



TEST REPORT

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR21-SPF0019
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KCTL

1. Client

- Name : Intel Mobile Communications
- Address : 100 Center Point Circle, Suite 200 Columbia, South Carolina 29210 USA
- Date of Receipt : 2021-03-16

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 : AX210D2W
- Manufacturer and Country of Origin : Intel Mobile Communications / USA

4. Host Product Name : Notebook PC

- Host Model Name : NP930QDB
- Manufacturer : Samsung Electronics Co., Ltd.

5. FCC ID Number : PD9AX210D2

6. Date of Test : 2021-03-26

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 : KDB Publication

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

Affirmation	Tested by	Technical Manager
	Name : Kyoungwoo Min (Signature)	Name : Jongwon Ma (Signature)

2021-04-05

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.

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REPORT REVISION HISTORY

Date	Revision	Page No
2021-04-05	Originally issued	-

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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**

(Note: When standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

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
ISED Number: 8035A
KOLAS No.: KT231
CAB Identifier: KR0040

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		AX210D2W
Product Manufacturer		Intel Mobile Communications
Host Product Name		Notebook PC
Host Model Number		NP930QDB
Host Manufacturer		Samsung Electronics Co., Ltd.
Host Product Serial Number	Radiation	1HNR91ZR200032E
	Conduction	1HNR91ZR200043R
Mode of Operation		WLAN 2.4 GHz / 5 GHz, Bluetooth
Device Overview		WLAN 2.4 GHz: 2 412.0 MHz ~ 2 472.0 MHz WLAN 5.3 GHz: 5 260.0 MHz ~ 5 320.0 MHz WLAN 5.6 GHz: 5 500.0 MHz ~ 5 720.0 MHz WLAN 5.8 GHz: 5 745.0 MHz ~ 5 825.0 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)
WLAN 2.4 GHz	DTS	1.25
U-NII-2A	NII	1.08
U-NII-2C	NII	0.88
U-NII-3	NII	0.72

2.3 #Changed Maximum WLAN Output Power (Notebook Mode)

Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
WLAN 2.4 GHz	Main	802.11b	1,6,11,12	15.00	16.00
			13	14.75	15.75
		802.11g	1,6,11	15.00	16.00
			12	13.00	14.00
			13	11.00	12.00
		802.11n(HT20)	1,6,11	15.00	16.00
			12	13.00	14.00
			13	11.00	12.00
		802.11n(HT40)	3,6,9	15.00	16.00
			10	11.00	12.00
			11	10.75	11.75
		SU 20 MHz	1,6,11	15.00	16.00
			12	13.00	14.00
			13	11.00	12.00
		RU 26T_20 MHz	1,6,11,12	15.00	16.00
			13	12.75	13.75
		RU 52T_20 MHz	1,6,11,12	15.00	16.00
			13	12.50	13.50
		RU 106T_20 MHz	1,6,11,12	15.00	16.00
			13	12.00	13.00
		RU 242T_20 MHz	1,6,11	15.00	16.00
			12	13.00	14.00
			13	11.00	12.00
		SU 40 MHz	3,6,9	15.00	16.00
			10	11.00	12.00
			11	10.75	11.75
		RU 26T_40 MHz	All Channel	15.00	16.00
		RU 52T_40 MHz	All Channel	15.00	16.00
		RU 106T_40 MHz	All Channel	15.00	16.00
		RU 242T_40 MHz	All Channel	15.00	16.00
		RU 484T_40 MHz	3,6,9	15.00	16.00
			10	11.00	12.00
			11	10.75	11.75

Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
WLAN 2.4 GHz	Aux	802.11b	All Channel	14.50	15.50
		802.11g	1,6,11	14.50	15.50
			12	13.25	14.25
			13	11.50	12.50
		802.11n(HT20)	1,6,11	14.50	15.50
			12	13.25	14.25
			13	11.50	12.50
		802.11n(HT40)	3,6,9	14.50	15.50
			10	12.25	13.25
			11	11.00	12.00
		SU 20 MHz	1,6,11	14.50	15.50
			12	13.25	14.25
			13	11.50	12.50
		RU 26T_20 MHz	1,6,11,12	14.50	15.50
			13	12.50	13.50
		RU 52T_20 MHz	1,6,11,12	14.50	15.50
			13	12.50	13.50
		RU 106T_20 MHz	1,6,11,12	14.50	15.50
			13	12.50	13.50
		RU 242T_20 MHz	1,6,11	14.50	15.50
			12	13.25	14.25
			13	11.50	12.50
		SU 40 MHz	3,6,9	14.50	15.50
			10	12.25	13.25
			11	11.00	12.00
		RU 26T_40 MHz	All Channel	14.50	15.50
		RU 52T_40 MHz	All Channel	14.50	15.50
		RU 106T_40 MHz	All Channel	14.50	15.50
		RU 242T_40 MHz	All Channel	14.50	15.50
		RU 484T_40 MHz	3,6,9	14.50	15.50
			10	12.25	13.25
			11	11.00	12.00

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Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
U-NII-1, U-NII-2A	Main	802.11a	All Channel	14.00	15.00
		802.11n(HT20)	All Channel	14.00	15.00
		802.11n(HT40)	All Channel	14.00	15.00
		802.11ac(VHT20)	All Channel	14.00	15.00
		802.11ac(VHT40)	All Channel	14.00	15.00
		802.11ac(VHT80)	All Channel	14.00	15.00
		802.11ac(VHT160)	All Channel	13.25	14.25
		SU 20 MHz	All Channel	14.00	15.00
		RU 26T_20 MHz	All Channel	13.00	14.00
		RU 52T_20 MHz	All Channel	14.00	15.00
		RU 106T_20 MHz	All Channel	14.00	15.00
		RU 242T_20 MHz	All Channel	14.00	15.00
		SU 40 MHz	All Channel	14.00	15.00
		RU 26T_40 MHz	All Channel	13.00	14.00
		RU 52T_40 MHz	All Channel	14.00	15.00
		RU 106T_40 MHz	All Channel	14.00	15.00
		RU 242T_40 MHz	All Channel	14.00	15.00
		RU 484T_40 MHz	All Channel	14.00	15.00
		SU 80 MHz	All Channel	14.00	15.00
		RU 26T_80 MHz	All Channel	13.00	14.00
		RU 52T_80 MHz	All Channel	14.00	15.00
		RU 106T_80 MHz	All Channel	14.00	15.00
		RU 242T_80 MHz	All Channel	14.00	15.00
		RU 484T_80 MHz	All Channel	14.00	15.00
		RU 996T_80 MHz	All Channel	14.00	15.00
		SU 160 MHz	All Channel	13.25	14.25
		RU 26T_160 MHz	All Channel	13.00	14.00
		RU 52T_160 MHz	All Channel	14.00	15.00
		RU 106T_160 MHz	All Channel	14.00	15.00
		RU 242T_160 MHz	All Channel	14.00	15.00
		RU 484T_160 MHz	All Channel	14.00	15.00
		RU 996T_160 MHz	All Channel	14.00	15.00
		RU 2x996T_160 MHz	All Channel	13.25	14.25

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Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
U-NII-1, U-NII-2A	Aux	802.11a	All Channel	10.00	11.00
		802.11n(HT20)	All Channel	10.00	11.00
		802.11n(HT40)	All Channel	10.00	11.00
		802.11ac(VHT20)	All Channel	10.00	11.00
		802.11ac(VHT40)	All Channel	10.00	11.00
		802.11ac(VHT80)	All Channel	10.00	11.00
		802.11ac(VHT160)	All Channel	10.00	11.00
		SU 20 MHz	All Channel	10.00	11.00
		RU 26T_20 MHz	All Channel	10.00	11.00
		RU 52T_20 MHz	All Channel	10.00	11.00
		RU 106T_20 MHz	All Channel	10.00	11.00
		RU 242T_20 MHz	All Channel	10.00	11.00
		SU 40 MHz	All Channel	10.00	11.00
		RU 26T_40 MHz	All Channel	10.00	11.00
		RU 52T_40 MHz	All Channel	10.00	11.00
		RU 106T_40 MHz	All Channel	10.00	11.00
		RU 242T_40 MHz	All Channel	10.00	11.00
		RU 484T_40 MHz	All Channel	10.00	11.00
		SU 80 MHz	All Channel	10.00	11.00
		RU 26T_80 MHz	All Channel	10.00	11.00
		RU 52T_80 MHz	All Channel	10.00	11.00
		RU 106T_80 MHz	All Channel	10.00	11.00
		RU 242T_80 MHz	All Channel	10.00	11.00
		RU 484T_80 MHz	All Channel	10.00	11.00
		RU 996T_80 MHz	All Channel	10.00	11.00
		SU 160 MHz	All Channel	10.00	11.00
		RU 26T_160 MHz	All Channel	10.00	11.00
		RU 52T_160 MHz	All Channel	10.00	11.00
		RU 106T_160 MHz	All Channel	10.00	11.00
		RU 242T_160 MHz	All Channel	10.00	11.00
		RU 484T_160 MHz	All Channel	10.00	11.00
		RU 996T_160 MHz	All Channel	10.00	11.00
		RU 2x996T_160 MHz	All Channel	10.00	11.00

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Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
U-NII-2C	Main	802.11a	All Channel	13.00	14.00
		802.11n(HT20)	All Channel	13.00	14.00
		802.11n(HT40)	All Channel	13.00	14.00
		802.11ac(VHT20)	All Channel	13.00	14.00
		802.11ac(VHT40)	All Channel	13.00	14.00
		802.11ac(VHT80)	All Channel	13.00	14.00
		802.11ac(VHT160)	All Channel	13.00	14.00
		SU 20 MHz	All Channel	13.00	14.00
		RU 26T_20 MHz	All Channel	13.00	14.00
		RU 52T_20 MHz	All Channel	13.00	14.00
		RU 106T_20 MHz	All Channel	13.00	14.00
		RU 242T_20 MHz	All Channel	13.00	14.00
		SU 40 MHz	All Channel	13.00	14.00
		RU 26T_40 MHz	All Channel	13.00	14.00
		RU 52T_40 MHz	All Channel	13.00	14.00
		RU 106T_40 MHz	All Channel	13.00	14.00
		RU 242T_40 MHz	All Channel	13.00	14.00
		RU 484T_40 MHz	All Channel	13.00	14.00
		SU 80 MHz	All Channel	13.00	14.00
		RU 26T_80 MHz	All Channel	13.00	14.00
		RU 52T_80 MHz	All Channel	13.00	14.00
		RU 106T_80 MHz	All Channel	13.00	14.00
		RU 242T_80 MHz	All Channel	13.00	14.00
		RU 484T_80 MHz	All Channel	13.00	14.00
		RU 996T_80 MHz	All Channel	13.00	14.00
		SU 160 MHz	All Channel	13.00	14.00
		RU 26T_160 MHz	All Channel	13.00	14.00
		RU 52T_160 MHz	All Channel	13.00	14.00
		RU 106T_160 MHz	All Channel	13.00	14.00
		RU 242T_160 MHz	All Channel	13.00	14.00
		RU 484T_160 MHz	All Channel	13.00	14.00
		RU 996T_160 MHz	All Channel	13.00	14.00
		RU 2x996T_160 MHz	All Channel	13.00	14.00

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Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
U-NII-2C	Aux	802.11a	All Channel	10.00	11.00
		802.11n(HT20)	All Channel	10.00	11.00
		802.11n(HT40)	All Channel	10.00	11.00
		802.11ac(VHT20)	All Channel	10.00	11.00
		802.11ac(VHT40)	All Channel	10.00	11.00
		802.11ac(VHT80)	All Channel	10.00	11.00
		802.11ac(VHT160)	All Channel	10.00	11.00
		SU 20 MHz	All Channel	10.00	11.00
		RU 26T_20 MHz	All Channel	10.00	11.00
		RU 52T_20 MHz	All Channel	10.00	11.00
		RU 106T_20 MHz	All Channel	10.00	11.00
		RU 242T_20 MHz	All Channel	10.00	11.00
		SU 40 MHz	All Channel	10.00	11.00
		RU 26T_40 MHz	All Channel	10.00	11.00
		RU 52T_40 MHz	All Channel	10.00	11.00
		RU 106T_40 MHz	All Channel	10.00	11.00
		RU 242T_40 MHz	All Channel	10.00	11.00
		RU 484T_40 MHz	All Channel	10.00	11.00
		SU 80 MHz	All Channel	10.00	11.00
		RU 26T_80 MHz	All Channel	10.00	11.00
		RU 52T_80 MHz	All Channel	10.00	11.00
		RU 106T_80 MHz	All Channel	10.00	11.00
		RU 242T_80 MHz	All Channel	10.00	11.00
		RU 484T_80 MHz	All Channel	10.00	11.00
		RU 996T_80 MHz	All Channel	10.00	11.00
		SU 160 MHz	All Channel	10.00	11.00
		RU 26T_160 MHz	All Channel	10.00	11.00
		RU 52T_160 MHz	All Channel	10.00	11.00
		RU 106T_160 MHz	All Channel	10.00	11.00
		RU 242T_160 MHz	All Channel	10.00	11.00
		RU 484T_160 MHz	All Channel	10.00	11.00
		RU 996T_160 MHz	All Channel	10.00	11.00
		RU 2x996T_160 MHz	All Channel	10.00	11.00

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Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
U-NII-3	Main	802.11a	All Channel	11.50	12.50
		802.11n(HT20)	All Channel	11.50	12.50
		802.11n(HT40)	All Channel	11.50	12.50
		802.11ac(VHT20)	All Channel	11.50	12.50
		802.11ac(VHT40)	All Channel	11.50	12.50
		802.11ac(VHT80)	All Channel	11.50	12.50
		SU 20 MHz	All Channel	11.50	12.50
		RU 26T_20 MHz	All Channel	11.50	12.50
		RU 52T_20 MHz	All Channel	11.50	12.50
		RU 106T_20 MHz	All Channel	11.50	12.50
		RU 242T_20 MHz	All Channel	11.50	12.50
		SU 40 MHz	All Channel	11.50	12.50
		RU 26T_40 MHz	All Channel	11.50	12.50
		RU 52T_40 MHz	All Channel	11.50	12.50
		RU 106T_40 MHz	All Channel	11.50	12.50
		RU 242T_40 MHz	All Channel	11.50	12.50
		RU 484T_40 MHz	All Channel	11.50	12.50
		SU 80 MHz	All Channel	11.50	12.50
		RU 26T_80 MHz	All Channel	11.50	12.50
		RU 52T_80 MHz	All Channel	11.50	12.50
		RU 106T_80 MHz	All Channel	11.50	12.50
		RU 242T_80 MHz	All Channel	11.50	12.50
		RU 484T_80 MHz	All Channel	11.50	12.50
		RU 996T_80 MHz	All Channel	11.50	12.50

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Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
U-NII-3	Aux	802.11a	All Channel	10.50	11.50
		802.11n(HT20)	All Channel	10.50	11.50
		802.11n(HT40)	All Channel	10.50	11.50
		802.11ac(VHT20)	All Channel	10.50	11.50
		802.11ac(VHT40)	All Channel	10.50	11.50
		802.11ac(VHT80)	All Channel	10.50	11.50
		SU 20 MHz	All Channel	10.50	11.50
		RU 26T_20 MHz	All Channel	10.50	11.50
		RU 52T_20 MHz	All Channel	10.50	11.50
		RU 106T_20 MHz	All Channel	10.50	11.50
		RU 242T_20 MHz	All Channel	10.50	11.50
		SU 40 MHz	All Channel	10.50	11.50
		RU 26T_40 MHz	All Channel	10.50	11.50
		RU 52T_40 MHz	All Channel	10.50	11.50
		RU 106T_40 MHz	All Channel	10.50	11.50
		RU 242T_40 MHz	All Channel	10.50	11.50
		RU 484T_40 MHz	All Channel	10.50	11.50
		SU 80 MHz	All Channel	10.50	11.50
		RU 26T_80 MHz	All Channel	10.50	11.50
		RU 52T_80 MHz	All Channel	10.50	11.50
		RU 106T_80 MHz	All Channel	10.50	11.50
		RU 242T_80 MHz	All Channel	10.50	11.50
		RU 484T_80 MHz	All Channel	10.50	11.50
		RU 996T_80 MHz	All Channel	10.50	11.50

2.4 #Changed Maximum WLAN Output Power (Tablet Mode)

Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
WLAN 2.4 GHz	Main	802.11b	All Channel	14.00	15.00
		802.11g	1,6,11	14.00	15.00
			12	13.00	14.00
			13	11.00	12.00
		802.11n(HT20)	1,6,11	14.00	15.00
			12	13.00	14.00
			13	11.00	12.00
		802.11n(HT40)	3,6,9	14.00	15.00
			10	11.00	12.00
			11	10.75	11.75
		SU 20 MHz	1,6,11	14.00	15.00
			12	13.00	14.00
			13	11.00	12.00
		RU 26T_20 MHz	1,6,11,12	14.00	15.00
			13	12.75	13.75
		RU 52T_20 MHz	1,6,11,12	14.00	15.00
			13	12.50	13.50
		RU 106T_20 MHz	1,6,11,12	14.00	15.00
			13	12.00	13.00
		RU 242T_20 MHz	1,6,11	14.00	15.00
			12	13.00	14.00
			13	11.00	12.00
		SU 40 MHz	3,6,9	14.00	15.00
			10	11.00	12.00
			11	10.75	11.75
		RU 26T_40 MHz	All Channel	14.00	15.00
		RU 52T_40 MHz	All Channel	14.00	15.00
		RU 106T_40 MHz	All Channel	14.00	15.00
		RU 242T_40 MHz	All Channel	14.00	15.00
		RU 484T_40 MHz	3,6,9	14.00	15.00
			10	11.00	12.00
			11	10.75	11.75

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

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Band	Ant.	Mode	Channel	Output Power (dB m)	
				changed	
				Target	Max. Allowed
WLAN 2.4 GHz	Aux	802.11b	All Channel	14.00	15.00
		802.11g	1,6,11	14.00	15.00
			12	13.25	14.25
			13	11.50	12.50
		802.11n(HT20)	1,6,11	14.00	15.00
			12	13.25	14.25
			13	11.50	12.50
		802.11n(HT40)	3,6,9	14.00	15.00
			10	12.25	13.25
			11	11.00	12.00
		SU 20 MHz	1,6,11	14.00	15.00
			12	13.25	14.25
			13	11.50	12.50
		RU 26T_20 MHz	1,6,11,12	14.00	15.00
			13	12.50	13.50
		RU 52T_20 MHz	1,6,11,12	14.00	15.00
			13	12.50	13.50
		RU 106T_20 MHz	1,6,11,12	14.00	15.00
			13	12.50	13.50
		RU 242T_20 MHz	1,6,11	14.00	15.00
			12	13.25	14.25
			13	11.50	12.50
		SU 40 MHz	3,6,9	14.00	15.00
			10	12.25	13.25
			11	11.00	12.00
		RU 26T_40 MHz	All Channel	14.00	15.00
		RU 52T_40 MHz	All Channel	14.00	15.00
		RU 106T_40 MHz	All Channel	14.00	15.00
		RU 242T_40 MHz	All Channel	14.00	15.00
		RU 484T_40 MHz	3,6,9	14.00	15.00
			10	12.25	13.25
			11	11.00	12.00

2.5 Tested Conditions

KDB 178919 D01 sec.VI, B, 3)

When adding an equivalent antenna for a Part 15 device, i.e., identical antenna type with the same or lower gain, with no other change to the transmitter and host device configurations, and the highest SAR measured for that antenna type in previous certification(s) is less than 0.8 W/kg, SAR evaluation is not required to add an equivalent antenna. Otherwise, SAR should be evaluated for the additional equivalent antenna(s) according to the procedures required for the transmitter, antenna and host device configurations.

Notebook Mode						
Band	Ant.	Mode	Channel	Output Power (dB m)		
				Target	Max. Allowed	SAR Test
WLAN 2.4 GHz	Main	802.11b	11	15.00	16.00	Yes
	Aux	802.11b	11	14.50	15.50	Yes
		802.11g	1	14.50	15.50	Yes
U-NII-2A	Main	802.11ac(VHT80)	All Channel	14.00	15.00	Yes
	Aux		All Channel	10.00	11.00	Yes
U-NII-2C	Main	802.11ac(VHT80)	All Channel	13.00	14.00	Yes
	Aux		All Channel	10.00	11.00	Yes
U-NII-3	Main	802.11ac(VHT80)	All Channel	11.50	12.50	Yes
	Aux		All Channel	10.50	11.50	Yes

Note : The specified maximum output power is the same for both UNII-1 and UNII-2A, was measured only for UNII-2A.

Tablet Mode						
Band	Ant.	Mode	Channel	Output Power (dB m)		
				Target	Max. Allowed	SAR Test
WLAN 2.4 GHz	Main	802.11b	11	14.00	15.00	Yes
	Aux	802.11b	6	14.00	15.00	Yes

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 heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

4. SAR Measurement Procedures

4.1 SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 1.4 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan & Zoom Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot and Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 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	$\frac{1}{2} \cdot \delta \cdot \ln(2)$ 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: Δz _{Zoom} (n)		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	Δz _{Zoom} (1): between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		Δz _{Zoom} (n>1): between subsequent points	≤ 1.5 · Δz _{Zoom} (n-1) 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.

6. RF Average Conducted Output Power

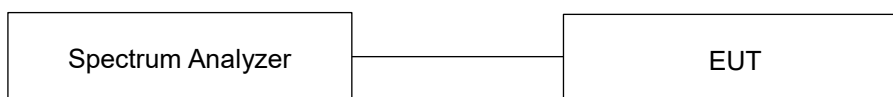
6.1 WLAN Average Conducted Output Power (Notebook Mode)

Band	Ant.	Mode	Conducted Powers (dBm)
WLAN 2.4 GHz	Main	802.11b	15.94
	Aux	802.11b	15.40
		802.11g	15.44
U-NII-2A	Main	802.11ac(VHT80)	14.96
	Aux	802.11ac(VHT80)	10.94
U-NII-2C	Main	802.11ac(VHT80)	13.83
	Aux	802.11ac(VHT80)	10.86
U-NII-3	Main	802.11ac(VHT80)	12.37
	Aux	802.11ac(VHT80)	11.29

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



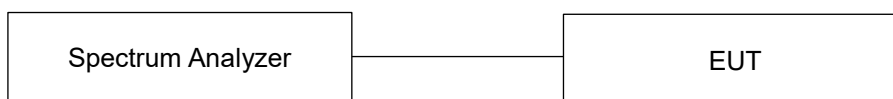
6.2 WLAN Average Conducted Output Power (Tablet Mode)

Band	Ant.	Mode	Conducted Powers (dBm)
WLAN 2.4 GHz	Main	802.11b	14.80
	Aux	802.11b	14.75

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. System Verification

7.1 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 MHz). 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 $(22 \pm 2) ^\circ\text{C}$.

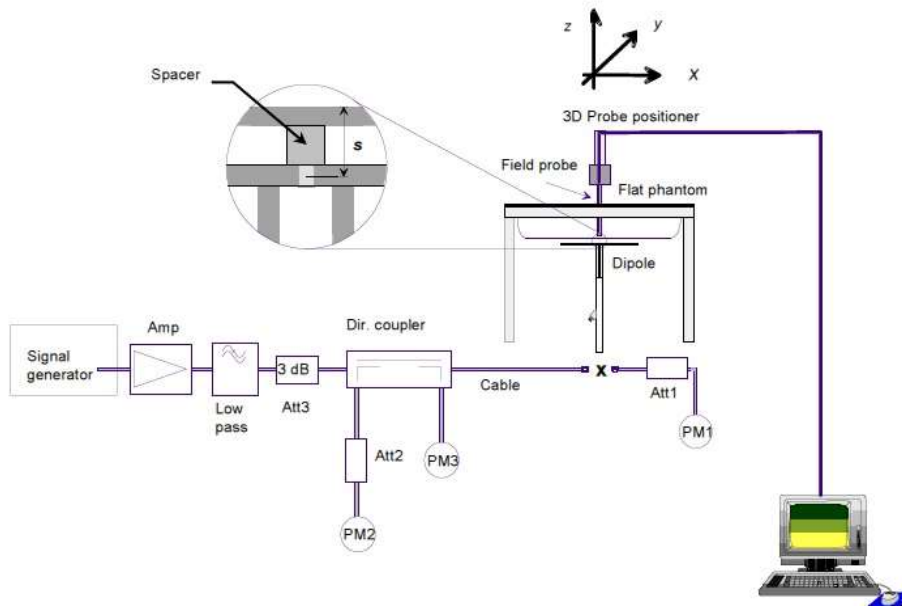
Freq. (MHz)	Limit/Measured		Permittivity (ρ)	Conductivity (σ)	Temp. ($^\circ\text{C}$)
2 450.0	Recommended Limit		$39.20 \pm 5 \%$ (37.24~41.16)	$1.80 \pm 5 \%$ (1.71~1.89)	22 ± 2
	Measured	2021-03-26	39.49	1.84	20.37
5 300.0	Recommended Limit		$35.90 \pm 5 \%$ (34.11~37.70)	$4.76 \pm 5 \%$ (4.52~5.00)	22 ± 2
	Measured	2021-03-26	35.71	4.86	20.54
5 600.0	Recommended Limit		$35.50 \pm 5 \%$ (33.73~37.28)	$5.07 \pm 5 \%$ (4.82~5.32)	22 ± 2
	Measured	2021-03-26	35.16	5.19	20.54
5 800.0	Recommended Limit		$35.30 \pm 5 \%$ (33.54~37.07)	$5.27 \pm 5 \%$ (5.01~5.53)	22 ± 2
	Measured	2021-03-26	34.79	5.41	20.54

<Table 1. Measurement result of Tissue electric parameters>

7.2 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 $\pm 10\%$ from the target 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 $(22 \pm 2) ^\circ\text{C}$, the relative humidity was in the range $(50 \pm 20) \%$ and the liquid depth Above the ear/grid reference 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 (MHz)	Tissue Type	Limit/Measured (Normalized to 1 W)		
D2450V2 SN: 895	EX3DV4 SN: 3865	2 450.0	HSL	Recommended Limit 1g (Normalized)		52.40 $\pm$ 10 % (47.16~57.64)
				Measured	2021-03-26	51.60
D5GHzV2 SN: 1134	EX3DV4 SN: 3865	5 300.0	HSL	Recommended Limit 1g (Normalized)		82.30 $\pm$ 10 % (74.07~90.53)
				Measured	2021-03-26	82.40
D5GHzV2 SN: 1134	EX3DV4 SN: 3865	5 600.0	HSL	Recommended Limit 1g (Normalized)		84.10 $\pm$ 10 % (75.69~92.51)
				Measured	2021-03-26	81.80
D5GHzV2 SN: 1134	EX3DV4 SN: 3865	5 800.0	HSL	Recommended Limit 1g (Normalized)		81.50 $\pm$ 10 % (73.35~89.65)
				Measured	2021-03-26	85.80

<Table 1. System Verification Result>

8. SAR Test Results

8.1 Standalone Body SAR Test Results (Notebook Mode)

WLAN 2.4 GHz											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dB m)	Max. Tune-up Power (dB m)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
Before Change Result (Report No: KR21-SPF0009)											
802.11b	Main	Rear	0	2 462.0	16.48	16.50	1.005	1.005	1.380	1.394	
	Aux	Rear	0	2 462.0	15.44	15.50	1.014	1.005	1.240	1.264	
After Changed Result											
802.11b	Main	Rear	0	2 462.0	15.94	16.00	1.014	1.005	1.000	1.019	1
	Aux	Rear	0	2 462.0	15.40	15.50	1.023	1.005	1.220	1.254	2

U-NII-2A											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dB m)	Max. Tune-up Power (dB m)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
Before Change Result (Report No: KR21-SPF0009)											
802.11ac (VHT80)	Main	Rear	0	5 290.0	14.97	15.00	1.007	1.012	1.010	1.029	
	Aux	Rear	0	5 290.0	11.84	12.00	1.038	1.012	0.945	0.993	
After Changed Result											
802.11ac (VHT80)	Main	Rear	0	5 290.0	14.96	15.00	1.009	1.012	1.060	1.082	3
	Aux	Rear	0	5 290.0	10.94	11.00	1.014	1.012	0.566	0.581	4

U-NII-2C											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dB m)	Max. Tune-up Power (dB m)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
Before Change Result (Report No: KR21-SPF0009)											
802.11ac (VHT80)	Main	Rear	0	5 690.0	13.81	14.00	1.045	1.012	0.994	1.051	
	Aux	Rear	0	5 610.0	10.97	11.00	1.007	1.012	0.987	1.006	
After Changed Result											
802.11ac (VHT80)	Main	Rear	0	5 690.0	13.83	14.00	1.040	1.012	0.839	0.883	5
	Aux	Rear	0	5 610.0	10.86	11.00	1.033	1.012	0.644	0.673	6

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U-NII-3											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dB m)	Max. Tune-up Power (dB m)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
Before Change Result (Report No: KR21-SPF0009)											
802.11ac (VHT80)	Main	Rear	0	5 775.0	12.43	12.50	1.016	1.012	0.820	0.843	
	Aux	Rear	0	5 775.0	11.43	11.50	1.016	1.012	1.020	1.049	
After Changed Result											
802.11ac (VHT80)	Main	Rear	0	5 775.0	12.37	12.50	1.030	1.012	0.503	0.524	7
	Aux	Rear	0	5 775.0	11.29	11.50	1.050	1.012	0.675	0.717	8

8.2 Standalone Body SAR Test Results (Tablet Mode)

WLAN 2.4 GHz											
Mode	Ant.	EUT Position	Distance (mm)	Frequency (MHz)	Measured Conducted Power (dB m)	Max. Tune-up Power (dB m)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Plot No.
Before Change Result (Report No: KR21-SPF0009)											
802.11b	Main	Left	0	2 462.0	14.95	15.00	1.012	1.005	1.050	1.068	
	Aux	Right	0	2 437.0	14.97	15.00	1.007	1.005	0.995	1.007	
After Changed Result											
802.11b	Main	Left	0	2 462.0	14.80	15.00	1.047	1.005	0.980	1.031	9
	Aux	Right	0	2 437.0	14.75	15.00	1.059	1.005	0.804	0.856	10

General Notes:

- Battery is fully charged for all readings and the standard batteries are the only options.
- Liquid tissue depth was at least 15 cm.
- 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.

WLAN Notes:

- 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.

9. Measurement Uncertainty

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is $< 1.5 \text{ W/kg}$ and the measured 10-g SAR within a frequency band is $< 3.75 \text{ W/kg}$. The expanded SAR measurement uncertainty must be $\leq 30\%$, 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 1.5 W/kg and highest measured 10-g SAR is less 3.75 W/kg . Therefore, the measurement uncertainty table is not required in this report.

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10. Test Equipment Information

Test Platform	SPEAG DASY5 System			
Version	DASY52: 52.10.4.1527 / SEMCAD: 14.6.14 (7483)			
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 - 4	-	-
DASY6 Robot	TX60 Lspeag	F/19/0007289/A/001	-	-
Phantom	2mm Oval Phantom ELI5	2098	-	-
Mounting Device	Laptop Holder	-	-	-
DAE	DAE4	1587	2020-07-29	2021-07-29
Probe	EX3DV4	3865	2021-01-25	2022-01-25
ESG Vector Signal Generator	E4438C	MY42080845	2021-02-25	2022-02-25
Dual Power Meter	EPM-442A	GB37480680	2020-05-12	2021-05-12
Power Sensor	8481H	2703A11902	2020-05-12	2021-05-12
Power Sensor	8481H	3318A18090	2020-05-12	2021-05-12
Attenuator	8491A	21552	2020-05-12	2021-05-12
Attenuator	8491A	35560	2020-05-12	2021-05-12
Attenuator	8491A	35934	2020-05-12	2021-05-12
Power Amplifier	AMP2027	10010	2020-05-12	2021-05-12
Dual Directional Coupler	772D	2839A160504	2020-05-12	2021-05-12
Low Pass Filter	VLF-3000+	31831	2020-05-12	2021-05-12
Low Pass Filter	VLF-6000+	31838	2020-05-12	2021-05-12
Dipole Validation Kits	D2450V2	895	2020-07-21	2022-07-21
Dipole Validation Kits	D5GHzV2	1134	2020-05-20	2022-05-20
Network Analyzer	E5071B	MY42403524	2021-02-15	2022-02-15
Dielectric Assessment Kit	DAK-3.5	1078	2020-05-19	2021-05-19
Humidity/Temp	MHB-382SD	46301	2021-02-28	2022-02-28

11. Test System Verification Results

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [2450 MHz Verification Input Power 100 mW 2021-03-26.da5:0](#)**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; $\sigma = 1.841$ S/m; $\epsilon_r = 39.493$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.87, 7.87, 7.87) @ 2450 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/2450 MHz Verification Input Power 100 mW 2021-03-26/Area Scan (10x11x1):

Measurement grid: dx=12mm, dy=12mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 6.53 W/kg

Configuration/2450 MHz Verification Input Power 100 mW 2021-03-26/Zoom Scan (7x7x7)/Cube

0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 68.81 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 10.9 W/kg

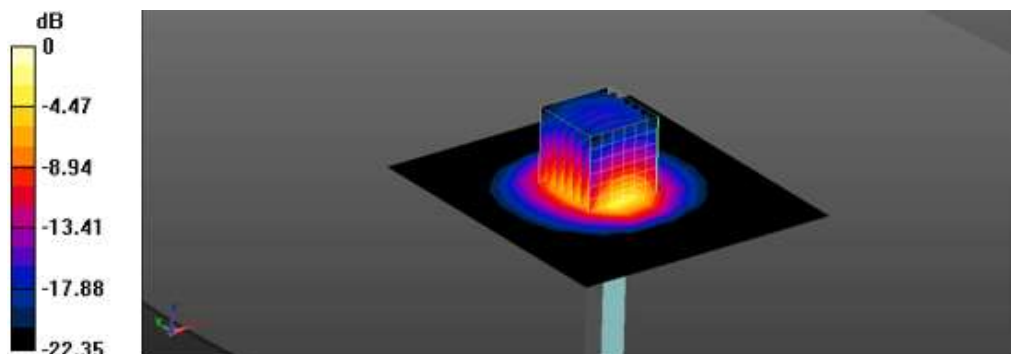
SAR(1 g) = 5.16 W/kg; SAR(10 g) = 2.4 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 47.6%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 8.73 W/kg



Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [5300 MHz Verification Input Power 100 mW 2021-03-26.da5:0](#)**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1134**

Communication System: UID 0, CW (0); Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 5300$ MHz; $\sigma = 4.863$ S/m; $\epsilon_r = 35.713$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.43, 5.43, 5.43) @ 5300 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/5300 MHz Verification Input Power 100 mW 2021-03-26/Area Scan (10x12x1):

Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 18.0 W/kg

Configuration/5300 MHz Verification Input Power 100 mW 2021-03-26/Zoom Scan (7x7x7)/Cube

0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.84 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 32.9 W/kg

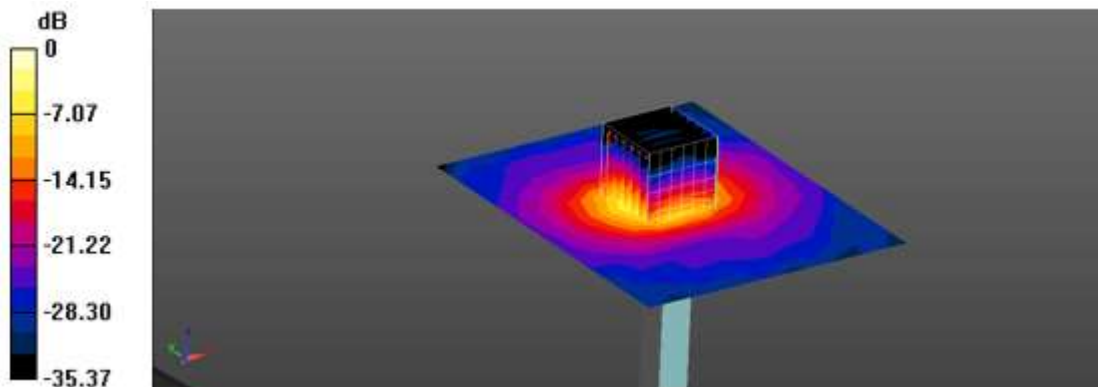
SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.37 W/kg

Smallest distance from peaks to all points 3 dB below = 7.5 mm

Ratio of SAR at M2 to SAR at M1 = 64.8%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 20.7 W/kg



0 dB = 20.7 W/kg = 13.16 dBW/kg

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [5600 MHz Verification Input Power 100 mW 2021-03-26.da5:0](#)**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1134**

Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5600$ MHz; $\sigma = 5.187$ S/m; $\epsilon_r = 35.157$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.02, 5.02, 5.02) @ 5600 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/5600 MHz Verification Input Power 100 mW 2021-03-26/Area Scan (10x12x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 18.1 W/kg

Configuration/5600 MHz Verification Input Power 100 mW 2021-03-26/Zoom Scan (7x7x7)/Cube**0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.62 V/m; Power Drift = 0.03 dB

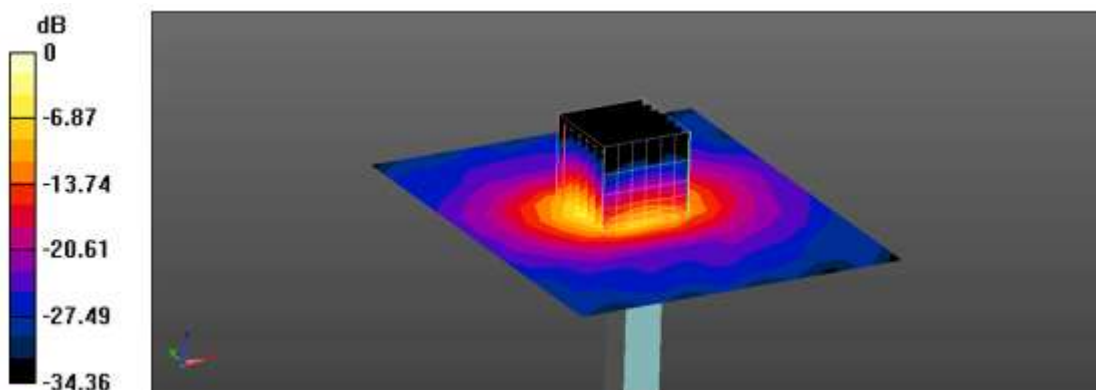
Peak SAR (extrapolated) = 33.0 W/kg

SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.35 W/kg

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 64.9%

Maximum value of SAR (measured) = 20.7 W/kg



0 dB = 20.7 W/kg = 13.16 dBW/kg

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [5800 MHz Verification Input Power 100 mW 2021-03-26.da5:0](#)**DUT: Dipole D5GHzV2, Type: D5GHzV2, Serial: D5GHzV2 - SN:1134**

Communication System: UID 0, CW (0); Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5800$ MHz; $\sigma = 5.41$ S/m; $\epsilon_r = 34.793$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.99, 4.99, 4.99) @ 5800 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/5800 MHz Verification Input Power 100 mW 2021-03-26/Area Scan (10x12x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 18.9 W/kg

Configuration/5800 MHz Verification Input Power 100 mW 2021-03-26/Zoom Scan (7x7x7)/Cube

0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.78 V/m; Power Drift = 0.06 dB

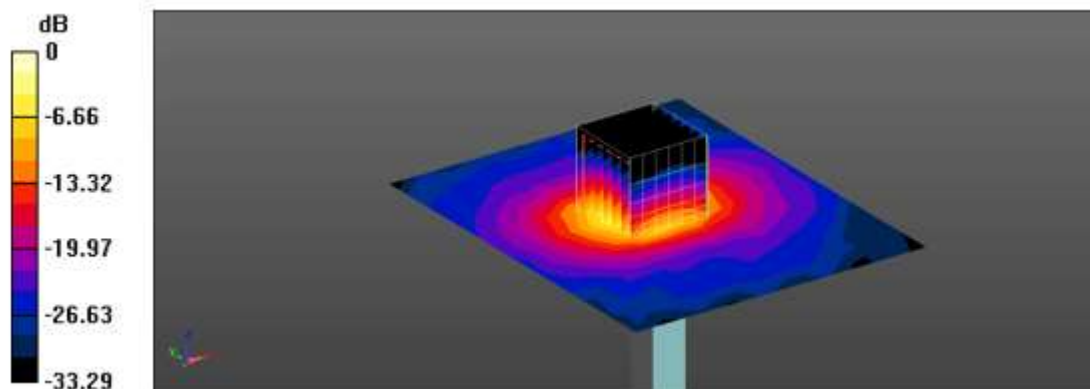
Peak SAR (extrapolated) = 34.5 W/kg

SAR(1 g) = 8.58 W/kg; SAR(10 g) = 2.46 W/kg

Smallest distance from peaks to all points 3 dB below = 7.5 mm

Ratio of SAR at M2 to SAR at M1 = 64.6%

Maximum value of SAR (measured) = 21.6 W/kg



0 dB = 21.6 W/kg = 13.34 dBW/kg

12. Test Results

1)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 2.4 GHz Notebook.da53:0](#)**DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E**

Communication System: UID 0, 2.4GWLAN (0); Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2462$ MHz; $\sigma = 1.845$ S/m; $\epsilon_r = 39.56$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.87, 7.87, 7.87) @ 2462 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 b_Main_CH11_Rear_0 mm/Area Scan (8x8x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 1.20 W/kg

Configuration/802.11 b_Main_CH11_Rear_0 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.532 V/m; Power Drift = -0.11 dB

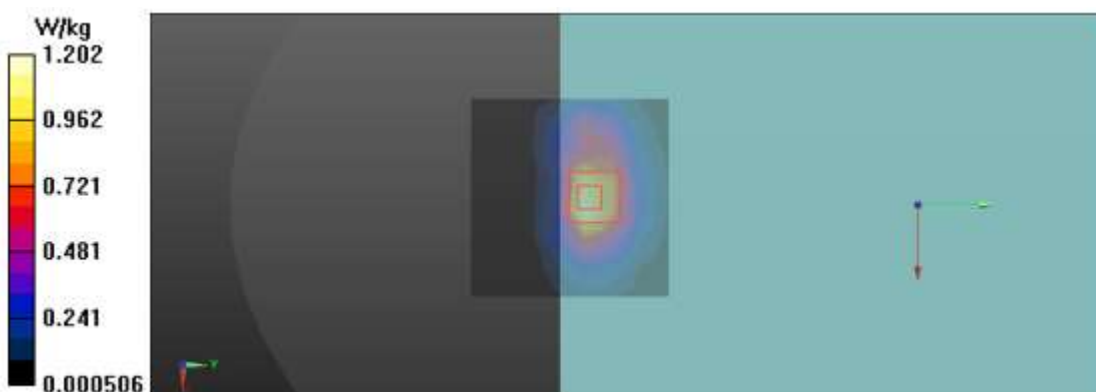
Peak SAR (extrapolated) = 2.61 W/kg

SAR(1 g) = 1 W/kg; SAR(10 g) = 0.406 W/kg

Smallest distance from peaks to all points 3 dB below = 6.4 mm

Ratio of SAR at M2 to SAR at M1 = 40.8%

Maximum value of SAR (measured) = 1.96 W/kg



2)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 2.4 GHz Notebook.da53:1](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 2.4GWLAN (0); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 1.845 \text{ S/m}$; $\epsilon_r = 39.56$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.87, 7.87, 7.87) @ 2462 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 b_Aux_CH11_Rear_0 mm/Area Scan (8x8x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Maximum value of SAR (measured) = 1.82 W/kg

Configuration 2/802.11 b_Aux_CH11_Rear_0 mm/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 0 V/m; Power Drift = 0.00 dB

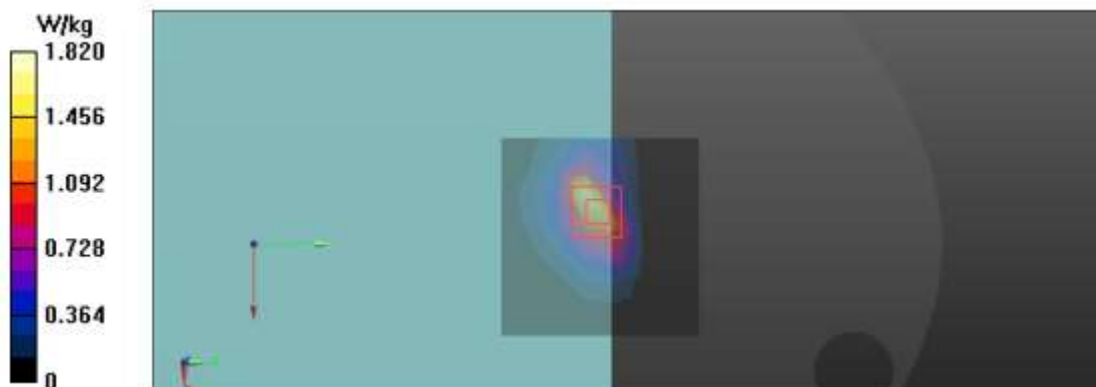
Peak SAR (extrapolated) = 3.46 W/kg

SAR(1 g) = 1.22 W/kg; SAR(10 g) = 0.460 W/kg

Smallest distance from peaks to all points 3 dB below = 5.7 mm

Ratio of SAR at M2 to SAR at M1 = 38.8%

Maximum value of SAR (measured) = 2.56 W/kg



3)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 5.3 GHz Notebook.da53:0](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 5GWLAN (0); Frequency: 5290 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5290 \text{ MHz}$; $\sigma = 4.853 \text{ S/m}$; $\epsilon_r = 35.723$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.43, 5.43, 5.43) @ 5290 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 ac_VHT80_Main_CH58_Rear_0 mm/Area Scan (9x9x1): Measurement grid:
 $dx=10\text{mm}$, $dy=10\text{mm}$

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 2.59 W/kg

Configuration/802.11 ac_VHT80_Main_CH58_Rear_0 mm/Zoom Scan (9x9x7)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 2.641 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 4.59 W/kg

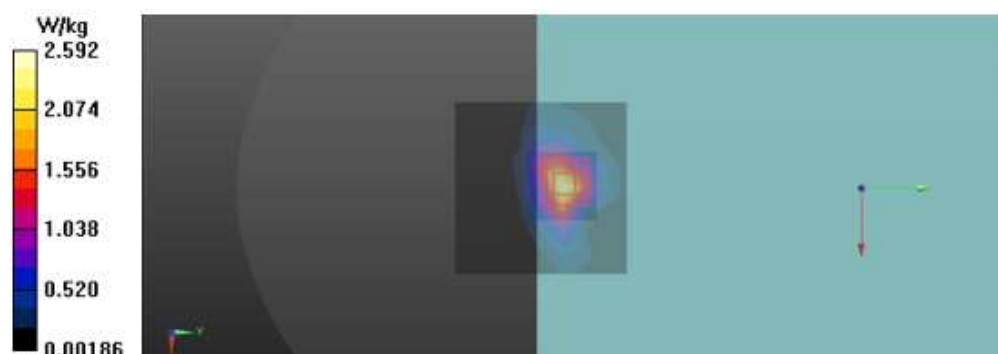
SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.363 W/kg

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 62%

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 2.58 W/kg



4)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 5.3 GHz Notebook.da53:1](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 5G WLAN (0); Frequency: 5290 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5290 \text{ MHz}$; $\sigma = 4.853 \text{ S/m}$; $\epsilon_r = 35.723$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.43, 5.43, 5.43) @ 5290 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 ac_VHT80_Aux_CH58_Rear_0 mm/Area Scan (9x9x1): Measurement grid:
 $dx=10\text{mm}$, $dy=10\text{mm}$

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.971 W/kg

Configuration 2/802.11 ac_VHT80_Aux_CH58_Rear_0 mm/Zoom Scan (11x11x7)/Cube 0:

Measurement grid: $dx=3\text{mm}$, $dy=3\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.75 W/kg

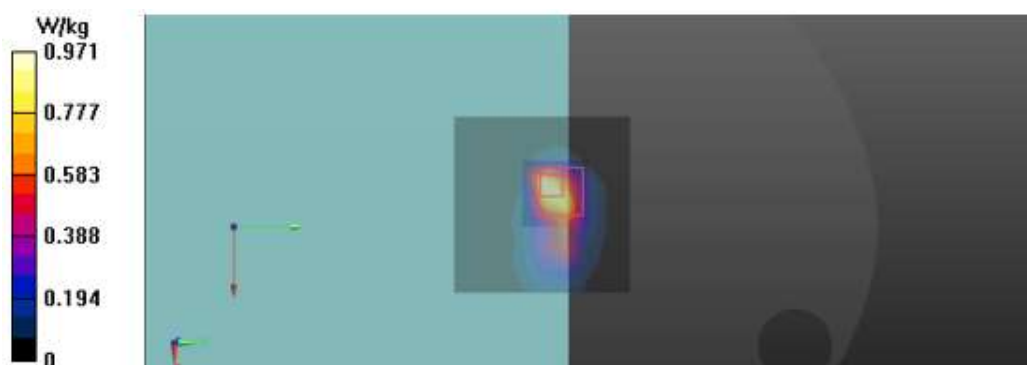
SAR(1 g) = 0.566 W/kg; SAR(10 g) = 0.159 W/kg

Smallest distance from peaks to all points 3 dB below = 3 mm

Ratio of SAR at M2 to SAR at M1 = 58.8%

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.98 W/kg



5)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 5.6 GHz Notebook.da53:0](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 5GWLAN (0); Frequency: 5690 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5690 \text{ MHz}$; $\sigma = 5.285 \text{ S/m}$; $\epsilon_r = 34.962$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.02, 5.02, 5.02) @ 5690 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 ac_VHT80_Main_CH168_Rear_0 mm/Area Scan (11x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.76 W/kg

Configuration/802.11 ac_VHT80_Main_CH168_Rear_0 mm/Zoom Scan (9x9x7)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 19.41 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 4.77 W/kg

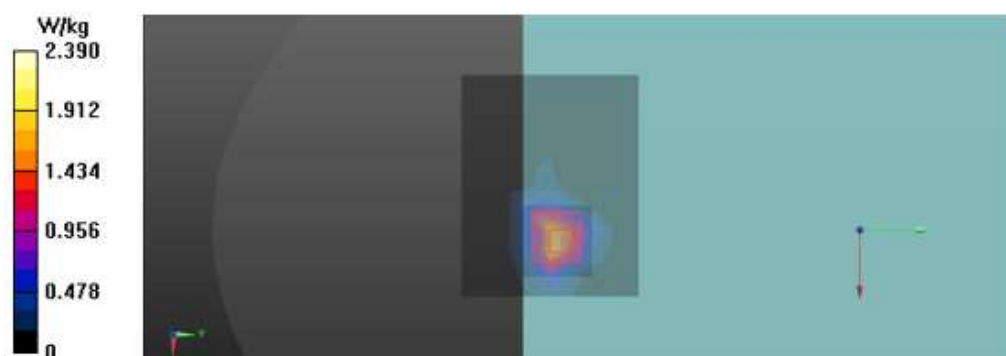
SAR(1 g) = 0.839 W/kg; SAR(10 g) = 0.286 W/kg

Smallest distance from peaks to all points 3 dB below = 4.7 mm

Ratio of SAR at M2 to SAR at M1 = 56.4%

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 2.39 W/kg



6)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 5.6 GHz Notebook.da53:1](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 5GWLAN (0); Frequency: 5610 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 5610 \text{ MHz}$; $\sigma = 5.197 \text{ S/m}$; $\epsilon_r = 35.133$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(5.02, 5.02, 5.02) @ 5610 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 ac_VHT80_Aux_CH122_Rear_0 mm/Area Scan (11x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.08 W/kg

Configuration 2/802.11 ac_VHT80_Aux_CH122_Rear_0 mm/Zoom Scan (11x11x7)/Cube 0:

Measurement grid: $dx=3\text{mm}$, $dy=3\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 4.30 W/kg

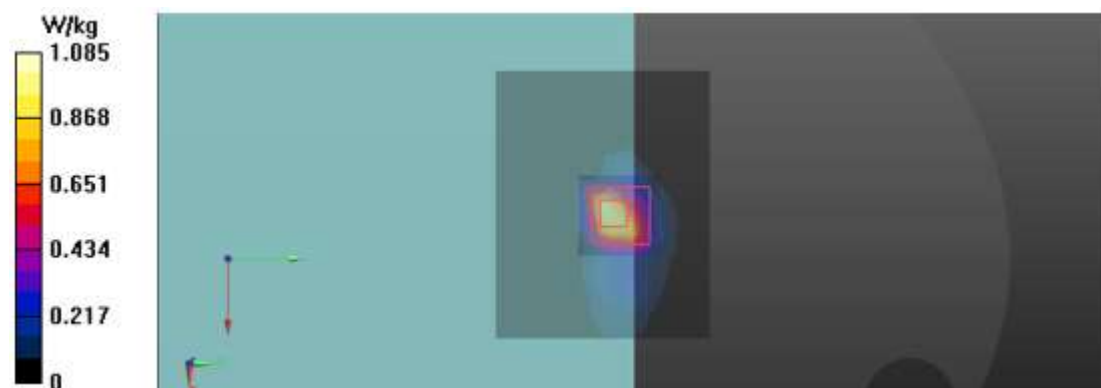
SAR(1 g) = 0.644 W/kg; SAR(10 g) = 0.157 W/kg

Smallest distance from peaks to all points 3 dB below = 3.1 mm

Ratio of SAR at M2 to SAR at M1 = 57%

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 2.29 W/kg



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7)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 5.8 GHz Notebook.da53:0](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 5G WLAN (0); Frequency: 5775 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5775$ MHz; $\sigma = 5.386$ S/m; $\epsilon_r = 34.852$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.99, 4.99, 4.99) @ 5775 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 ac_VHT80_Main_CH155_Rear_0 mm/Area Scan (9x9x1): Measurement grid:
 dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.23 W/kg

Configuration/802.11 ac_VHT80_Main_CH155_Rear_0 mm/Zoom Scan (10x10x7)/Cube 0:

Measurement grid: dx=3mm, dy=3mm, dz=1.4mm

Reference Value = 16.13 V/m; Power Drift = -0.03 dB

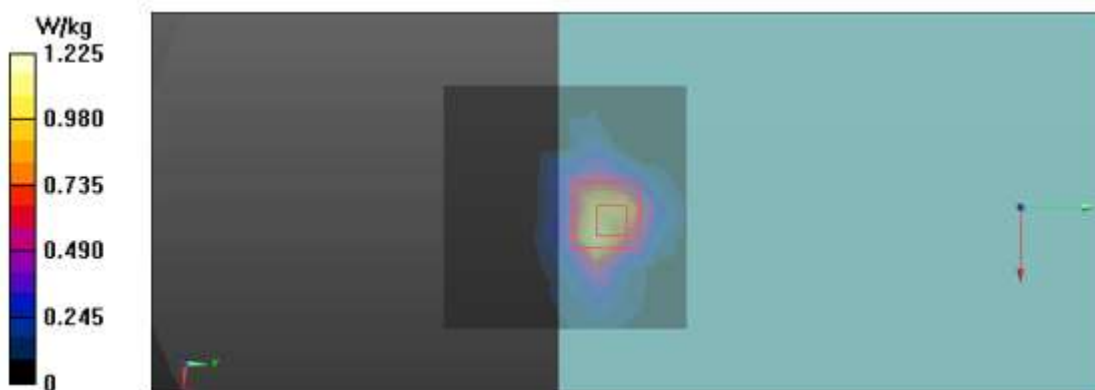
Peak SAR (extrapolated) = 3.01 W/kg

SAR(1 g) = 0.503 W/kg; SAR(10 g) = 0.187 W/kg

Smallest distance from peaks to all points 3 dB below = 4.3 mm

Ratio of SAR at M2 to SAR at M1 = 56%

Maximum value of SAR (measured) = 1.49 W/kg



8)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 5.8 GHz Notebook.da53:1](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 5G WLAN (0); Frequency: 5775 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5775 \text{ MHz}$; $\sigma = 5.386 \text{ S/m}$; $\epsilon_r = 34.852$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(4.99, 4.99, 4.99) @ 5775 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 ac_VHT80_Aux_CH155_Rear_0 mm/Area Scan (9x9x1): Measurement grid:
 $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 1.29 W/kg

Configuration 2/802.11 ac_VHT80_Aux_CH155_Rear_0 mm/Zoom Scan (9x9x7)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 0 V/m; Power Drift = 0.00 dB

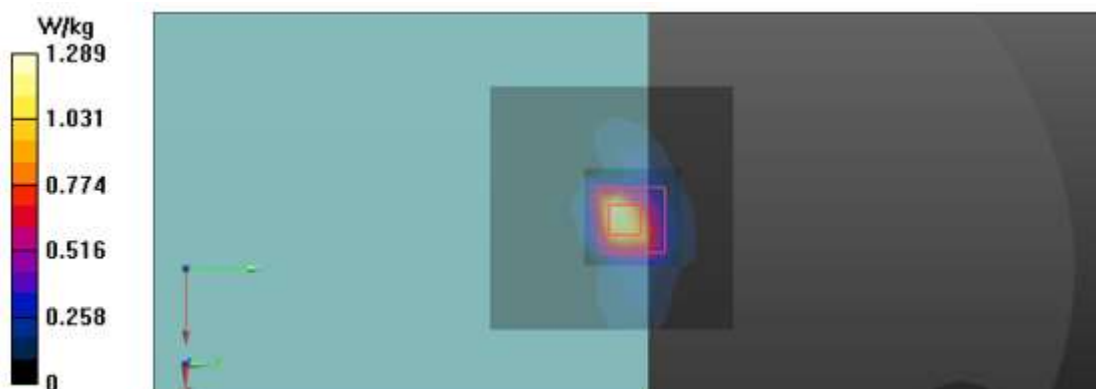
Peak SAR (extrapolated) = 4.33 W/kg

SAR(1 g) = 0.675 W/kg; SAR(10 g) = 0.168 W/kg

Smallest distance from peaks to all points 3 dB below = 4 mm

Ratio of SAR at M2 to SAR at M1 = 56.8%

Maximum value of SAR (measured) = 2.31 W/kg



9)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 2.4 GHz Tablet.da53:0](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 2.4GWLAN (0); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 1.845 \text{ S/m}$; $\epsilon_r = 39.56$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.87, 7.87, 7.87) @ 2462 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11 b_Main_CH11_Left_0 mm/Area Scan (8x10x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Maximum value of SAR (measured) = 1.52 W/kg

Configuration/802.11 b_Main_CH11_Left_0 mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=5\text{mm}$

Reference Value = 24.08 V/m; Power Drift = -0.19 dB

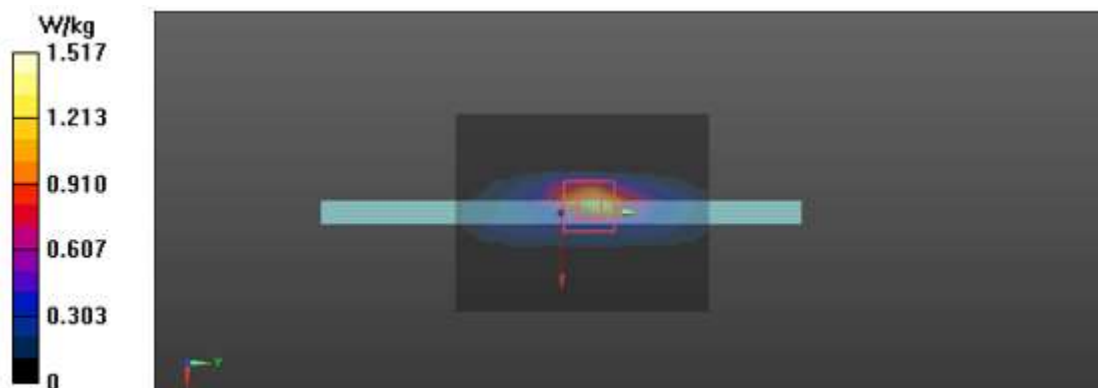
Peak SAR (extrapolated) = 3.08 W/kg

SAR(1 g) = 0.980 W/kg; SAR(10 g) = 0.324 W/kg

Smallest distance from peaks to all points 3 dB below = 4.8 mm

Ratio of SAR at M2 to SAR at M1 = 35.9%

Maximum value of SAR (measured) = 1.98 W/kg



10)

Date: 3/26/2021

Test Laboratory: KCTL Inc.

File Name: [1.WLAN 2.4 GHz Tablet.da53:1](#)

DUT: NP930QDB, Type: Notebook, Serial: 1HNR91ZR200032E

Communication System: UID 0, 2.4GWLAN (0); Frequency: 2437 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.821$ S/m; $\epsilon_r = 39.457$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(7.87, 7.87, 7.87) @ 2437 MHz; ; Calibrated: 1/25/2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1587; Calibrated: 7/29/2020
- Phantom: ELI V8.0_Left; Type: QD OVA 004 AA; Serial: 2098
- Measurement SW: DASY52, Version 52.10 (4);

Configuration 2/802.11 b_Aux_CH6_Right_0 mm/Area Scan (8x10x1): Measurement grid:
 dx=12mm, dy=12mm

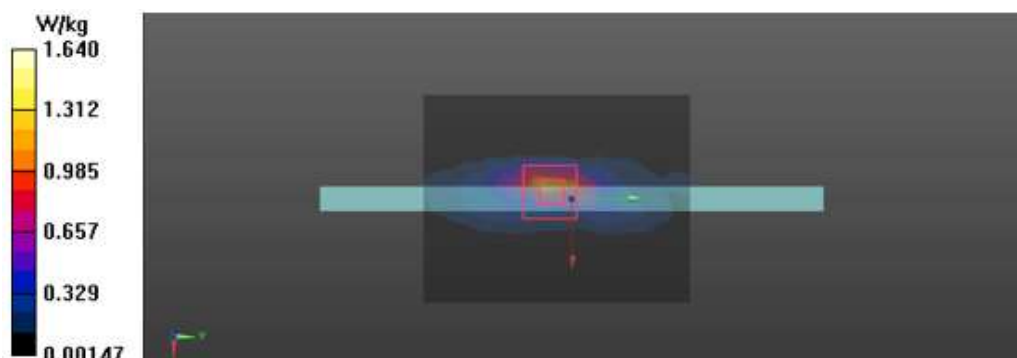
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.25 W/kg

Configuration 2/802.11 b_Aux_CH6_Right_0 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
 dx=5mm, dy=5mm, dz=5mm
 Reference Value = 25.85 V/m; Power Drift = 0.06 dB
 Peak SAR (extrapolated) = 2.54 W/kg
SAR(1 g) = 0.804 W/kg; SAR(10 g) = 0.273 W/kg
 Smallest distance from peaks to all points 3 dB below = 4.1 mm
 Ratio of SAR at M2 to SAR at M1 = 35.2%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.64 W/kg



Appendixes List

Appendix A	A.1 Probe Calibration certificate (EX3DV4_3865) A.2 Dipole Calibration certificate (D2450V2_895) A.3 Dipole Calibration certificate (D5GHzV2_1134)
Appendix B	SAR Tissue Specification
Appendix C	#Antenna Location & Distance
Appendix D	EUT Photo
Appendix E	Test Setup Photo