

TEST REPORT

Applicant: MediaTek Inc.
Address: No. 1, Dusing 1st Rd. Hsinchu Science Park
Hsinchu City 30078 Taiwan
Equipment Type: 2TX 11ax (WiFi6E) + BT/BLE Combo Card
Model Name: MT7922A22M
Brand Name: MediaTek
FCC ID: RAS-MT7922A22M
Test Standard: FCC 47 CFR Part 2.1093
(refer section 3.1)
Maximum SAR: Body 6GHz(1 g): 0.59 W/kg
Test Date: Jul. 25, 2022
Date of Issue: Aug. 08, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Zhang Jiwei

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Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Jun. 29, 2022</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Aug. 08, 2022</u>	<u>Changed the power of 802.11a/ ax (160M), all the data involved are updated</u>

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China

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	MediaTek Inc.
Address	No. 1, Dusing 1st Rd. Hsinchu Science Park Hsinchu City 30078 Taiwan

2.2 Manufacturer Information

Manufacturer	N/A
Address	N/A

2.3 General Description for Equipment under Test (EUT)

EUT Name	2TX 11ax (WiFi6E) + BT/BLE Combo Card
Model Name Under Test	MT7922A22M
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 14p G3 ARH
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 - 5.85 GHz	5.925 - 6.425 GHz	6.425 - 6.525 GHz	6.525 - 6.875 GHz	6.875 - 7.125 GHz
Main Antenna	DC33001 WT00	Amphenol	PIFA	2.51	-1.69	-1.69	-0.80	-0.48	1.55	0.72	1.93	3.51
Auxiliary Antenna	DC33001 WT10		PIFA	0.56	-0.85	0.46	0.60	0.60	-0.14	0.52	0.89	2.53
Main Antenna	DC33001 WR00	LUXSHA RE-ICT	PIFA	0.01	0.64	-0.73	1.20	1.20	2.53	2.18	3.66	3.79
Auxiliary Antenna	DC33001 WR10		PIFA	0.92	-1.63	-1.41	-0.59	-0.54	0.84	0.82	0.47	0.46

Note: The report only shown the antenna which matches the antenna with the highest antenna gain.

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 6G WIFI 802.11a, 802.11ax(HE20/40/80/160), U-NII-5/6/7/8
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	6G WLAN	
Frequency Range	802.11a /ax(HE20/HE40/ HE80/HE160)	5925 MHz ~ 6425 MHz
		6425 MHz ~ 6525 MHz
		6525 MHz ~ 6875 MHz
		6875 MHz ~ 7125 MHz
Antenna Type	WLAN: PIFA Antenna	
Hotspot Function	N/A	
Exposure Category	General Population/Uncontrolled exposure	
EUT Stage	Portable Device	
Product	Type	
	<input checked="" type="checkbox"/> Production unit	<input type="checkbox"/> 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	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
4	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
5	KDB 248227 D01 v02r02	SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters
6	KDB 616217 D04v01r02	SAR for laptop and tablets
7	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)

Band	Antenna	Maximum Scaled SAR (W/kg)	Maximum Report SAR (W/kg)
		Body	Body
6G WLAN	Main	0.59	0.59
6G WLAN	Aux.	0.28	
Limit (W/kg)		1.60	
Verdict		Pass	

3.3.2 Highest SAR of Simultaneous Transmission (1 g Value)

Test Mode	Position	Mode	Max. 1g SAR	1g Sum SAR	SPLSR	SPLSR
			(W/kg)	(W/kg)	(Yes/No)	/
Body (Separation 0 mm)						
Laptop	Bottom Side	6 G WLAN (Main Antenna)	0.589	0.881	No	/
		6 G WLAN (Aux. Antenna)	0.279			
		Bluetooth (Aux. Antenna)	0.013			
Note: The maximum SAR of Bluetooth refers to the SAR report BL-SZ2260135-701.						

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 0.589 W/kg, which is lower than 1.5 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

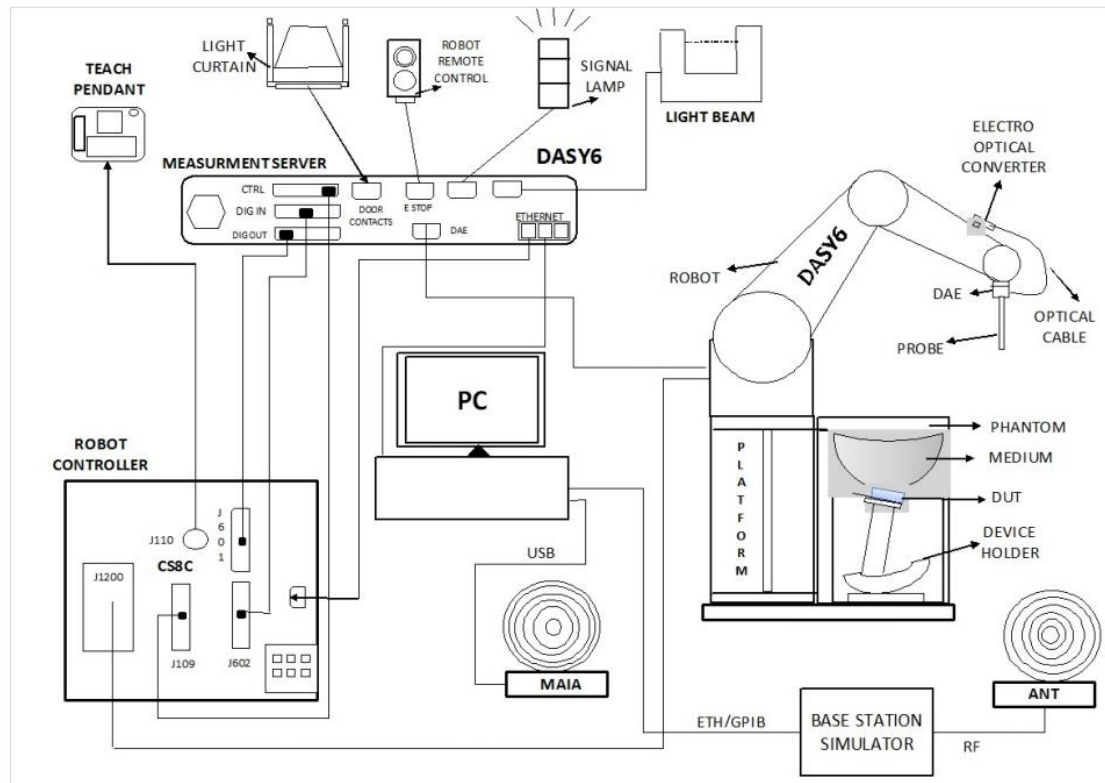
$$SAR = \frac{\sigma E^2}{\rho}$$

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

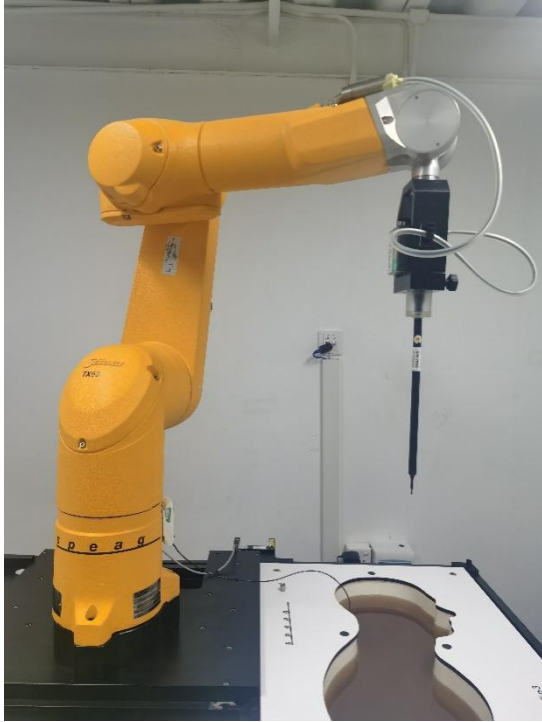


The DASY system for performing compliance tests consists of the following items:

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 DASY5 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 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	10 MHz to 6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
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 CENELEC EN 62209-1/-2 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 62209-1/2 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-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.



- Input Impedance: 200M Ω m
- The Inputs: Symmetrical and Floating
- Common 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.



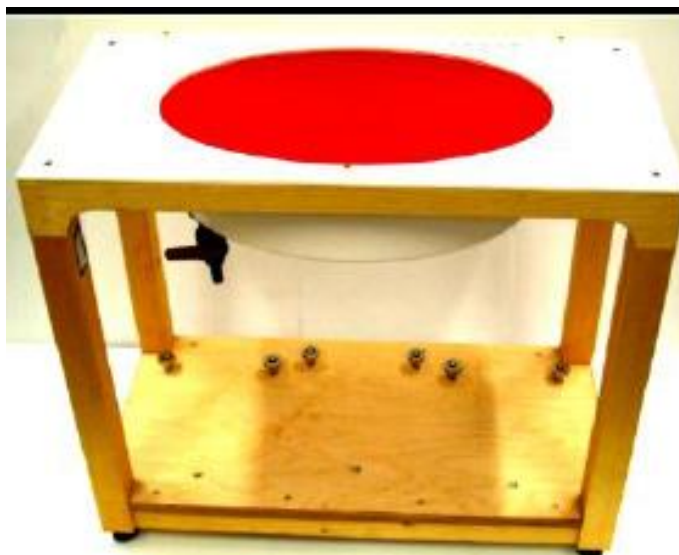
- Left hand
- Right hand
- Flat phantom

Photo of Phantom SN1857



Serial Number	Material	Length	Height
SN 1857 SAM	Vinylester, glass fiber reinforced	1000	500

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 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 SN1012



Serial Number	Shell Thickness (mm)	Major ellipse axis (mm)	Minor axis (mm)
SN 1012 ELI4	2.0 ± 0.2	600	500

4.2.6 Device Holder

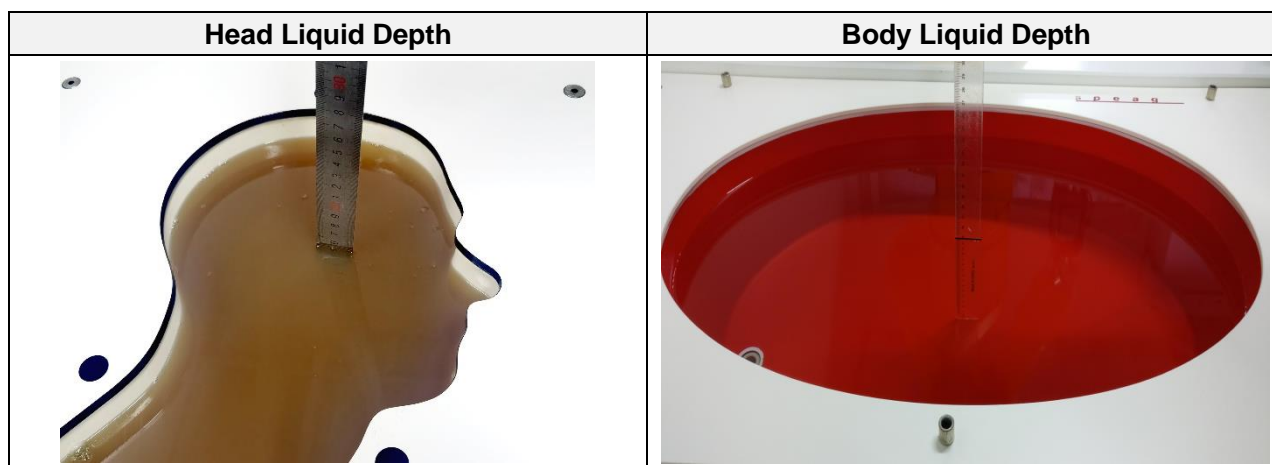
The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65° . The bottom plate contains three pair of bolts for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



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

4.2.7 Simulating Liquid

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



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

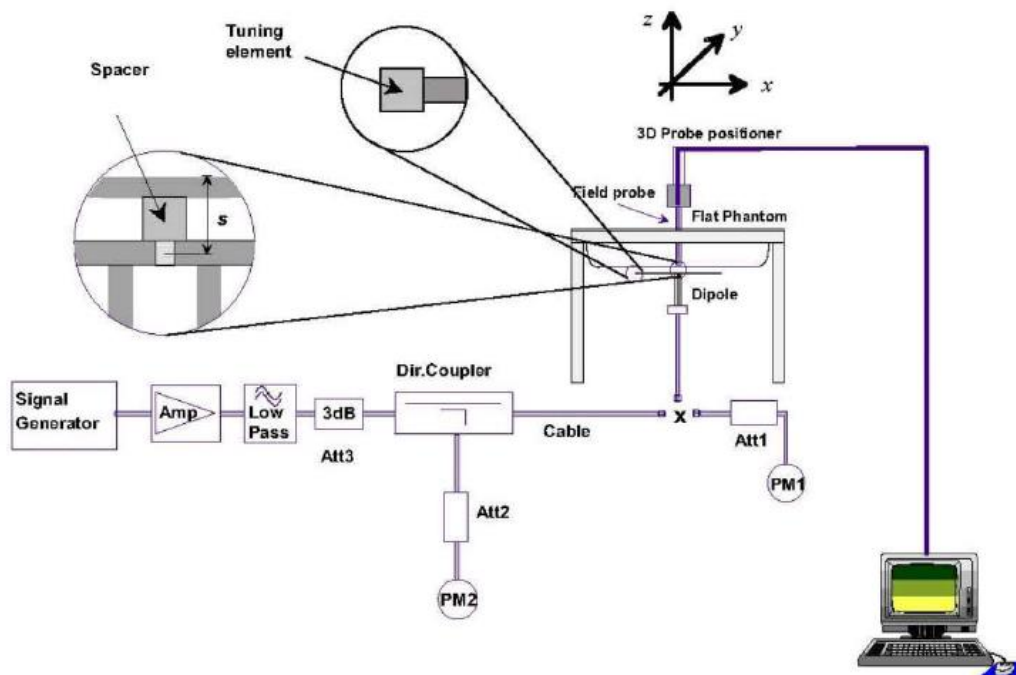
5 SYSTEM VERIFICATION

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

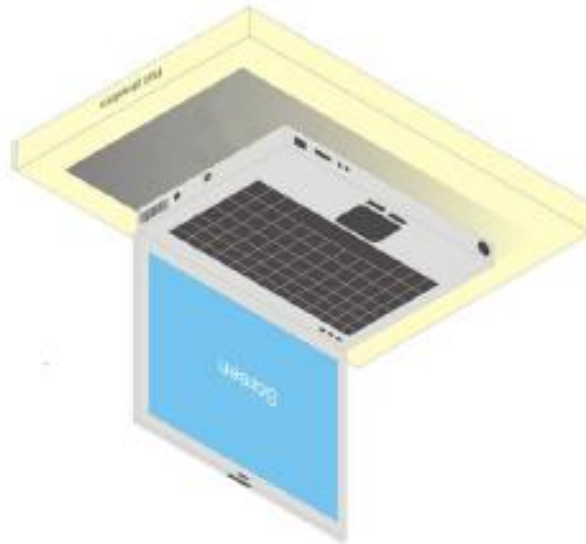
In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. 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

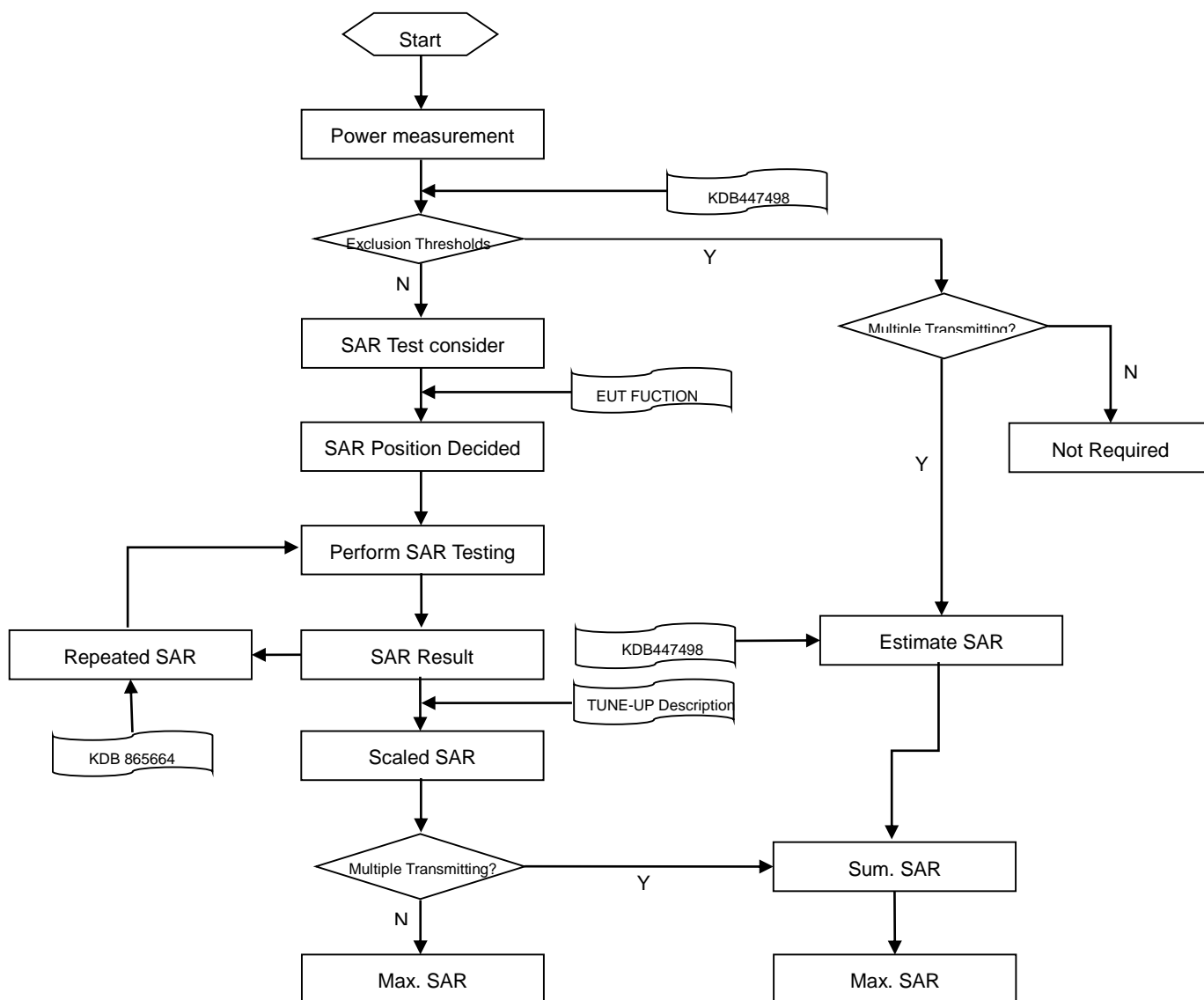
6.1 Laptop Exposure Condition

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
				5–6 GHz: ≤ 2 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 DASY8 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 OUTPUT POWER

8.1 WIFI

8.1.1 6G WIFI (Main Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Conducted Power (dBm)	Tune-up Power Limit (dBm)	SAR Test Require.
6 (5.925~7.125)	802.11a	1	5955	6.34	8.00	No
		45	6175	6.45	8.00	No
		93	6415	6.76	8.00	No
		97	6435	7.24	8.00	No
		105	6475	6.66	8.00	No
		113	6515	7.05	8.00	No
		117	6535	6.82	8.00	No
		153	6715	6.37	8.00	No
		181	6855	7.35	8.00	No
		185	6875	6.90	8.00	No
		213	7015	7.64	8.00	No
		233	7115	7.43	8.00	No
	802.11ax20	1	5955	0.89	2.00	No
		45	6175	0.69	2.00	No
		93	6415	0.44	1.00	No
		97	6435	1.35	2.00	No
		105	6475	1.52	2.00	No
		113	6515	1.39	2.00	No
		117	6535	1.34	2.00	No
		153	6715	0.56	1.00	No
		181	6855	0.91	2.00	No
		185	6875	1.23	2.00	No
		213	7015	2.01	3.00	No
		233	7115	1.12	2.00	No
	802.11ax40	3	5965	4.18	5.00	No
		43	6165	3.24	4.00	No
		91	6405	3.48	4.00	No
		99	6445	3.68	5.00	No
		107	6485	3.89	4.00	No
		115	6525	3.91	5.00	No
		123	6565	2.83	4.00	No
		155	6725	3.15	4.00	No
		179	6845	3.26	4.00	No
		187	6885	3.93	5.00	No
		211	7005	3.52	4.00	No

		227	7085	4.05	5.00	No
	802.11ax80	7	5985	7.08	8.00	No
		39	6145	6.13	7.00	No
		87	6385	6.67	7.00	No
		103	6465	7.15	8.00	No
		119	6545	6.80	8.00	No
		135	6625	6.76	8.00	No
		151	6705	5.94	7.00	No
		167	6785	6.58	7.00	No
		183	6865	7.17	8.00	No
		199	6945	7.09	8.00	No
		215	7025	6.08	7.00	No
	802.11ax160	15	6025	12.43	13.00	Yes
		47	6185	12.30	13.00	No
		79	6345	12.20	13.00	Yes
		111	6505	12.61	13.00	Yes
		143	6665	11.85	13.00	Yes
		175	6825	12.19	13.00	No
		207	6985	12.04	13.00	Yes
	RU-26/0	1	5955	-7.11	-6.00	No
	RU-26/8	93	6415	-8.06	-7.00	No
	RU-26/0	97	6435	-7.15	-6.00	No
	RU-26/0	117	6535	-7.66	-7.00	No
	RU-26/8	181	6855	-7.59	-7.00	No
	RU-26/8	233	7115	-9.38	-9.00	No
	RU-52/40	233	7115	-6.38	-5.00	No
	RU-106/53	1	5955	-2.61	-2.00	No
	RU-106/54	93	6415	-3.06	-2.00	No
	RU-106/53	97	6435	-1.65	-1.00	No
	RU-106/53	117	6535	-1.66	-1.00	No
	RU-106/54	181	6855	-1.59	-1.00	No
	RU-106/54	233	7115	-4.88	-4.00	No

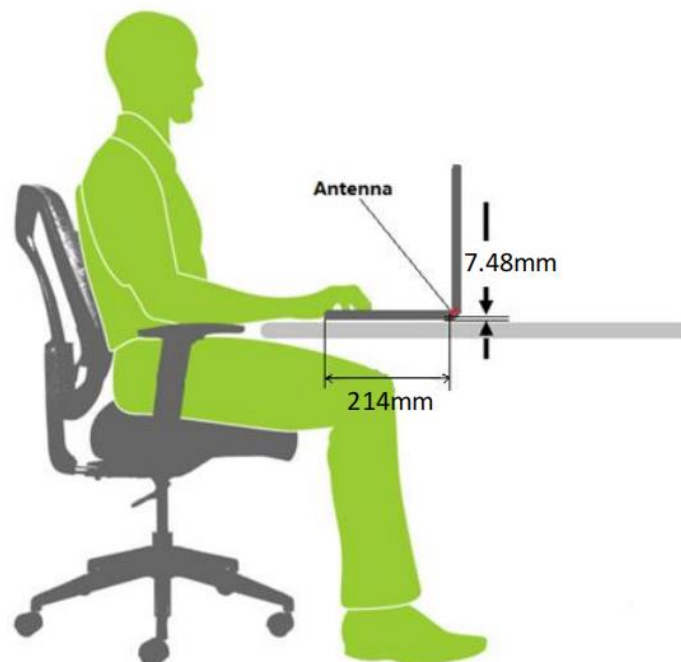
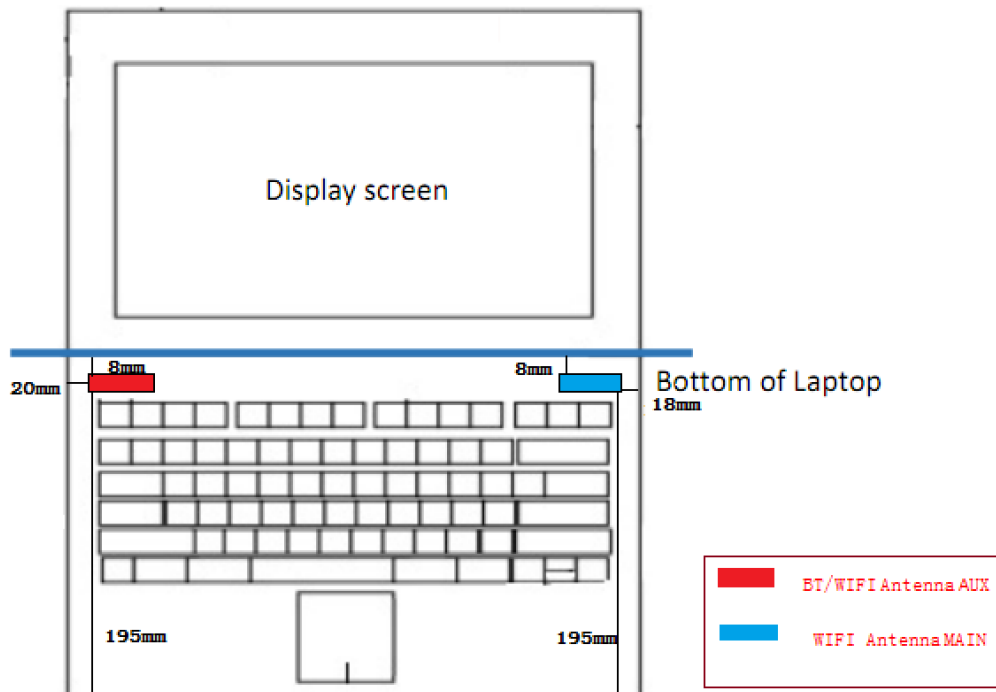
8.1.2 6G WIFI (Aux. Antenna)

Band (GHz)	Mode	Channel	Freq. (MHz)	Conducted Power (dBm)	Tune-up Power Limit (dBm)	SAR Test Require.
6 (5.925~7.125)	802.11a	1	5955	6.36	8.00	No
		45	6175	6.47	8.00	No
		93	6415	6.10	8.00	No
		97	6435	6.94	8.00	No
		105	6475	6.87	8.00	No
		113	6515	6.55	8.00	No
		117	6535	6.96	8.00	No
		153	6715	6.49	8.00	No
		181	6855	7.12	8.00	No
		185	6875	6.71	8.00	No
		213	7015	7.58	8.00	No
		233	7115	7.31	8.00	No
	802.11ax20	1	5955	1.02	2.00	No
		45	6175	1.28	2.00	No
		93	6415	1.41	2.00	No
		97	6435	1.93	3.00	No
		105	6475	1.92	3.00	No
		113	6515	1.72	3.00	No
		117	6535	0.78	1.00	No
		153	6715	1.06	2.00	No
		181	6855	0.98	2.00	No
		185	6875	1.92	3.00	No
		213	7015	1.63	2.00	No
		233	7115	2.42	3.00	No
	802.11ax40	3	5965	2.37	3.00	No
		43	6165	3.27	4.00	No
		91	6405	3.15	4.00	No
		99	6445	3.47	4.00	No
		107	6485	3.70	5.00	No
		115	6525	3.49	4.00	No
		123	6565	3.70	4.00	No
		155	6725	3.03	4.00	No
		179	6845	3.34	4.00	No
		187	6885	3.80	4.00	No
		211	7005	4.41	5.00	No
		227	7085	3.81	4.00	No
	802.11ax80	7	5985	6.28	7.00	No
		39	6145	6.68	8.00	No
		87	6385	6.39	7.00	No

		103	6465	6.73	8.00	No
		119	6545	7.09	8.00	No
		135	6625	7.03	8.00	No
		151	6705	6.13	7.00	No
		167	6785	5.94	7.00	No
		183	6865	6.18	7.00	No
		199	6945	6.68	8.00	No
		215	7025	7.75	9.00	No
	802.11ax160	15	6025	12.21	13.00	Yes
		47	6185	12.09	13.00	No
		79	6345	12.47	13.00	Yes
		111	6505	12.40	13.00	Yes
		143	6665	11.78	13.00	Yes
		175	6825	12.33	13.00	No
		207	6985	12.41	13.00	Yes
	RU-26/0	1	5955	-7.48	-7.00	No
	RU-26/8	93	6415	-7.09	-6.00	No
	RU-26/0	97	6435	-7.57	-7.00	No
	RU-26/0	117	6535	-7.22	-6.00	No
	RU-26/8	181	6855	-7.52	-7.00	No
	RU-26/8	233	7115	-8.58	-8.00	No
	RU-52/40	233	7115	-6.08	-5.00	No
	RU-106/53	1	5955	-1.48	-1.00	No
	RU-106/54	93	6415	-1.09	0.00	No
	RU-106/53	97	6435	-2.07	-1.00	No
	RU-106/53	117	6535	-1.72	-1.00	No
	RU-106/54	181	6855	-2.52	-2.00	No
	RU-106/54	233	7115	-4.08	-3.00	No

9 TEST EXCLUSION CONSIDERATION

9.1 Laptop Mode antenna location sketch



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 D01v06, 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 WIFI 6GHz

Antenna Manufacturer	Mode	Antenna	Test Position	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 Factor	1g Scaled SAR (W/kg)	Measured APD W/m2 (4cm2)	Scaled APD W/m2 (4cm2)	Meas. No.
Body																		
LUXSH ARE- ICT	802.11a x160	Main	Laptop	Bottom Side	0	111	6505	-0.19	0.286	12.61	13.00	1.094	86.00	1.163	0.364	2.380	3.028	/
					0	15	6025	-0.09	0.141	12.43	13.00	1.140	86.00	1.163	0.187	1.290	1.710	/
					0	79	6345	-0.06	0.204	12.20	13.00	1.202	86.00	1.163	0.285	1.810	2.530	/
					0	143	6665	0.17	0.199	11.85	13.00	1.303	86.00	1.163	0.302	1.760	2.667	/
					0	207	6985	0.09	0.406	12.04	13.00	1.247	86.00	1.163	0.589	3.440	4.989	1#
Amphe nol	802.11a x160	Main	Laptop	Bottom Side	0	111	6505	0.12	0.245	12.61	13.00	1.094	86.00	1.163	0.312	2.100	2.672	/
LUXSH ARE- ICT	802.11a x160	Aux.	Laptop	Bottom Side	0	79	6345	-0.04	0.137	12.47	13.00	1.130	86.00	1.163	0.180	1.160	1.524	/
					0	15	6025	0.13	0.068	12.21	13.00	1.199	86.00	1.163	0.095	0.573	0.799	/
					0	111	6505	0.05	0.143	12.40	13.00	1.148	86.00	1.163	0.191	1.190	1.589	/
					0	143	6665	0.07	0.181	11.78	13.00	1.324	86.00	1.163	0.279	1.570	2.418	2#
					0	207	6985	0.03	0.180	12.41	13.00	1.146	86.00	1.163	0.240	1.530	2.039	/
Amphe nol	802.11a x160	Aux.	Laptop	Bottom Side	0	79	6345	0.08	0.108	12.47	13.00	1.130	86.00	1.163	0.142	1.010	1.327	/
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 1g SAR, the highest measured 1g SAR is $0.406 < 0.80$ 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 to 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.	Mode	6G WLAN & Bluetooth
		Body
1	6 G WLAN (Main Antenna)	+ 6 G WLAN (Auxiliary Antenna)
2	6 G WLAN (Main Antenna)	+ Bluetooth (Auxiliary Antenna)
3	6 G WLAN (Auxiliary Antenna)	+ Bluetooth (Auxiliary Antenna)
4	6 G WLAN (Main Antenna)	+ 6 G WLAN (Auxiliary Antenna) + Bluetooth (Auxiliary Antenna)

Note:

- The Auxiliary Antenna supports TX/RX function for WLAN and Bluetooth, and the Main Antenna supports TX/RX function for WLAN.
- 2.4G WLAN or 5G WLAN and 6G WLAN does not support transmission together.
- The maximum SAR of Bluetooth refers to the SAR report BL-SZ2260135-701.

12.2 Sum SAR of Simultaneous Transmission

12.2.1 Highest Bluetooth and WLAN Sum Body SAR of Simultaneous Transmission

Test Mode	Position	Mode	Max. 1g SAR (W/kg)	1g Sum SAR (W/kg)	SPLSR (Yes/No)	SPLSR Num.
Body (Separation 0 mm)						
Laptop	Bottom Side	6G WLAN (Main Antenna)	0.589	0.602	No	/
		Bluetooth (Auxiliary Antenna)	0.013			
		6G WLAN (Auxiliary Antenna)	0.279	0.292	No	/
		Bluetooth (Auxiliary Antenna)	0.013			
		6G WLAN (Main Antenna)	0.589	0.868	No	/
		6G WLAN (Auxiliary Antenna)	0.279			
		6G WLAN (Main Antenna)	0.589	0.881	No	/
		6G WLAN (Auxiliary Antenna)	0.279			
		Bluetooth (Auxiliary Antenna)	0.013			

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
6.5GHz Validation Dipole	Speag	D6500V2	SN: 1037	2021/07/01	2024/06/30
E-Field Probe	Speag	EX3DV4	SN: 7607	2022/07/04	2023/07/03
Data Acquisition Electronics	Speag	DAE4	SN: 878	2022/06/13	2023/06/12
Signal Generator	R&S	SMB100A	177746	2021/08/24	2022/08/23
Power Meter	R&S	NRVD-B2	7250BJ-0112/2011	2021/09/08	2022/09/07
Power Sensor	R&S	NRV-Z4	100381	2021/09/08	2022/09/07
Power Sensor	R&S	NRV-Z2	100211	2021/09/08	2022/09/07
Network Analyzer	Agilent	E5071C	MY46103472	2021/12/29	2022/12/28
Thermometer	Elitech	RC-4HC	EF720B004820	2021/12/01	2022/11/30
Power Amplifier	SATIMO	6552B	22374	N/A	N/A
Dielectric Probe Kit	Speag	DAK3.5	1312	N/A	N/A
Phantom1	Speag	SAM	SN: 1857	N/A	N/A
Phantom1	Speag	ELI	SN: 1012	N/A	N/A
Attenuator	COM-MW	ZA-S1-31	1305003187	N/A	N/A
Directional coupler	AA-MCS	AAMCS-UDC	000272	N/A	N/A

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

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

ANNEX A SIMULATING LIQUID VERIFICATION RESULT

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

Date	Fre. (MHz)	Meas. Conductivity(σ) (S/m)	Meas. Permittivity (ϵ)	Target Conductivity(σ) (S/m)	Target Permittivity (ϵ)	Conductivity Tolerance (%)	Permittivity Tolerance (%)
2022.07.25	6500	6.16	34.09	6.07	34.46	1.48	-1.07

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).

Date	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)
2022.07.25	6500	100	28.50	285.0	286.0	-0.35
Note: The tolerance limit of System validation $\pm 10\%$.						

System Performance Check Data (6500MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D6.5GHzV2, SPEAG	60.0 x 10.0 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
Flat, HSL		Validation band	CW, 0--	6500.0, 6500	5.55	6.16	34.1

Hardware Setup

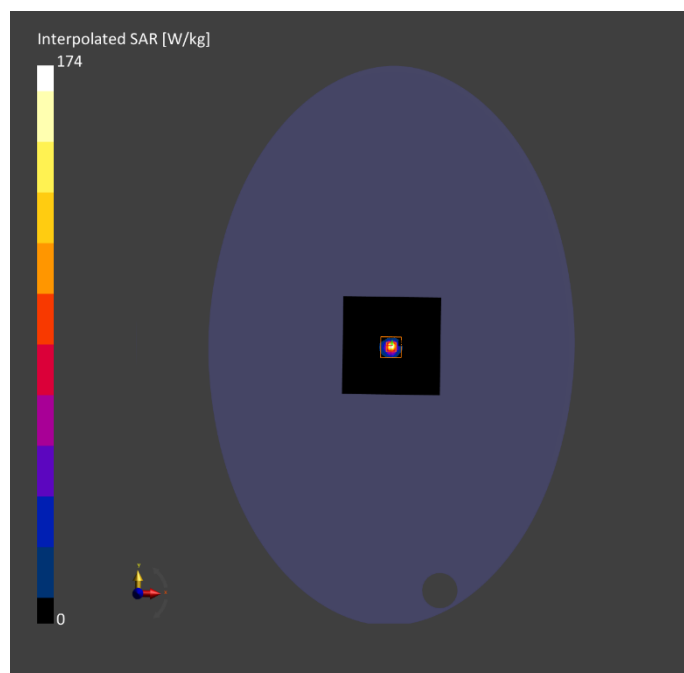
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - 1012	HBBL-600-10000, 2022-07-25	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	102.0 x 102.0	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	VMS + 6p	VMS + 6p
Detection		
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-07-25	2022-07-25
psSAR1g [W/kg]	25.1	28.5
psSAR10g [W/kg]	4.90	5.36
Power Drift [dB]	0.01	0.03
Power Scaling	Disabled	Disabled
Scaling Factor		
[dB]		
TSL	No correction	No correction
Correction		
M2/M1 [%]		55.5
Dist 3dB Peak [mm]		4.7



ANNEX C TEST DATA

Meas.1 Body Plane with Bottom Side on Ch207 in IEEE ax(HE160) Mode with Antenna Main

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
ThinkBook 14p G3	312.0 x 215.0 x 12.0		Laptop
ARH			

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BOTTOM, 0.00	U-NII-8	WLAN, 10743-AAC	6985.0, 207	5.55	6.85	33.1

Hardware Setup

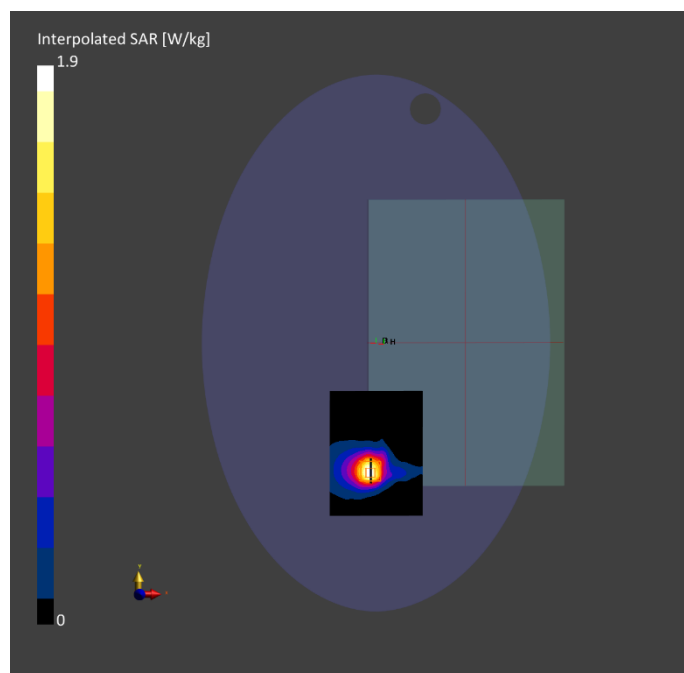
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - 1012	HBBL-600-10000, 2022-07-25	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	102.0 x 136.0	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	3.0	1.4
Surface [mm]		
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	2022-07-25	2022-07-25
psSAR1g [W/kg]	0.407	0.406
psSAR10g [W/kg]	0.158	0.154
psPDab(4.0cm ² ,sq) [W/m ²]		3.44
Power Drift [dB]	-0.02	0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No	No correction
	correction	
M2/M1 [%]		51.5
Dist 3dB Peak [mm]		10.8



Meas.2 Body Plane with Bottom Side on Ch143 in IEEE ax(HE160) Mode with Antenna Auxiliary

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
ThinkBook 14p G3	312.0 x 215.0 x 12.0		Laptop
ARH			

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BOTTOM, 0.00	U-NII-7	WLAN, 10743-AAC	6665.0, 143	5.55	6.42	33.8

Hardware Setup

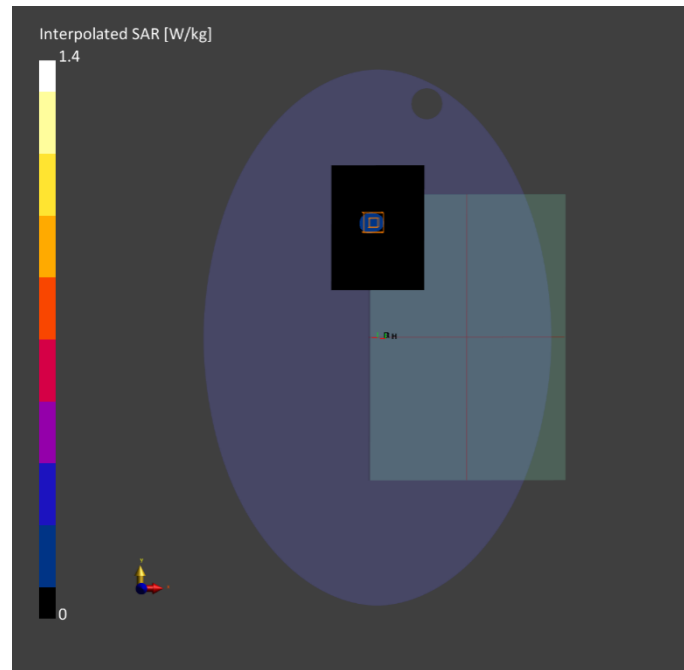
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - 1012	HBBL-600-10000, 2022-07-25	EX3DV4 - SN7607, 2022-07-04	DAE4 Sn878, 2022-06-13

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	102.0 x 136.0	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	3.0	1.4
Surface [mm]		
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	2022-07-25	2022-07-25
psSAR1g [W/kg]	0.185	0.181
psSAR10g [W/kg]	0.072	0.070
psPDab(4.0cm ² ,sq) [W/m ²]		1.57
Power Drift [dB]	-0.06	0.07
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		51.6
Dist 3dB Peak [mm]		11.2



ANNEX D EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2260135-AW.pdf”.

ANNEX E SAR TEST SETUP PHOTOS

Please refer the document “BL-SZ2260135-AS-2.pdf”.

ANNEX F CALIBRATION REPORT

Please refer the document “CALIBRATION REPORT-2.pdf”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
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--END OF REPORT--