FCC SAR TEST REPORT

FCC ID	:	**HLZAX201NG**
Equipment	:	**WLAN+Bluetooth module AX201NGW**
Brand Name	:	**acer**
Model Name	:	**AX201NGW**
Applicant	:	**Acer Incorporated** **8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 22181, Taiwan (R.O.C)**
Manufacturer	:	**Acer Incorporated** **8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 22181, Taiwan (R.O.C)**
Standard	:	**FCC 47 CFR Part 2 (2.1093)**

The product was installed into Notebook computer (Brand Name acer, Model Name: N20H4) during test.

The product was received on Aug. 06, 2020 and testing was started from Aug. 09, 2020 and completed on Aug. 10, 2020. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Cona Huang

Approved by: Cona Huang / Deputy Manager

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
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History of this test report

Report No.	Version	Description	Issued Date
FA071003	01	Initial issue of report	Sep. 09, 2020

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Acer Incorporated, WLAN+Bluetooth module AX201NGW, AX201NGW, are as follows.

Frequency Band		Highest SAR Summary Body (Separation 0mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
WLAN	2.4GHz WLAN	1.11	1.59
	5GHz WLAN	1.20	1.53
2.4GHz Band	Bluetooth	0.48	1.59
Date of Testing:		2020/8/9 ~ 2020/8/10	

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Wan Liu

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, if the KDB standards were not list within TAF approval, because it is include in the FCC KDB 447498.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	WLAN+Bluetooth module AX201NGW
Brand Name	acer
Model Name	AX201NGW
FCC ID	HLZAX201NG
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8GHz Band: 5725 MHz ~ 5825 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE
Remark: 1. This device is convertible type notebook PC, and there are two mode as usage way, one is laptop mode, another is tablet mode.	

Host Information	
Equipment Name	Notebook computer
Brand Name	acer
Model Name	N20H4
Marketing Name	TravelMate P4, TravelMate Spin P4, TMP414-51, TMP414-51G, TMP414RN-51, TMP414RN-51G, TMX40-53, TMX40-53G
EUT Stage	Identical Prototype

SKU List	SKU1	SKU3
CPU	I5	I5
LPDDR4	4GB_Micron	8GB_Hynix
SSD	256GB_Samsung	512GB_Sandisk
Battery	MURATA_3Cell 48Wh	LGC_3Cell 50Wh
WLAN	Intel_AX 201	Intel_AX 201
Camera	Tech-Front HD	CHICONY HD

4. Lid angle power verification

General Note:

1. This device is convertible type notebook PC, and there have Laptop and Tablet two usage way, when end user is used different mode which the device will according current mode to limit different maximum power, according to 201911 TCBC workshop Hall effect and Gravity sensor guidance to detect lid angle for the power verification in different usage mode was following below step:

   Step 1: With the lid is in closed mode (0 degrees), open the screen in 10 degree steps until laptop mode is obtained
   Step 2: Lower the screen 5 degrees. Closed mode should be reobtained. If not keep lowering in 5 degree steps.
   Step 3: Open the screen in 1 degree steps until laptop mode is reobtained
   Step 4: Continue opening the screen in 1 degree steps until at least 5 degrees past where laptop mode was obtained
   Step 5: Then continue opening the screen in 10 degree steps until tablet mode is obtained
   Step 6: Power measurements should be taken at each step
   Step 7: Reverse this procedure going from tablet mode back down to closed mode

when the screen angle is from 0 degree to 360 degree										
	Wireless		WLAN Ant 1				WLAN Ant 2			
	Band		2.4GHz WLAN	5.2/5.3GHz WLAN	5.5GHz WLAN	5.8GHz WLAN	2.4GHz WLAN	5.2/5.3GHz WLAN	5.5GHz WLAN	5.8GHz WLAN
Screen angle (degree) v.s. power	Lid Close	0	NA	NA	NA	NA	NA	NA	NA	NA
		5	NA	NA	NA	NA	NA	NA	NA	NA
		10	NA	NA	NA	NA	NA	NA	NA	NA
		15	NA	NA	NA	NA	NA	NA	NA	NA
		20	NA	NA	NA	NA	NA	NA	NA	NA
		25	NA	NA	NA	NA	NA	NA	NA	NA
		26	NA	NA	NA	NA	NA	NA	NA	NA
		27	NA	NA	NA	NA	NA	NA	NA	NA
		28	NA	NA	NA	NA	NA	NA	NA	NA
		29	NA	NA	NA	NA	NA	NA	NA	NA
	Laptop	30	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		31	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		32	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		33	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		34	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		35	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		40	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		45	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		50	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		55	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		60	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		65	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		70	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		75	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		80	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		85	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		90	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		95	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		100	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		105	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		110	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		115	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		120	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		125	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		130	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		135	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		140	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		145	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		150	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		155	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		160	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		165	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		170	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		175	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0

		180	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		185	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		190	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		195	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		200	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		205	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		210	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		215	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		220	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		225	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		230	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		235	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		240	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		245	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		250	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		255	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		260	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		265	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		270	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		275	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		280	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		285	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		290	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		295	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		300	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		305	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		310	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		315	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		320	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		325	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		330	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		335	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		336	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		337	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		338	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		339	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		340	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
	Tablet	341	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		342	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		343	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		344	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		345	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		350	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		355	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		360	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0

when the screen angle is from 360 degree to 0 degree										
Screen angle (degree) v.s. power	Wireless		WLAN Ant 1				WLAN Ant 2			
	Band		2.4GHz WLAN	5.2/5.3GHz WLAN	5.5GHz WLAN	5.8GHz WLAN	2.4GHz WLAN	5.2/5.3GHz WLAN	5.5GHz WLAN	5.8GHz WLAN
	Tablet	360	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		355	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		350	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		345	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		344	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		343	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		342	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
		341	11.5	12.5	12.0	13.0	15.5	13.5	13.5	14.0
	Laptop	340	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		339	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		338	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		337	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		336	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		335	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		330	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		325	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		320	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		315	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		310	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		305	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		300	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		295	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		290	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		285	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		280	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		275	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		270	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		265	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		260	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		255	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		250	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		245	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		240	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		235	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		230	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		225	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		220	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		215	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		210	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		205	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		200	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		195	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		190	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		185	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		180	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		175	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		170	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		165	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		160	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		155	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		150	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		145	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		140	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		135	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		130	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		125	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		120	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		115	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		110	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0

		105	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		100	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		95	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		90	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		85	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		80	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		75	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		70	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		65	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		60	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		55	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		50	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		45	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		40	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		35	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		34	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		33	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		32	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		31	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
		30	15.5	20.5	19.5	19.5	19.0	19.0	17.5	18.0
	Lid Close	29	NA	NA	NA	NA	NA	NA	NA	NA
		28	NA	NA	NA	NA	NA	NA	NA	NA
		27	NA	NA	NA	NA	NA	NA	NA	NA
		26	NA	NA	NA	NA	NA	NA	NA	NA
		25	NA	NA	NA	NA	NA	NA	NA	NA
		20	NA	NA	NA	NA	NA	NA	NA	NA
		15	NA	NA	NA	NA	NA	NA	NA	NA
		10	NA	NA	NA	NA	NA	NA	NA	NA
		5	NA	NA	NA	NA	NA	NA	NA	NA
		0	NA	NA	NA	NA	NA	NA	NA	NA

5. RF Exposure Limits

5.1 Uncontrolled Environment

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.

5.2 Controlled Environment

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. The 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.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

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.

6.2 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:

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

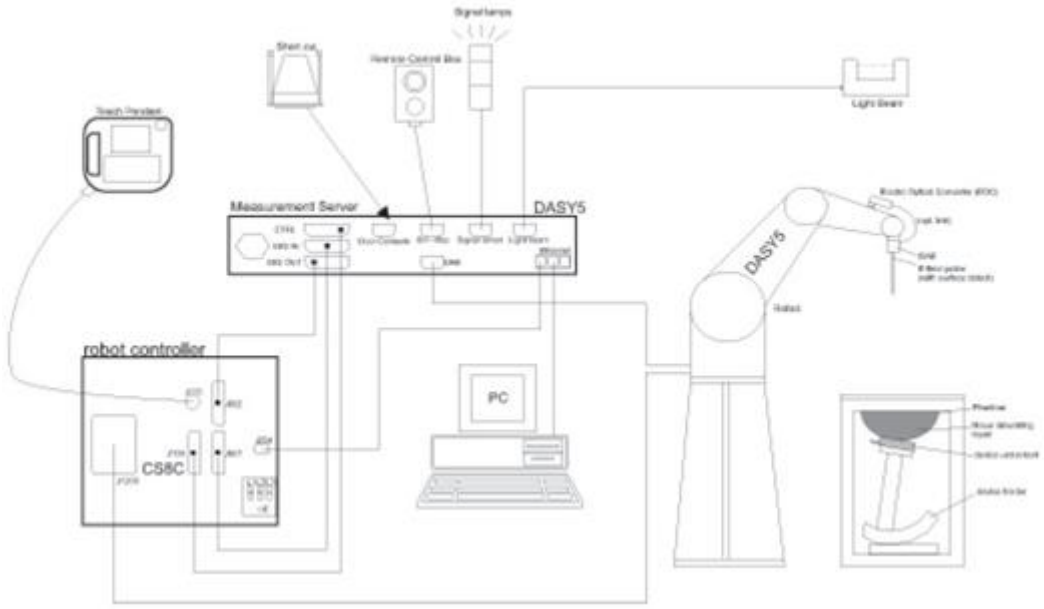
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 Test Side Location

Sporton Lab and below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 0007) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory			
Test Site Location	TW1190 No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, CHINESE TAIPEI		TW0007 No. 58, Aly. 75, Ln. 564, Wehnua 3rd, Rd., Guishan Dist., Taoyuan City, CHINESE TAIPEI	
Test Site No.	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY
	SAR06-HY	SAR10-HY		

7.2 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.3 Data Acquisition Electronics (DAE)

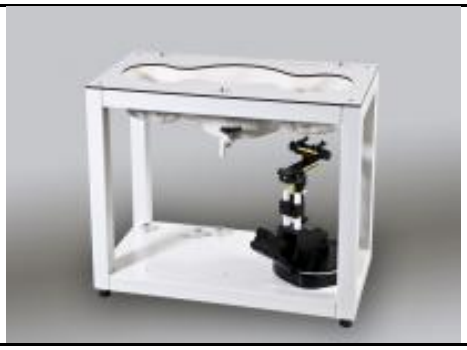
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

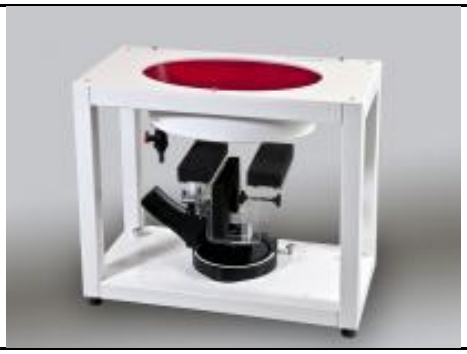
7.4 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 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. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area 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. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), 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 parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum 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.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
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·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	929	Nov. 21, 2019	Nov. 20, 2020
SPEAG	5GHz System Validation Kit	D5GHzV2	1128	Dec. 16, 2019	Dec. 15, 2020
SPEAG	Data Acquisition Electronics	DAE4	679	May. 06, 2020	May. 05, 2021
SPEAG	Dosimetric E-Field Probe	EX3DV4	7515	Oct. 22, 2019	Oct. 21, 2020
RCPTWN	Thermometer	HTC-1	TM685-1	Nov. 12, 2019	Nov. 11, 2020
R&S	BT Base Station	CBT	100815	Feb. 15, 2020	Feb. 14, 2021
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Nov. 20, 2019	Nov. 19, 2020
Agilent	ENA Network Analyzer	E5071C	MY46104758	Sep. 06, 2019	Sep. 05, 2020
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 18, 2019	Sep. 17, 2020
LINE SEIKI	Digital Thermometer	DTM3000-spezial	2942	Nov. 18, 2019	Nov. 17, 2020
Anritsu	Power Meter	ML2495A	0932001	Oct. 03, 2019	Oct. 02, 2020
Anritsu	Power Sensor	MA2411B	0846202	Oct. 03, 2019	Oct. 02, 2020
Anritsu	Power Meter	ML2495A	1218006	Oct. 14, 2019	Oct. 13, 2020
Anritsu	Power Sensor	MA2411B	1207363	Oct. 14, 2019	Oct. 13, 2020
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 27, 2019	Aug. 26, 2020
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Mar. 12, 2020	Mar. 11, 2021
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 16, 2019	Oct. 15, 2020
Mini-Circuits	Power Amplifier	ZHL-42W+	321501827	Aug. 06, 2020	Aug. 05, 2021
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

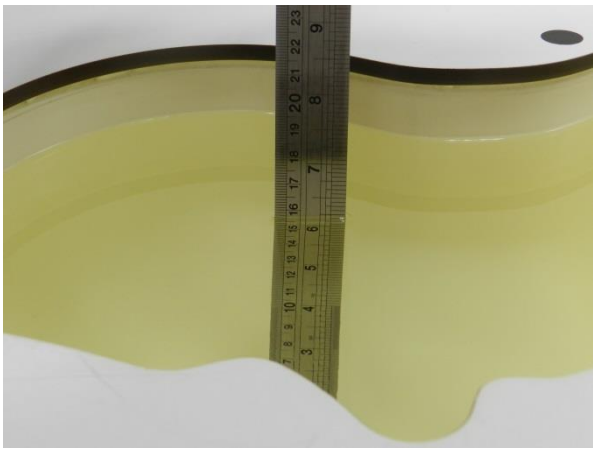


Fig 10.1Photo of Liquid Height for Head SAR

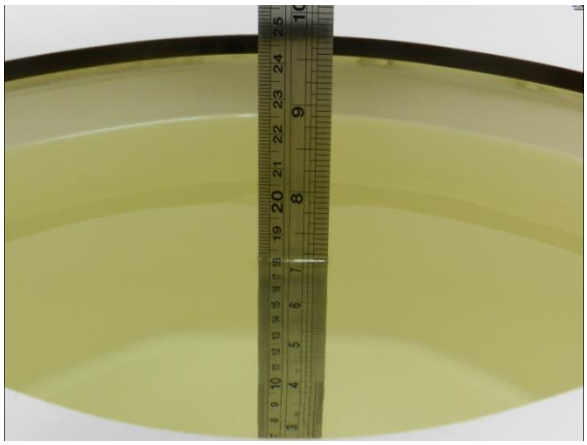


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	22.2	1.818	38.488	1.80	39.20	1.00	-1.82	±5	2020/8/9
5250	22.2	4.634	35.967	4.71	35.95	-1.61	0.05	±5	2020/8/10
5600	22.2	4.974	35.437	5.07	35.50	-1.89	-0.18	±5	2020/8/10
5750	22.2	5.147	35.246	5.22	35.35	-1.40	-0.29	±5	2020/8/10

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2020/8/9	2450	250	D2450V2-929	EX3DV4 - SN7515	DAE4 Sn679	13.80	53.10	55.2	3.95
2020/8/10	5250	100	D5GHzV2-1128-5250	EX3DV4 - SN7515	DAE4 Sn679	7.73	80.00	77.3	-3.37
2020/8/10	5600	100	D5GHzV2-1128-5600	EX3DV4 - SN7515	DAE4 Sn679	8.64	82.40	86.4	4.85
2020/8/10	5750	100	D5GHzV2-1128-5750	EX3DV4 - SN7515	DAE4 Sn679	8.07	79.10	80.7	2.02

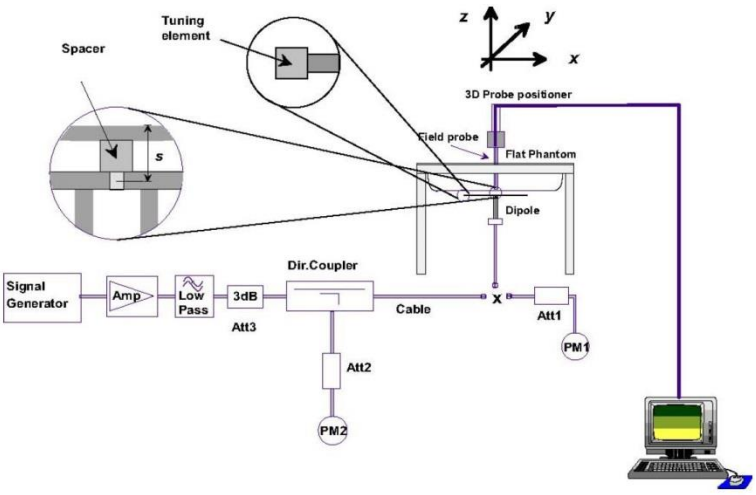


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. WiFi/Bluetooth Output Power (Unit: dBm)

General Note:

1. For each antenna, transmit power in SISO operation is larger than (or equal to) the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode.
2. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
3. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
4. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
5. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
6. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
7. Per 201904 TCBC workshops, General principles of FCC KDB Publication 248227 D01 can be applied to determine the SAR Initial Test Configurations and test reduction for 802.11ax SAR testing. For the table below the 802.11ax maximum power is SU (non-OFDMA).
8. In applying the test guidance, the IEEE 802.11 mode with the maximum output power (out of all modes) should be considered for testing
9. For modes with the same maximum output power, the guidance from section 5.3.2 a) of FCC KDB Publication 248227 D01 should be applied, with 802.11ax being considered as the highest 802.11 mode for the appropriate frequency bands
10. When SAR testing for 802.11ax is required
    a. If the maximum output power is highest for OFDMA scenarios, choose the tone size with the maximum number of tones and the highest maximum output power
    b. Otherwise, consider the fully allocated channel for SAR testing
    c. When SAR testing is required on RU sizes less than the fully allocated channel, use the RU number closest to the middle of the channel, choosing the higher RU number when two RUs are equidistant to the middle of the channel

<Laptop Power Mode>

<2.4GHz WLAN ANT 1>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	15.20	15.50	97.65
		6	2437	15.20	15.50	
		11	2462	15.30	15.50	
	802.11g 6Mbps	1	2412	Not required	15.50	Not required
		6	2437		15.50	
		11	2462		15.50	
	802.11n-HT20 MCS0	1	2412		15.50	
		6	2437		15.50	
		11	2462		15.50	
	802.11n-HT40 MCS0	3	2422		15.50	
		6	2437		15.50	
		9	2452		15.50	
	802.11ax-HE20 MCS0	1	2412		15.50	
		6	2437		15.50	
		11	2462		15.50	
	802.11ax-HE40 MCS0	3	2422		15.50	
		6	2437		15.50	
		9	2452		15.50	

<2.4GHz WLAN ANT 2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	18.00	19.00	97.89
		6	2437	18.20	19.00	
		11	2462	18.30	19.00	
	802.11g 6Mbps	1	2412	Not required	17.00	Not required
		6	2437		19.00	
		11	2462		17.50	
	802.11n-HT20 MCS0	1	2412		17.00	
		6	2437		19.00	
		11	2462		16.00	
	802.11n-HT40 MCS0	3	2422		16.50	
		6	2437		16.50	
		9	2452		16.00	
	802.11ax-HE20 MCS0	1	2412		17.50	
		6	2437		19.00	
		11	2462		16.00	
	802.11ax-HE40 MCS0	3	2422		16.50	
		6	2437		16.00	
		9	2452		16.00	

<2.4GHz WLAN ANT 1+2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11n-HT20 MCS0	1	2412	Not required	17.00	Not required
		6	2437		18.50	
		11	2462		17.50	
	802.11n-HT40 MCS0	3	2422		17.50	
		6	2437		17.00	
		9	2452		16.50	
	802.11ax-HE20 MCS0	1	2412		17.00	
		6	2437		18.50	
		11	2462		17.00	
	802.11ax-HE40 MCS0	3	2422		17.00	
		6	2437		17.50	
		9	2452		16.50	

<5GHz WLAN ANT1>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	Not required	18.50	Not required
		40	5200		20.50	
		44	5220		20.50	
		48	5240		20.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	36	5180		18.00	
		40	5200		20.50	
		44	5220		20.50	
		48	5240		20.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	38	5190		18.50	
		46	5230		20.50	
	802.11ac-VHT80 MCS0	42	5210		18.50	
	802.11ax-HE20 MCS0	36	5180		18.00	
		40	5200		20.50	
		44	5220		20.50	
		48	5240		20.50	
	802.11ax-HE40 MCS0	38	5190		18.00	
		46	5230		20.50	
	802.11ax-HE80 MCS0	42	5210		18.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	19.10	20.50	98.14
		56	5280	19.00	20.50	
		60	5300	19.00	20.50	
		64	5320	17.40	17.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	52	5260	Not required	20.50	Not required
		56	5280		20.50	
		60	5300		20.50	
		64	5320		17.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	54	5270	20.00	20.50	98.14
		62	5310	15.10	16.50	
	802.11ac-VHT80 MCS0	58	5290	Not required	17.50	Not required
	802.11ac-VHT160 MCS0	50	5250		15.00	
	802.11ax-HE20 MCS0	52	5260		20.50	
		56	5280		20.50	
		60	5300		20.50	
		64	5320		17.50	
	802.11ax-HE40 MCS0	54	5270		20.50	
		62	5310		16.50	
	802.11ax-HE80 MCS0	58	5290		17.50	
	802.11ax-HE160 MCS0	50	5250		15.00	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	Not required	17.50	Not required
		116	5580		19.50	
		124	5620		19.50	
		132	5660		19.50	
		144	5720		19.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	100	5500		17.50	
		116	5580		19.50	
		124	5620		19.50	
		132	5660		19.50	
		144	5720		19.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	102	5510		17.50	
		110	5550		19.50	
		126	5630		19.50	
		134	5670		19.00	
		142	5710		19.50	
	802.11ac-VHT80 MCS0	106	5530	17.30	18.00	98.76
		122	5610	18.60	19.50	
		138	5690	19.00	19.50	
	802.11ac-VHT160 MCS0	114	5570	Not required	14.50	Not required
	802.11ax-HE20 MCS0	100	5500		17.50	
		116	5580		19.50	
		124	5620		19.50	
		132	5660		19.50	
		144	5720		19.50	
	802.11ax-HE40 MCS0	102	5510		17.50	
		110	5550		19.50	
		126	5630		19.50	
		134	5670		19.00	
		142	5710		19.50	
	802.11ax-HE80 MCS0	106	5530		18.00	
		122	5610		19.50	
		138	5690		19.50	
	802.11ax-HE160 MCS0	114	5570		14.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	Not required	19.50	Not required
		157	5785		19.50	
		165	5825		19.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	149	5745		19.50	
		157	5785		19.50	
		165	5825		19.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	151	5755	18.90	19.50	98.76
		159	5795	19.10	19.50	
	802.11ac-VHT80 MCS0	155	5775	18.70	19.50	98.76
	802.11ax-HE20 MCS0	149	5745	Not required	19.50	Not required
		157	5785		19.50	
		165	5825		19.50	
	802.11ax-HE40 MCS0	151	5755		19.50	
		159	5795		19.50	
	802.11ax-HE80 MCS0	155	5775		19.00	

<5GHz WLAN ANT2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	Not required	18.00	Not required
		40	5200		19.00	
		44	5220		19.00	
		48	5240		19.00	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	36	5180		18.50	
		40	5200		19.00	
		44	5220		19.00	
		48	5240		19.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	38	5190		18.00	
		46	5230		19.00	
	802.11ac-VHT80 MCS0	42	5210		18.00	
	802.11ax-HE20 MCS0	36	5180		18.00	
		40	5200		19.00	
		44	5220		19.00	
		48	5240		19.00	
	802.11ax-HE40 MCS0	38	5190		18.00	
		46	5230		19.00	
	802.11ax-HE80 MCS0	42	5210		18.00	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	18.80	19.00	98.88
		56	5280	18.50	19.00	
		60	5300	18.60	19.00	
		64	5320	17.40	17.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	52	5260	Not required	19.00	Not required
		56	5280		19.00	
		60	5300		19.00	
		64	5320		17.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	54	5270	18.50	19.00	98.88
		62	5310	15.80	16.50	
	802.11ac-VHT80 MCS0	58	5290	Not required	17.50	Not required
	802.11ac-VHT160 MCS0	50	5250		15.00	
	802.11ax-HE20 MCS0	52	5260		19.00	
		56	5280		19.00	
		60	5300		19.00	
		64	5320		17.50	
	802.11ax-HE40 MCS0	54	5270		19.00	
		62	5310		16.50	
	802.11ax-HE80 MCS0	58	5290		17.50	
	802.11ax-HE160 MCS0	50	5250		15.00	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	Not required	17.50	Not required
		116	5580		17.50	
		124	5620		17.50	
		132	5660		17.50	
		144	5720		17.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	100	5500		17.50	
		116	5580		17.50	
		124	5620		17.50	
		132	5660		17.50	
		144	5720		17.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	102	5510		17.50	
		110	5550		17.50	
		126	5630		17.50	
		134	5670		17.50	
		142	5710		17.50	
	802.11ac-VHT80 MCS0	106	5530	16.70	17.50	98.51
		122	5610	16.80	17.50	
		138	5690	17.20	17.50	
	802.11ac-VHT160 MCS0	114	5570	Not required	15.00	Not required
	802.11ax-HE20 MCS0	100	5500		17.50	
		116	5580		17.50	
		124	5620		17.50	
		132	5660		17.50	
		144	5720		17.50	
	802.11ax-HE40 MCS0	102	5510		17.50	
		110	5550		17.50	
		126	5630		17.50	
		134	5670		17.50	
		142	5710		17.50	
	802.11ax-HE80 MCS0	106	5530		17.50	
		122	5610		17.50	
		138	5690		17.50	
	802.11ax-HE160 MCS0	114	5570		14.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	Not required	18.00	Not required
		157	5785		18.00	
		165	5825		18.00	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	149	5745		18.00	
		157	5785		18.00	
		165	5825		18.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	151	5755	17.50	18.00	98.51
		159	5795	17.30	18.00	
	802.11ac-VHT80 MCS0	155	5775	17.60	18.00	98.51
	802.11ax-HE20 MCS0	149	5745	Not required	18.00	Not required
		157	5785		18.00	
		165	5825		18.00	
	802.11ax-HE40 MCS0	151	5755		18.00	
		159	5795		18.00	
	802.11ax-HE80 MCS0	155	5775		18.00	

<5GHz WLAN ANT1+2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	36	5180	Not required	19.00	Not required
		40	5200		20.50	
		44	5220		21.00	
		48	5240		21.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	38	5190		18.50	
		46	5230		20.50	
	802.11ac-VHT80 MCS0	42	5210		18.50	
	802.11ax-HE20 MCS0	36	5180		19.00	
		40	5200		21.00	
		44	5220		21.00	
		48	5240		21.00	
	802.11ax-HE40 MCS0	38	5190		18.00	
		46	5230		20.50	
	802.11ax-HE80 MCS0	42	5210		18.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	52	5260	Not required	21.00	Not required
		56	5280		21.00	
		60	5300		21.00	
		64	5320		16.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	54	5270		18.50	
		62	5310		16.00	
	802.11ac-VHT80 MCS0	58	5290		17.00	
	802.11ac-VHT160 MCS0	50	5250		15.00	
	802.11ax-HE20 MCS0	52	5260		21.00	
		56	5280		21.00	
		60	5300		21.00	
		64	5320		16.50	
	802.11ax-HE40 MCS0	54	5270		19.50	
		62	5310		16.00	
	802.11ax-HE80 MCS0	58	5290		17.00	
	802.11ax-HE160 MCS0	50	5250		15.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	100	5500	Not required	17.50	Not required
		116	5580		20.50	
		124	5620		20.50	
		132	5660		20.50	
		144	5720		20.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	102	5510		18.00	
		110	5550		20.00	
		126	5630		20.00	
		134	5670		19.00	
		142	5710		20.50	
	802.11ac-VHT80 MCS0	106	5530		18.00	
		122	5610		20.00	
		138	5690		20.50	
	802.11ac-VHT160 MCS0	114	5570		15.00	
	802.11ax-HE20 MCS0	100	5500		17.50	
		116	5580		20.50	
		124	5620		20.50	
		132	5660		20.50	
		144	5720		20.00	
	802.11ax-HE40 MCS0	102	5510		18.00	
		110	5550		20.50	
		126	5630		20.50	
		134	5670		19.00	
		142	5710		20.50	
	802.11ax-HE80 MCS0	106	5530		17.50	
		122	5610		19.50	
		138	5690		20.50	
	802.11ax-HE160 MCS0	114	5570		14.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	149	5745	Not required	21.00	Not required
		157	5785		21.00	
		165	5825		21.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	151	5755		21.00	
		159	5795		21.00	
	802.11ac-VHT80 MCS0	155	5775		19.50	
	802.11ax-HE20 MCS0	149	5745		20.50	
		157	5785		21.00	
		165	5825		21.00	
	802.11ax-HE40 MCS0	151	5755		21.00	
		159	5795		21.00	
	802.11ax-HE80 MCS0	155	5775		19.50	

<Tablet Power Mode>

<2.4GHz WLAN ANT 1>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	11.00	11.50	97.65
		6	2437	11.00	11.50	
		11	2462	11.00	11.50	
	802.11g 6Mbps	1	2412	Not required	11.50	Not required
		6	2437		11.50	
		11	2462		11.50	
	802.11n-HT20 MCS0	1	2412		11.50	
		6	2437		11.50	
		11	2462		11.50	
	802.11n-HT40 MCS0	3	2422		11.50	
		6	2437		11.50	
		9	2452		11.50	
	802.11ax-HE20 MCS0	1	2412		11.50	
		6	2437		11.50	
		11	2462		11.50	
	802.11ax-HE40 MCS0	3	2422		11.50	
		6	2437		11.50	
		9	2452		11.50	

<2.4GHz WLAN ANT 2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	14.90	15.50	97.89
		6	2437	14.90	15.50	
		11	2462	15.30	15.50	
	802.11g 6Mbps	1	2412	Not required	15.50	Not required
		6	2437		15.50	
		11	2462		15.50	
	802.11n-HT20 MCS0	1	2412		15.50	
		6	2437		15.50	
		11	2462		15.50	
	802.11n-HT40 MCS0	3	2422		15.50	
		6	2437		15.50	
		9	2452		15.50	
	802.11ax-HE20 MCS0	1	2412		15.50	
		6	2437		15.50	
		11	2462		15.50	
	802.11ax-HE40 MCS0	3	2422		15.50	
		6	2437		15.50	
		9	2452		15.50	

<2.4GHz WLAN ANT 1+2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11n-HT20 MCS0	1	2412	Not required	14.50	Not required
		6	2437		14.50	
		11	2462		14.50	
	802.11n-HT40 MCS0	3	2422		14.50	
		6	2437		14.50	
		9	2452		14.50	
	802.11ax-HE20 MCS0	1	2412		14.50	
		6	2437		14.50	
		11	2462		14.50	
	802.11ax-HE40 MCS0	3	2422		14.50	
		6	2437		14.50	
		9	2452		14.50	

<5GHz WLAN ANT1>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	Not required	12.50	Not required
		40	5200		12.50	
		44	5220		12.50	
		48	5240		12.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	36	5180		12.50	
		40	5200		12.50	
		44	5220		12.50	
		48	5240		12.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	38	5190		12.50	
		46	5230		12.50	
	802.11ac-VHT80 MCS0	42	5210		12.50	
	802.11ax-HE20 MCS0	36	5180		12.50	
		40	5200		12.50	
		44	5220		12.50	
		48	5240		12.50	
	802.11ax-HE40 MCS0	38	5190		12.50	
		46	5230		12.50	
	802.11ax-HE80 MCS0	42	5210		12.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	Not required	12.50	Not required
		56	5280		12.50	
		60	5300		12.50	
		64	5320		12.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	52	5260		12.50	
		56	5280		12.50	
		60	5300		12.50	
		64	5320		12.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	54	5270		12.50	
		62	5310		12.50	
	802.11ac-VHT80 MCS0	58	5290	11.40	12.50	98.88
	802.11ac-VHT160 MCS0	50	5250	11.50	12.50	98.88
	802.11ax-HE20 MCS0	52	5260	Not required	12.50	Not required
		56	5280		12.50	
		60	5300		12.50	
		64	5320		12.50	
	802.11ax-HE40 MCS0	54	5270		12.50	
		62	5310		12.50	
	802.11ax-HE80 MCS0	58	5290		12.50	
	802.11ax-HE160 MCS0	50	5250		12.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	Not required	12.00	Not required
		116	5580		12.00	
		124	5620		12.00	
		132	5660		12.00	
		144	5720		12.00	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	100	5500		12.00	
		116	5580		12.00	
		124	5620		12.00	
		132	5660		12.00	
		144	5720		12.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	102	5510		12.00	
		110	5550		12.00	
		126	5630		12.00	
		134	5670		12.00	
		142	5710		12.00	
	802.11ac-VHT80 MCS0	106	5530	11.40	12.00	98.88
		122	5610	11.30	12.00	
		138	5690	11.20	12.00	
	802.11ac-VHT160 MCS0	114	5570	11.20	12.00	98.88
	802.11ax-HE20 MCS0	100	5500	Not required	12.00	Not required
		116	5580		12.00	
		124	5620		12.00	
		132	5660		12.00	
		144	5720		12.00	
	802.11ax-HE40 MCS0	102	5510		12.00	
		110	5550		12.00	
		126	5630		12.00	
		134	5670		12.00	
		142	5710		12.00	
	802.11ax-HE80 MCS0	106	5530		12.00	
		122	5610		12.00	
		138	5690		12.00	
	802.11ax-HE160 MCS0	114	5570		12.00	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	Not required	13.00	Not required
		157	5785		13.00	
		165	5825		13.00	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	149	5745		13.00	
		157	5785		13.00	
		165	5825		13.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	151	5755	12.10	13.00	98.76
		159	5795	12.00	13.00	
	802.11ac-VHT80 MCS0	155	5775	12.10	13.00	98.76
	802.11ax-HE20 MCS0	149	5745	Not required	13.00	Not required
		157	5785		13.00	
		165	5825		13.00	
	802.11ax-HE40 MCS0	151	5755		13.00	
		159	5795		13.00	
	802.11ax-HE80 MCS0	155	5775		13.00	

<5GHz WLAN ANT2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	Not required	13.50	Not required
		40	5200		13.50	
		44	5220		13.50	
		48	5240		13.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	36	5180		13.50	
		40	5200		13.50	
		44	5220		13.50	
		48	5240		13.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	38	5190		13.50	
		46	5230		13.50	
	802.11ac-VHT80 MCS0	42	5210		13.50	
	802.11ax-HE20 MCS0	36	5180		13.50	
		40	5200		13.50	
		44	5220		13.50	
		48	5240		13.50	
	802.11ax-HE40 MCS0	38	5190		13.50	
		46	5230		13.50	
	802.11ax-HE80 MCS0	42	5210		13.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	Not required	13.50	Not required
		56	5280		13.50	
		60	5300		13.50	
		64	5320		13.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	52	5260		13.50	
		56	5280		13.50	
		60	5300		13.50	
		64	5320		13.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	54	5270		13.50	
		62	5310		13.50	
	802.11ac-VHT80 MCS0	58	5290	13.00	13.50	98.76
	802.11ac-VHT160 MCS0	50	5250	13.00	13.50	98.76
	802.11ax-HE20 MCS0	52	5260	Not required	13.50	Not required
		56	5280		13.50	
		60	5300		13.50	
		64	5320		13.50	
	802.11ax-HE40 MCS0	54	5270		13.50	
		62	5310		13.50	
	802.11ax-HE80 MCS0	58	5290		13.50	
	802.11ax-HE160 MCS0	50	5250		13.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	Not required	13.50	Not required
		116	5580		13.50	
		124	5620		13.50	
		132	5660		13.50	
		144	5720		13.50	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	100	5500		13.50	
		116	5580		13.50	
		124	5620		13.50	
		132	5660		13.50	
		144	5720		13.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	102	5510		13.50	
		110	5550		13.50	
		126	5630		13.50	
		134	5670		13.50	
		142	5710		13.50	
	802.11ac-VHT80 MCS0	106	5530	12.60	13.50	98.76
		122	5610	12.60	13.50	
		138	5690	12.40	13.50	
	802.11ac-VHT160 MCS0	114	5570	12.70	13.50	98.76
	802.11ax-HE20 MCS0	100	5500	Not required	13.50	Not required
		116	5580		13.50	
		124	5620		13.50	
		132	5660		13.50	
		144	5720		13.50	
	802.11ax-HE40 MCS0	102	5510		13.50	
		110	5550		13.50	
		126	5630		13.50	
		134	5670		13.50	
		142	5710		13.50	
	802.11ax-HE80 MCS0	106	5530		13.50	
		122	5610		13.50	
		138	5690		13.50	
	802.11ax-HE160 MCS0	114	5570		13.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	Not required	14.00	Not required
		157	5785		14.00	
		165	5825		14.00	
	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	149	5745		14.00	
		157	5785		14.00	
		165	5825		14.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	151	5755	13.40	14.00	98.51
		159	5795	13.30	14.00	
	802.11ac-VHT80 MCS0	155	5775	13.30	14.00	98.51
	802.11ax-HE20 MCS0	149	5745	Not required	14.00	Not required
		157	5785		14.00	
		165	5825		14.00	
	802.11ax-HE40 MCS0	151	5755		14.00	
		159	5795		14.00	
	802.11ax-HE80 MCS0	155	5775		14.00	

<5GHz WLAN ANT1+2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	36	5180	Not required	15.50	Not required
		40	5200		15.50	
		44	5220		15.50	
		48	5240		15.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	38	5190		15.50	
		46	5230		15.50	
	802.11ac-VHT80 MCS0	42	5210		15.50	
	802.11ax-HE20 MCS0	36	5180		15.50	
		40	5200		15.50	
		44	5220		15.50	
		48	5240		15.50	
	802.11ax-HE40 MCS0	38	5190		15.50	
		46	5230		15.50	
	802.11ax-HE80 MCS0	42	5210		15.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	52	5260	Not required	15.50	Not required
		56	5280		15.50	
		60	5300		15.50	
		64	5320		15.50	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	54	5270		15.50	
		62	5310		15.50	
	802.11ac-VHT80 MCS0	58	5290		15.50	
	802.11ac-VHT160 MCS0	50	5250		15.00	
	802.11ax-HE20 MCS0	52	5260		15.50	
		56	5280		15.50	
		60	5300		15.50	
		64	5320		15.50	
	802.11ax-HE40 MCS0	54	5270		15.50	
		62	5310		15.50	
	802.11ax-HE80 MCS0	58	5290		15.50	
	802.11ax-HE160 MCS0	50	5250		15.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	100	5500	Not required	15.00	Not required
		116	5580		15.00	
		124	5620		15.00	
		132	5660		15.00	
		144	5720		15.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	102	5510		15.00	
		110	5550		15.00	
		126	5630		15.00	
		134	5670		15.00	
		142	5710		15.00	
	802.11ac-VHT80 MCS0	106	5530		15.00	
		122	5610		15.00	
		138	5690		15.00	
	802.11ac-VHT160 MCS0	114	5570		15.00	
	802.11ax-HE20 MCS0	100	5500		15.00	
		116	5580		15.00	
		124	5620		15.00	
		132	5660		15.00	
		144	5720		15.00	
	802.11ax-HE40 MCS0	102	5510		15.00	
		110	5550		15.00	
		126	5630		15.00	
		134	5670		15.00	
		142	5710		15.00	
	802.11ax-HE80 MCS0	106	5530		15.00	
		122	5610		15.00	
		138	5690		15.00	
	802.11ax-HE160 MCS0	114	5570		14.50	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11n-HT20 MCS0 802.11ac-VHT20 MCS0	149	5745	Not required	16.00	Not required
		157	5785		16.00	
		165	5825		16.00	
	802.11n-HT40 MCS0 802.11ac-VHT40 MCS0	151	5755		16.00	
		159	5795		16.00	
	802.11ac-VHT80 MCS0	155	5775		16.00	
	802.11ax-HE20 MCS0	149	5745		16.00	
		157	5785		16.00	
		165	5825		16.00	
	802.11ax-HE40 MCS0	151	5755		16.00	
		159	5795		16.00	
	802.11ax-HE80 MCS0	155	5775		16.00	

<2.4GHz Bluetooth>

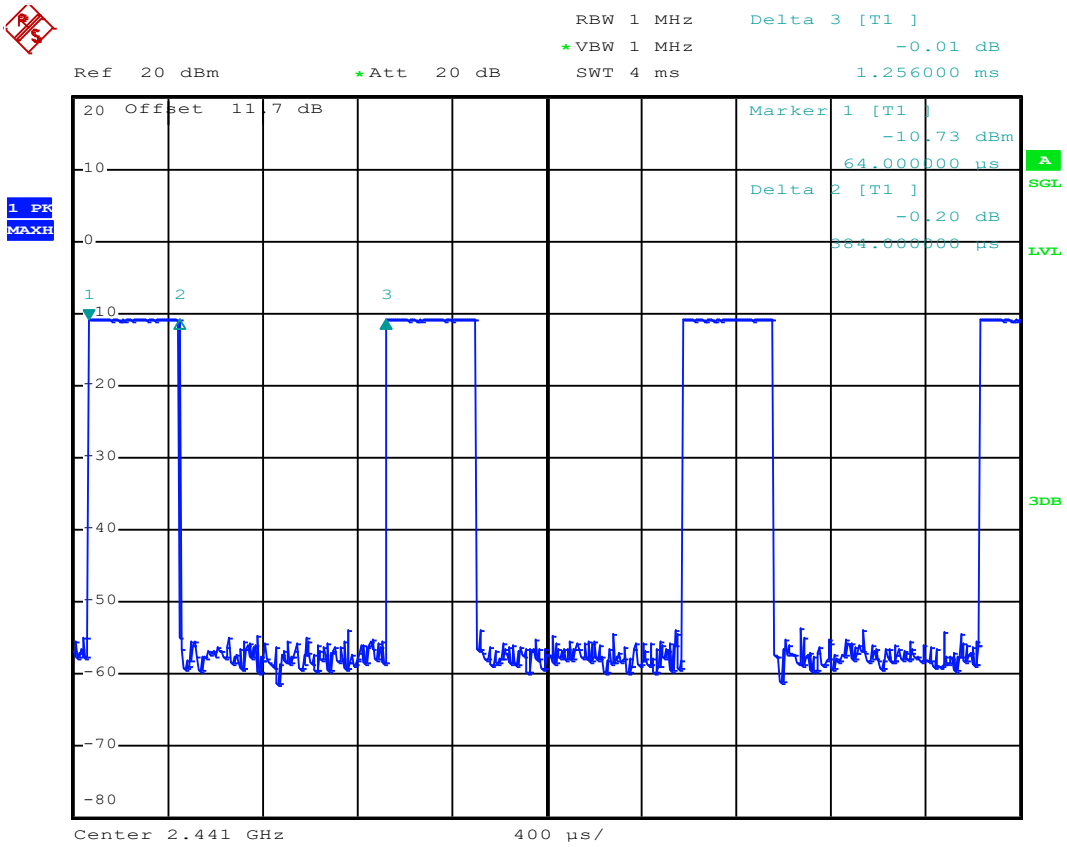
Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	10.16	8.86	8.86
	CH 39	2441	10.46	9.16	9.16
	CH 78	2480	10.36	9.16	9.16
Tune-up Limit			10.50	10.00	10.00

Mode	Channel	Frequency (MHz)	Average power (dBm)	
			1Mbps	2Mbps
LE	CH 00	2402	6.12	6.10
	CH 19	2440	6.51	6.47
	CH 39	2480	6.09	6.03
Tune-up Limit			7.00	7.00

General Note:

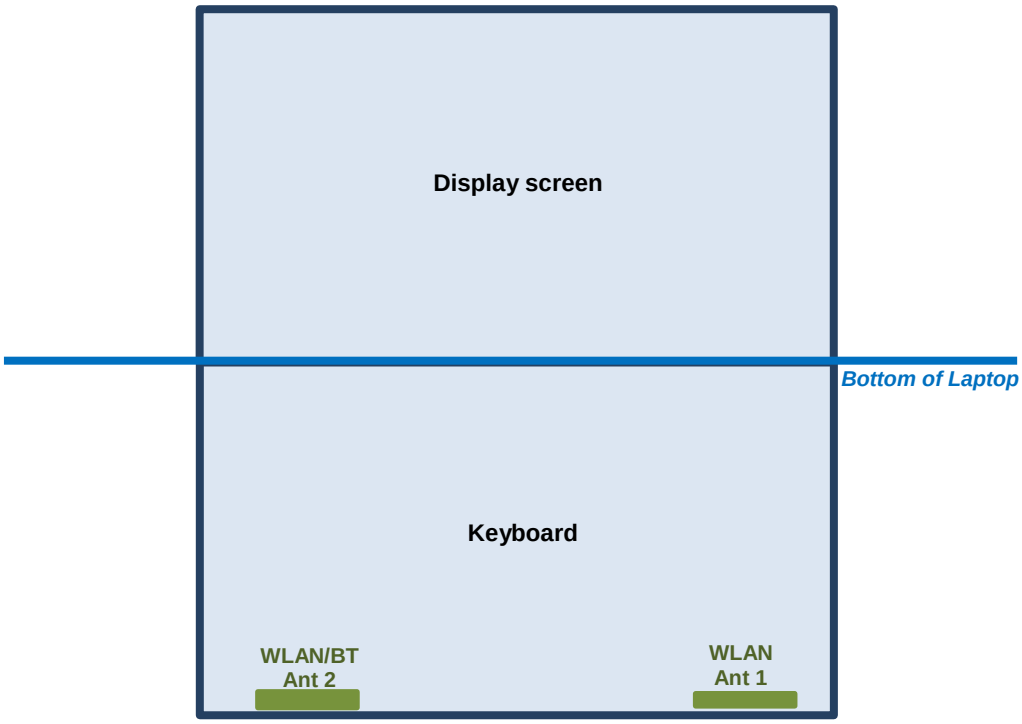
1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps due to its highest average power and duty cycle is 77.13% considered in SAR testing, and the duty cycle would be scaled to theoretical 83.3% in reported SAR calculation.

BT Duty cycle



12. Antenna Location

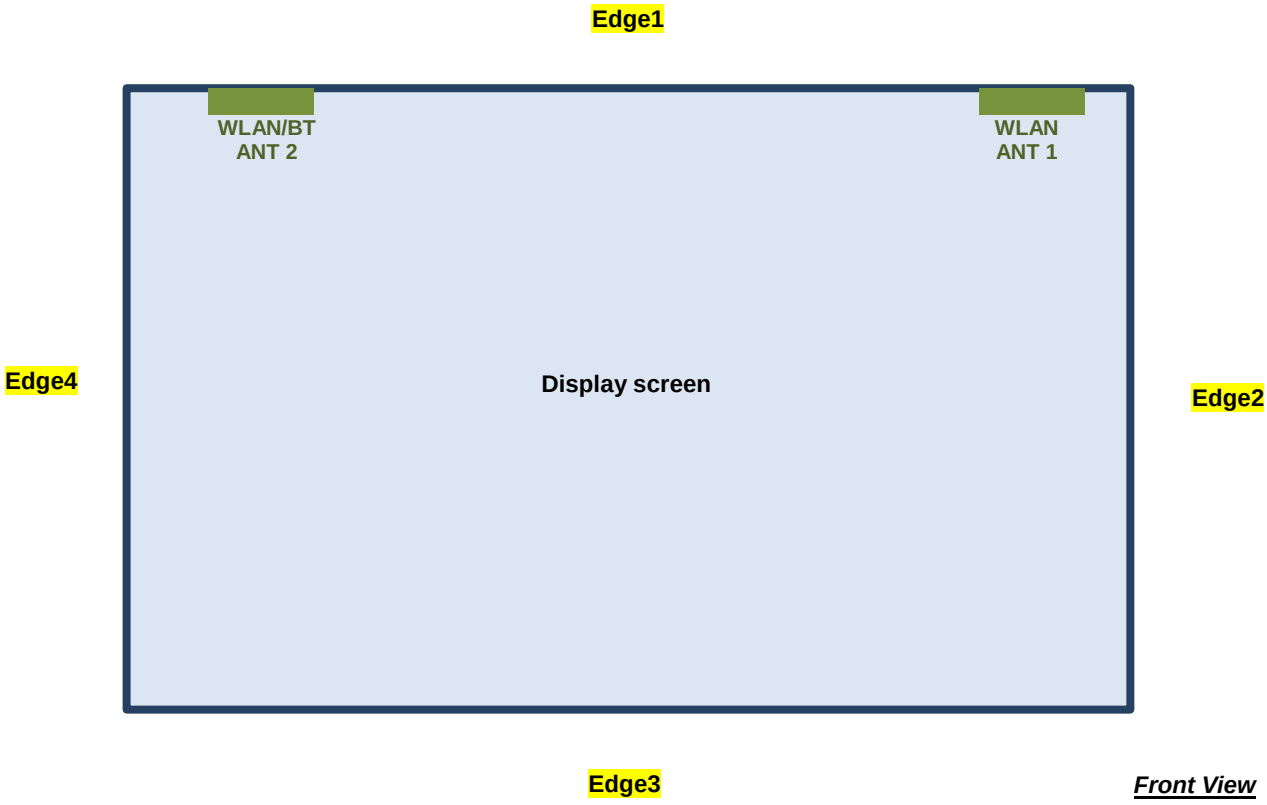
<Laptop Mode>



The separation distance for antenna to edge :

Antenna	To Bottom of Laptop (mm)
WLAN/BT Antenna 1	<5
WLAN Antenna	<5

<Tablet Mode>



Front View

The separation distance for antenna to edge :

Antenna	To Edge1 (mm)	To Edge2 (mm)	To Edge3 (mm)	To Edge4 (mm)
WLAN Antenna 1	<5	15	223	279
WLAN/BT Antenna 2	<5	230	223	61

<SAR test exclusion table>

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

Exposure Position	Wireless Interface	BT ANT 2	2.4GHz WLAN ANT 1	2.4GHz WLAN ANT 2	5GHz WLAN ANT 1	5GHz WLAN ANT 2
	Calculated Frequency	2480MHz	2462MHz	2462MHz	5825MHz	5825MHz
	Maximum power (dBm)	10.5	11.5	15.5	13	14
	Maximum rated power(mW)	11.0	14.0	35.0	20.0	25.0
Bottom Face	Separation distance(mm)	5.0	5.0	5.0	5.0	5.0
	exclusion threshold	3.5	4.4	11.0	9.7	12.1
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge 1	Separation distance(mm)	5.0	5.0	5.0	5.0	5.0
	exclusion threshold	3.5	4.4	11.0	9.7	12.1
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge 2	Separation distance(mm)	230.0	15.0	230.0	15.0	230.0
	exclusion threshold	1895.0	1.5	1896.0	3.2	1862.0
	Testing required?	**No**	**No**	**No**	**Yes**	**No**
Edge 3	Separation distance(mm)	223.0	223.0	223.0	223.0	223.0
	exclusion threshold	1825.0	1826.0	1826.0	1792.0	1792.0
	Testing required?	**No**	**No**	**No**	**No**	**No**
Edge 4	Separation distance(mm)	61.0	279.0	61.0	279.0	61.0
	exclusion threshold	205.0	2386.0	206.0	2352.0	172.0
	Testing required?	**No**	**No**	**No**	**No**	**No**

Exposure Position	Wireless Interface	BT ANT 2	2.4GHz WLAN ANT 1	2.4GHz WLAN ANT 2	5GHz WLAN ANT 1	5GHz WLAN ANT 2
	Calculated Frequency	2480MHz	2462MHz	2462MHz	5825MHz	5825MHz
	Maximum power (dBm)	10.5	15.5	19	20.5	19
	Maximum rated power(mW)	11.0	35.0	79.0	112.0	79.0
Bottom of Laptop	Separation distance(mm)	5.0	5.0	5.0	5.0	5.0
	exclusion threshold	3.5	11.0	24.8	54.1	38.1
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

13. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. For WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
6. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio ≤ 0.04, no additional SAR measurements for MIMO.
7. During SAR testing the WLAN transmission was verified using a spectrum analyzer.
8. Since the same RF amplifier and antenna is used for WiFi / Bluetooth transmitter and the Bluetooth output power is least 2 dB below the output power of WiFi, therefore, for Bluetooth SAR testing is selected worst position from each exposure condition to be tested.

13.1 Body SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	SKU	Configure (Tablet / Laptop)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 1	6	2437	11.00	11.50	1.122	97.65	1.024	0.13	0.953	1.095
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 1	1	2412	11.00	11.50	1.122	97.65	1.024	0.05	0.866	0.995
01	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 1	11	2462	11.00	11.50	1.122	97.65	1.024	-0.1	0.968	1.112
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	SKU3	Tablet	Ant 1	6	2437	11.00	11.50	1.122	97.65	1.024	-0.12	0.626	0.719
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	11	2462	15.30	15.50	1.047	97.65	1.024	0.06	1.010	1.083
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	1	2412	15.20	15.50	1.072	97.65	1.024	-0.13	0.908	0.996
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	6	2437	15.20	15.50	1.072	97.65	1.024	0.05	0.980	1.075
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU1	Laptop	Ant 1	11	2462	15.30	15.50	1.047	97.65	1.024	0.01	0.647	0.694
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	11	2462	15.30	15.50	1.047	97.89	1.022	-0.1	1.020	1.092
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	1	2412	14.90	15.50	1.148	97.89	1.022	0.05	0.910	1.068
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	6	2437	14.90	15.50	1.148	97.89	1.022	-0.11	0.929	1.090
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	SKU3	Tablet	Ant 2	11	2462	15.30	15.50	1.047	97.89	1.022	0.05	0.358	0.383
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	11	2462	18.30	19.00	1.175	97.89	1.022	-0.1	0.458	0.550
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	11	2462	18.30	19.00	1.175	97.89	1.022	-0.13	0.909	1.091
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	1	2412	18.00	19.00	1.259	97.89	1.022	0.02	0.811	1.043
	WLAN2.4GHz	802.11b 1Mbps	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	6	2437	18.20	19.00	1.202	97.89	1.022	0.01	0.875	1.075
	WLAN5GHz	802.11ac-VHT160 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 1	50	5250	11.50	12.50	1.259	98.88	1.011	-0.1	0.891	1.134
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 1	58	5290	11.40	12.50	1.288	98.88	1.011	-0.12	0.813	1.059
	WLAN5GHz	802.11ac-VHT160 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 1	50	5250	11.50	12.50	1.259	98.88	1.011	0.05	0.720	0.916
	WLAN5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 1	58	5290	11.40	12.50	1.288	98.88	1.011	-0.06	0.664	0.865
	WLAN5GHz	802.11ac-VHT160 MCS0	Edge 2	0mm	SKU3	Tablet	Ant 1	50	5250	11.50	12.50	1.259	98.88	1.011	-0.12	0.047	0.060
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	54	5270	20.00	20.50	1.122	98.14	1.019	-0.08	0.967	1.106
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	62	5310	15.10	16.50	1.380	98.14	1.019	0.1	0.377	0.530
	WLAN5GHz	802.11a 6Mbps	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	52	5260	19.10	20.50	1.380	98.14	1.019	0.06	0.726	1.021
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 1	54	5270	20.00	20.50	1.122	98.14	1.019	0.14	0.847	0.968
	WLAN5GHz	802.11ac-VHT160 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	50	5250	13.00	13.50	1.122	98.76	1.013	0.07	0.922	1.048
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	58	5290	13.00	13.50	1.122	98.76	1.013	0.05	0.796	0.905
	WLAN5GHz	802.11ac-VHT160 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 2	50	5250	13.00	13.50	1.122	98.76	1.013	0.04	0.413	0.469
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	54	5270	18.50	19.00	1.122	98.88	1.011	0.13	0.573	0.650
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	62	5310	15.80	16.50	1.175	98.88	1.011	0.13	0.311	0.369
02	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	54	5270	18.50	19.00	1.122	98.88	1.011	-0.05	1.020	1.157
	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	62	5310	15.80	16.50	1.175	98.88	1.011	0.13	0.591	0.702
	WLAN5GHz	802.11a 6Mbps	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	52	5260	18.80	19.00	1.047	98.88	1.011	0.02	0.864	0.915

Plot No.	Band	Mode	Test Position	Gap (mm)	SKU	Configure (Tablet / Laptop)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5GHz	802.11ac-VHT160 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 1	114	5570	11.20	12.00	1.202	98.88	1.011	0.01	0.957	1.163
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 1	106	5530	11.40	12.00	1.148	98.88	1.011	-0.18	0.829	0.962
	WLAN5GHz	802.11ac-VHT160 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 1	114	5570	11.20	12.00	1.202	98.88	1.011	0.13	0.626	0.761
	WLAN5GHz	802.11ac-VHT160 MCS0	Edge 2	0mm	SKU3	Tablet	Ant 1	114	5570	11.20	12.00	1.202	98.88	1.011	0.05	0.059	0.072
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	138	5690	19.00	19.50	1.122	98.76	1.013	0.07	0.761	0.865
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	122	5610	18.60	19.50	1.230	98.76	1.013	-0.1	0.908	1.132
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	106	5530	17.30	18.00	1.175	98.76	1.013	0.13	0.620	0.738
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 1	122	5610	18.60	19.50	1.230	98.76	1.013	0.08	0.655	0.816
03	WLAN5GHz	802.11ac-VHT160 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	114	5570	12.70	13.50	1.202	98.76	1.013	-0.01	0.981	1.195
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	106	5530	12.60	13.50	1.230	98.76	1.013	-0.13	0.784	0.977
	WLAN5GHz	802.11ac-VHT160 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 2	114	5570	12.70	13.50	1.202	98.76	1.013	-0.18	0.612	0.745
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	138	5690	17.20	17.50	1.072	98.51	1.015	0.07	0.391	0.425
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	106	5530	16.70	17.50	1.202	98.51	1.015	0.13	0.481	0.587
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	122	5610	16.80	17.50	1.175	98.51	1.015	-0.15	0.501	0.597
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	122	5610	16.80	17.50	1.175	98.51	1.015	0.06	0.942	1.123
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	106	5530	16.70	17.50	1.202	98.51	1.015	0.09	0.902	1.101
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	138	5690	17.20	17.50	1.072	98.51	1.015	0.07	0.831	0.904
04	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 1	155	5775	12.10	13.00	1.230	98.76	1.013	-0.14	0.958	1.194
	WLAN5GHz	802.11ac-VHT40 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 1	151	5755	12.10	13.00	1.230	98.76	1.013	0.06	0.810	1.009
	WLAN5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 1	155	5775	12.10	13.00	1.230	98.76	1.013	0.06	0.713	0.889
	WLAN5GHz	802.11ac-VHT40 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 1	151	5755	12.10	13.00	1.230	98.76	1.013	0.06	0.597	0.744
	WLAN5GHz	802.11ac-VHT80 MCS0	Edge 2	0mm	SKU3	Tablet	Ant 1	155	5775	12.10	13.00	1.230	98.76	1.013	0.17	0.124	0.155
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	155	5775	18.70	19.50	1.202	98.76	1.013	0.1	0.916	1.116
	WLAN5GHz	802.11ac-VHT40 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 1	159	5795	19.10	19.50	1.096	98.76	1.013	-0.19	0.883	0.981
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 1	155	5775	18.70	19.50	1.202	98.76	1.013	-0.19	0.893	1.088
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	155	5775	13.30	14.00	1.175	98.51	1.015	0.1	0.968	1.154
	WLAN5GHz	802.11ac-HT40 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	151	5755	13.40	14.00	1.148	98.51	1.015	-0.06	0.785	0.915
	WLAN5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 2	155	5775	13.30	14.00	1.175	98.51	1.015	-0.03	0.766	0.913
	WLAN5GHz	802.11ac-HT40 MCS0	Edge 1	0mm	SKU3	Tablet	Ant 2	151	5755	13.40	14.00	1.148	98.51	1.015	-0.06	0.569	0.663
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	155	5775	17.60	18.00	1.096	98.51	1.015	0.02	0.651	0.725
	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	155	5775	17.60	18.00	1.096	98.51	1.015	0.04	0.974	1.084
	WLAN5GHz	802.11ac-HT40 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	151	5755	17.50	18.00	1.122	98.51	1.015	0.02	0.846	0.963

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	SKU	Configure (Tablet / Laptop)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
05	Bluetooth	1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	39	2441	10.46	10.50	1.009	77.13	1.080	-0.02	0.439	0.479
	Bluetooth	1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	0	2402	10.16	10.50	1.081	77.13	1.080	-0.02	0.398	0.465
	Bluetooth	1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	78	2480	10.36	10.50	1.033	77.13	1.080	0.05	0.415	0.463
	Bluetooth	1Mbps	Edge 1	0mm	SKU3	Tablet	Ant 2	39	2441	10.46	10.50	1.009	77.13	1.080	-0.03	0.156	0.170
	Bluetooth	1Mbps	Bottom of Laptop	0mm	SKU3	Laptop	Ant 2	39	2441	10.46	10.50	1.009	77.13	1.080	0.07	0.362	0.395
	Bluetooth	1Mbps	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	39	2441	10.46	10.50	1.009	77.13	1.080	0.07	0.295	0.322

13.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	SKU	Configure (Tablet / Laptop)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	11	2462	15.30	15.50	1.047	97.89	1.022	-0.1	1.020	-	1.092
2nd	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	SKU3	Tablet	Ant 2	11	2462	15.30	15.50	1.047	97.89	1.022	0.02	1.000	1.02	1.070
1st	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	54	5270	18.50	19.00	1.122	98.88	1.011	-0.05	1.020	-	1.157
2nd	WLAN5GHz	802.11n-HT40 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	54	5270	18.50	19.00	1.122	98.88	1.011	0.03	0.987	1.03	1.120
1st	WLAN5GHz	802.11ac-VHT160 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	114	5570	12.70	13.50	1.202	98.76	1.013	-0.01	0.981	-	1.195
2nd	WLAN5GHz	802.11ac-VHT160 MCS0	Bottom Face	0mm	SKU3	Tablet	Ant 2	114	5570	12.70	13.50	1.202	98.76	1.013	-0.05	0.975	1.01	1.187
1st	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	155	5775	17.60	18.00	1.096	98.51	1.015	0.04	0.974	-	1.084
2nd	WLAN5GHz	802.11ac-VHT80 MCS0	Bottom of Laptop	0mm	SKU1	Laptop	Ant 2	155	5775	17.60	18.00	1.096	98.51	1.015	-0.09	0.943	1.03	1.049

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

14. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WLAN2.4GHz ANT 1+ WLAN2.4GHz ANT 2	Yes
2.	Bluetooth ANT 1+ WLAN2.4GHz ANT 2	Yes
3.	WLAN5GHz ANT 1+ WLAN5GHz ANT 2	Yes
4.	Bluetooth ANT 1+ WLAN5GHz ANT 2	Yes
5.	WLAN5GHz ANT 1+ WLAN5GHz ANT 2 + Bluetooth ANT 1	Yes

General Note:

1. 2.4GHz WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
3. The Scaled SAR summation is calculated based on the same configuration and test position.
4. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 13.2.

14.1 Body Exposure Conditions

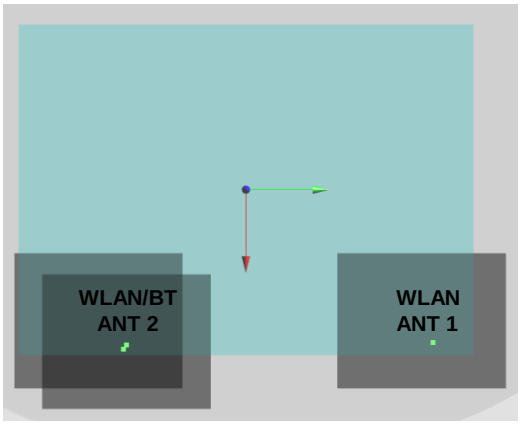
Exposure Position	1	2	3	4	5	1+2 Summed 1g SAR (W/kg)	3+4 Summed 1g SAR (W/kg)	1+5 Summed 1g SAR (W/kg)	3+5 Summed 1g SAR (W/kg)	3+4+5 Summed 1g SAR (W/kg)	1+2 SPLSR	1+2 Case No	3+4 SPLSR	3+4 Case No	3+5 SPLSR	3+5 Case No	3+4+5 SPLSR	3+4+5 Case No
	2.4GHz WLAN Ant 1	2.4GHz WLAN Ant 2	5GHz WLAN Ant 1	5GHz WLAN Ant 2	Bluetooth Ant 2													
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)													
Bottom Face at 0mm	1.112	1.092	1.194	1.195	0.479	2.204	2.389	1.591	1.673	2.868	0.02	Case 1	0.02	Case 2	0.01	Case 3	0.02	Case 4
Edge 1 at 0mm	0.719	0.383	0.916	0.913	0.170	1.102	1.829	0.889	1.086	1.999			0.01	Case 5			0.01	Case 6
Edge 2 at 0mm			0.155			0.000	0.155	0.000	0.155	0.155								
Bottom of Laptop at 0mm	1.083	1.091	1.132	1.157	0.395	2.174	2.289	1.478	1.527	2.684	0.01	Case 7	0.02	Case 8			0.02	Case 9

14.2 SPLSR Evaluation and Analysis

General Note:

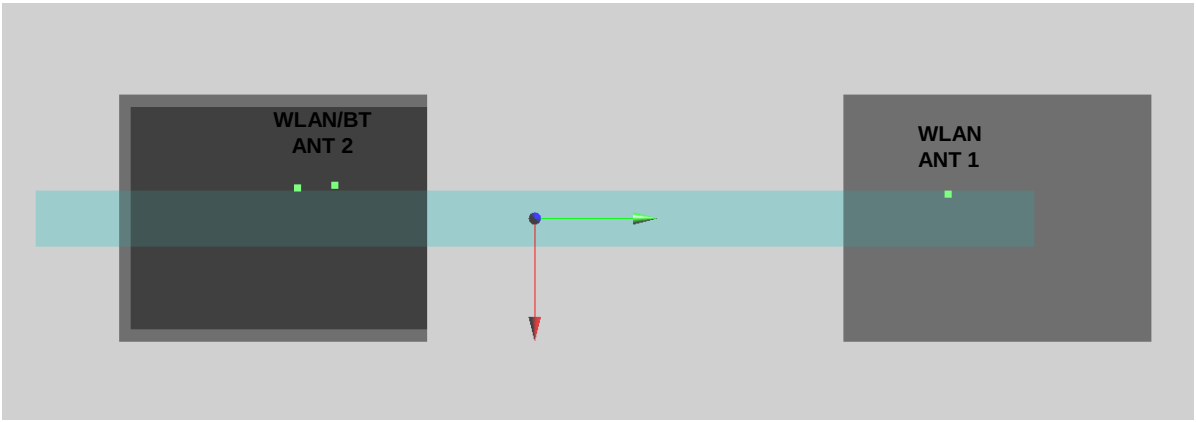
1. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
2. The detail hotspot point for each transmitter in each exposure condition are showing as below figure and the minimum 3D distance for each sum combination is used for SPLSR analysis.

Bottom Face



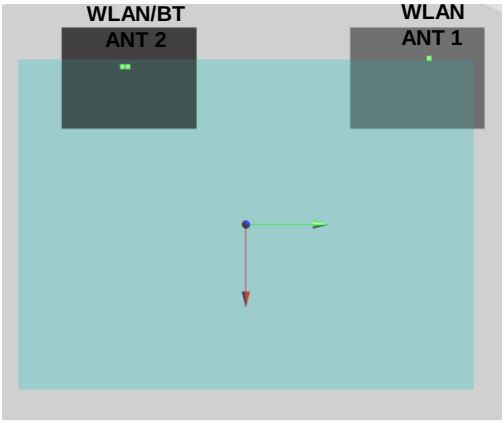
	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case 1	WLAN2.4GHz_Ant 1	Bottom Face	1.112	0	110.6	134.4	1.62	217.4	2.20	0.02	Not required
	WLAN2.4GHz_Ant 2		1.092	0	113.4	-83	1.51				
	Band	**Position**	**SAR (W/kg)**	**Gap**	**SAR peak location (mm)**			**3D distance (mm)**	**Summed SAR (W/kg)**	**SPLSR Results**	**Simultaneous SAR**
				(mm)	**X**	**Y**	**Z**				
Case 2	WLAN5GHz_Ant 1	Bottom Face	1.194	0	111.4	139	2.16	220.0	2.39	0.02	Not required
	WLAN5GHz_Ant 2		1.195	0	114	-81	2.04				
	Band	**Position**	**SAR (W/kg)**	**Gap**	**SAR peak location (cm)**			**3D distance (mm)**	**Summed SAR (W/kg)**	**SPLSR Results**	**Simultaneous SAR**
				(mm)	**X**	**Y**	**Z**				
Case 3	WLAN5GHz_Ant 1	Bottom Face	1.194	0	111.4	139	2.16	224.1	1.67	0.01	Not required
	Bluetooth_Ant 2		0.479	0	116.4	-85	1.35				
	Band	**Position**	**SAR (W/kg)**	**Gap**	**SAR peak location (cm)**			**3D distance (mm)**	**Summed SAR (W/kg)**	**SPLSR Results**	**Simultaneous SAR**
				(mm)	**X**	**Y**	**Z**				
Case 4	WLAN5GHz_Ant 1	Bottom Face	1.194	0	111.4	139	2.16	220.0	2.87	0.02	Not required
	WLAN5GHz_Ant 2+BT_Ant 2		1.674	0	114	-81	2.04				

Edge 1



	Band	Position	SAR (W/kg)	Gap	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case 5	WLAN5GHz_Ant 1	Edge 1	0.916	0	-12	131.6	0.5	198.2	1.83	0.01	Not required
	WLAN5GHz_Ant 2		0.913	0	-9.2	-66.6	1.08				
	Band	Position	SAR (W/kg)	Gap	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case 6	WLAN5GHz_Ant 1	Edge 1	0.916	0	-12	131.6	0.5	196.6	2.00	0.01	Not required
	WLAN5GHz_Ant 2+BT_Ant 2		1.083	0	-8.8	-65	1.1				

Bottom of Laptop



	Band	Position	SAR (W/kg)	Gap	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case 7	WLAN2.4GHz_Ant 1	Bottom of Laptop	1.083	0	-116.4	130.4	0.41	217.7	2.17	0.01	Not required
	WLAN2.4GHz_Ant 2		1.091	0	-111.4	-87.2	0.19				
	Band	Position	SAR (W/kg)	Gap	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case 8	WLAN5GHz_Ant 1	Bottom of Laptop	1.132	0	-115.2	134	0.06	218.2	2.29	0.02	Not required
	WLAN5GHz_Ant 2		1.157	0	-111	-84.2	-0.23				
	Band	Position	SAR (W/kg)	Gap	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case 9	WLAN5GHz_Ant 1	Bottom of Laptop	1.132	0	-115.2	134	0.06	218.2	2.68	0.02	Not required
	WLAN5GHz_Ant 2+BT_Ant 2		1.552	0	-111	-84.2	-0.23				

Test Engineer： Terry Chou Bob Cheng and York Lu

15. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, 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 Std 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. Therefore, the measurement uncertainty table is not required in this report.
Declaration of Conformity:
The test results with all measurement uncertainty excluded is presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

16. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[8] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[9] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.