TEST REPORT

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1. Client

- Name : Intel Mobile Communications
- Address : 100 Center Point Circle, Suite 200 Columbia, South Carolina 29210 USA
- Date of Receipt : 2022-03-03

2. Use of Report : Class II Permissive Change

3. Name of Product and Model : WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card
- Model Number : AX211D2W
- Manufacturer and Country of Origin : Intel Mobile Communications / USA

4. Host Product Name : Notebook PC
- Host Model Name : NP950XEE
- Manufacturer : Samsung Electronics Co., Ltd.

5. FCC ID : PD9AX211D2

6. Date of Test : 2022-03-11~ 2022-03-16

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

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

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

	Tested by	Technical Manager
Affirmation	Name : Mungi Jeong (Signature)	Name : Gyuhyun Shim (Signature)

2022-03-23

KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-03-23	Originally issued	-

General remarks for test reports

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

(may be required by the product standard or client)

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

Procedure number, issue date and title:

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

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

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

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1. General information

Client	:	Intel Mobile Communications
Address	:	100 Center Point Circle, Suite 200 Columbia, South Carolina 29210 USA
Manufacturer	:	Intel Mobile Communications
Address	:	100 Center Point Circle, Suite 200 Columbia, South Carolina 29210 USA
Contact Person		Steven Hackett / Steven.c.hackett@intel.com
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-3327, G-198, C-3706, T-1849 CAB Identifier: KR0040, ISED Number: 8035A KOLAS No.: KT231

1.1 Report Overview

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

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

2. Device information

2.1 Basic description

Product Name		WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card
Product Model Number		AX211D2W
Product Manufacturer		Intel Mobile Communications
Host Product Name		Notebook PC
Host Model Name		NP950XEE
Host Manufacturer		Samsung Electronics Co., Ltd.
Host Product Serial Number	Radiation	5B1C9FMT100037H, 5B1C9FMT100020M
	Conduction	5B1C9FMT100110M
Mode of Operation		WLAN 802.11a,b,g,n,ac,ax, Bluetooth
Device Overview		WLAN 2.4 GHz: 2 412.0 MHz ~ 2 472.0 MHz U-NII-1: 5 180.0 MHz ~ 5 240.0 MHz U-NII-2A: 5 260.0 MHz ~ 5 320.0 MHz U-NII-2C: 5 500.0 MHz ~ 5 720.0 MHz U-NII-3: 5 745.0 MHz ~ 5 825.0 MHz U-NII-5: 5 955.0 MHz ~ 6 415.0 MHz U-NII-6: 6 435.0 MHz ~ 6 515.0 MHz U-NII-7: 6 535.0 MHz ~ 6 855.0 MHz U-NII-8: 6 875.0 MHz ~ 7 115.0 MHz Bluetooth: 2 402.0 MHz ~ 2 480.0 MHz
TDWR Information		5.60 GHz ~ 5.65 GHz band (TDWR) is supported by the device.

2.2 Summary of SAR Test Results

Band	Equipment Class	Highest Reported	
		1g SAR (W/kg)	PD 4cm^2 (W/m^2)
WLAN 2.4 ㎓	DTS	0.27	N/A
U-NII-2A	NII	0.37	N/A
U-NII-2C	NII	0.52	N/A
U-NII-3	NII	0.67	N/A
U-NII-5	NII	0.96	7.91
U-NII-6	NII	0.93	6.58
U-NII-7	NII	**1.02**	8.68
U-NII-8	NII	0.93	**8.99**
Bluetooth	DSS/DTS	< 0.10	N/A
Simultaneous SAR per KDB 690783 D01v01r03		1.34	N/A

2.3 #Maximum Tune-up power

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

When the specified maximum output power is the same for both UNII Band1 and UNII Band 2A, begins SAR measurement in UNII band 2A; and if the highest reported SAR for U NII band 2A is ≤ 1.2W/kg, SAR is not required for U-NII-1 band for that configuration; otherwise, each band is tested independently for SAR.

2.3.1 #Maximum WLAN Output Power

Band	Ant.	Mode	Channel	Output Power (dBm)		
				Target	Max. Allowed	SAR Test
WLAN 2.4 GHz	Main	802.11b	All Channel	14.00	**15.00**	Yes
		802.11g	13	11.50	**12.50**	No
			Except 13	14.00	**15.00**	
		802.11n(HT20)	12	12.25	**13.25**	No
			13	9.75	**10.75**	
			Except 12,13	14.00	**15.00**	
		802.11n(HT40)	10	11.75	**12.75**	No
			11	9.25	**10.25**	
			Except 10,11	14.00	**15.00**	
		SU 20 MHz	12	13.00	**14.00**	No
			13	10.50	**11.50**	
			Except 12,13	14.00	**15.00**	
		RU 26T_20 MHz	13	12.50	**13.50**	No
			Except 13	14.00	**15.00**	
		RU 52T_20 MHz	13	12.50	**13.50**	No
			Except 13	14.00	**15.00**	
		RU 106T_20 MHz	13	12.50	**13.50**	No
			Except 13	14.00	**15.00**	
		RU 242T_20 MHz	13	11.50	**12.50**	No
			Except 13	14.00	**15.00**	
		SU 40 MHz	10	11.75	**12.75**	No
			11	9.25	**10.25**	
			Except 10,11	14.00	**15.00**	
		RU 26T_40 MHz	All Channel	14.00	**15.00**	No
		RU 52T_40 MHz	All Channel	14.00	**15.00**	No
		RU 106T_40 MHz	All Channel	14.00	**15.00**	No
		RU 242T_40 MHz	All Channel	14.00	**15.00**	No
		RU 484T_40 MHz	10	11.75	**12.75**	No
			11	9.25	**10.25**	
			Except 10,11	14.00	**15.00**	

Band	Ant.	Mode	Channel	Output Power (dBm)		
				Target	Max. Allowed	SAR Test
WLAN 2.4 GHz	Aux	802.11b	All Channel	13.00	**14.00**	**Yes**
		802.11g	13	11.50	**12.50**	No
			Except 13	13.00	**14.00**	
		802.11n(HT20)	13	11.50	**12.50**	No
			Except 13	13.00	**14.00**	
		802.11n(HT40)	10	12.00	**13.00**	No
			11	10.50	**11.50**	
			Except 10,11	13.00	**14.00**	
		SU 20 MHz	13	10.50	**11.50**	No
			Except 13	13.00	**14.00**	
		RU 26T_20 MHz	13	12.50	**13.50**	No
			Except 13	13.00	**14.00**	
		RU 52T_20 MHz	13	12.50	**13.50**	No
			Except 13	13.00	**14.00**	
		RU 106T_20 MHz	13	12.50	**13.50**	No
			Except 13	13.00	**14.00**	
		RU 242T_20 MHz	13	11.50	**12.50**	No
			Except 13	13.00	**14.00**	
		SU 40 MHz	10	12.00	**13.00**	No
			11	10.50	**11.50**	
			Except 10,11	13.00	**14.00**	
		RU 26T_40 MHz	All Channel	13.00	**14.00**	No
		RU 52T_40 MHz	All Channel	13.00	**14.00**	No
		RU 106T_40 MHz	All Channel	13.00	**14.00**	No
		RU 242T_40 MHz	All Channel	13.00	**14.00**	No
		RU 484T_40 MHz	10	12.00	**13.00**	No
			11	10.50	**11.50**	
			Except 10,11	13.00	**14.00**	
U-NII-1, U-NII-2A	Main, Aux	802.11a	All Channel	13.00	**14.00**	No
		802.11n(HT20)	All Channel	13.00	**14.00**	No
		802.11n(HT40)	All Channel	13.00	**14.00**	No
		802.11ac(VHT20)	All Channel	13.00	**14.00**	No
		802.11ac(VHT40)	All Channel	13.00	**14.00**	No
		802.11ac(VHT80)	All Channel	13.00	**14.00**	**Yes**
		802.11ac(VHT160)	All Channel	13.00	**14.00**	No
		SU (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 26T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 52T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 106T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 242T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 484T (40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 996T (80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 2x996T (160 MHz)	All Channel	13.00	**14.00**	No

Band	Ant.	Mode	Channel	Output Power (dBm)		
				Target	Max. Allowed	SAR Test
U-NII-2C	Main	802.11a	All Channel	12.00	**13.00**	No
		802.11n(HT20)	All Channel	12.00	**13.00**	No
		802.11n(HT40)	All Channel	12.00	**13.00**	No
		802.11ac(VHT20)	All Channel	12.00	**13.00**	No
		802.11ac(VHT40)	All Channel	12.00	**13.00**	No
		802.11ac(VHT80)	All Channel	12.00	**13.00**	**Yes**
		802.11ac(VHT160)	All Channel	12.00	**13.00**	No
		SU (20/40/80/160 MHz)	All Channel	12.00	**13.00**	No
		RU 26T (20/40/80/160 MHz)	All Channel	12.00	**13.00**	No
		RU 52T (20/40/80/160 MHz)	All Channel	12.00	**13.00**	No
		RU 106T (20/40/80/160 MHz)	All Channel	12.00	**13.00**	No
		RU 242T (20/40/80/160 MHz)	All Channel	12.00	**13.00**	No
		RU 484T (40/80/160 MHz)	All Channel	12.00	**13.00**	No
		RU 996T (80/160 MHz)	All Channel	12.00	**13.00**	No
		RU 2x996T (160 MHz)	All Channel	12.00	**13.00**	No
	Aux	802.11a	All Channel	13.00	**14.00**	No
		802.11n(HT20)	All Channel	13.00	**14.00**	No
		802.11n(HT40)	All Channel	13.00	**14.00**	No
		802.11ac(VHT20)	All Channel	13.00	**14.00**	No
		802.11ac(VHT40)	All Channel	13.00	**14.00**	No
		802.11ac(VHT80)	All Channel	13.00	**14.00**	**Yes**
		802.11ac(VHT160)	All Channel	13.00	**14.00**	No
		SU (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 26T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 52T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 106T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 242T (20/40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 484T (40/80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 996T (80/160 MHz)	All Channel	13.00	**14.00**	No
		RU 2x996T (160 MHz)	All Channel	13.00	**14.00**	No
U-NII-3	Main, Aux	802.11a	All Channel	13.00	**14.00**	No
		802.11n(HT20)	All Channel	13.00	**14.00**	No
		802.11n(HT40)	All Channel	13.00	**14.00**	No
		802.11ac(VHT20)	All Channel	13.00	**14.00**	No
		802.11ac(VHT40)	All Channel	13.00	**14.00**	No
		802.11ac(VHT80)	All Channel	13.00	**14.00**	**Yes**
		SU (20/40/80 MHz)	All Channel	13.00	**14.00**	No
		RU 26T (20/40/80 MHz)	All Channel	13.00	**14.00**	No
		RU 52T (20/40/80 MHz)	All Channel	13.00	**14.00**	No
		RU 106T (20/40/80 MHz)	All Channel	13.00	**14.00**	No
		RU 242T (20/40/80 MHz)	All Channel	13.00	**14.00**	No
		RU 484T (40/80 MHz)	All Channel	13.00	**14.00**	No
		RU 996T (80 MHz)	All Channel	13.00	**14.00**	No

Band	Ant.	Mode	Channel	Output Power (dB m)		
				Target	Max. Allowed	SAR Test
U-NII-5	Main, Aux	SU 20 MHz	All Channel	4.50	**5.50**	No
		SU 40 MHz	All Channel	7.75	**8.75**	No
		SU 80 MHz	All Channel	10.25	**11.25**	No
		SU 160 MHz	All Channel	12.50	**13.50**	**Yes**
		RU 26T (20/40/80/160 MHz)	All Channel	-4.00	**-3.00**	No
		RU 52T (20/40/80/160 MHz)	All Channel	0.00	**1.00**	No
		RU 106T (20/40/80/160 MHz)	All Channel	2.00	**3.00**	No
		RU 242T (20/40/80/160 MHz)	All Channel	4.50	**5.50**	No
		RU 484T (40/80/160 MHz)	All Channel	7.75	**8.75**	No
		RU 996T (80/160 MHz)	All Channel	10.25	**11.25**	No
		RU 2x996T (160 MHz)	All Channel	12.50	**13.50**	No
U-NII-6	Main, Aux	SU 20 MHz	All Channel	3.50	**4.50**	No
		SU 40 MHz	All Channel	7.50	**8.50**	No
		SU 80 MHz	All Channel	10.25	**11.25**	No
		SU 160 MHz	All Channel	12.50	**13.50**	**Yes**
		RU 26T (20/40/80/160 MHz)	All Channel	-4.00	**-3.00**	No
		RU 52T (20/40/80/160 MHz)	All Channel	0.00	**1.00**	No
		RU 106T (20/40/80/160 MHz)	All Channel	2.00	**3.00**	No
		RU 242T (20/40/80/160 MHz)	All Channel	4.50	**5.50**	No
		RU 484T (40 MHz)	All Channel	7.50	**8.50**	No
		RU 484T (80/160 MHz)	All Channel	7.75	**8.75**	No
		RU 996T (80/160 MHz)	All Channel	10.25	**11.25**	No
		RU 2x996T (160 MHz)	All Channel	12.50	**13.50**	No
U-NII-7	Main, Aux	SU 20 MHz	All Channel	3.75	**4.75**	No
		SU 40 MHz	All Channel	7.00	**8.00**	No
		SU 80 MHz	119	10.25	**11.25**	No
			Except 119	9.50	**10.50**	
		SU 160 MHz	All Channel	12.25	**13.25**	**Yes**
		RU 26T (20/40/80/160 MHz)	119	-4.00	**-3.00**	No
			Except 119	-4.75	**-3.75**	
		RU 52T(20/40/80/160 MHz)	119	0.00	**1.00**	No
			Except 119	-1.75	**-0.75**	
		RU 106T (20/40/80/160 MHz)	119	2.00	**3.00**	No
			Except 119	1.25	**2.25**	
		RU 242T (20/40/80/160 MHz)	119	4.50	**5.50**	No
			Except 119	3.75	**4.75**	
		RU 484T (40/80/160 MHz)	119	7.75	**8.75**	No
			Except 119	7.00	**8.00**	
		RU 996T (80/160 MHz)	119	10.25	**11.25**	No
			Except 119	9.50	**10.50**	
		RU 2x996T (160 MHz)	All Channel	12.25	**13.25**	No

Band	Ant.	Mode	Channel	Output Power (dB m)		
				Target	Max. Allowed	SAR Test
U-NII-8	Main, Aux	SU 20 MHz	233	-3.00	**-2.00**	No
			Except 233	2.75	**3.75**	
		SU 40 MHz	All Channel	7.00	**8.00**	No
		SU 80 MHz	All Channel	9.50	**10.50**	No
		SU 160 MHz	All Channel	12.25	**13.25**	**Yes**
		RU 26T (20/40/80/160 MHz)	All Channel	-4.75	**-3.75**	No
		RU 52T (20/40/80/160 MHz)	All Channel	-1.75	**-0.75**	No
		RU 106T (20/40/80/160 MHz)	All Channel	1.25	**2.25**	No
		RU 242T (20 MHz)	233	-3.00	**-2.00**	No
			Except 233	2.75	**3.75**	
		RU 242T (40/80/160 MHz)	All Channel	3.75	**4.75**	No
		RU 484T (40/80/160 MHz)	All Channel	7.00	**8.00**	No
		RU 996T (80/160 MHz)	All Channel	9.50	**10.50**	No
		RU 2x996T (160 MHz)	All Channel	12.25	**13.25**	No

2.3.2 #Maximum Bluetooth Output Power

Band	Ant.	Mode	Channel	Output Power (dB m)		
				Target	Max. Allowed	SAR Test
Bluetooth	Aux	BDR(GFSK)	All Channel	9.50	**11.00**	**Yes**
		EDR (π/4DQPSK)	All Channel	5.50	**7.00**	No
		EDR(8DPSK)	All Channel	5.50	**7.00**	No
		LE(GFSK)	All Channel	5.50	**7.00**	No

2.4 SAR Test Configurationsd

2.4.1 #DUT Antenna Locations

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

2.4.2 SAR Test Exclusion Considerations

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

2.5 SAR Test Methods and Procedures

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

- IEEE 1528-2013
- IEC/IEEE 62209-1528:2020
- IEC 62479:2010
- IEC TR 63170:2018
- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 865664 D01 SAR measurement 100 ㎒ to 6 ㎓ v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 616217 D04 SAR for laptop and tablets v01r02
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)
- April 2019 TCB Workshop Notes (Tissue Simulating Liquids)
- TCB Workshop–October 2021 : RF Exposure Policies and Procedures
- SPEAG DASY6 System Handbook (June 2020)
- SPEAG DASY6 Application Note (Interim Procedures for Devices Operating at 6-10 GHz)

2.5.1 UNII-6-7 GHz Tested Conditions

The Device was operated utilizing proprietary software and each channel was measured using a broadband power meter to determine the maximum average power.

As per the Interim Procedures for UNII 6-7GHz RF Exposure, explained in RF Exposure Policies and Procedures: TCB Workshop – October 2020, the testing has been performed on SAR following IEC/IEEE 62209-1528:2020 and then on Power Density for the highest SAR test configurations.

The testing has been in both chains and four considered bands U-NII-5, U-NII-6, U-NII-7 and U-NII-8 in SAR mode.

3. Specific Absorption Rate

3.1 Introduction

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

3.2 SAR Definition

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

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

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

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

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

3.3 Peak Spatially Averaged Power Density Assessment Based on E-field Measurements

Within a short distance from the transmitting source, power density was determined based on both electric and magnetic fields. Generally, the magnitude and phase of two components of either the E-field or H-field were needed on a sufficiently large surface to fully characterize the total E-field and H-field distributions. Nevertheless, solutions based on direct measurement of E-field and H-field can be used to compute power density. The general measurement approach used for this device was:

a) The local E field on the measurement surface was measured at a reference location where the field is well above the noise level. This reference level was used at the end of this procedure to assess output power drift of the DUT during the measurement.

b) The electric field on the measurement surface was scanned. Measurements are conducted according to the instructions provided by the measurement system manufacturer. Measurement spatial resolution can depend on the measured field characteristic and measurement methodology used by the system. The planar scan step size was configured at λ/4.

c) For cDASY6, H-field was calculated from the measured E-field using a reconstruction algorithm. As the power density calculation requires knowledge of both amplitude and phase, reconstruction algorithms can also be used to obtain field information from the measured E-field data (e.g. the phase from the amplitude if only the amplitude is measured). H-field and phase data was reconstructed from repeated measurements (three per measurement point) on two measurement planes separated by λ/4.

d) The total Peak spatially averaged power density (psPD) distribution on the evaluation surface is determined per the below equation. The spatial averaging area, A, is specified by the applicable exposure limits or regulatory requirements.

$$psPD = \frac{1}{2A_{av}} \iint_{A_{av}} || Re\{E \times H^*\} || dA$$

e) The maximum spatial-average on the evaluation surface is the final quantity to determine compliance against applicable limits.

f) The local E field reference value, at the same location as step 2, was re-measured after the scan was complete to calculate the power drift. If the drift deviated by more than 5%, the power density test and drift measurements were repeated.

4. SAR Measurement Procedures

4.1 SAR Scan Procedures

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

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm ± 1 mm	½·δ·ln(2) mm 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details. * When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

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

5. RF Exposure Limits

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

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

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

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

5.1 RF Exposure Limits for Frequencies Above 6 GHz

Per §1.1310 (d)(3), the MPE limits are applied for frequencies above 6 GHz. Power Density is expressed in units of W/m^2 or mW/cm^2.

Peak Spatially Averaged Power Density was evaluated over a circular area of 4 cm^2 per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes.

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Power Density	1.0 mW/cm^2	5.0 mW/cm^2

Note: 1.0 mW/cm^2 is 10 W/m^2

6. FCC SAR General Measurement Procedures

6.1 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. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

6.2 SAR Testing with 802.11 Transmitters

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

6.2.1 General Device Setup

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

6.2.2 U-NII-1 and U-NII-2A

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

6.2.3 U-NII-2C and U-NII-3

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

6.2.4 Initial Test Position Procedure

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

6.2.5 2.4 ㎓ SAR Test Requirement

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

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

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

6.2.6 OFDM Transmission Mode and SAR Test Channel Selection

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

6.2.7 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 ㏈ 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.

6.2.8 Subsequent Test Configuration Procedures

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

7. RF Average Conducted Output Power

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

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

Power Measurement Setup

7.1 WLAN Average Conducted Output Power

Band	Mode	Freq. [MHz]	Channel	Conducted Powers (dBm)	
				Main Ant.	Aux Ant.
WLAN 2.4 GHz	802.11b	2 412.0	1	**14.85**	13.80
		2 437.0	6	14.83	13.80
		2 462.0	11	14.79	**13.86**
U-NII-2A	802.11ac (VHT80)	5 210.0	42	13.76	13.97
		5 290.0	58	**13.74**	**13.92**
U-NII-2C	802.11ac (VHT80)	5 530.0	106	12.84	13.80
		5 610.0	122	12.83	**13.96**
		5 690.0	138	**12.98**	13.83
U-NII-3	802.11ac (VHT80)	5 775.0	155	**13.93**	**13.83**
U-NII-5	802.11ax (160-SU)	6 025.0	15	**12.48**	**12.41**
		6 185.0	47	**12.43**	**12.40**
		6 345.0	79	**12.47**	12.35
U-NII-6	802.11ax (160-SU)	6 505.0	111	**12.54**	**12.46**
U-NII-7	802.11ax (160-SU)	6 665.0	143	**12.36**	12.17
		6 825.0	175	**12.20**	**12.28**
U-NII-8	802.11ax (160-SU)	6 985.0	207	**12.17**	**12.33**

7.2 Bluetooth Average Conducted Output Power

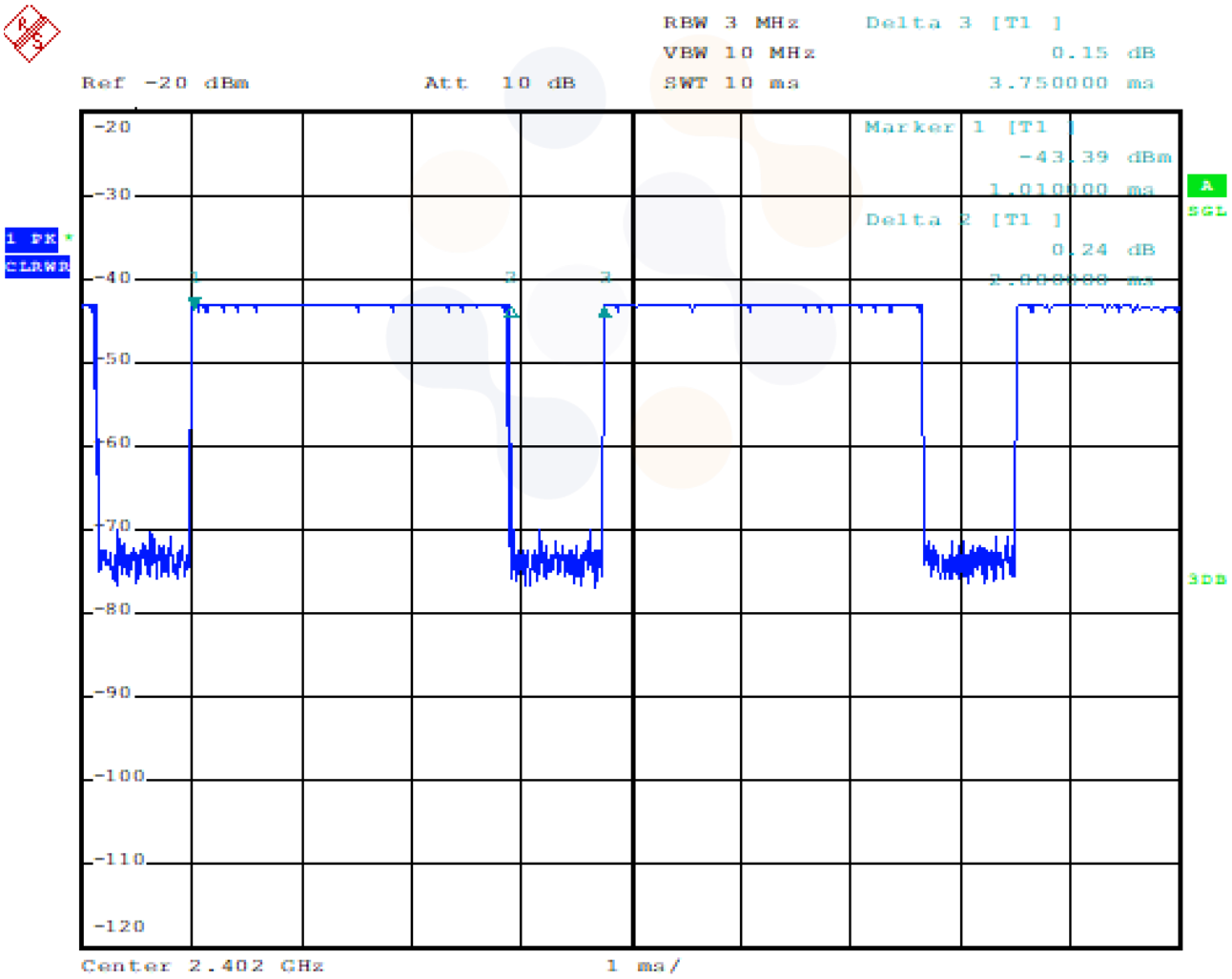
Mode	Freq. [MHz]	Channel	Conducted Powers (dBm)
BDR_DH5 (1 Mbps)	2 402.0	0	**9.89**
	2 441.0	39	9.76
	2 480.0	78	9.63

7.3 Bluetooth Duty Factor

Mode	Packet	On Time (ms)	On-Off Time (ms)	Duty Cycle (%)	Duty Cycle Compensate Factor
BDR(GFSK)	DH5	2.88	3.75	76.8	1.302

7.4 Bluetooth Power Measurement Setup

7.5 Bluetooth Duty Plot



8. System Verification

8.1 Tissue Verification

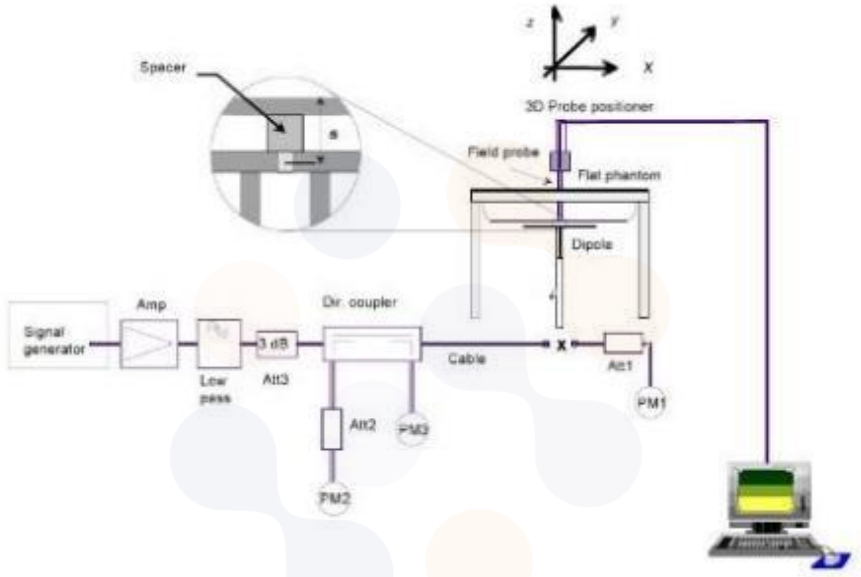
The dielectric properties for this Tissue Simulant Liquids were measured by using the SPEAG Model DAK3.5 Dielectric Probe in conjunction with Agilent E5071B Network Analyzer (300 kHz – 8 500 ㎒). The Conductivity (σ) and Permittivity (ρ) are listed in Table 1.For the SAR measurement given in this report.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

Freq. (㎒)	Limit/Measured		Permittivity (ρ)	Conductivity (σ)	Temp. (°C)
2 450.0	Recommended Limit		39.20 ± 5 % (37.24~41.16)	1.80 ± 5 % (1.71~1.89)	22 ± 2
	Measured	2022-03-15	38.27	1.85	20.62
5 300.0	Recommended Limit		35.90 ± 5 % (34.11~37.70)	4.76 ± 5 % (4.52~5.00)	22 ± 2
	Measured	2022-03-16	36.50	4.71	20.68
5 600.0	Recommended Limit		35.50 ± 5 % (33.73~37.28)	5.07 ± 5 % (4.82~5.32)	22 ± 2
	Measured	2022-03-16	35.84	5.02	20.68
5 800.0	Recommended Limit		35.30 ± 5 % (33.54~37.07)	5.27 ± 5 % (5.01~5.53)	22 ± 2
	Measured	2022-03-16	35.30	5.19	20.68
6 500.0	Recommended Limit		34.50 ± 5 % (32.78~36.23)	6.07 ± 5 % (5.77~6.37)	22 ± 2
	Measured	2022-03-11	33.60	5.88	20.83

<Table 1. Measurement result of Tissue electric parameters>

8.1.1 SAR Test System Verification

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

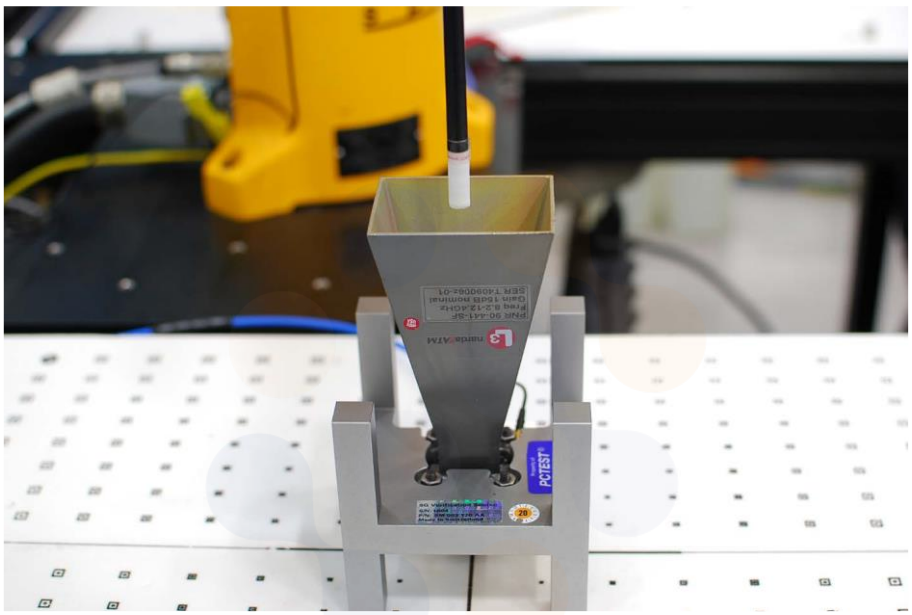


Verification Kit	Probe S/N	Frequency (㎒)	Tissue Type	Input Power (㎽)	Limit/Measured (Normalized to 1 W)		
D2450V2 SN: 895	EX3DV4 SN: 7541	2 450.0	HSL	100	Recommended Limit 1g (Normalized)		52.40 ± 10 % (47.16~57.64)
					Measured	2022-03-15	50.50
D5GHzV2 SN: 1293	EX3DV4 SN: 7541	5 300.0	HSL	100	Recommended Limit 1g (Normalized)		82.30 ± 10 % (74.07~90.53)
					Measured	2022-03-16	77.90
D5GHzV2 SN: 1293	EX3DV4 SN: 7541	5 600.0	HSL	100	Recommended Limit 1g (Normalized)		83.80 ± 10 % (75.42~92.18)
					Measured	2022-03-16	82.30
D5GHzV2 SN: 1293	EX3DV4 SN: 7541	5 800.0	HSL	100	Recommended Limit 1g (Normalized)		80.60 ± 10 % (72.54~88.66)
					Measured	2022-03-16	77.60
D6.5GHzV2 SN: 1005	EX3DV4 SN: 7540	6 500.0	HSL	10	Recommended Limit 1g (Normalized)		286.00 ± 10 % (257.40~314.60)
					Measured	2022-03-11	284.00

<Table 2. System Verification Result>

8.1.2 Power Density Test System Verification

The system was verified to be within ± 0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check.
The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.



[Figure 3. System Verification Setup Photo]

Source (S/N)	Probe (S/N)	Frequency (GHz)	Date	Prad (mW)	Total psPD (W/m² over 4 cm²)	Input Power (mW)	Total psPD (W/m² over 4 cm²)		Deviation (dB)	Limit (dB)
					Target		Measured	Normalized		
1023	9489	10	2022-03-14	86.1	51.5	10	5.83	50.2	-0.11	± 0.66
1023	9489	10	2022-03-15	86.1	51.5	10	5.48	47.2	-0.38	± 0.66

Notes
1) 10 ㎜ distance spacing was used from the reference horn antenna aperture to the probe element.
2) According to IEC TR 63170, the power density measurement results should be normalized to the delivered input power to an input power level of 0 ㏈m and compared to the appropriate target values of the calibrated reference sources.

9. SAR Test Results

9.1 Standalone Body SAR Test Results

WLAN 2.4 GHz											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11b	Main	Rear	0	2 412.0	14.85	15.00	1.035	1.010	0.258	**0.270**	1
	Aux	Rear	0	2 462.0	13.86	14.00	1.033	1.011	0.217	**0.227**	2

U-NII-2A											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11ac (VHT80)	Main	Rear	0	5 290.0	13.74	14.00	1.062	1.011	0.341	**0.366**	3
	Aux	Rear	0	5 290.0	13.92	14.00	1.019	1.011	0.337	**0.347**	4

U-NII-2C											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11ac (VHT80)	Main	Rear	0	5 690.0	12.98	13.00	1.005	1.011	0.491	**0.499**	5
	Aux	Rear	0	5 610.0	13.96	14.00	1.009	1.011	0.506	**0.516**	6

U-NII-3											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
802.11ac (VHT80)	Main	Rear	0	5 775.0	13.93	14.00	1.016	1.011	0.563	**0.578**	7
	Aux	Rear	0	5 775.0	13.83	14.00	1.040	1.011	0.638	**0.671**	8

Bluetooth											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
BDR_DH5	Aux	Rear	0	2 402.0	9.89	11.00	1.291	1.302	0.052	**0.087**	9

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. All modes of operation were investigated, and worst-case results are reported.
3. Battery is fully charged for all readings and the standard batteries are the only options.
4. Liquid tissue depth was at least 15 cm.
5. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.

WLAN & Bluetooth Notes:

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

9.2 Standalone Body SAR and Absorbed Power Density Test Results

U-NII-5												
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Estimated APD (W/m^2) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	0	6 025.0	12.48	13.50	1.265	1.015	0.482	0.619	3.21	
		Rear	0	6 345.0	12.47	13.50	1.268	1.015	0.742	**0.955**	5.08	10
		Rear	0	6 185.0	12.43	13.50	1.279	1.015	0.627	0.814	4.40	
	Aux	Rear	0	6 025.0	12.41	13.50	1.285	1.015	0.207	0.270	1.35	
		Rear	0	6 185.0	12.40	13.50	1.288	1.015	0.254	**0.332**	1.73	11

U-NII-6												
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Estimated APD (W/m^2) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	0	6 505.0	12.54	13.50	1.247	1.015	0.736	**0.932**	5.01	12
	Aux	Rear	0	6 505.0	12.46	13.50	1.271	1.015	0.507	**0.654**	3.37	13

U-NII-7												
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Estimated APD (W/m^2) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	0	6 665.0	12.36	13.25	1.227	1.015	0.789	0.983	5.25	
		Rear	0	6 825.0	12.20	13.25	1.274	1.015	0.788	**1.019**	5.36	14
	Aux	Rear	0	6 825.0	12.28	13.25	1.250	1.015	0.522	**0.662**	3.46	15

U-NII-8												
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Estimated APD (W/m^2) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	0	6 985.0	12.17	13.25	1.282	1.015	0.711	**0.925**	4.90	16
	Aux	Rear	0	6 985.0	12.33	13.25	1.236	1.015	0.508	**0.637**	3.34	17

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
5. Per FCC guidance, SAR was performed using 6.5 GHz SAR probe calibration factors. Per October 2020 TCB Workshop notes, 5 channels were tested. Absorbed power density (APD) using a 4㎡ averaging area is reported based on SAR measurements.

WLAN Notes:

1. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance.
2. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.

10. Power Density Test Results

10.1 Standalone Body Power Density Test Results

U-NII-5											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Max. Tune-up Power (dBm)	iPD	Grid Step (λ)	Measurement Uncertainty	Measured Total psPD (W/m²) 4㎠	Scaled Total psPD (W/m²) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	2	6 345.0	13.50	-	0.0625	1.462	5.41	**7.91**	18
		Rear	2	6 185.0	13.50	-	0.0625	1.462	4.68	6.84	
		Rear	2	6 025.0	13.50	-	0.0625	1.462	4.06	5.94	

U-NII-6											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Max. Tune-up Power (dBm)	iPD	Grid Step (λ)	Measurement Uncertainty	Measured Total psPD (W/m²) 4㎠	Scaled Total psPD (W/m²) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	2	6 505.0	13.50	-	0.0625	1.462	4.50	**6.58**	19

U-NII-7											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Max. Tune-up Power (dBm)	iPD	Grid Step (λ)	Measurement Uncertainty	Measured Total psPD (W/m²) 4㎠	Scaled Total psPD (W/m²) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	2	6 825.0	13.25	-	0.0625	1.462	5.83	8.52	
		Rear	2	6 665.0	13.25	-	0.0625	1.462	5.94	**8.68**	20

U-NII-8											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Max. Tune-up Power (dBm)	iPD	Grid Step (λ)	Measurement Uncertainty	Measured Total psPD (W/m²) 4㎠	Scaled Total psPD (W/m²) 4㎠	Plot No.
802.11ax (160-SU)	Main	Rear	2	6 985.0	13.25	18.20	0.0625	1.462	6.15	**8.99**	21
		Rear	8.59	6 985.0	13.25	15.10	0.0625	1.462	3.00	4.39	

Power Density General Notes:

1. Batteries are fully charged at the beginning of the measurements.
2. Power density was calculated by repeated E-field measurements on two measurement planes separated by λ/4.
3. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools.
4. Per FCC guidance and equipment manufacturer guidance, power density results were scaled according to IEC 62479:2010 for the portion of the measurement uncertainty > 30%. Total expanded uncertainty of 2.46 dB (76.198%) was used to determine the psPD measurement scaling factor.
5. Per equipment manufacturer guidance, power density was measured at d=2mm and d=λ/5mm using the same grid size and grid step size for some frequencies and surfaces. The integrated Power Density (iPD) was calculated based on these measurements. Since iPD ratio between the two distances is < 1dB, the grid step was sufficient for determining compliance at d=2mm.

11. Simultaneous Transmission

11.1 #Simultaneous Transmission Configurations

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

Notes:

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

11.2 Simultaneous Transmission Analysis

Exposure Condition /Position		WLAN						Bluetooth
		2.4 ㎓		5 ㎓		6 ㎓		
		Main	Aux	Main	Aux	Main	Aux	Aux
		[①]	[②]	[③]	[④]	[⑤]	[⑥]	[⑦]
Body	Rear	0.270	0.227	0.578	0.671	1.019	0.662	0.087

Summation										
-	[①+②]	[①+⑦]	[③+④]	[③+⑦]	[④+⑦]	[③+④+⑦]	[⑤+⑥]	[⑤+⑦]	[⑥+⑦]	[⑤+⑥+⑦]
	0.497	0.357	1.249	0.665	0.758	**1.336**	1.681	1.106	0.749	1.768
SPLSR Required (Yes / No)	No	No	No	No	No	No	Yes	No	No	Yes

Notes:

- Simultaneous transmission SAR test exclusion considerations
  Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneously transmitting antenna. When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration. Per KDB Publication 447498 D01v06.
- When the sum of SAR1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR1g 1.6 W/kg), the SPLSR procedures is not required. When the sum of SAR1g is greater than the SAR limit (SAR1g 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

11.3 SAR to Peak Location Separation Ratio Analysis

The simultaneous transmitting antennas in each operating mode and exposure condition combination are considered one pair at a time to determine the SPLSR. When SAR is measured for both antennas in the pair, the peak location separation distance is computed by the following formula.

$$\text{Peak Location Separation Distance} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

Where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the area or zoom scans.

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna. Due to curvatures on the SAM phantom, when SAR is estimated for one of the antennas in an antenna pair, the measured peak SAR location will be translated onto the test device to determine the peak location separation for the antenna pair.

The SPLSR is determined by the following formula.

$$\text{SPLSR} = \frac{(\text{SAR}_1 + \text{SAR}_2)^{1.5}}{R_i}$$

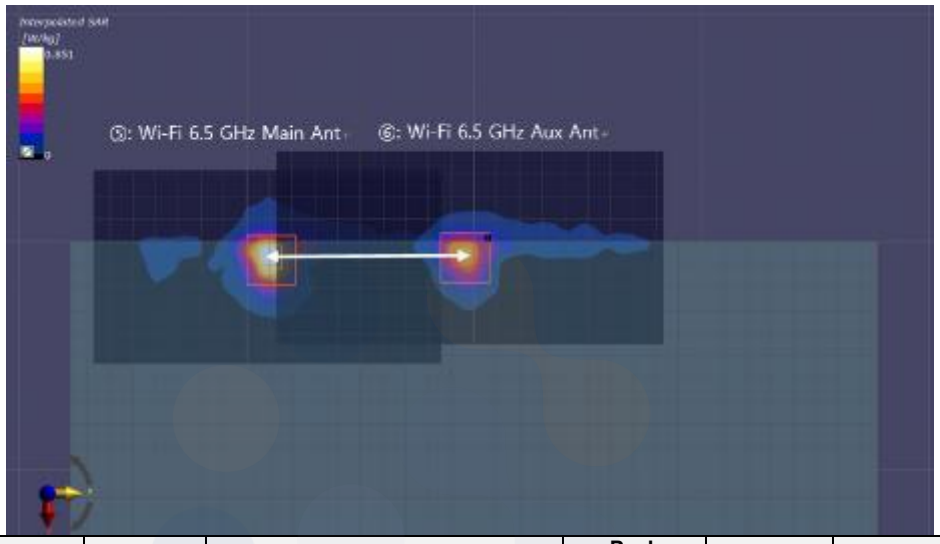
Where SAR_1 and SAR_2 are the highest reported or estimated SAR for each antenna in the pair, and R_i is the separation distance between the peak SAR locations for the antenna pair in mm.

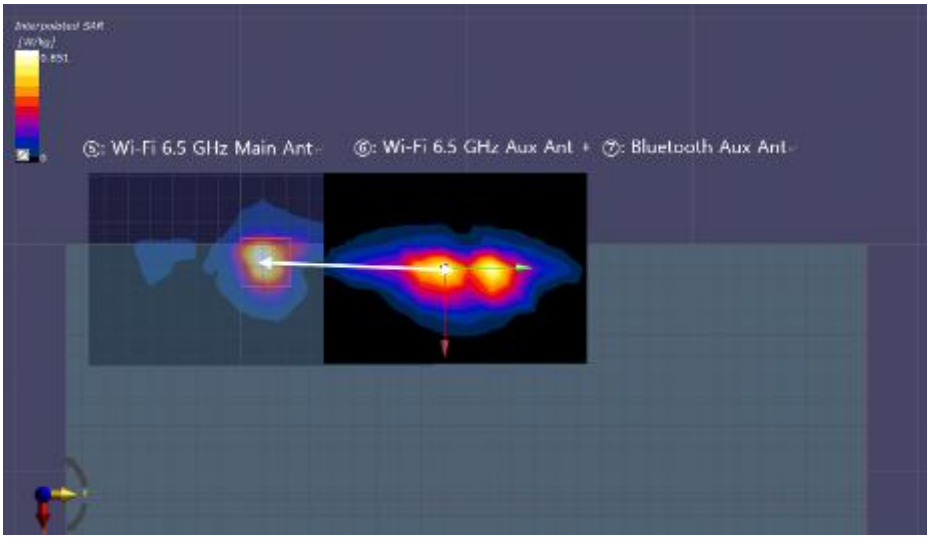
When the SPLSR is ≤ 0.04, ≤ 0.10 (10g) the simultaneous transmission SAR is not required. Otherwise, the enlarged zoom scan and volume scan post-processing procedures will be performed.

11.3.1 Summary of SPLSR Result

Exposure Condition /Position	WLAN 2.4 GHz		WLAN 5 GHz		WLAN 6 GHz		Bluetooth	Worst Summation		SPLSR Result
	Main	Aux	Main	Aux	Main	Aux	Aux			
	[①]	[②]	[③]	[④]	[⑤]	[⑥]	[⑦]	Sum No.	[W/kg]	
	-	-	-	-	1.019	0.662	-	[⑤+⑥]	1.681	0.03
	-	-	-	-	1.019	0.662	0.087	[⑤+⑥+⑦]	1.768	0.03

11.3.2 SPLSR Analysis

RF Exposure Condition	Mode / Ant.	SAR Value (W/kg)	Coordinates			Peak Location Separation Distance (mm)	SPLSR Result	Simultaneous Transmission SAR
			X	Y	Z			
Body (Notebook)	WLAN 6.5 GHz Main	1.019	0.00685	-0.09131	-0.17702	86.29	0.03	Not Required (SPLSR < 0.04)
	WLAN 6.5 GHz Aux	0.662	0.00567	-0.00503	-0.17702			
								

RF Exposure Condition	Mode / Ant.	SAR Value (W/kg)	Coordinates			Peak Location Separation Distance (mm)	SPLSR Result	Simultaneous Transmission SAR
			X	Y	Z			
Body (Notebook)	WLAN 6.5 GHz Main	1.019	0.00685	-0.09131	-0.17702	86.29	0.03	Not Required (SPLSR < 0.04)
	WLAN 6.5 GHz Aux + Bluetooth	0.749	0.00567	-0.00503	-0.17702			
								

Note: The distance between WLAN 6.5 GHz Main and WLAN 6.5 GHz Aux + Bluetooth is calculated conservatively.

12. SAR Measurement Variability

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

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

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

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

13. Measurement Uncertainty

13.1 SAR Measurement Uncertainty

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

13.2 Power Density Measurement Uncertainty

Source f uncertainty	Uncertainty Value (± dB)	Probability distribution	Div.	c_i	Standard Uncertainty (± dB)	v_i
Measurement system						
Calibration	0.49	N	1.00	1.00	0.49	∞
Probe correction	0.00	R	1.73	1.00	0.00	∞
Frequency response (BW ≤ 1 GHz)	0.20	R	1.73	1.00	0.12	∞
Sensor cross coupling	0.00	R	1.73	1.00	0.00	∞
Isotropy	0.50	R	1.73	1.00	0.29	∞
Linearity	0.20	R	1.73	1.00	0.12	∞
Probe scattering	0.00	R	1.73	1.00	0.00	∞
Probe positioning offset	0.30	R	1.73	1.00	0.17	∞
Probe positioning repeatability	0.04	R	1.73	1.00	0.02	∞
Sensor mechanical offset	0.00	R	1.73	1.00	0.00	∞
Probe spatial resolution	0.00	R	1.73	1.00	0.00	∞
Field impedance dependance dependence	0.00	R	1.73	1.00	0.00	∞
Amplitude and phase drift	0.00	R	1.73	1.00	0.00	∞
Amplitude and phase noise	0.04	R	1.73	1.00	0.02	∞
Measurement area truncation	0.00	R	1.73	1.00	0.00	∞
Data acquisition	0.03	N	1.00	1.00	0.03	∞
Sampling	0.00	R	1.73	1.00	0.00	∞
Field reconstruction	1.77	R	1.73	1.00	1.02	∞
Forward transformation	0.00	R	1.73	1.00	0.00	∞
Power density scaling	-	R	1.73	1.00	-	∞
Spatial averaging	0.10	R	1.73	1.00	0.06	∞
System detection limit	0.04	R	1.73	1.00	0.02	∞
DUT and environmental factors						
Probe coupling with DUT	0.00	R	1.73	1.00	0.00	∞
Modulation response	0.40	R	1.73	1.00	0.23	∞
Integration time	0.00	R	1.73	1.00	0.00	∞
Response time	0.00	R	1.73	1.00	0.00	∞
Device holder influence	0.10	R	1.73	1.00	0.06	∞
DUT alignment	0.00	R	1.73	1.00	0.00	∞
RF ambient conditions	0.04	R	1.73	1.00	0.02	∞
Ambient reflections	0.04	R	1.73	1.00	0.02	∞
Immunity / secondary reception	0.00	R	1.73	1.00	0.00	∞
Drift of the DUT	0.22	R	1.73	1.00	0.13	∞
Combined standard uncertainty	RSS				1.23	
Expanded uncertainty (95 % confidence interval)	*k* = 2				2.46	

14. Test Equipment Information

Test Platform	SPEAG DASY5 System SPEAG DASY6 System			
Version	DASY52: 52.10.4.1535 / SEMCAD: 14.6.14 (7501) DASY6: 16.0.0.116 / DASY6 mmWave: 2.4.2.62			
Location	KCTL Inc, 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea			
Manufacture	SPEAG			
Hardware Reference				
Equipment	Model	Serial Number	Date of Calibration	Due date of next Calibration
Shield Room	-	8F - 3	-	-
Shield Room	-	8F - 4	-	-
DASY6 Robot	TX90XL speag	F/18/0004968/A/001	-	-
DASY6 Robot	TX60 Lspeag	F/19/0007289/A/001	-	-
Phantom	2mm Oval Phantom ELI5	2097	-	-
Phantom	2mm Oval Phantom ELI5	2098	-	-
Phantom	mmWave Phantom	1062	-	-
Mounting Device	Laptop Holder	-	-	
mmWave Device Holder	mmWave Device Holder	1116	-	-
DAE	DAE4	1342	2021-06-02	2022-06-02
DAE	DAE4	1587	2021-07-26	2022-07-26
Probe	EX3DV4	7540	2021-04-29	2022-04-29
Probe	EX3DV4	7541	2021-07-30	2022-07-30
Isotropic E-Field Probe	EUmmWV4	9489	2021-05-28	2022-05-28
ESG Vector Signal Generator	E4438C	MY42080486	2021-05-10	2022-05-10
PSG Analog Signal Generator	E8257D	MY60020337	2022-01-26	2023-01-26
Dual Power Meter	EPM-442A	GB37480680	2021-05-11	2022-05-11
Power Sensor	8481H	2703A11902	2021-05-11	2022-05-11
Power Sensor	8481H	3318A18090	2021-05-11	2022-05-11
Attenuator	8491A	21552	2021-05-10	2022-05-10
Attenuator	8491A	35560	2021-05-10	2022-05-10
Attenuator	8491A	35934	2021-05-10	2022-05-10
Low Pass Filter	VLF-3000+	31831	2021-05-10	2022-05-10
Low Pass Filter	VLF-6000+	31838	2021-05-10	2022-05-10
Low Pass Filter	PE87FL1016	20-1	2021-11-11	2022-11-11
Low Pass Filter	PE87FL1017	2134	2022-01-06	2023-01-06
Dual Directional Coupler	772D	2839A160504	2021-05-10	2022-05-10
Power Amplifier	AMP2027	10010	2021-05-10	2022-05-10
Preamplifier	8449B	3008A01802	2021-04-01	2022-04-01
System Verification Device	5G Verification Source 10 GHz	1023	2022-01-20	2023-01-20
Dipole Validation Kits	D2450V2	895	2020-07-21	2022-07-21
Dipole Validation Kits	D5GHzV2	1293	2021-07-22	2023-07-22
Dipole Validation Kits	D6.5GHzV2	1005	2020-08-21	2022-08-21
Network Analyzer	E5071B	MY42403524	2022-02-15	2023-02-15
Dielectric Assessment Kit	DAK-3.5	1078	2021-05-26	2022-05-26
Humidity/Temp	MHB-382SD	73871	2021-05-13	2022-05-13
Humidity/Temp	MHB-382SD	46301	2022-02-25	2023-02-25
Spectrum Analyzer	FSP7	100289	2021-12-21	2022-12-21

15. SAR Test System Verification and Test Results

Date: 3/15/2022

Test Laboratory: KCTL Inc.
File Name: 2450 MHz Verification Iuput Power 100 mW 2022-03-15.da52:0

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

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.853 S/m; ε_r = 38.265; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

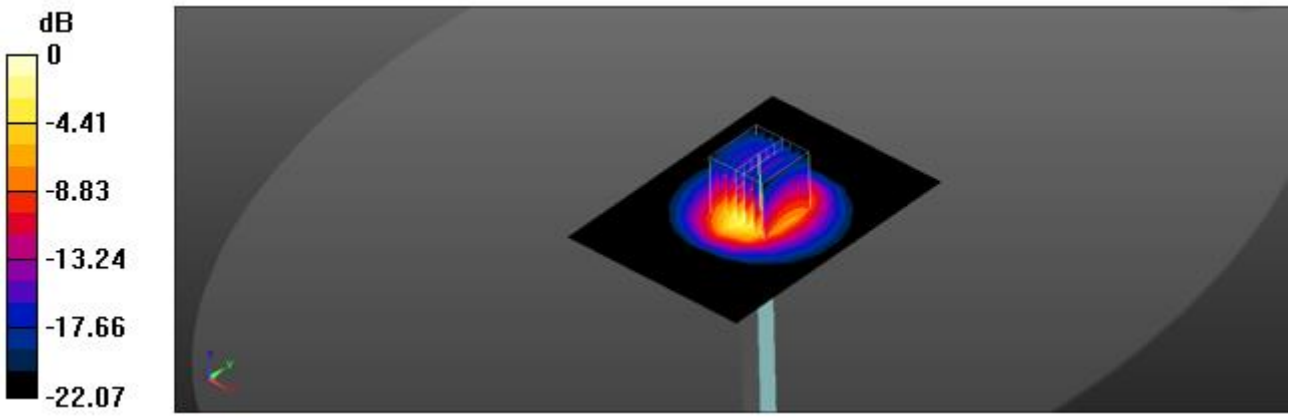
- Probe: EX3DV4 - SN7541;ConvF(7.69, 7.69, 7.69) @ 2450 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/2450 MHz Verification Input Power 100 mW 2022-03-15/Area Scan (9x12x1):
Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 7.68 W/kg

Configuration/2450 MHz Verification Input Power 100 mW 2022-03-15/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 67.89 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 10.5 W/kg
SAR(1 g) = 5.05 W/kg; SAR(10 g) = 2.35 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 48.1%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 8.50 W/kg



0 dB = 8.50 W/kg = 9.29 dBW/kg

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 5300 MHz Verification Input Power 100 mW 2022-03-16.da5:0

DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293

Communication System: UID 0, CW (0); Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5300 MHz; σ = 4.711 S/m; ε_r = 36.501; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

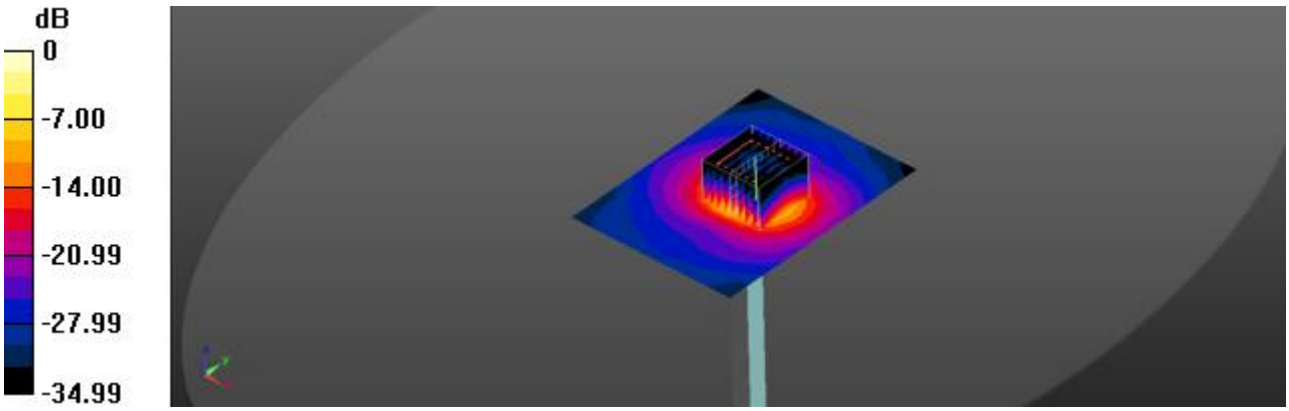
- Probe: EX3DV4 - SN7541;ConvF(5.37, 5.37, 5.37) @ 5300 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/5300 MHz Verification Input Power 100 mW 2022-03-16/Area Scan (10x13x1):
Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 19.3 W/kg

Configuration/5300 MHz Verification Input Power 100 mW 2022-03-16/Zoom Scan (9x9x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 56.61 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 32.6 W/kg
SAR(1 g) = 7.79 W/kg; SAR(10 g) = 2.24 W/kg
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 63.5%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 5600 MHz Verification Input Power 100 mW 2022-03-16.da5:0

DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293

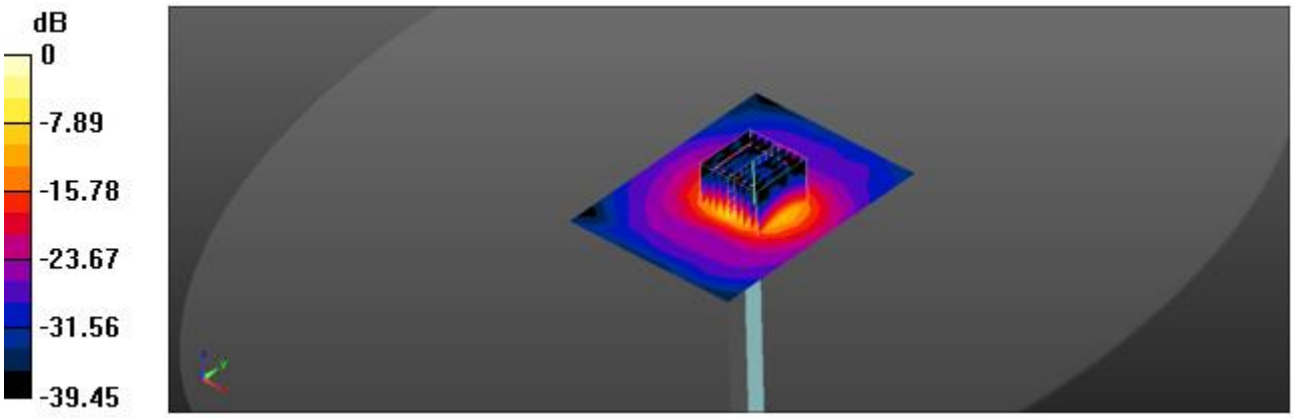
Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.015 S/m; ε_r = 35.843; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7541;ConvF(4.65, 4.65, 4.65) @ 5600 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/5600 MHz Verification Input Power 100 mW 2022-03-16/Area Scan (10x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 20.8 W/kg

Configuration/5600 MHz Verification Input Power 100 mW 2022-03-16/Zoom Scan (9x9x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 56.99 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 37.6 W/kg
SAR(1 g) = 8.23 W/kg; SAR(10 g) = 2.35 W/kg
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 60.8%
Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 5800 MHz Verification Input Power 100 mW 2022-03-16.da5:0

DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1293

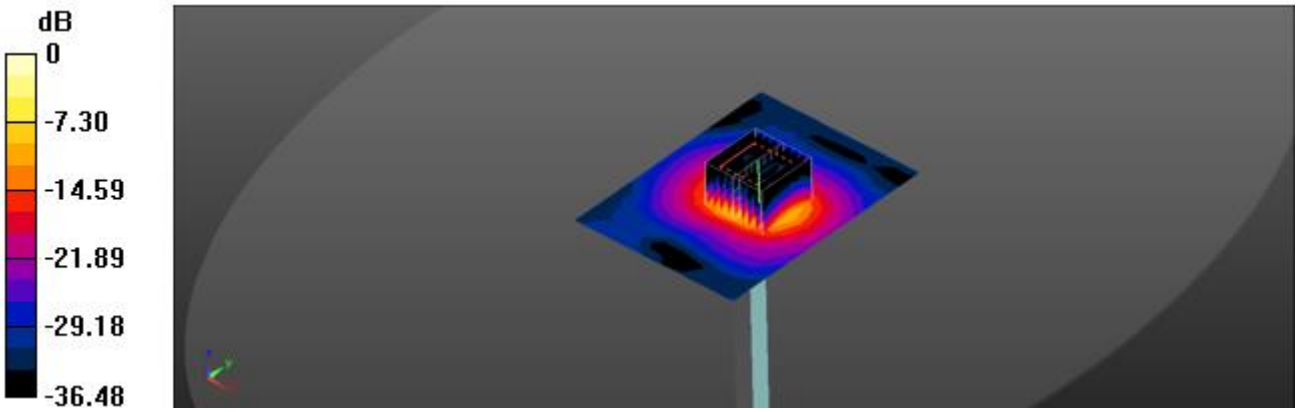
Communication System: UID 0, CW (0); Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.193 S/m; ε_r = 35.295; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7541;ConvF(4.7, 4.7, 4.7) @ 5800 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/5800 MHz Verification Input Power 100 mW 2022-03-16/Area Scan (10x13x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 20.2 W/kg

Configuration/5800 MHz Verification Input Power 100 mW 2022-03-16/Zoom Scan (9x9x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.40 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 37.2 W/kg
SAR(1 g) = 7.76 W/kg; SAR(10 g) = 2.21 W/kg
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 59.2%
Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 20.5 W/kg = 13.12 dBW/kg

KCTL Inc.

Measurement Report for Dipole D6.5GHzV2, FRONT, Validation band, UID 0 -, Channel 6500 (6500.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
Dipole D6.5GHzV2, Speag	16.0 x 6.0 x 300.0	1005	Validation Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 5.00	Validation band	CW, 0--	6500.0, 6500	5.45	5.88	33.6

Hardware Setup

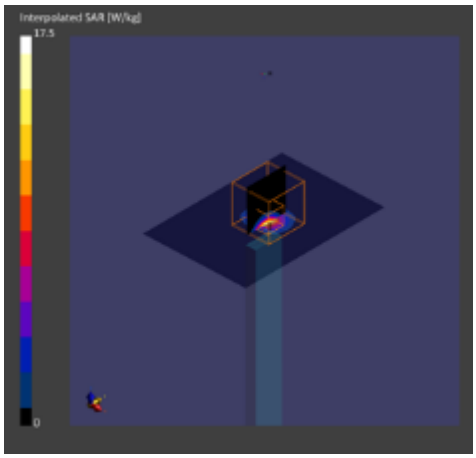
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	60.0 x 85.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	6.0 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	2.48	2.84
psSAR10g [W/kg]	0.510	0.544
psPDab (1.0cm2, sq) [W/m2]		28.4
psPDab (4.0cm2, sq) [W/m2]		13.2
Power Drift [dB]		0.01
M2/M1 [%]		50.5
Dist 3dB Peak [mm]		4.8



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1)

Date: 3/15/2022

Test Laboratory: KCTL Inc.
File Name: 1.WLAN 2.4 GHz_Notebook.da53:0

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

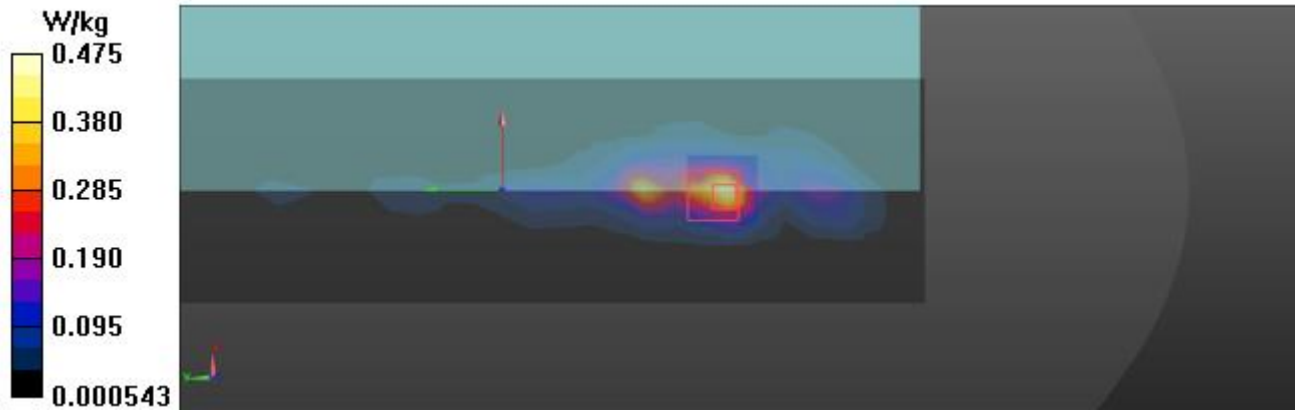
Communication System: UID 0, 2.4GWLAN (0); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.82 S/m; ε_r = 38.364; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7541;ConvF(7.69, 7.69, 7.69) @ 2412 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 b_Main_CH1_Rear 0mm/Area Scan (9x31x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.491 W/kg

Configuration/802.11 b_Main_CH1_Rear 0mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.39 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.670 W/kg
SAR(1 g) = 0.258 W/kg; SAR(10 g) = 0.114 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 36.8%
Maximum value of SAR (measured) = 0.475 W/kg



2)

Date: 3/15/2022

Test Laboratory: KCTL Inc.
File Name: 1.WLAN 2.4 GHz_Notebook.da53:1

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

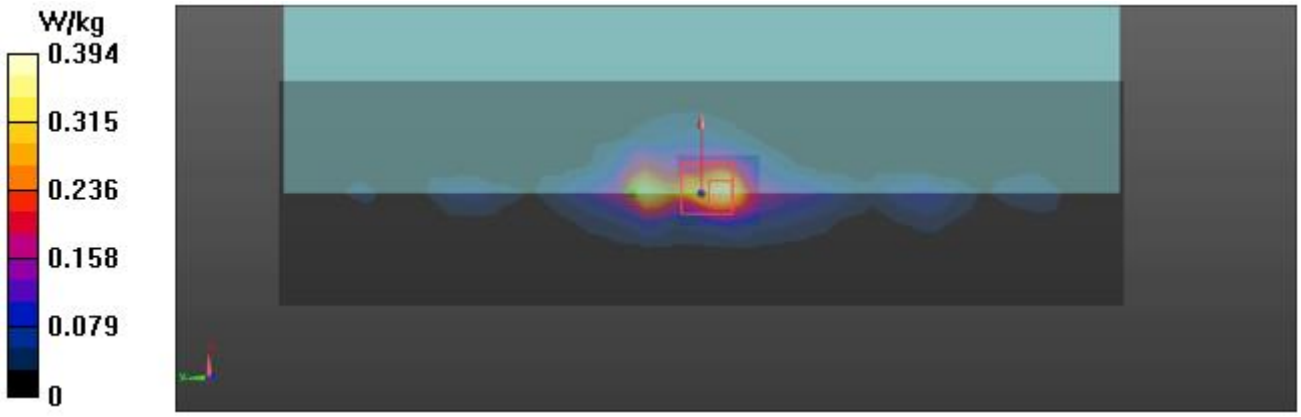
Communication System: UID 0, 2.4GWLAN (0); Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.865 S/m; ε_r = 38.214; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7541;ConvF(7.69, 7.69, 7.69) @ 2462 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 b_Aux_CH11_Rear 0mm/Area Scan (9x31x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.394 W/kg

Configuration 2/802.11 b_Aux_CH11_Rear 0mm/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.82 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.580 W/kg
SAR(1 g) = 0.217 W/kg; SAR(10 g) = 0.100 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 35.8%
Maximum value of SAR (measured) = 0.424 W/kg



3)

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 1.WLAN 5.3 GHz_Notebook.da53:0

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

Communication System: UID 0, 5GWLAN (0); Frequency: 5290 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5290 MHz; σ = 4.7 S/m; ε_r = 36.498; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

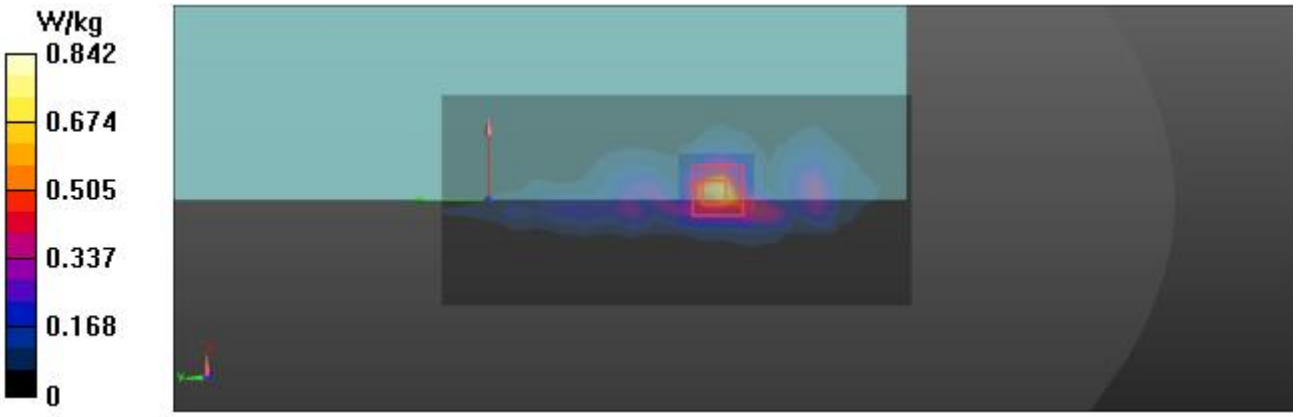
- Probe: EX3DV4 - SN7541;ConvF(5.37, 5.37, 5.37) @ 5290 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 ac_VHT80_Main_CH58_Rear 0mm/Area Scan (10x21x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.719 W/kg

Configuration/802.11 ac_VHT80_Main_CH58_Rear 0mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 13.65 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 1.56 W/kg
SAR(1 g) = 0.341 W/kg; SAR(10 g) = 0.111 W/kg
Smallest distance from peaks to all points 3 dB below = 6.9 mm
Ratio of SAR at M2 to SAR at M1 = 60.4%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.842 W/kg



4)

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 1.WLAN 5.3 GHz_Notebook.da53:1

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

Communication System: UID 0, 5GWLAN (0); Frequency: 5290 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5290 MHz; σ = 4.7 S/m; ε_r = 36.498; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

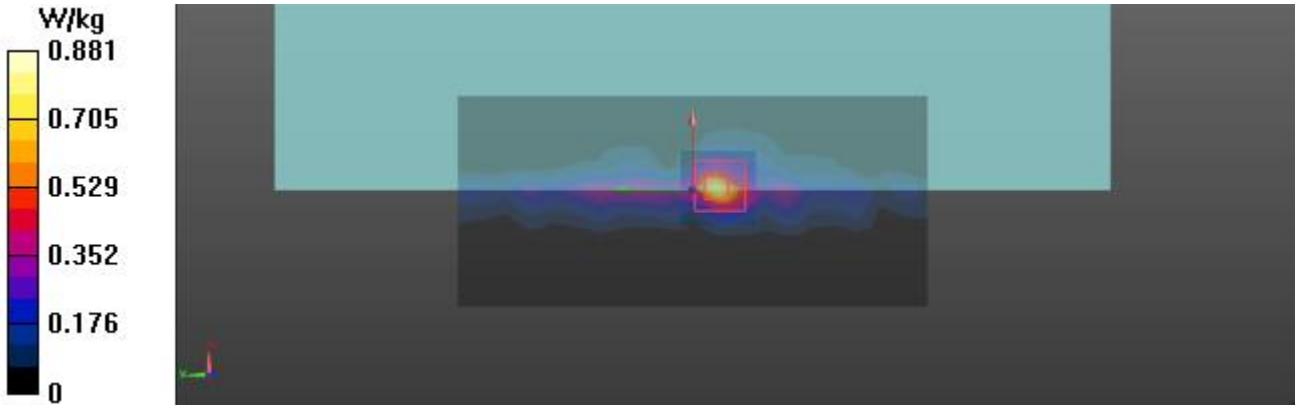
- Probe: EX3DV4 - SN7541;ConvF(5.37, 5.37, 5.37) @ 5290 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 ac_VHT80_Aux_CH58_Rear 0mm/Area Scan (10x21x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.879 W/kg

Configuration 2/802.11 ac_VHT80_Aux_CH58_Rear 0mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 10.54 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 1.56 W/kg
SAR(1 g) = 0.337 W/kg; SAR(10 g) = 0.103 W/kg
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 60.3%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.881 W/kg



5)

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 2.WLAN 5.6 GHz_Notebook.da53:0

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

Communication System: UID 0, 5GWLAN (0); Frequency: 5690 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5690 MHz; σ = 5.096 S/m; ε_r = 35.578; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

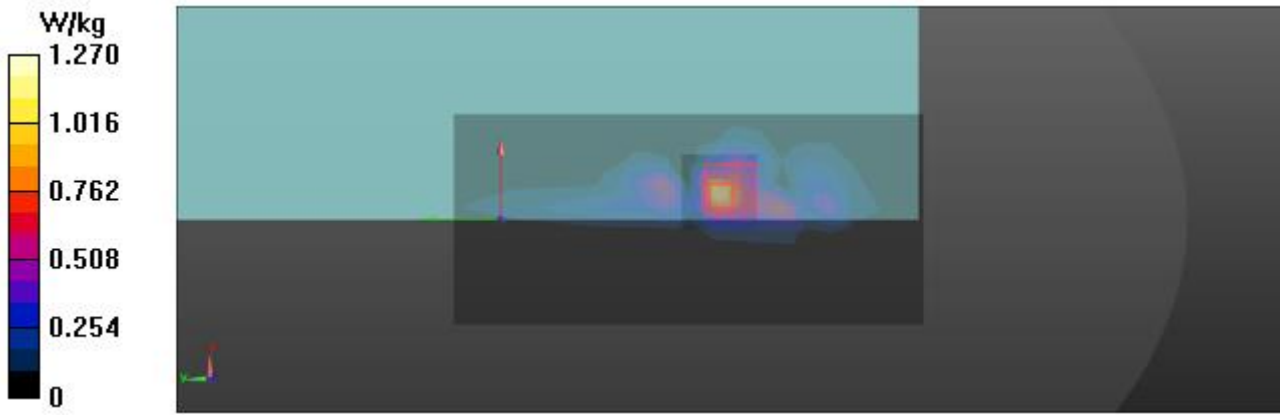
- Probe: EX3DV4 - SN7541;ConvF(4.65, 4.65, 4.65) @ 5690 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 ac_VHT80_Main_CH138_Rear 0mm/Area Scan (10x21x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.887 W/kg

Configuration/802.11 ac_VHT80_Main_CH138_Rear 0mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 8.158 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 2.57 W/kg
SAR(1 g) = 0.491 W/kg; SAR(10 g) = 0.153 W/kg
Smallest distance from peaks to all points 3 dB below = 5.7 mm
Ratio of SAR at M2 to SAR at M1 = 58.1%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.27 W/kg



6)

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 2.WLAN 5.6 GHz_Notebook.da53:1

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

Communication System: UID 0, 5GWLAN (0); Frequency: 5610 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5610 MHz; σ = 5.024 S/m; ε_r = 35.814; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

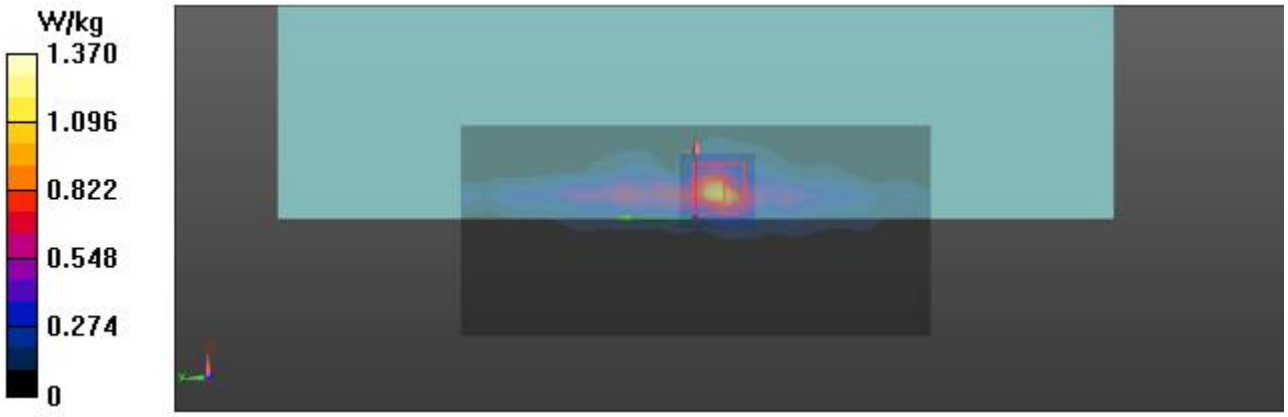
- Probe: EX3DV4 - SN7541;ConvF(4.65, 4.65, 4.65) @ 5610 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 ac_VHT80_Aux_CH122_Rear 0mm/Area Scan (10x21x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.17 W/kg

Configuration 2/802.11 ac_VHT80_Aux_CH122_Rear 0mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 5.938 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 2.68 W/kg
SAR(1 g) = 0.506 W/kg; SAR(10 g) = 0.150 W/kg
Smallest distance from peaks to all points 3 dB below = 6.4 mm
Ratio of SAR at M2 to SAR at M1 = 57.4%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.37 W/kg



7)

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 3.WLAN 5.8 GHz_Notebook.da53:0

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

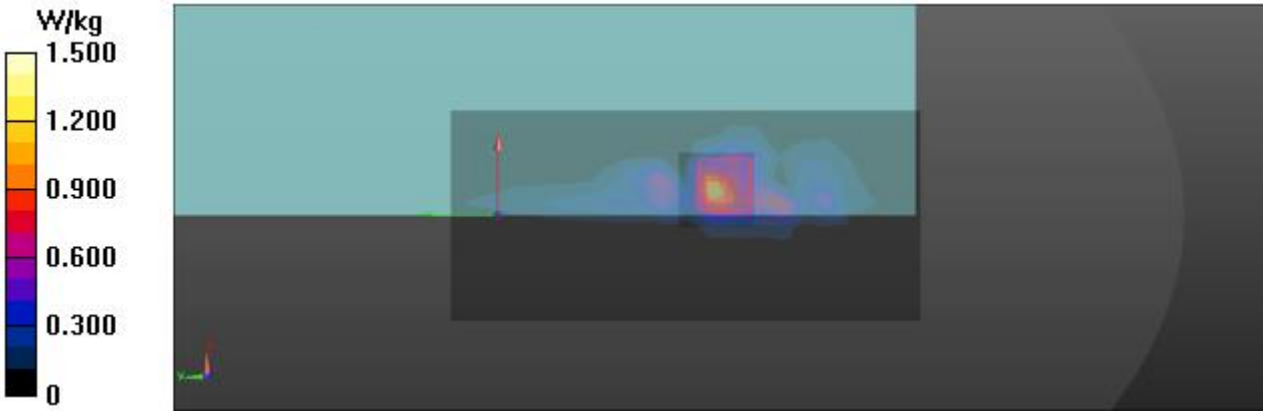
Communication System: UID 0, 5GWLAN (0); Frequency: 5775 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5775 MHz; σ = 5.172 S/m; ε_r = 35.362; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7541;ConvF(4.7, 4.7, 4.7) @ 5775 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 ac_VHT80_Main_CH155_Rear 0mm/Area Scan (10x21x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.05 W/kg

Configuration/802.11 ac_VHT80_Main_CH155_Rear 0mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 9.083 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.98 W/kg
SAR(1 g) = 0.563 W/kg; SAR(10 g) = 0.173 W/kg
Smallest distance from peaks to all points 3 dB below = 5.4 mm
Ratio of SAR at M2 to SAR at M1 = 57%
Maximum value of SAR (measured) = 1.50 W/kg



8)

Date: 3/16/2022

Test Laboratory: KCTL Inc.
File Name: 3.WLAN 5.8 GHz_Notebook.da53:1

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

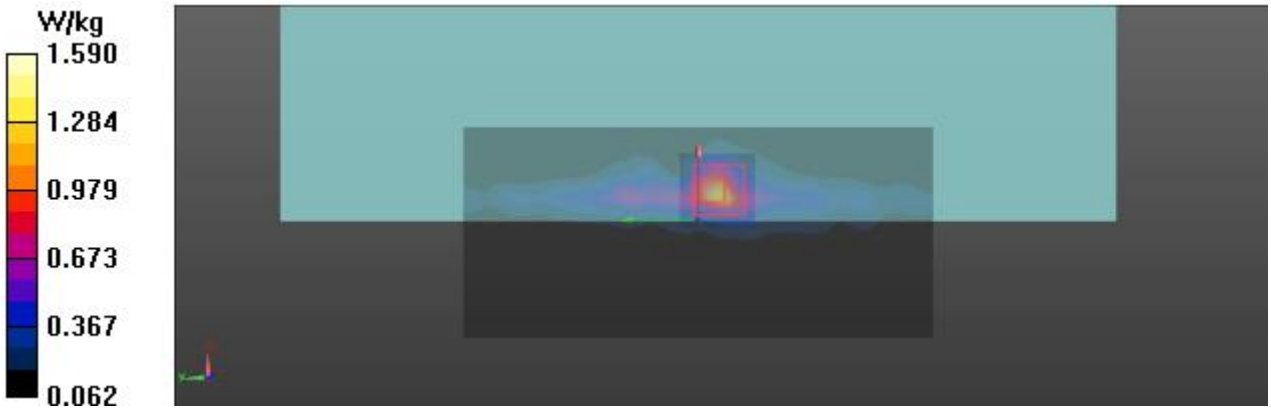
Communication System: UID 0, 5GWLAN (0); Frequency: 5775 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5775 MHz; σ = 5.172 S/m; ε_r = 35.362; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7541;ConvF(4.7, 4.7, 4.7) @ 5775 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 ac_VHT80_Aux_CH155_Rear 0mm/Area Scan (10x21x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.28 W/kg

Configuration 2/802.11 ac_VHT80_Aux_CH155_Rear 0mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 7.390 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 3.23 W/kg
SAR(1 g) = 0.638 W/kg; SAR(10 g) = 0.234 W/kg
Smallest distance from peaks to all points 3 dB below = 6.4 mm
Ratio of SAR at M2 to SAR at M1 = 59.7%
Maximum value of SAR (measured) = 1.59 W/kg



9)

Date: 3/15/2022

Test Laboratory: KCTL Inc.
File Name: 2.Bluetooth_BDR_Notebook.da53:0

DUT: NT950XEE, Type: Notebook, Serial: 5B1C9FMT100037H

Communication System: UID 0, Bluetooth (0); Frequency: 2402 MHz; Duty Cycle: 1:1.30167
Medium parameters used (interpolated): f = 2402 MHz; σ = 1.806 S/m; ε_r = 38.398; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

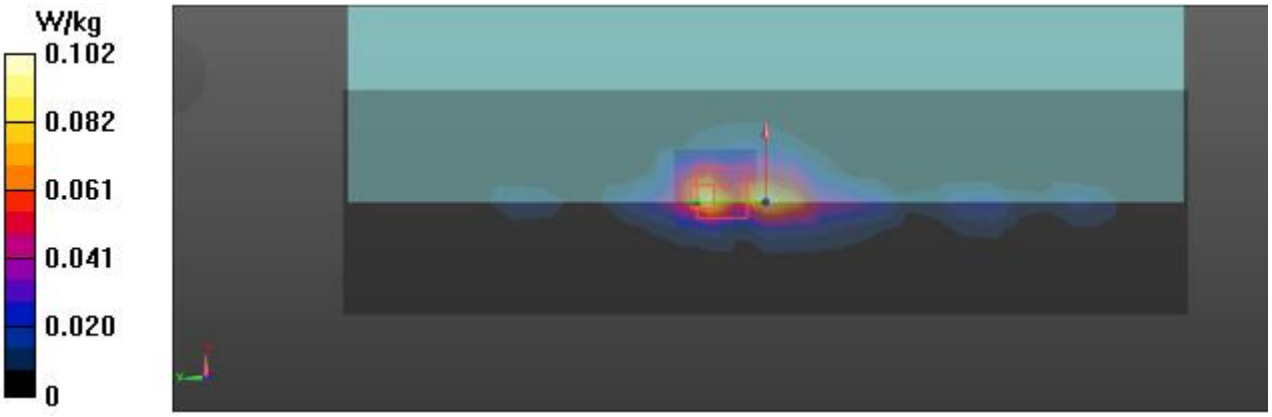
- Probe: EX3DV4 - SN7541;ConvF(7.69, 7.69, 7.69) @ 2402 MHz; Calibrated: 7/30/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1342; Calibrated: 6/2/2021
- Phantom: Front_Left_ELI V8.0; Type: QD OVA 004 AA; Serial: 2097
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/Bluetooth_BDR_DH5_CH0_Rear 0mm/Area Scan (9x31x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0962 W/kg

Configuration/Bluetooth_BDR_DH5_CH0_Rear 0mm/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.508 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.144 W/kg
SAR(1 g) = 0.052 W/kg; SAR(10 g) = 0.022 W/kg
Smallest distance from peaks to all points 3 dB below = 8.5 mm
Ratio of SAR at M2 to SAR at M1 = 36.3%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.102 W/kg



10)
KCTL Inc.

Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 79 (6345.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6345.0, 79	5.45	5.73	33.8

Hardware Setup

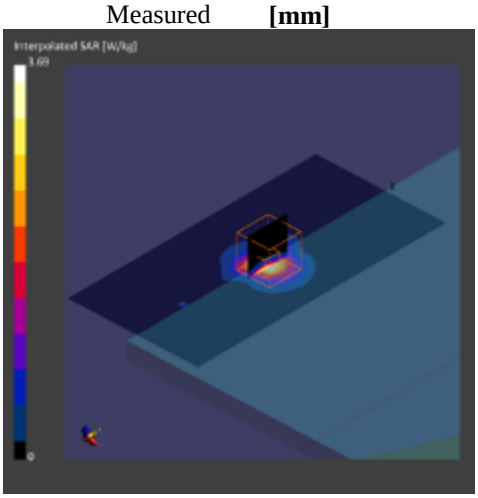
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 170.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.604	0.742
psSAR10g [W/kg]	0.200	0.221
psPDab (1.0cm2, sq) [W/m2]		7.42
psPDab (4.0cm2, sq) [W/m2]		5.08
Power Drift [dB]		0.04
M2/M1 [%]		51.6
Dist 3dB Peak [mm]		6.3



11)
KCTL Inc.
Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 47 (6185.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Aux Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6185.0, 47	5.45	5.56	34.1

Hardware Setup

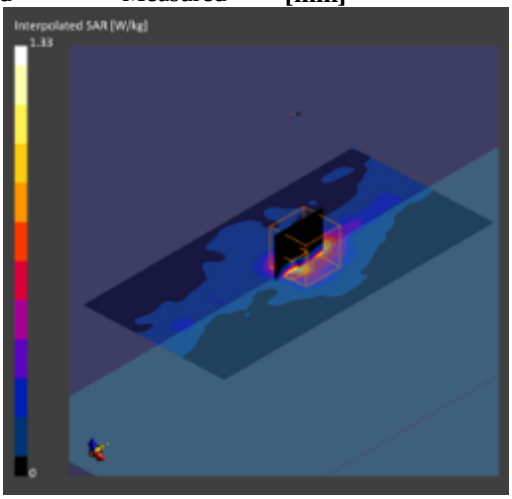
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 170.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.248	0.254
psSAR10g [W/kg]	0.083	0.077
psPDab (1.0cm2, sq) [W/m2]		2.54
psPDab (4.0cm2, sq) [W/m2]		1.73
Power Drift [dB]		-0.01
M2/M1 [%]		52.8
Dist 3dB Peak [mm]		4.8



12)
KCTL Inc.
Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 111 (6505.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6505.0, 111	5.45	5.89	33.6

Hardware Setup

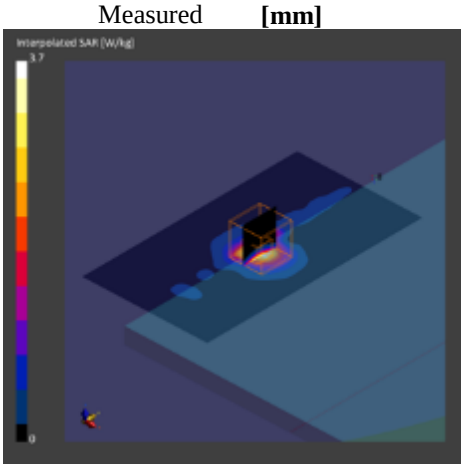
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 153.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.616	0.736
psSAR10g [W/kg]	0.205	0.217
psPDab (1.0cm2, sq) [W/m2]		7.36
psPDab (4.0cm2, sq) [W/m2]		5.01
Power Drift [dB]		-0.06
M2/M1 [%]		50.3
Dist 3dB Peak [mm]		6.1



13)
KCTL Inc.
Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 111 (6505.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Aux Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6505.0, 111	5.45	5.89	33.6

Hardware Setup

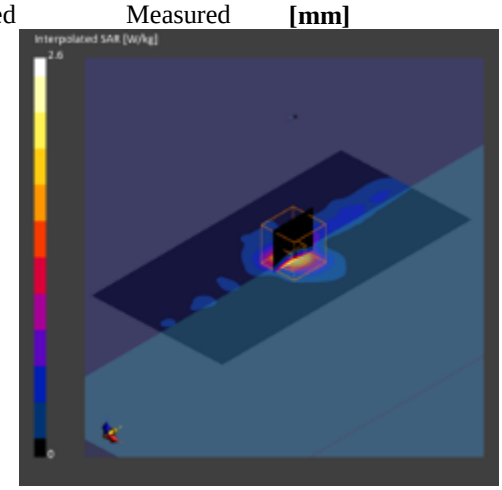
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 170.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.476	0.507
psSAR10g [W/kg]	0.155	0.146
psPDab (1.0cm2, sq) [W/m2]		5.07
psPDab (4.0cm2, sq) [W/m2]		3.37
Power Drift [dB]		-0.05
M2/M1 [%]		49.7
Dist 3dB Peak [mm]		6.3



14)
KCTL Inc.
Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 175 (6825.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6825.0, 175	5.45	6.24	33.1

Hardware Setup

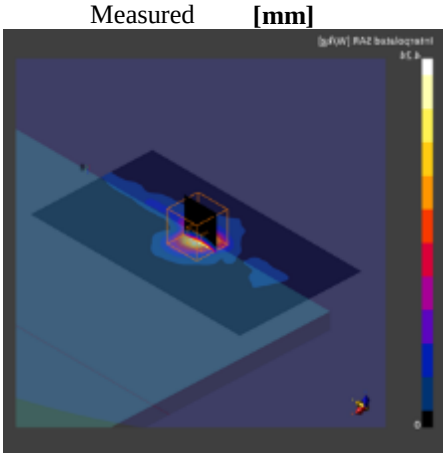
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 153.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.672	0.788
psSAR10g [W/kg]	0.218	0.232
psPDab (1.0cm2, sq) [W/m2]		7.88
psPDab (4.0cm2, sq) [W/m2]		5.36
Power Drift [dB]		0.03
M2/M1 [%]		48.2
Dist 3dB Peak [mm]		6.3



15)
KCTL Inc.
Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 175 (6825.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Aux Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6825.0, 175	5.45	6.24	33.1

Hardware Setup

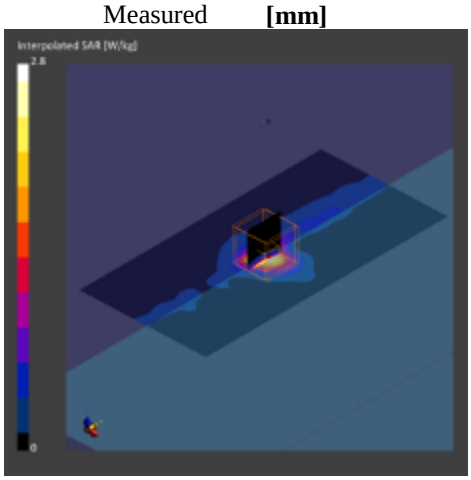
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 170.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.478	0.522
psSAR10g [W/kg]	0.152	0.148
psPDab (1.0cm2, sq) [W/m2]		5.22
psPDab (4.0cm2, sq) [W/m2]		3.46
Power Drift [dB]		0.02
M2/M1 [%]		47.9
Dist 3dB Peak [mm]		6.3



16)
KCTL Inc.
Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 207 (6985.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6985.0, 207	5.45	6.41	32.9

Hardware Setup

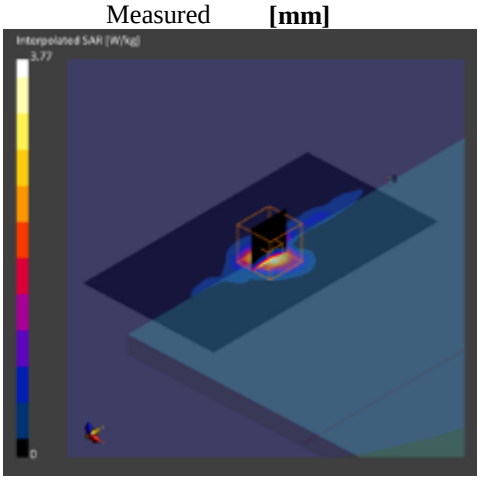
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 153.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.571	0.711
psSAR10g [W/kg]	0.185	0.213
psPDab (1.0cm2, sq) [W/m2]		7.11
psPDab (4.0cm2, sq) [W/m2]		4.90
Power Drift [dB]		-0.01
M2/M1 [%]		47.3
Dist 3dB Peak [mm]		6.7



17)
KCTL Inc.
Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 207 (6985.0MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	355.0 x 225.0 x 11.0	5B1C9FMT100020M	Laptop + Aux Antenna

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 0.00	Custom Band	CW, 10755-AAC	6985.0, 207	5.45	6.41	32.9

Hardware Setup

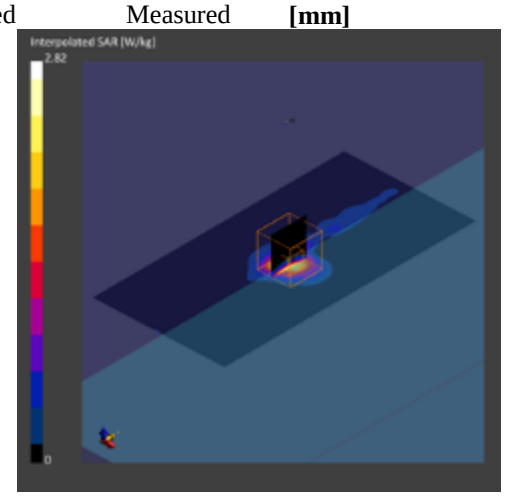
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2098	HBBL-600-10000, 2022-Mar-11	EX3DV4 - SN7540, 2021-04-29	DAE4 Sn1587, 2021-07-26

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	85.0 x 170.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	8.5 x 8.5	3.4 x 3.4 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.4
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-03-11	2022-03-11
psSAR1g [W/kg]	0.437	0.508
psSAR10g [W/kg]	0.135	0.144
psPDab (1.0cm2, sq) [W/m2]		5.08
psPDab (4.0cm2, sq) [W/m2]		3.34
Power Drift [dB]		-0.08
M2/M1 [%]		46.8
Dist 3dB Peak [mm]		6.4



16. PD Test System Verification and Test Results

KCTL Inc.

Measurement Report for 10 GHz Verification Source, FRONT, Validation band, UID 0 -, Channel 10000 (10000.0MHz)

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
10 GHz Verification Source, Speag	100.0 x 172.0 x 100.0	1023	Validation Dipole

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor
5G	FRONT, 10.00	10000.0, 10000	1.0

Hardware Setup

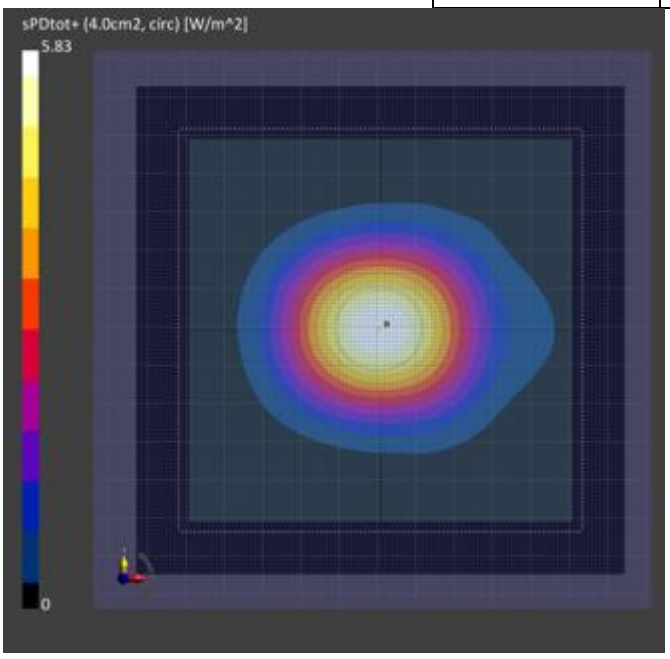
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave	Air	EUmmWV4 - SN9489_F1-55GHz, 2021-05-28	DAE4 Sn1587, 2021-07-26

Scans Setup

Measurement Results

Scan Type	5G Scan
Grid Extents [mm]	120.0 x 120.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	10.0
MAIA	N/A

Scan Type	5G Scan
Date	2022-03-14
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	5.79
psPDtot+ [W/m^2]	5.83
E_{max} [V/m]	49.8
Power Drift [dB]	0.09



KCTL Inc.

Measurement Report for 10 GHz Verification Source, FRONT, Validation band, UID 0 -, Channel 10000 (10000.0MHz)

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
10 GHz Verification Source, Speag	100.0 x 172.0 x 100.0	1023	Validation Dipole

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor
5G	FRONT, 10.00	10000.0, 10000	1.0

Hardware Setup

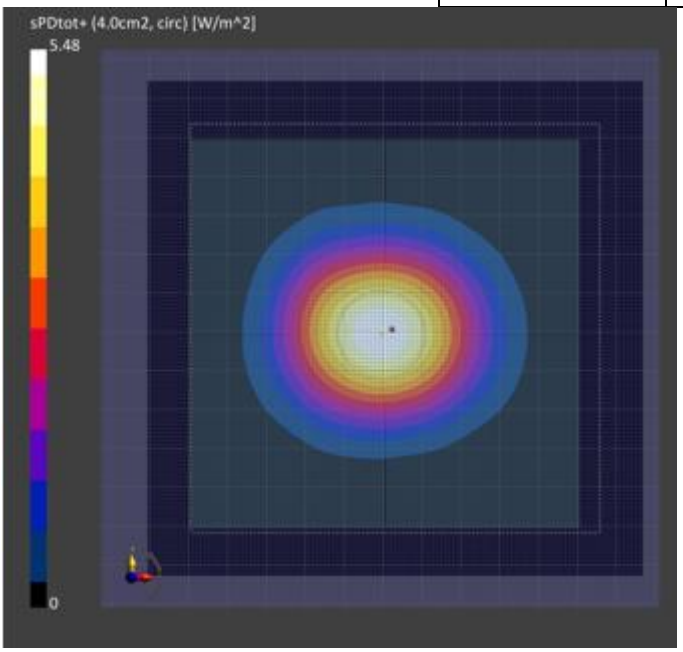
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave	Air	EUmmWV4 - SN9489_F1-55GHz, 2021-05-28	DAE4 Sn1587, 2021-07-26

Scans Setup

Measurement Results

Scan Type	5G Scan
Grid Extents [mm]	120.0 x 120.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	10.0
MAIA	N/A

Scan Type	5G Scan
Date	2022-03-15
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	5.45
psPDtot+ [W/m^2]	5.48
E_{max} [V/m]	48.9
Power Drift [dB]	0.04



18)
KCTL Inc.

Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 79 (6345.0MHz)

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	225.0 x 11.0 x 355.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor
5G	BACK, 2.00	6345.0, 79	1.0

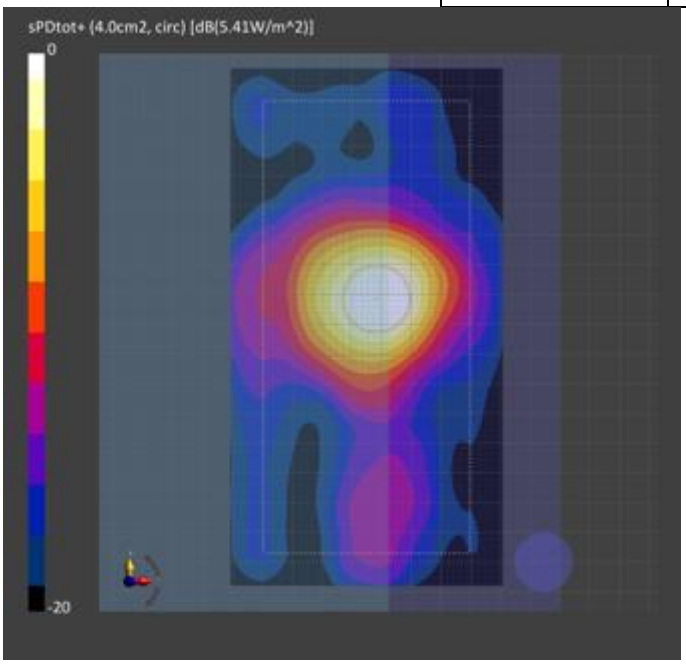
Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave	Air	EUmmWV4 - SN9489_F1-55GHz, 2021-05-28	DAE4 Sn1587, 2021-07-26

Scans Setup
Measurement Results

Scan Type	5G Scan
Grid Extents [mm]	90.0 x 170.0
Grid Steps [lambda]	0.0625 x 0.0625
Sensor Surface [mm]	2.0
MAIA	N/A

Scan Type	5G Scan
Date	2022-03-14
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	4.63
psPDtot+ [W/m^2]	5.41
E_{max} [V/m]	80.3
Power Drift [dB]	0.14



19)
KCTL Inc.

Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 111 (6505.0MHz)

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	225.0 x 11.0 x 355.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor
5G	BACK, 2.00	6505.0, 111	1.0

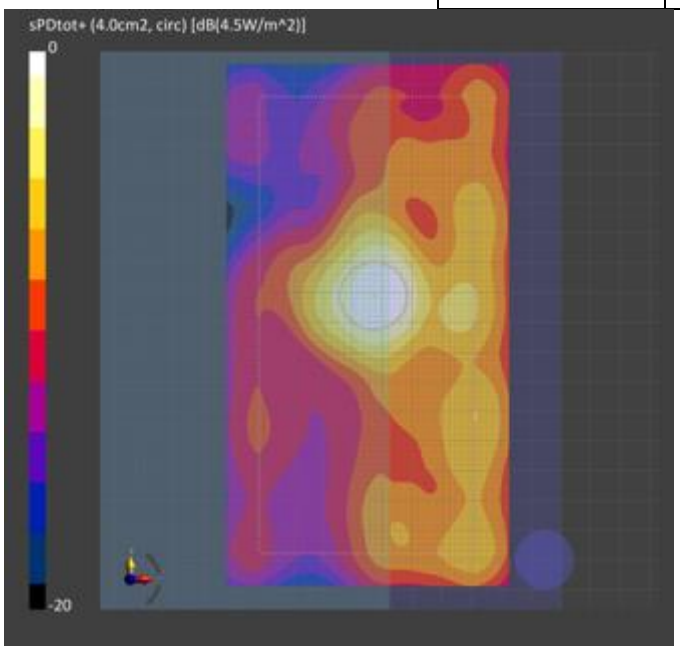
Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave	Air	EUmmWV4 - SN9489_F1-55GHz, 2021-05-28	DAE4 Sn1587, 2021-07-26

Scans Setup
Measurement Results

Scan Type	5G Scan
Grid Extents [mm]	90.0 x 170.0
Grid Steps [lambda]	0.0625 x 0.0625
Sensor Surface [mm]	2.0
MAIA	N/A

Scan Type	5G Scan
Date	2022-03-14
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	3.87
psPDtot+ [W/m^2]	4.50
E_{max} [V/m]	68.6
Power Drift [dB]	0.03



20)
KCTL Inc.

Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 143 (6665.0MHz)

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	225.0 x 11.0 x 355.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor
5G	BACK, 2.00	6665.0, 143	1.0

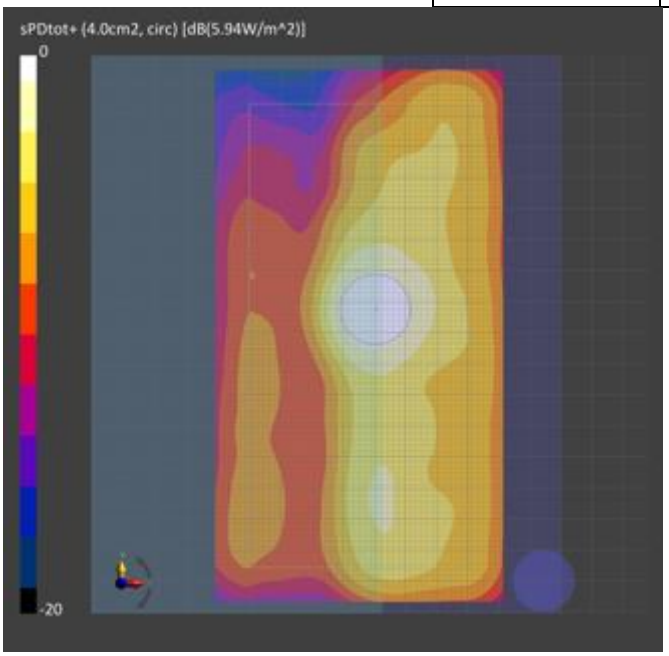
Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave	Air	EUmmWV4 - SN9489_F1-55GHz, 2021-05-28	DAE4 Sn1587, 2021-07-26

Scans Setup
Measurement Results

Scan Type	5G Scan
Grid Extents [mm]	90.0 x 170.0
Grid Steps [lambda]	0.0625 x 0.0625
Sensor Surface [mm]	2.0
MAIA	N/A

Scan Type	5G Scan
Date	2022-03-15
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	5.11
psPDtot+ [W/m^2]	5.94
E_{max} [V/m]	80.1
Power Drift [dB]	-0.10



21)
KCTL Inc.

Measurement Report for NP950XEE, BACK, Custom Band 802.11 ax, UID 10755 AAC, Channel 207 (6985.0MHz)

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
NP950XEE, SAMSUNG	225.0 x 11.0 x 355.0	5B1C9FMT100020M	Laptop + Main Antenna

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor
5G	BACK, 2.00	6985.0, 207	1.0

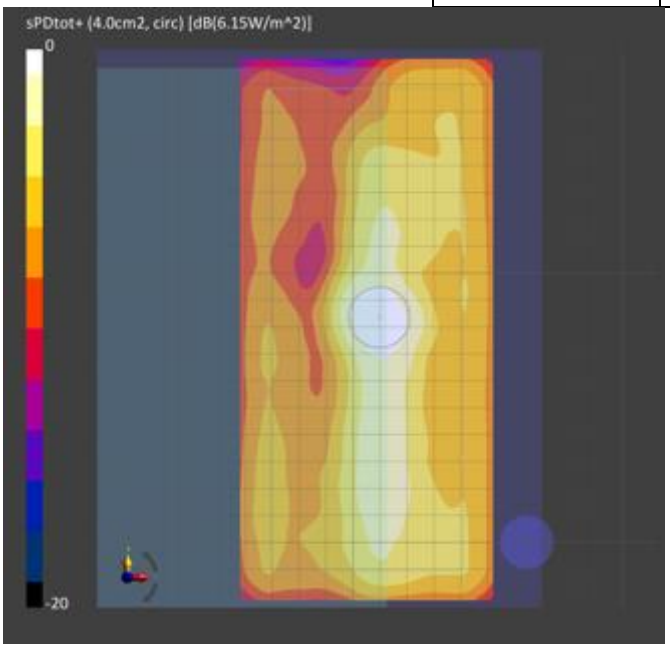
Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave	Air	EUmmWV4 - SN9489_F1-55GHz, 2021-05-28	DAE4 Sn1587, 2021-07-26

Scans Setup
Measurement Results

Scan Type	5G Scan
Grid Extents [mm]	90.0 x 200.0
Grid Steps [lambda]	0.0625 x 0.0625
Sensor Surface [mm]	2.0
MAIA	N/A

Scan Type	5G Scan
Date	2022-03-14
Avg. Area [cm^2]	4.00
psPDn+ [W/m^2]	5.16
psPDtot+ [W/m^2]	6.15
E_{max} [V/m]	77.9
Power Drift [dB]	-0.08



Appendixes List

Appendix A	A.1 Probe Calibration certificate (EX3DV4_7540) A.2 Probe Calibration certificate (EX3DV4_7541) A.3 Probe Calibration certificate (EUmmWV4_9489) A.4 System Calibration certificate 5G Verification Source 10 GHz_1023) A.5 Dipole Calibration certificate (D2450V2_895) A.6 Dipole Calibration certificate (D5GHzV2_1293) A.7 Dipole Calibration certificate (D6.5GHzV2_SN1005) A.8 Justification for Extended SAR Dipole Calibrations
Appendix B	SAR Tissue Specification
Appendix C	#Antenna Location & Distance
Appendix D	EUT Photo
Appendix E	Test Setup Photo