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HCT

TEST REPORT

SAR Test for certification of SM-P620

APPLICANT
Samsung Electronics. Co., Ltd.

REPORT NO.
HCT-SR-2402-FC005-R1

DATE OF ISSUE
Feb. 26, 2024

Tested by Do Hyung, Kim	(signature)	김도형
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TEST REPORT

FCC SAR Test for certification

REPORT NO.
HCT-SR-2402-FC005-R1

DATE OF ISSUE
Feb. 26, 2024

FCC ID
A3LSMP620

Applicant	SAMSUNG Electronics Co., Ltd 129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677, Korea
Product Name Model Name	Tablet SM-P620
Date of Test	Feb. 16, 2024
Location of Test	■ Permanent Testing Lab ☐ On Site Testing Lab (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,
FCC Rule Part(s)	CFR §2.1093
Test Results	PASS (SAR Limit : 1.6 W/kg) Refer to the clause 3.2 Attestation of test result

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	Feb. 20, 2024	Initial Release
1	Feb. 26, 2024	Page 5, 31 revised.

Notice

Content
The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s). The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***. When confirmation of authenticity of this test report is required, please contact www.hct.co.kr The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

CONTENTS

1. Test Regulations

The tests documented in this report were performed in accordance with FCC CFR § 2.1093, IEEE 1528-2013, ANSI C63.26-2015 the following FCC Published RF exposure KDB procedures:

- FCC KDB Publication 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB Publication 447498 D01 General RF Exposure Guidance v06
- FCC KDB Publication 616217 D04 SAR Tablets v01r02
- FCC KDB Publication 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- FCC KDB Publication 865664 D02 SAR Reporting v01r02
- FCC KDB Publication 690783 D01 SAR Listings on Grants v01r03
- FCC KDB Publication 971168 D01 Power Mesa License Digital Systems v03r01

In Addition to the above, the following information was used.

- April 2015 TCB Workshop Notes (Simultaneous transmission summation clarified)
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)
- April 2019 TCB Workshop Notes (Tissue Simulating Liquid (TSL))

2. Test Location

2.1 Test Laboratory

Company Name	HCT Co., Ltd.
Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Telephone	031-645-6300
Fax.	031-645-6401

2.2 Test Facilities

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Korea	National Radio Research Agency (Designation No. KR0032)
	KOLAS (Testing No. KT197)

3. Information of the EUT

3.1 General Information of the EUT

Model Name	SM-P620
Equipment Type	Tablet
FCC ID	A3LSMP620
Application Type	Certification
Applicant	SAMSUNG Electronics Co., Ltd.

3.2 Attestation of test result of device under test

Band	Tx. Frequency	Equipment Class	Reported SAR (W/kg) Reported 1g Body SAR
2.4 GHz WLAN	2 412 MHz ~ 2 472 MHz	DTS	0.805
U-NII-1&2A	5 180 MHz ~ 5 320 MHz	NII	0.585
U-NII-2C	5 500 MHz ~ 5 720 MHz	NII	0.594
U-NII-3	5 745 MHz ~ 5 825 MHz	NII	0.449
Bluetooth	2 402 MHz ~ 2 480 MHz	DSS	0.484
Simultaneous SAR per KDB 690783 D01v01r03			0.912
Date(s) of Tests:	Feb. 16, 2024		

4. Device Under Test Description

4.1 DUT specification

Device Wireless specification overview		
Band & Mode	Operating Mode	Tx Frequency
U-NII-1	Voice / Data	5 180 ㎒ ~ 5 240 ㎒
U-NII-2A	Voice / Data	5 260 ㎒ ~ 5 320 ㎒
U-NII-2C	Voice / Data	5 500 ㎒ ~ 5 720 ㎒
U-NII-3	Voice / Data	5 745 ㎒ ~ 5 825 ㎒
2.4 ㎓ WLAN	Voice / Data	2 412 ㎒ ~ 2 472 ㎒
Bluetooth / LE 5.3	Data	2 402 ㎒ ~ 2 480 ㎒
S-Pen	Data	531 ㎑

<table>
<tr><th colspan="3">Device Description</th></tr>
<tr><td>Battery</td><td colspan="2">EB-BT725ABU (BYD)</td></tr>
<tr><td>S-Pen</td><td colspan="2">CP-911-01B-X (WACOM)</td></tr>
<tr><td>Keyboard</td><td colspan="2">EF-BP610 (SEC)</td></tr>
<tr><td rowspan="3">Device Serial Numbers</td><td>Mode</td><td>Serial Number</td></tr>
<tr><td>2.4 ㎓ WLAN, 5 ㎓ WLAN, Bluetooth</td><td>WHL0062R,
XAG1218M</td></tr>
<tr><td colspan="2">The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics are within operational tolerances expected for production units.</td></tr>
</table>

4.2 SAR Test Consideration for Data Referencing.

According to the FCC TCB Workshop note in October 2020 and FCC Guidance, Spot check verification of the variant model(A3LSMP620) of the depopulated version was conducted with reference to the SAR test results of the fully populated reference model (A3LSMP625).

SAR spot check verification of A3LSMP620 was performed by referring to all test results of Bluetooth and WLAN mode of A3LSMP625.
The final SAR report for compliance shall be based on the most conservative results, selected among the measurements on the reference model(A3LSMP625), and those from the spot-check testing(A3LSMP620).

For detailed difference between reference model (A3LSMP625) and depopulated Varient model (A3LSMP620), please refer to the technical documentation.

4.3 Power Reduction for SAR

This device uses an independent fixed level power reduction mechanism for WLAN operations When 2.4 ㎓ WLAN mode and 5 ㎓ WLAN mode are simultaneously transmitted, and also during activating in close proximity to the user's Body
FCC KDB Publication 616217 D04v01r02 Sec.6 was used as a guideline for selection SAR test distances for device.

The reduced powers for the power reduction mechanisms were conformed via conducted power measurements at the RF Port.

4.4 Nominal and Maximum Output Power Specifications

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 D01v06.

4.4.1 Maximum output power

2.4 ㎓, 5 ㎓ WIFI

Mode	IEEE 802.11 (dBm)														
	SISO (ANT0)					SISO (ANT1)					MIMO				
	a	b	g	n	ac	a	b	g	n	ac	a	b	g	n	ac
2.4 ㎓		14 CH12,13 : 3	13.5 CH1,2 : 9 CH3,13 : 1.5 CH8, 9, 10, 11 : 9.5 CH12 : 3	13.5 CH1,2 : 9 CH3,13 : 1.5 CH8, 9, 10, 11 : 9.5 CH12 : 3										16.5 CH1,2 : 12 CH3,13 : 4.5 CH8, 9, 10, 11 : 12.5 CH12 : 6	
5 ㎓ (20 ㎒ BW)						11			11	11				14	14
5 ㎓ (40 ㎒ BW)									8.5	8.5				11.5	11.5
5 ㎓ (80 ㎒ BW)										5					8

(Tolerance: Target +1 dB)

4.4.2 Reduced output power

2.4 GHz, 5 GHz WIFI (Grip Sensor)

Mode	IEEE 802.11 (dBm)														
	SISO (ANT0)					SISO (ANT1)					MIMO				
	a	b	g	n	ac	a	b	g	n	ac	a	b	g	n	ac
2.4 GHz		11 Ch12,13 : 3	11 CH1,2 : 9 CH3,13 : 1.5 CH8, 9, 10, 11 : 9.5 CH12 : 3	11 CH1,2 : 9 CH3,13 : 1.5 CH8, 9, 10, 11 : 9.5 CH12 : 3										14 CH1,2 : 12 CH3,13 : 4.5 CH8, 9, 10, 11 : 12.5 CH12 : 6	
5 GHz(20 MHz BW)						7 CH140 : 8			7 CH140 : 8	7 CH140 : 8				10 CH140 : 11	10 CH140 : 11
5 GHz(40 MHz BW)									7	7				10	10
5 GHz(80 MHz BW)										5					8

(Tolerance: Target +1 dB)

4.4.3 Maximum Bluetooth Power

Mode	Frequency	Target power(dBm)
Bluetooth BDR (in dBm)	2402	9.5
	2441	
	2480	
Bluetooth EDR (in dBm)	2402	7.5
	2441	
	2480	
Bluetooth LE (in dBm)		9.5

(Upper tolerance: target +1.0dB)

4.5 SAR Test Configuration

Since the Dedicated Host Approach is applied, the standalone SAR test exclusion procedure in KDB447498 4.3.1 is applied in conjunction with KDB 616217 4.3 to determine the minimum test separation distance:

When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion

Case of separation distance under 50mm

Antenna	Band	Freq.	GHz	dbm	mW	Separation Distances (mm)					SAR Test Exclusion Threshold (Test separation distances <50 mm threshold value <3)				
		[MHz]		Max Target		Rear	Left	Right	Top	Bottom	Rear	Left	Right	Top	Bottom
Grip Sensor inactive															
WIFI0	2.4GHz WLAN	2472	2.4720	15	31.6	13	110.03	7	18	232.8	3.8	50 mm <	7.1	2.8	50 mm <
WIFI0,1	2.4GHz WLAN	2472	2.4720	14.5	28.2	13	7	7	18	232.8	3.4	6.3	6.3	2.5	50 mm <
WIFI1	5GHz WLAN	5825	5.8250	12	15.8	13	7	110.03	18	232.8	2.9	5.5	50 mm <	2.1	50 mm <
WIFI0,1	5GHz WLAN	5825	5.8250	12	15.8	13	7	7	18	232.8	2.9	5.5	5.5	2.1	50 mm <
WIFI0	Bluetooth	2480	2.4800	10.5	11.2	0	110.03	0	0	232.8	3.5	50 mm <	3.5	3.5	50 mm <
Grip Sensor active															
WIFI0	2.4GHz WLAN	2472	2.4720	12	15.8	0		0	0		5.0		5.0	5.0	
WIFI0,1	2.4GHz WLAN	2472	2.4720	12	15.8	0	0	0	0		5.0	5.0	5.0	5.0	
WIFI1	5GHz WLAN	5825	5.8250	9	7.9	0	0		0		3.8	3.8		3.8	
WIFI0,1	5GHz WLAN	5825	5.8250	9	7.9	0	0	0	0		3.8	3.8	3.8	3.8	
WIFI0	Bluetooth	2480	2.4800	10.5	11.2										

Case of separation distance over 50mm

Antenna	Band	Freq.	GHz	dbm	mW	Separation Distances (mm)					SAR Test Exclusion Threshold(mW)				
		[MHz]		Max Target		Rear	Left	Right	Top	Bottom	Rear	Left	Right	Top	Bottom
Grip Sensor active															
WIFI0	2.4GHz WLAN	2472	2.4720	15	31.6	13	110.03	7	18	232.8	≤50mm	695.7 mW	≤50mm	≤50mm	1923.4 mW
WIFI0,1	2.4GHz WLAN	2472	2.4720	14.5	28.2	13	7	7	18	232.8	≤50mm	≤50mm	≤50mm	≤50mm	1923.4 mW
WIFI1	5GHz WLAN	5825	5.8250	12	15.8	13	7	110.03	18	232.8	≤50mm	≤50mm	662.5 mW	≤50mm	1890.2 mW
WIFI0,1	5GHz WLAN	5825	5.8250	12	15.8	13	7	7	18	232.8	≤50mm	≤50mm	≤50mm	≤50mm	1890.2 mW
WIFI0	Bluetooth	2480	2.4800	10.5	11.2	0	110.03	0	0	232.8	≤50mm	695.6 mW	≤50mm	≤50mm	1923.3 mW
Grip Sensor active															
WIFI0	2.4GHz WLAN	2472	2.4720	12	15.8	0		0	0		≤50mm		≤50mm	≤50mm	
WIFI0,1	2.4GHz WLAN	2472	2.4720	12	15.8	0	0	0	0		≤50mm	≤50mm	≤50mm	≤50mm	
WIFI1	5GHz WLAN	5825	5.8250	9	7.9	0	0		0		≤50mm	≤50mm		≤50mm	
WIFI0,1	5GHz WLAN	5825	5.8250	9	7.9	0	0	0	0		≤50mm	≤50mm	≤50mm	≤50mm	
WIFI0	Bluetooth	2480	2.4800	10.5	11.2										

- Note: All test configurations are based on front view.

Antennas <50mm to adjacent edges: According to KDB 447498 D01v06, if the calculated threshold value >3 then SAR test is required.
Antennas >50mm to adjacent edges: According to KDB 447498 D01v06, if the power threshold is less than the output power, SAR is required.
Per FCC KDB 447498 D01v06, The SAR exclusion threshold for distance < 50 mm is defined by the following equation:

$$\frac{MaxPowerofChannel(mW)}{TestSeparationDistance(mm)} * \sqrt{Frequency(GHz)} \leq 3.0(1\text{g SAR}), 7.5(10\text{g SAR})$$

Antennas >50mm to adjacent edges: According to KDB 447498 D01v06, if the power threshold is less than the output power, SAR is required.
Per KDB 447498 D01v06 Sec 4.3.1 b) For 100 ㎒ to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B)
1) {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·(f(㎒)/150)]} mW, for 100 ㎒ to 1500 ㎒
2) {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 ㎒ and ≤ 6 GHz

Per FCC KDB Publication 616217 D04v01r02, the rear surface and edges of tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in 447498 D01 v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closet distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

This device was tested considering the Rear/left/right/top/bottom side for simultaneous transmission analysis of multiple transmitter conditions. The bottom side of the upper antenna and the top surface of the lower antenna excluded according to FCC KDB 616217 D04v01r02.

- Note: All test configurations are based on front view.
Per FCC KDB Publication 616217 D04v01r02, the rear surface and edges of tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closet distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

Since the Dedicated Host Approach is applied, the standalone SAR test exclusion procedure in KDB 447498 D01v06 2.1.1 is applied in conjunction with KDB 616217 D04v01r02 4.3 to determine the minimum test separation distance:
This device was tested considering the Rear/left/right/top/bottom side for simultaneous transmission analysis of multiple transmitter conditions. The bottom side of the upper antenna excluded according to KDB 6162717.
bottom surface, excluding SAR test by FCC KDB 616217 D04v01r02, were analyzed by applying 0.4 w/kg according to FCC KDB 447498 D04v01 during simultaneous transmission analysis.

4.6 SAR Summation Scenario

According to FCC KDB 447498 D01v06, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the EUT are shown below paths and are mode in same rectangle to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB 447498 D01v06.

Simultaneous Transmission Scenarios	
Applicable Combination	Body
5GHz WIFI Ant.1 + Bluetooth Ant.0	Yes
5GHz WIFI MIMO + Bluetooth Ant.0	Yes

Note:

1. Bluetooth and 2.4GHz WLAN cannot transmit simultaneously.
2. 2.4GHz WLAN and 5GHz WLAN cannot transmit simultaneously.
3. The highest reported SAR for each exposure condition is used for SAR summation purpose.
4. This device supports Bluetooth tethering.
5. This device supports SISO Tx for Ant.0 at 2.4GHz and Ant.1 at 5GHz.
6. This device supports 2x2 MIMO Tx for WLAN 802.11n/ac. 802.11n/ac MIMO supports SDM. Each WLAN antenna can transmit together when operating with MIMO.

4.7 SAR Test Considerations

4.7.1 WiFi

Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg for 1g SAR and is less than 3.0 W/kg for 10g SAR, SAR is not required for U-NII-1 band according to FCC KDB 248227D01v02r02.

This device supports IEEE 802.11 ac with the following features:

a) Up to 80㎒ Bandwidth only for 5 ㎓
b) 2Tx Antenna output
c) Up to 256 QAM is supported
d) TDWR and Band gap channels are supported for 5 ㎓
e) Straddle channels are supported.

5. Introduction

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices.

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 ㎑ to 300 ㎓. 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring SAR due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative of the incremental electromagnetic energy (d*W*) absorbed by (dissipated in) an incremental mass (d*m*) contained in a volume element (d*V*) of a given density (*r*). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right)$$

Figure 1. SAR Mathematical Equation

SAR is expressed in units of Watts per Kilogram (W/kg)

Where:
= conductivity of the tissue-simulant material (S/m)
= mass density of the tissue-simulant material (kg/㎥)
= Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

6. Description of test equipment

6.1 SAR MEASUREMENT SETUP

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid& Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Figure.2).

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The PC with Windows XP or Windows 7 is working with SAR Measurement system DASY4 & DASY5, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

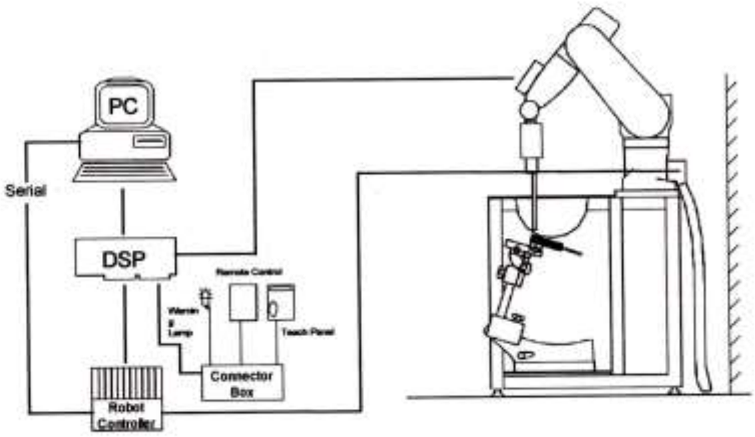


Figure 2. HCT SAR Lab. Test Measurement Set-up

The DAE consists 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 and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

7. SAR Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013.

1. The SAR distribution at the exposed side of the head or body was measured at a distance no more than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the DUT's head and body area and the horizontal grid resolution was depending on the FCC KDB 865664 D01v01r04 table 4-1 & IEEE 1528-2013.

2. Based on step, the area of the maximum absorption was determined by sophisticated interpolations routines implemented in DASY software. When an Area Scan has measured all reachable point. DASY system computes the field maximal found in the scanned are, within a range of the maximum. SAR at this fixed point was measured and used as a reference value.

3. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB 865664 D01v01r04 table 4-1 and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (reference from the DASY manual.)

   a. The data at the surface were extrapolated, since the center of the dipoles is no more than 2.7 mm away from the tip of the probe (it is different from the probe type) and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition in x, y, and z directions. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan. If the value changed by more than 5 %, the SAR evaluation and drift measurements were repeated.

Area scan and zoom scan resolution setting follow KDB 865664 D01v01r04 quoted below.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5±1 mm	·δ·ln(2)±0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30°±1°	20°±1°
Maximum **areascan** 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	$\leq 1.5 \cdot \Delta z_{zoom}(n-1)$	
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: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* 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 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8. Description of Test Position

8.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity ε and loss tangent δ=0.02.

8.2 SAR Testing for Tablet Per KDB Publication 616217 D04v01r02

Per FCC KDB Publication 616217 D04v01r02, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configuration. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

8.3 Proximity Sensor Considerations.

This device uses a sensor to reduce output powers in certain use conditions when the device is used close the user's body.

When the sensor detects a user is touching the device on or near to the antenna the device reduces the maximum allowed output power However, the proximity sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, an additional exposure condition is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level.

FCC KDB 616217 D04 Section 8 and additional FCC guidance were used as a guideline for selecting SAR test distances for this device at these additional exposure conditions. The smallest separation distance determined by the sensor triggering and sensor coverage for each applicable edge, minus 1 ㎜. was used as the test separation distance for SAR testing. Sensor triggering distance evaluation is provided in a separate document.

The required separation distance to evaluate SAR at full powers were:

Wireless technologies	Position	§6.2 Triggering Distance [㎜]	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for Body SAR [㎜]
WLAN /BT WiFi0 Ant.	Rear	14	N/A	N/A	13
	Right	8	N/A	N/A	7
	Top	19	N/A	N/A	18
WLAN WiFi1 Ant.	Rear	14	N/A	N/A	13
	Left	8	N/A	N/A	7
	Top	19	N/A	N/A	18

9. RF Exposure Limits

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT Occupational (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Partial Body)	1.6	8.0
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.4
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.0	20.0

NOTES:

* The Spatial Peak value of the SAR averaged over any 1 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole-body.

*** The Spatial Peak value of the SAR averaged over any 10 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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 mad 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.

10. FCC SAR General Measurement Procedures

Power Measurements for licensed transmitters are performed using a base simulator under digital average power.

10.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, 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. The highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

10.2 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. 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 chipsetbased test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

10.2.1 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 system 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.

10.2.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII2A 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 for 1g SAR or > 3.0 W/kg for 10g SAR. When different maximum output powers are specified for the Bands, SAR measurement for the U-NII Band with the lower maximum output power 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 for 1g SAR or > 3.0 W/kg for 10g SAR.

10.2.3 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.

10.2.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating nest 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 for 1g SAR and ≤ 1.0 W/kg for 10g SAR, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg for 1g SAR and ≤ 2.0 W/kg for 10g SAR or all test positions are measured.

10.2.5 2.4 ㎓ SAR test Requirements

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 is 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. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 ㎓ 802.11 g/n OFDM are additionally evaluated for SAR if the 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.

10.2.6 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 ㎓ and 5 ㎓ Bands, 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 and lowest order 802.11 a/g/n/ac mode. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11 ac or 802.11g and 802.11n with the same channel Bandwidth, modulation and data rate etc., the lower order 802.11 mode i.2., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When the maximum output power is 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.

10.2.7 Initial Test Configuration Procedure

For OFDM, in both 2.4 ㎓ and 5 ㎓ 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.

10.2.8 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 on 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 for 1g SAR and ≤ 3.0 W/kg for 10g SAR, no additional SAR tests for the subsequent test configurations are required.

10.2.9 MIMO SAR Considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 D01v06. should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is <1.6 W/kg, no additional SAR Measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

11. Output Power Specifications

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 D01v06.

11.1 WIFI Conducted Power measurement method

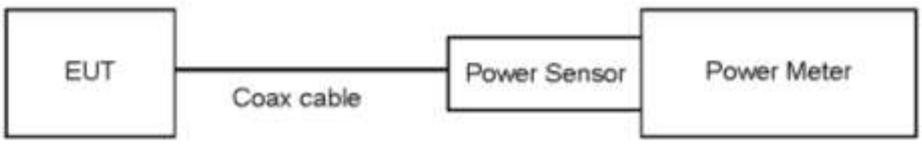
Un-Licensed Bands (DTS Band)

Test Description	Test Procedure Used
Conducted Output Power	- KDB 558074 v05 - Section 8.3.2.3 - ANSI 63.10-2013 - Section 11.9.2.3

Test Procedure

1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Test setup



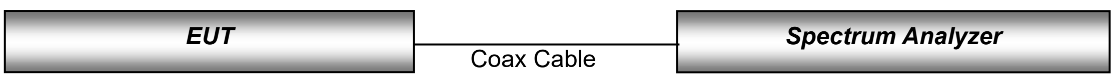
Un-Licensed Bands (NII Band)

Test Description	Test Procedure Used
Conducted Output Power	- KDB 789033 D02 v02r01 - Section E.3.a

Test Procedure

1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Test setup



11.1.1 IEEE 802.11 (2.4 ㎓) Maximum Conducted Power

Mode	Frequency [㎒]	Channel	IEEE 802.11 (2.4 ㎓) Average RF Conducted Power [dBm]
			Antenna 0
802.11b	2 412	1	14.08
	2 437	6	13.14
	2 462	11	14.03
	2 467	12	3.13
	2 472	13	3.16
802.11g	2 412	1	9.43
	2 437	6	13.45
	2 462	11	8.62
	2 467	12	3.17
	2 472	13	2.00
802.11n (HT20)	2 412	1	9.42
	2 437	6	13.87
	2 462	11	9.62
	2 467	12	3.27
	2 472	13	1.95

Mode	Frequency[㎒]	Channel	IEEE 802.11 (2.4 ㎓) Average RF Conducted Power [dBm]		
			Antenna 0	Antenna 1	MIMO
802.11n (HT20)	2 412	1	8.78	8.49	11.65
	2427	4	13.99	13.10	16.58
	2 437	6	13.35	13.33	16.35
	2442	7	13.92	14.09	17.02
	2 462	11	8.87	8.22	11.57
	2 467	12	2.45	2.95	5.72
	2 472	13	1.25	0.72	4.00

11.1.2 IEEE 802.11 (2.4 ㎓) Reduced Conducted Power

Mode	Frequency [㎒]	Channel	IEEE 802.11 (2.4 ㎓) Average RF Conducted Power [dBm]
			Antenna 0
802.11b	2 412	1	11.51
	2 437	6	10.96
	2 462	11	11.12
	2 467	12	3.13
	2 472	13	3.16
802.11g	2 412	1	9.43
	2 437	6	10.25
	2 462	11	8.62
	2 467	12	3.17
	2 472	13	2.00
802.11n (HT20)	2 412	1	9.42
	2 437	6	10.68
	2 462	11	9.62
	2 467	12	3.27
	2 472	13	1.95

Mode	Frequency [㎒]	Channel	IEEE 802.11 (2.4 ㎓) Average RF Conducted Power [dBm]		
			Antenna 0	Antenna 1	MIMO
802.11n (HT20)	2 412	1	8.78	8.49	11.65
	2427	4	10.93	9.48	13.28
	2 437	6	10.61	10.17	13.41
	2442	7	10.01	10.29	13.17
	2 462	11	8.87	8.22	11.57
	2 467	12	2.45	2.95	5.72
	2 472	13	1.25	0.72	4.00

11.1.3 IEEE 802.11 (5 GHz) Maximum Conducted Power

Mode	Frequency [MHz]	Channel	IEEE 802.11 (5 GHz) Average RF Conducted Power [dBm]
			Antenna 2
802.11a (20MHz BW)	5 180	36	10.59
	5 200	40	10.54
	5 240	48	10.99
	5 260	52	11.01
	5 300	60	10.84
	5 320	64	10.74
	5 500	100	10.52
	5 600	120	11.21
	5 720	144	11.47
	5 745	149	11.48
	5 785	157	11.24
	5 825	165	10.95

Mode	Frequency [MHz]	Channel	IEEE 802.11 (5 GHz) Average RF Conducted Power [dBm]		
			Antenna 0	Antenna 1	MIMO
802.11n (20MHz BW)	5 180	36	10.78	10.22	13.52
	5 200	40	10.23	10.02	13.14
	5 220	44	10.54	10.43	13.50
	5 240	48	10.68	10.68	13.69
	5 260	52	11.01	11.79	14.43
	5 280	56	11.03	11.83	14.46
	5 300	60	10.97	11.70	14.36
	5 320	64	11.04	11.61	14.35
	5 500	100	10.60	11.84	14.28
	5 600	120	10.96	11.74	14.38
	5 620	124	10.79	11.68	14.27
	5 720	144	11.06	11.71	14.41
	5 745	149	11.05	11.60	14.35
	5 785	157	10.97	11.58	14.30
	5 825	165	11.26	11.16	14.22

11.1.4 IEEE 802.11 (5 ㎓) Reduced Conducted Power

Mode	Frequency [㎒]	Channel	IEEE 802.11 (5 ㎓) Average RF Conducted Power [dBm]
			Antenna 1
802.11a (20 ㎒ BW)	5 500	100	7.52
	5 600	120	8.06
	5 620	124	7.95
	5 700	140	8.36
	5 720	144	7.59

Mode	Frequency [㎒]	Channel	IEEE 802.11 (5 ㎓) Average RF Conducted Power [dBm]
			Antenna 1
802.11n (40 ㎒ BW)	5 210	38	6.91
	5 230	46	7.03
	5 270	54	7.57
	5 310	62	7.32
	5 755	151	7.49
	5 795	159	7.32

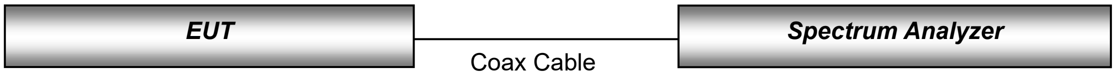
Mode	Frequency [㎒]	Channel	IEEE 802.11 (5 ㎓) Average RF Conducted Power [dBm]		
			Antenna 0	Antenna 1	MIMO
802.11n (20 ㎒ BW)	5 500	100	6.01	7.31	9.72
	5 600	120	6.87	7.76	10.35
	5 620	124	7.25	7.57	10.43
	5 700	140	8.20	8.80	11.52
	5 720	144	7.41	7.79	10.62

Mode	Frequency [㎒]	Channel	IEEE 802.11 (5 ㎓) Average RF Conducted Power [dBm]		
			Antenna 0	Antenna 1	MIMO
802.11n (40 ㎒ BW)	5 210	38	7.16	7.19	10.18
	5 230	46	7.52	7.45	10.49
	5 270	54	6.50	7.48	10.03
	5 310	62	6.23	7.22	9.76
	5 755	151	6.53	7.35	9.97
	5 795	159	6.66	7.16	9.93

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 mode 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. For configurations with multiple mid-Band channels, due to an even number of channels, both channels were measured.

Test Configuration



11.2 Bluetooth

Maximum Conducted Power

The Burst averaged-conducted power

Mode	Frequency [MHz]	Channel	Bluetooth Power [dBm]
			Antenna 0
DH5	2 402	0	9.68
	2 441	39	9.99
	2 480	78	9.20
2-DH5	2 402	0	7.10
	2 441	39	7.28
	2 480	78	6.35
3-DH5	2 402	0	7.11
	2 441	39	7.29
	2 480	78	6.36

The Burst averaged-conducted power

Mode	Packet Length	Channel	Bluetooth Power [dBm]
			Antenna 0
LE 125kbps	37	0	9.62
		19	9.91
		39	9.22
	255	0	9.45
		19	9.81
		39	8.85

Per October 2016 TCB Workshop Notes:
When call box and Bluetooth protocol are used for Bluetooth SAR measurement, time-domain plot is required to identify duty factor for supporting the test setup and result.
Bluetooth duty cycle was measured using Bluetooth tester equipment (CBT / R&S) with Bluetooth DH5 mode.

Bluetooth DH 5 Mode

Bluetooth Duty Cycle [BDR]

Duty Cycle = (BT-On time /BT-Full time) = (2.883/3.750) = 0.769 (DH5)

BT DH5 Maximum Duty Factor:

The theoretical maximum duty cycle defined by chipset manufacturer is 78.00 % In the ideal theory Duty Cycle, the test error tolerance [1%] of the test equipment was considered and applied to the measurement results.

BT LE Mode was tested in FTM mode with maximum duty transmission.

12. System Verification

12.1 Tissue Verification

The head simulating material is calibrated by HCT using the DAKS 3.5 to determine the conductivity and permittivity.

Table for Head Tissue Verification									
Date of Tests	Tissue Temp. (°C)	Tissue Type	Freq. (MHz)	Measured Conductivity σ (S/m)	Measured Dielectric Constant, ε	Target Conductivity σ (S/m)	Target Dielectric Constant, ε	dev σ (%)	dev ε (%)
02/16/2024	20.1	2450H	2400	1.797	40.626	1.756	39.290	2.33	3.40
			2450	1.855	40.428	1.800	39.200	3.06	3.13
			2500	1.913	40.262	1.855	39.140	3.13	2.87
02/16/2024	20.9	5250H	5180	4.559	37.142	4.635	36.010	-1.64	3.14
			5250	4.694	36.986	4.706	35.930	-0.25	2.94
			5280	4.740	36.976	4.737	35.894	0.06	3.01
			5320	4.781	36.975	4.778	35.846	0.06	3.15
02/16/2024	20.9	5600H	5500	4.899	36.700	4.963	35.640	-1.29	2.97
			5600	5.004	36.394	5.065	35.530	-1.20	2.43
02/16/2024	20.9	5750H	5750	5.214	36.434	5.219	35.360	-0.10	3.04
			5800	5.138	36.456	5.270	35.300	-2.50	3.27
			5825	5.113	36.402	5.296	35.270	-3.46	3.21

Note : Head-simulating liquids are used for SAR test according to April TCBC workshop note.

12.2 System Verification

Input Power: 50 mW

Freq. [MHz]	Date	Probe (S/N)	Dipole (S/N)	Liquid	Amb. Temp. [°C]	Liquid Temp. [°C]	1 W Target SAR_{1g} (SPEAG) [W/kg]	50 mW Measured SAR_{1g} [W/kg]	1 W Normalized SAR_{1g} [W/kg]	Deviation [%]	Limit [%]
2 450	02/16/2024	7681	1049	Head	20.2	20.1	52.7	2.66	53.2	0.95	± 10
5 250	02/16/2024	3768	1317	Head	20.2	20.1	78.8	3.88	77.6	-1.52	± 10
5 600	02/16/2024	3768	1317	Head	20.2	20.1	81.2	4.04	80.8	-0.49	± 10
5 750	02/16/2024	3768	1317	Head	20.2	20.1	77.4	3.94	78.8	1.81	± 10

12.3 System Verification Procedure

SAR measurement was prior to assessment, the system is verified to the ± 10 % of the specifications at each frequency Band by using the system verification kit. (Graphic Plots Attached)
- Cabling the system, using the verification kit equipment.
- Generate about 50 mW Input level from the signal generator to the Dipole Antenna.
- Dipole antenna was placed below the flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10 % of the target reference value.
- The results are normalized to 1 W input power.

Note;
SAR Verification was performed according to the FCC KDB 865664 D01v01r04.

13. SAR Test Data Summary

13.1 Body SAR Measurement Results

Spot Check Verification Results: DTS Body SAR (1g)																											
Reference Model Measurement Results																			Variant Model Measurement Results								
Frequency		Mode	Ant.	Band width	Data Rate	Tune-Up Limit	Ant.0 Meas. Power	Ant.1 Meas. Power	Power Drift	Test Position	Sensor	Duty Cycle	Distance (mm)	Area Scan Peak SAR	1g Meas. SAR	Scaling Factor	Scaling Factor	1g Scaled SAR	Tune-Up Limit	Meas. Power	Power Drift	Area Scan Peak SAR	1g Meas. SAR	Scaling Factor	Scaling Factor	1g Scaled SAR	Plot No.
MHz	Ch.			(MHz)	(Mbps)	(dB)	(dBm)	(dBm)	(dB)					(W/kg)	(W/kg)		(Duty)	(W/kg)	(dB)	(dB)	(dB)	(W/kg)	(W/kg)		(Duty)	(W/kg)	
2 412	1	802.11b	Ant.0	20	1Mbps	12.0	11.51		0.00	Rear	ON	98.2	0	0.863	0.381	1.119	1.018	0.434	12.0	11.51	0.00	0.82	0.470	1.119	1.018	0.536	-
2 412	1	802.11b	Ant.0	20	1Mbps	12.0	11.51		0.17	Right	ON	98.2	0	0.736	0.364	1.119	1.018	0.415	12.0	11.51	0.16	1.01	0.502	1.119	1.018	0.572	B1
2 412	1	802.11b	Ant.0	20	1Mbps	12.0	11.51		0.16	Top	ON	98.2	0	0.629	0.306	1.119	1.018	0.349									
2 412	1	802.11b	Ant.0	20	1Mbps	15.0	14.08		0.00	Rear	OFF	98.2	13	0.0703	0.042	1.236	1.018	0.053									
2 412	1	802.11b	Ant.0	20	1Mbps	15.0	14.08		-0.15	Right	OFF	98.2	7	0.174	0.108	1.236	1.018	0.136									
2 412	1	802.11b	Ant.0	20	1Mbps	15.0	14.08		0.04	Top	OFF	98.2	18	0.0324	0.021	1.236	1.018	0.026									
2 437	6	802.11n	MIMO	20	MCS8	12.0	10.61	10.17	0.10	Rear	ON	90.7	0	0.563	0.225	1.524	1.103	0.378									
2 437	6	802.11n	MIMO	20	MCS8	12.0	10.61	10.17	0.00	Left	ON	90.7	0	1.27	0.470	1.524	1.103	0.790	12.0	10.17	0.05	0.97	0.479	1.524	1.103	0.805	B2
2 437	6	802.11n	MIMO	20	MCS8	12.0	10.61	10.17	0.02	Right	ON	90.7	0	0.654	0.307	1.524	1.103	0.516	12.0	10.17	0.03	0.598	0.326	1.524	1.103	0.548	-
2 437	6	802.11n	MIMO	20	MCS8	12.0	10.61	10.17	0.13	Top	ON	90.7	0	0.608	0.285	1.524	1.103	0.479	12.0	10.17	0.12	0.372	0.200	1.524	1.103	0.336	-
2 442	7	802.11n	MIMO	20	MCS8	14.5	14.09	13.92	-0.10	Rear	OFF	90.7	13	0.0546	0.034	1.143	1.103	0.043									
2 442	7	802.11n	MIMO	20	MCS8	14.5	14.09	13.92	0.14	Left	OFF	90.7	7	0.161	0.100	1.143	1.103	0.126									
2 442	7	802.11n	MIMO	20	MCS8	14.5	14.09	13.92	0.09	Right	OFF	90.7	7	0.232	0.142	1.143	1.103	0.179									
2 442	7	802.11n	MIMO	20	MCS8	14.5	14.09	13.92	0.12	Top	OFF	90.7	18	0.0357	0.022	1.143	1.103	0.028									
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population														Body 1.6 W/kg Averaged over 1 gram													

The reported SAR result of WLAN MIMO Mode was applied to the higher power scaling factor of each SISO antenna

Spot Check Verification Results: DSS Tethering SAR (1g)																					
Reference Model Measurement Results														Variant Model Measurement Results							
Frequency		Mode	Ant.	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Sensor	Distance (mm)	1g Meas. SAR	Scaling Factor	Scaling Factor	1g Scaled SAR	Tune-Up Limit	Meas. Power	Power Drift	1g Meas. SAR	Scaling Factor	Scaling Factor	1g Scaled SAR	Plot No.
MHz	Ch.			(dB)	(dB)	(dB)				(W/kg)		(Duty)	(W/kg)	(dB)	(dB)	(dB)	(W/kg)		(Duty)	(W/kg)	
2 441	39	Bluetooth DH5	Ant.0	10.5	9.99	0.00	Rear	N/A	0	0.262	1.125	1.010	**0.298**	10.5	9.99	0.00	0.303	1.125	1.010	0.344	-
2 441	39	Bluetooth DH5	Ant.0	10.5	9.99	0.00	Left	N/A	0	0.0000	1.125	1.010	0.000								
2 441	39	Bluetooth DH5	Ant.0	10.5	9.99	0.10	Right	N/A	0	0.211	1.125	1.010	0.240								
2 441	39	Bluetooth DH5	Ant.0	10.5	9.99	0.17	Top	N/A	0	0.201	1.125	1.010	0.228								
2 440	19	Bluetooth LE 125K	Ant.0	10.5	9.81	0.00	Rear	N/A	0	0.312	1.172	1.010	**0.369**	10.5	9.81	0.06	0.409	1.172	1.010	**0.484**	B3
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population										Body 1.6 W/kg Averaged over 1 gram											

Spot Check Verification Results: 5 GHz WLAN Body SAR (1g)																											
Reference Model Measurement Results																			Variant Model Measurement Results								
Frequency		Mode		Band width	Data Rate	Tune-Up Limit	Ant 0 Meas. Power	Ant 1 Meas. Power	Power Drift	Test Position	Sensor	Duty Cycle	Distance (mm)	Area Scan Peak SAR	1g Meas. SAR	Scaling Factor	Scaling Factor	1g Scaled SAR	Tune-Up Limit	Meas. Power	Power Drift	Area Scan Peak SAR	1g Meas. SAR	Scaling Factor	Scaling Factor	1g Scaled SAR	Plot No.
MHz	Ch.			(MHz)	(Mbps)	(dB)	(dBm)	(dBm)	(dB)					(W/kg)	(W/kg)		(Duty)	(W/kg)	(dB)	(dB)	(dB)	(W/kg)	(W/kg)		(Duty)	(W/kg)	
5 270	54	802.11n	Ant.1	40	MCS0	8.0		7.57	-0.12	Rear	On	91.5	0	0.233	0.335	1.104	1.093	0.404	8.0	7.57	-0.11	0.316	0.355	1.104	1.093	0.428	-
5 270	54	802.11n	Ant.1	40	MCS0	8.0		7.57	-0.10	Left	On	91.5	0	0.147	0.152	1.104	1.093	0.183									
5 270	54	802.11n	Ant.1	40	MCS0	8.0		7.57	-0.13	Top	On	91.5	0	0.06	0.083	1.104	1.093	0.100									
5 260	52	802.11a	Ant.1	20	6Mbps	12.0		11.01	0.10	Rear	Off	90.8	13	0.023	0.01	1.256	1.101	0.014									
5 260	52	802.11a	Ant.1	20	6Mbps	12.0		11.01	-0.12	Left	Off	90.8	7	0.060	0.043	1.256	1.101	0.059									
5 260	52	802.11a	Ant.1	20	6Mbps	12.0		11.01	-0.17	Top	Off	90.8	18	0.021	0.015	1.256	1.101	0.021									
5 700	140	802.11a	Ant.1	20	6Mbps	9.0		8.36	-0.19	Rear	On	90.8	0	0.472	0.276	1.159	1.101	0.352									
5 700	140	802.11a	Ant.1	20	6Mbps	9.0		8.36	-0.13	Left	On	90.8	0	0.723	0.466	1.159	1.101	0.595	9.0	8.36	-0.11	0.521	0.461	1.159	1.101	0.588	B4
5 700	140	802.11a	Ant.1	20	6Mbps	9.0		8.36	-0.19	Top	On	90.8	0	0.176	0.14	1.159	1.101	0.179									
5 720	144	802.11a	Ant.1	20	6Mbps	12.0		11.47	0.17	Rear	Off	90.8	13	0.024	0.011	1.130	1.101	0.014									
5 720	144	802.11a	Ant.1	20	6Mbps	12.0		11.47	-0.16	Left	Off	90.8	7	0.151	0.105	1.130	1.101	0.131									
5 720	144	802.11a	Ant.1	20	6Mbps	12.0		11.47	-0.17	Top	Off	90.8	18	0.036	0.017	1.130	1.101	0.021									
5 755	151	802.11n	Ant.1	40	MCS0	8.0		7.49	0.16	Rear	On	91.5	0	0.224	0.223	1.125	1.093	0.274									
5 755	151	802.11n	Ant.1	40	MCS0	8.0		7.49	0.19	Left	On	91.5	0	0.193	0.254	1.125	1.093	0.312	8.0	7.49	0.15	0.318	0.302	1.125	1.093	0.371	-
5 755	151	802.11n	Ant.1	40	MCS0	8.0		7.49	0.19	Top	On	91.5	0	0.049	0.059	1.125	1.093	0.073									
5 785	149	802.11a	Ant.1	20	6Mbps	12.0		11.48	0.10	Rear	Off	90.8	13	0.017	0.01	1.127	1.101	0.012									
5 785	149	802.11a	Ant.1	20	6Mbps	12.0		11.48	-0.10	Left	Off	90.8	7	0.156	0.116	1.127	1.101	0.144									
5 785	149	802.11a	Ant.1	20	6Mbps	12.0		11.48	0.17	Top	Off	90.8	18	0.018	0.014	1.127	1.101	0.017									
5 270	54	802.11n	MIMO	40	MCS8	8.0	6.50	7.48	-0.10	Rear	On	91	0	0.316	0.238	1.413	1.099	0.370									
5 270	54	802.11n	MIMO	40	MCS8	8.0	6.50	7.48	-0.18	Left	On	91	0	0.220	0.125	1.413	1.099	0.194									
5 270	54	802.11n	MIMO	40	MCS8	8.0	6.50	7.48	0.15	Right	On	91	0	0.382	0.363	1.413	1.099	0.564	8.0	6.50	0.13	0.565	0.377	1.413	1.099	0.585	-
5 270	54	802.11n	MIMO	40	MCS8	8.0	6.50	7.48	0.16	Top	On	91	0	0.219	0.142	1.413	1.099	0.220									
5 280	56	802.11n	MIMO	20	MCS8	12.0	11.03	11.83	-0.12	Rear	Off	90.9	13	0.073	0.055	1.250	1.100	0.076									
5 280	56	802.11n	MIMO	20	MCS8	12.0	11.03	11.83	0.12	Left	Off	90.9	7	0.085	0.061	1.250	1.100	0.084									
5 280	56	802.11n	MIMO	20	MCS8	12.0	11.03	11.83	-0.15	Right	Off	90.9	7	0.316	0.255	1.250	1.100	0.351									
5 280	56	802.11n	MIMO	20	MCS8	12.0	11.03	11.83	0.15	Top	Off	90.9	18	0.039	0.021	1.250	1.100	0.029									
5 700	140	802.11n	MIMO	20	MCS8	9.0	8.20	8.80	-0.10	Rear	On	90.9	0	0.575	0.381	1.202	1.100	0.504	9.0	8.20	-0.08	0.354	0.242	1.202	1.100	0.320	-
5 700	140	802.11n	MIMO	20	MCS8	9.0	8.20	8.80		Left	On	90.9	0	0.699	0.446	1.202	1.100	0.590	9.0	8.20	0.09	0.643	0.449	1.202	1.100	0.594	B5
5 700	140	802.11n	MIMO	20	MCS8	9.0	8.20	8.80	0.17	Right	On	90.9	0	0.787	0.469	1.202	1.100	0.620	9.0	8.20	0.11	0.542	0.378	1.202	1.100	0.500	-
5 700	140	802.11n	MIMO	20	MCS8	9.0	8.20	8.80	0.10	Top	On	90.9	0	0.188	0.116	1.202	1.100	0.153									
5 720	144	802.11n	MIMO	20	MCS8	12.0	11.06	11.71	0.14	Rear	Off	90.9	13	0.083	0.045	1.242	1.100	0.061									
5 720	144	802.11n	MIMO	20	MCS8	12.0	11.06	11.71	-0.18	Left	Off	90.9	7	0.153	0.113	1.242	1.100	0.154									
5 720	144	802.11n	MIMO	20	MCS8	12.0	11.06	11.71	-0.19	Right	Off	90.9	7	0.27	0.212	1.242	1.100	0.290									
5 720	144	802.11n	MIMO	20	MCS8	12.0	11.06	11.71	-0.15	Top	Off	90.9	18	0.024	0.016	1.242	1.100	0.022									
5 755	151	802.11n	MIMO	40	MCS8	8.0	6.53	7.35	0.10	Rear	On	91	0	0.426	0.219	1.403	1.099	0.338									
5 755	151	802.11n	MIMO	40	MCS8	8.0	6.53	7.35	0.10	Left	On	91	0	0.471	0.330	1.403	1.099	0.509	8.0	6.53	0.08	0.409	0.291	1.403	1.099	0.449	-
5 755	151	802.11n	MIMO	40	MCS8	8.0	6.53	7.35	0.17	Right	On	91	0	0.6	0.415	1.403	1.099	0.640	8.0	6.53	0.18	0.393	0.285	1.403	1.099	0.439	-
5 755	151	802.11n	MIMO	40	MCS8	8.0	6.53	7.35	0.15	Top	On	91	0	0.174	0.096	1.403	1.099	0.148									
5 745	149	802.11n	MIMO	20	MCS8	12.0	11.05	11.60	0.17	Rear	Off	90.9	13	0.049	0.027	1.245	1.100	0.037									
5 745	149	802.11n	MIMO	20	MCS8	12.0	11.05	11.60	0.13	Left	Off	90.9	7	0.09	0.068	1.245	1.100	0.093									
5 745	149	802.11n	MIMO	20	MCS8	12.0	11.05	11.60	-0.15	Right	Off	90.9	7	0.131	0.105	1.245	1.100	0.144									
5 745	149	802.11n	MIMO	20	MCS8	12.0	11.05	11.60	-0.13	Top	Off	90.9	18	0.032	0.020	1.245	1.100	0.027									
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population														Body 1.6 W/kg Averaged over 1 gram													

The reported SAR result of WLAN MIMO Mode was applied to the higher power scaling factor of each SISO antenna

13.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04v01r02 and KDB Publication 447498 D04v01.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. 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.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB 447498 D04v01.
6. Per FCC KDB 865664 D01v01r04, variability SAR measurement were performed when the measured SAR results for a frequency Band were greater than or equal to 0.8 W/kg for 1g SAR and >2 for 10g SAR Please see Section 15 for variability analysis.
7. FCC KDB Publication 616217 D04v01r02 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D04v01 was applied to determine SAR test exclusion for adjacent edge configurations

WLAN Notes:

1. Per KDB 2482227 D01v02r02 justification for test configurations of 2.4 ㎓ WiFi Single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 ㎓ 802.11 g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
2. Per KDB 2482227 D01v02r02 justification for test configurations of 5 ㎓ WiFi Single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ration of maximum output powers is less than 1.2 W/kg for 1g SAR and less than 3.0 W/kg for 10 g SAR.
3. 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 or all test channels were measured.
4. The device was configured to transmit continuously at the required data rated, 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. Procedures used to measure the duty factor are identical to that in the associated WLAN test reports.

Bluetooth Notes:

1. 1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests mode type. The theoretical maximum duty cycle defined by chipset manufacturer is 78.0 % In the ideal theory Duty Cycle, the test error tolerance [1%] of the test equipment was considered and applied to the measurement results. BT LE Mode was tested in FTM mode with maximum duty transmission Under the worst case SAR conditions of BT BDR. Please see sec.11.2 for the time-domain plot and calculation for duty factor of the device.

14. Simultaneous SAR Analysis

14.1 Body SAR Simultaneous Transmission Analysis

Simultaneous Transmission Summation Scenario with 5 ㎓ WLAN & Bluetooth						
	5 ㎓ WLAN SISO Ant.1	5 ㎓ WLAN MIMO	BT	∑ 1-g SAR	∑ 1-g SAR	SPLSR
	(W/kg)	(W/kg)	(W/kg)	(W/kg)	(W/kg)	(Yes / No)
	1	2	3	1+3	2+3	
Rear	0.428	0.32	0.484	0.912	0.804	No
Front						No
Left	0.588	0.594	0	0.588	0.594	No
Right	0.4	0.5	0.24	0.64	0.74	No
Top	0.179	0.22	0.228	0.407	0.448	No
Bottom						No

14.2 Simultaneous Transmission Conclusion

The above numerical summed SAR Results are sufficient to determine that simultaneous transmission cases will not exceed the SAR Limit and therefore measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE1528-2013.

15. SAR Measurement Variability and Uncertainty

In accordance with KDB procedure 865664 D01v01r04 SAR measurement 100 ㎒ to 6 ㎓, SAR 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 Measurement variability was assessed using the following procedures for each frequency Band:

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg for 1g SAR or < 2.0 W/kg for 10g SAR; steps 2) through 4) do not apply.

2) When the original highest measured 1g SAR is ≥ 0.80 W/kg or 10g SAR ≥ 2.0W/kg, repeat that measurement once.

3) Perform a second repeated measurement only 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 for 1g SAR or ≥ 3.625 W/kg for 10g SAR (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg for 1g SAR or ≥3.75 W/kg for 10g SAR and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

16. Measurement Uncertainty

The measured SAR was <1.5 W/Kg for 1g SAR and <3.75 W/Kg For 10g SAR for all frequency Bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE1528-2013 was not required.

17. SAR Test Equipment

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	ELI Phantom	-	N/A	N/A	N/A
Staubli #10	CS8Cspeag-TX90	F13/ 5SD0A1/ C/ 01	N/A	N/A	N/A
Staubli#13	CS9spe-TX2-60	F/21/0029145/C/001	N/A	N/A	N/A
Staubli #10	TX90 Xl speag	F13/ 5SD0A1/ A/ 01	N/A	N/A	N/A
Staubli#13	TX2-60 Lspe	F/21/0029145/A/001	N/A	N/A	N/A
Staubli #10	Teach Pendant (Joystick)	001729	N/A	N/A	N/A
Staubli#13	Teach Pendant (Joystick)	D21144507C	N/A	N/A	N/A
TESTO	608-H1/Thermometer	83348029	03/27/2023	Annual	03/27/2024
TESTO	608-H1/Thermometer	83348028	03/27/2023	Annual	03/27/2024
SPEAG	DAE4	648	04/25/2023	Annual	04/25/2024
SPEAG	DAE4	1750	09/19/2023	Annual	09/19/2024
SPEAG	E-Field Probe EX3DV4	3768	07/18/2023	Annual	07/18/2024
SPEAG	E-Field Probe EX3DV4	7681	11/27/2023	Annual	11/27/2024
SPEAG	Dipole D2450V2	1049	04/25/2023	Annual	04/25/2024
SPEAG	Dipole D5 ㎓ V2	1317	05/17/2023	Annual	05/17/2024
Agilent	Power Meter E4419B	MY41291386	09/21/2023	Annual	09/21/2024
Agilent	Power Meter N1911A	MY45101406	05/26/2023	Annual	05/26/2024
Agilent	Power Sensor 8481A	SG1091286	09/21/2023	Annual	09/21/2024
H.P	Power Sensor 8481A	MY41090675	09/21/2023	Annual	09/21/2024
Agilent	Wideband Power Sensor N1921A	MY55220026	07/28/2023	Annual	07/28/2024
Agilent	11636B/Power Divider	58698	01/15/2024	Annual	01/15/2025
SPEAG	DAKS 3.5	1038	01/25/2023	Annual	01/25/2024
SPEAG	DAKS 3.5	1031	08/24/2023	Annual	08/24/2024
SPEAG	DAKS 3.5	1038	01/22/2024	Annual	01/22/2025
SPEAG	Vector Reflectometer	0141013	01/11/2024	Annual	01/11/2025
SPEAG	MXA Signal Analyzer	MY49100108	01/09/2024	Annual	01/09/2025
R&S	Wireless Communication Test Set CMW500	115733	03/23/2023	Annual	03/23/2024
Agilent	SIGNAL GENERATOR N5182A	MY47070230	03/23/2023	Annual	03/23/2024
EMPOWER	RF Power Amplifier	1084	05/26/2023	Annual	05/26/2024
EMPOWER	RF Power Amplifier	1011	09/21/2023	Annual	09/21/2024
MICRO LAB	LP Filter / LA-15N	10453	09/21/2023	Annual	09/21/2024
MICRO LAB	LP Filter / LA-30N	-	09/21/2023	Annual	09/21/2024
MICRO LAB	LP Filter / LA-60N	32011	09/21/2023	Annual	09/21/2024
Agilent	Attenuator (3dB) 8693B	MY39260298	08/22/2023	Annual	08/22/2024
HP	Attenuator (3dB) 33340A	02427	08/22/2023	Annual	08/22/2024
HP	Attenuator (20dB) 8493C	09271	08/22/2023	Annual	08/22/2024
Agilent	Directional Bridge 86205A	3140A04581	04/25/2023	Annual	04/25/2024
OSI	Power Divider	#3	05/26/2023	Annual	05/26/2024
Agilent	MXA Signal Analyzer N9020A	MY50510407	06/07/2023	Annual	06/07/2024
HP	Dual Directional Coupler	16072	09/21/2023	Annual	09/21/2024
ROHDE&SCHWARZ	BLUETOOTH TESTER CBT	100272	01/16/2024	Annual	01/16/2025

* The E-field probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Verification measurement is performed by HCT Lab. before each test. The brain/body simulating material is calibrated by HCT using the DAKS 3.5 to determine the conductivity and permittivity (dielectric constant) of the brain/body-equivalent material.

18. Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/ IEEE C95.1 - 2005.

These measurements were taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the abortion and distribution of electromagnetic energy in the body are very complex phenomena the depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

19. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio frequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1 - 2005 , American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 ㎑ to 300 ㎓, New York: IEEE, Sept. 1992

[3] ANSI/IEEE C 95.1 - 2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 ㎑ to 300 ㎓, New York: IEEE, 2006

[4 ANSI/IEEE C95.3 - 2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: December 2002.

[5] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice or Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices

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Appendix A. DUT Ant. Information & SETUP PHOTO

Please refer to test DUT Ant. Information &setup photo file no. as follows:

Report No.
HCT-SR-2402-FC005-P

Appendix B. – SAR Test Plots

Test Laboratory: HCT CO., LTD
EUT Type: Tablet
Liquid Temperature: 20.1 ℃
Ambient Temperature: 20.2 ℃
Test Date: 02/16/2024
Plot No.: B1

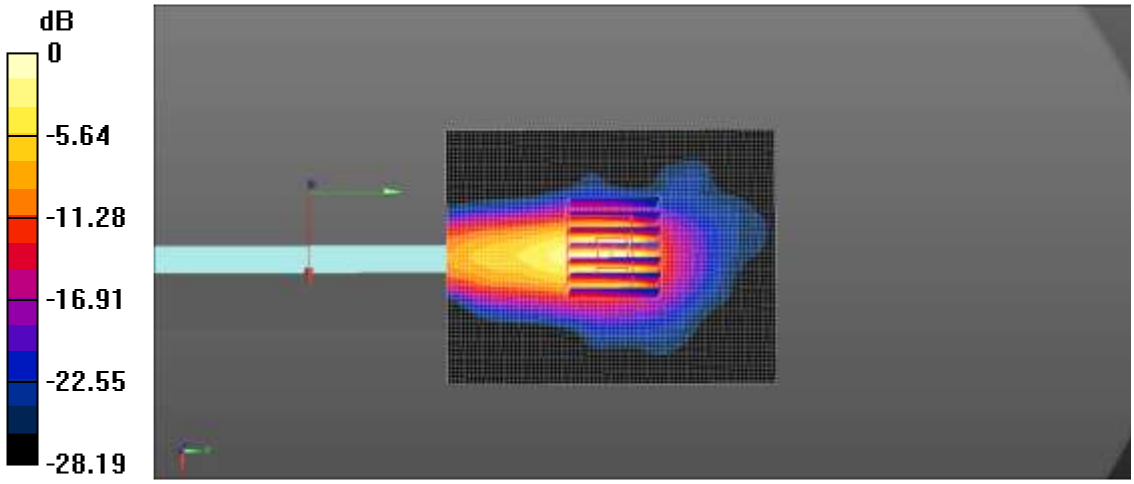
Communication System: UID 0, 2450MHz FCC (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.813 S/m; ε_r = 40.575; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7681; ConvF(7.46, 7.89, 8.02) @ 2412 MHz; Calibrated: 2023-11-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2023-04-25
- Phantom: ELI v5.0_2014_03_05; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

802.11b Body Right 1Mbps 1ch/Area Scan (71x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.01 W/kg

802.11b Body Right 1Mbps 1ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.596 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 0.502 W/kg; SAR(10 g) = 0.194 W/kg
Maximum value of SAR (measured) = 1.09 W/kg



0 dB = 1.09 W/kg = 0.37 dBW/kg

Test Laboratory:	HCT CO., LTD
EUT Type:	Tablet
Liquid Temperature:	20.1 ℃
Ambient Temperature:	20.2 ℃
Test Date:	02/16/2024
Plot No.:	B2

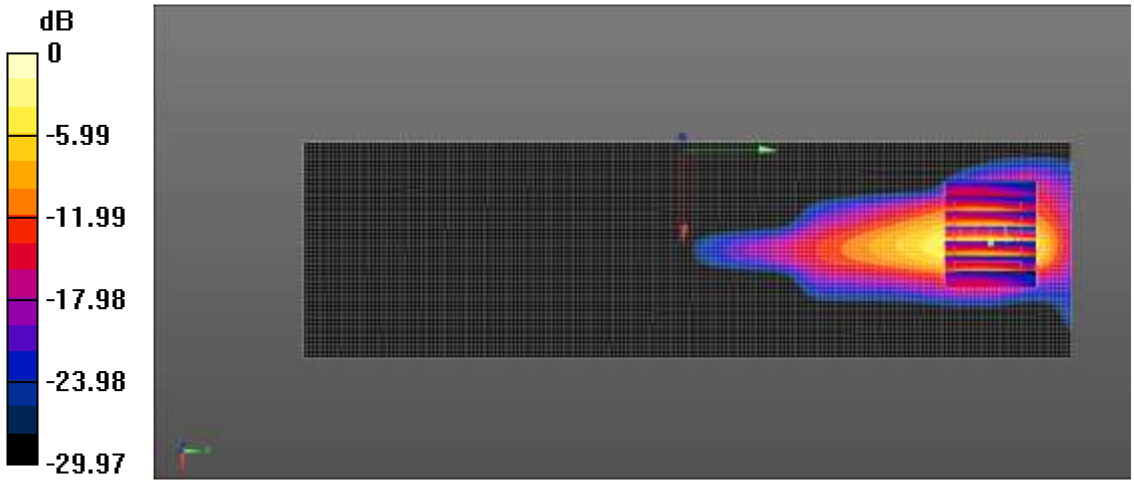
Communication System: UID 0, 2450MHz FCC (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.842 S/m; ε_r = 40.476; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7681; ConvF(7.46, 7.89, 8.02) @ 2437 MHz; Calibrated: 2023-11-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2023-04-25
- Phantom: ELI v5.0_2014_03_05; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

802.11n Body Left MCS8 6ch/Area Scan (61x211x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm.
Maximum value of SAR (interpolated) = 0.970 W/kg

802.11n Body Left MCS8 6ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.94 W/kg
SAR(1 g) = 0.479 W/kg; SAR(10 g) = 0.170 W/kg
Maximum value of SAR (measured) = 1.16 W/kg



0 dB = 1.16 W/kg = 0.64 dBW/kg

Test Laboratory: HCT CO., LTD
EUT Type: Tablet
Liquid Temperature: 20.1 ℃
Ambient Temperature: 20.2 ℃
Test Date: 02/16/2024
Plot No.: B3

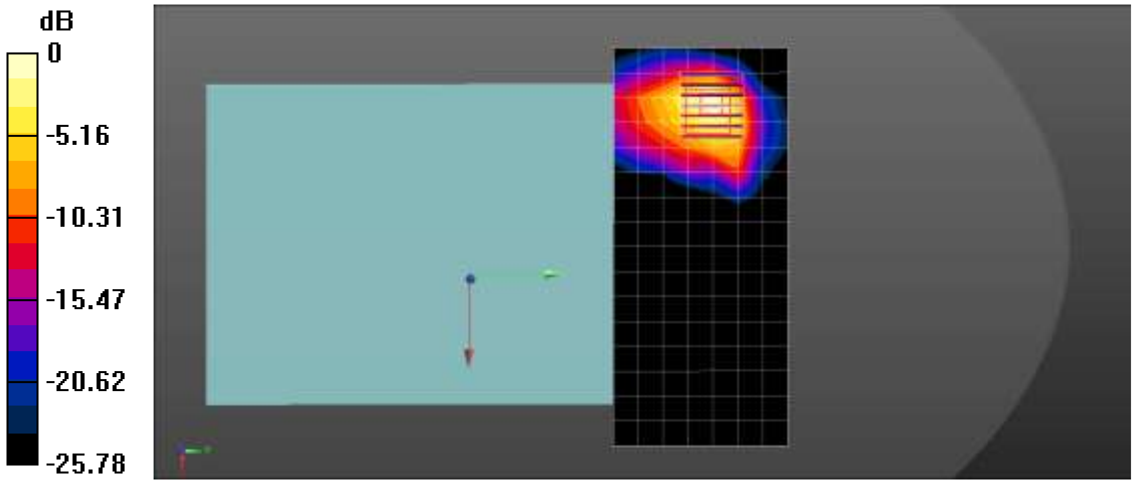
Communication System: UID 0, Bluetooth (0); Frequency: 2440 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2440 MHz; σ = 1.846 S/m; ε_r = 40.465; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7681; ConvF(7.46, 7.89, 8.02) @ 2440 MHz; Calibrated: 2023-11-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2023-04-25
- Phantom: ELI v5.0_2014_03_05; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bluetooth Body Rear LE 125K 255 19ch/Area Scan (17x8x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.831 W/kg

Bluetooth Body Rear LE 125K 255 19ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.18 W/kg
SAR(1 g) = 0.409 W/kg; SAR(10 g) = 0.177 W/kg
Maximum value of SAR (measured) = 0.794 W/kg



0 dB = 0.794 W/kg = -1.00 dBW/kg

Test Laboratory:	HCT CO., LTD
EUT Type:	Tablet
Liquid Temperature:	20.9 ℃
Ambient Temperature:	21.0 ℃
Test Date:	02/16/2024
Plot No.:	B4

Measurement Report for Device, EDGE LEFT, U-NII-2C, U-NII-3, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps), Channel 140 (5700.0 MHz)

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	EDGE LEFT, 0.00	U-NII-2C, U-NII-3	WLAN, 10062-CAD	5700.0, 140	4.88	5.22	36.3

Hardware Setup

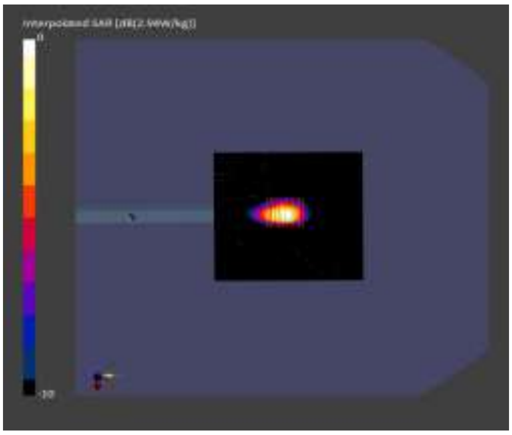
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - xxxx	EX3DV4 - SN3768, 2023-07-18	DAE4 Sn1750, 2023-09-19

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 100.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	0.325	0.461
psSAR10g [W/Kg]	0.088	0.10
Power Drift [dB]	-0.13	-0.11



Test Laboratory: HCT CO., LTD
EUT Type: Tablet
Liquid Temperature: 20.9 ℃
Ambient Temperature: 21.0 ℃
Test Date: 02/16/2024
Plot No.: B5

Measurement Report for Device, EDGE LEFT, U-NII-2C Standalone, IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle), Channel 140 (5700.0 MHz)

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	EDGE LEFT, 0.00	U-NII-2C Standalone	WLAN, 10591-AAC	5700.0, 140	4.88	5.22	36.3

Hardware Setup

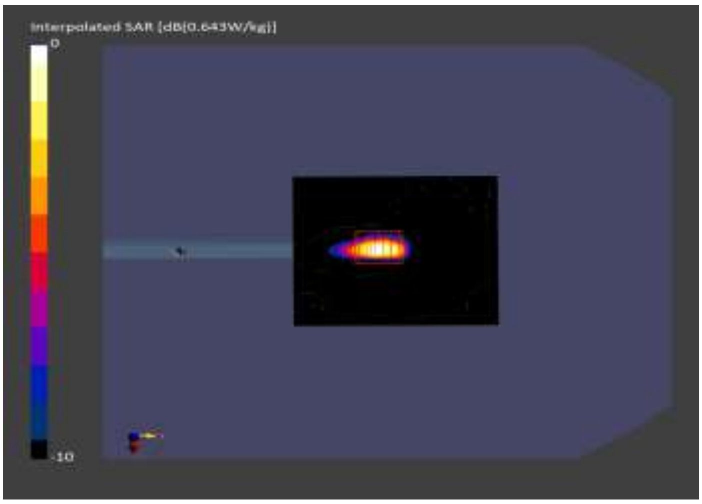
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - xxxx	EX3DV4 - SN3768, 2023-07-18	DAE4 Sn1750, 2023-09-19

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	100.0 x 100.0	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

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	0.395	0.449
psSAR10g [W/Kg]	0.098	0.097
Power Drift [dB]	0.13	0.09



Appendix C. – Dipole Verification Plots

■ Verification Data (2450 ㎒ Head)

Test Laboratory: HCT CO., LTD
Input Power 0.05 W
Liquid Temp: 20.1 ℃
Test Date: 02/16/2024

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:1049

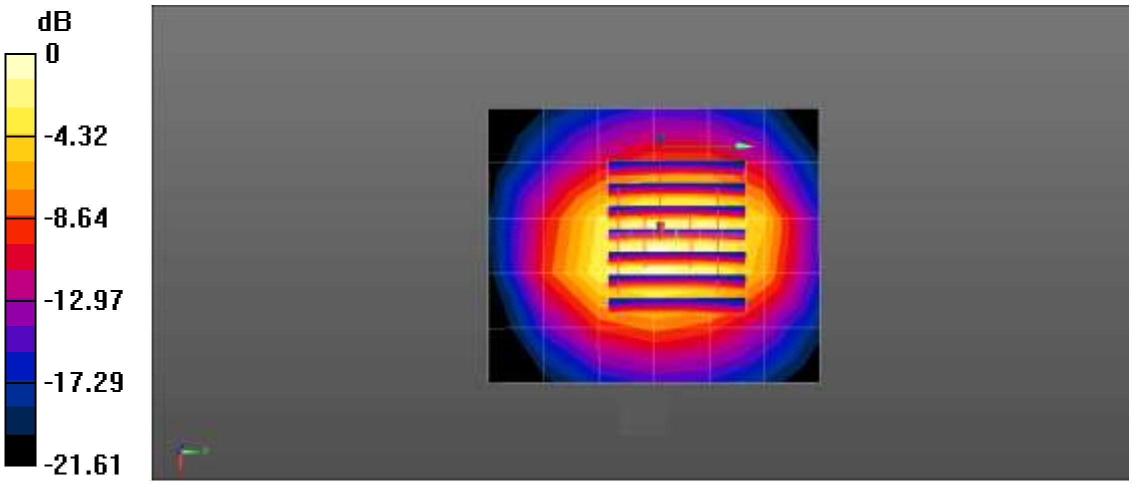
Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.857 S/m; ε_r = 40.428; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7681; ConvF(7.46, 7.89, 8.02) @ 2450 MHz; Calibrated: 2023-11-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2023-04-25
- Phantom: ELI v5.0_2014_03_05; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Dipole/2450MHz Head Verification/Area Scan (6x7x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 3.46 W/kg

Dipole/2450MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.18 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 5.43 W/kg
SAR(1 g) = 2.66 W/kg; SAR(10 g) = 1.26 W/kg
Maximum value of SAR (measured) = 4.38 W/kg



0 dB = 4.38 W/kg = 6.41 dBW/kg

■ Verification Data (5250 ㎒ Head)

Test Laboratory: HCT CO., LTD
Input Power 0.05 W
Liquid Temp: 20.9 ℃
Test Date: 02/16/2024

Measurement Report for Device, , , CW, Channel 0 (5250.0 MHz)

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	,		CW, 0--	5250.0, 0	5.37	4.70	37.0

Hardware Setup

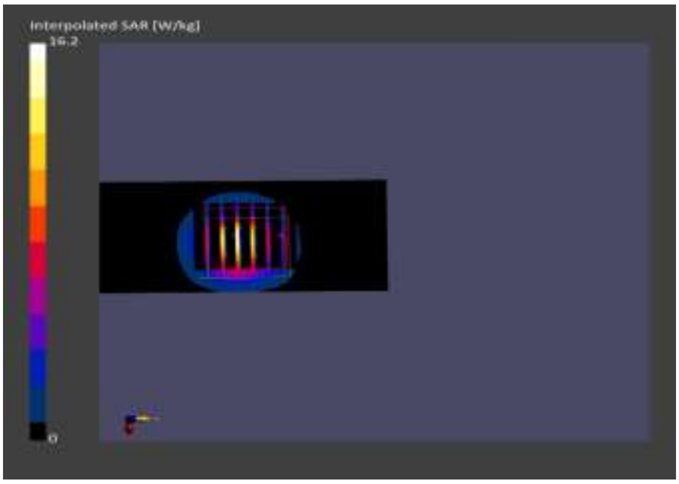
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - xxxx	EX3DV4 - SN3768, 2023-07-18	DAE4 Sn1750, 2023-09-19

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	3.47	3.88
psSAR10g [W/Kg]	1.02	1.08
Power Drift [dB]	0.00	-0.02



■ Verification Data (5600 ㎒ Head)

Test Laboratory: HCT CO., LTD
Input Power 0.05 W
Liquid Temp: 20.9 ℃
Test Date: 02/16/2024

Measurement Report for Device, , , CW, Channel 0 (5600.0 MHz)

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	,		CW, 0--	5600.0, 0	4.81	5.01	36.4

Hardware Setup

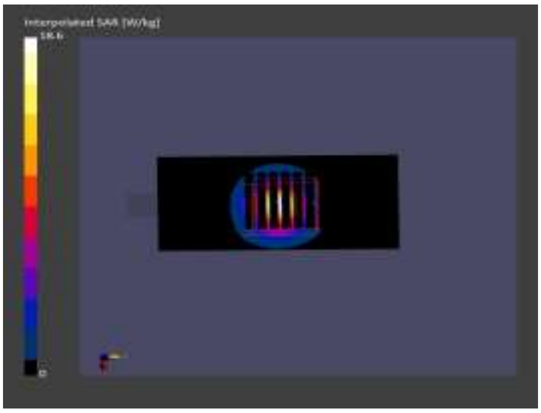
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - xxxx	EX3DV4 - SN3768, 2023-07-18	DAE4 Sn1750, 2023-09-19

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	3.69	4.04
psSAR10g [W/Kg]	1.03	1.12
Power Drift [dB]	0.01	0.01



■ Verification Data (5750 ㎒ Head)

Test Laboratory:	HCT CO., LTD
Input Power	0.05 W
Liquid Temp:	20.9 ℃
Test Date:	02/16/2024

Measurement Report for Device, , , CW, Channel 0 (5750.0 MHz)

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	,		CW, 0--	5750.0, 0	4.88	5.22	36.4

Hardware Setup

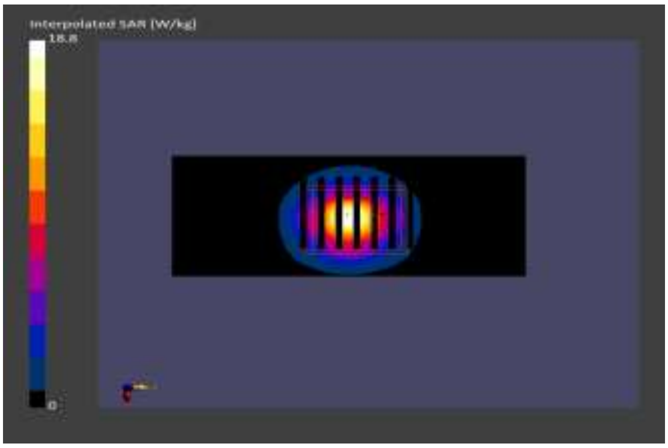
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI V4.0 (20deg probe tilt) - xxxx	EX3DV4 - SN3768, 2023-07-18	DAE4 Sn1750, 2023-09-19

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	3.58	3.94
psSAR10g [W/Kg]	0.997	1.07
Power Drift [dB]	-0.00	0.03



Appendix D. – SAR Tissue Characterization

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for
the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Harts grove.

Ingredients (% by weight)	Frequency (MHz)			
	2 450 – 2 700		3500 - 5 800	
Tissue Type	Head	Body	Head	Body
Water	71.88	73.2	65.52	78.66
Salt (NaCl)	0.16	0.1	0.0	0.0
Sugar	0.0	0.0	0.0	0.0
HEC	0.0	0.0	0.0	0.0
Bactericide	0.0	0.0	0.0	0.0
Triton X-100	19.97	0.0	17.24	10.67
DGBE	7.99	26.7	0.0	0.0
Diethylene glycol hexyl ether	-	-	-	-

Salt:	99 % Pure Sodium Chloride	Sugar:	98 % Pure Sucrose
Water:	De-ionized, 16M resistivity	HEC:	Hydroxyethyl Cellulose
DGBE:	99 % Di(ethylene glycol) butyl ether,[2-(2-butoxyethoxy) ethanol]		
Triton X-100(ultra-pure):	Polyethylene glycol mono[4-(1,1,3,3-tetramethylbutyl)phenyl] ether		

Composition of the Tissue Equivalent Matter

Appendix E. – SAR System Validation

Per FCC KCB 865664 D02v01r02, SAR system validation status should be document to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in IEEE 1528-2013 and FCC KDB 865664 D01v01r04. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.
A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

SAR System No.	Probe	Probe Type	Probe Calibration Point		Dipole	Date	Dielectric Parameters		CW Validation			Modulation Validation		
							Measured Permittivity	Measured Conductivity	Sensitivity	Probe Linearity	Probe Isotropy	MOD. Type	Duty Factor	PAR
17	7681	EX3DV4	Head	2450	1049	2023-12-22	39.3	1.84	PASS	PASS	PASS	OFDM	N/A	PASS
22	3768	EX3DV4	Head	5250	1317	2023-08-30	35.7	4.66	PASS	PASS	PASS	OFDM	N/A	PASS
22	3768	EX3DV4	Head	5600	1317	2023-08-30	35.5	5.01	PASS	PASS	PASS	OFDM	N/A	PASS
22	3768	EX3DV4	Head	5750	1317	2023-08-30	35.4	5.17	PASS	PASS	PASS	OFDM	N/A	PASS

SAR System Validation Summary 1g

Note;
All measurement were performed using probes calibrated for CW signal only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04. SAR system were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to KDB 865664 D01v01r04.