FCC RADIO TEST REPORT

FCC ID	**:**	**HD5-CT30PX0N**
Equipment	**:**	**Mobile computer**
Brand Name	**:**	**Honeywell**
Model Name	**:**	**CT30PX0N**
Applicant	**:**	**Honeywell International Inc. 9680 Old Bailes Road, Fort Mill, SC 29707 USA**
Manufacturer	**:**	**Honeywell International Inc. 9680 Old Bailes Road, Fort Mill, SC 29707 USA**
Standard	**:**	**FCC Part 15 Subpart E §15.407**

The product was received on Dec. 14, 2023 and testing was performed from Feb. 02, 2024 to Feb. 19, 2024. 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

Table of Contents

History of this test report

Report No.	Version	Description	Issue Date
FR1N0505-06B	01	Initial issue of report	Feb. 29, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.403(i)	26dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.407(a)	Maximum Conducted Output Power	Pass	-
-	15.407(a)	Power Spectral Density	Not Required	-
3.2	15.407(b)	Unwanted Emissions	Pass	1.60 dB under the limit at 5147.94 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report for Vietnam migration change. All the test cases were performed on original report which can be referred to Sporton Report Number FR1N0505-03C. Based on the original report, only worst case was verified.

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Wei Chen

Report Producer: Rebecca Wu

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
General Specs	Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax and NFC.
Sample 1	EUT with Scanner (S0703)
Sample 2	EUT with Scanner (6803)
Sample 3	EUT with Scanner (N6700)
HW version	v1.0
SW version	OS.11.001
Antenna Type	WLAN: **<Ant. 1>:** PIFA Antenna **<Ant. 2>:** PIFA Antenna Bluetooth: PIFA Antenna NFC: Loop Antenna

Antenna information		
5150 MHz ~ 5250 MHz	Peak Gain (dBi)	Ant. 1: 3.3 Ant. 2: 2.1
5250 MHz ~ 5350 MHz	Peak Gain (dBi)	Ant. 1: 2.8 Ant. 2: 1.5
5470 MHz ~ 5725 MHz	Peak Gain (dBi)	Ant. 1: 2.8 Ant. 2: 1.4

Remark:

1. The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.
2. Internal tracking board version is DVT2(NFC) and SW PN is 311.C1.00.0404-N-DEBUG-G2H.

1.1.1 Antenna Directional Gain

<For CDD Mode>

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)ii)

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows:

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

G_{ANT} is set equal to the gain of the antenna having the highest gain.

For PSD measurements, the directional gain calculation.

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;
N_{SS} = the number of independent spatial streams of data;
N_{ANT} = the total number of antennas
$g_{j,k} = 10^{G_k / 20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;
G_k is the gain in dBi of the kth antenna.

As minimum N_{SS}=1 is supported by EUT, the formula can be simplified as:

Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

Where G1, G2….GN denote single antenna gain.

The directional gain “DG” is calculated as following table.

	Ant 1 (dBi)	Ant 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
Band I	3.30	2.10	3.30	5.73	0.00	0.00
Band II	2.80	1.50	2.80	5.18	0.00	0.00
Band III	2.80	1.40	2.80	5.14	0.00	0.00

Calculation example:

If a device has two antenna, G_{ANT1}= 3.3dBi; G_{ANT2}=2.1dBi

Directional gain of power measurement = max(3.3, 2.1) + 0 = 3.3 dBi

Directional gain of PSD derived from formula which is

10 x log { { [10^ (3.30 dBi / 20) + 10^ (2.10 dBi / 20)] ^ 2 } / 2 }

= 5.73 dBi

Power and PSD limit reduction = Composite gain – 6dBi, (min = 0)

1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 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

1.4 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 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 (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 three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.

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

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138#	5690	144	5720
	142*	5710		

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 SISO mode conducted power is covered by MIMO mode per chain, so only the MIMO mode is tested.

The final test modes include the worst data rates for each modulation shown in the table below.

MIMO Mode

Modulation	Data Rate
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**

Remark: The conducted power level of each chain in MIMO mode is equal or higher than SISO mode.

Ch. #		Band I：5150-5250 MHz		
		802.11ax HE20	802.11ax HE40	802.11ax HE80
L	Low	36	38	-
M	Middle	-	-	42
H	High	-	-	-
Straddle		-		-

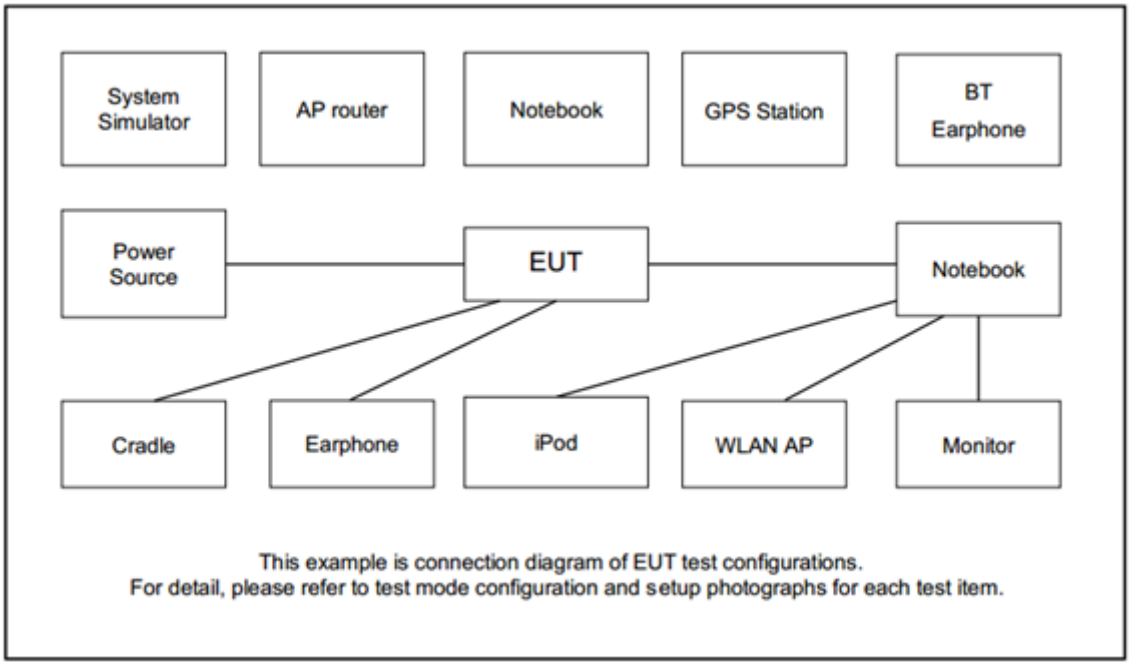
Remark:

1. For Radiated Test Cases, the tests were performed with Sample 1.

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

3. Only radiated measurements are used to show compliance with FCC limits for fundamental and spurious emissions.

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

The RF test items, utility “FTM Tool Version1.9” 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.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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

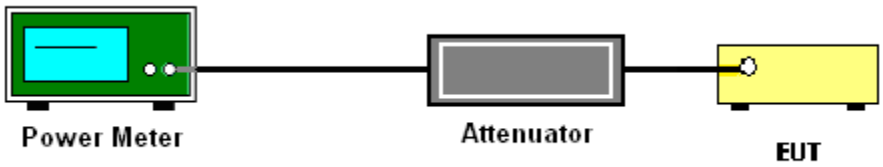
The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

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 Peak Unwanted Emissions Measurements Above 1000 MHz

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

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

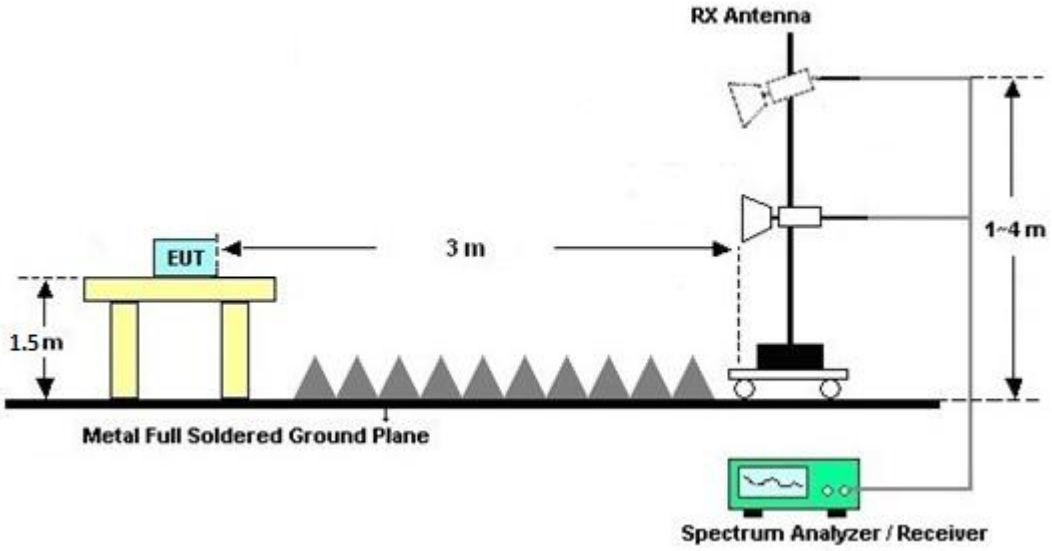
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

2. The EUT is placed on a turntable with 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 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 test above 1GHz



3.2.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.2.6 Duty Cycle

Please refer to Appendix D.

3.2.7 Test Result of Radiated Spurious Emissions

Please refer to Appendix B and C.

3.3 Antenna Requirements

3.3.1 Standard Applicable

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.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz~18GHz	Aug. 17, 2023	Feb. 02, 2024~ Feb. 17, 2024	Aug. 16, 2024	Radiation (03CH13-HY)
Hygrometer	TECPEL	DTM-303A	TP215159	N/A	Sep. 13, 2023	Feb. 02, 2024~ Feb. 17, 2024	Sep. 12, 2024	Radiation (03CH13-HY)
Preamplifier	EM Electronics	EM01G18G	060803	1GHz-18GHz	Jan. 09, 2024	Feb. 02, 2024~ Feb. 17, 2024	Jan. 08, 2025	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Jan. 18, 2024	Feb. 02, 2024~ Feb. 17, 2024	Jan. 17, 2025	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30MHz~18GHz	Feb. 08, 2023	Feb. 02, 2024~ Feb. 06, 2024	Feb. 07, 2024	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30MHz~18GHz	Feb. 07, 2024	Feb. 07, 2024~ Feb. 17, 2024	Feb. 06, 2025	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30MHz~18GHz	Feb. 08, 2023	Feb. 02, 2024~ Feb. 06, 2024	Feb. 07, 2024	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30MHz~18GHz	Feb. 07, 2024	Feb. 07, 2024~ Feb. 17, 2024	Feb. 06, 2025	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30MHz~18GHz	Feb. 08, 2023	Feb. 02, 2024~ Feb. 06, 2024	Feb. 07, 2024	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30MHz~18GHz	Feb. 07, 2024	Feb. 07, 2024~ Feb. 17, 2024	Feb. 06, 2025	Radiation (03CH13-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Feb. 02, 2024~ Feb. 17, 2024	N/A	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Feb. 02, 2024~ Feb. 17, 2024	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Feb. 02, 2024~ Feb. 17, 2024	N/A	Radiation (03CH13-HY)
Software	Audix	N/A	RK-001124	N/A	N/A	Feb. 02, 2024~ Feb. 17, 2024	N/A	Radiation (03CH13-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 07, 2023	Feb. 16, 2024~ Feb. 19, 2024	Nov. 06, 2024	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	17I00015SNO36 (NO:35)	10MHz~6GHz	Aug. 23, 2023	Feb. 16, 2024~ Feb. 19, 2024	Aug. 22, 2024	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101564	10Hz ~ 40GHz	Sep. 12, 2023	Feb. 16, 2024~ Feb. 19, 2024	Sep. 11, 2024	Conducted (TH05-HY)

5 Measurement Uncertainty

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.2 dB**

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.6 dB**

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

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

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Wei Shun	Temperature:	21~25	°C
Test Date:	2024/02/16 ~ 2024/02/19	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table

FCC U-NII-1 MIMO													
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC 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	11.80	12.70	15.28	24.00		3.30		-	Pass
HT40	MCS0	2	38	5190	11.50	12.00	14.77	24.00		3.30			Pass
VHT20	MCS0	2	36	5180	11.90	12.80	15.38	24.00		3.30			Pass
VHT40	MCS0	2	38	5190	11.60	12.10	14.87	24.00		3.30			Pass
VHT80	MCS0	2	42	5210	10.40	11.30	13.88	24.00		3.30			Pass

TEST RESULTS DATA
Average Power Table

FCC U-NII-1 MIMO														
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			FCC 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	12.00	12.90	15.48	24.00		3.30		-	Pass
HE40	MCS0	2	38	5190	Full	11.70	12.20	14.97	24.00		3.30			Pass
HE80	MCS0	2	42	5210	Full	10.50	11.40	13.98	24.00		3.30			Pass

Appendix B. Radiated Spurious Emission

Test Engineer :	Rain Lee	Temperature :	20~26°C
		Relative Humidity :	40~65%

Band 1 - 5150~5250MHz

WIFI 802.11ax HE20 Full (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Margin	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)
		5149.5	61.36	-12.64	74	58.22	33.2	7	37.06	100	300	P	H
		5149.5	49.83	-4.17	54	46.69	33.2	7	37.06	100	300	A	H
	*	5180	107.44	-	-	104.23	33.2	7.05	37.04	100	300	P	H
	*	5180	100.7	-	-	97.49	33.2	7.05	37.04	100	300	A	H
802.11ax													H
HE20 Full													H
CH 36		5149.24	61.67	-12.33	74	58.53	33.2	7	37.06	113	94	P	V
5180MHz		5149.76	45.26	-8.74	54	42.5	33.2	6.62	37.06	113	94	A	V
	*	5180	104.74	-	-	101.53	33.2	7.05	37.04	113	94	P	V
	*	5180	99.44	-	-	96.23	33.2	7.05	37.04	113	94	A	V
													V
													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 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (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 38 5190MHz		5150.02	61.41	-88.59	150	58.27	33.2	7	37.06	100	297	P	H
		5150	50.9	-3.1	54	47.76	33.2	7	37.06	100	297	A	H
	*	5190	101.92	-	-	98.69	33.2	7.06	37.03	100	297	P	H
	*	5190	95.52	-	-	92.29	33.2	7.06	37.03	100	297	A	H
		5367.32	46.96	-27.04	74	43.85	33	7.02	36.91	100	297	P	H
		5369	38.53	-15.47	54	35.42	33	7.02	36.91	100	297	A	H
		5148.98	60.8	-13.2	74	57.66	33.2	7	37.06	100	353	P	V
		5149.5	50.87	-3.13	54	47.73	33.2	7	37.06	100	353	A	V
	*	5190	102.27	-	-	99.04	33.2	7.06	37.03	100	353	P	V
	*	5190	94.67	-	-	91.44	33.2	7.06	37.03	100	353	A	V
		5413.24	47.71	-26.29	74	44.55	33.03	7.01	36.88	100	353	P	V
		5377.4	38.07	-15.93	54	34.95	33	7.02	36.9	100	353	A	V
Remark	3. No other spurious found. 4. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ax HE80 Full (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (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 HE80 Full CH 42 5210MHz		5136.5	59.87	-14.13	74	56.79	33.17	6.98	37.07	257	307	P	H
		5145.86	51.04	-2.96	54	47.91	33.19	7	37.06	257	307	A	H
	*	5210	100.06	-	-	96.8	33.2	7.08	37.02	257	307	P	H
	*	5210	93.51	-	-	90.25	33.2	7.08	37.02	257	307	A	H
		5414.08	49.81	-24.19	74	46.65	33.03	7.01	36.88	257	307	P	H
		5394.2	43.1	-10.9	54	39.98	33	7.01	36.89	257	307	A	H
		5150	62.96	-11.04	74	59.82	33.2	7	37.06	105	352	P	V
		5147.94	52.4	-1.6	54	49.26	33.2	7	37.06	105	352	A	V
	*	5210	98.36	-	-	95.1	33.2	7.08	37.02	105	352	P	V
	*	5210	91.86	-	-	88.6	33.2	7.08	37.02	105	352	A	V
		5400.08	50.19	-23.81	74	47.07	33	7.01	36.89	105	352	P	V
		5378.24	42.74	-11.26	54	39.62	33	7.02	36.9	105	352	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

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 **Margin** 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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		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. Margin (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. Margin (dB)

= Leve(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. Margin (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 C. Radiated Spurious Emission Plots

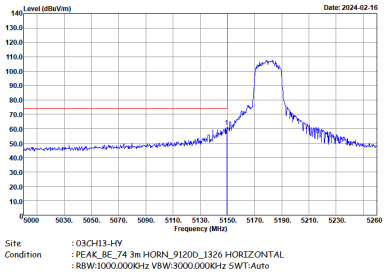
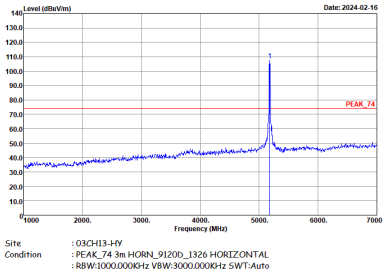
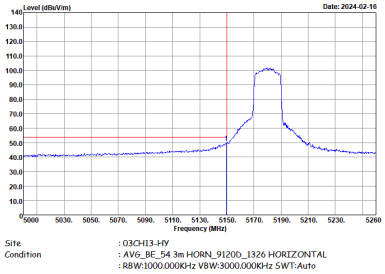
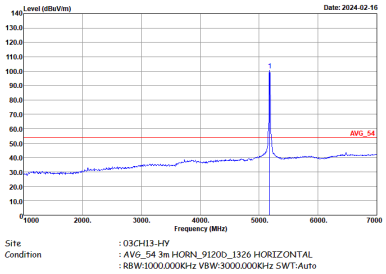
Test Engineer :	Rain Lee	**Temperature :**	20~26°C
		Relative Humidity :	40~65%

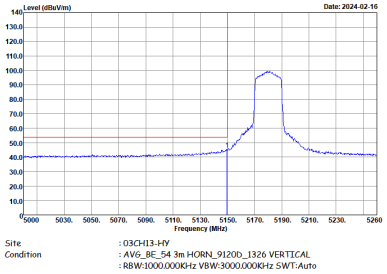
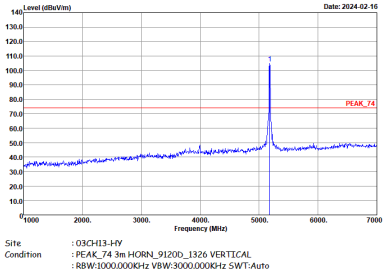
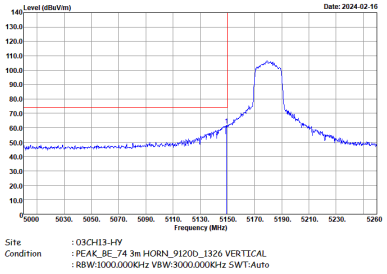
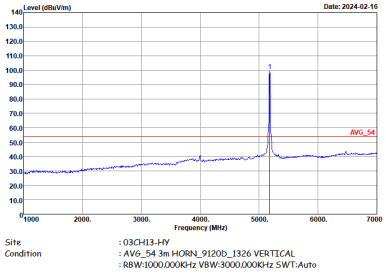
Note symbol

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

Band 1 - 5150~5250MHz

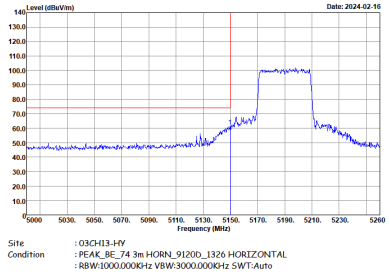
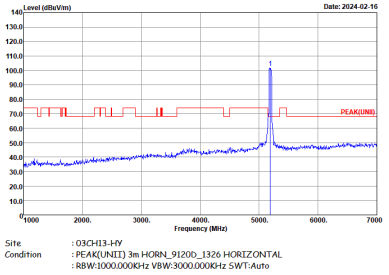
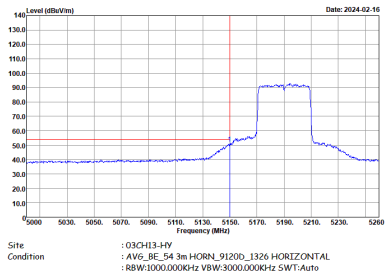
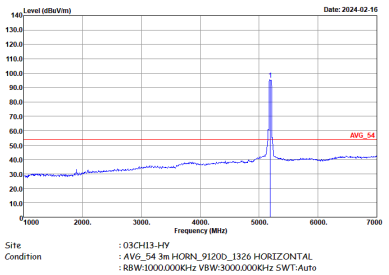
WIFI 802.11ax HE20 Full (Band Edge @ 3m)

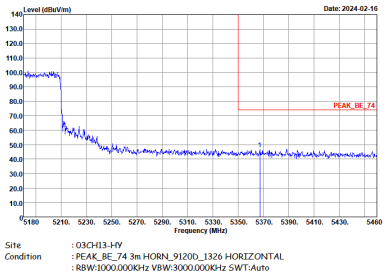
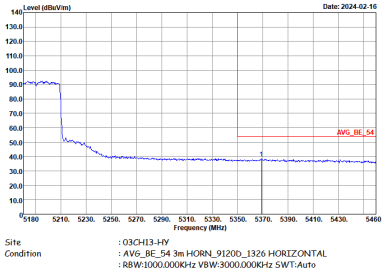
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH36 5180MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

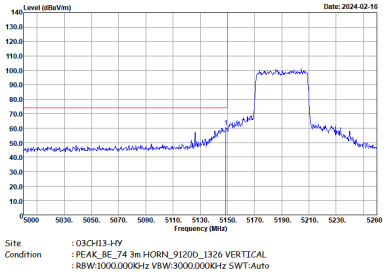
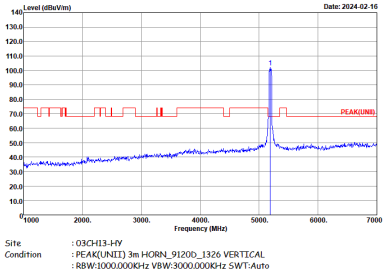
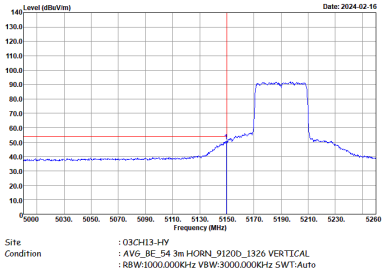
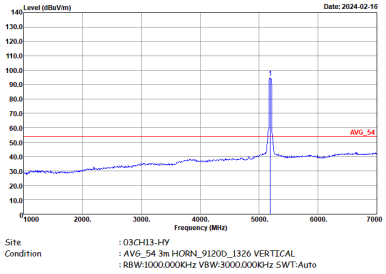
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH36 5180MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

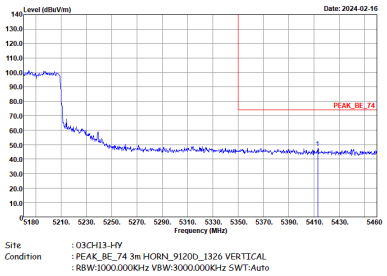
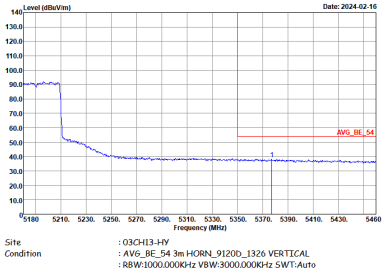
Band 1 5150~5250MHz

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.		

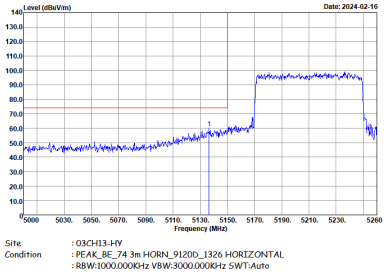
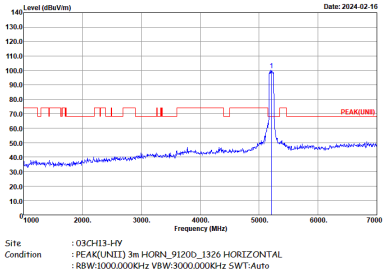
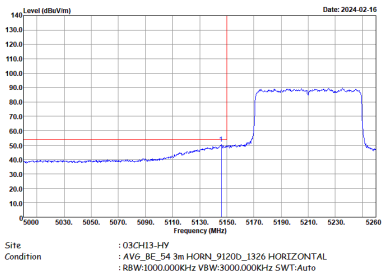
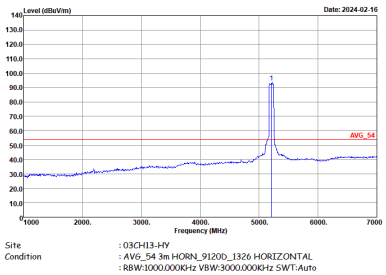
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

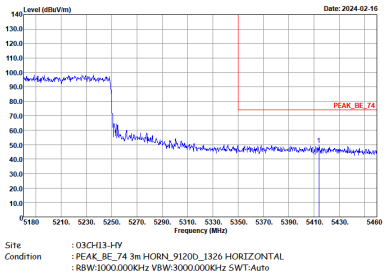
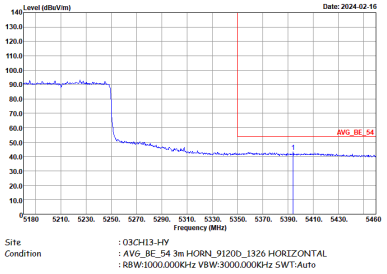
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

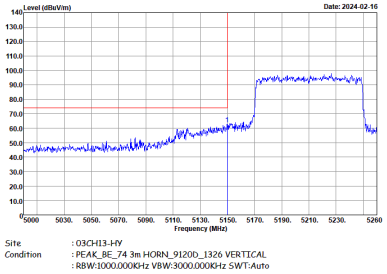
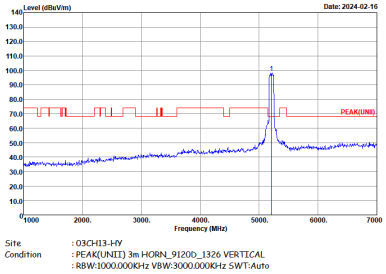
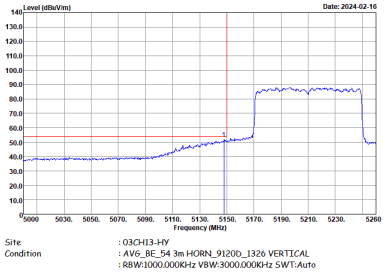
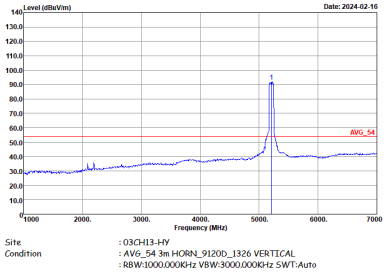
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH38 5190MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

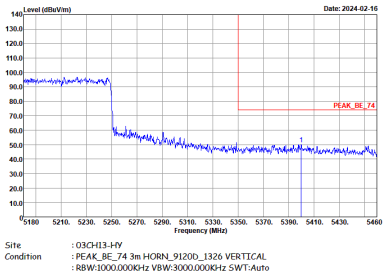
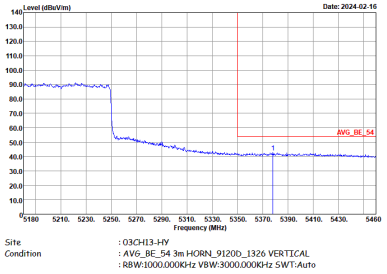
Band 1 5150~5250MHz

WIFI 802.11ax HE80 Full (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

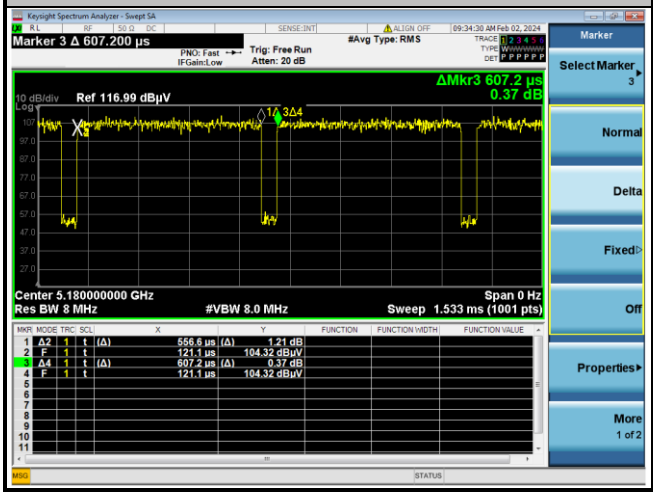
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

Appendix D. Duty Cycle Plots

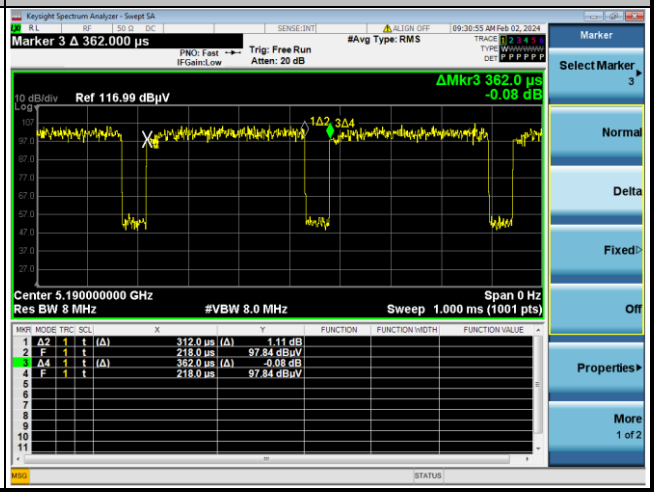
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1+2	5GHz 802.11ax HE20 Full RU	91.67	556.6	1.80	3kHz
1+2	5GHz 802.11ax HE40 Full RU	86.19	312	3.21	10kHz
1+2	5GHz 802.11ax HE80 Full RU	78.50	184	5.43	10kHz

MIMO <Ant.1+2>

5GHz 802.11ax HE20 Full RU



5GHz 802.11ax HE40 Full RU



5GHz 802.11ax HE80 Full RU