FCC CO-LOCATION RADIO TEST REPORT

FCC ID	:	TVE-110T17
Equipment	:	Bluetooth Low Energy Module
Brand Name	:	FORTINET
Model Name	:	FBLE-2024TI
Applicant	:	Fortinet Inc. 909 Kifer Rd., Sunnyvale, CA 94086, United States
Manufacturer	:	Fortinet Inc. 909 Kifer Rd., Sunnyvale, CA 94086, United States
Standard	:	FCC Part 15 Subpart C §15.247 FCC Part 15 Subpart E §15.407

The product was received on Mar. 22, 2024 and testing was performed from Jul. 23, 2024 to Jul. 24, 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 report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

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

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History of this test report

Report No.	Version	Description	Issue Date
FR3D0610-01B	01	Initial issue of report	Jul. 31, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(d) 15.407(b)	Unwanted Emissions	Pass	2.56 dB under the limit at 7440.00 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: Yun Huang

Report Producer: Michelle Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
SKU 1	FWF-50G-5G, FWF-51G-5G, FWF-50G-SFP, FWF-51G-SFP
SKU 2	FG-50G-5G, FG-51G-5G, FG-50G-SFP, FG-51G-SFP
Installed into the Host	Equipment Name: Network Security Gateway Brand Name: FORTINET Model Name: FortiGate 50Gxxxxxxxxxx, FORTIGATE-50Gxxxxxxxxxx, FG-50Gxxxxxxxxxx, FortiGate 51Gxxxxxxxxxx, FORTIGATE-51Gxxxxxxxxxx, FG-51Gxxxxxxxxxx, FortiGate 50G-SFPxxxxxxxxxx, FORTIGATE-50G-SFPxxxxxxxxxx, FG-50G-SFPxxxxxxxxxx, FortiGate 51G-SFPxxxxxxxxxx, FORTIGATE-51G-SFPxxxxxxxxxx, FG-51G-SFPxxxxxxxxxx, FortiWifi 50Gxxxxxxxxxx, FORTIWIFI-50Gxxxxxxxxxx, FWF-50Gxxxxxxxxxx, FortiWifi 51Gxxxxxxxxxx, FORTIWIFI-51Gxxxxxxxxxx, FWF-51Gxxxxxxxxxx, FortiWiFi 50G-SFPxxxxxxxxxx, FORTIWIFI-50G-SFPxxxxxxxxxx, FWF-50G-SFPxxxxxxxxxx, FortiWiFi 51G-SFPxxxxxxxxxx, FORTIWIFI-51G-SFPxxxxxxxxxx, FWF-51G-SFPxxxxxxxxxx (where "x" can be used as "A-Z", or "0-9", or "-", or blank for software purposes or marketing purposes only) Marketing Name: FortiGate 50G, FortiGate 51G, FortiGate 50G-SFP, FortiGate 51G-SFP, FortiWiFi 50G, FortiWiFi 51G, FortiWiFi 50G-SFP, FortiWiFi 51G-SFP
General Specs	Bluetooth-LE
Antenna Type	Monopole

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	1.53

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

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.**
	03CH15-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 Part 15 Subpart C §15.247
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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 (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

2.1 Carrier Frequency and Channel

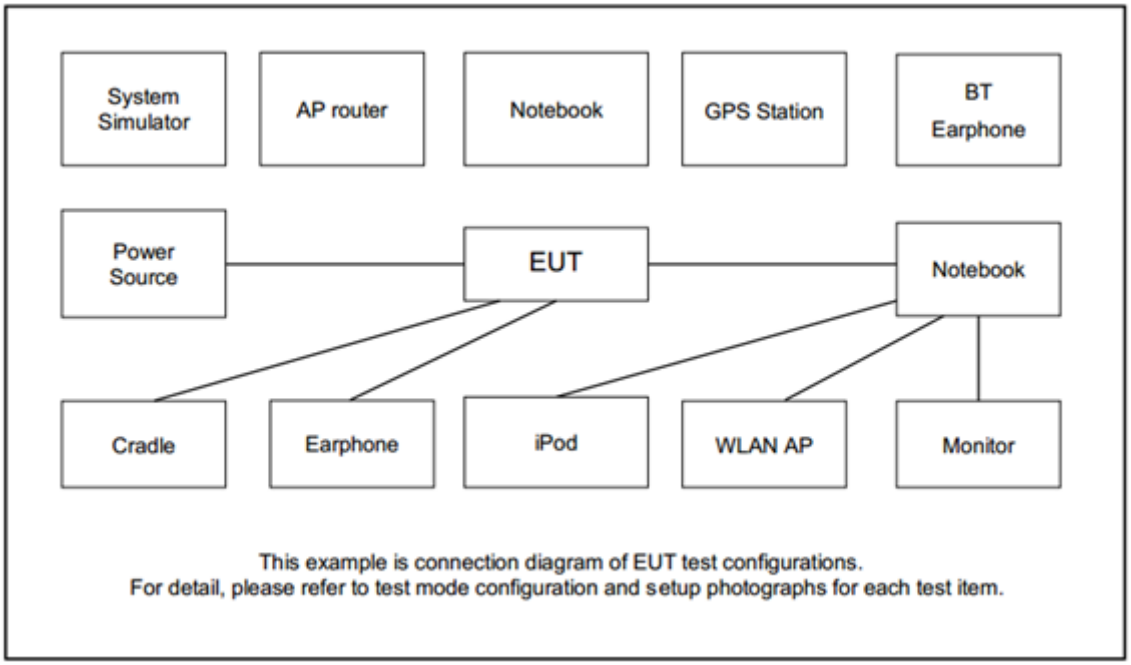
2400-2483.5 MHz			
Bluetooth - LE		802.11ax HE20	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
39	2480	1	2412

<Co-Location>

Modulation	Data Rate
2.4GHz Bluetooth-LE GFSK <Ant. 1> + 2.4GHz 802.11ax HE20 for MIMO <Ant. 1+2>	500kbps + MCS0

Remark: All the tests were performed with SKU 1.

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	MPNXB2A260EX	PD9AX201NG	N/A	N/A

2.4 EUT Operation Test Setup

The RF test items, utility “Tera Term Version 4.95” 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) Unwanted spurious emissions fallen 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

(2) 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) Use the following spectrum analyzer settings:

For average measurement:

The procedure for method trace averaging is as follows:

a) RBW = 1 MHz.

b) VBW ≥ [3 × RBW].

c) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.

d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging.

e) Sweep time = auto.

f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / *D*, where *D* is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

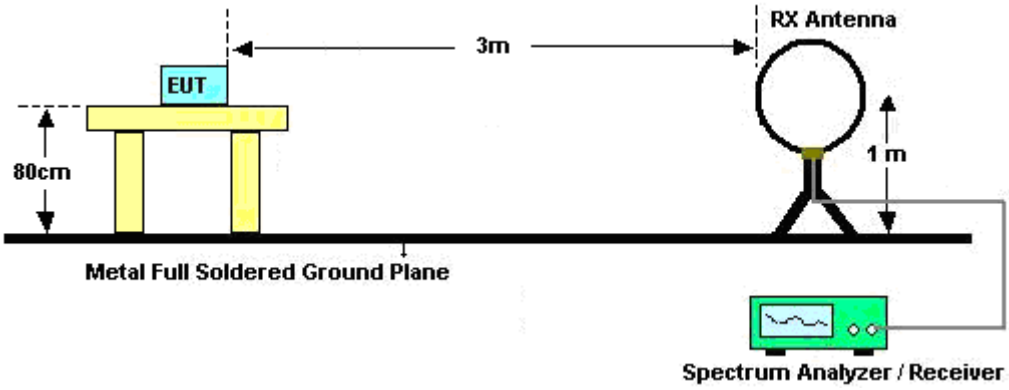
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / *D*)], where *D* is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

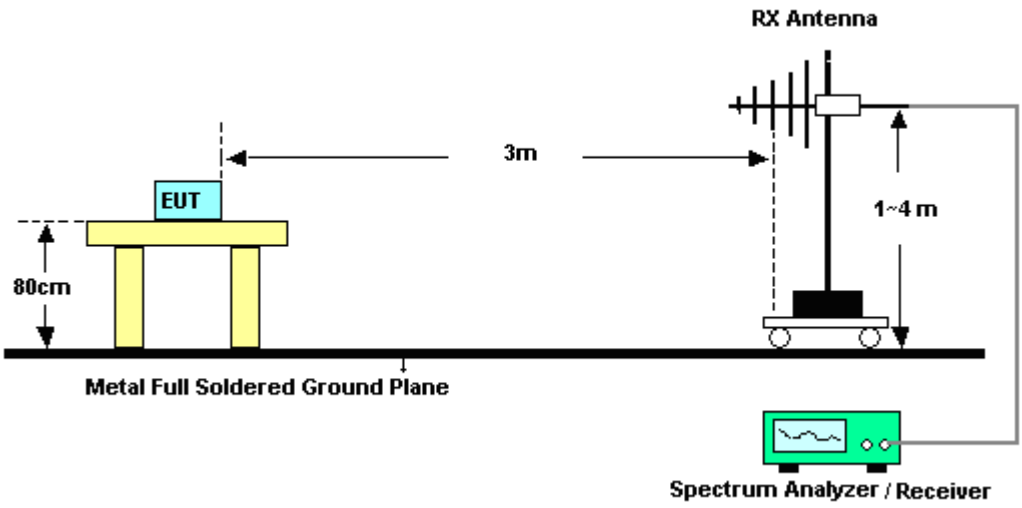
2) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

3.1.4 Test Setup

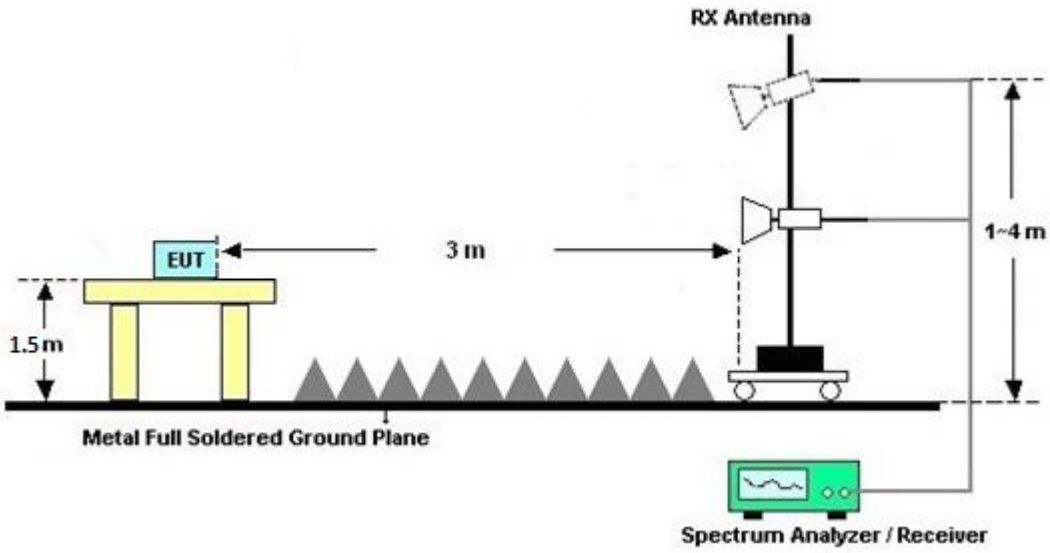
For radiated emissions below 30MHz



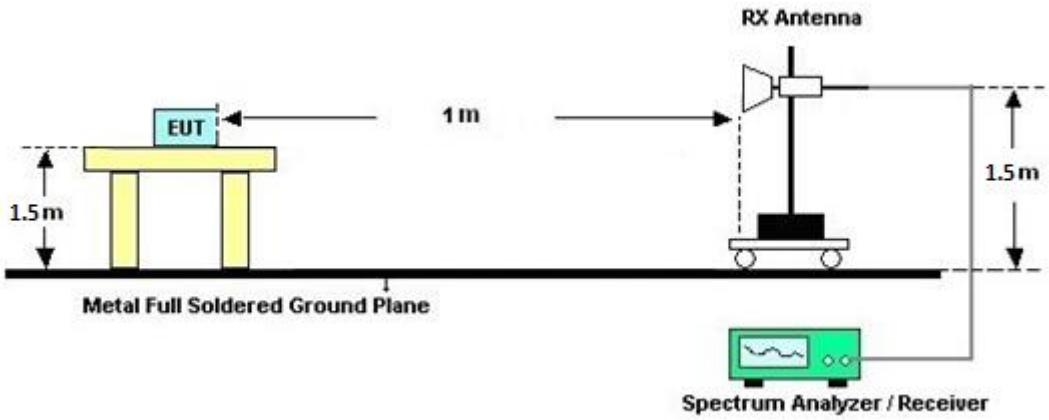
For radiated emissions from 30MHz to 1GHz



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.

3.1.7 Duty Cycle

Please refer to Appendix B.

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

Please refer to Appendix A.

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
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	Jul. 23, 2024~ Jul. 24, 2024	Sep. 11, 2024	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	41912 & 05	30MHz~1GHz	Feb. 04, 2024	Jul. 23, 2024~ Jul. 24, 2024	Feb. 03, 2025	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 25, 2023	Jul. 23, 2024~ Jul. 24, 2024	Dec. 24, 2024	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02294	1GHz~18GHz	Jul. 20, 2024	Jul. 23, 2024~ Jul. 24, 2024	Jul. 19, 2025	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May.18, 2024	Jul. 23, 2024~ Jul. 24, 2024	May 17, 2025	Radiation (03CH15-HY)
Preamplifier	EMEC	EM01G18G	060837	1GHz~18GHz	Feb. 15, 2024	Jul. 23, 2024~ Jul. 24, 2024	Feb. 14, 2025	Radiation (03CH15-HY)
Preamplifier	EM Electronics	EM01G18G	060802	1GHz~18GHz	Feb. 29, 2024	Jul. 23, 2024~ Jul. 24, 2024	Feb. 28, 2025	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	May 27, 2024	Jul. 23, 2024~ Jul. 24, 2024	May 26, 2025	Radiation (03CH15-HY)
Spectrum Analyzer	Keysight	N9010B	MY60241058	10Hz~44GHz	Jul. 11, 2024	Jul. 23, 2024~ Jul. 24, 2024	Jul. 10, 2025	Radiation (03CH15-HY)
Hygrometer	TECPEL	DTM-302	SN4	N/A	Sep. 08, 2023	Jul. 23, 2024~ Jul. 24, 2024	Sep. 07, 2024	Radiation (03CH15-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Jul. 23, 2024~ Jul. 24, 2024	N/A	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jul. 23, 2024~ Jul. 24, 2024	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jul. 23, 2024~ Jul. 24, 2024	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.09824_2019122	RK-002348	N/A	N/A	Jul. 23, 2024~ Jul. 24, 2024	N/A	Radiation (03CH15-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN4	3GHz High Pass Filter	Jun. 05, 2024	Jul. 23, 2024~ Jul. 24, 2024	Jun. 04, 2025	Radiation (03CH15-HY)
Filter	Wainwright	WLJ4-1000-1530-6000-40ST	SN4	1.53GHz Low Pass Filter	Jun. 05, 2024	Jul. 23, 2024~ Jul. 24, 2024	Jun. 04, 2025	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY582185/4,519228/2,803950/2	N/A	Jun. 11, 2024	Jul. 23, 2024~ Jul. 24, 2024	Jun. 10, 2025	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804011/2,804012/2	18-40G	Jan. 02, 2024	Jul. 23, 2024~ Jul. 24, 2024	Jan. 01, 2025	Radiation (03CH15-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))	6.3 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.5 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.5 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.4 dB

Appendix A. Radiated Spurious Emission Test Data

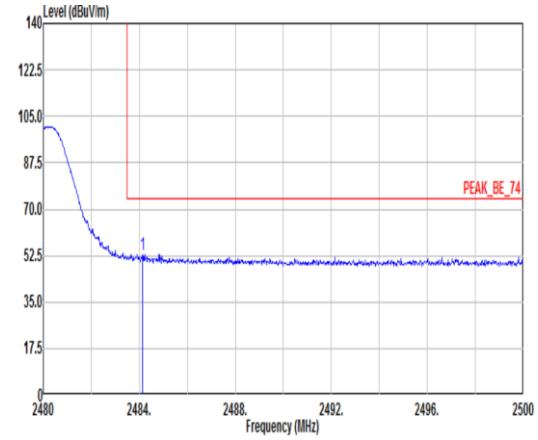
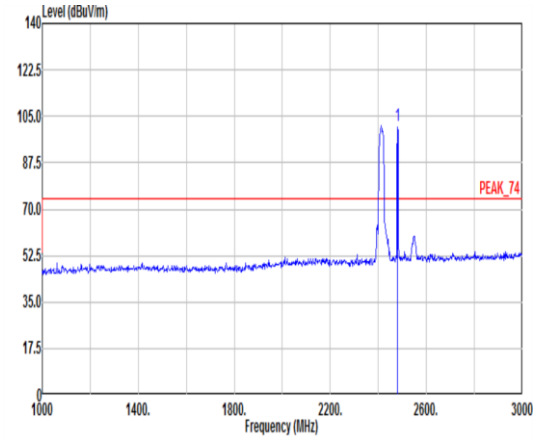
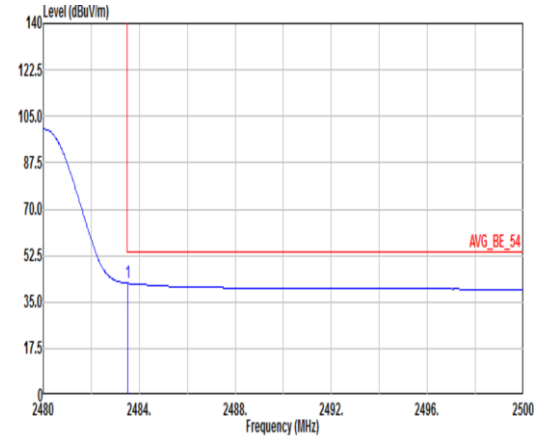
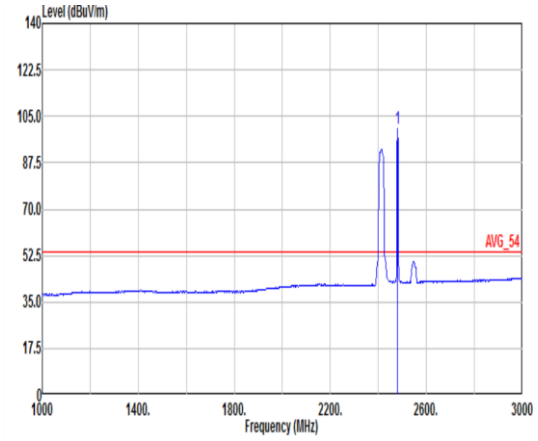
Test Engineer :	Quentin Liu and Bigshow Wang	**Temperature :**	22.4~22.6°C
		Relative Humidity :	50~56%

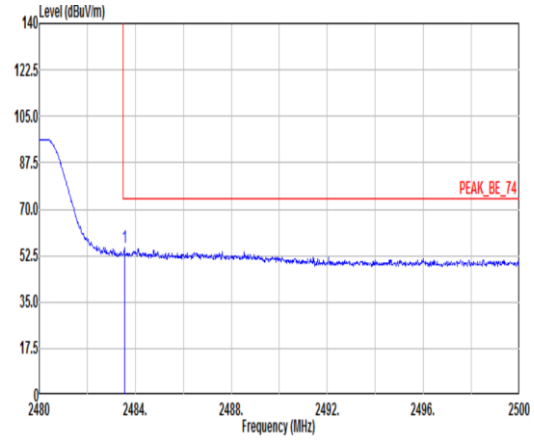
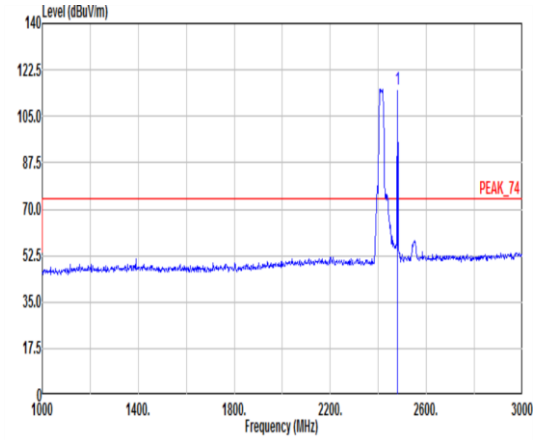
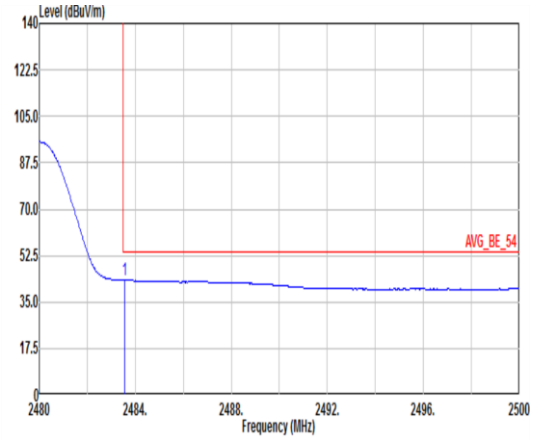
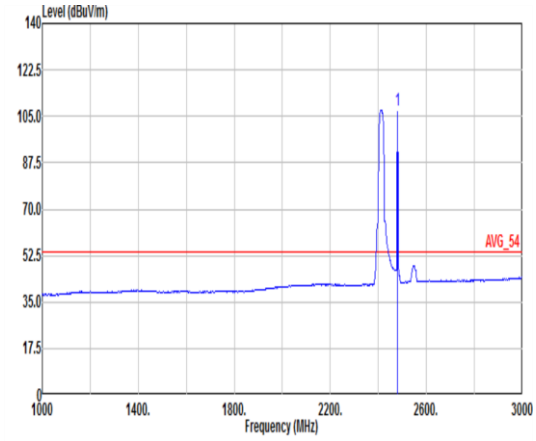
A1. Radiated Spurious Emission Test Modes

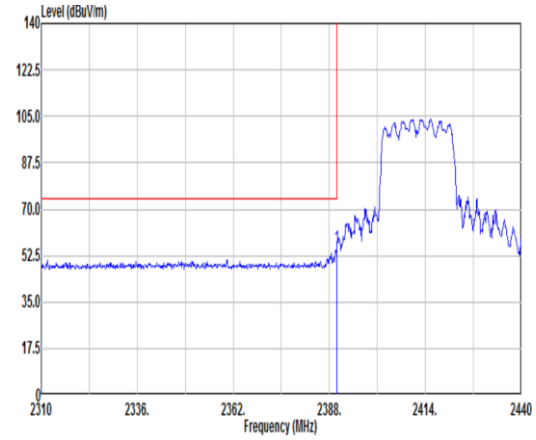
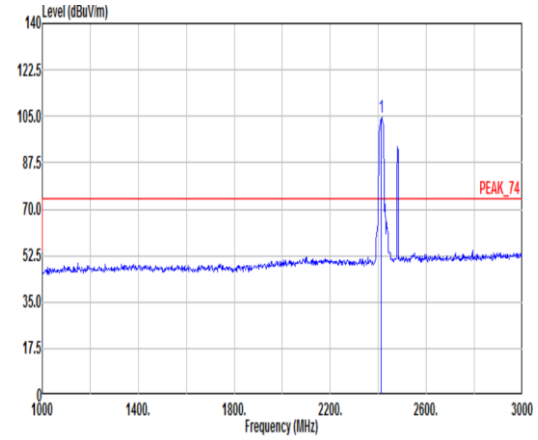
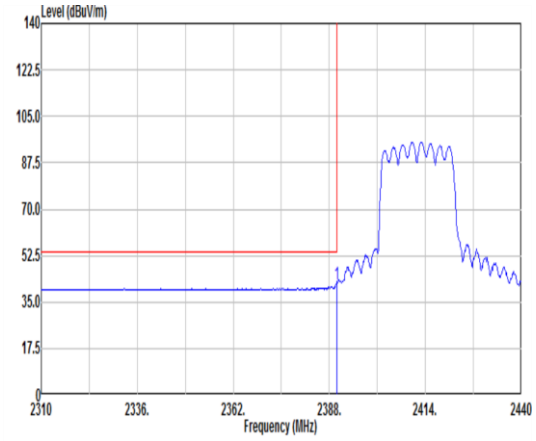
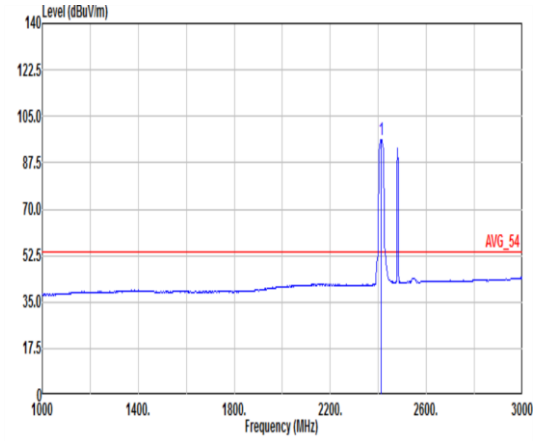
Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	BT Ant 1	Bluetooth-LE_GFSK	39	2480	500kbps	-	-
	2400-2483.5	WLAN Ant 1+2	802.11ax HE20	1	2412	MCS0		

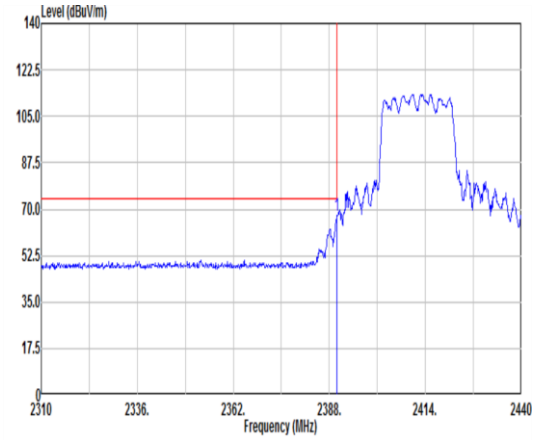
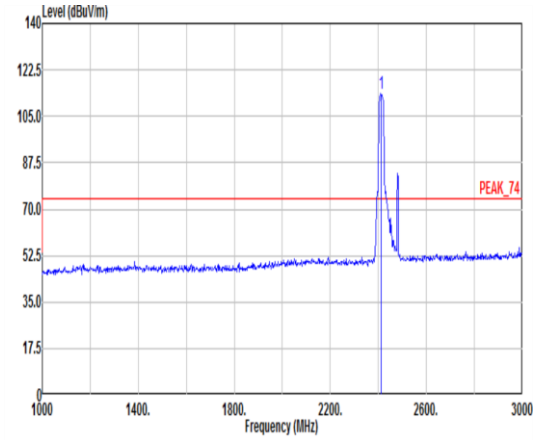
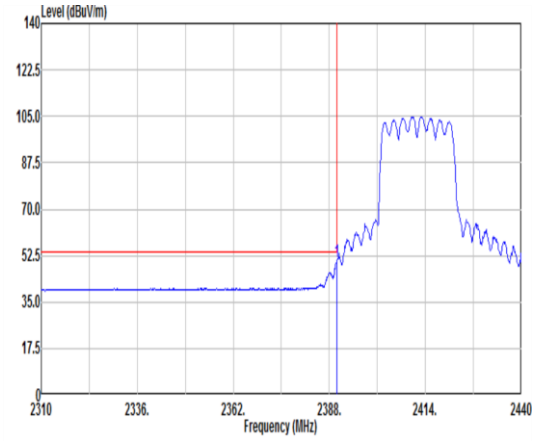
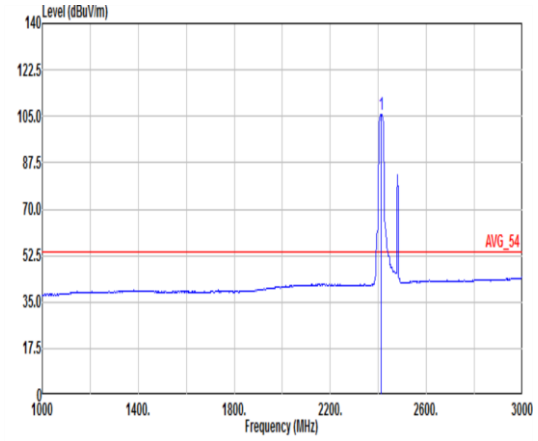
A2. Summary of each worse mode

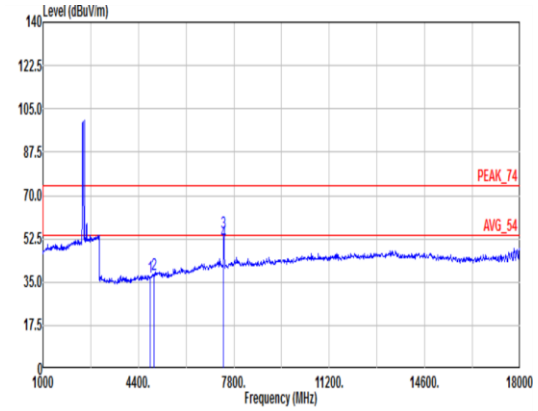
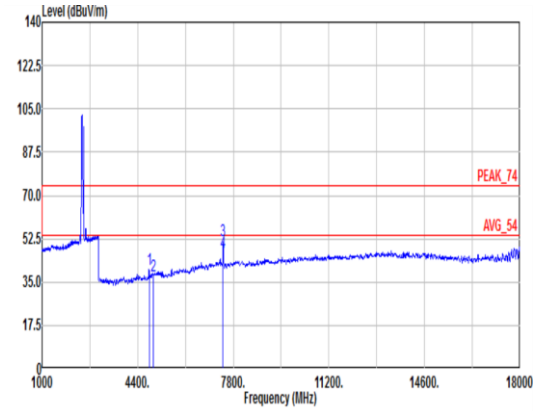
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	RU	Remark
1	Bluetooth-LE_GSFK + 802.11ax	39 + 01	2389.95	50.3	54	-3.7	V	Avg.	Pass	-	Band Edge
			7440	51.44	54	-2.56	H	Avg.	Pass	-	Harmonic

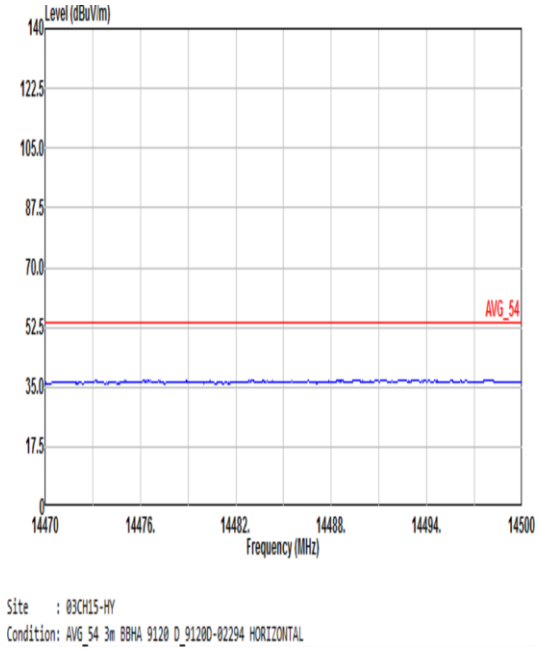
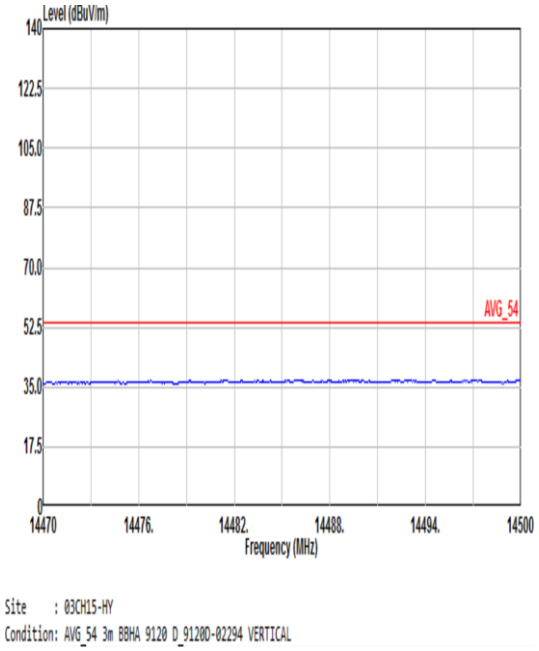
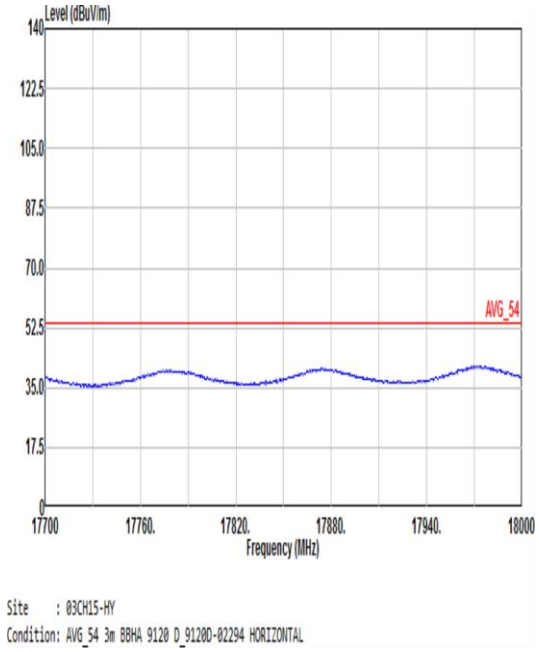
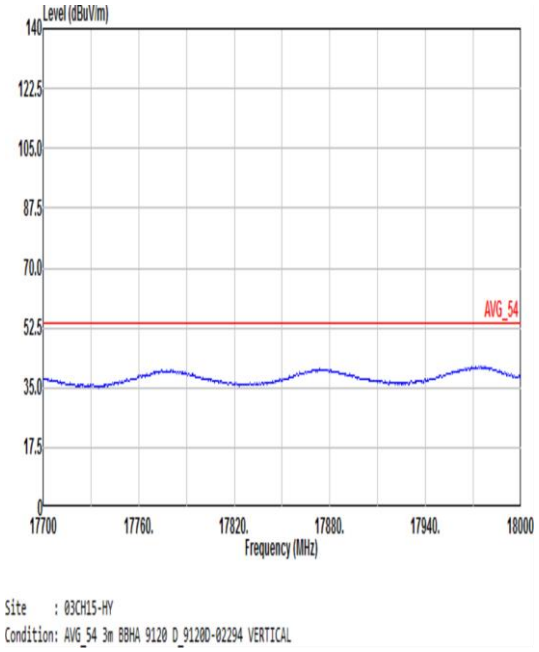
Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth-LE_GFSK _CH39_2480MHz	
ANT	BT Ant 1	
Pol.	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition: PEAK_BE_74 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2484.14 53.07 74.00 -20.93 46.04 27.80 5.77 36.46 9.92 100 122 PEAK	 Site : 03CH15-HY Condition: PEAK_74 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2480.00 101.29 ------ ------ 94.73 27.45 5.67 36.48 9.92 100 122 PEAK
Avg	 Site : 03CH15-HY Condition: AVG_BE_54 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.52 42.03 54.00 -11.97 35.00 27.80 5.77 36.46 9.92 100 122 AVERAGE	 Site : 03CH15-HY Condition: AVG_54 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2480.00 100.54 ------ ------ 93.54 27.78 5.76 36.46 9.92 100 122 AVERAGE

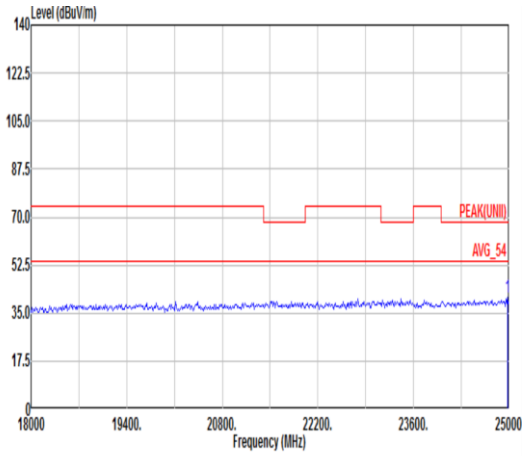
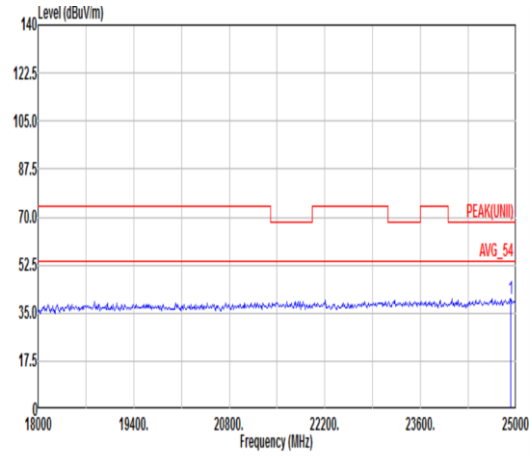
Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth-LE_GFSK _CH39_2480MHz	
ANT	BT Ant 1	
Pol.	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition: PEAK_BE_74 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark 1 2483.54 55.35 74.00 -18.65 48.32 27.80 5.77 36.46 9.92 349 356 PEAK	 Site : 03CH15-HY Condition: PEAK_74 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark 1 2480.00 115.05 ------ ------ 108.51 27.44 5.66 36.48 9.92 349 356 PEAK
Avg	 Site : 03CH15-HY Condition: AVG_BE_54 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark 1 2483.54 43.15 54.00 -10.85 36.12 27.80 5.77 36.46 9.92 349 356 AVERAGE	 Site : 03CH15-HY Condition: AVG_54 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark 1 2480.00 107.39 ------ ------ 100.85 27.44 5.66 36.48 9.92 349 356 AVERAGE

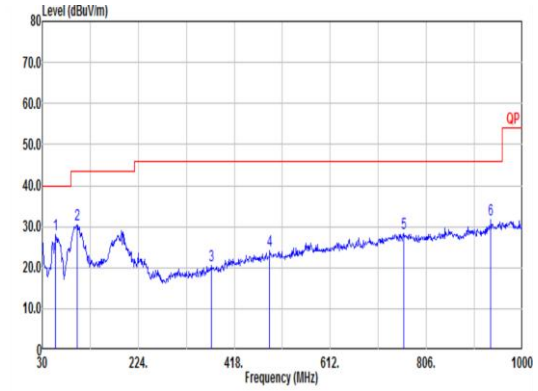
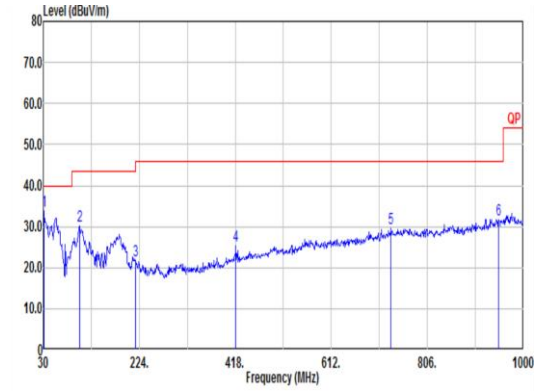
Mode	1	
	Band Edge	
	2400-2483.5_802.11ax HE20_CH01_2412MHz	
ANT	WLAN Ant 1+2	
Pol.	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition: PEAK_BE_74 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2389.95 55.61 74.00 -18.39 49.15 27.38 5.64 36.48 9.92 245 208 PEAK	 Site : 03CH15-HY Condition: PEAK_74 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2412.00 104.68 ------ ------ 98.11 27.46 5.67 36.48 9.92 245 208 PEAK
Avg	 Site : 03CH15-HY Condition: AVG_BE_54 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:1.100kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2389.95 41.91 54.00 -12.09 35.45 27.38 5.64 36.48 9.92 245 208 AVERAGE	 Site : 03CH15-HY Condition: AVG_54 3m BBHA 9120 D_9120D-02294 HORIZONTAL : RBW:1000.000kHz VBW:1.100kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2412.00 96.22 ------ ------ 89.68 27.44 5.66 36.48 9.92 245 208 AVERAGE

Mode	1	
	Band Edge	
	2400-2483.5_802.11ax HE20_CH01_2412MHz	
ANT	WLAN Ant 1+2	
Pol.	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition: PEAK_BE_74 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2389.95 67.46 74.00 -6.54 61.00 27.38 5.64 36.48 9.92 263 166 PEAK	 Site : 03CH15-HY Condition: PEAK_74 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2412.00 113.44 ------ ------ 106.90 27.44 5.66 36.48 9.92 263 166 PEAK
Avg	 Site : 03CH15-HY Condition: AVG_BE_54 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:1.100kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2389.95 50.30 54.00 -3.70 43.84 27.38 5.64 36.48 9.92 263 166 AVERAGE	 Site : 03CH15-HY Condition: AVG_54 3m BBHA 9120 D_9120D-02294 VERTICAL : RBW:1000.000kHz VBW:1.100kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2412.00 105.90 ------ ------ 99.36 27.44 5.66 36.48 9.92 263 166 AVERAGE

Mode	1	
	Harmonic	
	2400-2483.5_Bluetooth-LE_GFSK _CH39_2480MHz	
	2400-2483.5_802.11ax HE20_CH01_2412MHz	
Pol.	Horizontal	Vertical
Peak Avg	 Site : 03CH15-HY Condition: PEAK_74 3m BBHA 9120 D_9120D-02294 HORIZONTAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4824.00 37.06 74.00 -36.94 55.22 32.46 8.17 59.17 0.38 -- -- Peak 2 4960.00 37.83 74.00 -36.17 55.23 33.09 8.28 59.22 0.45 -- -- Peak 3 7440.00 54.97 74.00 -19.03 68.27 36.32 10.12 59.98 0.24 100 114 Peak 4 7440.00 51.44 54.00 -2.56 64.74 36.32 10.12 59.98 0.24 100 114 Average	 Site : 03CH15-HY Condition: PEAK_74 3m BBHA 9120 D_9120D-02294 VERTICAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4824.00 40.02 74.00 -33.98 58.27 32.40 8.15 59.16 0.36 -- -- Peak 2 4960.00 37.77 74.00 -36.23 55.17 33.09 8.28 59.22 0.45 -- -- Peak 3 7440.00 51.70 74.00 -22.30 65.00 36.32 10.12 59.98 0.24 338 174 Peak 4 7440.00 46.79 54.00 -7.21 60.09 36.32 10.12 59.98 0.24 338 174 Average

Mode	1	
	Harmonic	
	2400-2483.5_Bluetooth-LE_GFSK _CH39_2480MHz	
	2400-2483.5_802.11ax HE20_CH01_2412MHz	
	U-NII-1_5.15-5.25_802.11an HT20_CH48_5240MHz	
Pol.	Horizontal	Vertical
14.47G ~14.5G Avg		
17.7G ~18G Avg		

Mode	1	
	SHF	
	2400-2483.5_Bluetooth-LE_GFSK _CH39_2480MHz	
	2400-2483.5_802.11ax HE20_CH01_2412MHz	
Pol.	Horizontal	Vertical
Peak	 Site : 03CH15-HY Condition: PEAK(UNII) 1m BBHA9170576 HORIZONTAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 24974.00 40.77 68.20 -27.43 56.92 39.50 7.11 53.22 -9.54 -- -- Peak	 Site : 03CH15-HY Condition: PEAK(UNII) 1m BBHA9170576 VERTICAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 24919.00 40.37 68.20 -27.83 56.55 39.50 7.11 53.25 -9.54 -- -- Peak

Mode	1	
	LF	
	2400-2483.5_Bluetooth-LE_GFSK _CH39_2480MHz	
	2400-2483.5_802.11ax HE20_CH01_2412MHz	
Pol.	Horizontal	Vertical
QP/ Peak		

Site : 03CH15-HY
Condition: QP 3m CBL 6111D & 00800N1D01N-06_41912&05 HORIZONTAL

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	57.16	27.96	40.00	-12.04	47.14	12.27	0.93	32.44	0.06	--	--	Peak
2	99.84	30.62	43.50	-12.88	45.97	15.81	1.21	32.41	0.04	--	--	Peak
3	371.44	20.62	46.00	-25.38	30.01	20.61	2.26	32.39	0.13	--	--	Peak
4	489.78	24.05	46.00	-21.95	30.22	23.38	2.61	32.39	0.23	--	--	Peak
5	760.41	28.44	46.00	-17.56	29.54	27.76	3.20	32.19	0.13	--	--	Peak
6	935.98	31.79	46.00	-14.21	29.48	29.65	3.53	31.14	0.27	--	--	Peak

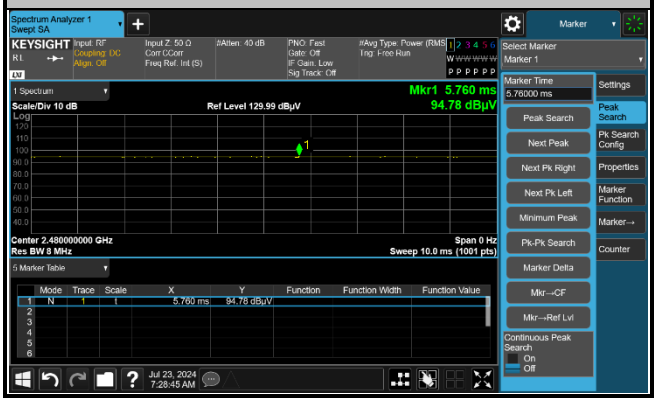
Site : 03CH15-HY
Condition: QP 3m CBL 6111D & 00800N1D01N-06_41912&05 VERTICAL

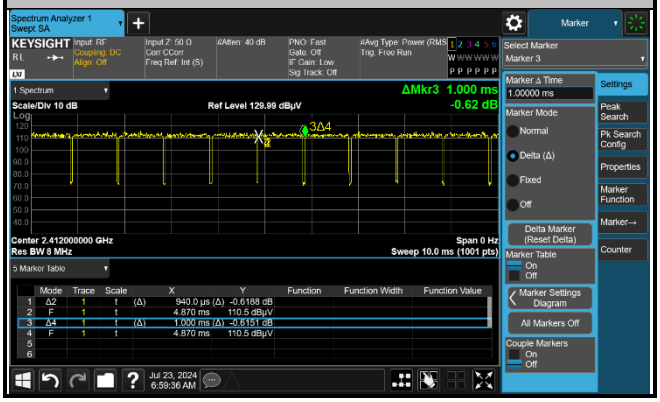
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	30.97	33.72	40.00	-6.28	41.02	24.29	0.71	32.39	0.09	--	--	Peak
2	103.72	30.31	43.50	-13.19	45.29	16.15	1.23	32.42	0.06	--	--	Peak
3	216.24	21.74	46.00	-24.26	37.24	14.92	1.74	32.39	0.23	--	--	Peak
4	418.97	25.36	46.00	-20.64	33.02	22.23	2.40	32.40	0.11	--	--	Peak
5	732.28	29.70	46.00	-16.30	31.47	27.20	3.14	32.26	0.15	--	--	Peak
6	949.56	31.71	46.00	-14.29	29.21	29.66	3.55	31.01	0.30	--	--	Peak

Appendix B. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	Bluetooth-LE GFSK	100.00	-	-	10Hz
1+2	2.4GHz 802.11ax HE20 Full RU	94.00	940	1.06	1.1kHz

Bluetooth-LE GFSK



MIMO <Ant. 1+2>

2.4GHz 802.11ax HE20 Full RU