongTi anXun		Aux.		0	15	6025	0.14	0.029	13.27	13.50	1.054	91.32	1.095	0.034	/
					0	47	6185	-0.15	0.029	13.20	13.50	1.072	91.32	1.095	0.034	/
					0	79	6345	-0.08	0.038	13.00	13.50	1.122	91.32	1.095	0.046	/
					0	111	6505	-0.11	0.042	13.04	13.50	1.112	91.32	1.095	0.051	/
					0	143	6665	0.01	0.049	13.22	13.50	1.067	91.32	1.095	0.057	26
					0	175	6825	0.11	0.041	13.40	13.50	1.023	91.32	1.095	0.046	/
					0	207	6985	0.08	0.041	13.17	13.50	1.079	91.32	1.095	0.048	/

Note: Refer to ANNEX C for the detailed test data for each test configuration.

11 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10 , the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3. If the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 , or when the original or repeated measurement is ≥ 1.45 W/kg, perform a second repeated measurement.
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.

Note: For product specific 1g SAR, the highest measured 1g SAR is $0.38 < 0.80$ W/kg, repeated measurement is not required.

Note: For product specific 10g SAR, the highest measured 10g SAR is $0.16 < 2.00$ W/kg, repeated measurement is not required.

12 SIMULTANEOUS TRANSMISSION

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

According KDB 447498 D04, simultaneous transmission:

- a) $SPLSR = (SAR1 + SAR2)^{1.5} / R_i$ (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
SAR1 is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition.
SAR2 is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition as the first.
- b) If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary.
- c) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

12.1 Simultaneous Transmission Mode Considerations

No.	Simultaneous Tx Combination	Body	Limbs
1	Bluetooth + WLAN 2.4GHz (Antenna Main)	Yes	Yes
2	Bluetooth + WLAN 5GHz (Antenna Main)	Yes	Yes
3	Bluetooth + WLAN 5GHz (Antenna Auxiliary)	Yes	Yes
4	Bluetooth + WLAN 6GHz (Antenna Main)	Yes	Yes
5	Bluetooth + WLAN 6GHz (Antenna Auxiliary)	Yes	Yes
6	WLAN 2.4GHz (Antenna Main) + WLAN 2.4GHz (Antenna Auxiliary)	Yes	Yes
7	WLAN 2.4GHz (Antenna Main) + WLAN 5GHz (Antenna Auxiliary)	Yes	Yes
8	WLAN 2.4GHz (Antenna Auxiliary) + WLAN 5GHz (Antenna Main)	Yes	Yes
9	WLAN 5GHz (Antenna Auxiliary) + WLAN 5GHz (Antenna Main)	Yes	Yes
10	WLAN 2.4GHz (Antenna Main) + WLAN 6GHz (Antenna Auxiliary)	Yes	Yes
11	WLAN 2.4GHz (Antenna Auxiliary) + WLAN 6GHz (Antenna Main)	Yes	Yes
12	WLAN 6GHz (Antenna Auxiliary) + WLAN 6GHz (Antenna Main)	Yes	Yes

Note:

1. The EUT supports the Antenna Auxiliary with TX/RX diversity function for WLAN and Bluetooth, the Antenna Main with TX/RX diversity function for WLAN.
2. WLAN 2.4GHz and Bluetooth will not be transmitting from the Antenna Auxiliary at same time.
3. The simultaneous transmission combinations of the more antennas contain combinations of less antennas, so only the worst simultaneous transmission combinations is shown in this report.

12.2 Sum SAR of Simultaneous Transmission

12.2.1 Body Simultaneous Transmission SAR Evaluation for WLAN Antenna with Bluetooth

State	Position			Stand alone SAR							
				1	2	3	4	5	6	7	
				Bluetooth	WLAN 2.4GHz (Antenna Auxiliary)	WLAN 2.4GHz (Antenna Main)	MAX. WLAN 5GHz (Antenna Auxiliary)	MAX. WLAN 5GHz (Antenna Main)	WLAN 6GHz (Antenna Auxiliary)	WLAN 6GHz (Antenna Main)	
Body	Laptop	Bottom Side	0.073	0.123	0.094	0.402	0.427	0.195	0.342		
SUM SAR											
Sum SAR (1+3)	Sum SAR (1+4)	Sum SAR (1+5)	Sum SAR (1+6)	Sum SAR (1+7)	Sum SAR (2+3)	Sum SAR (2+5)	Sum SAR (3+4)	Sum SAR (4+5)	Sum SAR (2+7)	Sum SAR (3+6)	Sum SAR (6+7)
0.167	0.475	0.500	0.268	0.415	0.217	0.550	0.496	0.829	0.465	0.289	0.537
Note:											
1: The highest Summed 1g SAR is 0.829W/Kg > 1.6 W/kg, so Simultaneous Transmission SAR test is required.											

12.2.2 Limbs Simultaneous Transmission SAR Evaluation for WLAN Antenna with Bluetooth

State	Position			Stand alone SAR							
				1	2	3	4	5	6	7	
				Bluetooth	WLAN 2.4GHz (Antenna Auxiliary)	WLAN 2.4GHz (Antenna Main)	MAX. WLAN 5GHz (Antenna Auxiliary)	MAX. WLAN 5GHz (Antenna Main)	WLAN 6GHz (Antenna Auxiliary)	WLAN 6GHz (Antenna Main)	
Limbs	Laptop	Back Side Of Moniter	0.021	0.045	0.042	0.164	0.182	0.057	0.105		
SUM SAR											
Sum SAR (1+3)	Sum SAR (1+4)	Sum SAR (1+5)	Sum SAR (1+6)	Sum SAR (1+7)	Sum SAR (2+3)	Sum SAR (2+5)	Sum SAR (3+4)	Sum SAR (4+5)	Sum SAR (2+7)	Sum SAR (3+6)	Sum SAR (6+7)
0.063	0.185	0.203	0.078	0.126	0.087	0.227	0.206	0.346	0.150	0.099	0.162
Note:											
1: The highest Summed 10g SAR is 0.346W/Kg > 4.0 W/kg, so Simultaneous Transmission SAR test is required.											

13 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No./Version	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
Test Software	Speag	DASY6	16.0.0.116	N/A	N/A
2450MHz Validation Dipole	Speag	D2450V2	SN: 952	2021/05/19	2024/05/18
5GHz Validation Dipole	Speag	D5GHzV2	SN: 1200	2021/05/18	2024/05/17
6.5GHz Validation Dipole	Speag	D6.5GHzV2	SN: 1037	2022/07/01	2024/06/30
E-Field Probe	Speag	EX3DV4	SN: 7607	2022/07/04	2023/07/03
E-Field Probe	Speag	EX3DV4	SN: 7664	2022/09/23	2023/09/23
Data Acquisition Electronicsr	Speag	DAE4	SN: 878	2022/06/13	2023/06/12
Signal Generator	R&S	SMB100A	177746	2022/05/19	2023/05/18
Power Meter	R&S	NRVD-B2	7250BJ-0112/2011	2022/09/06	2023/09/05
Power Sensor	R&S	NRV-Z4	100381	2022/09/06	2023/09/05
Power Sensor	R&S	NRV-Z2	100211	2022/09/06	2023/09/05
Network Analyzer	Agilent	E5071C	MY46103472	2022/12/06	2023/12/05
Thermometer	Elitech	RC-4HC	EF7225003028	2022/11/18	2023/11/17
Thermometer	Elitech	RC-4HC	EF720B004813	2022/11/18	2023/11/17
Power Amplifier	SATIMO	6552B	22374	N/A	N/A
Dielectric Probe Kit	Speag	DAK3.5	SN: 1312	N/A	N/A
Phantom	Speag	ELI V8.0	SN: 2159	N/A	N/A
Attenuator	COM-MW	ZA-S1-31	1305003187	N/A	N/A
Directional coupler	AA-MCS	AAMCS-UDC	000272	N/A	N/A

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

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

ANNEX A SIMULATING LIQUID VERIFICATION RESULT

The dielectric parameters of the liquids were verified prior to the SAR evaluation using a DAK3.5 Dielectric Probe Kit.

Date	Liquid Type	Fre. (MHz)	Temp. (°C)	Meas. Conductivity (σ) (S/m)	Meas. Permittivity (ϵ)	Target Conductivity (σ) (S/m)	Target Permittivity (ϵ)	Conductivity Tolerance (%)	Permittivity Tolerance (%)
2023.02.09	Head	2450	20.9	1.80	39.64	1.80	39.20	0.00	1.12
2023.02.06	Head	5250	20.7	4.70	35.89	4.71	35.93	-0.21	-0.11
2023.02.07	Head	5600	21.2	5.05	35.23	5.07	35.53	-0.39	-0.84
2023.02.08	Head	5750	21.2	5.17	35.66	5.22	35.36	-0.96	0.85
2023.01.30	Head	6500	20.9	6.12	34.85	6.07	34.46	0.82	1.13
Note: The tolerance limit of Conductivity and Permittivity is $\pm 5\%$.									

ANNEX B SYSTEM CHECK RESULT

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

Head liquid 1g

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)
2023.02.09	Head	2450	100	5.35	53.50	53.00	0.94
2023.02.06	Head	5250	100	7.88	78.80	77.80	1.29
2023.02.07	Head	5600	100	8.19	81.90	81.20	0.86
2023.02.08	Head	5750	100	7.69	76.90	77.20	-0.39
2023.01.30	Head	6500	100	29.20	292.00	286.00	2.10

Note: The tolerance limit of System validation $\pm 10\%$.

Head liquid 10g

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)
2023.02.09	Head	2450	100	2.31	23.10	24.10	-4.15
2023.02.06	Head	5250	100	2.23	22.30	22.10	0.90
2023.02.07	Head	5600	100	2.35	23.50	23.10	1.73
2023.02.08	Head	5750	100	2.09	20.90	21.70	-3.69
2023.01.30	Head	6500	100	5.29	52.90	52.60	0.57

Note: The tolerance limit of System validation $\pm 10\%$.

System Performance Check Data (2450MHz)

Device under Test Properties

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

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL		Validation band	CW, 0--	2450.0, 2450	7.79	1.80	39.6	22.3	21.0

Hardware Setup

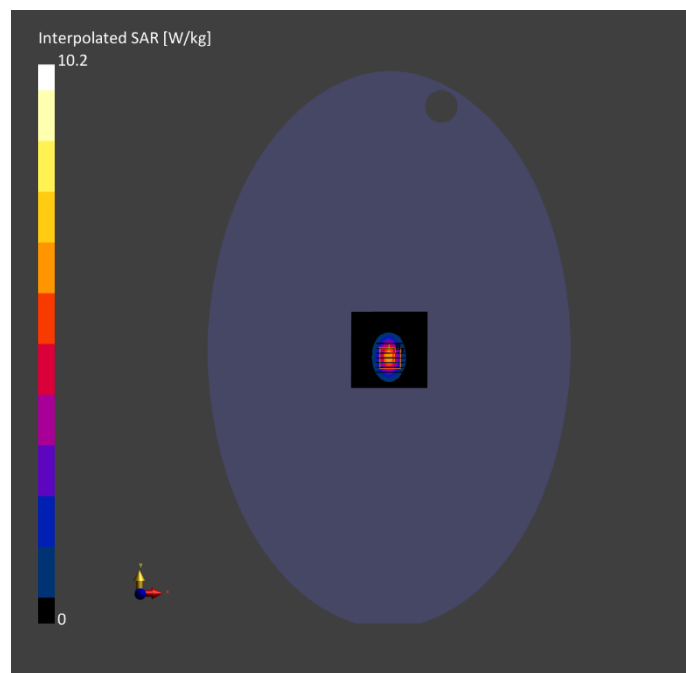
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-09	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

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

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-09	2023-02-09
psSAR1g [W/kg]	5.30	5.35
psSAR10g [W/kg]	2.27	2.31
Power Drift [dB]	0.02	0.00
Power	Disabled	Disabled
Scaling		
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		80.1
Dist 3dB Peak [mm]		8.5



System Performance Check Data (5250MHz)

Device under Test Properties

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

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL		Validation band	CW, 0--	5250.0, 5250	5.45	4.70	35.9	21.9	20.9

Hardware Setup

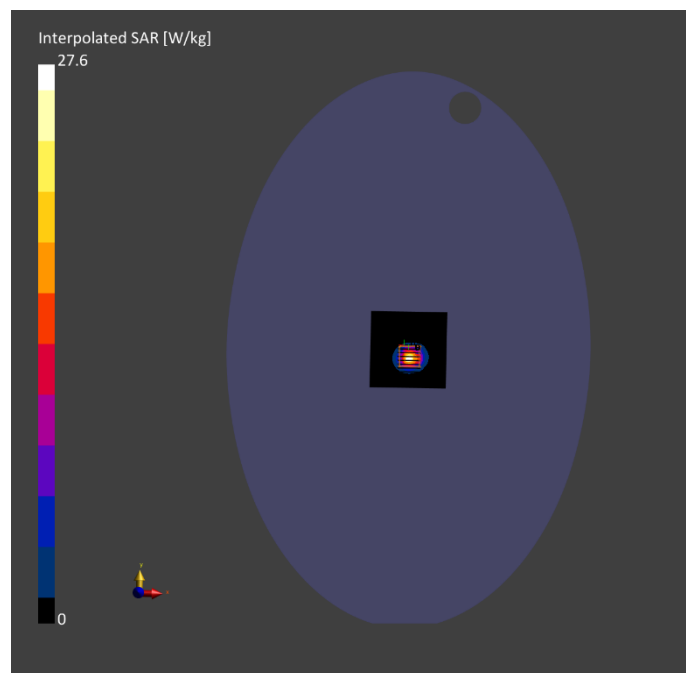
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-06	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

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

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-06	2023-02-06
psSAR1g [W/kg]	7.53	7.88
psSAR10g [W/kg]	2.04	2.23
Power Drift [dB]	0.01	0.05
Power	Disabled	Disabled
Scaling		
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		64.9
Dist 3dB Peak [mm]		7.8



System Performance Check Data (5600MHz)

Device under Test Properties

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

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL		Validation band	CW, 0--	5600.0, 5600	4.9	5.05	35.2	22.2	21.2

Hardware Setup

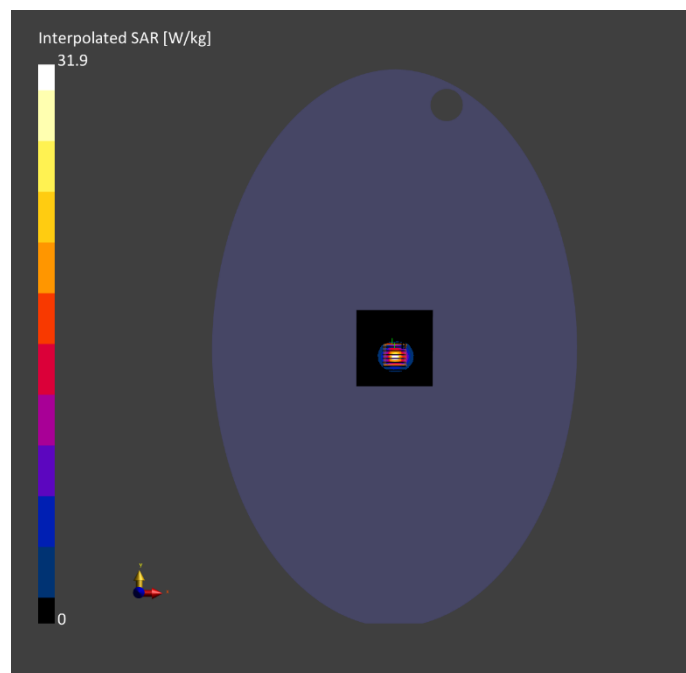
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 07 2023-02-	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

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

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-07	2023-02-07
psSAR1g [W/kg]	8.01	8.19
psSAR10g [W/kg]	2.22	2.35
Power Drift [dB]	-0.11	-0.07
Power	Disabled	Disabled
Scaling		
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		62.6
Dist 3dB Peak [mm]		7.3



System Performance Check Data (5750MHz)

Device under Test Properties

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

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL		Validation band	CW, 0--	5750.0, 5750	5.0	5.17	35.7	22.0	21.1

Hardware Setup

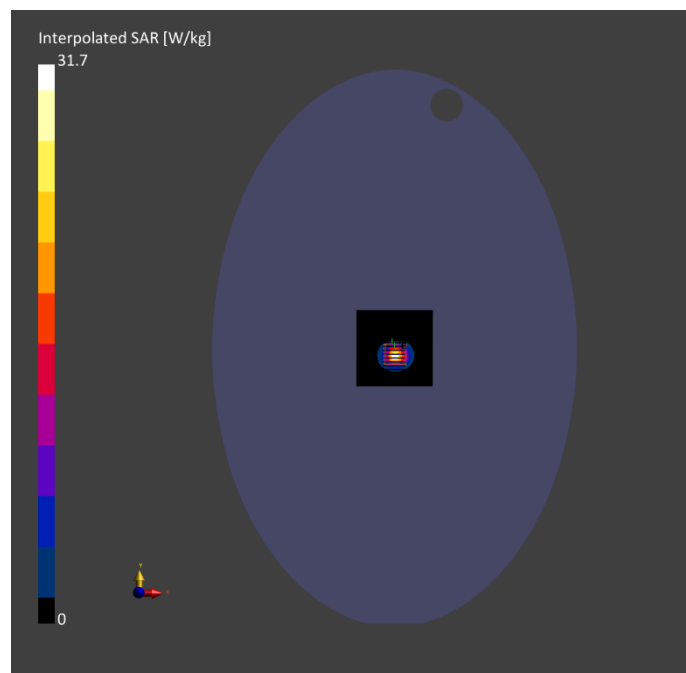
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

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

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	7.73	7.69
psSAR10g [W/kg]	2.04	2.09
Power Drift [dB]	0.12	0.01
Power	Disabled	Disabled
Scaling		
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		61.7
Dist 3dB Peak [mm]		8.3



System Performance Check Data (6500MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
D6.5GHzV2, SPEAG	10.0 x 10.0 x 3.0	Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL		Validation band	CW, 0--	6500.0, 6500	5.55	6.12	34.9	21.8	20.7

Hardware Setup

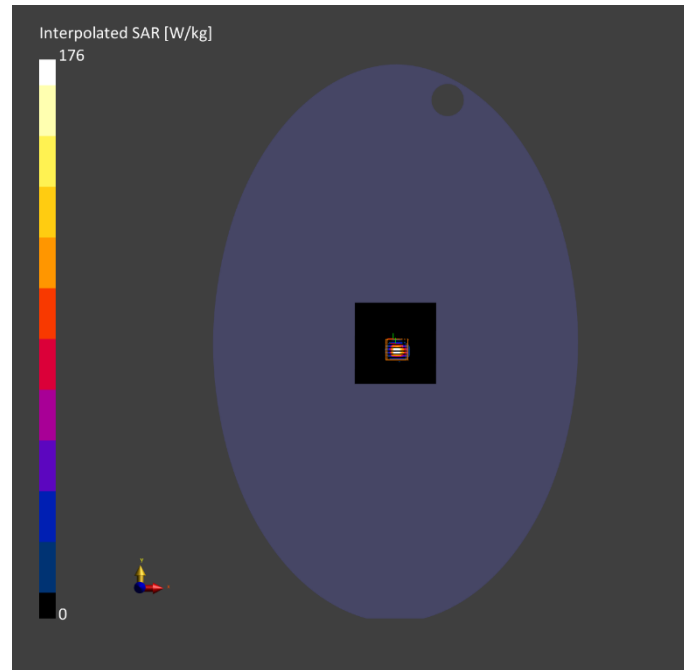
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-01-30	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 85.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-01-30	2023-01-30
psSAR1g [W/kg]	29.9	29.2
psSAR10g [W/kg]	5.03	5.29
Power Drift [dB]	-0.06	-0.01
Power	Disabled	Disabled
Scaling		
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		49.3
Dist 3dB Peak [mm]		4.6



ANNEX C TEST DATA

Meas.1 Body Plane with Bottom Side 0mm on 78 Channel in Bluetooth mode with Antenna Auxiliary

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2480.0, 78	7.79	1.85	39.4	22.3	21.0

Hardware Setup

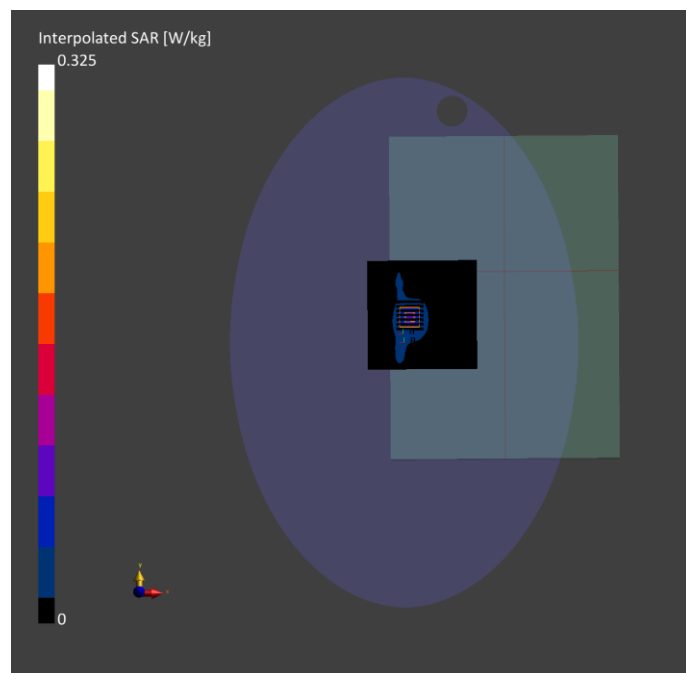
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-09	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-09	2023-02-09
psSAR1g [W/kg]	0.049	0.049
psSAR10g [W/kg]	0.025	0.020
Power Drift [dB]	0.16	-0.07
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		55.6
Dist 3dB Peak [mm]		13.1



Meas.2 Body Plane with Bottom Side 0mm on 11 Channel in IEEE 802.11b mode with Antenna Main
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 2.4GH	WLAN, 10012-CAB	2462.0, 11	7.79	1.82	39.6	22.3	21.0

Hardware Setup

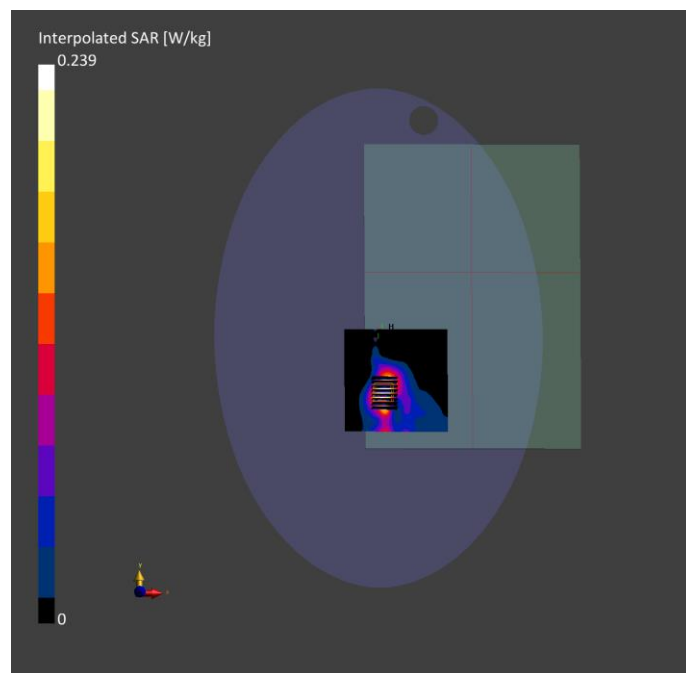
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-09	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-09	2023-02-09
psSAR1g [W/kg]	0.078	0.081
psSAR10g [W/kg]	0.039	0.039
Power Drift [dB]	-0.10	-0.13
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		45.0
Dist 3dB Peak [mm]		11.7



Meas.3 Body Plane with Bottom Side 0mm on 11 Channel in IEEE 802.11b mode with Antenna Auxiliary
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 2.4GH	WLAN, 10012-CAB	2462.0, 11	7.79	1.82	39.6	22.3	21.0

Hardware Setup

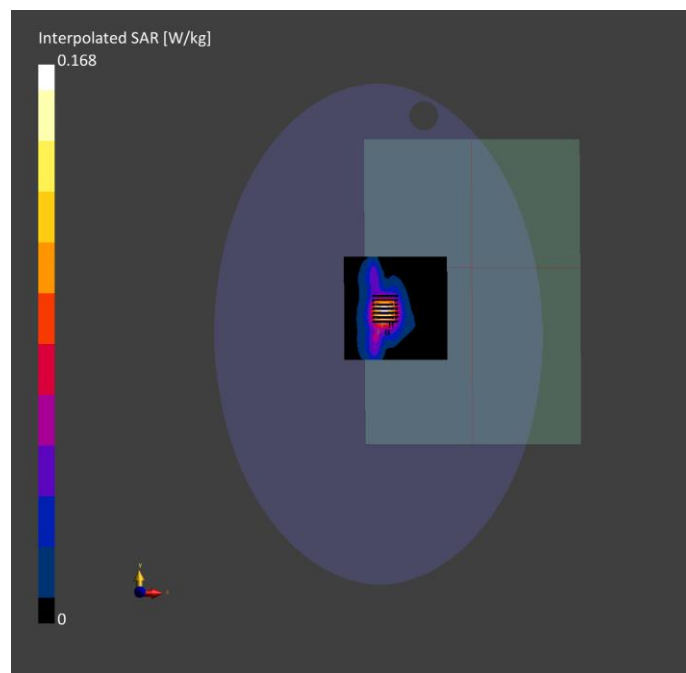
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-09	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-09	2023-02-09
psSAR1g [W/kg]	0.106	0.112
psSAR10g [W/kg]	0.055	0.052
Power Drift [dB]	0.05	-0.10
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		52.5
Dist 3dB Peak [mm]		6.0



Meas.4 Body Plane with Bottom Side 0mm on 54 Channel in IEEE 802.11n40 mode with Antenna Main**Device under Test Properties**

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10599-AAC	5270.0, 54	5.45	4.75	35.6	21.9	20.9

Hardware Setup

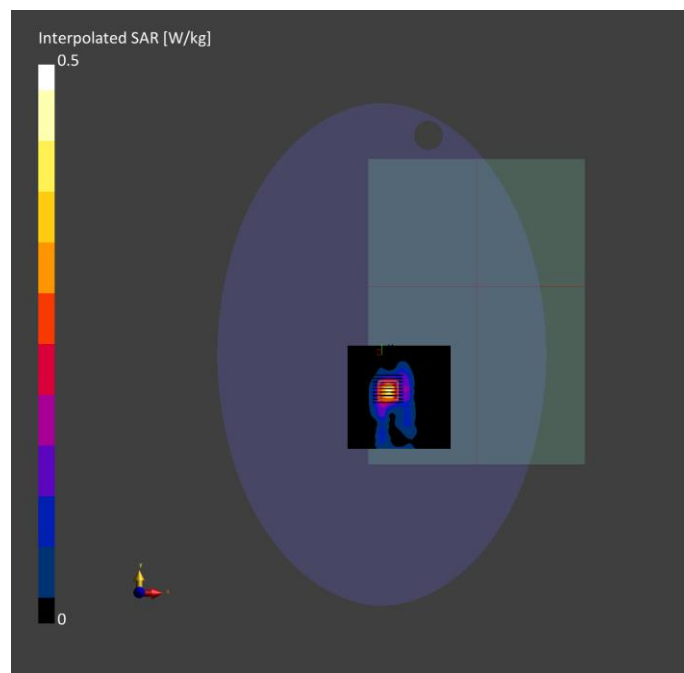
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-06	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-06	2023-02-06
psSAR1g [W/kg]	0.266	0.278
psSAR10g [W/kg]	0.104	0.103
Power Drift [dB]	0.00	0.12
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		56.1
Dist 3dB Peak [mm]		8.6



Meas.5 Body Plane with Bottom Side 0mm on 54 Channel in IEEE 802.11n40 mode with Antenna Auxiliary**Device under Test Properties**

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10599-AAC	5270.0, 54	5.45	4.75	35.6	21.9	20.9

Hardware Setup

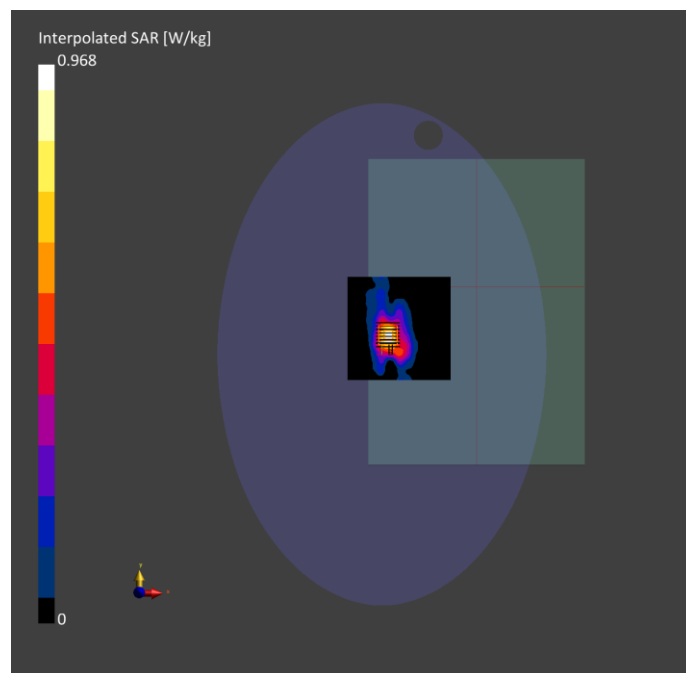
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-06	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-06	2023-02-06
psSAR1g [W/kg]	0.320	0.309
psSAR10g [W/kg]	0.116	0.102
Power Drift [dB]	0.08	-0.16
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		59.0
Dist 3dB Peak [mm]		6.4



Meas.6 Body Plane with Bottom Side 0mm on 106 Channel in IEEE 802.11ac80 mode with Antenna Main**Device under Test Properties**

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5530.0, 106	4.9	4.94	36.0	22.2	21.2

Hardware Setup

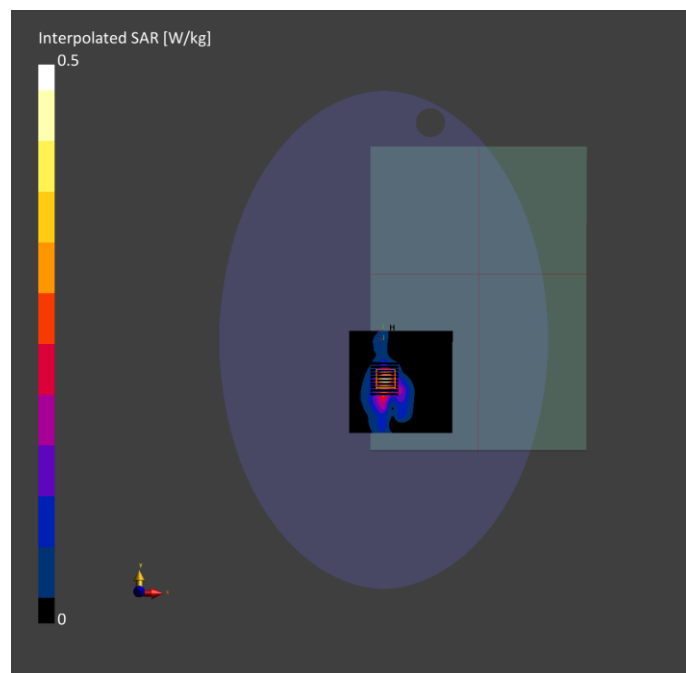
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-07	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-07	2023-02-07
psSAR1g [W/kg]	0.327	0.337
psSAR10g [W/kg]	0.122	0.118
Power Drift [dB]	0.18	-0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		53.5
Dist 3dB Peak [mm]		8.2



Meas.7 Body Plane with Bottom Side 0mm on 106 Channel in IEEE 802.11ac80 mode with Antenna Auxiliary**Device under Test Properties**

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5530.0, 106	4.9	4.94	36.0	22.2	21.2

Hardware Setup

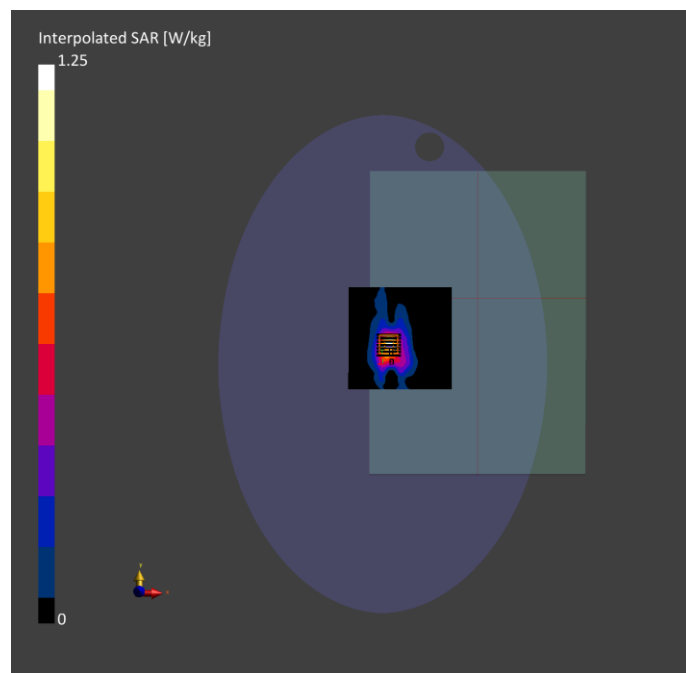
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-07	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-07	2023-02-07
psSAR1g [W/kg]	0.340	0.368
psSAR10g [W/kg]	0.123	0.128
Power Drift [dB]	-0.18	0.01
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		52.7
Dist 3dB Peak [mm]		7.4



Meas.8 Body Plane with Bottom Side 0mm on 155 Channel in IEEE 802.11ac80 mode with Antenna Main**Device under Test Properties**

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5775.0, 155	5.0	5.22	35.3	22.0	21.1

Hardware Setup

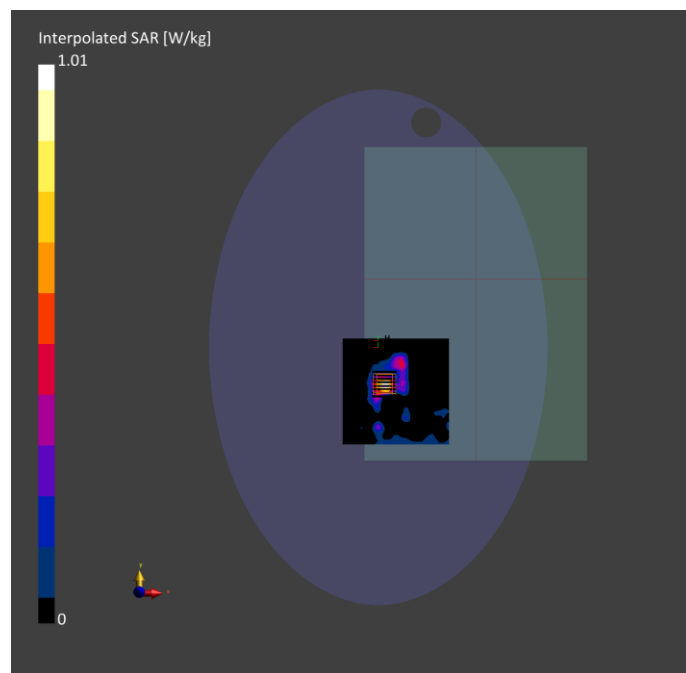
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.380	0.382
psSAR10g [W/kg]	0.144	0.137
Power Drift [dB]	0.07	0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		47.7
Dist 3dB Peak [mm]		8.0



Meas.9 Body Plane with Bottom Side 0mm on 155 Channel in IEEE 802.11ac80 mode with Antenna Auxiliary
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5775.0, 155	5.0	5.22	35.3	22.0	21.1

Hardware Setup

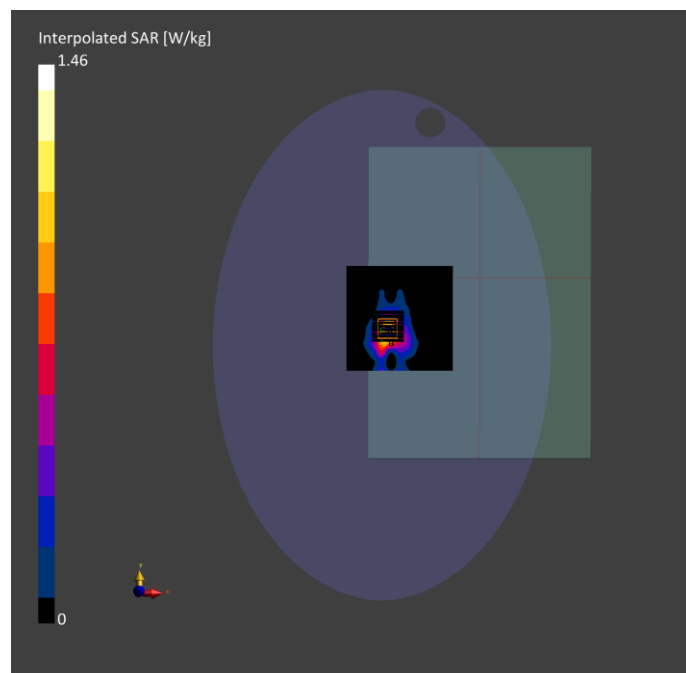
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.197	0.199
psSAR10g [W/kg]	0.062	0.055
Power Drift [dB]	0.02	-0.12
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		54.8
Dist 3dB Peak [mm]		6.4



Meas.10 Body Plane with Bottom Side 0mm on 163 Channel in IEEE 802.11ac160 mode with Antenna Main**Device under Test Properties**

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10554-AAD	5815.0, 163	5.0	5.28	34.9	22.0	21.1

Hardware Setup

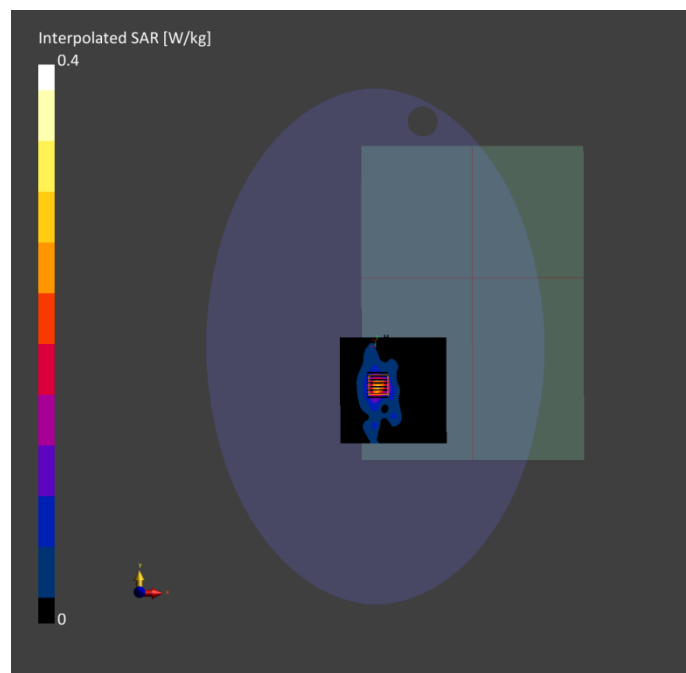
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.277	0.279
psSAR10g [W/kg]	0.108	0.101
Power Drift [dB]	0.09	-0.12
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		52.1
Dist 3dB Peak [mm]		8.0



Meas.11 Body Plane with Bottom Side 0mm on 163 Channel in IEEE 802.11ac160 mode with Antenna Auxiliary
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature
Flat, HSL	BOTTOM, 0.00	WLAN 5GHz	WLAN, 10554-AAD	5815.0, 163	5.0	5.28	34.9	22.0	21.1

Hardware Setup

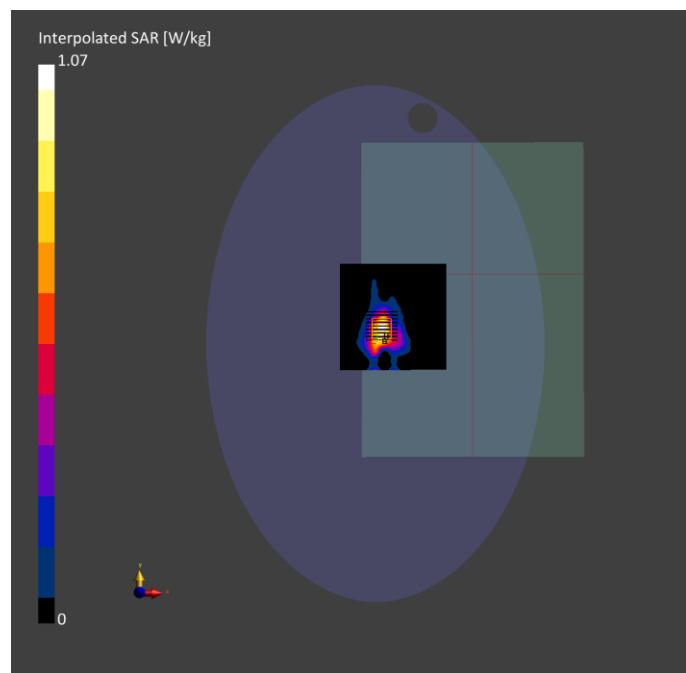
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.208	0.229
psSAR10g [W/kg]	0.074	0.074
Power Drift [dB]	-0.17	-0.14
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		51.7
Dist 3dB Peak [mm]		7.5



Meas.12 Body Plane with Bottom Side 0mm on 47 Channel in IEEE 802.11ax160 mode with Antenna Main
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	U-NII-5	WLAN, 10743-AAC	6185.0, 47	5.55	5.47	35.8	21.8	20.7

Hardware Setup

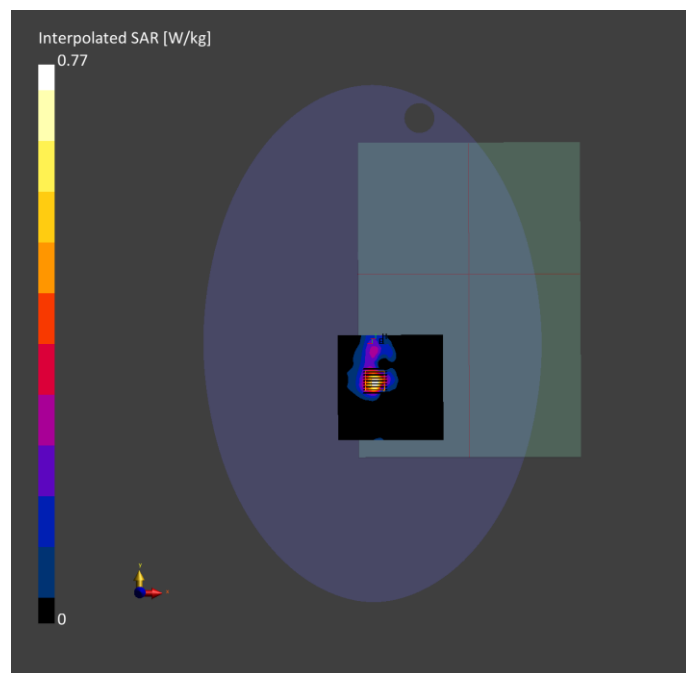
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-01-30	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	119.0 x 119.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-01-30	2023-01-30
psSAR1g [W/kg]	0.256	0.296
psSAR10g [W/kg]	0.086	0.091
Power Drift [dB]	0.13	0.04
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		54.1
Dist 3dB Peak [mm]		5.8



Meas.13 Body Plane with Bottom Side 0mm on 143 Channel in IEEE 802.11ax160 mode with Antenna Auxiliary
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 12.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BOTTOM, 0.00	U-NII-7	WLAN, 10743-AAC	6665.0, 143	5.55	6.36	34.2	21.8	20.7

Hardware Setup

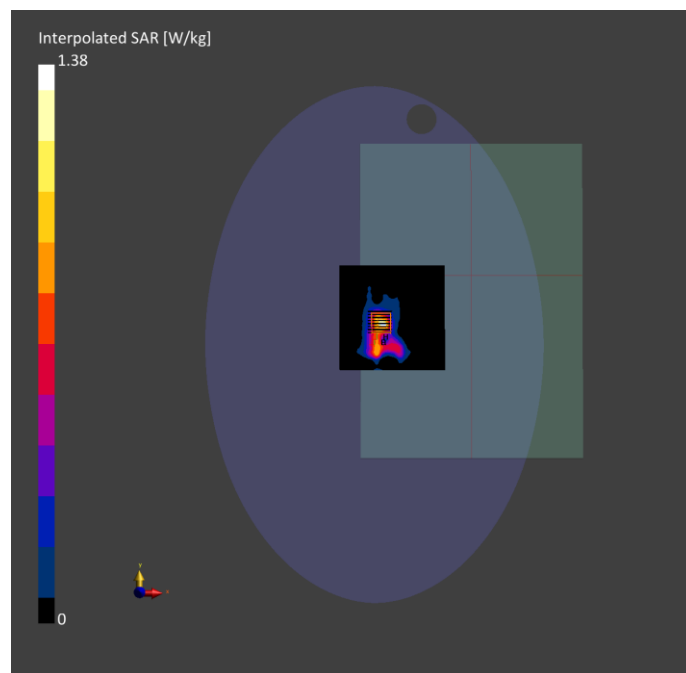
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-01-30	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	119.0 x 119.0	27.2 x 27.2 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-01-30	2023-01-30
psSAR1g [W/kg]	0.164	0.167
psSAR10g [W/kg]	0.055	0.055
Power Drift [dB]	-0.10	-0.10
Power Scaling	Disabled	Disabled
Scaling Factor		
TSL Correction [dB]	No correction	No correction
M2/M1 [%]		53.4
Dist 3dB Peak [mm]		7.1



Meas.14 Limbs Plane with Back Side of Monitor 0mm on 78 Channel in Bluetooth mode with Antenna Auxiliary
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2480.0, 78	7.79	1.85	39.4	22.3	21.0

Hardware Setup

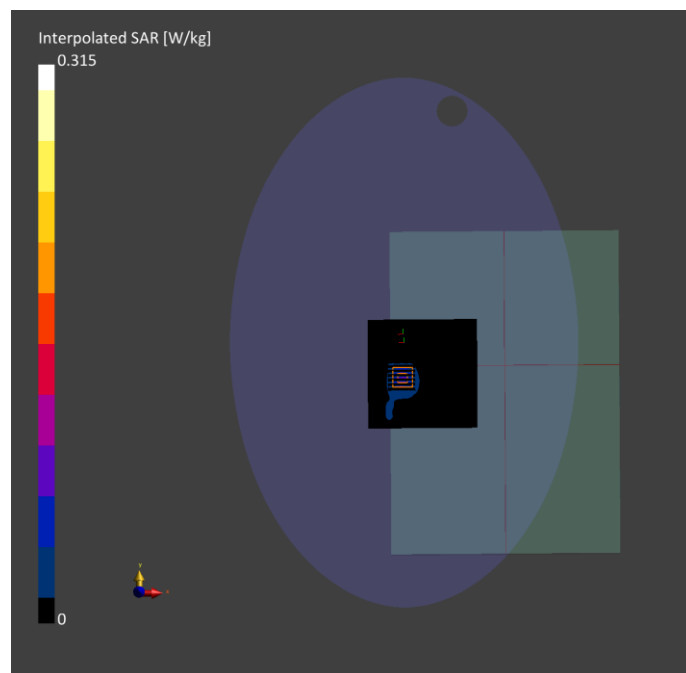
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-09	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-09	2023-02-09
psSAR1g [W/kg]	0.032	0.032
psSAR10g [W/kg]	0.016	0.014
Power Drift [dB]	0.04	-0.15
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		46.2
Dist 3dB Peak [mm]		11.7



Meas.15 Limbs Plane with Back Side of Monitor 0mm on 11 Channel in IEEE 802.11b mode with Antenna Main
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 2.4GH	WLAN, 10012-CAB	2462.0, 11	7.79	1.82	39.6	22.3	21.0

Hardware Setup

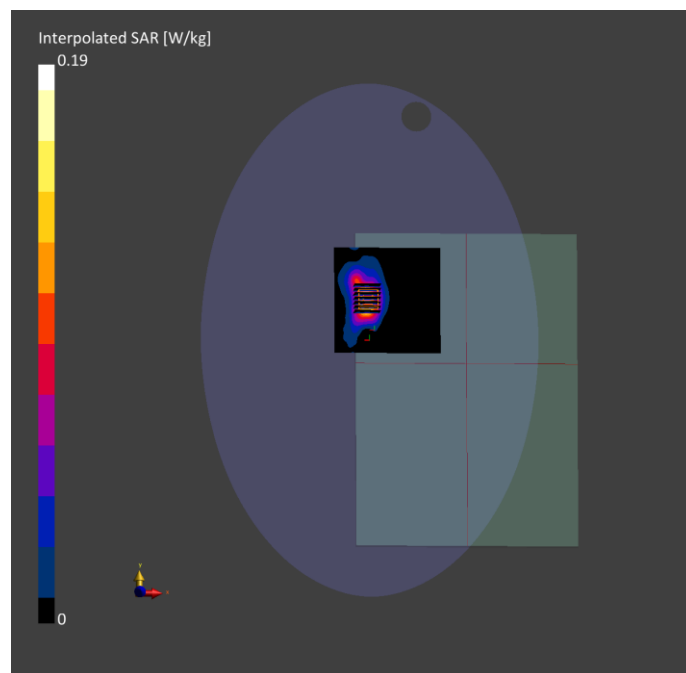
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-09	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-09	2023-02-09
psSAR1g [W/kg]	0.075	0.080
psSAR10g [W/kg]	0.037	0.036
Power Drift [dB]	0.17	-0.10
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		46.0
Dist 3dB Peak [mm]		9.8



Meas.16 Limbs Plane with Back Side of Monitor 0mm on 11 Channel in IEEE 802.11b mode with Antenna Auxiliary
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 2.4GH	WLAN, 10012-CAB	2462.0, 11	7.79	1.82	39.6	22.3	21.0

Hardware Setup

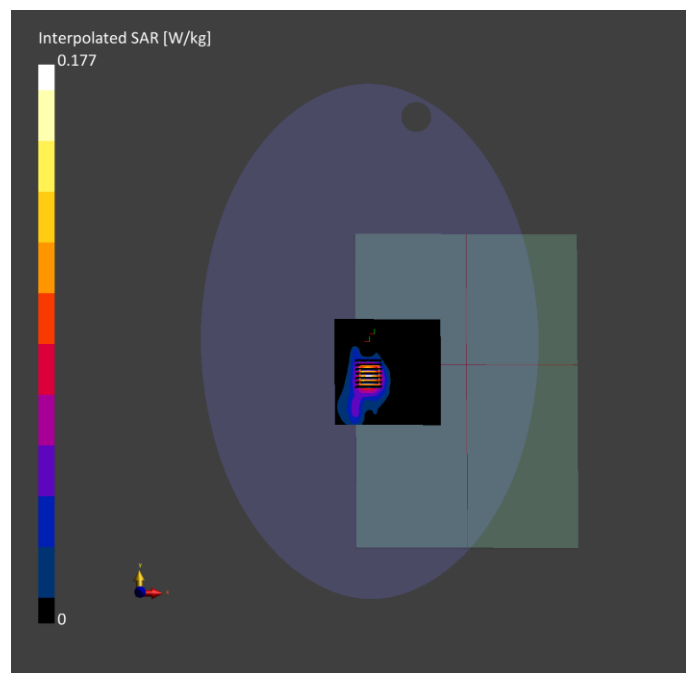
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-09	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-09	2023-02-09
psSAR1g [W/kg]	0.086	0.087
psSAR10g [W/kg]	0.043	0.041
Power Drift [dB]	0.13	0.11
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		45.8
Dist 3dB Peak [mm]		8.5



Meas.17 Limbs Plane with Back Side of Monitor 0mm on 54 Channel in IEEE 802.11n40 mode with Antenna Main
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10599-AAC	5270.0, 54	5.45	4.75	35.6	21.9	20.9

Hardware Setup

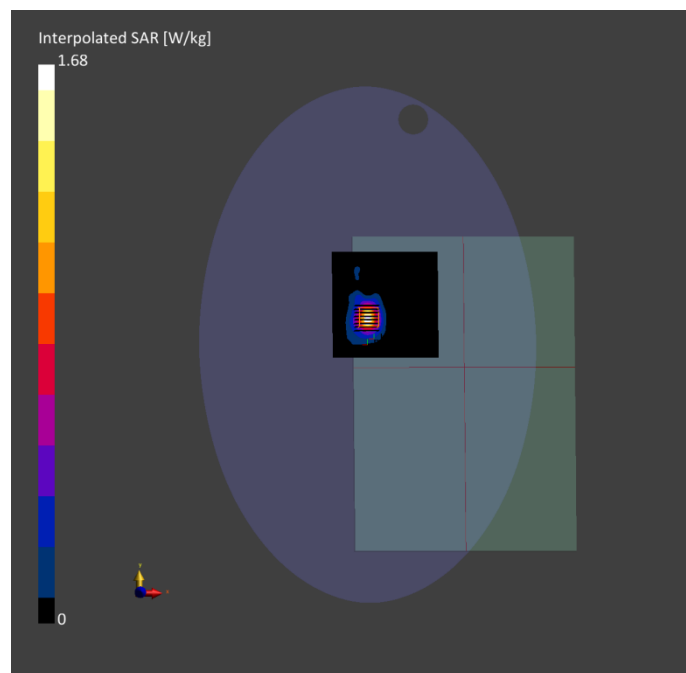
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-06	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-06	2023-02-06
psSAR1g [W/kg]	0.323	0.355
psSAR10g [W/kg]	0.123	0.134
Power Drift [dB]	-0.00	-0.11
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		52.4
Dist 3dB Peak [mm]		8.8



Meas.18 Limbs Plane with Back Side of Monitor 0mm on 54 Channel in IEEE 802.11n40 mode with Antenna Auxiliary

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10599-AAC	5270.0, 54	5.45	4.75	35.6	21.9	20.9

Hardware Setup

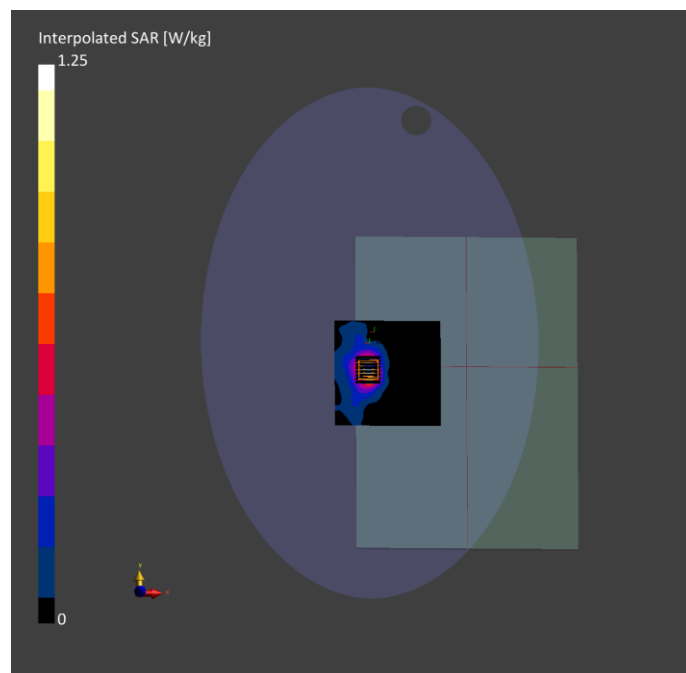
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-06	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-06	2023-02-06
psSAR1g [W/kg]	0.400	0.439
psSAR10g [W/kg]	0.141	0.145
Power Drift [dB]	0.15	0.19
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		54.2
Dist 3dB Peak [mm]		7.6



Meas.19 Limbs Plane with Back Side of Monitor 0mm on 122 Channel in IEEE 802.11ac80 mode with Antenna**Main****Device under Test Properties**

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5610.0, 122	4.9	5.07	35.1	22.2	21.2

Hardware Setup

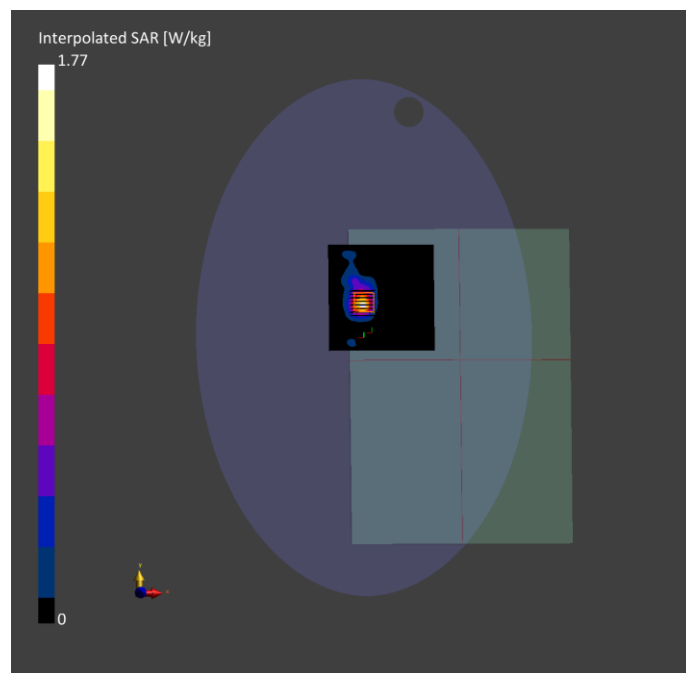
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-07	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-07	2023-02-07
psSAR1g [W/kg]	0.342	0.367
psSAR10g [W/kg]	0.125	0.127
Power Drift [dB]	0.15	0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		47.9
Dist 3dB Peak [mm]		8.0



Meas.20 Limbs Plane with Back Side of Monitor 0mm on 106 Channel in IEEE 802.11ac80 mode with Antenna Auxiliary

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5530.0, 106	4.9	4.94	36.0	22.2	21.2

Hardware Setup

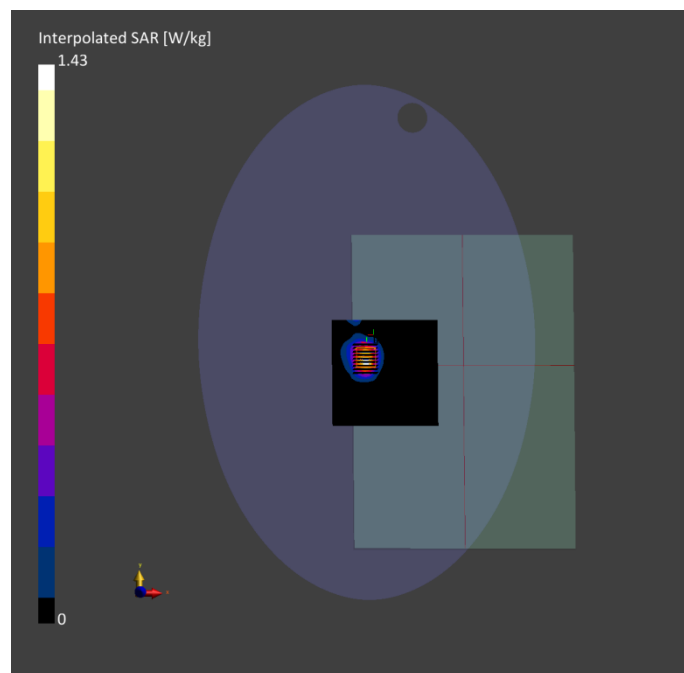
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-07	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-07	2023-02-07
psSAR1g [W/kg]	0.390	0.432
psSAR10g [W/kg]	0.134	0.134
Power Drift [dB]	-0.18	-0.19
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		52.8
Dist 3dB Peak [mm]		6.8



Meas.21 Limbs Plane with Back Side of Monitor 0mm on 155 Channel in IEEE 802.11ac80 mode with Antenna
Main
Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5775.0, 155	5.0	5.22	35.3	22.0	21.1

Hardware Setup

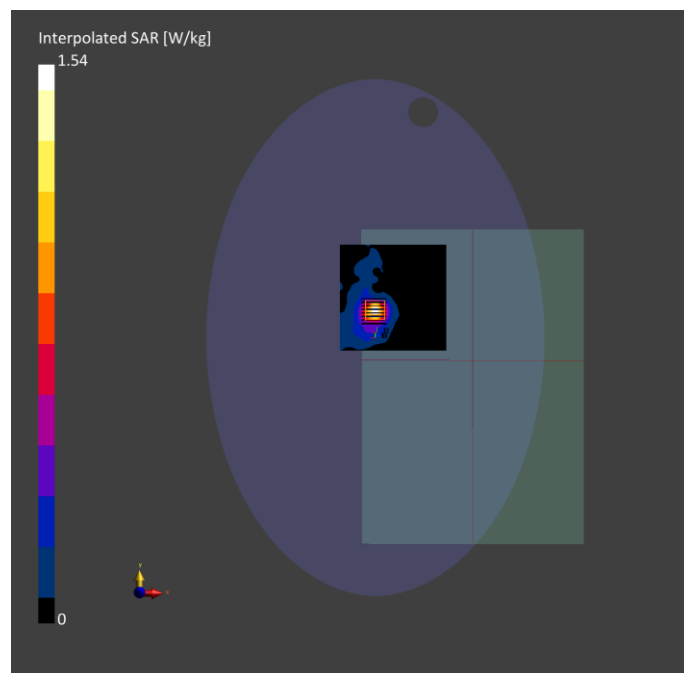
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.393	0.418
psSAR10g [W/kg]	0.153	0.163
Power Drift [dB]	0.18	0.14
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		49.1
Dist 3dB Peak [mm]		8.4



Meas.22 Limbs Plane with Back Side of Monitor 0mm on 155 Channel in IEEE 802.11ac80 mode with Antenna Auxiliary

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10544-AAC	5775.0, 155	5.0	5.22	35.3	22.0	21.1

Hardware Setup

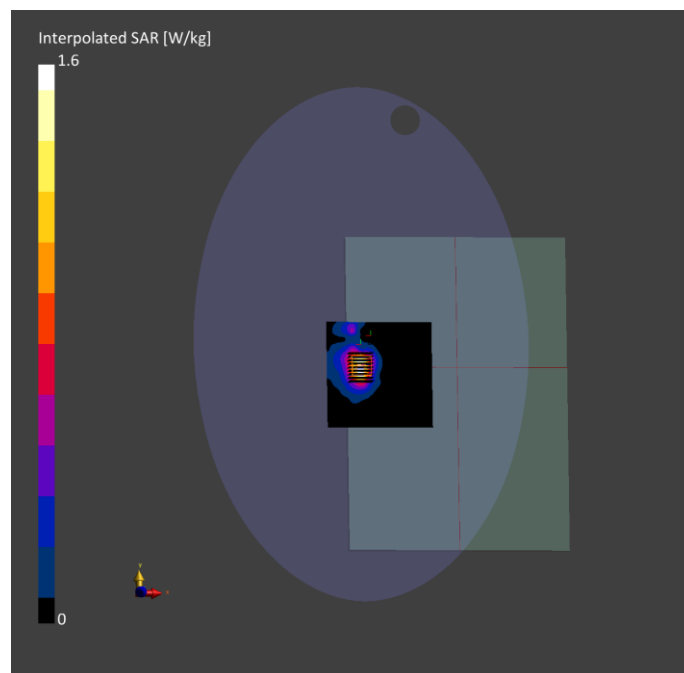
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.367	0.387
psSAR10g [W/kg]	0.126	0.134
Power Drift [dB]	-0.01	0.18
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		47.6
Dist 3dB Peak [mm]		8.4



Meas.23 Limbs Plane with Back Side of Monitor 0mm on 163 Channel in IEEE 802.11ac160 mode with Antenna Main

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10554-AAD	5815.0, 163	5.0	5.28	34.9	22.0	21.1

Hardware Setup

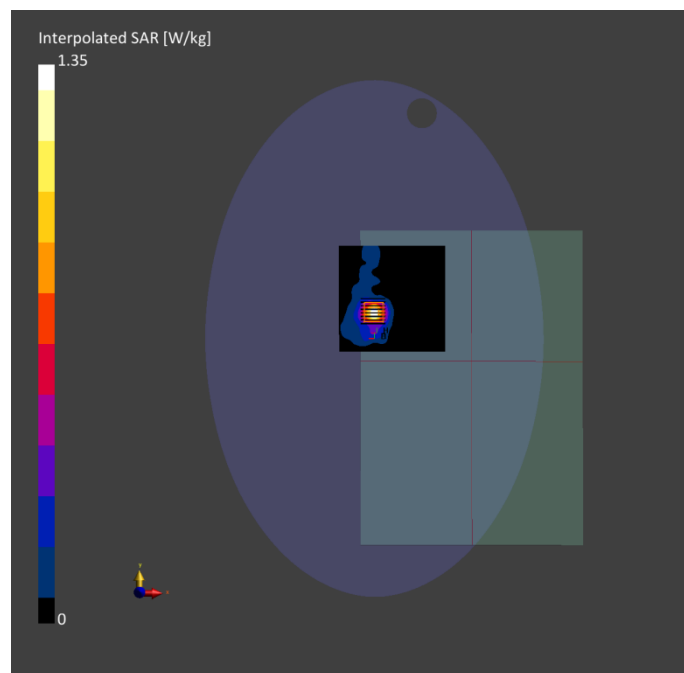
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.294	0.317
psSAR10g [W/kg]	0.116	0.129
Power Drift [dB]	-0.13	-0.11
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		49.2
Dist 3dB Peak [mm]		8.9



Meas.24 Limbs Plane with Back Side of Monitor 0mm on 163 Channel in IEEE 802.11ac160 mode with Antenna Auxiliary

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	WLAN 5GHz	WLAN, 10554-AAD	5815.0, 163	5.0	5.28	34.9	22.0	21.1

Hardware Setup

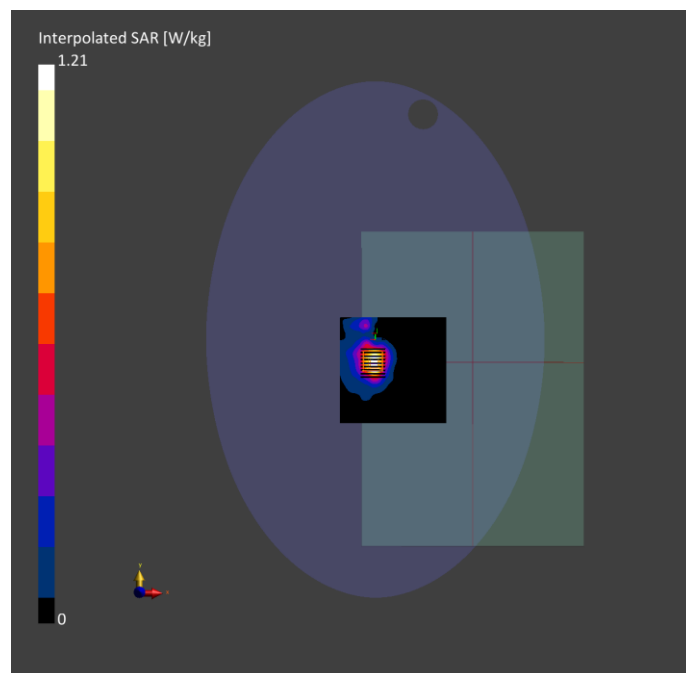
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-02-08	EX3DV4 - SN7664, 2022-09-23	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 120.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-02-08	2023-02-08
psSAR1g [W/kg]	0.296	0.336
psSAR10g [W/kg]	0.100	0.116
Power Drift [dB]	-0.14	0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		50.4
Dist 3dB Peak [mm]		7.4



Meas.25 Limbs Plane with Back Side of Monitor 0mm on 47 Channel in IEEE 802.11ax160 mode with Antenna Main

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	U-NII-5	WLAN, 10743-AAC	6185.0, 47	5.55	5.47	35.8	21.8	20.7

Hardware Setup

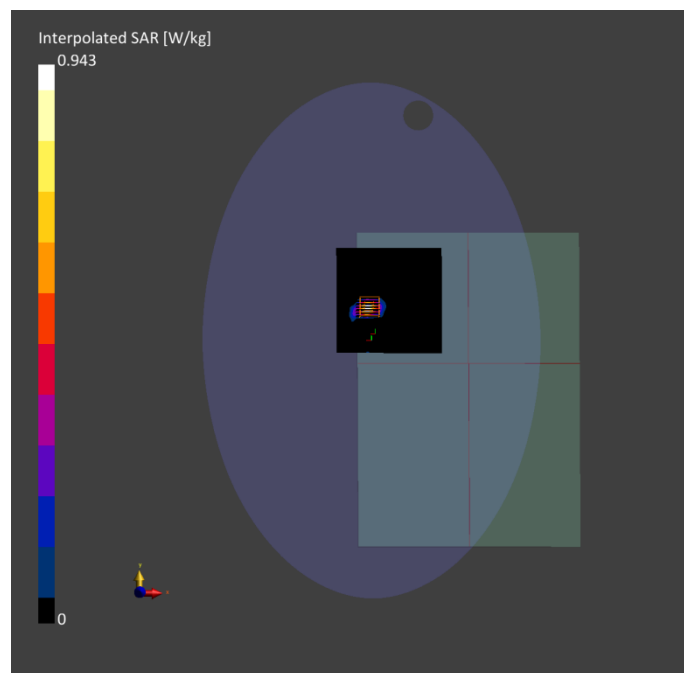
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-01-30	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	119.0 x 119.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-01-30	2023-01-30
psSAR1g [W/kg]	0.260	0.261
psSAR10g [W/kg]	0.095	0.091
Power Drift [dB]	0.07	-0.18
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		53.1
Dist 3dB Peak [mm]		8.7



Meas.26 Limbs Plane with Back Side of Monitor 0mm on 143 Channel in IEEE 802.11ax160 mode with Antenna Auxiliary

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	DUT Type
ThinkBook 16 G4+ ARA	356.0 x 251.0 x 6.0	Laptop

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity	Ambient Temperature [°C]	Liquid Temperature [°C]
Flat, HSL	BACK, 0.00	U-NII-7	WLAN, 10743-AAC	6665.0, 143	5.55	6.36	34.2	21.8	20.7

Hardware Setup

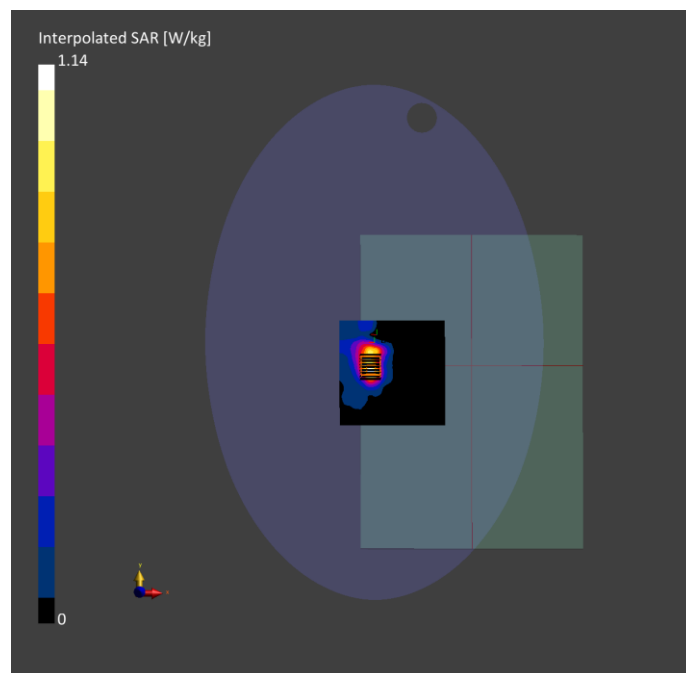
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2159	HBBL-600-10000 2023-01-30	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	119.0 x 119.0	27.2 x 27.2 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-01-30	2023-01-30
psSAR1g [W/kg]	0.187	0.169
psSAR10g [W/kg]	0.055	0.049
Power Drift [dB]	0.03	0.01
Power Scaling	Disabled	Disabled
Scaling Factor		
[dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		55.9
Dist 3dB Peak [mm]		7.2



ANNEX D EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2310644-AW.pdf”.

ANNEX E SAR TEST SETUP PHOTOS

Please refer the document “BL-SZ2310644-AS-1.pdf”.

ANNEX F CALIBRATION REPORT

Please refer the document “CALIBRATION REPORT-1.pdf”.

ANNEX G TUNE-UP PROCEDURE

Please refer the document “BL-SZ2310644 Tune-up Procedure-1.pdf”.

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