



# FCC CO-LOCATION RADIO TEST REPORT

**FCC ID** : 2ADZRBEACON10  
**Equipment** : NOKIA WiFi Beacon 10  
**Brand Name** : NOKIA  
**Model Name** : Beacon 10  
**Applicant** : Nokia Shanghai Bell Co., Ltd.  
No.388, Ningqiao Rd, Pilot Free Trade Zone, Shanghai,  
201206 P.R. China  
**Manufacturer** : Nokia of America Corporation  
2301 Sugar Bush Rd. Raleigh, NC 27612  
**Standard** : FCC Part 15 Subpart E §15.407

The product was received on Mar. 06, 2023 and testing was performed from Mar. 09, 2023 to Apr. 28, 2023. 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 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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### Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	0.39 dB under the limit at 7125.000 MHz
3.2	15.203	Antenna Requirement	Pass	-

**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: Clio Lo**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Product Feature	
<p><b>General Specs</b> Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax and Wi-Fi 6GHz 802.11a/n/ac/ax.</p> <p><b>Antenna Type</b> <b>WLAN</b> &lt;Ant. 1&gt;: Dipole Antenna &lt;Ant. 2&gt;: Dipole Antenna &lt;Ant. 3&gt;: Dipole Antenna &lt;Ant. 4&gt;: Dipole Antenna &lt;Ant. 5&gt;: Dipole Antenna &lt;Ant. 6&gt;: Dipole Antenna &lt;Ant. 7&gt;: Dipole Antenna &lt;Ant. 8&gt;: Dipole Antenna</p>	

Antenna information		
<b>2400 MHz ~ 2483.5 MHz</b>	Peak Gain (dBi)	Ant. 1: 3.22 Ant. 2: 2.35
<b>5150 MHz ~ 5250 MHz</b>	Peak Gain (dBi)	Ant. 1: 2.17 Ant. 2: 3.25 Ant. 3: 2.70 Ant. 4: 2.83
<b>6875 MHz ~ 7125 MHz</b>	Peak Gain (dBi)	Ant. 5: 2.63 Ant. 6: 2.61 Ant. 7: 2.71 Ant. 8: 1.99

**Remark:** The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

## 1.2 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.3 Testing Location

<b>Test Site</b>	Sporton International Inc. Wensan Laboratory
<b>Test Site Location</b>	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
<b>Test Site No.</b>	<b>Sporton Site No.</b> 03CH16-HY

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

FCC designation No.: TW3786



## **1.4 Applicable Standards**

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 987594 D02 U-NII 6 GHz EMC Measurement v01r01
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

### **Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
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 (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

### 2.1 Carrier Frequency and Channel

2400-2483.5 MHz		5150 MHz ~ 5250 MHz		6875 MHz ~ 7125 MHz	
802.11ax HE40		802.11ax HE80		802.11a	
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
06	2437	42	5210	233	7115

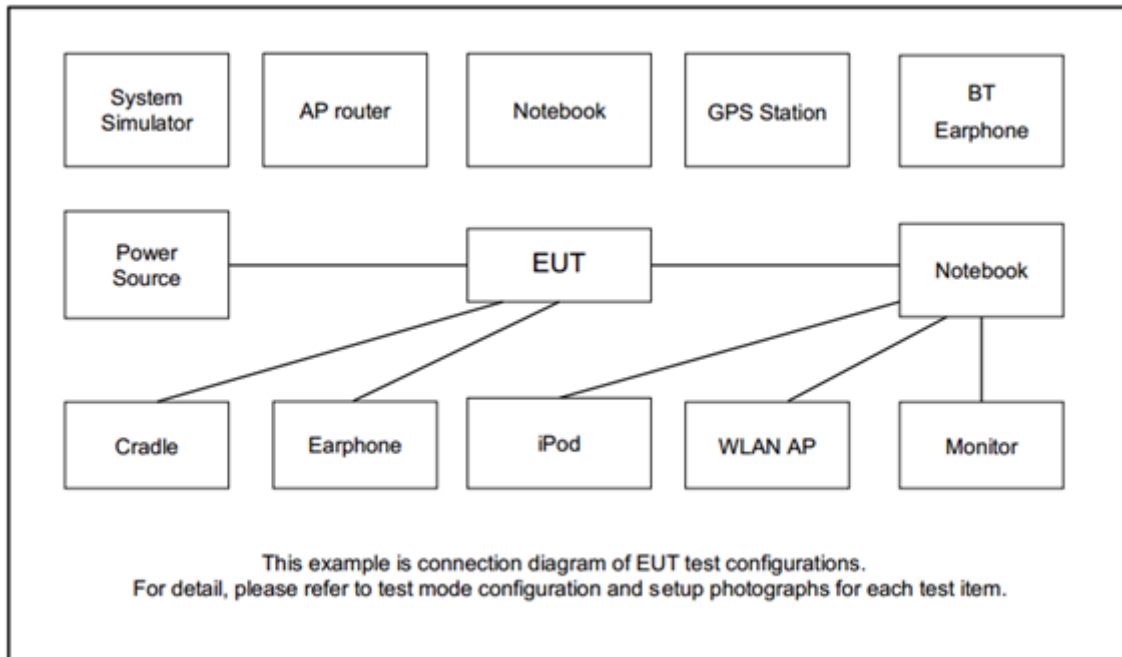
### 2.2 Test Mode

<Co-Location>

Test Mode	Modulation	Data Rate
Mode 1	WLAN 2.4GHz 802.11ax HE40 for MIMO <Ant. 1+2> + WLAN 5GHz 802.11ax HE80 for MIMO <Ant. 1+2+3+4> + WLAN 6GHz 802.11a for MIMO <Ant. 5+6+7+8>	MCS0

Remark: For Radiated Test Cases, the tests were performed with Adapter 1.

### 2.3 Connection Diagram of Test System



### 2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Phone	Google	N/A	N/A	N/A	N/A

### 2.5 EUT Operation Test Setup

The RF test items, utility “QSPR 5.0-002002” 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 Unwanted Emissions Measurement

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

##### 3.1.1 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.

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



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.

### 3.1.2 Measuring Instruments

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

### 3.1.3 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

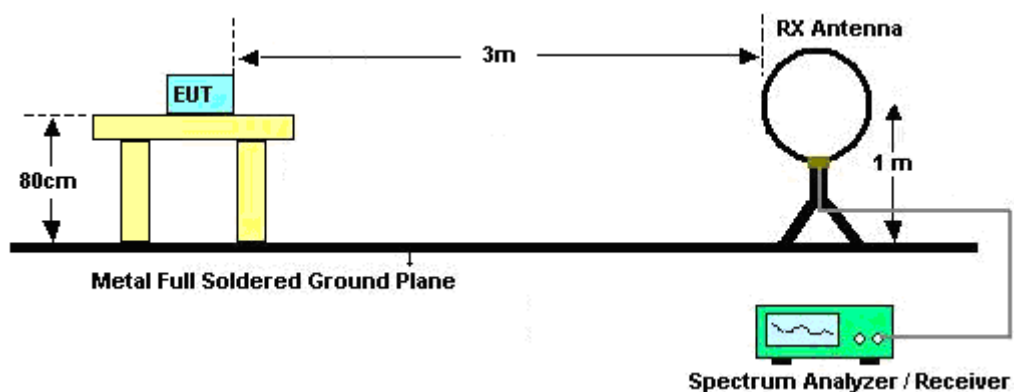
(3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz

- 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.

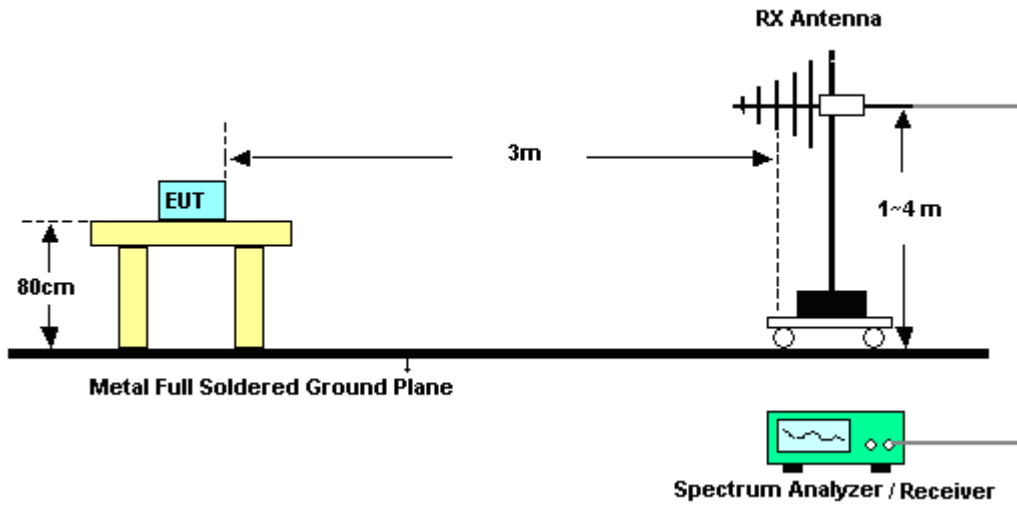
2. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT is set 3 meters away from the receiving antenna which is mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna 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 “-”.

### 3.1.4 Test Setup

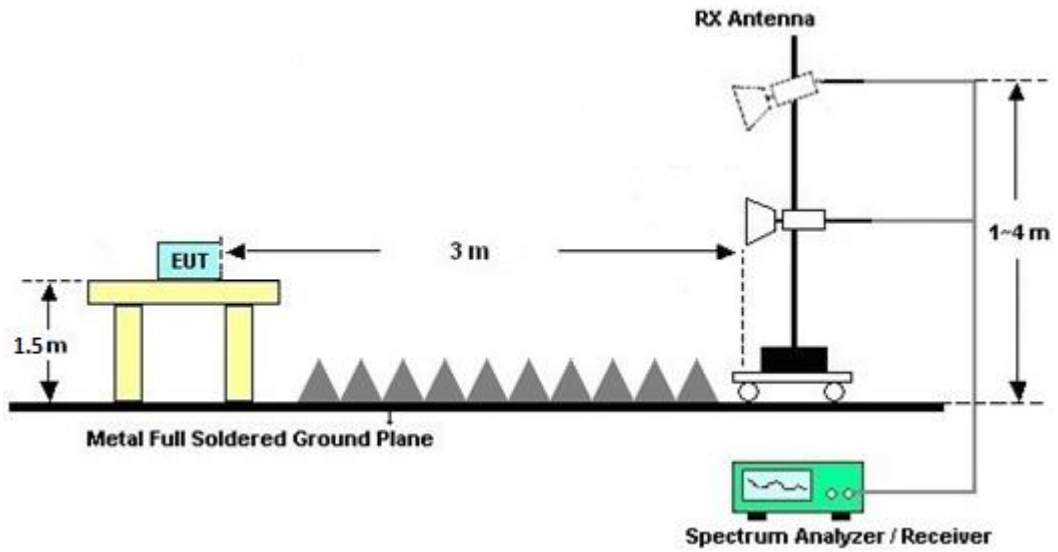
For radiated emissions below 30MHz



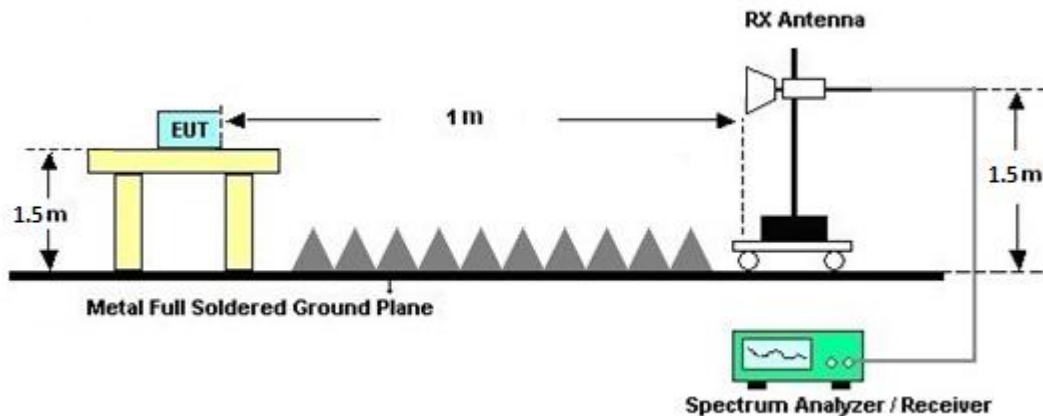
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



### 3.1.5 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.

### 3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

### 3.1.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix A and B.



## **3.2 Antenna Requirements**

### **3.2.1 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.

### **3.2.2 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-02038	1GHz~18GHz	Aug. 09, 2022	Mar. 09, 2023~ Apr. 28, 2023	Aug. 08, 2023	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00993	18GHz~40GHz	Nov. 24, 2022	Mar. 09, 2023~ Apr. 28, 2023	Nov. 23, 2023	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz~1GHz	Oct. 08, 2022	Mar. 09, 2023~ Apr. 28, 2023	Oct. 07, 2023	Radiation (03CH16-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 20, 2022	Mar. 09, 2023~ Apr. 28, 2023	Sep. 19, 2023	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 28, 2022	Mar. 09, 2023~ Apr. 28, 2023	Jun. 27, 2023	Radiation (03CH16-HY)
Preamplifier	EMEC	EM1G18G	060812	1GHz~18GHz	Dec. 26, 2022	Mar. 09, 2023~ Apr. 28, 2023	Dec. 25, 2023	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 09, 2022	Mar. 09, 2023~ Apr. 28, 2023	Dec. 08, 2023	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1GHz	Jul. 04, 2022	Mar. 09, 2023~ Apr. 28, 2023	Jul. 03, 2023	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Dec. 15, 2022	Mar. 09, 2023~ Apr. 28, 2023	Dec. 14, 2023	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	805935/4	N/A	Aug. 09, 2022	Mar. 09, 2023~ Apr. 28, 2023	Aug. 08, 2023	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	802434/4	N/A	Aug. 09, 2022	Mar. 09, 2023~ Apr. 28, 2023	Aug. 08, 2023	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-5757	N/A	Aug. 09, 2022	Mar. 09, 2023~ Apr. 28, 2023	Aug. 08, 2023	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Mar. 09, 2023~ Apr. 28, 2023	N/A	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Mar. 09, 2023~ Apr. 28, 2023	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Mar. 09, 2023~ Apr. 28, 2023	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Mar. 09, 2023~ Apr. 28, 2023	N/A	Radiation (03CH16-HY)



## 5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	6.5 dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.6 dB
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### Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.5 dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.6 dB
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## Appendix A. Radiated Spurious Emission

Test Engineer :	Andy Yang, Gary Guo and Steven Wu	Temperature :	20~25°C
		Relative Humidity :	50~65%

### 2.4GHz 2400~2483.5MHz

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

WIFI Ant.	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 06 2437MHz		2318.26	60.16	-13.84	74	46.24	27.2	17.21	30.49	199	154	P	H
		2387.7	44.61	-9.39	54	30.35	27.38	17.35	30.47	199	154	A	H
	*	2437	110.84	-	-	96.25	27.6	17.44	30.45	199	154	P	H
	*	2437	100.1	-	-	85.51	27.6	17.44	30.45	199	154	A	H
		2486.07	59.53	-14.47	74	44.69	27.76	17.51	30.43	199	154	P	H
		2486.07	46.71	-7.29	54	31.87	27.76	17.51	30.43	199	154	A	H
		2316.44	61.97	-12.03	74	48.06	27.2	17.2	30.49	195	64	P	V
		2389.94	47.84	-6.16	54	33.55	27.4	17.36	30.47	195	64	A	V
	*	2437	114.98	-	-	100.39	27.6	17.44	30.45	195	64	P	V
	*	2437	104.81	-	-	90.22	27.6	17.44	30.45	195	64	A	V
	2483.83	65.12	-8.88	74	50.31	27.74	17.51	30.44	195	64	P	V	
	2483.5	52.6	-1.4	54	37.79	27.74	17.51	30.44	195	64	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 HE80 Full (Band Edge @ 3m)**

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2+3+4		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
<b>802.11ax HE80 Full CH 42 5210MHz</b>		5150.02	58.53	-91.47	150	44.04	33	10.96	29.47	229	360	P	H
		5149.5	49.92	-4.08	54	35.43	33	10.96	29.47	229	360	A	H
	*	5210	104.75	-	-	90.33	32.98	10.97	29.53	229	360	P	H
	*	5210	97.22	-	-	82.8	32.98	10.97	29.53	229	360	A	H
		5391.4	53.66	-20.34	74	39.32	32.9	11.14	29.7	229	360	P	H
		5351.36	41.79	-12.21	54	27.45	32.9	11.1	29.66	229	360	A	H
		5142.74	63.76	-10.24	74	49.26	33	10.96	29.46	190	81	P	V
		5141.96	53.53	-0.47	54	39.03	33	10.96	29.46	190	81	A	V
	*	5210	112.78	-	-	98.36	32.98	10.97	29.53	190	81	P	V
	*	5210	103.45	-	-	89.03	32.98	10.97	29.53	190	81	A	V
		5388.32	52.97	-21.03	74	38.63	32.9	11.14	29.7	190	81	P	V
	5351.08	42.52	-11.48	54	28.18	32.9	11.1	29.66	190	81	A	V	
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 8 - 6875~7125MHz  
WIFI 802.11a (Band Edge @ 3m)**

WIFI Ant. 5+6+7+8	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)
802.11a CH 233 7115MHz	*	7115	105.15	-	-	86.05	36.49	13.05	30.44	207	273	P	H
	*	7115	98.69	-	-	79.59	36.49	13.05	30.44	207	273	A	H
		7125	70.79	-17.41	88.2	51.62	36.55	13.06	30.44	207	273	P	H
		7125	63.64	-4.56	68.2	44.47	36.55	13.06	30.44	207	273	A	H
													H
													H
	*	7115	108.8	-	-	89.67	36.52	13.05	30.44	224	223	P	V
	*	7115	103.06	-	-	83.96	36.49	13.05	30.44	224	223	A	V
		7125	74.52	-13.68	88.2	55.35	36.55	13.06	30.44	224	223	P	V
		7125	67.81	-0.39	68.2	48.64	36.55	13.06	30.44	224	223	A	V
													V
													V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz + Band 1 - 5150~5250MHz + Band 8 - 6875~7125MHz

WIFI (2.4GHz) 802.11ax HE40\_Tx\_Ch06 + WIFI (5GHz) 802.11ax HE80\_Tx\_Ch42 + WIFI (6GHz) 802.11a\_Tx\_Ch233 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4+5+6+7+8	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)
		4874	54.55	-19.45	74	40.02	32.65	11.35	29.47	100	316	P	H
		4874	43.14	-10.86	54	28.61	32.65	11.35	29.47	100	316	A	H
		7311	60.97	-13.03	74	41.12	36.88	13.5	30.53	301	36	P	H
		7311	49.43	-4.57	54	29.58	36.88	13.5	30.53	301	36	A	H
		10420	47.8	-40.4	88.2	60.34	38.7	15.89	67.13	-	-	P	H
		14230	53.31	-34.89	88.2	59.21	41.04	19.2	66.14	200	152	P	H
		14230	48.42	-19.78	68.2	54.32	41.04	19.2	66.14	200	152	P	H
		15630	49.04	-24.96	74	58.85	37.28	19.66	66.75	138	206	P	H
		15630	43.92	-10.08	54	53.73	37.28	19.66	66.75	138	206	A	H
		20840	45.21	-28.79	74	65.49	37.74	-3.19	54.83	150	175	P	H
		20840	43.46	-10.54	54	63.74	37.74	-3.19	54.83	150	175	A	H
		21345	35.87	-38.13	74	55.76	38.05	-3.14	54.8	-	-	P	H
		4874	54.64	-19.36	74	40.11	32.65	11.35	29.47	100	360	P	V
		4874	43.15	-10.85	54	28.62	32.65	11.35	29.47	100	360	A	V
		7311	60.55	-13.45	74	40.7	36.88	13.5	30.53	199	0	P	V
		7311	49.44	-4.56	54	29.59	36.88	13.5	30.53	199	0	A	V
		10420	46.95	-41.25	88.2	59.49	38.7	15.89	67.13	-	-	P	V
		14230	49.97	-38.23	88.2	55.87	41.04	19.2	66.14	-	-	P	V
		15630	46.48	-27.52	74	56.29	37.28	19.66	66.75	-	-	P	V
		21345	36.59	-37.41	74	56.48	38.05	-3.14	54.8	-	-	P	V
													V
													V
													V
													V
<b>Remark</b>	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> <li>The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.</li> </ol>												



Emission below 1GHz

WIFI (2.4GHz) 802.11ax HE40\_Tx\_Ch06 + WIFI (5GHz) 802.11ax HE80\_Tx\_Ch42 + WIFI (6GHz) 802.11a\_Tx\_Ch233 (LF @ 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+3+4+5+6+7+8		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)	
WIFI (2.4GHz) 802.11ax HE40_Tx_Ch06 + WIFI (5GHz) 802.11ax HE80_Tx_Ch42 + WIFI (6GHz) 802.11a_Tx_Ch233		33.78	21.68	-18.32	40	30.71	22.62	0.55	32.2	200	0	P	H	
		99.66	23.35	-20.15	43.5	38.14	15.9	1.54	32.23	200	0	P	H	
		141.51	29.05	-14.45	43.5	42.07	17.42	1.83	32.27	200	0	P	H	
		487.6	25.67	-20.33	46	31.07	23.73	3.4	32.53	100	0	P	H	
		706	28.41	-17.59	46	30.66	26.19	4.1	32.54	100	0	P	H	
		868.4	31.76	-14.24	46	30.55	28.57	4.6	31.96	100	0	P	H	
														H
														H
														H
														H
														H
			34.05	27.76	-12.24	40	36.9	22.51	0.55	32.2	200	0	P	V
			151.5	28.12	-15.38	43.5	41.42	17.09	1.89	32.28	200	0	P	V
			188.22	26.08	-17.42	43.5	41.39	14.9	2.11	32.32	200	0	P	V
			624.8	28.14	-17.86	46	30.99	25.89	3.88	32.62	100	0	P	V
			799.8	34.49	-11.51	46	34.98	27.55	4.38	32.42	100	0	P	V
			894.3	34.02	-11.98	46	32.59	28.54	4.66	31.77	100	0	P	V
														V
													V	
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>Margin</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



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+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11a		5925	55.45	-32.75	88.2	54.51	32.22	4.58	35.86	103	308	P	H
CH 01		5925	43.54	-24.66	68.2	42.6	32.22	4.58	35.86	103	308	A	H
5955MHz													

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 @ 5925MHz:**

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)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -32.75(dB)

**For Average Limit @ 5925MHz:**

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)  
= -24.66(dB)

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



## Appendix B. Radiated Spurious Emission Plots

Test Engineer :	Andy Yang, Gary Guo and Steven Wu	Temperature :	20~25°C
		Relative Humidity :	50~65%

### Note symbol

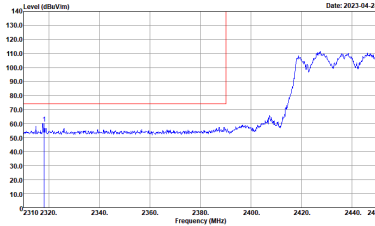
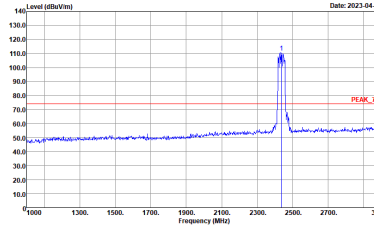
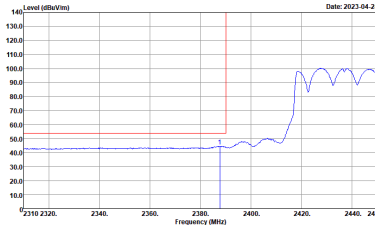
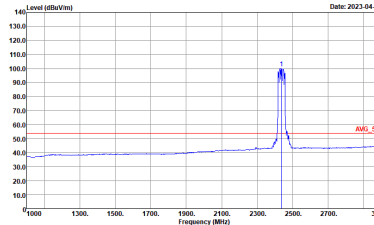
-L	Low channel location
-R	High channel location



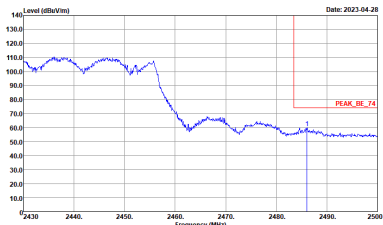
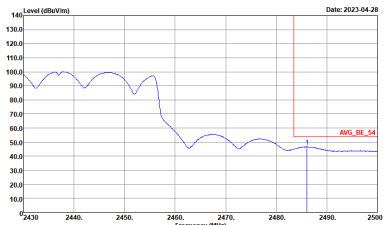


2.4GHz 2400~2483.5MHz

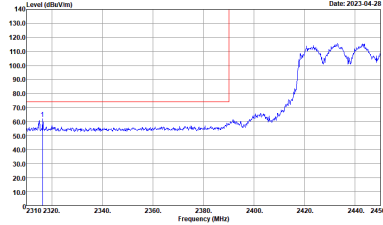
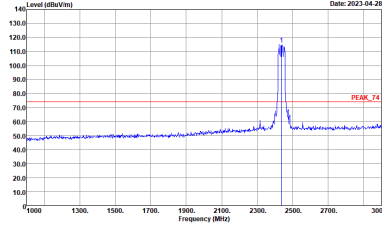
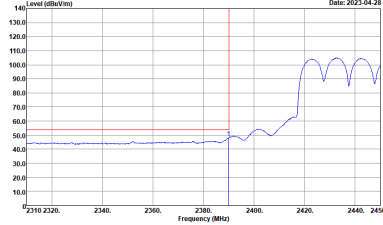
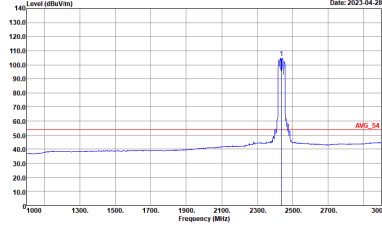
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Ant.	802.11ax HE40 Full CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak	 <p>Site : 03CH16-1FY Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Site : 03CH16-1FY Condition : PEAK_74 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-1FY Condition : AVG_BE_54 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000kHz VBW:0.180kHz SWT:Auto</p>	 <p>Site : 03CH16-1FY Condition : AVG_54 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000kHz VBW:0.180kHz SWT:Auto</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Ant.	802.11ax HE40 Full CH06 2437MHz - R	
1+2	Horizontal	Fundamental
<p><b>Peak</b></p>	 <p>Site : 03CH16-11Y Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Left blank</p>
<p><b>Avg.</b></p>	 <p>Site : 03CH16-11Y Condition : AVG_BE_54 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:0.180KHz SWT:Auto</p>	<p>Left blank</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Ant.	802.11ax HE40 Full CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak	 <p>Site : 03CH16-1FY Condition : PEAK_BE_74 3m 91200_1522_230323 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-1FY Condition : PEAK_74 3m 91200_1522_230323 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-1FY Condition : AVG_BE_54 3m 91200_1522_230323 VERTICAL RBW:1000.000KHz VBW:0.180KHz SWT:Auto</p>	 <p>Site : 03CH16-1FY Condition : AVG_54 3m 91200_1522_230323 VERTICAL RBW:1000.000KHz VBW:0.180KHz SWT:Auto</p>

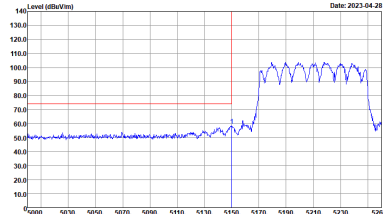
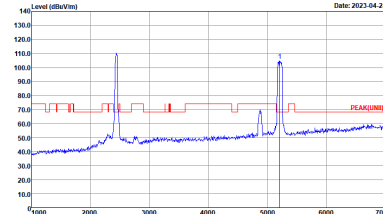
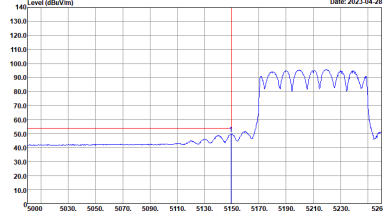
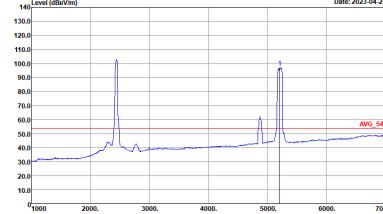


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Ant.	802.11ax HE40 Full CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CH16-11Y Condition : PEAK_BE_74 3m 91200_1522_230323 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	<p>Site : 03CH16-11Y Condition : AVG_BE_54 3m 91200_1522_230323 VERTICAL RBW:1000.000KHz VBW:0.180KHz SWT:Auto</p>	Left blank

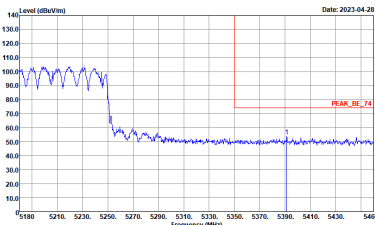
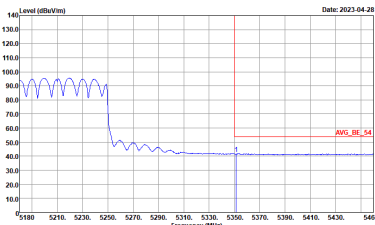


Band 1 - 5150~5250MHz

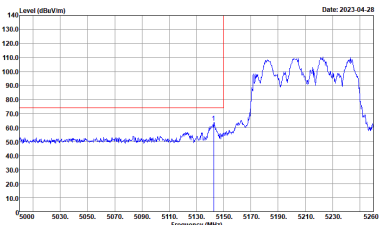
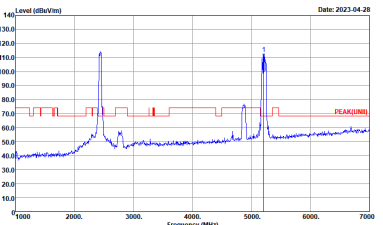
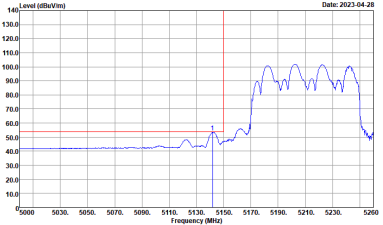
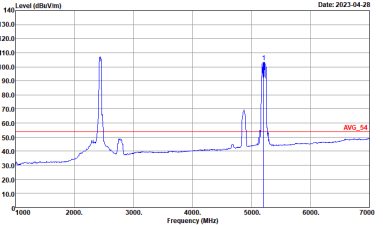
WIFI 802.11ax HE80 Full (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - L	
1+2+3+4	Horizontal	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:0.200KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:0.200KHz SWT:Auto</p>



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - R	
1+2+3+4	Horizontal	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL : 88W:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 HORIZONTAL : 88W:1000.000KHz VBW:0.200KHz SWT:Auto</p>	Left blank



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - L	
1+2+3+4	Vertical	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:0.200KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:0.200KHz SWT:Auto</p>

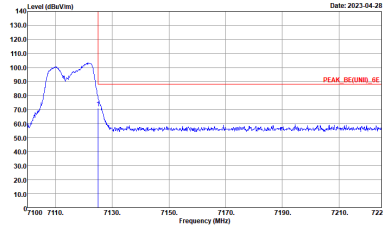
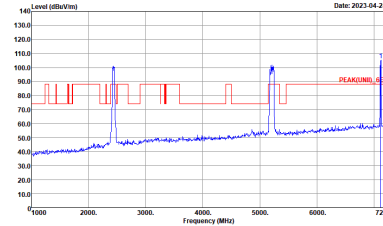
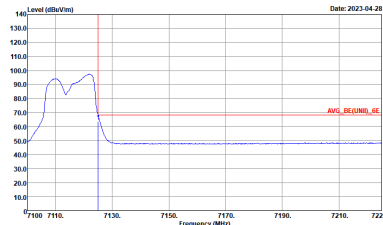
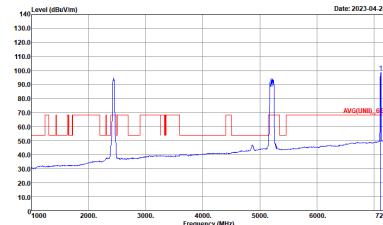


WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE80 Full CH42 5210MHz - R	
1+2+3+4	Vertical	Fundamental
<p style="text-align: center;"><b>Peak</b></p>	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 VERTICAL : 88W:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p style="text-align: center;">Left blank</p>
<p style="text-align: center;"><b>Avg.</b></p>	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 VERTICAL : 88W:1000.000KHz VBW:0.200KHz SWT:Auto</p>	<p style="text-align: center;">Left blank</p>

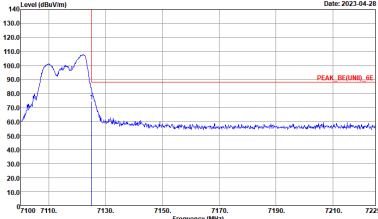
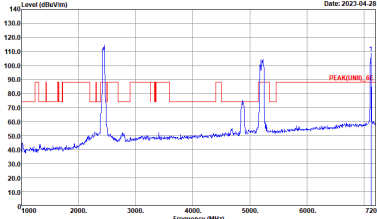
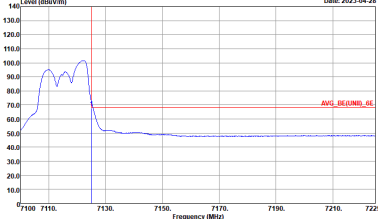
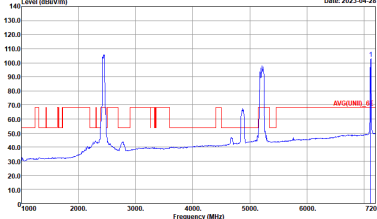




**Band 8 - 6875~7125MHz**  
**WIFI 802.11a (Band Edge @ 3m)**

WIFI	Band 8 6875~7125MHz Band Edge @ 3m	
ANT	802.11a CH233 7115MHz	
5+6+7+8	Horizontal	Fundamental
<b>Peak</b>	 <p>Site : 03CH16-HY            Condition : PEAK_BE(UNIT1)_6E 3m 91200_1522_230323 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY            Condition : PEAK(UNIT1)_6E 3m 91200_1522_230323 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
<b>Avg.</b>	 <p>Site : 03CH16-HY            Condition : AVG_BE(UNIT1)_6E 3m 91200_1522_230323 HORIZONTAL            : RBW:1000.000KHz VBW:0.510KHz SWT:Auto</p>	 <p>Site : 03CH16-HY            Condition : AVG(UNIT1)_6E 3m 91200_1522_230323 HORIZONTAL            : RBW:1000.000KHz VBW:0.510KHz SWT:Auto</p>



WIFI	Band 8 6875~7125MHz Band Edge @ 3m	
ANT	802.11a CH233 7115MHz	
5+6+7+8	Vertical	Fundamental
Peak	 <p>Level (dBm/100MHz) vs Frequency (MHz) for Vertical. Peak at 7115 MHz. Date: 2023-04-28</p> <p>Site : 03CH16-HY Condition : PEAK_BE(UNIT1)_6E 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Level (dBm/100MHz) vs Frequency (MHz) for Fundamental. Peak at 7115 MHz. Date: 2023-04-28</p> <p>Site : 03CH16-HY Condition : PEAK(UNIT1)_6E 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Level (dBm/100MHz) vs Frequency (MHz) for Vertical. Avg at 7115 MHz. Date: 2023-04-28</p> <p>Site : 03CH16-HY Condition : AVG_BE(UNIT1)_6E 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:0.510KHz SWT:Auto</p>	 <p>Level (dBm/100MHz) vs Frequency (MHz) for Fundamental. Avg at 7115 MHz. Date: 2023-04-28</p> <p>Site : 03CH16-HY Condition : AVG(UNIT1)_6E 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:0.510KHz SWT:Auto</p>

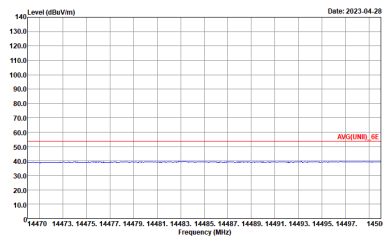
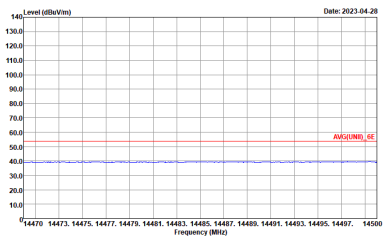
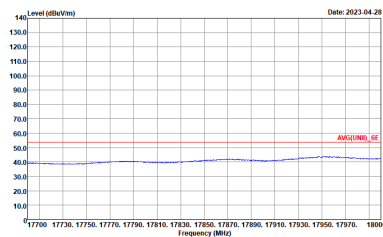
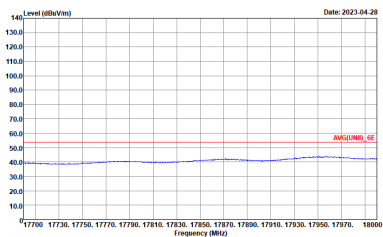


2.4GHz 2400~2483.5MHz + Band 1 - 5150~5250MHz + Band 8 - 6875~7125MHz

WIFI (2.4GHz) 802.11ax HE40\_Tx\_Ch06 + WIFI (5GHz) 802.11ax HE80\_Tx\_Ch42 + WIFI (6GHz)  
802.11a\_Tx\_Ch233 (Harmonic @ 3m)

WIFI	Band 8 6875~7125MHz Harmonic @ 3m	
ANT	802.11a CH233 7115MHz	
5+6+7+8	Horizontal	Vertical
<p><b>Peak</b></p> <p><b>Avg.</b></p>	<p>Site : 03CH16-HY Condition : PEAK(UNII)_6E 1m SHF_993_1124 HORIZONTAL Detector : Peak Project : 330612</p>	<p>Site : 03CH16-HY Condition : PEAK(UNII)_6E 1m SHF_993_1124 VERTICAL Detector : Peak Project : 330612</p>



WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ax HE80 Full CH 42 5210MHz	
1+2+3+4	Horizontal	Vertical
<p><b>14.47G</b> <b>~14.5G</b> <b>Avg.</b></p>	 <p>Site : 03CH16-HY Condition : AVG(LINE)_6E 3m 91200_1522_230323 HORIZONTAL Detector : Peak Project : 330612</p>	 <p>Site : 03CH16-HY Condition : AVG(LINE)_6E 3m 91200_1522_230323 VERTICAL Detector : Peak Project : 330612</p>
<p><b>17.7G</b> <b>~18G</b> <b>Avg</b></p>	 <p>Site : 03CH16-HY Condition : AVG(LINE)_6E 3m 91200_1522_230323 HORIZONTAL Detector : Peak Project : 330612</p>	 <p>Site : 03CH16-HY Condition : AVG(LINE)_6E 3m 91200_1522_230323 VERTICAL Detector : Peak Project : 330612</p>



Emission below 1GHz

WIFI (2.4GHz) 802.11ax HE40\_Tx\_Ch06 + WIFI (5GHz) 802.11ax HE80\_Tx\_Ch42 + WIFI (6GHz) 802.11a\_Tx\_Ch233 (LF @ 3m)

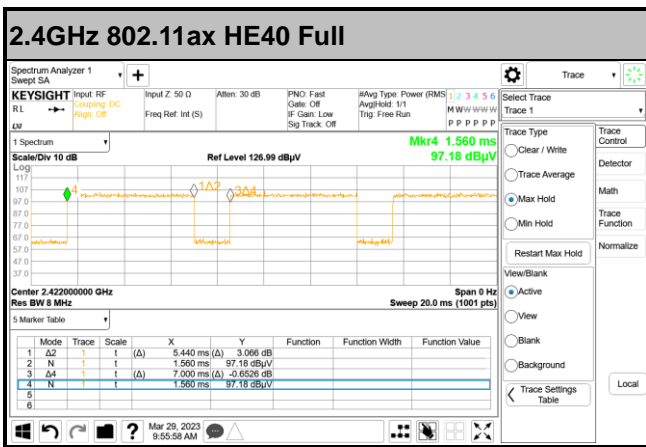
WIFI	WIFI (2.4GHz) 802.11ax HE40_Tx_Ch06+WIFI (5GHz) 802.11ax HE80_Tx_Ch42+WIFI (6GHz) 802.11a_Tx_Ch233	
ANT	802.11a LF	
1+2+3+4+5+6+7+8	Horizontal	Vertical
QP / Peak		



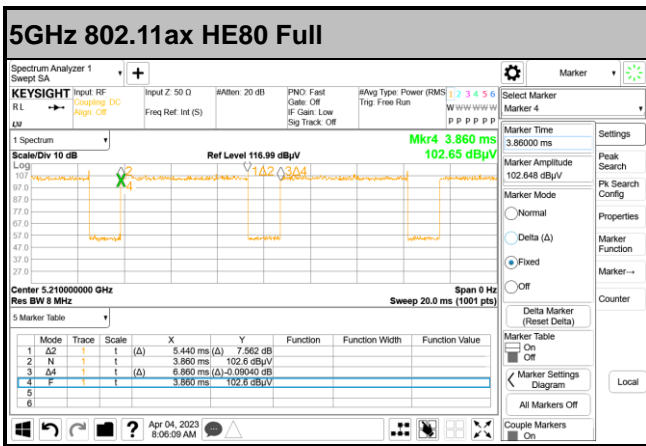
## Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1+2	2.4GHz 802.11ax HE40 Full	77.71	5440	0.18	300Hz
1+2+3+4	5GHz 802.11ax HE80 Full	79.30	5440	0.18	300Hz
5+6+7+8	6GHz 802.11a	96.58	1975	510Hz	

### MIMO <Ant. 1+2>



### MIMO <Ant. 1+2+3+4>





MIMO <Ant. 5+6+7+8>

