

TEST REPORT

FCC SAR Test for LGSBWAC95
Class II Permissive Change

APPLICANT
LG Electronics Inc.

REPORT NO.
HCT-SR-2412-FC010

DATE OF ISSUE
December 23, 2024

Tested by
Chan Min Ko



Technical Manager
Yun Jeang Heo



HCT CO., LTD.
Bongjai Huh
BongJai Huh / CEO



HCT CO.,LTD.

2-6, 73, 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 645 6300 Fax. +82 31 645 6401

TEST REPORT

FCC SAR Test for
C2PC

REPORT NO.

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FCC ID

BEJLGSBWAC95

Applicant

LG Electronics Inc.

222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 17709, Republic of
Korea

Product Name

RF Module

Model Name

LGSBWAC95

Date of Test

Nov. 08, 2024 ~ Nov. 13, 2024

Location of Test

☒ Permanent Testing Lab ☐ On Site Testing Lab

(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,
Gyeonggi-do, 17383 KOREA)

FCC Rule Part(s)

CFR 52.1091

Test Results

PASS (SAR Limit : 1.6 W/kg(1g))

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	Dec. 23, 2024	Initial Release

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	5
2. Test Location	6
3. Information of the EUT	7
4. Device Under Test Description.....	8
5. Introduction	12
6. Description of test equipment.....	13
7. SAR Measurement Procedure	14
8. Description of Test Position	16
9. RF Exposure Limits	17
10. FCC SAR General Measurement Procedures.....	18
11. Output Power Specifications.....	21
12. System Verification	26
13. RF Exposure Test Data Summary.....	28
14. Simultaneous SAR Analysis.....	31
15. SAR Measurement Variability and Uncertainty	32
16. Measurement Uncertainty	33
17. SAR Test Equipment	34
18. Conclusion.....	35
19. References	36
Appendix A. DUT Ant. Information & SETUP PHOTO	38
Appendix B. SAR Test Plots.....	39
Appendix C. System Verification Plots.....	43
Appendix D. – SAR Tissue Characterization	53
Appendix E. – SAR System Validation.....	54
Appendix F. Probe Calibration Data	
Appendix G. Dipole Calibration Data	

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 941225 D06 Hot Spot SAR v02r01
- FCC KDB Publication 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB Publication 447498 D01 General RF Exposure Guidance v06
- 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 Meas 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)

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	LGSBWAC95
Equipment Type	RF Module
FCC ID	BEJLGSBWAC95
Application Type	C2PC
Applicant	LG Electronics Inc.

3.2 Attestation of test result of device under test

The Highest Reported SAR			
Band	Tx. Frequency	Equipment Class	Reported SAR (W/kg)
			1 g Body
2.4 GHz WLAN	2 412 MHz ~ 2 462 MHz	DTS	0.4
U-NII-1	5 180 MHz ~ 5 240 MHz	NII	N/A
U-NII-2A	5 260 MHz ~ 5 320 MHz	NII	1.27
U-NII-2C	5 500 MHz ~ 5 720 MHz	NII	1.22
U-NII-3	5 745 MHz ~ 5 825 MHz	NII	0.54
Bluetooth	2 402 MHz ~ 2 480 MHz	DSS/DTS	< 0.1
Simultaneous SAR per KDB 690783 D01v01r03			1.27
Date(s) of Tests:	Nov. 08, 2024 ~ Nov. 12, 2024		

4. Device Under Test Description

4.1 DUT specification

Device Wireless specification overview		
Band & Mode	Operating Mode	Tx Frequency
U-NII-1	Data	5 180 MHz ~ 5 240 MHz
U-NII-2A	Data	5 260 MHz ~ 5 320 MHz
U-NII-2C	Data	5 500 MHz ~ 5 720 MHz
U-NII-3	Data	5 745 MHz ~ 5 825 MHz
2.4 GHz WLAN	Data	2 412 MHz ~ 2 462 MHz
Bluetooth EDR	Data	2 402 MHz ~ 2 472 MHz
Bluetooth LE	Data	2 401 MHz ~ 2 471 MHz
Device Description		
Device Serial Numbers	Mode	Serial Number
	WLAN2.4 GHz, 5 GHz, Bluetooth	EAT65167004
	The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics are within operational tolerances expected for production units.	

4.3 Nominal and Maximum Output Power Specifications

4.3.1 Maximum 2.4 GHz, 5 GHz WIFI output power

a. Maximum Power Pmax

Mode	Channel	SISO(ANT1=ANT2)					MIMO				
		a	b	g	n	ac	a	b	g	n	ac
WLAN 2.4GHz (20MHz)	1-5 ch		12.75	14	14			15.75	17	17	
	6-10 ch		13.5	14	14			16.5	17	17	
	11ch		13.75	14	14			16.75	17	17	
	12 ch		13.5	12	11.75			16.5	15	14.75	
	13 ch		11.25	5.75	3			14.25	8.75	6	
WLAN 2.4GHz (40MHz)	3-5 ch				13.25					16.25	
	6-8 ch				13.5					16.5	
	9 ch				12.5					15.5	
5GHz (20MHz)	U-NII-1	12			12	12	15			15	15
	U-NII-2A	12			12	12	15			15	15
	U-NII-2C	12			12	12	15			15	15
	U-NII-3	12			12	12	15			15	15
5GHz (40MHz)	U-NII-1				12	12				15	15
	U-NII-2A				11.5	11.75				14.5	14.75
	U-NII-2C				12	10.75				15	13.75
	U-NII-3				12	12				15	15
5GHz (80MHz)	U-NII-1					11					14
	U-NII-2A					9					12
	U-NII-2C					10					13
	U-NII-3					12					15

(Upper tolerance: target +2.0 dB)

4.3.2 Maximum Bluetooth Power

a. Maximum Power

Mode	ANT1
Bluetooth (1Mbps) (in dBm)	9.0
Bluetooth (EDR) (in dBm)	9.0
Bluetooth (LE,1M/2M) (in dBm)	8.0
Bluetooth (LE,125k/500k) (in dBm)	8.0

(Upper tolerance: target ± 1.0 dB)

4.4 DUT Antenna Locations

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 KDB447498 4.3.1 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 616217. bottom surface, excluding SAR test by FCC KDB 616217 D04v01r02, were analyzed by applying 0.4 w/kg according to FCC KDB 447498 D01v06 during simultaneous transmission analysis.

Antenna	Mode	Rear	Left	Right	Bottom	Top
WIFI 1	2.4 GHz, 5 GHz WLAN	Yes	Yes	No	No	No
WIFI2	2.4 GHz, 5 GHz WLAN	Yes	Yes	No	No	No
BT 1	Bluetooth	Yes	Yes	No	No	No

4.5 SAR Summation Scenario

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

Capable Transmit Configuration	Body
Bluetooth + WLAN 2.4 GHz Ant.1	Yes
Bluetooth + WLAN 2.4 GHz Ant.2	Yes
Bluetooth + WLAN 5 GHz Ant.1	Yes
Bluetooth + WLAN 5 GHz Ant.2	Yes
WLAN 2.4 GHz Ant.1 + WLAN 5 GHz Ant.2	Yes

4.9 SAR Test Considerations

4.9.1 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 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only for 5 GHz
- b) Up to 40 MHz Bandwidth only for 2.4 GHz
- c) 2Tx antenna output
- d) Up to 1024 QAM is supported
- e) TDWR and Band gap channels are **not** supported for 5 GHz
- f) MU-MIMO UL Operations are not 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 kHz to 300 GHz. 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 (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

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

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/m³)
- = 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 or Window 10 or Window 11 is working with SAR Measurement system DASY4 & DASY5 & DASY6 & DASY8 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.

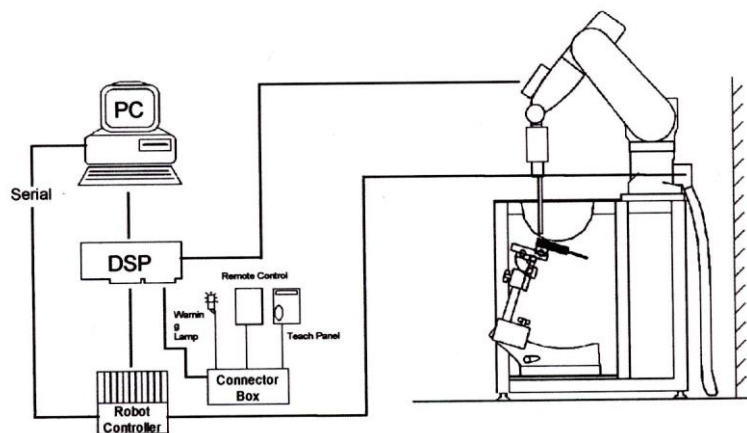


Figure 2. HCT SAR Lab. Test Measurement Set-up

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.

			$\leq 3 \text{ GHz}$	$> 3 \text{ GHz}$
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			$5 \pm 1 \text{ mm}$	$\cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location			$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan Spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$			$\leq 2 \text{ GHz: } \leq 15 \text{ mm}$ $2\text{-}3 \text{ GHz: } \leq 12 \text{ mm}$	$3\text{-}4 \text{ GHz: } \leq 12 \text{ mm}$ $4\text{-}6 \text{ GHz: } \leq 10 \text{ mm}$
			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 $\leq$ 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: $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$			$\leq 2 \text{ GHz: } \leq 8 \text{ mm}$ $2\text{-}3 \text{ GHz: } \leq 5 \text{ mm}^*$	$3\text{-}4 \text{ GHz: } \leq 5 \text{ mm}^*$ $4\text{-}6 \text{ GHz: } \leq 4 \text{ mm}^*$
Maximum zoom scan Spatial resolution normal to phantom surface	uniform grid: $\Delta z_{\text{zoom}}(n)$		$\leq 5 \text{ mm}$	$3\text{-}4 \text{ GHz: } \leq 4 \text{ mm}$ $4\text{-}5 \text{ GHz: } \leq 3 \text{ mm}$ $5\text{-}6 \text{ GHz: } \leq 2 \text{ mm}$
	graded grid	$\Delta z_{\text{zoom}}(1)$: between 1 st two Points closest to phantom surface	$\leq 4 \text{ mm}$	$3\text{-}4 \text{ GHz: } \leq 3 \text{ mm}$ $4\text{-}5 \text{ GHz: } \leq 2.5 \text{ mm}$ $5\text{-}6 \text{ GHz: } \leq 2 \text{ mm}$
		$\Delta z_{\text{zoom}}(n>1)$: between subsequent Points	$\leq 1.5 \cdot \Delta z_{\text{zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		$\geq 30 \text{ mm}$	$3\text{-}4 \text{ GHz: } \geq 28 \text{ mm}$ $4\text{-}5 \text{ GHz: } \geq 25 \text{ mm}$ $5\text{-}6 \text{ GHz: } \geq 22 \text{ mm}$
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 $\leq 1.4 \text{ W/kg}$, $\leq 8 \text{ mm}$, $\leq 7 \text{ mm}$ and $\leq 5 \text{ mm}$ 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 $\delta=0.02$.

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.

9. RF Exposure Limits

RF Exposure Limits for Frequencies Below 6GHz

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/kg)	CONTROLLED ENVIRONMENT Occupational (W/kg)
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 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.

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 chipset based 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-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 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 MHz (5.47 GHz – 5.85 GHz), 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 GHz – 5.65 GHz 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 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 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 GHz SAR test Requirements

SAR is measured for 2.4 GHz 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 GHz 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 GHz Band, the Initial Test Configuration Procedures should be followed.

10.2.6 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 GHz and 5 GHz 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.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When the 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.

10.2.7 Initial Test Configuration Procedure

For OFDM, in both 2.4 GHz 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.

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

11.1 WIFI Conducted Power measurement method

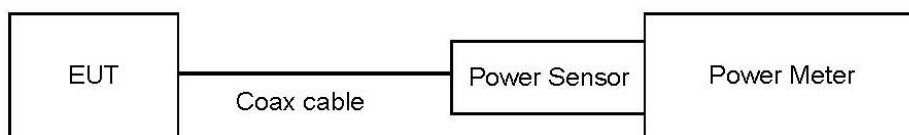
Un-Licensed Bands (DTS Band)

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



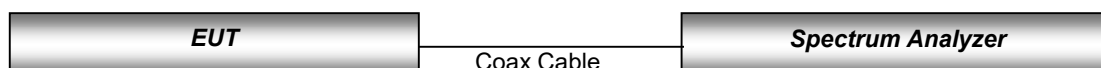
Un-Licensed Bands (NII Band)

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 GHz) Maximum Conducted Power

Mode	Frequency [MHz]	Channel	IEEE 802.11 (2.4 GHz) Average RF Conducted Power [dBm]		
			WIFI 1	WIFI 2	MIMO
802.11b	2 412	1	12.80	12.88	15.85
	2 437	6	13.54	13.58	16.57
	2 462	11	13.80	13.83	16.83
	2 467	12	13.22	13.80	16.53
	2 472	13	11.40	10.91	14.17

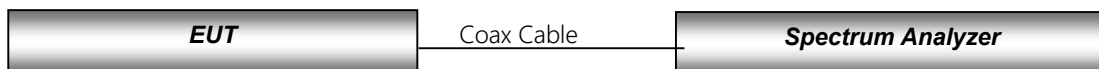
11.1.2 IEEE 802.11 (5 GHz) Maximum Conducted Power

Mode	Frequency [MHz]	Channel	IEEE 802.11 (5 GHz) Average RF Conducted Power [dBm]		
			WIFI 1	WIFI 2	MIMO
802.11a (20 MHz BW)	5 180	36	12.56	12.70	15.64
	5 200	40	12.76	12.15	15.48
	5 240	48	12.90	12.38	15.66
	5 260	52	12.64	12.63	15.65
	5 300	60	12.58	12.48	15.54
	5 320	64	12.47	12.53	15.51
	5 500	100	12.72	11.64	15.22
	5 580	116	12.74	11.24	15.06
	5 720	144	12.71	11.69	15.24
	5 745	149	12.79	12.34	15.58
	5 785	157	12.80	12.52	15.67
	5 825	165	12.52	11.53	15.06
Mode	Frequency [MHz]	Channel	IEEE 802.11 (5 GHz) Average RF Conducted Power [dBm]		
			WIFI 1	WIFI 2	MIMO
802.11n (40 MHz BW)	5 190	38	12.56	12.70	15.64
	5 230	46	12.76	12.15	15.48
	5 270	54	12.90	12.38	15.66
	5 310	62	12.64	12.63	15.65
	5 510	102	12.58	12.48	15.54
	5 550	110	12.47	12.53	15.51
	5 710	142	12.72	11.64	15.22
	5 755	151	12.74	11.24	15.06
	5 795	159	12.71	11.69	15.24
Mode	Frequency [MHz]	Channel	IEEE 802.11 (5 GHz) Average RF Conducted Power [dBm]		
			WIFI 1	WIFI 2	MIMO
802.11ac (80 MHz BW)	5 210	42	10.52	11.01	13.78
	5 290	58	8.50	9.11	11.83
	5 530	106	10.28	9.37	12.86
	5 690	138	12.13	12.73	15.45
	5 775	155	12.53	13.10	15.83

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



11.6 Bluetooth Conducted Power

11.6.1 Bluetooth Maximum Conducted Power

The Burst Averaged-conducted power

Mode	Channel	Max. Average Conducted Power [dBm]
DH5	0	8.62
	39	9.04
	78	9.05

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.

11.6.2 Bluetooth-LE Maximum Conducted Power

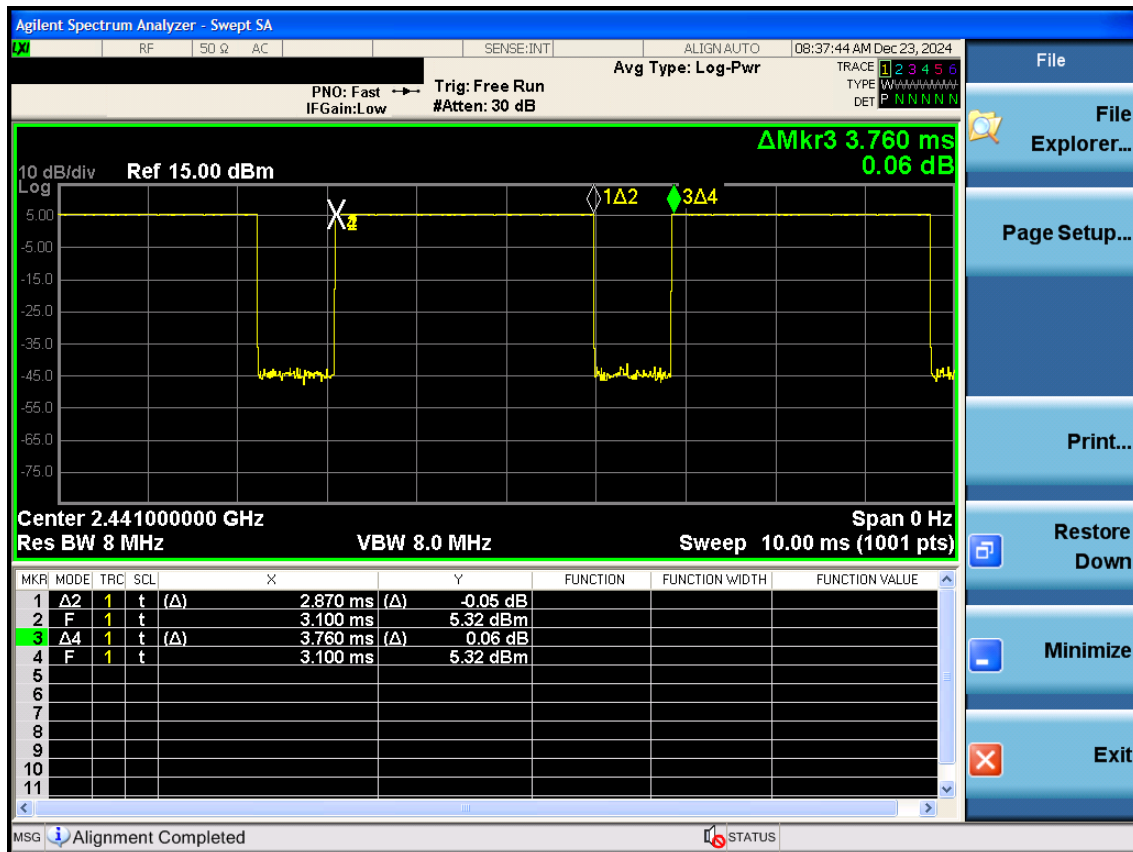
The Burst Averaged-conducted power

Mode	Channel	Max. Average Conducted Power [dBm]
125K 37 Packet	37	8.05
	17	8.30
	39	8.74
125K 255 Packet	37	8.11
	17	8.30
	39	8.76
500K 37 Packet	0	8.14
	17	8.34
	36	8.83
500K 255 Packet	0	8.15
	17	8.35
	36	8.81

The Burst Averaged-conducted power

Mode	Channel	Max. Average Conducted Power [dBm]
1M 37 Packet	37	8.16
	17	8.45
	39	8.82
1M 255 Packet	37	8.17
	17	8.40
	39	8.76
2M 37 Packet	0	8.16
	17	8.40
	36	8.74
2M 255 Packet	0	8.14
	17	8.31
	36	8.71

Bluetooth DH 5 Mode



Duty Cycle

$$= (\text{BT-On time} / \text{BT-Full time}) = (2.870 / 3.760) = 0.762 \text{ (DH5)}$$

BT DH5 Maximum Duty Factor:

The duty cycle of DH5 measured by DUT was 76.2%. For more information on BT , please refer to the technical description document.

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
2024/11/07	21.8	2450H	2 400	1.773	39.059	1.756	39.290	+ 0.97	- 0.59
			2 450	1.813	39.126	1.800	39.200	+ 0.72	- 0.19
			2 500	1.860	39.226	1.855	39.140	+ 0.27	+ 0.22
2024/11/08	21.8	2450H	2 400	1.748	39.366	1.756	39.290	- 0.46	+ 0.19
			2 450	1.805	39.154	1.800	39.200	+ 0.28	- 0.12
			2 500	1.863	38.976	1.855	39.140	+ 0.43	- 0.42
2024/11/13	22.4	2450H	2 400	1.758	39.523	1.756	39.290	+ 0.11	+ 0.59
			2 450	1.794	39.621	1.800	39.200	- 0.33	+ 1.07
			2 500	1.842	39.719	1.855	39.140	- 0.70	+ 1.48
2024/11/11	21.6	5180H-5320H	5 180	4.681	36.925	4.635	36.010	+ 0.99	+ 2.54
			5 250	4.817	36.710	4.706	35.930	+ 2.36	+ 2.17
			5 280	4.874	36.690	4.737	35.894	+ 2.89	+ 2.22
			5 320	4.934	36.714	4.778	35.846	+ 3.26	+ 2.42
2024/11/12	21.6	5180H-5320H	5 180	4.571	36.907	4.635	36.010	- 1.38	+ 2.49
			5 250	4.703	36.686	4.706	35.930	- 0.06	+ 2.10
			5 280	4.757	36.669	4.737	35.894	+ 0.42	+ 2.16
			5 320	4.811	36.696	4.778	35.846	+ 0.69	+ 2.37
2024/11/11	21.6	5500H-5600H	5 500	5.071	36.650	4.963	35.640	+ 2.18	+ 2.83
			5 600	5.127	36.430	5.065	35.530	+ 1.22	+ 2.53
			5 750	5.345	36.187	5.219	35.360	+ 2.41	+ 2.34
2024/11/12	21.6	5500H-5600H	5 500	4.950	36.639	4.963	35.640	- 0.26	+ 2.80
			5 600	5.010	36.415	5.065	35.530	- 1.09	+ 2.49
			5 750	5.218	36.193	5.219	35.360	- 0.02	+ 2.36
2024/11/11	21.6	5750H-5825H	5 750	5.345	36.187	5.219	35.360	+ 2.41	+ 2.34
			5 800	5.306	36.174	5.270	35.300	+ 0.68	+ 2.48
			5 825	5.297	36.140	5.296	35.270	+ 0.02	+ 2.47
2024/11/12	21.6	5750H-5825H	5 750	5.218	36.193	5.219	35.360	- 0.02	+ 2.36
			5 800	5.185	36.187	5.270	35.300	- 1.61	+ 2.51
			5 825	5.177	36.121	5.296	35.270	- 2.25	+ 2.41

12.2 System Verification

Input Power: 50 mW

Freq.	Date	Probe	Dipole	Liquid	Amb. Temp.	Liquid Temp.	1 W Target SAR _{1q} (SPEAG)	50mW Measured SAR _{1q}	1 W Normalized SAR _{1q}	Deviation	Limit
[MHz]		(S/N)	(S/N)		[°C]	[°C]	[W/kg]	[W/kg]	[W/kg]	[%]	[%]
2 450	2024/11/07	7651	743	Head	21.9	21.8	51.8	2.54	50.80	- 1.93	± 10
2 450	2024/11/08	7651		Head	22.0	21.8	51.8	2.54	50.80	- 1.93	± 10
2 450	2024/11/13	7370		Head	22.6	22.4	51.8	2.67	53.40	+ 3.09	± 10
5 250	2024/11/11	7651	1107	Head	21.8	21.6	80.2	3.99	79.80	- 0.50	± 10
5 250	2024/11/12	7651		Head	21.7	21.6	80.2	3.91	78.20	- 2.49	± 10
5 600	2024/11/11	7651		Head	21.8	21.6	82.1	4.14	82.80	+ 0.85	± 10
5 600	2024/11/12	7651		Head	21.7	21.6	82.1	4.04	80.80	- 1.58	± 10
5 750	2024/11/11	7651		Head	21.8	21.6	79.9	3.70	74.00	- 7.38	± 10
5 750	2024/11/12	7651		Head	21.7	21.6	79.9	3.63	72.60	- 9.14	± 10

12.3 System Verification Procedure

For SAR Measurement

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. RF Exposure Test Data Summary

13.1 SAR Measurement Results

13.1.1 Body SAR Measurement Considerations

DTS Body SAR																
Frequency		Mode	Ant.	Band width (MHz)	Data Rate	Tune-Up Limit (dBm)	Meas. Power (dBm)	Power Drift (dB)	Test Position	Duty Cycle	Distance (mm)	Meas. SAR (W/kg)	Scaling Factor	Scaling Factor (Duty)	Reported SAR (W/kg)	Plot No.
MHz	Ch.															
2 472	11	802.11b	1	20	1 Mbps	15.75	13.80	-0.07	Rear	99.6	0	0.193	1.567	1.004	0.304	-
2 472	11	802.11b	1	20	1 Mbps	15.75	13.80	-0.19	Left	99.6	0	0.045	1.567	1.004	0.071	-
2 412	1	802.11b	1	20	1 Mbps	14.75	12.80	-0.11	Rear	99.6	0	0.150	1.567	1.004	0.236	-
2 437	6	802.11b	1	20	1 Mbps	15.50	13.54	-0.18	Rear	99.6	0	0.140	1.570	1.004	0.221	-
2 472	11	802.11b	2	20	1 Mbps	15.75	13.83	0.00	Rear	99.6	0	0.062	1.556	1.004	0.097	-
2 472	11	802.11b	2	20	1 Mbps	15.75	13.83	-0.17	Left	99.6	0	0.007	1.556	1.004	0.011	-
2 412	1	802.11b	2	20	1 Mbps	14.75	12.88	-0.02	Rear	99.6	0	0.077	1.538	1.004	0.119	-
2 437	6	802.11b	2	20	1 Mbps	15.50	13.58	-0.01	Rear	99.6	0	0.052	1.556	1.004	0.081	-
2 472	11	802.11b	1+2	20	1Mbps	18.75	16.83	0.02	Rear	99.6	0	0.220	1.567	1.004	0.346	-
2 472	11	802.11b	1+2	20	1Mbps	18.75	16.83	-0.01	Left	99.6	0	0.056	1.567	1.004	0.088	-
2 412	1	802.11b	1+2	20	1Mbps	17.75	15.85	0.05	Rear	99.6	0	0.251	1.567	1.004	0.395	A1
2 437	6	802.11b	1+2	20	1Mbps	18.5	16.57	0.00	Rear	99.6	0	0.185	1.570	1.004	0.292	-
ANSI/ IEEE C95.1 - 2005- Safety Limit Spatial Peak Uncontrolled Exposure/ General Population													Body 1.6 W/kg Averaged over 1 gram			

note:

The 2.4 GHz 802.11g/n OFDM SAR test is excluded by Sec. 5.2.2 of FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02.

NII Hotspot SAR

Frequency		Mode	Ant.	Band width (MHz)	Data Rate (Mbps)	Tune-Up Limit (dBm)	Meas. Power (dBm)	Power Drift (dB)	Test Position	Duty Cycle	Distance (mm)	Meas. SAR (W/kg)	Scaling Factor	Scaling Factor (Duty)	Reported SAR (W/kg)	Plot No.
MHz	Ch.															
5 270	54	802.11n	1	40	MCS 0	14.0	12.65	-0.03	Rear	97.6	0	0.811	1.365	1.025	1.134	-
5 270	54	802.11n	1	40	MCS 0	14.0	12.65	0.02	Left	97.6	0	0.062	1.365	1.025	0.087	-
5 300	60	802.11a	1	20	6Mbps	14.0	12.58	-0.05	Rear	97.2	0	0.585	1.387	1.029	0.835	-
5 320	64	802.11a	1	20	6Mbps	14.0	12.47	-0.08	Rear	97.2	0	0.582	1.422	1.029	0.851	-
5 270	54	802.11n	1	40	MCS 0	14.0	12.65	-0.17	Rear	97.6	0	0.819	1.365	1.025	1.145	#
5 550	110	802.11n	1	40	MCS 0	14.0	12.64	-0.16	Rear	97.6	0	0.422	1.368	1.025	0.591	-
5 550	110	802.11n	1	40	MCS 0	14.0	12.64	-0.18	Left	97.6	0	0.074	1.368	1.025	0.104	-
5 510	102	802.11n	1	40	MCS 0	14.0	12.38	0.06	Rear	97.6	0	0.362	1.452	1.025	0.539	-
5 710	138	802.11ac	1	80	MCS 0	14.0	12.13	-0.18	Rear	90.0	0	0.149	1.538	1.111	0.255	-
5 775	155	802.11ac	1	80	MCS 0	14.0	12.53	-0.12	Rear	90.0	0	0.319	1.403	1.111	0.497	-
5 775	155	802.11ac	1	80	MCS 0	14.0	12.53	0.03	Left	90.0	0	0.118	1.403	1.111	0.184	-
5 270	54	802.11n	2	40	MCS 0	14.0	13.05	-0.06	Rear	97.6	0	0.246	1.245	1.025	0.314	-
5 270	54	802.11n	2	40	MCS 0	14.0	13.05	0.00	Left	97.6	0	0.036	1.245	1.025	0.046	-
5 300	60	802.11a	2	20	6Mbps	14.0	12.48	0.11	Rear	97.2	0	0.221	1.419	1.029	0.323	-
5 320	64	802.11a	2	20	6Mbps	14.0	12.53	-0.06	Rear	97.2	0	0.235	1.403	1.029	0.339	-
5 550	110	802.11n	2	40	MCS 0	14.0	12.34	0.03	Rear	97.6	0	0.283	1.466	1.025	0.425	-
5 550	110	802.11n	2	40	MCS 0	14.0	12.34	0.03	Left	97.6	0	0.034	1.466	1.025	0.051	-
5 510	102	802.11n	2	40	MCS 0	14.0	12.13	0.01	Rear	97.6	0	0.280	1.538	1.025	0.441	-
5 710	138	802.11ac	2	80	MCS 0	14.0	12.73	0.06	Rear	90.0	0	0.168	1.340	1.111	0.250	-
5 775	155	802.11ac	2	80	MCS 0	14.0	13.10	0.12	Rear	90.0	0	0.185	1.230	1.111	0.253	-
5 775	155	802.11ac	2	80	MCS 0	14.0	13.10	0.00	Left	90.0	0	0.034	1.230	1.111	0.046	-
5 270	54	802.11n	1+2	40	MCS 0	14.0	12.65	-0.17	Rear	97.6	0	0.906	1.365	1.025	1.267	A2
5 270	54	802.11n	1+2	40	MCS 0	14.0	12.65	-0.03	Left	97.6	0	0.073	1.365	1.025	0.102	-
5 300	60	802.11a	1+2	20	6Mbps	14.0	12.48	-0.16	Rear	97.2	0	0.773	1.419	1.029	1.128	-
5 320	64	802.11a	1+2	20	6Mbps	14.0	12.53	-0.04	Rear	97.2	0	0.696	1.403	1.029	1.005	-
5 270	54	802.11n	1+2	40	MCS 0	14.0	12.65	-0.02	Rear	97.6	0	0.854	1.365	1.025	1.194	#
5 550	110	802.11n	1+2	40	MCS 0	14.0	12.34	-0.14	Rear	97.6	0	0.710	1.466	1.025	1.066	-
5 550	110	802.11n	1+2	40	MCS 0	14.0	12.34	0.03	Left	97.6	0	0.091	1.466	1.025	0.137	-
5 510	102	802.11n	1+2	40	MCS 0	14.0	11.63	0.02	Rear	97.6	0	0.688	1.726	1.025	1.217	-
5 710	138	802.11ac	1+2	80	MCS 0	14.0	12.13	0.09	Rear	90.0	0	0.314	1.538	1.111	0.537	-
5 775	155	802.11ac	1+2	80	MCS 0	14.0	12.53	0.07	Rear	90.0	0	0.349	1.403	1.111	0.544	-
5 775	155	802.11ac	1+2	80	MCS 0	14.0	12.53	0.09	Left	90.0	0	0.146	1.403	1.111	0.228	-
ANSI/ IEEE C95.1 - 2005- Safety Limit Spatial Peak Uncontrolled Exposure/ General Population												Body 1.6 W/kg Averaged over 1 gram				

Measurement Validity

DSS Body SAR

Frequency		Mode	Ant.	Tune-Up Limit (dBm)	Meas. Power (dBm)	Power Drift (dB)	Test Position	Distance (mm)	Meas. SAR (W/kg)	Scaling Factor	Scaling Factor (Duty)	Reported SAR (W/kg)	Plot No.
MHz	Ch.												
2 441	39	Bluetooth DH5	1	10.0	9.04	0.02	Rear	0	0.048	1.247	1.312	0.079	-
2 441	39	Bluetooth DH5	1	10.0	9.04	0.00	Left	0	0.000	1.247	1.312	0.000	-
2 402	0	Bluetooth DH5	1	10.0	8.62	-0.01	Rear	0	0.052	1.374	1.312	0.094	-
2 480	78	Bluetooth DH5	1	10.0	9.05	-0.11	Rear	0	0.059	1.245	1.312	0.096	A3
ANSI/ IEEE C95.1 - 2005- Safety Limit Spatial Peak Uncontrolled Exposure/ General Population									Body 1.6 W/kg Averaged over 1 gram				

13.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, FCC KDB Procedure.
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 D01v06.
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 D01v06 was applied to determine SAR test exclusion for adjacent edge configurations

WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. For initial test position, the highest extrapolated peak SAR will be used. 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 positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR results is ≤ 0.8 W/kg for 1g SAR and ≤ 2.0 W/kg for 10 g SAR or all test position are measured.
2. Per KDB 2482227 D01v02r02 justification for test configurations of 2.4 GHz 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 GHz 802.11 g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
3. Per KDB 2482227 D01v02r02 justification for test configurations of 5 GHz WiFi Single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission mode was 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 1 g SAR and less than 3.0 W/kg for 10 g SAR.
4. 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.
5. 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. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests mode type. Per October 2016 TCBC Workshop Notes, the reported SAR was scaled to 100% transmission duty factor to determine compliance. Please see sec.11 for the time-domain plot and calculation for duty factor of the device.

14. Simultaneous SAR Analysis

This device is contained transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per KDB Publication 447498 D01v06 4.3.2, simultaneous transmission SAR test exclusion may be applied when the sum of 1g SAR and 10g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is $\leq 1.6\text{W/kg}$ for 1g SAR and $\leq 4\text{ W/kg}$ for 10g SAR. The different test positions in an exposure condition may be considered collectively to determine SAR exclusion according to the sum of 1g or 10g SAR.

If the sum result with each antenna exceeds the FCC SAR limit of 1.6 W/kg 1g ,4.0 W/kg 10g, the SPLSR was re-evaluated according to FCC KDB 447498 D01v06 4.3.2.

	WLAN 2.4G Ant.1	WLAN 2.4G Ant.2	WLAN 5G Ant.1	WLAN 5G Ant.2	Bluetooth
	1	2	3	4	5
Rear	0.304	0.119	1.145	0.441	0.096
Left	0.071	0.011	0.184	0.051	0.000

	Summation	Summation	Summation	Summation
	1+5	2+5	3+5	4+5
Rear	0.400	0.215	1.241	0.537
Left	0.071	0.011	0.184	0.051

14.1 Conclusion

The above numerical summed SAR results is sufficient to show that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01V06 and IEEE 1528-2013 Section 6.3.4.1

15. SAR Measurement Variability and Uncertainty

In accordance with KDB procedure 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz, 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 ≥ 2.0 W/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.

Frequency		Mode/Band	Configuration	Measured SAR (W/kg)	Repeated SAR (W/kg)	SAR Ratio
MHz	Channel					
5 270	54	WLAN 5 GHz (Ant.1)	Rear	0.811	0.819	1.01
5 270	54	WLAN 5 GHz (Ant.1+2)	Rear	0.906	0.854	1.06

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	SAM Phantom	-	N/A	N/A	N/A
SPEAG	ELI Phantom	-	N/A	N/A	N/A
HP	SAR System Control PC	-	N/A	N/A	N/A
Staubli	CS8Cspeag-TX90	F12/ 5K9GA1/ C/ 01	N/A	N/A	N/A
Staubli	TX90 XLspeag	F12/ 5K9GA1/ A/ 01	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	S-1206 0513	N/A	N/A	N/A
TESTO	175-H1/Thermometer	40331936309	12/26/2023	Annual	12/26/2024
SPEAG	DAE4	1417	02/16/2024	Annual	02/16/2025
SPEAG	DAE4	648	04/19/2024	Annual	04/19/2025
SPEAG	E-Field Probe EX3DV4	7651	03/18/2024	Annual	03/18/2025
SPEAG	E-Field Probe EX3DV4	7370	08/22/2024	Annual	08/22/2025
SPEAG	Dipole D2450V2	743	03/14/2024	Annual	03/14/2025
SPEAG	Dipole D5GHzV2	1107	04/19/2024	Annual	05/17/2025
Agilent	Power Meter E4419B	MY41291386	09/11/2024	Annual	09/11/2025
Agilent	Power Meter N1911A	MY45101406	05/21/2024	Annual	05/21/2025
Agilent	Power Sensor 8481A	SG1091286	09/12/2024	Annual	09/12/2025
H.P	Power Sensor 8481A	MY41090675	09/12/2024	Annual	09/12/2025
Agilent	Wideband Power Sensor N1921A	MY55220026	07/30/2024	Annual	07/30/2025
Agilent	11636B/Power Divider	58698	01/15/2024	Annual	01/15/2025
SPEAG	DAKS 3.5	1038	01/22/2024	Annual	01/22/2025
SPEAG	Vector Reflectometer	0141013	01/11/2024	Annual	01/11/2025
SPEAG	DAKS 12	1048	03/20/2024	Annual	03/20/2025
SPEAG	Vector Reflectometer	21393001	03/21/2024	Annual	03/21/2025
SPEAG	MXA Signal Analyzer	MY49100108	01/09/2024	Annual	01/09/2025
H.P	Network Analyzer /8753ES	JP39240221	12/26/2023	Annual	12/26/2024
Protek	NETWORK ANALYZER	X11-15305	02/15/2024	Annual	02/15/2025
Agilent	SIGNAL GENERATOR N5182A	MY47070230	03/19/2024	Annual	03/19/2025
Keysight	PSG Vector Signal Generator	MY50350097	03/05/2024	Annual	03/05/2025
EMPOWER	RF Power Amplifier	1041D/C0508	05/21/2024	Annual	05/21/2025
EMPOWER	RF Power Amplifier	1011	09/11/2024	Annual	09/11/2025
MICRO LAB	LP Filter / LA-30N	-	09/11/2024	Annual	09/11/2025
MICRO LAB	LP Filter / LA-60N	32011	09/11/2024	Annual	09/11/2025
Agilent	Attenuator (3dB) 8693B	MY39260298	08/20/2024	Annual	08/20/2025
HP	Attenuator (20dB) 8493C	09271	08/21/2024	Annual	08/21/2025
Agilent	Directional Bridge 86205A	3140A04581	04/22/2024	Annual	04/22/2026
Agilent	MXA Signal Analyzer N9020A	MY50510407	06/04/2024	Annual	06/04/2025
KEYSIGHT	EXG Vector Signal Generator	MY50350097	03/05/2024	Annual	03/05/2025
HP	Dual Directional Coupler	16072	09/11/2024	Annual	09/11/2025
Narda	DIRECTIONAL COUPLER	07066	01/08/2024	Annual	01/08/2025
YAMADA	STRAIGHT RULE	-	06/25/2024	Annual	06/25/2025

* 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 and RF Exposure 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 absorption and distribution of electromagnetic energy in the body are very complex phenomena that 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.

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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-2412-FC010-P

Appendix B. SAR Test Plots

SAR Test Plot

Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Ambient Temperature: 22.0 °C
Liquid Temperature: 21.8 °C
Test Date: 11/08/2024
Plot No.: A1

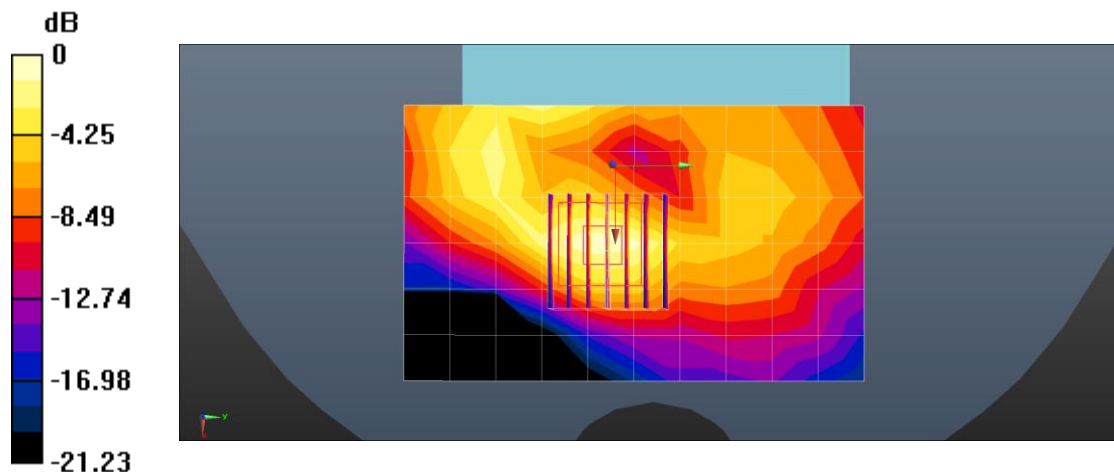
Communication System: UID 0, 2450MHz FCC (0); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412 \text{ MHz}$; $\sigma = 1.761 \text{ S/m}$; $\epsilon_r = 39.313$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(7.62, 7.91, 7.15) @ 2412 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

802.11b Body Rear 1Mbps 1ch/Area Scan_Main (7x11x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$
Maximum value of SAR (measured) = 0.351 W/kg

802.11b Body Rear 1Mbps 1ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 14.63 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.450 W/kg
SAR(1 g) = 0.251 W/kg; SAR(10 g) = 0.122 W/kg
Maximum value of SAR (measured) = 0.380 W/kg



0 dB = 0.380 W/kg = -4.20 dBW/kg

Test Laboratory: HCT CO., LTD
 EUT Type: Mobile Phone
 Ambient Temperature: 21.8 °C
 Liquid Temperature: 21.6 °C
 Test Date: 11/12/2024
 Plot No.: A2

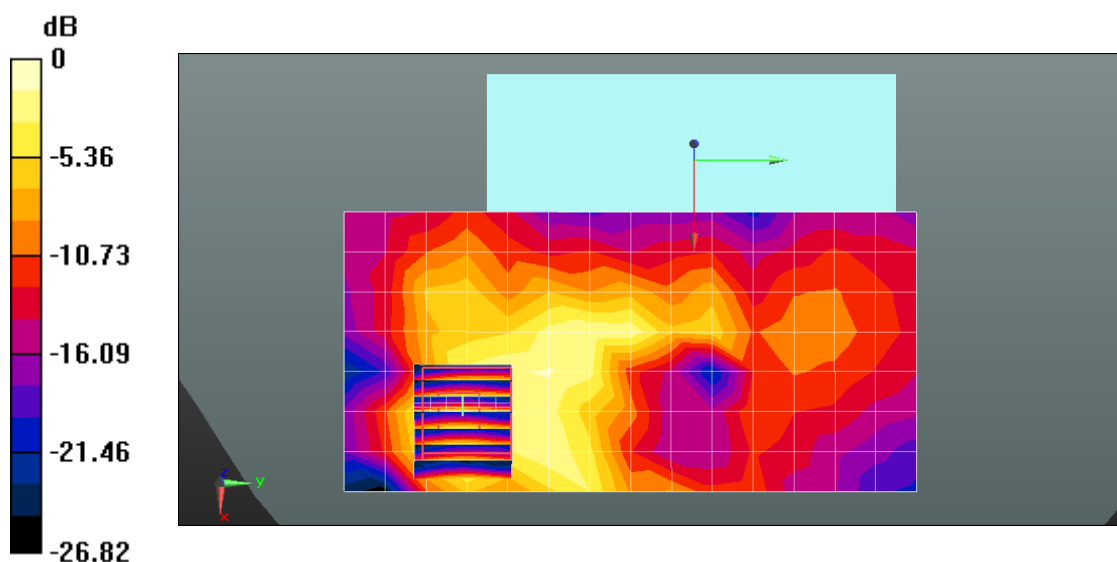
Communication System: UID 0, WIFI 5GHz n40 (0); Frequency: 5270 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5270 \text{ MHz}$; $\sigma = 4.742 \text{ S/m}$; $\epsilon_r = 36.667$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(5.59, 5.9, 5.32) @ 5270 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

802.11n40 Body Rear MCS0 54ch/Area Scan_Main (8x15x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
 Maximum value of SAR (measured) = 1.80 W/kg

802.11n40 Body Rear MCS0 54ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$
 Reference Value = 22.07 V/m; Power Drift = -0.17 dB
 Peak SAR (extrapolated) = 2.64 W/kg
SAR(1 g) = 0.906 W/kg; SAR(10 g) = 0.337 W/kg
 Maximum value of SAR (measured) = 1.84 W/kg



0 dB = 1.84 W/kg = 2.65 dBW/kg

Test Laboratory: HCT CO., LTD
 EUT Type: Mobile Phone
 Ambient Temperature: 22.6 °C
 Liquid Temperature: 22.4 °C
 Test Date: 11/13/2024
 Plot No.: A3

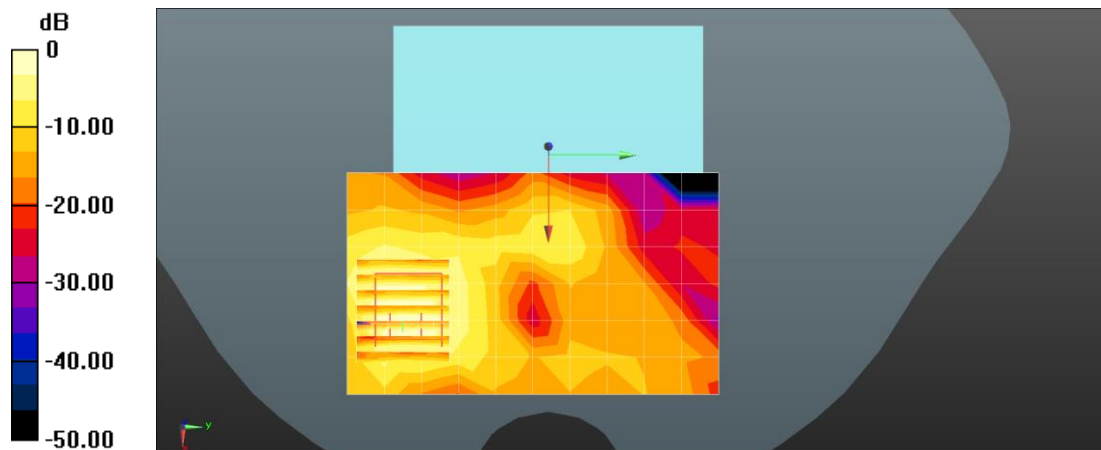
Communication System: UID 0, Bluetooth (0); Frequency: 2480 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2480$ MHz; $\sigma = 1.821$ S/m; $\epsilon_r = 39.667$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7370; ConvF(6.68, 7.54, 7.31) @ 2480 MHz; Calibrated: 2024-08-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2024-04-19
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Bluetooth Body Rear DH5 78ch/Area Scan_Main (7x11x1): Measurement grid: dx=12mm, dy=12mm
 Maximum value of SAR (measured) = 0.0859 W/kg

Bluetooth Body Rear DH5 78ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 7.961 V/m; Power Drift = -0.01 dB
 Peak SAR (extrapolated) = 0.130 W/kg
SAR(1 g) = 0.059 W/kg; SAR(10 g) = 0.028 W/kg
 Smallest distance from peaks to all points 3 dB below = 8.5 mm
 Ratio of SAR at M2 to SAR at M1 = 45.1%
 Maximum value of SAR (measured) = 0.100 W/kg



0 dB = 0.100 W/kg = -10.00 dBW/kg

Appendix C. System Verification Plots

■ Verification Data (2 450 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.8 °C
 Test Date: 11/07/2024

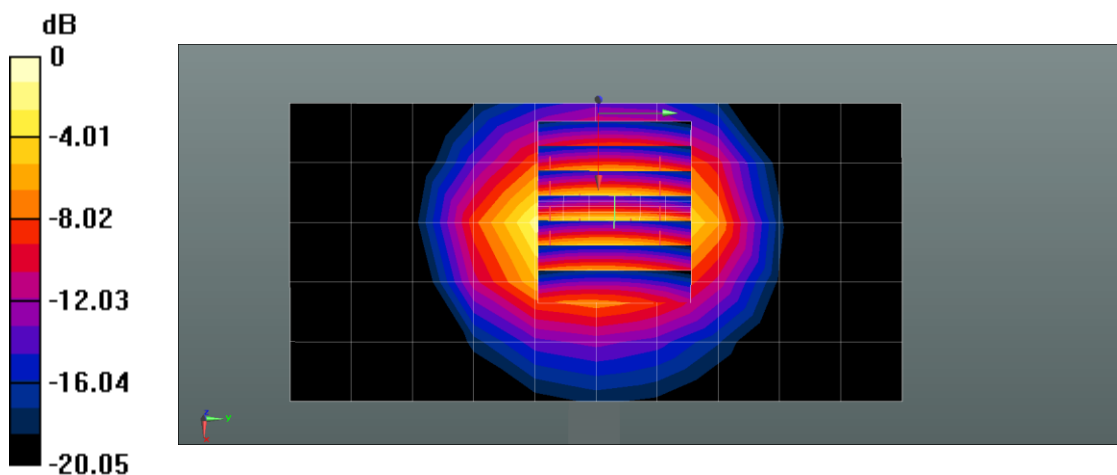
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.813$ S/m; $\epsilon_r = 39.126$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(7.62, 7.91, 7.15) @ 2450 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

2450MHz Head Verification/Area Scan (6x11x1): Measurement grid: dx=12mm, dy=12mm
 Maximum value of SAR (measured) = 3.94 W/kg

2450MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 43.65 V/m; Power Drift = 0.02 dB
 Peak SAR (extrapolated) = 4.62 W/kg
SAR(1 g) = 2.54 W/kg; SAR(10 g) = 1.24 W/kg
 Maximum value of SAR (measured) = 3.93 W/kg



0 dB = 3.93 W/kg = 5.94 dBW/kg

■ Verification Data (2 450 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.8 °C
 Test Date: 11/08/2024

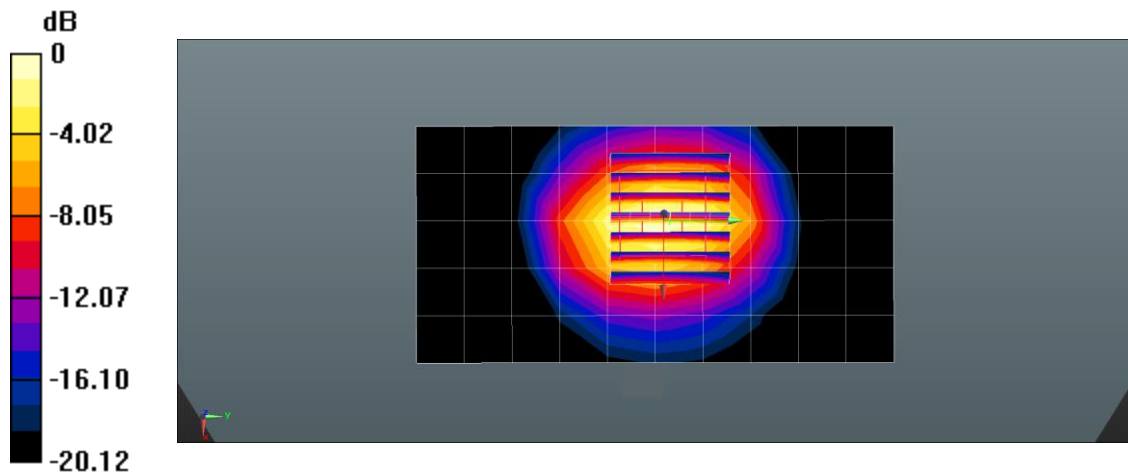
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.805 \text{ S/m}$; $\epsilon_r = 39.154$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(7.62, 7.91, 7.15) @ 2450 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

2450MHz Head Verification/Area Scan (6x11x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$
 Maximum value of SAR (measured) = 3.93 W/kg

2450MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
 Reference Value = 43.37 V/m; Power Drift = 0.14 dB
 Peak SAR (extrapolated) = 4.62 W/kg
SAR(1 g) = 2.54 W/kg; SAR(10 g) = 1.24 W/kg
 Maximum value of SAR (measured) = 3.92 W/kg



0 dB = 3.92 W/kg = 5.93 dBW/kg

■ Verification Data (2 450 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 22.4 °C
 Test Date: 11/13/2024

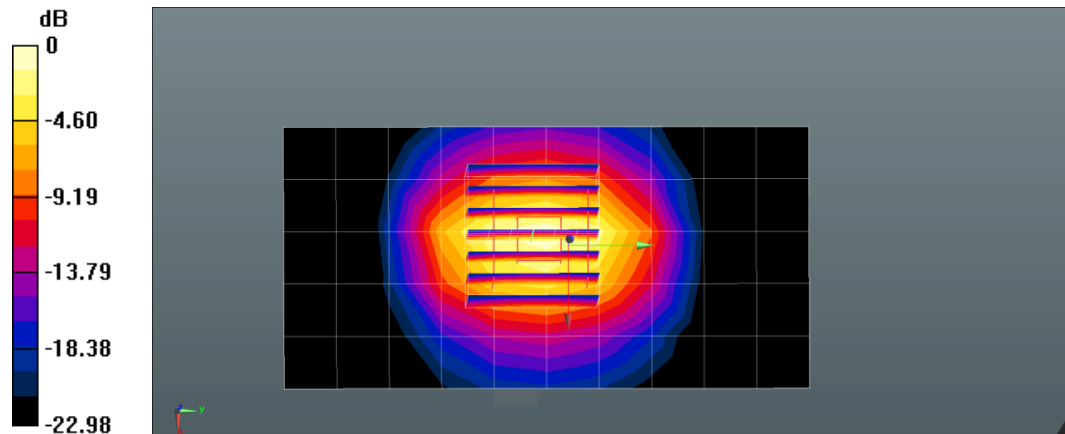
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.794 \text{ S/m}$; $\epsilon_r = 39.621$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7370; ; Calibrated: 2024-08-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2024-04-19
- Phantom: SAM_Front_2011217
- Measurement SW: DASY52, Version 52.10 (4);

2450MHz Head Verification/Area Scan (6x11x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$
 Maximum value of SAR (measured) = 4.13 W/kg

2450MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
 Reference Value = 49.74 V/m; Power Drift = 0.09 dB
 Peak SAR (extrapolated) = 5.43 W/kg
SAR(1 g) = 2.67 W/kg; SAR(10 g) = 1.23 W/kg
 Maximum value of SAR (measured) = 4.44 W/kg



0 dB = 4.44 W/kg = 6.47 dBW/kg

■ Verification Data (5 250 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.6 °C
 Test Date: 11/11/2024

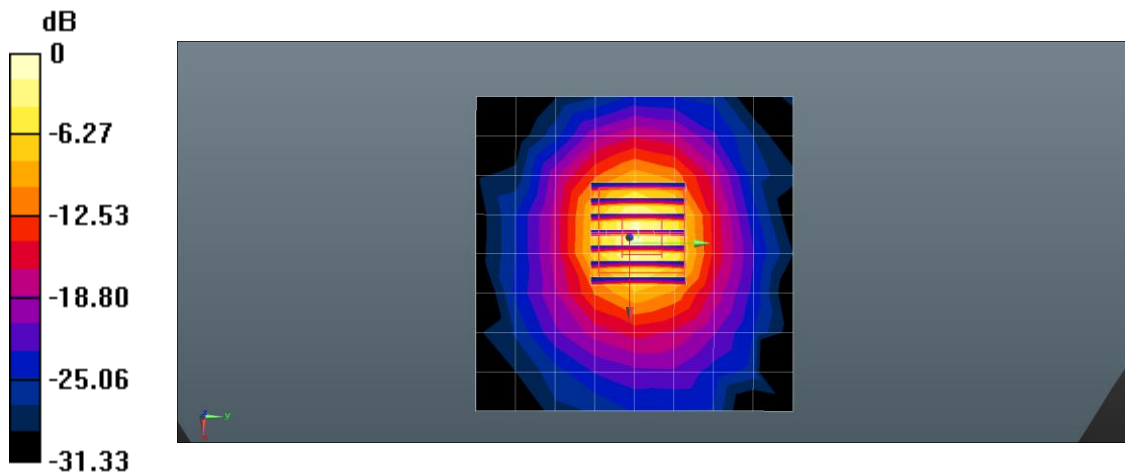
Communication System: UID 0, CW (0); Frequency: 5250 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5250$ MHz; $\sigma = 4.817$ S/m; $\epsilon_r = 36.71$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(5.59, 5.9, 5.32) @ 5250 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

5250MHz Head Verification/Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (measured) = 7.19 W/kg

5250MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 41.27 V/m; Power Drift = 0.01 dB
 Peak SAR (extrapolated) = 13.8 W/kg
SAR(1 g) = 3.99 W/kg; SAR(10 g) = 1.19 W/kg
 Maximum value of SAR (measured) = 9.45 W/kg



0 dB = 9.45 W/kg = 9.75 dBW/kg

■ Verification Data (5 250 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.6 °C
 Test Date: 11/12/2024

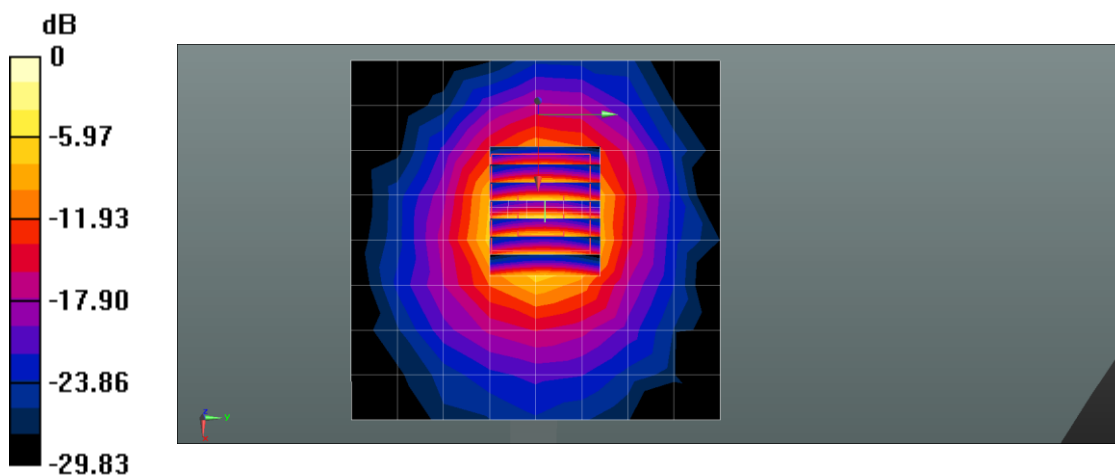
Communication System: UID 0, CW (0); Frequency: 5250 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5250 \text{ MHz}$; $\sigma = 4.703 \text{ S/m}$; $\epsilon_r = 36.686$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(5.59, 5.9, 5.32) @ 5250 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

5250MHz Head Verification/Area Scan (9x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
 Maximum value of SAR (measured) = 7.13 W/kg

5250MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$
 Reference Value = 41.99 V/m; Power Drift = 0.10 dB
 Peak SAR (extrapolated) = 13.4 W/kg
SAR(1 g) = 3.91 W/kg; SAR(10 g) = 1.17 W/kg
 Maximum value of SAR (measured) = 9.27 W/kg



0 dB = 9.27 W/kg = 9.67 dBW/kg

■ Verification Data (5 600 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.6 °C
 Test Date: 11/11/2024

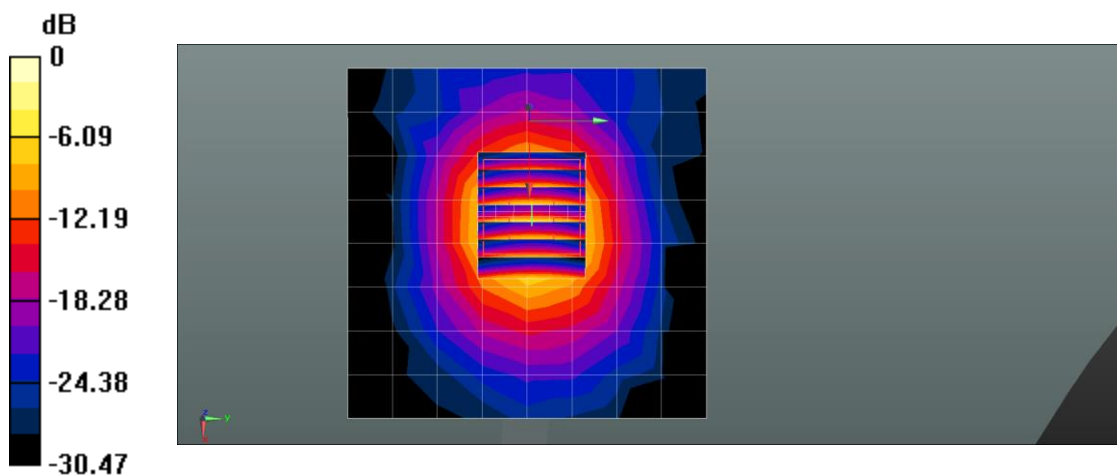
Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5600 \text{ MHz}$; $\sigma = 5.127 \text{ S/m}$; $\epsilon_r = 36.43$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(5, 5.27, 4.78) @ 5600 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

5600MHz Head Verification/Area Scan (9x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
 Maximum value of SAR (measured) = 7.65 W/kg

5600MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$
 Reference Value = 42.06 V/m; Power Drift = 0.09 dB
 Peak SAR (extrapolated) = 14.9 W/kg
SAR(1 g) = 4.14 W/kg; SAR(10 g) = 1.22 W/kg
 Maximum value of SAR (measured) = 10.1 W/kg



0 dB = 10.1 W/kg = 10.04 dBW/kg

■ Verification Data (5 600 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.6 °C
 Test Date: 11/12/2024

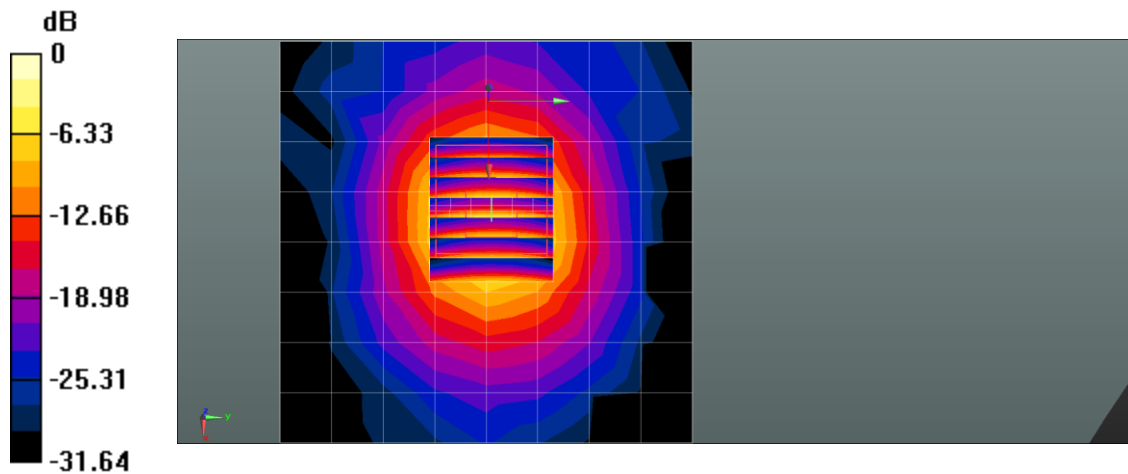
Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5600 \text{ MHz}$; $\sigma = 5.01 \text{ S/m}$; $\epsilon_r = 36.415$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(5, 5.27, 4.78) @ 5600 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

5600MHz Head Verification/Area Scan (9x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
 Maximum value of SAR (measured) = 7.46 W/kg

5600MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$
 Reference Value = 42.10 V/m; Power Drift = 0.11 dB
 Peak SAR (extrapolated) = 14.5 W/kg
SAR(1 g) = 4.04 W/kg; SAR(10 g) = 1.19 W/kg
 Maximum value of SAR (measured) = 9.85 W/kg



0 dB = 9.85 W/kg = 9.93 dBW/kg

■ Verification Data (5 750 MHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.6 °C
 Test Date: 11/11/2024

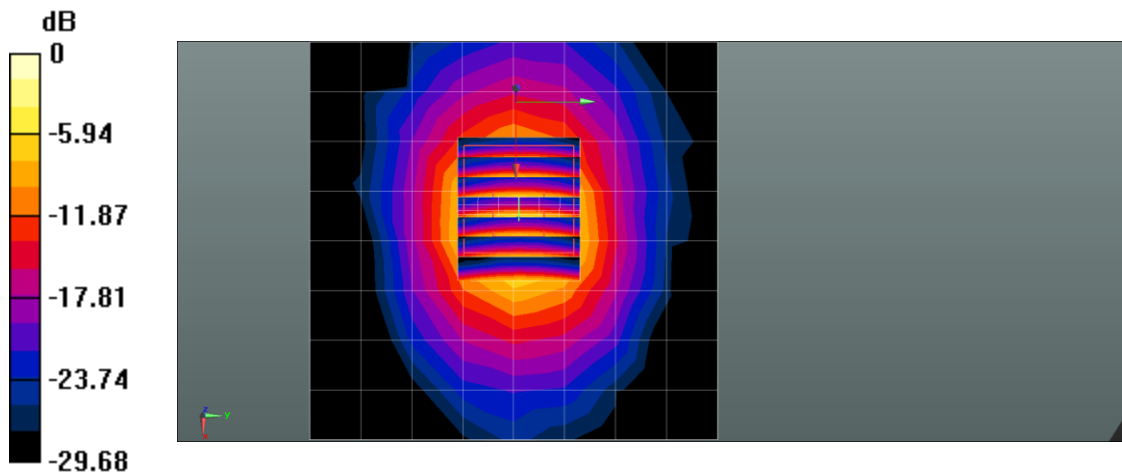
Communication System: UID 0, CW (0); Frequency: 5750 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5750 \text{ MHz}$; $\sigma = 5.345 \text{ S/m}$; $\epsilon_r = 36.187$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(5.11, 5.37, 4.91) @ 5750 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

5750MHz Head Verification/Area Scan (9x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
 Maximum value of SAR (measured) = 6.99 W/kg

5750MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$
 Reference Value = 39.76 V/m; Power Drift = 0.07 dB
 Peak SAR (extrapolated) = 13.6 W/kg
SAR(1 g) = 3.7 W/kg; SAR(10 g) = 1.09 W/kg
 Maximum value of SAR (measured) = 9.16 W/kg



0 dB = 9.16 W/kg = 9.62 dBW/kg

■ Verification Data (5 750 Mhz Head)

Test Laboratory: HCT CO., LTD
 Input Power 0.05 W
 Liquid Temp: 21.6 °C
 Test Date: 11/12/2024

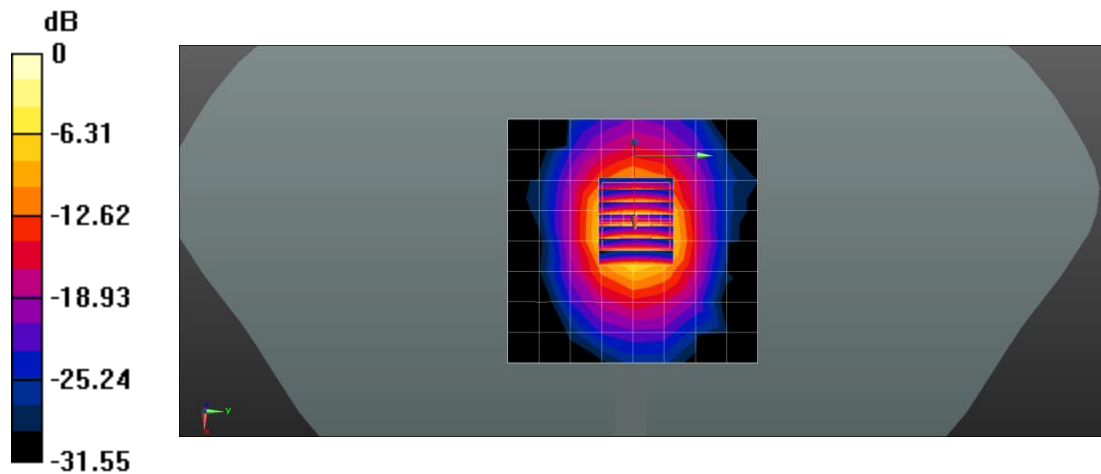
Communication System: UID 0, CW (0); Frequency: 5750 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5750 \text{ MHz}$; $\sigma = 5.218 \text{ S/m}$; $\epsilon_r = 36.193$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7651; ConvF(5.11, 5.37, 4.91) @ 5750 MHz; Calibrated: 2024-03-18
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1417; Calibrated: 2024-02-16
- Phantom: SAM_Front_2011217; Type: QD000P40CB; Serial: 1514
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

5750MHz Head Verification/Area Scan (9x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
 Maximum value of SAR (measured) = 6.82 W/kg

5750MHz Head Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$
 Reference Value = 39.73 V/m; Power Drift = 0.12 dB
 Peak SAR (extrapolated) = 13.4 W/kg
SAR(1 g) = 3.63 W/kg; SAR(10 g) = 1.06 W/kg
 Maximum value of SAR (measured) = 8.98 W/kg



0 dB = 8.98 W/kg = 9.53 dBW/kg

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 bactericide 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)									
	750		835		1 900		2 450 – 2 700		3500 - 5 800	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	41.1	51.7	40.45	53.06	54.9	70.17	71.88	73.2	65.52	78.66
Salt (NaCl)	1.4	0.9	1.45	0.94	0.18	0.39	0.16	0.1	0.0	0.0
Sugar	57.0	47.2	57.0	44.9	0.0	0	0.0	0.0	0.0	0.0
HEC	0.2	0	1.0	1.0	0.0	0	0.0	0.0	0.0	0.0
Bactericide	0.2	0.1	0.1	0.1	0.0	0	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	19.97	0.0	17.24	10.67
DGBE	0.0	0.0	0.0	0.0	44.92	29.44	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 KDB 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	
6	7370	EX3DV4	Head	2450	743	2024-08-23	39.3	1.84	PASS	PASS	PASS	OFDM	N/A	PASS
20	7651	EX3DV4	Head	2450	743	2024-11-02	39.3	1.82	PASS	PASS	PASS	OFDM	N/A	PASS
20	7651	EX3DV4	Head	5250	1107	2024-11-02	35.7	4.70	PASS	PASS	PASS	OFDM	N/A	PASS
20	7651	EX3DV4	Head	5600	1107	2024-11-02	35.1	5.05	PASS	PASS	PASS	OFDM	N/A	PASS
20	7651	EX3DV4	Head	5750	1107	2024-11-02	35.5	5.21	PASS	PASS	PASS	OFDM	N/A	PASS

SAR System Validation Summary

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.