FCC RADIO TEST REPORT

FCC ID	:	**I28-WYSBHVDXP**
Equipment	:	**WLAN/BTLE module**
Brand Name	:	**ZEBRA**
Model Name	:	**WYSBHVDXP**
Applicant	:	**Zebra Technologies Corporation** **3 Overlook Point, Lincolnshire, IL 60069, United States**
Manufacturer	:	**Zebra Technologies Corporation** **3 Overlook Point, Lincolnshire, IL 60069, United States**
Standard	:	**FCC Part 15 Subpart E §15.407**

The product was received on Feb. 11, 2022 and testing was performed from Mar. 03, 2022 to Mar. 16, 2022. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issue Date
FR0D2423-04B	01	Initial issue of report	Mar. 25, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.247(b)	Power Output Measurement	Pass	-
-	15.247(e)	Power Spectral Density	Not Required	-
-	15.247(d)	Conducted Band Edges	Not Required	-
		Conducted Spurious Emission	Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	6.48 dB under the limit at 5356.800 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note: This is a variant report which can be referred Product Equality Declaration. All the test cases were performed on original report which can be referred to Sporton Report Number FR0D2423D. Based on the original report, the test cases were verified.

Declaration of Conformity:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".
Comments and Explanations:
The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Wei Chen

Report Producer: Vivian Hsu

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	WLAN/BTLE module
Brand Name	ZEBRA
Model Name	WYSBHVDXP
FCC ID	I28-WYSBHVDXP
EUT supports Radios application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 WLAN 11ax HE20/HE40/HE80 Bluetooth BR/EDR/LE
HW Version	Revision G
SW Version	17.68.01.p94
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

Supported Unit Used in Test Configuration and System				
Printer	**Brand Name**	ZEBRA	**Model Name**	ZQ521
Battery	**Brand Name**	ZEBRA	**Part Number**	P1089503-003
AC Adapter	**Brand Name**	ZEBRA	**Model Name**	FSP025-DYAA3
Bluetooth Antenna 1	**Brand Name**	gigaAnt	**Model Name**	3030A5645-01
Bluetooth Antenna 2	**Brand Name**	TAIYO YUDEN	**Model Name**	AH 168M245001
Bluetooth Antenna 3	**Brand Name**	Johanson Technology	**Model Name**	2450AT07A0100
WLAN Antenna 1	**Brand Name**	Laird	**Model Name**	RD2458-5
WLAN Antenna 2	**Brand Name**	Pulse	**Model Name**	W3006
WLAN Antenna 3	**Brand Name**	Auden	**Model Name**	220370-09
WLAN Antenna 4	**Brand Name**	Auden	**Model Name**	B91882-30

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz
Maximum Output Power to Antenna	**<5180 MHz ~ 5240 MHz>** **MIMO <Ant. 1+2>** 802.11n HT20: 12.68 dBm / 0.0186 W 802.11n HT40: 11.86 dBm / 0.0154 W 802.11ac VHT20: 12.58 dBm / 0.0181 W 802.11ac VHT40: 11.76 dBm / 0.0150 W 802.11ac VHT80: 6.86 dBm / 0.0049 W 802.11ax HE20: 12.78 dBm / 0.0190 W 802.11ax HE40: 11.96 dBm / 0.0157 W 802.11ax HE80: 6.96 dBm / 0.0050 W **<5260 MHz ~ 5320 MHz>** **MIMO <Ant. 1+2>** 802.11n HT20: 12.56 dBm / 0.0180 W 802.11n HT40: 11.81 dBm / 0.0152 W 802.11ac VHT20: 12.46 dBm / 0.0176 W 802.11ac VHT40: 11.71 dBm / 0.0148 W 802.11ac VHT80: 7.16 dBm / 0.0052 W 802.11ax HE20: 12.66 dBm / 0.0185 W 802.11ax HE40: 11.91 dBm / 0.0155 W 802.11ax HE80: 7.26 dBm / 0.0053 W **<5500 MHz ~ 5720 MHz>** **MIMO <Ant. 1+2>** 802.11n HT20: 12.86 dBm / 0.0193 W 802.11n HT40: 11.56 dBm / 0.0143 W 802.11ac VHT20: 12.76 dBm / 0.0189 W 802.11ac VHT40: 11.46 dBm / 0.0140 W 802.11ac VHT80: 7.60 dBm / 0.0057 W 802.11ax HE20: 12.96 dBm / 0.0198 W 802.11ax HE40: 11.66 dBm / 0.0147 W 802.11ax HE80: 7.70 dBm / 0.0059 W

Product Specification is subject to this standard	
Antenna Type / Gain	**<5180 MHz ~ 5240 MHz>** **<RD2458-5>:** <Ant. 1>: Dipole Antenna with gain 5.0 dBi <Ant. 2>: Dipole Antenna with gain 5.0 dBi **<W3006>:** <Ant. 1>: Chip Antenna with gain 4.2 dBi <Ant. 2>: Chip Antenna with gain 4.2 dBi **<220370-09>** <Ant. 1>: Mylar Antenna with gain 2.18 dBi <Ant. 2>: Mylar Antenna with gain 2.18 dBi **<B91882-30>** <Ant. 1>: Mylar Antenna with gain 3.4 dBi <Ant. 2>: Mylar Antenna with gain 3.4 dBi **<5260 MHz ~ 5320 MHz>** **<RD2458-5>:** <Ant. 1>: Dipole Antenna with gain 5.0 dBi <Ant. 2>: Dipole Antenna with gain 5.0 dBi **<W3006>:** <Ant. 1>: Chip Antenna with gain 4.2 dBi <Ant. 2>: Chip Antenna with gain 4.2 dBi **<220370-09>** <Ant. 1>: Mylar Antenna with gain 2.71 dBi <Ant. 2>: Mylar Antenna with gain 2.71 dBi **<B91882-30>** <Ant. 1>: Mylar Antenna with gain 3.3 dBi <Ant. 2>: Mylar Antenna with gain 3.3 dBi **<5500 MHz ~ 5720 MHz>** **<RD2458-5>:** <Ant. 1>: Dipole Antenna with gain 5.0 dBi <Ant. 2>: Dipole Antenna with gain 5.0 dBi **<W3006>:** <Ant. 1>: Chip Antenna with gain 4.2 dBi <Ant. 2>: Chip Antenna with gain 4.2 dBi **<220370-09>** <Ant. 1>: Mylar Antenna with gain 3.19 dBi <Ant. 2>: Mylar Antenna with gain 3.19 dBi **<B91882-30>** <Ant. 1>: Mylar Antenna with gain 4.4 dBi <Ant. 2>: Mylar Antenna with gain 4.4 dBi
Type of Modulation	802.11a/n : OFDM (BPSK/QPSK/16QAM/64QAM) 802.11ac : OFDM (BPSK/QPSK/16QAM/64QAM/256QAM) 802.11ax : OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM/ 1024QAM)
Antenna Function Description	

	Ant. 1	Ant. 2
802.11 n/ac/ax MIMO	V	V

Remark:

1. MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.
2. The above EUT's information is declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	TH05-HY, 03CH15-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW3786

1.5 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in two antenna polarization (Horizontal and Vertical), and adjusting the measurement antenna polarization, following C63.10 exploratory test procedures and find Vertical as worst cases.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42#	5210		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5250-5350 MHz Band 2 (U-NII-2A)	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58#	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5470-5725 MHz Band 3 (U-NII-2C)	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106#	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700

Frequency Band	Channel	Freq. (MHz)
5150-5350 MHz	50@	5250
5470-5725 MHz	114@	5570

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
TDWR Channel	118*	5590	124	5620
	120	5600	126*	5630
	122#	5610	128	5640

Note:

1. The above Frequency and Channel with "*" are 802.11n HT40 and 802.11ac VHT40 and 802.11ax HE40.
2. The above Frequency and Channel with "#" are 802.11ac VHT80 and 802.11ax HE80.

2.2 Test Mode

The final test modes consider the modulation and the worst data rates as shown in the table below.

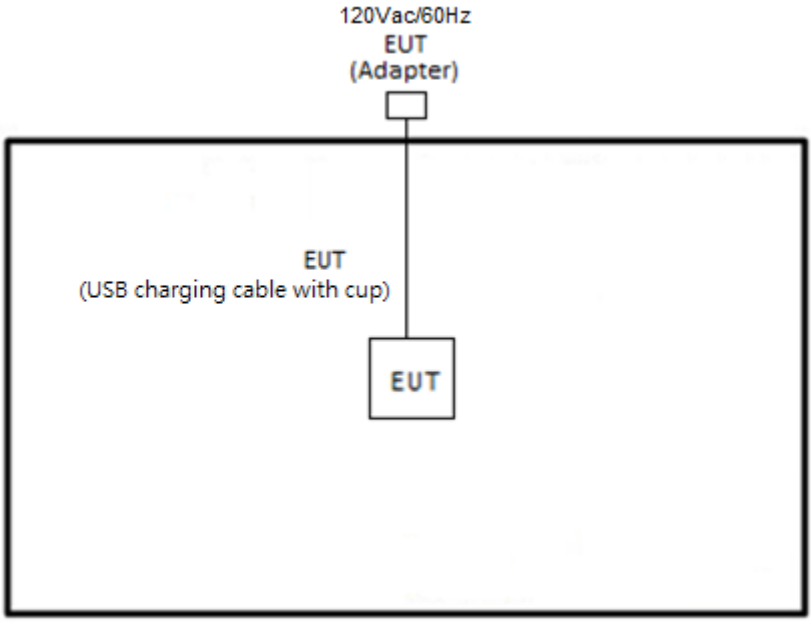
MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11ax HE40	802.11ax HE40	802.11ac VHT80
L	Low	38	-	106
M	Middle	-	-	
H	High	-	62	

Remark: For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

The RF test items, utility “Toolbox1.84” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For the 5.15–5.25 GHz bands:

■ For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For the 5.25–5.725 GHz bands:

■ The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

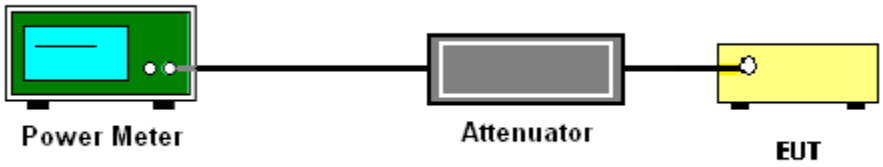
3.1.3 Test Procedures

The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM-G (Measurement using a gated RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter.
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Test Engineer :	Hank Hsu	Temperature :	21~25℃
		Relative Humidity :	51~54%

Band I MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
HT20	MCS0	2	36	5180	9.40	9.30	12.36	24.00		5.00		Pass
HT20	MCS0	2	44	5220	9.50	9.30	12.41	24.00		5.00		Pass
HT20	MCS0	2	48	5240	10.10	9.20	**12.68**	24.00		5.00		Pass
HT40	MCS0	2	38	5190	7.40	7.40	10.41	24.00		5.00		Pass
HT40	MCS0	2	46	5230	9.00	8.70	11.86	24.00		5.00		Pass
VHT20	MCS0	2	36	5180	9.30	9.20	12.26	24.00		5.00		Pass
VHT20	MCS0	2	44	5220	9.40	9.20	12.31	24.00		5.00		Pass
VHT20	MCS0	2	48	5240	10.00	9.10	12.58	24.00		5.00		Pass
VHT40	MCS0	2	38	5190	7.30	7.30	10.31	24.00		5.00		Pass
VHT40	MCS0	2	46	5230	8.90	8.60	11.76	24.00		5.00		Pass
VHT80	MCS0	2	42	5210	3.90	3.80	6.86	24.00		5.00		Pass

Band I MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
						Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
HE20	MCS0	2	36	5180	Full	9.50	9.40	12.46	24.00		5.00		Pass
HE20	MCS0	2	44	5220	Full	9.60	9.40	12.51	24.00		5.00		Pass
HE20	MCS0	2	48	5240	Full	10.20	9.30	**12.78**	24.00		5.00		Pass
HE40	MCS0	2	38	5190	Full	7.50	7.50	10.51	24.00		5.00		Pass
HE40	MCS0	2	46	5230	Full	9.10	8.80	11.96	24.00		5.00		Pass
HE80	MCS0	2	42	5210	Full	4.00	3.90	6.96	24.00		5.00		Pass

Band II MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
HT20	MCS0	2	52	5260	9.60	9.10	12.37	23.98		5.00		26.99	Pass
HT20	MCS0	2	60	5300	9.70	9.40	**12.56**	23.98		5.00		26.99	Pass
HT20	MCS0	2	64	5320	9.50	8.90	12.22	23.98		5.00		26.99	Pass
HT40	MCS0	2	54	5270	9.00	8.60	11.81	23.98		5.00		26.99	Pass
HT40	MCS0	2	62	5310	7.60	7.10	10.37	23.98		5.00		26.99	Pass
VHT20	MCS0	2	52	5260	9.50	9.00	12.27	23.98		5.00		26.99	Pass
VHT20	MCS0	2	60	5300	9.60	9.30	12.46	23.98		5.00		26.99	Pass
VHT20	MCS0	2	64	5320	9.40	8.80	12.12	23.98		5.00		26.99	Pass
VHT40	MCS0	2	54	5270	8.90	8.50	11.71	23.98		5.00		26.99	Pass
VHT40	MCS0	2	62	5310	7.50	7.00	10.27	23.98		5.00		26.99	Pass
VHT80	MCS0	2	58	5290	4.30	4.00	7.16	23.98		5.00		26.99	Pass

Band II MIMO														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
						Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
HE20	MCS0	2	52	5260	Full	9.70	9.20	12.47	23.98		5.00		26.99	Pass
HE20	MCS0	2	60	5300	Full	9.80	9.50	**12.66**	23.98		5.00		26.99	Pass
HE20	MCS0	2	64	5320	Full	9.60	9.00	12.32	23.98		5.00		26.99	Pass
HE40	MCS0	2	54	5270	Full	9.10	8.70	11.91	23.98		5.00		26.99	Pass
HE40	MCS0	2	62	5310	Full	7.70	7.20	10.47	23.98		5.00		26.99	Pass
HE80	MCS0	2	58	5290	Full	4.40	4.10	7.26	23.98		5.00		26.99	Pass

Band III MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
HT20	MCS0	2	100	5500	9.20	9.00	12.11	23.98		5.00		26.99	Pass
HT20	MCS0	2	116	5580	10.00	9.70	**12.86**	23.98		5.00		26.99	Pass
HT20	MCS0	2	140	5700	9.70	9.50	12.61	23.98		5.00		26.99	Pass
HT40	MCS0	2	102	5510	8.30	8.00	11.16	23.98		5.00		26.99	Pass
HT40	MCS0	2	110	5550	8.70	8.40	11.56	23.98		5.00		26.99	Pass
HT40	MCS0	2	134	5670	8.30	8.30	11.31	23.98		5.00		26.99	Pass
VHT20	MCS0	2	100	5500	9.10	8.90	12.01	23.98		5.00		26.99	Pass
VHT20	MCS0	2	116	5580	9.90	9.60	12.76	23.98		5.00		26.99	Pass
VHT20	MCS0	2	140	5700	9.60	9.40	12.51	23.98		5.00		26.99	Pass
VHT40	MCS0	2	102	5510	8.20	7.90	11.06	23.98		5.00		26.99	Pass
VHT40	MCS0	2	110	5550	8.60	8.30	11.46	23.98		5.00		26.99	Pass
VHT40	MCS0	2	134	5670	8.20	8.20	11.21	23.98		5.00		26.99	Pass
VHT80	MCS0	2	106	5530	4.50	3.60	7.08	23.98		5.00		26.99	Pass
VHT80	MCS0	2	122	5610	5.10	4.00	7.60	23.98		5.00		26.99	Pass

Band III straddle channel MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
HT20	MCS0	2	144	5720	9.30	9.00	12.16	23.98		5.00		26.99	Pass
HT40	MCS0	2	142	5710	8.60	8.30	11.46	23.98		5.00		26.99	Pass
VHT20	MCS0	2	144	5720	9.20	8.90	12.06	23.98		5.00		26.99	Pass
VHT40	MCS0	2	142	5710	8.50	8.20	11.36	23.98		5.00		26.99	Pass
VHT80	MCS0	2	138	5690	3.00	3.00	6.01	23.98		5.00		26.99	Pass

Band III MIMO														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
						Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
HE20	MCS0	2	100	5500	Full	9.30	9.10	12.21	23.98		5.00		26.99	Pass
HE20	MCS0	2	116	5580	Full	10.10	9.80	**12.96**	23.98		5.00		26.99	Pass
HE20	MCS0	2	140	5700	Full	9.80	9.60	12.71	23.98		5.00		26.99	Pass
HE40	MCS0	2	102	5510	Full	8.40	8.10	11.26	23.98		5.00		26.99	Pass
HE40	MCS0	2	110	5550	Full	8.80	8.50	11.66	23.98		5.00		26.99	Pass
HE40	MCS0	2	134	5670	Full	8.40	8.40	11.41	23.98		5.00		26.99	Pass
HE80	MCS0	2	106	5530	Full	4.60	3.70	7.18	23.98		5.00		26.99	Pass
HE80	MCS0	2	122	5610	Full	5.20	4.10	7.70	23.98		5.00		26.99	Pass

Band III straddle channel MIMO														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
						Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
HE20	MCS0	2	144	5720	Full	9.40	9.10	12.26	23.98		5.00		26.99	Pass
HE40	MCS0	2	142	5710	Full	8.70	8.40	11.56	23.98		5.00		26.99	Pass
HE80	MCS0	2	138	5690	Full	3.10	3.10	6.11	23.98		5.00		26.99	Pass

3.2 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.2.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) Unwanted spurious emissions falls in restricted bands shall comply with the general field strength limits as below table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

Note: The following formula is used to convert the EIRP to field strength.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

(3) KDB789033 D02 v02r01 G)2)c)

(i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of −27 dBm/MHz.

(ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are based on the use of a peak detector.

3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

(1) Procedure for Unwanted Emissions Measurements Below 1000 MHz

- RBW = 120 kHz
- VBW = 300 kHz
- Detector = Peak
- Trace mode = max hold

(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

- RBW = 1 MHz
- VBW ≥ 3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

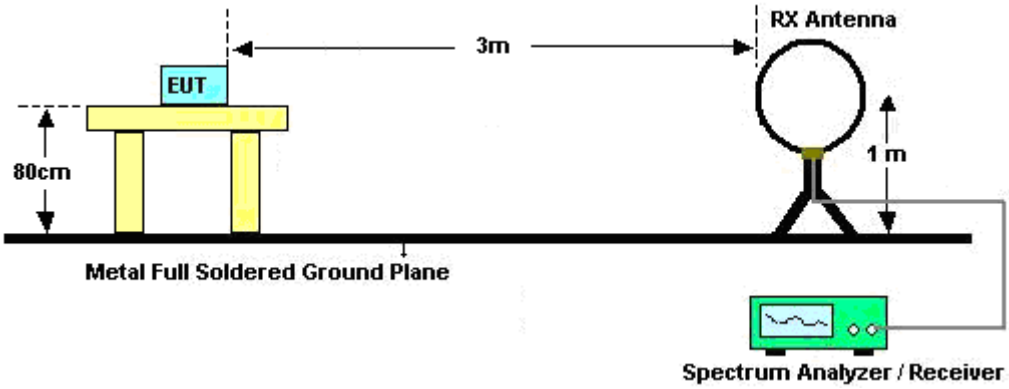
(3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz

- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

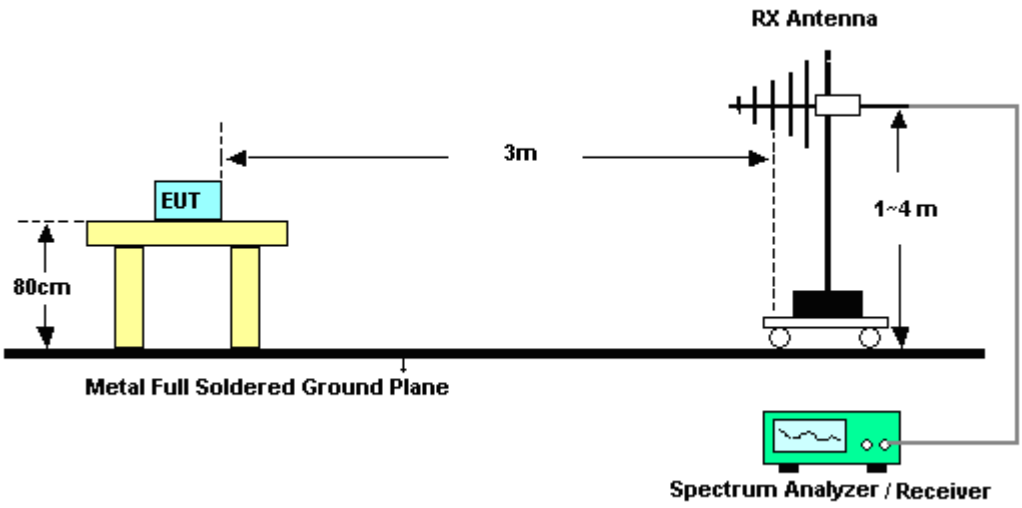
2. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT is set 3 meters away from the receiving antenna which is mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT is arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".

3.2.4 Test Setup

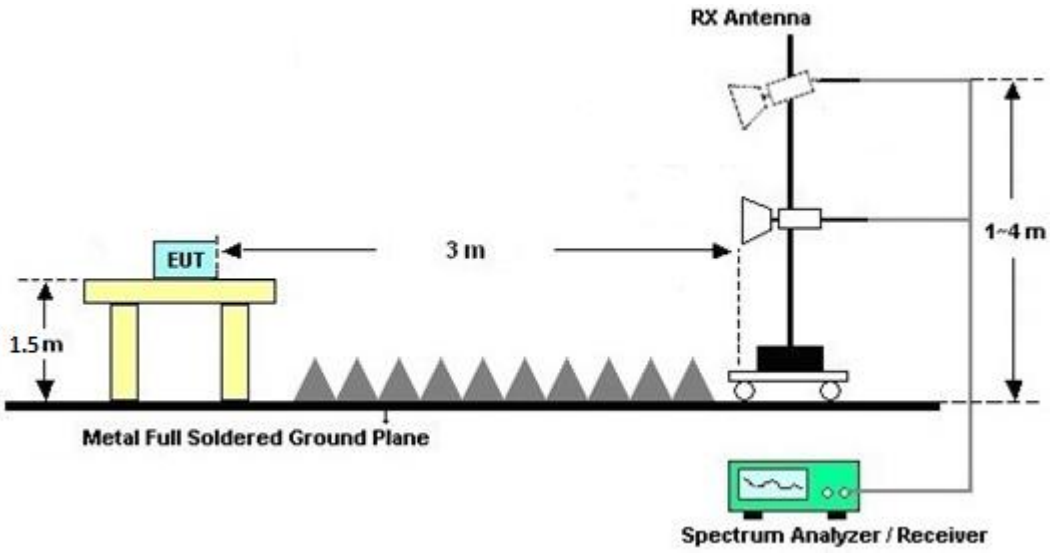
For radiated emissions below 30MHz



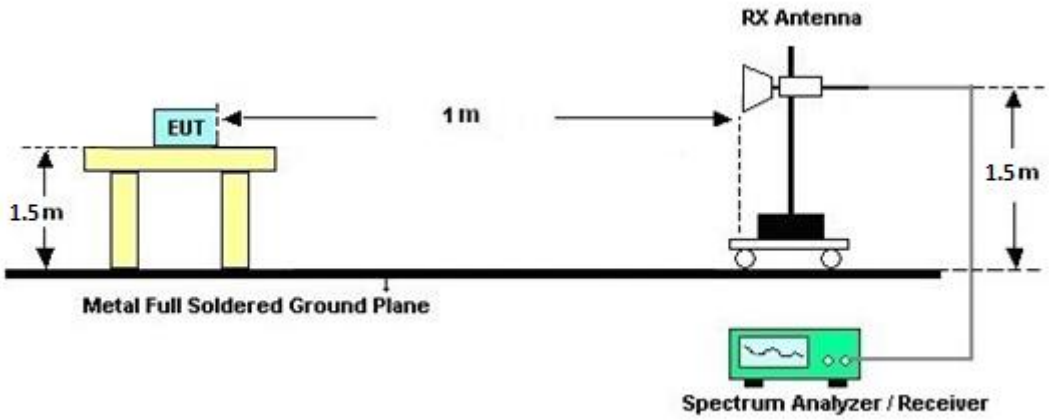
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site **v01r01**, and the result came out very similar.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.2.7 Duty Cycle

Please refer to Appendix C.

3.2.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix A and B.

3.3 Antenna Requirements

3.3.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 09, 2021	Mar. 15, 2022~ Mar. 16, 2022	Sep. 08, 2022	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	41912 & 05	30MHz~1GHz	Feb. 06, 2022	Mar. 15, 2022~ Mar. 16, 2022	Feb. 05, 2023	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 27, 2021	Mar. 15, 2022~ Mar. 16, 2022	Dec. 26, 2022	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02038	1GHz~18GHz	Aug. 04, 2021	Mar. 15, 2022~ Mar. 16, 2022	Aug. 03, 2022	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Nov. 30, 2021	Mar. 15, 2022~ Mar. 16, 2022	Nov. 29, 2022	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055006	1GHz~18GHz	May 06, 2021	Mar. 15, 2022~ Mar. 16, 2022	May 05, 2022	Radiation (03CH15-HY)
Preamplifier	EM Electronics	EM01G18G	060803	1GHz-18GHz	Dec. 16, 2021	Mar. 15, 2022~ Mar. 16, 2022	Dec. 15, 2022	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	060801	18-40GHz	Jun. 22, 2021	Mar. 15, 2022~ Mar. 16, 2022	Jun. 21, 2022	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Oct. 21, 2021	Mar. 15, 2022~ Mar. 16, 2022	Oct. 20, 2022	Radiation (03CH15-HY
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	May 07, 2021	Mar. 15, 2022~ Mar. 16, 2022	May 06, 2022	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Mar. 15, 2022~ Mar. 16, 2022	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Mar. 15, 2022~ Mar. 16, 2022	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24(k5)	RK-000451	N/A	N/A	Mar. 15, 2022~ Mar. 16, 2022	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY36980/4, MY9838/4PE, 508405/2E	30MHz~18G	Nov. 15, 2021	Mar. 15, 2022~ Mar. 16, 2022	Nov. 14, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804011/2,804012/2	30MHz-40GHz	Jan. 04, 2022	Mar. 15, 2022~ Mar. 16, 2022	Jan. 03, 2023	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 10, 2022	Mar. 15, 2022~ Mar. 16, 2022	Mar. 09, 2023	Radiation (03CH15-HY)
Filter	Wainwright	WLJ4-1000-1530-6000-40ST	SN4	1.53GHz Low Pass Filter	Jul. 02, 2021	Mar. 15, 2022~ Mar. 16, 2022	Jul. 01, 2022	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN6	6.75GHz High Pass Filter	Jun. 30, 2021	Mar. 15, 2022~ Mar. 16, 2022	Jun. 29, 2022	Radiation (03CH15-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Mar. 03, 2022~ Mar. 08, 2022	Nov. 15, 2022	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO12 (NO:113)	10MHz~6GHz	Dec. 16, 2021	Mar. 03, 2022~ Mar. 08, 2022	Dec. 15, 2022	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	932001	N/A	Sep. 30, 2021	Mar. 03, 2022~ Mar. 08, 2022	Sep. 29, 2022	Conducted (TH05-HY)
Power Meter	Anritsu	MA2411B	846202	300MHz~40GHz	Sep. 30, 2021	Mar. 03, 2022~ Mar. 08, 2022	Sep. 29, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Mar. 03, 2022~ Mar. 08, 2022	Aug. 29, 2022	Conducted (TH05-HY)
Switch Control Manframe	E-IUSTRUMENT	ETF-1405-0	EC1900067 (BOX7)	N/A	Aug. 12, 2021	Mar. 03, 2022~ Mar. 08, 2022	Aug. 11, 2022	Conducted (TH05-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.8 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.3 dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.6 dB**

Appendix A. Radiated Spurious Emission

Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	Temperature :	22~25°C
		Relative Humidity :	40~55%

Band 1 - 5150~5250MHz

WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ax HE40 Full CH 38 5190MHz		5148.2	46.81	-27.19	74	40.79	32.91	10	36.89	100	265	P	H
		5149.76	39.65	-14.35	54	33.64	32.9	10	36.89	100	265	A	H
	*	5190	92.41	-	-	86.41	32.82	10.04	36.86	100	265	P	H
	*	5190	84.36	-	-	78.36	32.82	10.04	36.86	100	265	A	H
		5420.52	46.13	-27.87	74	39.95	32.7	10.23	36.75	100	265	P	H
		5395.04	38.7	-15.3	54	32.55	32.7	10.21	36.76	100	265	A	H
		5148.72	55.97	-18.03	74	49.95	32.91	10	36.89	246	9	P	V
		5149.76	46.15	-7.85	54	40.14	32.9	10	36.89	246	9	A	V
	*	5190	103.33	-	-	97.33	32.82	10.04	36.86	246	9	P	V
	*	5190	94.23	-	-	88.23	32.82	10.04	36.86	246	9	A	V
		5451.04	47.05	-26.95	74	40.83	32.7	10.25	36.73	246	9	P	V
		5351.92	39.61	-14.39	54	33.52	32.7	10.17	36.78	246	9	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ax HE40 Full (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		10380	46.31	-21.89	68.2	54.09	38.48	14.56	60.82	-	-	P	H
		15570	46.16	-27.84	74	53.31	38.06	17.03	62.24	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
802.11ax													H
HE40 Full													H
CH 38		10380	45.27	-22.93	68.2	53.05	38.48	14.56	60.82	-	-	P	V
5190MHz		15570	46.91	-27.09	74	54.06	38.06	17.03	62.24	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Band 2 - 5250~5350MHz

WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 Full CH 62 5310MHz		5090.44	46.41	-27.59	74	40.35	33.04	9.93	36.91	193	81	P	H
		5111.86	38.74	-15.26	54	32.63	33.05	9.96	36.9	193	81	A	H
	*	5310	92.3	-	-	86.11	32.86	10.14	36.81	193	81	P	H
	*	5310	83.55	-	-	77.36	32.86	10.14	36.81	193	81	A	H
		5353.2	47.74	-26.26	74	41.65	32.7	10.17	36.78	193	81	P	H
		5352.24	38.9	-15.1	54	32.81	32.7	10.17	36.78	193	81	A	H
		5120.02	46.46	-27.54	74	40.37	33.02	9.97	36.9	241	358	P	V
		5120.02	40.73	-13.27	54	34.64	33.02	9.97	36.9	241	358	A	V
	*	5310	104.19	-	-	98	32.86	10.14	36.81	241	358	P	V
	*	5310	97.11	-	-	90.92	32.86	10.14	36.81	241	358	A	V
		5352.48	57.34	-16.66	74	51.25	32.7	10.17	36.78	241	358	P	V
		5356.8	47.52	-6.48	54	41.42	32.7	10.18	36.78	241	358	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 2 5250~5350MHz

WIFI 802.11ax HE40 Full (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		10620	45.67	-28.33	74	53.1	38.8	14.68	60.91	-	-	P	H
		15930	44.76	-29.24	74	50.79	37.63	17.22	60.88	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
802.11ax													H
HE40 Full													H
CH 62		10620	45.73	-28.27	74	53.16	38.8	14.68	60.91	-	-	P	V
5310MHz		15930	45.38	-28.62	74	51.41	37.63	17.22	60.88	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Band 3 - 5470~5725MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 106 5530MHz		5384.56	46.27	-27.73	74	40.14	32.7	10.2	36.77	191	79	P	H
		5470	45.38	-22.82	68.2	39.09	32.74	10.27	36.72	191	79	P	H
		5428	39	-15	54	32.82	32.7	10.23	36.75	191	79	A	H
	*	5530	84.51	-	-	78.12	32.8	10.32	36.73	191	79	P	H
	*	5530	77.14	-	-	70.75	32.8	10.32	36.73	191	79	A	H
		5753.975	46.53	-21.67	68.2	39.45	33.42	10.55	36.89	191	79	P	H
		5446	48.14	-25.86	74	41.93	32.7	10.25	36.74	238	359	P	V
		5469.52	49.2	-19	68.2	42.92	32.74	10.27	36.73	238	359	P	V
		5459.44	41.86	-12.14	54	35.61	32.72	10.26	36.73	238	359	A	V
	*	5530	97.08	-	-	90.69	32.8	10.32	36.73	238	359	P	V
	*	5530	89.92	-	-	83.53	32.8	10.32	36.73	238	359	A	V
		5740.43	45.73	-22.47	68.2	38.74	33.34	10.53	36.88	238	359	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 5470~5725MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		11060	47.9	-26.1	74	55.25	38.6	14.91	60.86	-	-	P	H
		16590	47.72	-20.48	68.2	50.23	38.33	17.75	58.59	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
802.11ac													H
VHT80													H
CH 106		11060	46.95	-27.05	74	54.3	38.6	14.91	60.86	-	-	P	V
5530MHz		16590	47.04	-21.16	68.2	49.55	38.33	17.75	58.59	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission below 1GHz

WIFI 802.11ax HE40 Full (LF @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 Full LF		72.68	23.9	-16.1	40	42.74	12.5	1.15	32.49	-	-	P	H
		103.72	29.04	-14.46	43.5	43.85	16.32	1.35	32.48	-	-	P	H
		197.81	33.7	-9.8	43.5	49.54	14.73	1.93	32.5	-	-	P	H
		286.08	36.24	-9.76	46	47.44	18.88	2.33	32.41	100	303	Q	H
		480.08	38.73	-7.27	46	44.69	23.55	2.93	32.44	-	-	P	H
		593.57	37.88	-8.12	46	41.54	25.51	3.34	32.51	-	-	P	H
													H
													H
													H
													H
													H
													H
		40.67	32.61	-7.39	40	45.36	19.01	0.78	32.54	-	-	P	V
		103.72	27.41	-16.09	43.5	42.22	16.32	1.35	32.48	-	-	P	V
		260.86	34.04	-11.96	46	44.42	19.8	2.26	32.44	-	-	P	V
		382.11	29.37	-16.63	46	38.21	21.01	2.62	32.47	-	-	P	V
		498.51	30.33	-15.67	46	35.96	23.82	3.01	32.46	-	-	P	V
		593.57	35.04	-10.96	46	38.7	25.51	3.34	32.51	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5150MHz		5150	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		5150	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 5150MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 5150MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix B. Radiated Spurious Emission

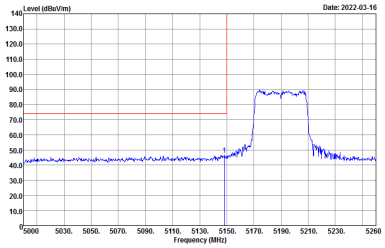
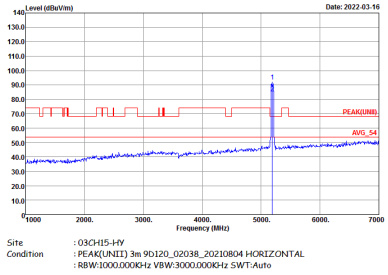
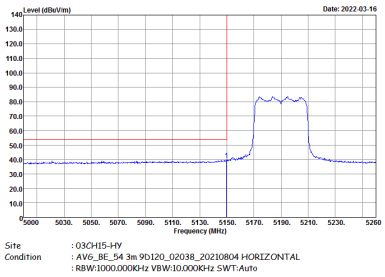
Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	**Temperature :**	22~25°C
		Relative Humidity :	40~55%

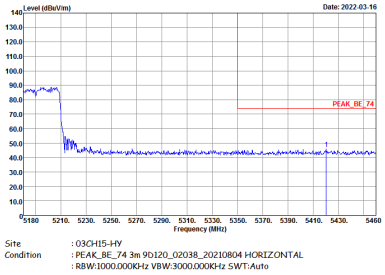
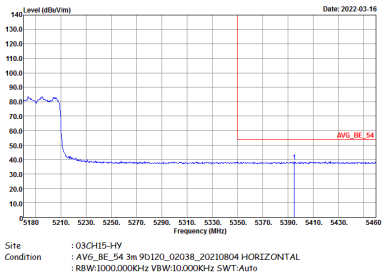
Note symbol

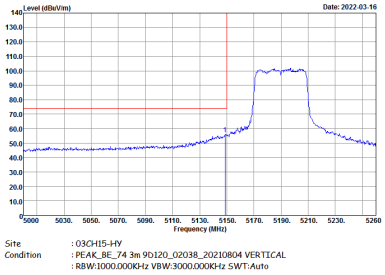
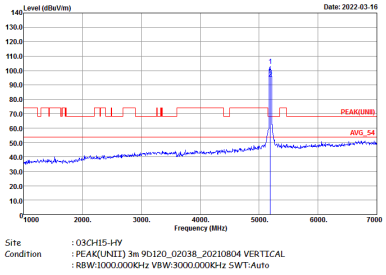
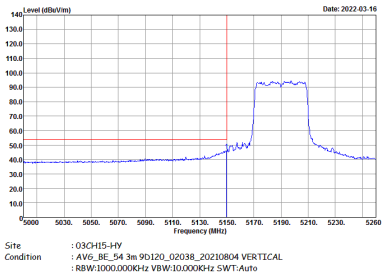
-L	**Low channel location**
-R	**High channel location**

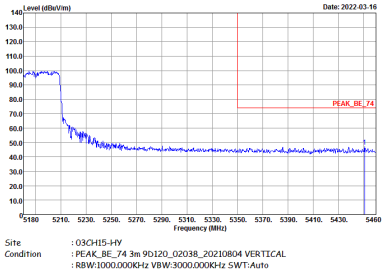
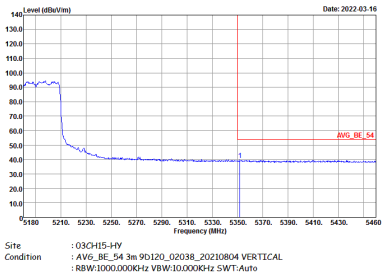
Band 1 - 5150~5250MHz

WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		Left blank

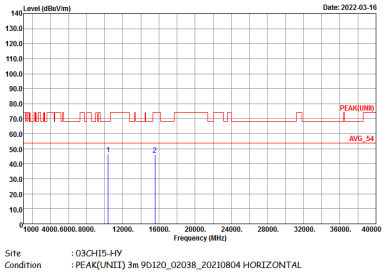
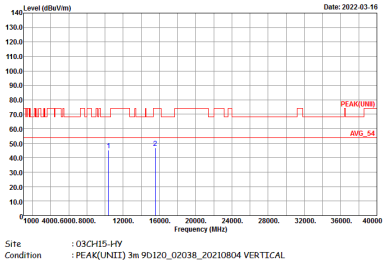
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

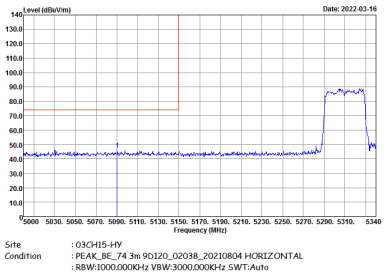
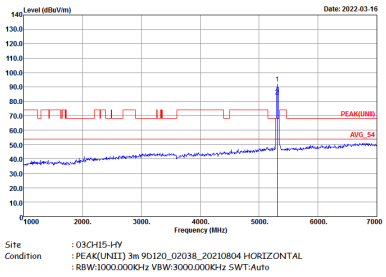
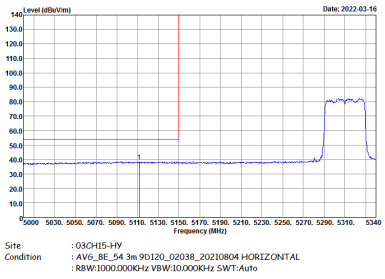
Band 1 - 5150~5250MHz

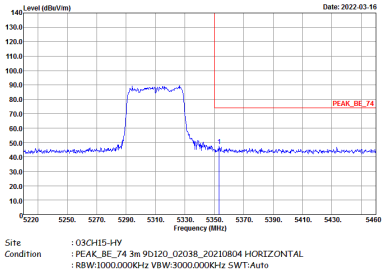
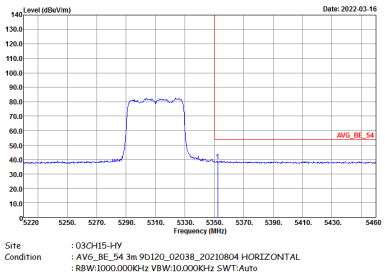
WIFI 802.11ax HE40 Full (Harmonic @ 3m)

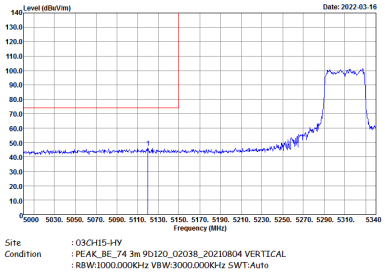
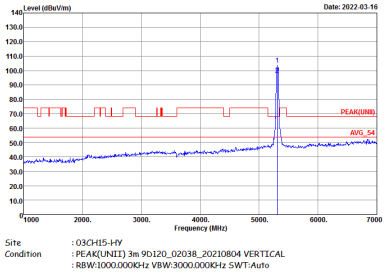
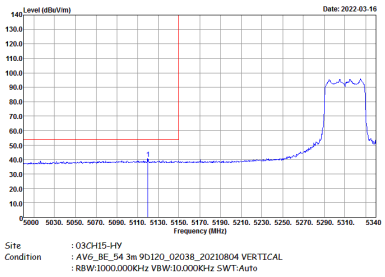
WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz	
1+2	Horizontal	Vertical
Peak Avg.		

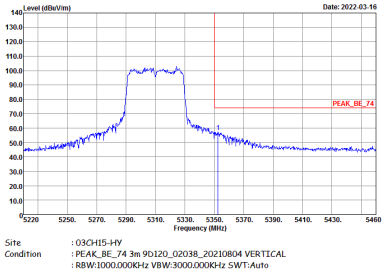
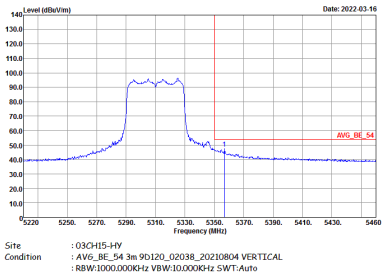
Band 2 - 5250~5350MHz

WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH62 5310 - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		Left blank

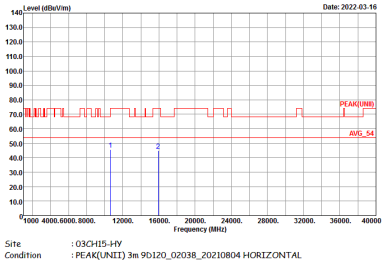
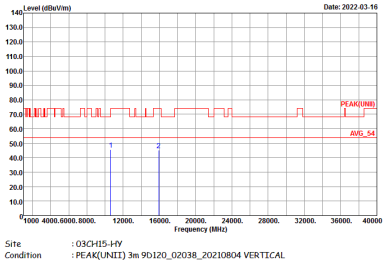
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH62 5310 - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH62 5310 - L	
1+2	Vertical	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH62 5310 - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

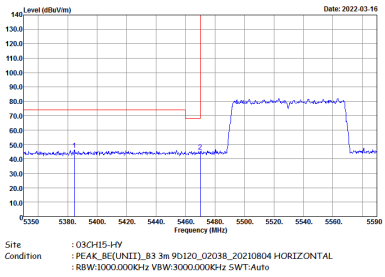
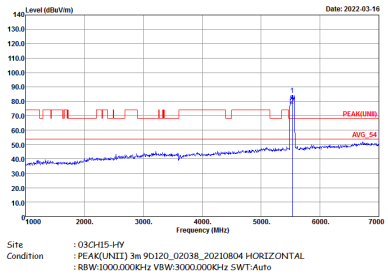
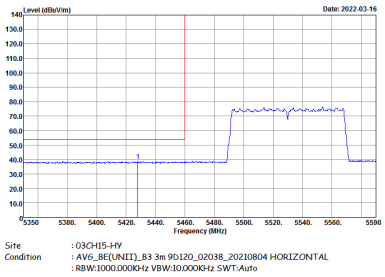
Band 2 - 5250~5350MHz

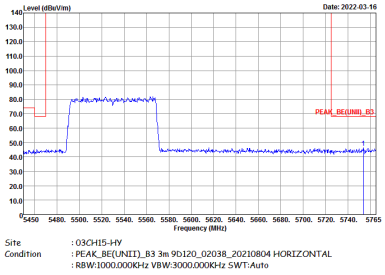
WIFI 802.11ax HE40 Full (Harmonic @ 3m)

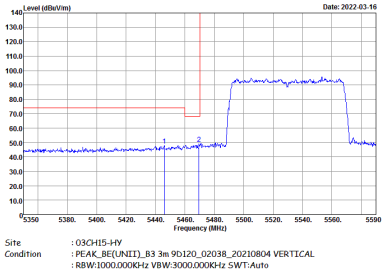
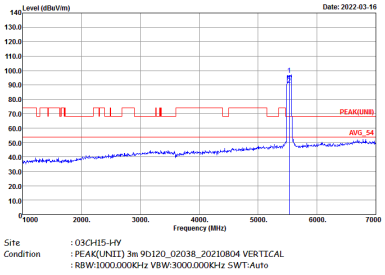
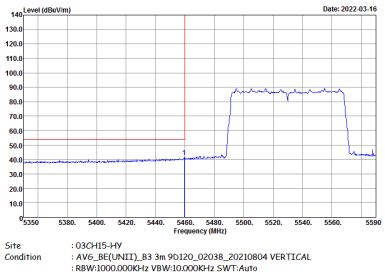
WIFI	Band 2 5250~5350MHz Harmonic @ 3m	
ANT	802.11ax HE40 Full CH62 5310	
1+2	Horizontal	Vertical
Peak Avg.		

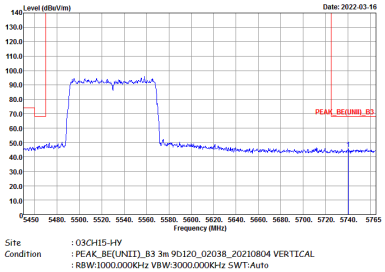
Band 3 - 5470~5725MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		Left blank

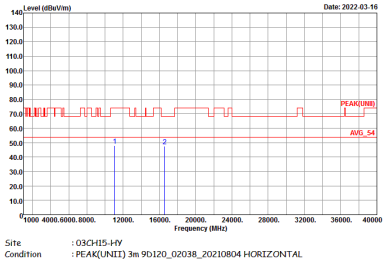
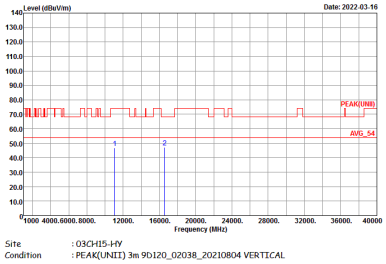
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank

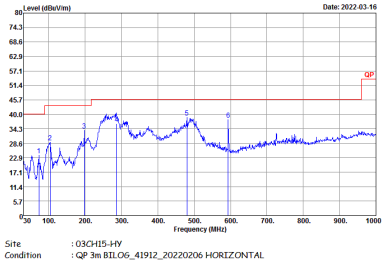
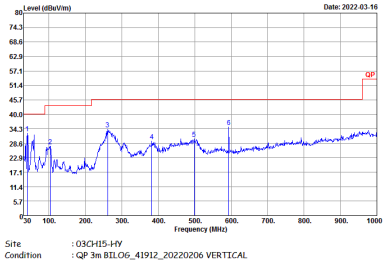
Band 3 - 5470~5725MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI	Band 3 5470~5725MHz Harmonic @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz	
1+2	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

5GHz WIFI 802.11ax HE40 Full (LF)

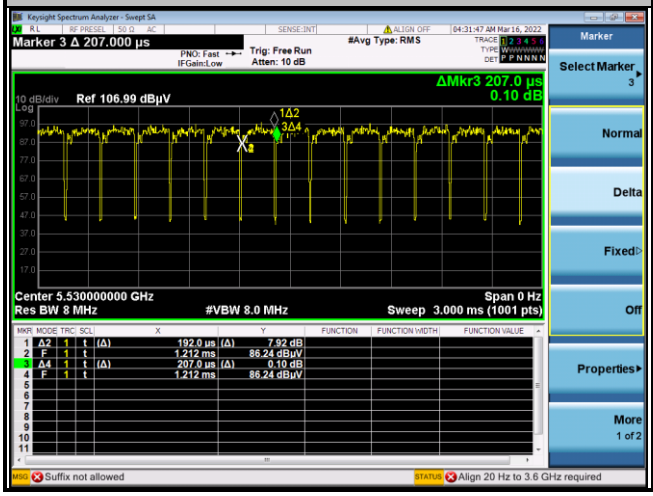
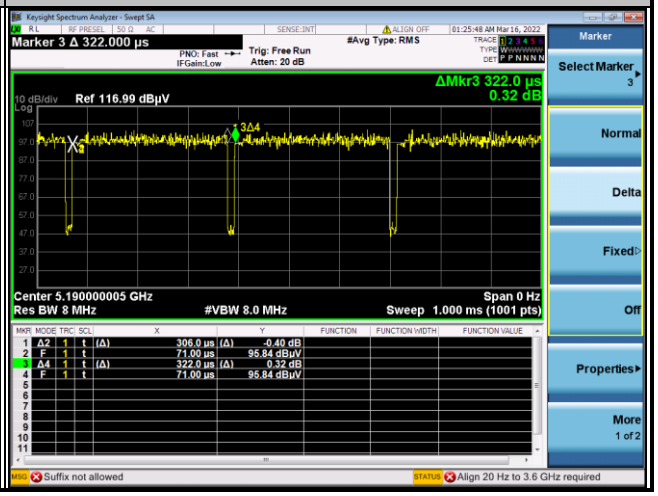
WIFI	5GHz WIFI	
ANT	802.11ax HE40 Full LF	
1+2	Horizontal	Vertical
QP / Peak		

Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1+2	5GHz 802.11ac VHT80	92.75	192	5.21	10kHz
1+2	5GHz 802.11ax HE40 Full RU	95.03	306	3.27	10kHz

MIMO <Ant. 1+2>

802.11ac VHT80



802.11ax HE40