



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 C §15.247

The product was received on Feb. 11, 2022 and testing was performed from Mar. 03, 2022 to Mar. 13, 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.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description	5
1.1 Product Feature of Equipment Under Test.....	5
1.2 Product Specification of Equipment Under Test.....	6
1.3 Modification of EUT	6
1.4 Testing Location	7
1.5 Applicable Standards.....	7
2 Test Configuration of Equipment Under Test	8
2.1 Carrier Frequency and Channel	8
2.2 Test Mode.....	8
2.3 Connection Diagram of Test System.....	9
2.4 EUT Operation Test Setup	9
3 Test Result	10
3.1 Output Power Measurement.....	10
3.2 Radiated Band Edges and Spurious Emission Measurement	12
3.3 Antenna Requirements.....	15
4 List of Measuring Equipment.....	16
5 Uncertainty of Evaluation	17
Appendix A. Radiated Spurious Emission	
Appendix B. Radiated Spurious Emission Plots	
Appendix C. Duty Cycle Plots	
Appendix D. Setup Photographs	



History of this test report

Report No.	Version	Description	Issue Date
FR0D2423-04A	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	2.12 dB under the limit at 2389.940 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note:

- Not required means after assessing, test items are not necessary to carry out.
- 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 FR0D2423C. Based on the original report, the test cases were verified.

Declaration of Conformity:

- 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.
- 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: Clio Lo



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 EUT's information above is 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 Channel Frequency Range	2412 MHz ~ 2462 MHz		
Maximum Output Power to Antenna	MIMO<Ant. 1+2> 802.11n HT20 : 13.47 dBm / 0.0222 W 802.11n HT40 : 12.27 dBm / 0.0169 W 802.11ac VHT20: 13.37 dBm / 0.0217 W 802.11ac VHT40: 12.17 dBm / 0.0165 W 802.11ax HE20: 13.57 dBm / 0.0228 W 802.11ax HE40: 12.37 dBm / 0.0173 W		
Antenna Type / Gain	<RD2458-5> <Ant. 1>: Dipole Antenna with gain 3.00 dBi <Ant. 2>: Dipole Antenna with gain 3.00 dBi <W3006> <Ant. 1>: Chip Antenna with gain 3.20 dBi <Ant. 2>: Chip Antenna with gain 3.20 dBi <220370-09> <Ant. 1>: Mylar Antenna with gain 3.81 dBi <Ant. 2>: Mylar Antenna with gain 3.81 dBi <B91882-30> <Ant. 1>: Mylar Antenna with gain 0.30 dBi <Ant. 2>: Mylar Antenna with gain 0.30 dBi		
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/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

Note:

1. MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.
2. The EUT's information above 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, 03CH13-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 C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ 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

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 (1 GHz 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 Ant. Horizontal as worst cases.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

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

MIMO Antenna

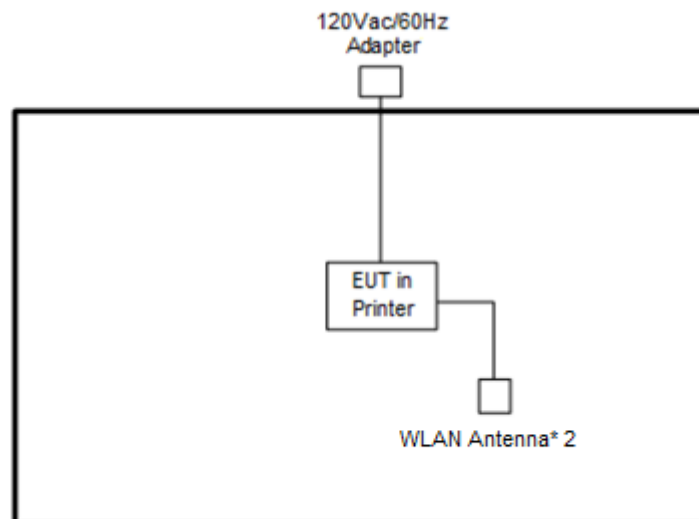
Modulation	Data Rate
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0

Ch. #	2400-2483.5 MHz
	802.11ax HE40
Low	03
Middle	-
High	-

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

<WLAN Tx Mode>



2.4 EUT Operation Test Setup

The RF test items, utility “Toolbox 1.84” 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 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna with directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

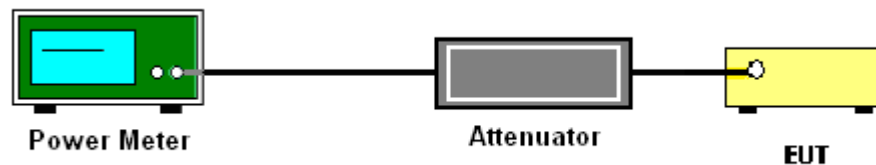
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power and record the results in the test report.
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 Average Output Power

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

2.4GHz Band MIMO Antenna																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HT20	MCS0	2	1	2412	11.00	9.50	13.32	30.00		3.81		17.13		36.00		Pass
HT20	MCS0	2	6	2437	11.10	9.70	13.47	30.00		3.81		17.28		36.00		Pass
HT20	MCS0	2	11	2462	10.60	9.40	13.05	30.00		3.81		16.86		36.00		Pass
HT40	MCS0	2	3	2422	7.90	6.70	10.35	30.00		3.81		14.16		36.00		Pass
HT40	MCS0	2	6	2437	9.90	8.50	12.27	30.00		3.81		16.08		36.00		Pass
HT40	MCS0	2	9	2452	7.90	6.80	10.40	30.00		3.81		14.21		36.00		Pass
VHT20	MCS0	2	1	2412	10.90	9.40	13.22	30.00		3.81		17.03		36.00		Pass
VHT20	MCS0	2	6	2437	11.00	9.60	13.37	30.00		3.81		17.18		36.00		Pass
VHT20	MCS0	2	11	2462	10.50	9.30	12.95	30.00		3.81		16.76		36.00		Pass
VHT40	MCS0	2	3	2422	7.80	6.60	10.25	30.00		3.81		14.06		36.00		Pass
VHT40	MCS0	2	6	2437	9.80	8.40	12.17	30.00		3.81		15.98		36.00		Pass
VHT40	MCS0	2	9	2452	7.80	6.70	10.30	30.00		3.81		14.11		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

2.4GHz Band MIMO Antenna																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	11.10	9.60	13.42	30.00		3.81		17.23		36.00		Pass
HE20	MCS0	2	6	2437	Full	11.20	9.80	13.57	30.00		3.81		17.38		36.00		Pass
HE20	MCS0	2	11	2462	Full	10.70	9.50	13.15	30.00		3.81		16.96		36.00		Pass
HE40	MCS0	2	3	2422	Full	8.00	6.80	10.45	30.00		3.81		14.26		36.00		Pass
HE40	MCS0	2	6	2437	Full	10.00	8.60	12.37	30.00		3.81		16.18		36.00		Pass
HE40	MCS0	2	9	2452	Full	8.00	6.90	10.50	30.00		3.81		14.31		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device is measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.2.2 Measuring Instruments

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

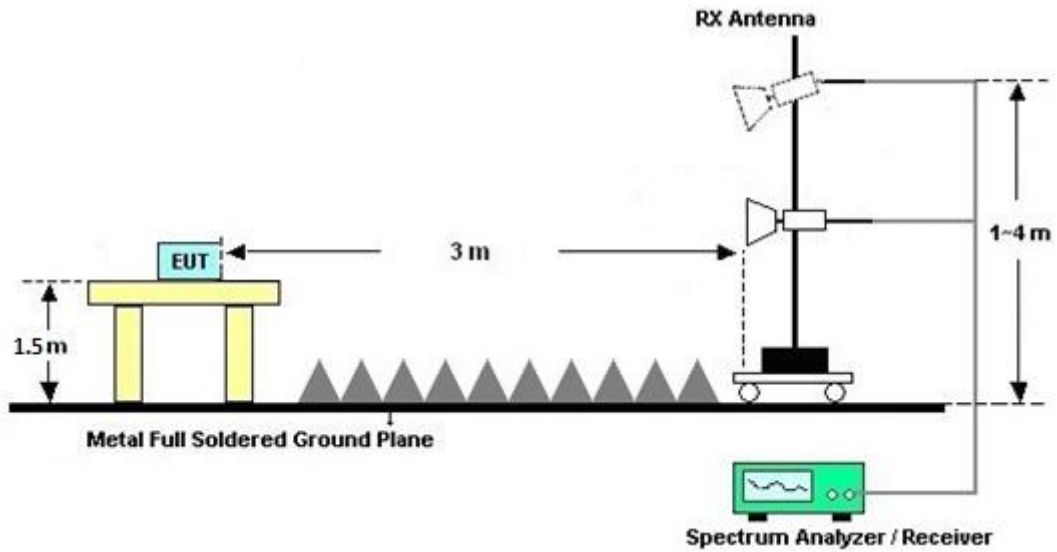


3.2.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT is placed on a turntable with 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. 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 “-”.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW = 100 kHz for $f < 1$ GHz; $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, $VBW = 3$ MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - $VBW = 10$ Hz, when duty cycle is no less than 98 percent.
 - $VBW \geq 1/T$, 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.

3.2.4 Test Setup

For radiated test above 1GHz



3.2.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.2.6 Duty Cycle

Please refer to Appendix C.

3.2.7 Test Result of Radiated Spurious Emission

Please refer to Appendix A and B.



3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

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
Hygrometer	TECEPIL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Mar. 03, 2022	Nov. 15, 2022	Conducted (TH05-HY)
Power Meter	DARE	RPR3006W	16I00054SNO 12 (NO:113)	10MHz~6GHz	Dec. 16, 2021	Mar. 03, 2022	Dec. 15, 2022	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	932001	N/A	Sep. 30, 2021	Mar. 03, 2022	Sep. 29, 2022	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	846202	300MHz~40GHz	Sep. 30, 2021	Mar. 03, 2022	Sep. 29, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Mar. 03, 2022	Aug. 29, 2022	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz~40GHz	Dec. 30, 2022	Mar. 03, 2022	Dec. 29, 2023	Conducted (TH05-HY)
Switch Control Manframe	E-IUSTRUMENT	ETF-1405-0	EC1900067 (BOX7)	N/A	Aug. 12, 2021	Mar. 03, 2022	Aug. 11, 2022	Conducted (TH05-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Jul. 13, 2021	Mar. 13, 2022	Jul. 12, 2022	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Oct. 26, 2021	Mar. 13, 2022	Oct. 25, 2022	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 18, 2021	Mar. 13, 2022	Mar. 17, 2022	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Mar. 13, 2022	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Mar. 13, 2022	N/A	Radiation (03CH13-HY)
Software	Audix	E3 6.2009-8-24	RK-000992	N/A	N/A	Mar. 13, 2022	N/A	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30M-18G	Feb. 09, 2022	Mar. 13, 2022	Feb. 08, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30M-18G	Feb. 09, 2022	Mar. 13, 2022	Feb. 08, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30M-18G	Feb. 09, 2022	Mar. 13, 2022	Feb. 08, 2023	Radiation (03CH13-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2 dB
--	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.9 dB
--	--------



Appendix A. Radiated Spurious Emission

Test Engineer :	Yuan Lee	Temperature :	20~25°C
		Relative Humidity :	50~60%

2.4GHz 2400~2483.5MHz

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 03 2422MHz		2389.24	58.29	-15.71	74	43.58	27.72	14.06	27.07	262	40	P	H
		2389.94	51.88	-2.12	54	37.17	27.72	14.06	27.07	262	40	A	H
	*	2422	101.52	-	-	86.82	27.66	14.09	27.05	262	40	P	H
	*	2422	94.09	-	-	79.39	27.66	14.09	27.05	262	40	A	H
		2485.16	55.25	-18.75	74	40.46	27.67	14.15	27.03	262	40	P	H
		2492.86	47.75	-6.25	54	32.94	27.69	14.15	27.03	262	40	A	H
		2388.12	56.37	-17.63	74	41.66	27.72	14.06	27.07	293	92	P	V
		2387	49.63	-4.37	54	34.91	27.73	14.06	27.07	293	92	A	V
	*	2422	96.99	-	-	82.29	27.66	14.09	27.05	293	92	P	V
	*	2422	90.75	-	-	76.05	27.66	14.09	27.05	293	92	A	V
		2484.46	55.08	-18.92	74	40.29	27.67	14.15	27.03	293	92	P	V
		2487.47	47.89	-6.11	54	33.1	27.67	14.15	27.03	293	92	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE40 Full (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.		(MHz)	(dBμV/m)	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2				(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ax HE40 Full CH 03 2422MHz		4844	39.51	-34.49	74	58.23	31.49	6.81	57.02	-	-	P	H
		7266	44.67	-29.33	74	56.18	36.9	8.39	56.8	-	-	P	H
		10845	50.27	-23.73	74	55.49	40.79	9.97	55.98	-	-	P	H
		10845	40.33	-13.67	54	45.55	40.79	9.97	55.98	-	-	A	H
		14490	50.52	-23.48	74	52.97	41.86	11.77	56.08	-	-	P	H
		14490	40.63	-13.37	54	43.08	41.86	11.77	56.08	-	-	A	H
		18000	57.01	-16.99	74	51.68	48.5	13.55	56.72	-	-	P	H
		18000	46.74	-7.26	54	41.41	48.5	13.55	56.72	-	-	A	H
													H
													H
													H
													H
		4844	39.56	-34.44	74	58.28	31.49	6.81	57.02	-	-	P	V
		7266	44.79	-29.21	74	56.3	36.9	8.39	56.8	-	-	P	V
		10635	48.88	-25.12	74	54.99	40.31	9.85	56.27	-	-	P	V
		10635	38.95	-15.05	54	45.06	40.31	9.85	56.27	-	-	A	V
		14490	50.1	-23.9	74	52.55	41.86	11.77	56.08	-	-	P	V
		14490	40.23	-13.77	54	42.68	41.86	11.77	56.08	-	-	A	V
		18000	56.58	-17.42	74	51.25	48.5	13.55	56.72	-	-	P	V
		18000	46.06	-7.94	54	40.73	48.5	13.55	56.72	-	-	A	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.												
	4. The emission level close to 18GHz is checked that the average emission level 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	Peak or Average
H/V	Horizontal or Vertical



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.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	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 @ 2390MHz:

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 @ 2390MHz:

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 Plots

Test Engineer :	Yuan Lee	Temperature :	20~25°C
		Relative Humidity :	50~60%

Note symbol

-L	Low channel location
-R	High channel location

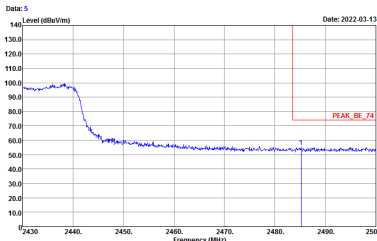
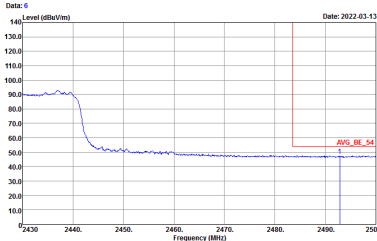


2.4GHz 2400~2483.5MHz

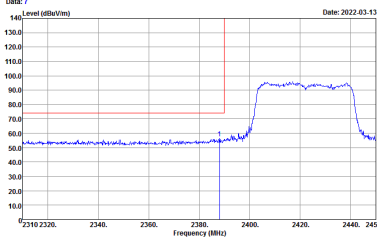
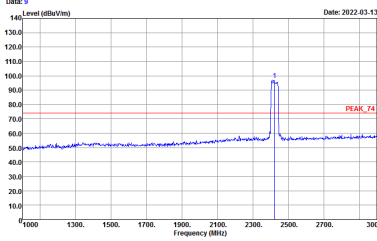
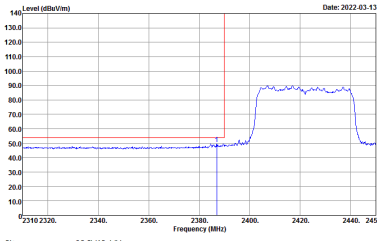
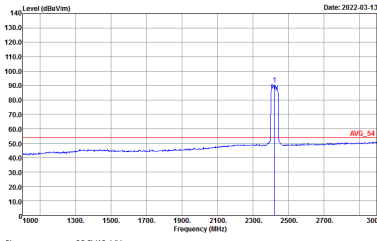
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Horizontal	Fundamental
Peak	Data: 1 Level (dBuV/m) Date: 2022-03-13 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Data: 3 Level (dBuV/m) Date: 2022-03-13 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	Data: 2 Level (dBuV/m) Date: 2022-03-13 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Data: 4 Level (dBuV/m) Date: 2022-03-13 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

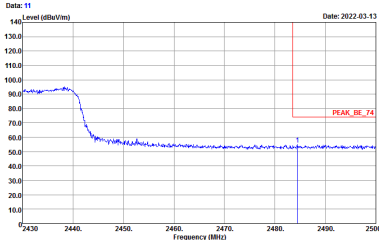
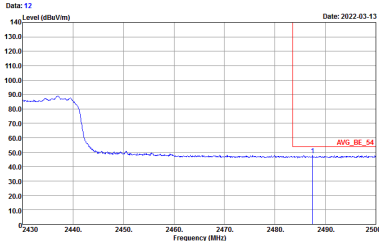


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL RBW:1000.000KHz VBW:30.000KHz SWT:Auto	Left blank



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
1+2	Vertical	Fundamental
Peak	Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto 	Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto 
Avg.	Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto 	Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto 



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
1+2	Vertical	Fundamental
Peak	Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto 	Left blank
Avg.	Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL RBW:1000.000KHz VBW:30.000KHz SWT:Auto 	Left blank



2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE40 Full (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE40 Full CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.	Date: 1 Level (dBuV/m) Date: 2022-03-13 Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1241 HORIZONTAL	Date: 2 Level (dBuV/m) Date: 2022-03-13 Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1241 VERTICAL



Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1+2	2.4GHz 802.11ax HE40 Full RU	95.33	306	3.27	10kHz

MIMO <Ant. 1+2>

