TEST REPORT

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1. Client

- Name : Intel Corporation SAS
- Address : 425 Rue de Goa – Le Cargo B6 – 06600 Antibes, FRANCE
- Date of Receipt : 2024-06-18

2. Use of Report : Class II Permissive Change

3. Name of Product and Model : WLAN and BT, 2X2 PCIe M.2 1216 SD adapter card
- Model Number : AX211D2W
- Manufacturer and Country of Origin : Intel Corporation SAS / FRANCE

4. Host Product Name : Notebook PC
- Host Model Name : XE550XGA
- Manufacturer : Samsung Electronics Co., Ltd.

5. FCC ID : PD9AX211D2

6. Date of Test : 2024-06-26 ~ 2024-07-01

7. Location of Test : ■ Permanent Testing Lab □ On Site Testing
(Address: 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

8. Test Standards : IEEE 1528-2013, ANSI/IEEE C95.1, KDB Publication

9. Test Results : Refer to the test result in the test report

	Tested by	Technical Manager
Affirmation	Name : Mungi Jeong (Signature)	Name : Jongwon Ma (Signature)

2024-07-17

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2024-07-17	Originally issued	-

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

1. Identification when information is provided by the customer: Information marked " # " is provided by the customer. - Disclaimer: This information is provided by the customer and can affect the validity of results.

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1. General information

Client	:	Intel Corporation SAS
Address	:	425 Rue de Goa – Le Cargo B6 – 06600 Antibes, FRANCE
Manufacturer	:	Intel Corporation SAS
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Host Client	:	Samsung Electronics Co., Ltd.
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Laboratory	:	Eurofins KCTL Co.,Ltd.
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Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-3327, G-198, C-3706, T-1849 CAB Identifier: KR0040, ISED Number: 8035A KOLAS No.: KT231

1.1 Report Overview

This report details the results of testing carried out on the samples listed in section 2, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this test report is used in any configuration other than that detailed in the test report, the manufacturer must ensure the new configuration complies with all relevant standards and certification requirements. Any mention of Eurofins KCTL Co.,Ltd. Wireless lab or testing done by Eurofins KCTL Co.,Ltd. Wireless lab made in connection with the distribution or use of the tested product must be approved in writing by Eurofins KCTL Co.,Ltd. Wireless lab.

2. Device information

2.1 Basic description

Product	Name	WLAN and BT, 2X2 PCIe M.2 1216 SD adapter card
	Model Number	AX211D2W
	Manufacturer	Intel Corporation SAS
Host	Product Name	Notebook PC
	Model Name	XE550XGA
	Derivative Model	XE551XGA, XQ550XGA, XQ551XGA
	Manufacturer	Samsung Electronics Co., Ltd.
Host Product Serial Number	Radiation	6QTS9FMX500014R
	Conduction	6QTS9FMX500014R
Mode of Operation		WLAN 802.11a,b,g,n,ac,ax, Bluetooth
Device Overview		WLAN 2.4 ㎓: 2 412.0 ㎒ ~ 2 472.0 ㎒ U-NII-1: 5 180.0 ㎒ ~ 5 240.0 ㎒ U-NII-2A: 5 260.0 ㎒ ~ 5 320.0 ㎒ U-NII-2C: 5 500.0 ㎒ ~ 5 720.0 ㎒ U-NII-3: 5 745.0 ㎒ ~ 5 825.0 ㎒ Bluetooth: 2 402.0 ㎒ ~ 2 480.0 ㎒
TDWR Information		5.60 ㎓ ~ 5.65 ㎓ band (TDWR) is supported by the device.

2.1.1 Differences from Derivative Models

The difference between Main model and Derivative model is as below.

Main model	XE550XGA
Derivative model	XE551XGA
Differences	Marketing and logistic Difference

2.2 Summary of SAR Test Results

Band	Equipment Class	Highest Reported
		1g SAR (W/kg)
WLAN 2.4 ㎓	DTS	0.46
U-NII-2A	NII	0.57
U-NII-2C	NII	**0.72**
U-NII-3	NII	0.62
Bluetooth	DSS/DTS	0.12
Simultaneous SAR per KDB 690783 D01v01r03		1.44

2.3 #Antenna information

Antenna Type		PIFA antenna				
Band		WLAN 2.4 ㎓ / Bluetooth	UNII-1	UNII-2A	UNII-2C	UNII-3
Peak gain (dBi)	Main	1.88	1.59	2.89	2.45	0.70
	Aux	1.85	1.07	1.37	1.34	0.82

2.4 #Maximum Tune-up power

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D04v01.

When the specified maximum output power is the same for both UNII Band1 and UNII Band 2A, begins SAR measurement in UNII band 2A; and if the highest reported SAR for UNII ba nd 2A is ≤ 1.2W/kg, SAR is not required for UNII band1 > 1.2W/kg, both bands should be t ested independently for SAR.

2.4.1 #Maximum WLAN Output Power

Band	Ant.	Mode	Channel	Output Power (dBm)	
				Target	Max. Allowed
WLAN 2.4 ㎓	SISO (Main)	802.11b	13	15.50	**16.50**
			Other	16.00	**17.00**
		802.11g	12	14.50	**15.50**
			13	11.50	**12.50**
			Other	16.00	**17.00**
		802.11n(HT20)	12	14.50	**15.50**
			13	11.50	**12.50**
			Other	16.00	**17.00**
		802.11n(HT40)	3	14.75	**15.75**
			4	15.75	**16.75**
			8,9	15.00	**16.00**
			10	11.75	**12.75**
			11	9.25	**10.25**
			Other	16.00	**17.00**
		802.11ax_20 ㎒ SU	12	13.50	**14.50**
			13	10.50	**11.50**
			Other	16.00	**17.00**
		802.11ax_40 ㎒ SU	3	14.75	**15.75**
			4	15.75	**16.75**
			8,9	15.00	**16.00**
			10	11.75	**12.75**
			11	9.25	**10.25**
			Other	16.00	**17.00**
	SISO (Aux)	802.11b	All Channel	15.00	**16.00**
		802.11g	12	14.50	**15.50**
			13	11.50	**12.50**
			Other	15.00	**16.00**
		802.11n(HT20)	12	14.50	**15.50**
			13	11.50	**12.50**
			Other	15.00	**16.00**
		802.11n(HT40)	10	12.00	**13.00**
			11	10.50	**11.50**
			Other	15.00	**16.00**
		802.11ax_20 ㎒ SU	12	13.50	**14.50**
			13	10.50	**11.50**
			Other	15.00	**16.00**
		802.11ax_40 ㎒ SU	10	12.00	**13.00**
			11	10.50	**11.50**
			Other	15.00	**16.00**

Band	Ant.	Mode	Channel	Output Power (dBm)	
				Target	Max. Allowed
WLAN 2.4 GHz	MIMO (Main, Aux)	802.11n(HT20)	12	11.00	**12.00**
			13	8.00	**9.00**
			Other	13.00	**14.00**
		802.11n(HT40)	3	12.00	**13.00**
			4,8,9	12.50	**13.50**
			10	9.00	**10.00**
			11	7.00	**8.00**
			Other	13.00	**14.00**
		802.11ax_20 MHz SU	12	11.00	**12.00**
			13	8.00	**9.00**
			Other	13.00	**14.00**
		802.11ax_40 MHz SU	3	12.00	**13.00**
			4,8,9	12.50	**13.50**
			10	9.00	**10.00**
			11	7.00	**8.00**
			Other	13.00	**14.00**
U-NII-1, U-NII-2A, U-NII-2C, U-NII-3	SISO (Main, Aux)	802.11a	All Channel	13.00	**14.00**
		802.11n(HT20)	All Channel	13.00	**14.00**
		802.11n(HT40)	All Channel	13.00	**14.00**
		802.11ac(VHT20)	All Channel	13.00	**14.00**
		802.11ac(VHT40)	All Channel	13.00	**14.00**
		802.11ac(VHT80)	All Channel	13.00	**14.00**
		802.11ac(VHT160)	All Channel	13.00	**14.00**
		802.11ax_20/40/80/160 MHz SU	All Channel	13.00	**14.00**
	MIMO (Main, Aux)	802.11a	All Channel	10.50	**11.50**
		802.11n(HT20)	All Channel	10.50	**11.50**
		802.11n(HT40)	All Channel	10.50	**11.50**
		802.11ac(VHT20)	All Channel	10.50	**11.50**
		802.11ac(VHT40)	All Channel	10.50	**11.50**
		802.11ac(VHT80)	All Channel	10.50	**11.50**
		802.11ac(VHT160)	All Channel	10.50	**11.50**
		802.11ax_20/40/80/160 MHz SU	All Channel	10.50	**11.50**

2.4.2 #Maximum Bluetooth Output Power

Band	Mode	Channel	Output Power (dBm)	
			Target	Max. Allowed
Bluetooth	BDR(GFSK)	All Channel	9.50	**11.00**
	EDR(π/4DQPSK)	All Channel	5.50	**7.00**
	EDR(8DPSK)	All Channel	5.50	**7.00**
Bluetooth LE	1M,2M, 125k,500k	All Channel	5.50	**7.00**

2.5 SAR Test Configurations

2.5.1 #DUT Antenna Locations

A diagram showing the location of the device antennas can be found in Appendix C.

2.5.2 SAR Test Exclusion Considerations

Band / Ant.	Device Edge for SAR Testing (Front View)					
	Front	Rear	Left Edge	Right Edge	Top	Bottom
WLAN & Bluetooth	No	Yes	No	No	No	No

2.6 SAR Test Methods and Procedures

The tests documented in this report were performed in accordance with IEEE 1528-2013 and the following published KDB procedures:

- IEEE 1528-2013
- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D04 Interim General RF Exposure Guidance v01
- 865664 D01 SAR measurement 100 ㎒ to 6 ㎓ v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 616217 D04 SAR for laptop and tablets v01r02
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)
- April 2019 TCB Workshop Notes (Tissue Simulating Liquids)

3. Specific Absorption Rate

3.1 Introduction

The 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.

3.2 SAR Definition

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

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

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

$$SAR = C\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or 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. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

4. SAR Measurement Procedures

4.1 SAR Scan Procedures

Step 1: Power Reference Measurement
The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 1.4 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.
Step 2: Area Scan & Zoom Scan
The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot and Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing1 g and 10 g of simulated tissue. If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly. Area Scan & Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm ± 1 mm	½·δ·ln(2) mm 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area 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: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: 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
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm	
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: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details. * When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 3: Power drift measurement
The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

5. SAR Measurement Configurations

5.1 Body-supported device

A typical example of a body supported device is a wireless enabled laptop device that among other orientations may be supported on the thighs of a sitting user. To represent this orientation, the device shall be positioned with its base against the flat phantom. Other orientations may be specified by the manufacturer in the user instructions. If the intended use is not specified, the device shall be tested directly against the flat phantom in all usable orientations.

The screen portion of the device shall be in an open position at a 90° angle as seen in Figure 1 (left side), or at an operating angle specified for intended use by the m anufacturer in the operating instructions. Where a body supported device has an integral screen required for normal operation, then the screen-side will not need to be tested if the antenna(s) integrated in it ordinarily remain(s) 200 mm from the body. Where a screen mounted antenna is present, the measurement shall be performed with the screen against the flat phantom as shown in Figure 1 (right side), if operating the screen against the body is consistent with the intended use.

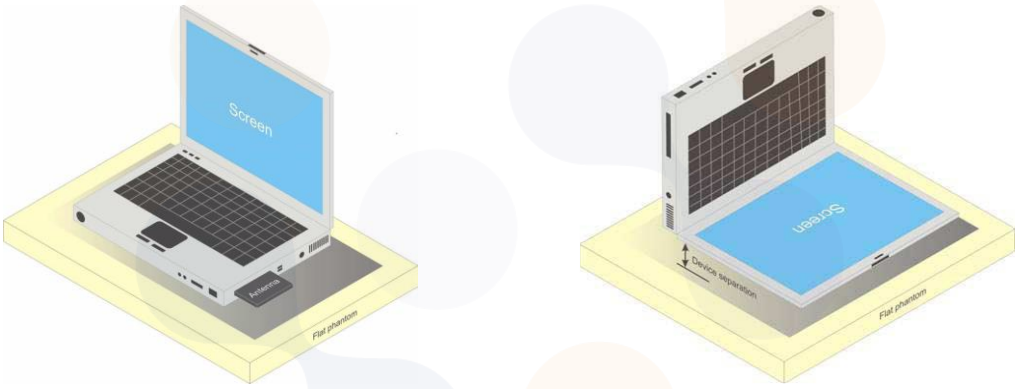


Figure 1. Notebook

6. RF Exposure Limits

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The 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.

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). 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.

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Partial Peak SAR [1] (Partial)	1.60 mW/g	8.00 mW/g
Partial Average SAR [2] (Whole Body)	0.08 mW/g	0.40 mW/g
Partial Peak SAR [3] (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

1) The spatial Peak value of the SAR averaged over any 1g gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2) The spatial Average value of the SAR averaged over the whole body.
3) The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

7. FCC SAR General Measurement Procedures

7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D04v01, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

7.2 SAR Testing with 802.11 Transmitters

The normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

7.2.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 – 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

7.2.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

7.2.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 ㎒ (5.47 – 5.85 ㎓), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 ㎓ in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. When band gap channels are disabled, each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency point requirements.

7.2.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

7.2.5 2.4 ㎓ SAR Test Requirement

SAR is measured for 2.4 ㎓ 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following.

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel; i.e., all channels require testing.

   2.4 ㎓ 802.11g/n OFDM are additionally evaluated for SAR if highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 ㎓ band, the Initial Test Configuration Procedures should be followed.

7.2.6 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 ㎓ and 5 ㎓ band, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel band width, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

7.2.7 Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 dB of each other, mid channel of the transmission mode with highest average RF output power is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements.

7.2.8 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8. RF Average Conducted Output Power

8.1 WLAN Average Conducted Output Power

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported.

Power Measurement Setup

8.1.1 WLAN Average Conducted Output Power

Band	Mode	Freq. [MHz]	Channel	Conducted Powers (dBm)	
				Main Ant.	Aux Ant.
WLAN 2.4 GHz	802.11b	2 412.0	1	16.88	15.76
		2 437.0	6	16.77	15.63
		2 462.0	11	16.71	15.65
U-NII-1	802.11ac (VHT80)	5 210.0	42	13.93	13.59
U-NII-2A		5 290.0	58	13.82	13.84
U-NII-2C		5 530.0	106	13.85	13.56
		5 610.0	122	13.77	13.59
		5 690.0	138	13.81	13.63
U-NII-3		5 775.0	155	13.72	13.57

8.2 Bluetooth Average Conducted Output Power

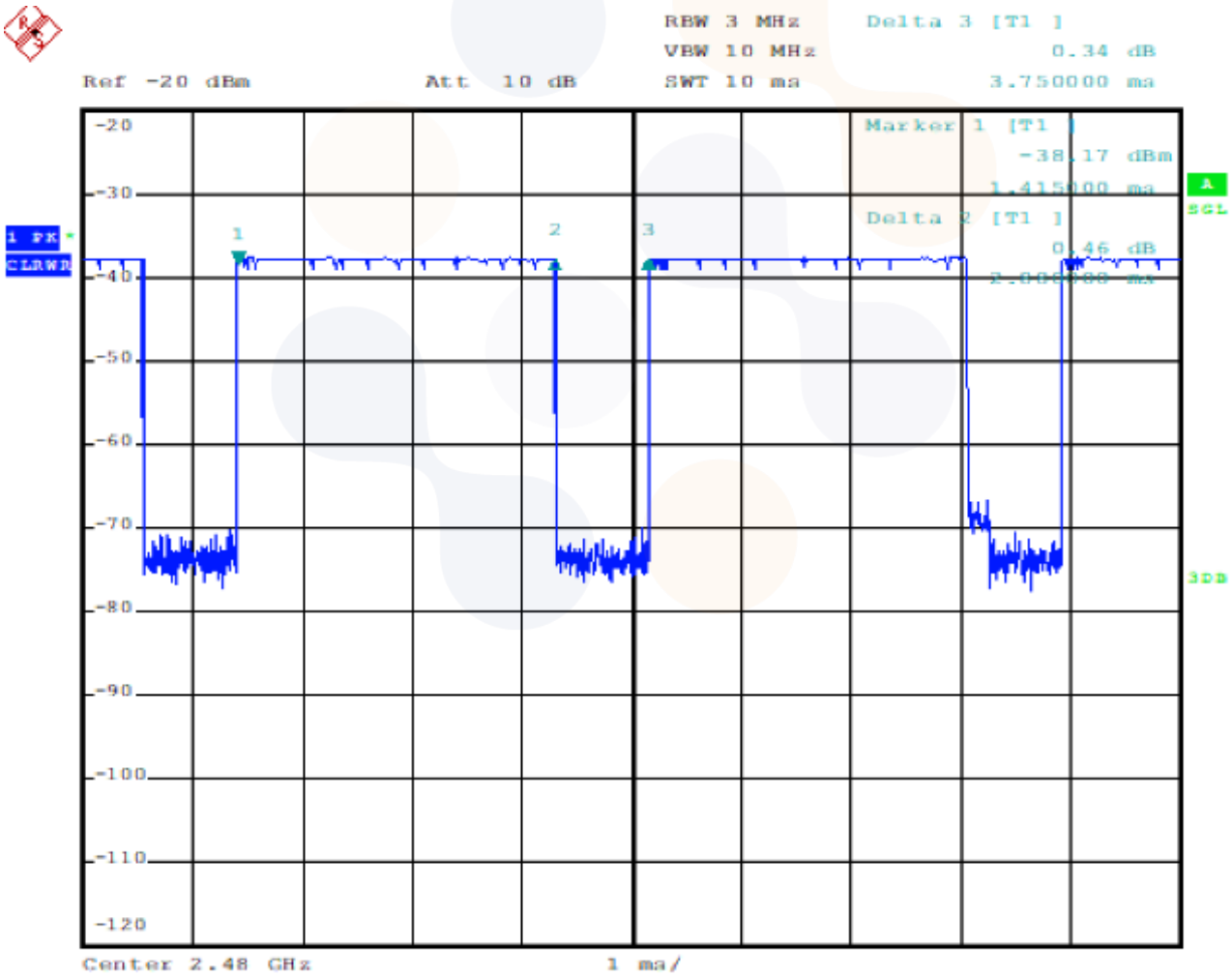
Mode	Freq. [㎒]	Channel	Conducted Powers (dBm)
BDR_DH5 (1 Mbps)	2 402.0	0	9.38
	2 441.0	39	9.61
	2 480.0	78	10.00
BDR_2-DH5 (2 Mbps)	2 402.0	0	5.98
	2 441.0	39	6.17
	2 480.0	78	5.96
EDR_3-DH5 (3 Mbps)	2 402.0	0	5.93
	2 441.0	39	6.16
	2 480.0	78	5.95
LE (1 Mbps)	2 402.0	0	5.73
	2 440.0	19	6.22
	2 480.0	39	6.26
LE (2 Mbps)	2 402.0	0	5.73
	2 440.0	19	6.23
	2 480.0	39	6.27
LE (125k)	2 402.0	0	5.74
	2 440.0	19	6.25
	2 480.0	39	6.28
LE (500k)	2 402.0	0	5.76
	2 440.0	19	6.25
	2 480.0	39	6.28

8.3 Bluetooth Duty Factor

Mode	Packet	On Time (ms)	On-Off Time (ms)	Duty Cycle (%)	Duty Cycle Compensate Factor
BDR(GFSK)	DH5	2.88	3.75	0.768	1.302

8.4 Bluetooth Power Measurement Setup

8.5 Bluetooth Duty Plot



9. System Verification

9.1 Measurement date and environment

Shield room	Date	Environment	
		Temperature (°C)	Humidity (%)
8F - 2	2024-06-26	22.4 ~ 22.5	53.5 ~ 55.8
8F - 7	2024-06-27	22.1 ~ 22.4	57.1 ~ 57.4
	2024-07-01	22.5 ~ 22.8	58.0 ~ 58.9

9.2 Tissue Verification

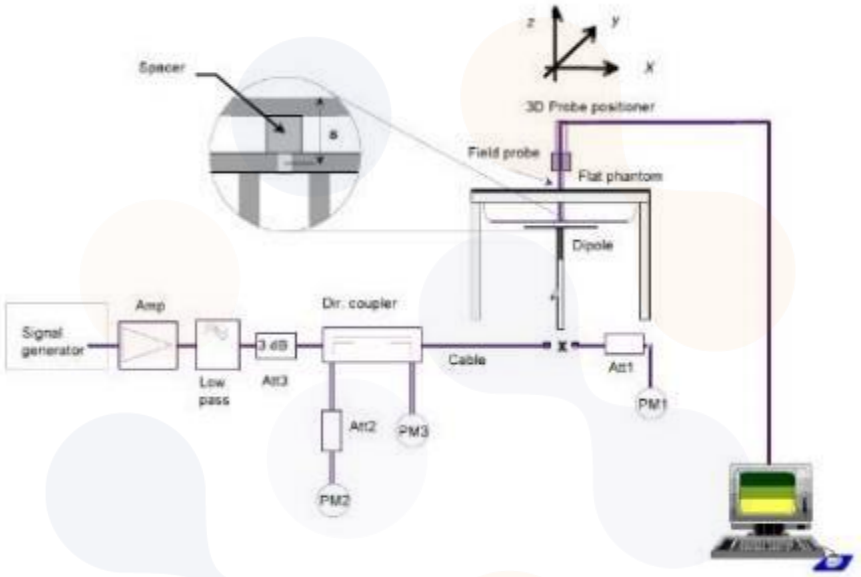
The dielectric properties for this Tissue Simulant Liquids were measured by using the SPEAG Model DAK3.5 Dielectric Probe in conjunction with Agilent E5071B Network Analyzer (300 kHz – 8 500 ㎒). The Conductivity (σ) and Permittivity (ε_r) are listed in Table 1.For the SAR measurement given in this report. The temperature variation of the Tissue Simulant Liquids was (22 ± 2) ℃.

Freq. (㎒)	Date	Recommended Limit / Measured		Temp. (°C)
		Permittivity (ε_r)	Conductivity (σ)	22 ± 2
2 450.0	2024-06-26	39.20 ± 5 % (37.24~41.16)	1.80 ± 5 % (1.71~1.89)	21.19
		37.73	1.85	
	2024-06-27	39.20 ± 5 % (37.24~41.16)	1.80 ± 5 % (1.71~1.89)	21.25
		37.70	1.86	
5 250.0	2024-07-01	35.95 ± 5 % (34.15~37.75)	4.71 ± 5 % (4.47~4.95)	21.08
		35.30	4.91	
5 600.0		35.50 ± 5 % (33.73~37.28)	5.07 ± 5 % (4.82~5.32)	
		34.60	5.30	
5 800.0		35.30 ± 5 % (33.54~37.07)	5.27 ± 5 % (5.01~5.53)	
		34.10	5.51	

<Table 1. Measurement result of Tissue electric parameters>

9.3 Test System Verification

The microwave circuit arrangement for system verification is sketched below picture.
The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within ± 10% from the t arget SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the Table 2. During the tests, the ambient temperature of the laboratory was in the range (22 ± 2) ℃, th e relative humidity was in the range(50 ± 20)% and the liquid depth Above the ear/grid refer ence points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



Frequency (㎒)	Date	Tissue Type	Verification Kit	Probe S/N	Limit/Measured (Normalized to 1 W) Recommended Limit 1g (Normalized)
2 450.0	2024-06-26	HSL	D2450V2 SN: 895	EX3DV4 SN: 3697	52.20 ± 10 % (46.98~57.42)
					55.80
	2024-06-27			EX3DV4 SN: 7770	52.20 ± 10 % (46.98~57.42)
					52.80
5 250.0	2024-07-01	HSL	D5GHzV2 SN: 1134	EX3DV4 SN: 7770	79.00 ± 10 % (71.10~86.90)
					81.40
5 600.0					82.40 ± 10 % (74.16~90.64)
					79.40
5 800.0					78.60 ± 10 % (70.74~86.46)
					76.50

<Table 2. System Verification Result>

10. SAR Test Results

10.1 Standalone Body SAR Test Results

WLAN 2.4 GHz											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11b	Main	Rear	0	2 412.0	16.88	17.00	1.028	1.010	0.445	**0.462**	1
	Aux	Rear	0	2 412.0	15.76	16.00	1.057	1.010	0.239	**0.255**	2

U-NII-2A											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11ac (VHT80)	Main	Rear	0	5 290.0	13.82	14.00	1.042	1.011	0.542	**0.571**	3
	Aux	Rear	0	5 290.0	13.84	14.00	1.038	1.011	0.495	**0.519**	4

U-NII-2C											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11ac (VHT80)	Main	Rear	0	5 530.0	13.85	14.00	1.035	1.011	0.686	**0.718**	5
	Aux	Rear	0	5 690.0	13.63	14.00	1.089	1.011	0.542	**0.597**	6

U-NII-3											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11ac (VHT80)	Main	Rear	0	5 775.0	13.72	14.00	1.067	1.011	0.576	**0.621**	7
	Aux	Rear	0	5 775.0	13.57	14.00	1.104	1.011	0.465	**0.519**	8

Bluetooth											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
BDR_DH5	Aux	Rear	0	2 480.0	10.00	11.00	1.259	1.302	0.074	**0.121**	9

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D04v01.
2. All modes of operation were investigated, and worst-case results are reported.
3. Battery is fully charged for all readings and the standard batteries are the only options.
4. Liquid tissue depth was at least 15 cm.
5. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.

WLAN & Bluetooth Notes:

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4㎓ WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 ㎓ 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
2. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance.
3. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.
4. When the specified maximum output power is the same for both UNII Band1 and UNII Band 2A, begins SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is ≤ 1.2W/kg, SAR is not required for UNII band1 > 1.2W/kg, both bands should be tested independently for SAR.
5. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
6. WLAN & Bluetooth transmission was verified using a spectrum analyzer.

11. Simultaneous Transmission

11.1 #Simultaneous Transmission Configurations

No.	Scenario	Operation
1	WLAN 2.4 GHz Main + WLAN 2.4 GHz Aux	Yes
2	WLAN 2.4 GHz Main + Bluetooth Aux	Yes
3	WLAN 2.4 GHz Aux + Bluetooth Aux	No
4	WLAN 2.4 GHz Main + WLAN 2.4 GHz Aux + Bluetooth Aux	No
5	WLAN 5 GHz Main + WLAN 5 GHz Aux	Yes
6	WLAN 5 GHz Main + Bluetooth Aux	Yes
7	WLAN 5 GHz Aux + Bluetooth Aux	Yes
8	WLAN 5 GHz Main + WLAN 5 GHz Aux + Bluetooth Aux	Yes
9	WLAN 6 GHz Main + WLAN 6 GHz Aux	Yes
10	WLAN 6 GHz Main + Bluetooth Aux	Yes
11	WLAN 6 GHz Aux + Bluetooth Aux	Yes
12	WLAN 6 GHz Main + WLAN 6 GHz Aux + Bluetooth Aux	Yes
13	WLAN 2.4 GHz Main + WLAN 5 GHz Aux + Bluetooth Aux (RSDB scenario)	No
14	WLAN 5 GHz Main + WLAN 2.4 GHz Aux + Bluetooth Aux (RSDB scenario)	No
15	WLAN 2.4/5 GHz Main + WLAN 6 GHz Aux + Bluetooth Aux (RSDB scenario)	No
16	WLAN 6 GHz Main + WLAN 2.4/5 GHz Aux + Bluetooth Aux (RSDB scenario)	No

Notes:

- It does not transmit simultaneously the Bluetooth and WLAN 2.4 GHz.
- It is to use the Bluetooth and WLAN same antenna path.

11.2 Simultaneous Transmission Analysis

Exposure Condition /Position		WLAN						Bluetooth
		2.4 ㎓		5 ㎓		*6 ㎓		
		Main	Aux	Main	Aux	Main	Aux	Aux
		[①]	[②]	[③]	[④]	[⑤]	[⑥]	[⑦]
Body	Rear	0.462	0.255	0.718	0.597	0.743	0.496	0.121

Summation									
[①+②]	[①+⑦]	[③+④]	[③+⑦]	[④+⑦]	[③+④+⑦]	[⑤+⑥]	[⑤+⑦]	[⑥+⑦]	[⑤+⑥+⑦]
0.717	0.583	1.315	0.839	0.718	**1.436**	1.239	0.864	0.617	1.360

Notes:

- Simultaneous transmission SAR test exclusion considerations
  Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneously transmitting antenna. When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration. Per KDB Publication 447498 D04.
- *For WLAN 6 ㎓ value, refer to the Report No. “KR24-SPF0018”.

12. SAR Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1) **Repeated measurements are not required when the original highest measured SAR is < 0.80 W/㎏.**
2) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
3) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10％ from the 1-g SAR limit).
4) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

RF Exposure Conditions	Band	Mode	Ant.	Frequency (㎒)	EUT Position	Separation Distance (㎜)	Measured 1 g SAR (W/kg)	Repeated 1 g SAR (W/kg)	Ratio
N/A									

13. Measurement Uncertainty

Per KDB 865664 D01 SAR measurement 100㎒ to 6㎓, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of *k* = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Standard 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

14. Test Equipment Information

Test Platform	SPEAG DASY 5/8 System			
Version	DASY52: 52.10.4.1535 / SEMCAD: 14.6.14 (7501) DASY8: 16.4.0.5005			
Location	Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea			
Manufacture	SPEAG			
Hardware Reference				
Equipment	Model	Serial Number	Date of Calibration	Due date of next Calibration
Shield Room	-	8F - 2	-	-
	-	8F - 7	-	-
DASY5 Robot	TX90XL	F12/5L7FA1/A/01	-	-
DASY8 Robot	TX2-60L	F/22/0040787/A/001	-	-
Phantom	2mm Oval Phantom ELI5	1173	-	-
	2mm Oval Phantom ELI5	1178	-	-
Mounting Device	Laptop Holder	-	-	-
DAE	DAE4	1342	2024-02-16	2025-02-16
	DAE4	1759	2023-09-20	2024-09-20
Probe	EX3DV4	3697	2024-04-22	2025-04-22
	EX3DV4	7770	2023-11-24	2024-11-24
MICROWAVE GENERATOR	SMP02	100295	2023-12-18	2024-12-18
Dual Power Meter	E4419B	GB43312301	2024-02-13	2025-02-13
Power Sensor	8481H	3318A19379	2024-02-13	2025-02-13
	8481H	3318A19377	2024-02-13	2025-02-13
Attenuator	PE7005-10	2228-7	2023-12-11	2024-12-11
	PE7005-10	2228-8	2023-12-11	2024-12-11
	PE7005-10	2228-9	2023-12-11	2024-12-11
Directional Coupler	772D	MY46151145	2023-11-01	2024-11-01
Power Amplifier	AMP2027ADB	10005	2024-04-26	2025-04-26
Low Pass Filter	PE8725	2144	2023-12-11	2024-12-11
	PE87FL1016	2213	2023-12-11	2024-12-11
Dipole Validation Kits	D2450V2	895	2023-09-26	2025-09-26
	D5GHzV2	1134	2024-01-17	2026-01-17
ENA Series Network Analyzer	E5071B	MY42403524	2024-02-13	2025-02-13
Dielectric Assessment Kit	DAK-3.5	1078	2024-06-10	2025-06-10
	DAKS-3.5	1165	2023-11-20	2024-11-20
VECTOR REFLECTOMETER	R140B	22420003	2023-11-21	2024-11-21
Digital Thermometer	DTM3000	3939	2024-02-15	2025-02-15
Humidity/Temp	PC-5400TRH	PC-5400TRH-3	2023-11-06	2024-11-06
	MHB-382SD	25737	2024-05-17	2025-05-17
MXA SIGNAL ANALYZER	N9020A	MY520900024	2023-11-01	2024-11-01

15. Test System Verification Results

Date: 2024-06-26

Test Laboratory: Eurofins KCTL Co.,Ltd.
File Name: **2450 MHz Verification Input Power 100 mW 2024-06-26.da5.da53:0**

DUT: Dipole 2450 MHz D2450V2, Type: D2450V2, Serial: D2450V2 - SN:895

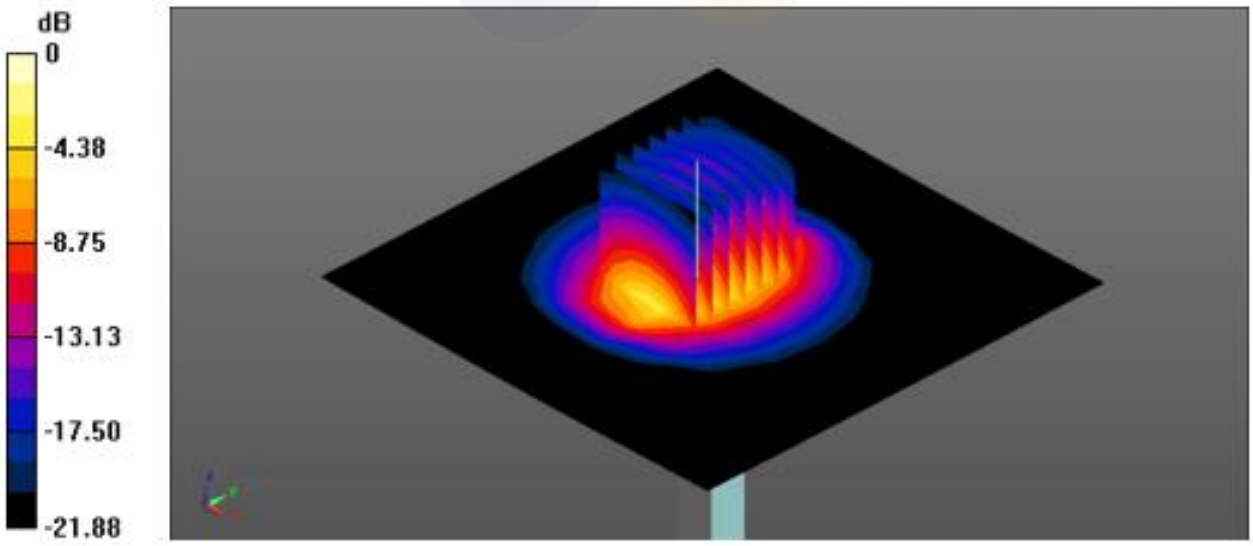
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.845 S/m; ε_r = 37.729; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3697;ConvF(7.21, 7.21, 7.21) @ 2450 MHz; Calibrated: 2024-04-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2024-02-16
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/2450 MHz Verification Input Power 100 mW 2024-06-26/Area Scan (11x11x1):
Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 8.20 W/kg

Configuration/2450 MHz Verification Input Power 100 mW 2024-06-26/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 69.05 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 11.6 W/kg
SAR(1 g) = 5.58 W/kg; SAR(10 g) = 2.6 W/kg
Maximum value of SAR (measured) = 9.39 W/kg



0 dB = 9.39 W/kg = 9.73 dBW/kg

Eurofins KCTL Co.,Ltd.

Measurement Report for D2450V2 - SN895, FRONT, D2450, UID 0 -, (2450.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
D2450V2 - SN895, Speag	10.0 x 10.0 x 290.0	895	Validation Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, Head Simulating Liquid	FRONT, 10.00	D2450	CW, 0--	2450.000	6.51	1.86	37.7

Hardware Setup

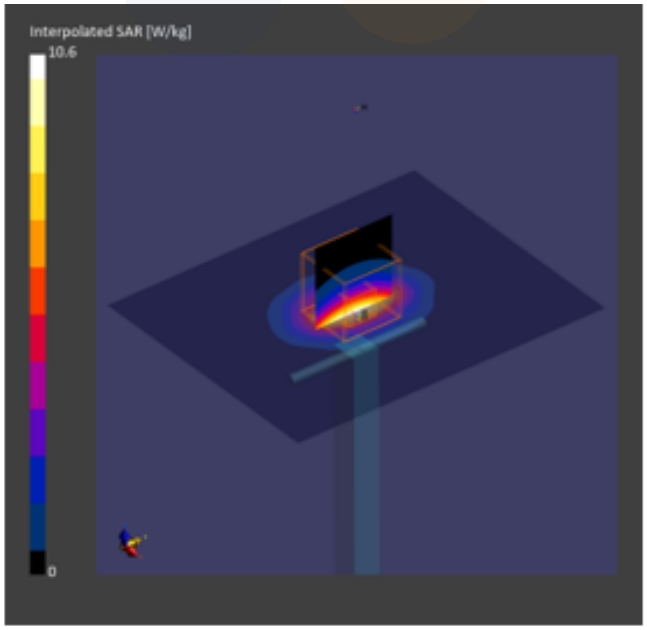
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-06-27	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	96.0 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	No	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-27	2024-06-27
psSAR1g [W/kg]	5.26	5.28
psSAR8g [W/kg]	2.70	2.71
psSAR10g [W/kg]	2.44	2.46
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		0.05
Peak SAR [W/kg]		10.6



Eurofins KCTL Co.,Ltd.

Measurement Report for D5GHzV2 - SN1134, FRONT, Custom Band, UID 0 -, (5250.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
D5GHzV2 - SN1134, Speag	10.0 x 10.0 x 300.0	1134	Validation Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, Head Simulating Liquid	FRONT, 10.00	Custom Band	CW, 0--	5250.000	4.66	4.91	35.3

Hardware Setup

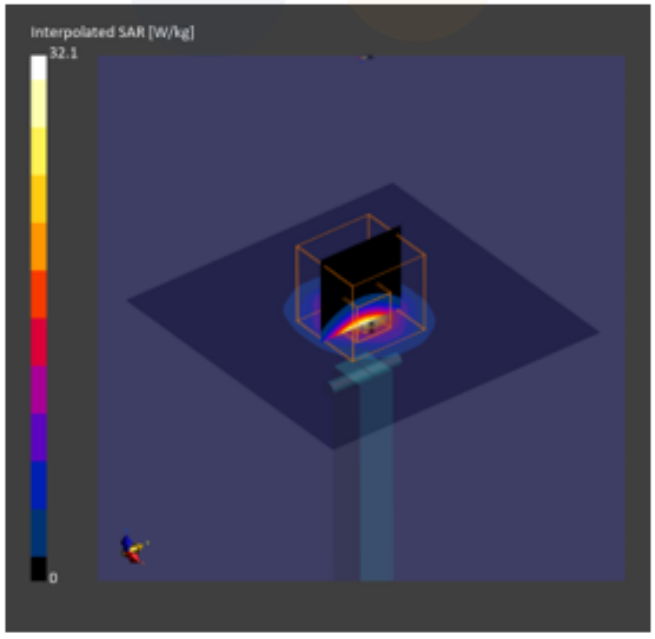
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	7.89	8.14
psSAR8g [W/kg]	2.65	2.76
psSAR10g [W/kg]	2.29	2.38
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		0.07
Peak SAR [W/kg]		32.1



Eurofins KCTL Co.,Ltd.

Measurement Report for D5GHzV2 - SN1134, FRONT, D5GHz, UID 0 -, (5600.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
D5GHzV2 - SN1134, Speag	10.0 x 10.0 x 300.0	1134	Validation Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, Head Simulating Liquid	FRONT, 10.00	D5GHz	CW, 0--	5600.000	4.05	5.30	34.6

Hardware Setup

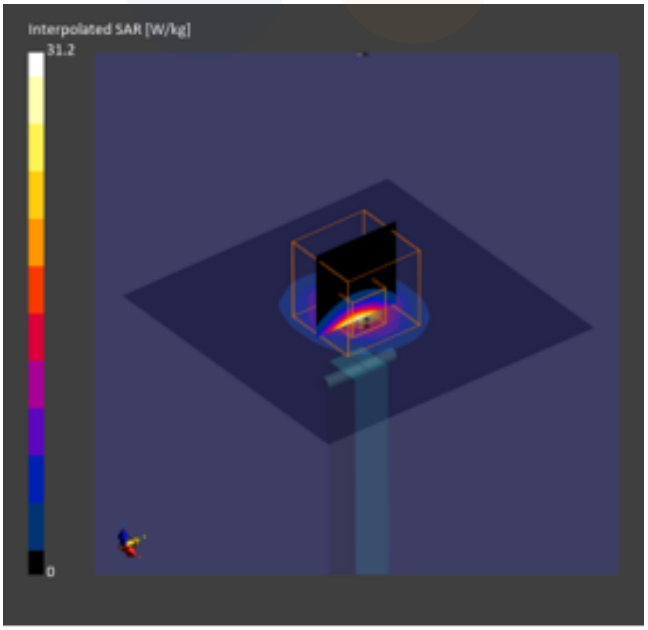
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	7.89	7.94
psSAR8g [W/kg]	2.61	2.69
psSAR10g [W/kg]	2.25	2.32
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		0.03
Peak SAR [W/kg]		31.2



Eurofins KCTL Co.,Ltd.

Measurement Report for D5GHzV2 - SN1134, FRONT, D5GHz, UID 0 -, (5800.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
D5GHzV2 - SN1134, Speag	10.0 x 10.0 x 300.0	1134	Validation Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, Head Simulating Liquid	FRONT, 10.00	D5GHz	CW, 0--	5800.000	4.08	5.51	34.1

Hardware Setup

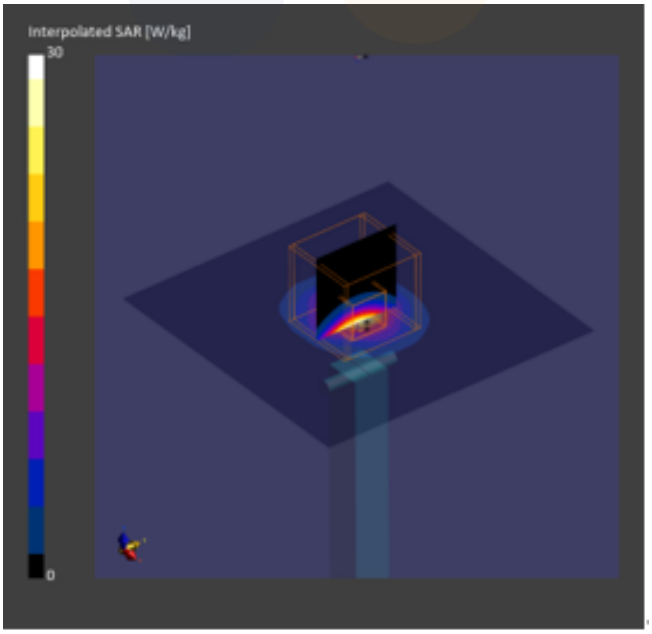
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 80.0	24.0 x 24.0 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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	7.84	7.65
psSAR8g [W/kg]	2.57	2.60
psSAR10g [W/kg]	2.22	2.25
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		-0.03
Peak SAR [W/kg]		30.0



16. Test Results

1)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, D2450, UID 0 -, Channel 1 (2412.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Main Antenna

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, Head Simulating Liquid	BACK, 0.00	D2450	CW, 0--	2412.000, 1	6.51	1.83	37.7

Hardware Setup

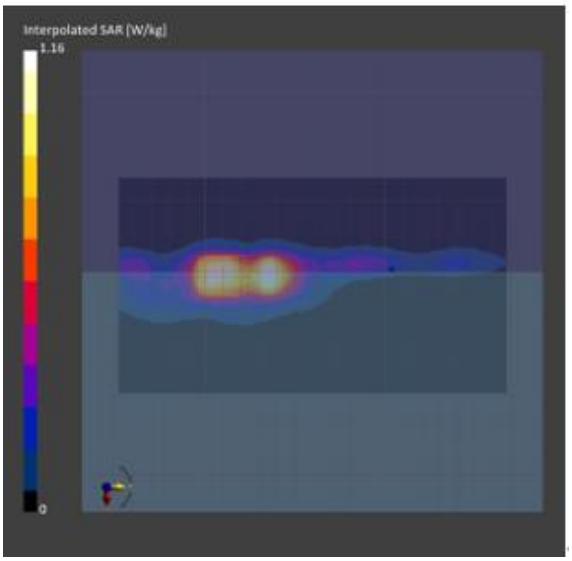
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-06-27	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 204.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	No	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-27	2024-06-27
psSAR1g [W/kg]	0.363	0.445
psSAR8g [W/kg]	0.201	0.208
psSAR10g [W/kg]	0.183	0.189
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		-0.04
Peak SAR [W/kg]		1.16



2)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, D2450, UID 0 -, Channel 1 (2412.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Aux Antenna

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, Head Simulating Liquid	BACK, 0.00	D2450	CW, 0--	2412.000, 1	6.51	1.83	37.7

Hardware Setup

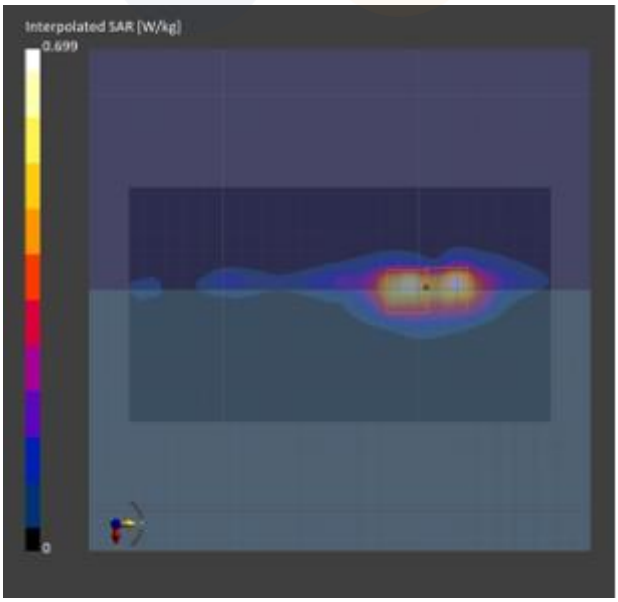
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-06-27	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 204.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	No	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-06-27	2024-06-27
psSAR1g [W/kg]	0.250	0.239
psSAR8g [W/kg]	0.130	0.117
psSAR10g [W/kg]	0.119	0.108
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		-0.02
Peak SAR [W/kg]		0.699



3)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, D5GHz, UID 0 -, Channel 58 (5290.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Main Antenna

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, Head Simulating Liquid	BACK, 0.00	D5GHz	CW, 0--	5290.000, 58	4.66	4.96	35.3

Hardware Setup

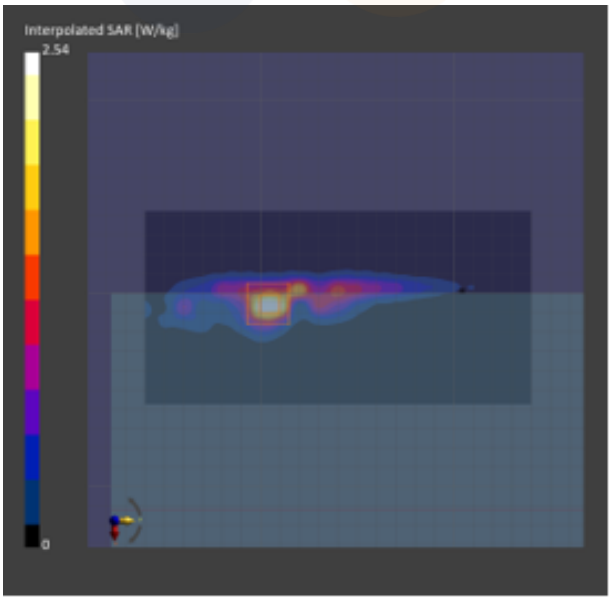
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 200.0	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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	0.444	0.542
psSAR8g [W/kg]	0.171	0.177
psSAR10g [W/kg]	0.150	0.153
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		-0.14
Peak SAR [W/kg]		2.54



4)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, D5GHz, UID 0 -, Channel 58 (5290.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Aux Antenna

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, Head Simulating Liquid	BACK, 0.00	D5GHz	CW, 0--	5290.000, 58	4.66	4.96	35.3

Hardware Setup

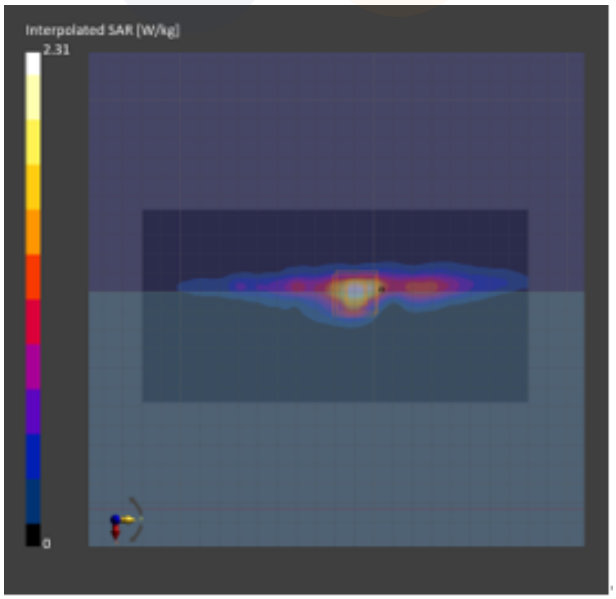
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 200.0	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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	0.427	0.495
psSAR8g [W/kg]	0.164	0.157
psSAR10g [W/kg]	0.144	0.135
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		-0.08
Peak SAR [W/kg]		2.31



5)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, D5GHz, UID 0 -, Channel 106 (5530.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Main Antenna

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, Head Simulating Liquid	BACK, 0.00	D5GHz	CW, 0--	5530.000, 106	4.05	5.21	34.7

Hardware Setup

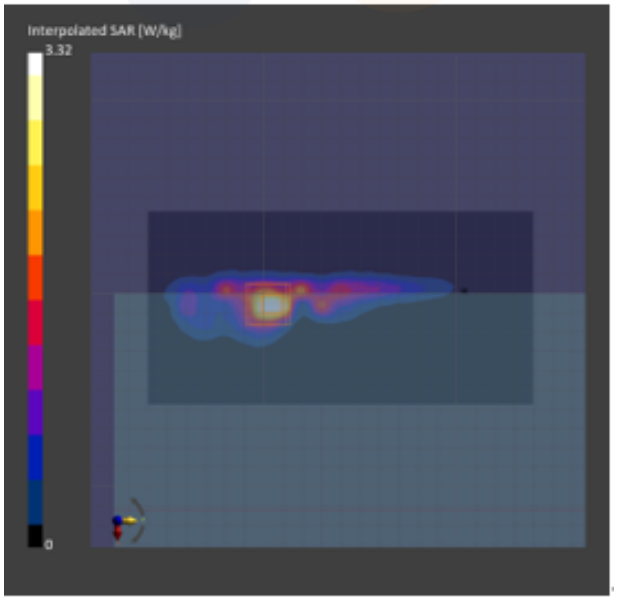
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 200.0	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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	0.569	0.686
psSAR8g [W/kg]	0.219	0.220
psSAR10g [W/kg]	0.193	0.190
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		-0.01
Peak SAR [W/kg]		3.32



6)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, D5GHz, UID 0 -, Channel 138 (5690.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Aux Antenna

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, Head Simulating Liquid	BACK, 0.00	D5GHz	CW, 0--	5690.000, 138	4.05	5.40	34.4

Hardware Setup

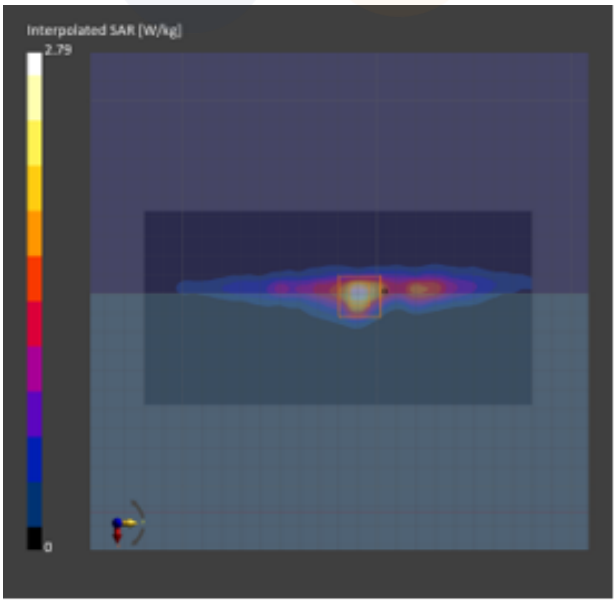
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 200.0	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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	0.450	0.542
psSAR8g [W/kg]	0.167	0.162
psSAR10g [W/kg]	0.146	0.139
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		0.18
Peak SAR [W/kg]		2.79



7)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, Custom Band, UID 0 -, Channel 155 (5775.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Main Antenna

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, Head Simulating Liquid	BACK, 0.00	Custom Band	CW, 0--	5775.000, 155	4.08	5.48	34.2

Hardware Setup

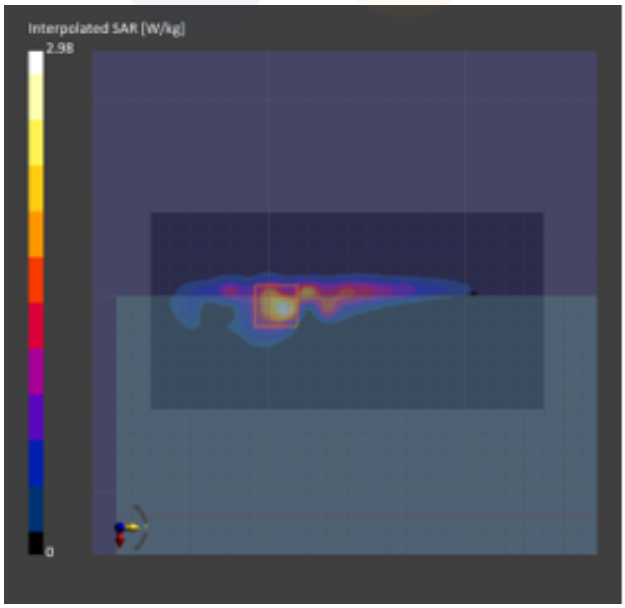
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 200.0	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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	0.455	0.576
psSAR8g [W/kg]	0.173	0.179
psSAR10g [W/kg]	0.152	0.154
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		0.04
Peak SAR [W/kg]		2.98



8)

Eurofins KCTL Co.,Ltd.

Measurement Report for XE550XGA, BACK, Custom Band, UID 0 -, Channel 155 (5775.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	Serial Number	DUT Type
XE550XGA, SAMSUNG	355.0 x 225.0 x 10.0	6QTS9FMX500014R	Laptop + Aux Antenna

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, Head Simulating Liquid	BACK, 0.00	Custom Band	CW, 0--	5775.000, 155	4.08	5.48	34.2

Hardware Setup

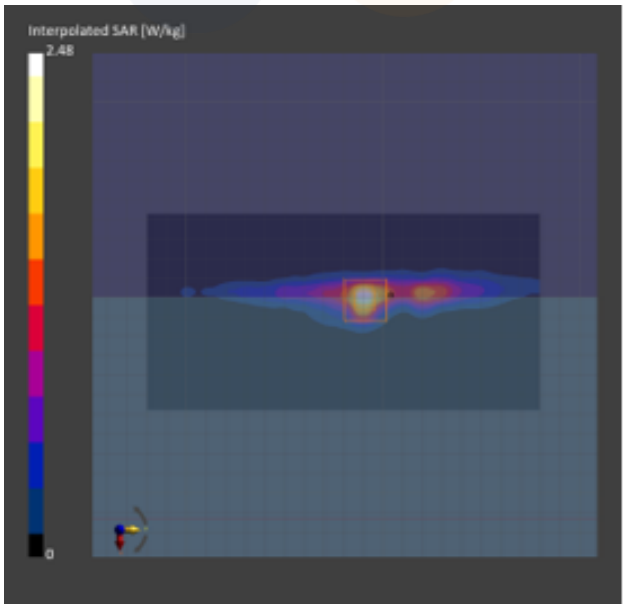
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V5.0 - 1173	HBBL-600-10000, 2024-07-01	EX3DV4 - SN7770, 2023-11-24	DAE4 Sn1759, 2023-09-20

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 200.0	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	No	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2024-07-01	2024-07-01
psSAR1g [W/kg]	0.394	0.465
psSAR8g [W/kg]	0.143	0.134
psSAR10g [W/kg]	0.125	0.114
psAPD (1.0cm2, sq) [W/m2]		N/A
psAPD (4.0cm2, sq) [W/m2]		N/A
Power Drift [dB]		-0.15
Peak SAR [W/kg]		2.48



9)

Date: 2024-06-26

Test Laboratory: Eurofins KCTL Co.,Ltd.
File Name: **1. Bluetooth_BDR_Notebook.da53:0**

DUT: XE550XGA, Type: Notebook, Serial: 6QTS9FMX500014R

Communication System: UID 0, Bluetooth (0); Frequency: 2480 MHz; Duty Cycle: 1:1.30167
Medium parameters used: f = 2480 MHz; σ = 1.861 S/m; ε_r = 37.718; ρ = 1000 kg/m^3
Phantom section: Flat Section

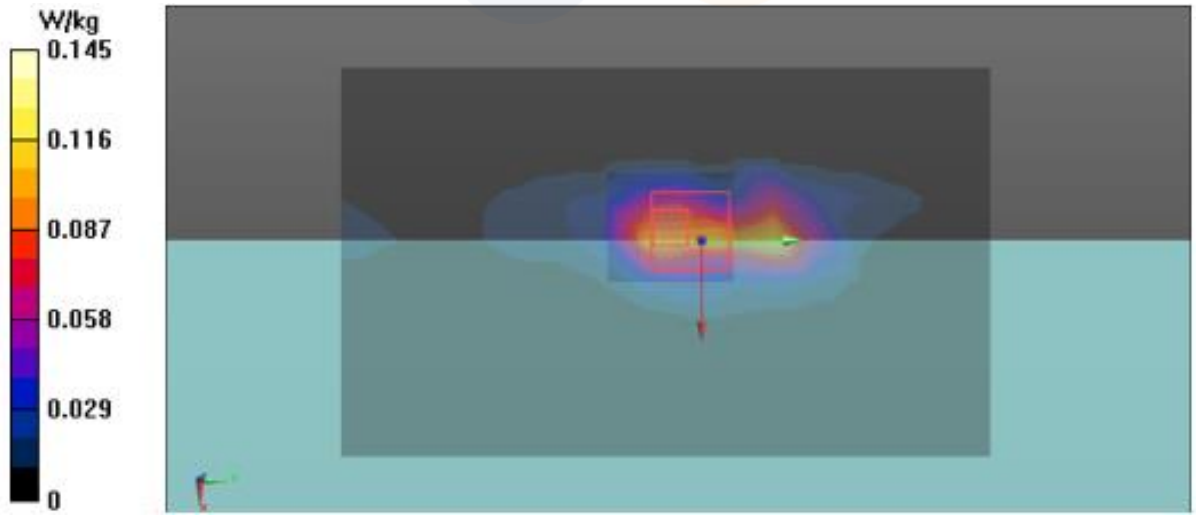
DASY5 Configuration:

- Probe: EX3DV4 - SN3697;ConvF(7.21, 7.21, 7.21) @ 2480 MHz; Calibrated: 2024-04-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 2024-02-16
- Phantom: ELI v5.0 sn1178; Type: QDOVA002AA; Serial: TP:1178
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/Bluetooth_DH5_BDR_Ch78_Rear_0mm/Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.123 W/kg

Configuration/Bluetooth_DH5_BDR_Ch78_Rear_0mm/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.026 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.207 W/kg
SAR(1 g) = 0.074 W/kg; SAR(10 g) = 0.033 W/kg

Maximum value of SAR (measured) = 0.145 W/kg



Appendixes List

Appendix A	A.1 Probe Calibration certificate (EX3DV4_3697) A.2 Probe Calibration certificate (EX3DV4_7770) A.3 Dipole Calibration certificate (D2450V2_895) A.4 Dipole Calibration certificate (D5GHzV2_1134)
Appendix B	SAR Tissue Specification
Appendix C	#Antenna Location & Distance
Appendix D	EUT Photo
Appendix E	Test Setup Photo