



FCC CO-LOCATION RADIO TEST REPORT

FCC ID : A4RG9FPL
Equipment : Phone
Model Name : G9FPL, G0B96
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : FCC Part 15 Subpart E §15.407

The product was received on Nov. 21, 2022 and testing was performed from Nov. 24, 2022 to Jan. 06, 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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History of this test report

Report No.	Version	Description	Issue Date
FR262403-04J	01	Initial issue of report	Feb. 10, 2023
FR262403-04J	02	Revise Comments and Explanations and appendix A, B	Mar. 07, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	2.04 dB under the limit at 5149.760 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

Declaration of Conformity:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".

Comments and Explanations:

1. The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.
2. The G9FPL and G0B96 are 100% identical in Hardware / Software to each other, and only have different model names for separate marketing purposes. The test samples are all model G9FPL.

Reviewed by: William Chen

Report Producer: Cindy Liu

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Phone
Model Name	G9FPL, G0B96
FCC ID	A4RG9FPL
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/NFC/GNSS / UWB/WPT Client WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE

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

EUT Information List	
S/N	Performed Test Item
2B021FDHS0003T 2B071FDHS0000K	Radiated Spurious Emission

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx/Rx Channel Frequency Range	2402 MHz ~ 2480 MHz 5180 MHz ~ 5240 MHz
Antenna Type / Gain <Open Mode>	<Bluetooth> <Ant. 3> : Coupling feed Antenna with gain -3.2 dBi <Ant. 4> : IFA Antenna with gain -2.1 dBi <2402 MHz ~ 2480 MHz> <Ant. 3> : Coupling feed Antenna with gain -3.2 dBi <Ant. 4> : IFA Antenna with gain -2.1 dBi <5180 MHz ~ 5240 MHz> <Ant. 3> : Coupling feed Antenna with gain -1.8 dBi <Ant. 4> : IFA Antenna with gain -4.9 dBi
Antenna Type / Gain <Close Mode>	<Bluetooth> <Ant. 3> : Coupling feed Antenna with gain -4.3 dBi <Ant. 4> : IFA Antenna with gain -4.7 dBi <2402 MHz ~ 2480 MHz> <Ant. 3> : Coupling feed Antenna with gain -4.3 dBi <Ant. 4> : IFA Antenna with gain -4.7 dBi <5180 MHz ~ 5240 MHz> <Ant. 3> : Coupling feed Antenna with gain -4.7 dBi <Ant. 4> : IFA Antenna with gain -5.3 dBi

Product Specification is subject to this standard			
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK Bluetooth LE: GFSK 802.11g: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ax : OFDMA (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)		
Antenna Function for Transmitter		Ant. 3	Ant. 4
	Bluetooth	V	V
	Bluetooth-LE	V	V
	802.11g/ax MIMO	V	V

Remark:

1. MIMO Ant. 3+4 is a calculated result from sum of the power MIMO Ant. 3 and MIMO Ant. 4.
2. The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.3 Modification of EUT

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

1.4 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. 03CH13-HY

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

FCC designation No.: TW3786



1.5 Applicable Standards

According to the specifications of 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 Publication No. 558074 D01 15.247 Meas Guidance v05r02
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All 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.
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

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). 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 (open and close) and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and accessory (Adapter or Earphone) 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

2400-2483.5 MHz			
Bluetooth for 1Mbps		Bluetooth – LE for 1Mbps	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
78	2480	39	2480

2400-2483.5 MHz		5150~5250 MHz	
802.11g		802.11ax HE20	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
11	2462	36	5180

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

<Co-Location>

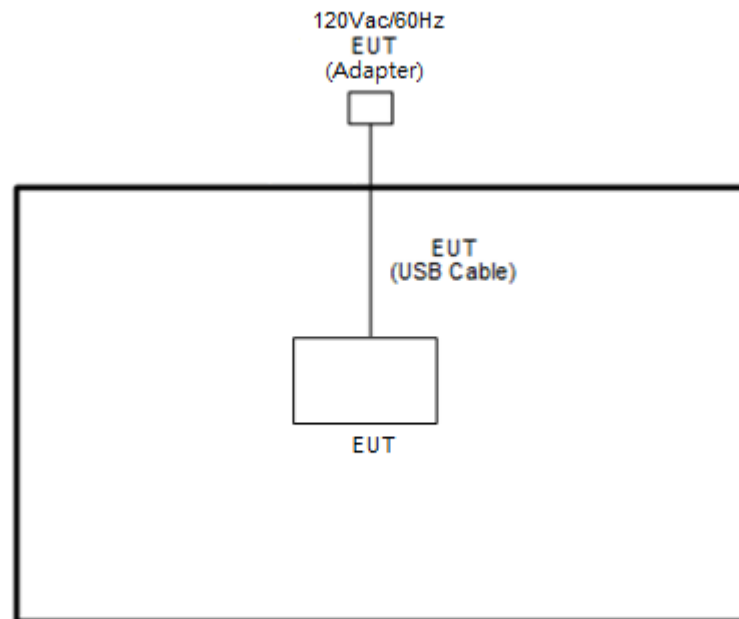
Test Mode	Modulation	Data Rate
Mode 1	Bluetooth for MIMO < Ant. 3+4> + WLAN 5GHz 802.11ax HE20 for MIMO < Ant. 3+4>	1Mbps + MCS0
Mode 2	Bluetooth-LE for MIMO < Ant. 3+4> + WLAN 5GHz 802.11ax HE20 for MIMO < Ant. 3+4>	1Mbps + MCS0
Mode 3	WLAN 2.4GHz 802.11g for MIMO < Ant. 3+4> + WLAN 5GHz 802.11ax HE20 for MIMO < Ant. 3+4>	6Mbps + MCS0

Remark:

- For Radiated Test Cases, the tests were performed with Adapter 1 and USB Cable 1.
- During the preliminary test, both charging modes (Adapter mode and WPT Client mode) were verified. It is determined that the adaptor mode is the worst case for official test.

2.3 Connection Diagram of Test System

<Co-Location Tx Mode>



2.4 EUT Operation Test Setup

The RF test items, utility "Cmd Version 1.0.39" 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.
- (2) 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.

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

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.

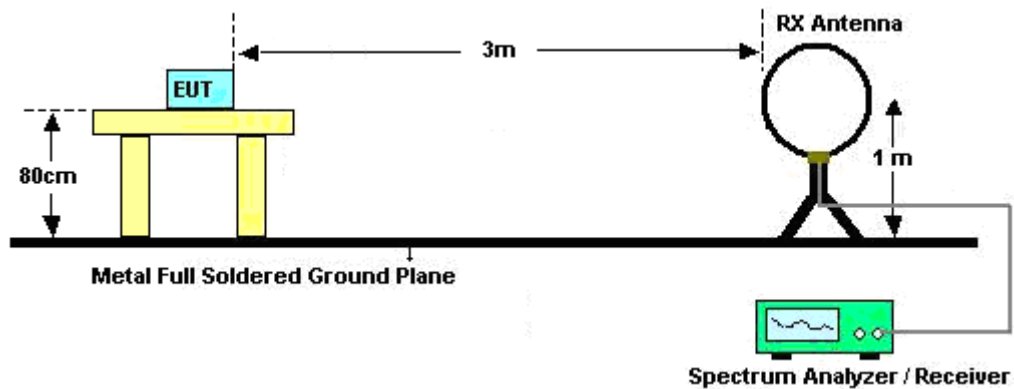
3.1.3 Test Procedures

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 1000MHz
 - 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 $\geq$ 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = max hold
 - (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
 - RBW = 1 MHz
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
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.

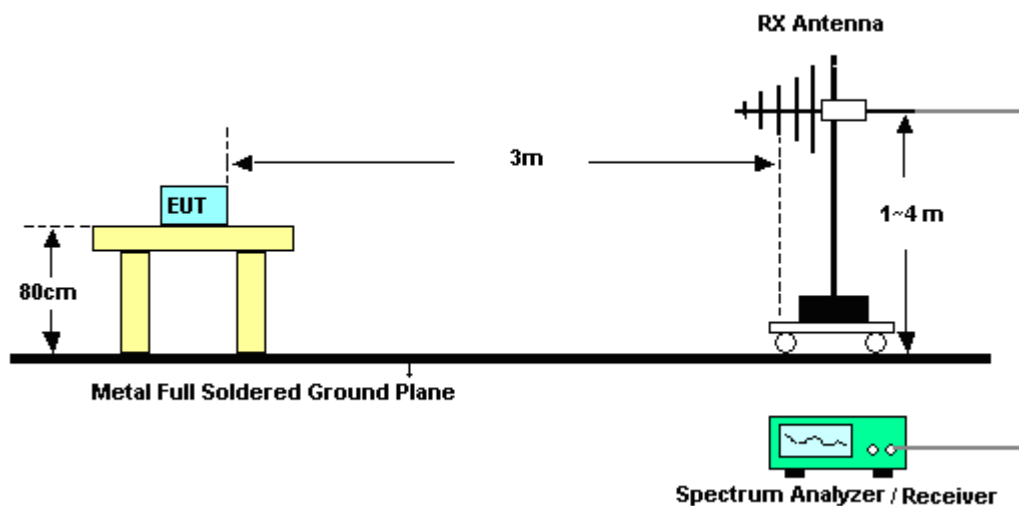
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit 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

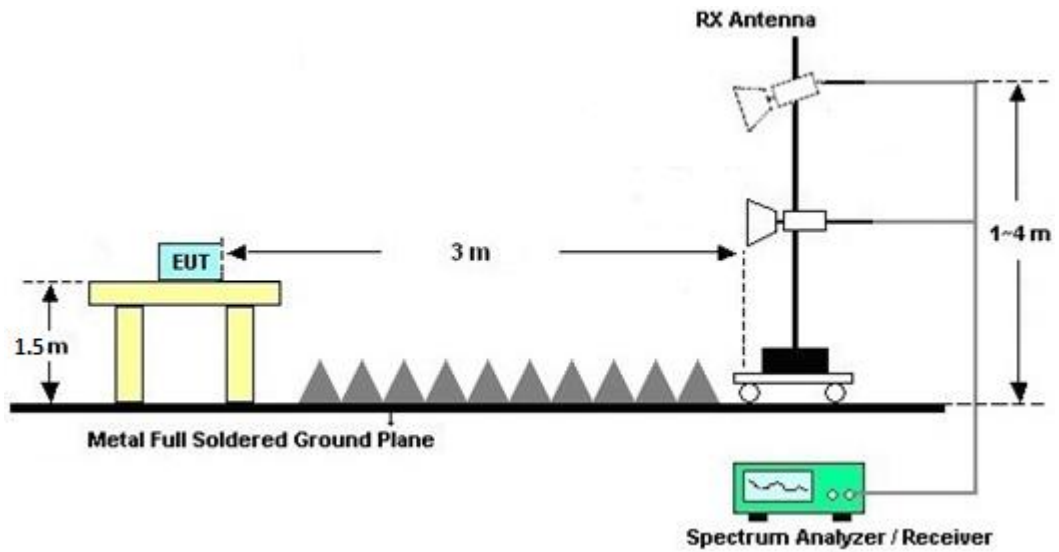
For radiated emissions below 30MHz



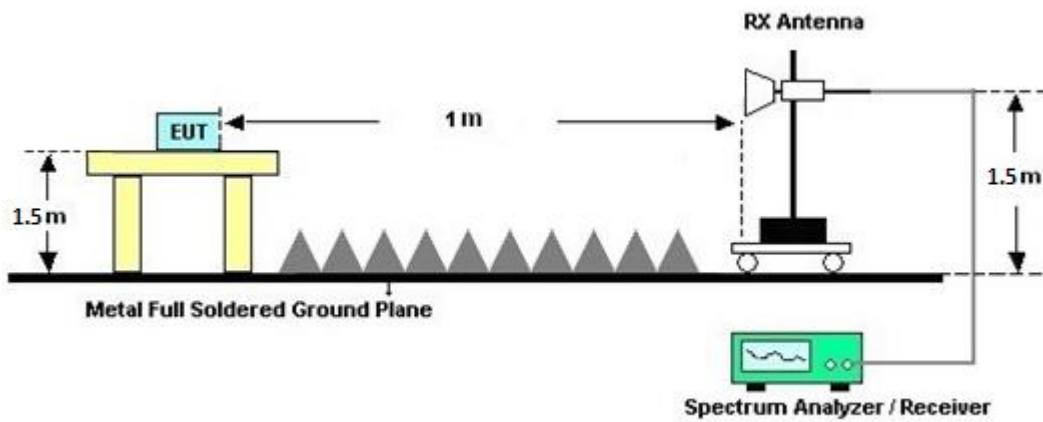
For radiated emissions from 30MHz to 1GHz



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 started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was 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
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	May 13, 2022	Nov. 24, 2022~ Jan. 06, 2023	May 12, 2023	Radiation (03CH13-HY)
Amplifier	SONOMA	310N	187282	9kHz~1GHz	Dec. 15, 2021	Nov. 24, 2022~ Dec. 13, 2022	Dec. 14, 2022	Radiation (03CH13-HY)
Amplifier	SONOMA	310N	187282	9kHz~1GHz	Dec. 14, 2022	Dec. 14, 2022~ Jan. 06, 2023	Dec. 13, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 10, 2022	Nov. 24, 2022~ Jan. 06, 2023	Mar. 09, 2023	Radiation (03CH13-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 28, 2022	Nov. 24, 2022~ Jan. 06, 2023	Jun. 27, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Feb. 21, 2022	Nov. 24, 2022~ Jan. 06, 2023	Feb. 20, 2023	Radiation (03CH13-HY)
Hygrometer	TECEPIL	DTM-303B	TP140325	N/A	Aug. 15, 2022	Nov. 24, 2022~ Jan. 06, 2023	Aug. 14, 2023	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	40103 & 07	30MHz~1GHz	Apr. 24, 2022	Nov. 24, 2022~ Jan. 06, 2023	Apr. 23, 2023	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz~18GHz	Jul. 25, 2022	Nov. 24, 2022~ Jan. 06, 2023	Jul. 24, 2023	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-00101800 -30-10P	1590074	1GHz~18GHz	May 17, 2022	Nov. 24, 2022~ Jan. 06, 2023	May 16, 2023	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Oct. 25, 2022	Nov. 24, 2022~ Jan. 06, 2023	Oct. 24, 2023	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 18, 2022	Nov. 24, 2022~ Jan. 06, 2023	Mar. 17, 2023	Radiation (03CH13-HY)
Filter	Wainwright	WHKX12-2700-300 0-18000-60SS	SN2	3GHz High Pass Filter	Jul. 11, 2022	Nov. 24, 2022~ Jan. 06, 2023	Jul. 10, 2023	Radiation (03CH13-HY)
Filter	Wainwright	WHKX8-5872.5-67 50-18000-40ST	SN5	6.75GHz High Pass Filter	Mar. 10, 2022	Nov. 24, 2022~ Jan. 06, 2023	Mar. 09, 2023	Radiation (03CH13-HY)
Filter	Wainwright	WLK4-1000-1530- 8000-40SS	SN12	1.53GHz Low Pass Filter	Sep. 13, 2022	Nov. 24, 2022~ Jan. 06, 2023	Sep. 12, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30MHz~18GHz	Feb. 09, 2022	Nov. 24, 2022~ Jan. 06, 2023	Feb. 08, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30MHz~18GHz	Feb. 09, 2022	Nov. 24, 2022~ Jan. 06, 2023	Feb. 08, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30MHz~18GHz	Feb. 09, 2022	Nov. 24, 2022~ Jan. 06, 2023	Feb. 08, 2023	Radiation (03CH13-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Nov. 24, 2022~ Jan. 06, 2023	N/A	Radiation (03CH13-HY)
Notch Filter	ST1	STI15_9935_5150- 5850	N/A	N/A	Apr. 07, 2022	Nov. 24, 2022~ Jan. 06, 2023	Apr. 06, 2023	Radiation (03CH13-HY)
Notch Filter	ST1	STI15_9935_5150- 5850	N/A	N/A	Apr. 07, 2022	Nov. 24, 2022~ Jan. 06, 2023	Apr. 06, 2023	Radiation (03CH13-HY)
Notch Filter	Wainwright	WRCQV14-6025-6 425-7125-7525-60 SS	SN2	N/A	Jan. 07, 2022	Nov. 24, 2022 ~ Jan. 05, 2023	Jan. 06, 2023	Radiation (03CH13-HY)
Filter	Wainwright	WHW2-7100-1000 0-18000-40CC	SN2	10GHz High Pass Filter	Nov. 14, 2022	Nov. 24, 2022~ Jan. 06, 2023	Nov. 13, 2023	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 24, 2022~ Jan. 06, 2023	N/A	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170576	18GHz-40GHz	May 14, 2022	Nov. 24, 2022~ Jan. 06, 2023	May 13, 2023	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 24, 2022~ Jan. 06, 2023	N/A	Radiation (03CH13-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	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% ($U = 2Uc(y)$)	4.4 dB
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Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.8 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.3 dB
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Appendix A. Radiated Spurious Emission

Test Engineer :	Mancy Chou, Jacky Hong and Rain Lee	Temperature :	20~25°C
		Relative Humidity :	50~60%

<Open mode>

2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

BT_Tx_Ch78 + 802.11ax HE20_Tx_Ch36 (Band Edge @ 3m)

BT Ant.	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
3+4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 78 2480MHz	*	2480	104.72	-	-	100.52	27.74	4.21	27.75	101	147	P	H
	*	2480	79.96	-	-	-	-	-	-	-	-	A	H
		2483.76	45.54	-28.46	74	41.34	27.73	4.22	27.75	101	147	P	H
		2483.76	20.78	-33.22	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	100.01	-	-	95.81	27.74	4.21	27.75	301	51	P	V
	*	2480	75.25	-	-	-	-	-	-	-	-	A	V
		2492.8	45.14	-28.86	74	40.95	27.71	4.22	27.74	301	51	P	V
		2492.8	20.38	-33.62	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



BT_Tx_Ch78 + 802.11ax HE20_Tx_Ch36 (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.	
3+4		(MHz)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ax HE20 Full CH 36 5180MHz		5149.5	60.29	-13.71	74	49.42	32.1	6.21	27.44	100	208	P	H
		5149.76	51.96	-2.04	54	41.09	32.1	6.21	27.44	100	208	A	H
	*	5180	109.03	-	-	98.24	31.98	6.25	27.44	100	208	P	H
	*	5180	100.15	-	-	89.36	31.98	6.25	27.44	100	208	A	H
													H
													H
		5149.5	59.63	-14.37	74	48.76	32.1	6.21	27.44	346	55	P	V
		5150	50.09	-3.91	54	39.21	32.1	6.22	27.44	346	55	A	V
	*	5180	109.54	-	-	98.75	31.98	6.25	27.44	346	55	P	V
	*	5180	99.43	-	-	88.64	31.98	6.25	27.44	346	55	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
3+4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz	*	2480	110.81	-	-	96.68	27.74	14.14	27.75	100	152	P	H
	*	2480	110.16	-	-	96.03	27.74	14.14	27.75	100	152	A	H
		2498.56	54.48	-19.52	74	40.36	27.7	14.16	27.74	100	152	P	H
		2483.72	45.79	-8.21	54	31.66	27.73	14.15	27.75	100	152	A	H
													H
													H
	*	2480	106.59	-	-	92.46	27.74	14.14	27.75	300	44	P	V
	*	2480	105.97	-	-	91.84	27.74	14.14	27.75	300	44	A	V
		2484.96	53.94	-20.06	74	39.81	27.73	14.15	27.75	300	44	P	V
		2491.16	45.6	-8.4	54	31.47	27.72	14.15	27.74	300	44	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (Band Edge @ 3m)

WIFI Ant. 3+4	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 HE20 Full CH 36 5180MHz		5145.34	66.16	-7.84	74	54.82	32.1	6.68	27.44	100	205	P	H
		5149.24	51.71	-2.29	54	40.37	32.1	6.68	27.44	100	205	A	H
	*	5180	108.02	-	-	96.76	31.98	6.72	27.44	100	205	P	H
	*	5180	100.23	-	-	88.97	31.98	6.72	27.44	100	205	A	H
													H
													H
		5139.62	63.24	-10.76	74	51.91	32.1	6.67	27.44	348	49	P	V
		5149.76	50.95	-3.05	54	39.61	32.1	6.68	27.44	348	49	A	V
	*	5180	109.2	-	-	97.94	31.98	6.72	27.44	348	49	P	V
	*	5180	100.43	-	-	89.17	31.98	6.72	27.44	348	49	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

BT_Tx_Ch78 + 802.11ax HE20_Tx_Ch36 (Harmonic @ 3m)

WIFI+BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 78 2480MHz + 802.11ax HE20 Full CH 36 5180MHz		4960	54.48	-19.52	74	43.87	31.66	6.41	27.46	100	228	P	H
		4960	29.72	-24.28	54	-	-		-	-	-	A	H
		7440	43.27	-30.73	74	55.08	36.98	8.73	57.52	-	-	P	H
		7440	18.51	-35.49	54	-	-		-	-	-	A	H
		10360	57.89	-10.31	68.2	64.58	40.1	9.78	56.57	100	227	P	H
		15540	50.69	-23.31	74	56.15	39.02	12.05	56.53	140	132	P	H
		15540	38.88	-15.12	54	44.34	39.02	12.05	56.53	140	132	A	H
													H
													H
													H
													H
		4964	55.46	-18.54	74	44.82	31.68	6.42	27.46	350	45	P	V
		4964	30.7	-23.3	54	-	-		-	-	-	A	V
		7440	42.87	-31.13	74	54.68	36.98	8.73	57.52	-	-	P	V
		7440	18.11	-35.89	54	-	-		-	-	-	A	V
		10360	64.35	-3.85	68.2	71.04	40.1	9.78	56.57	103	304	P	V
		15540	57.79	-16.21	74	63.25	39.02	12.05	56.53	107	305	P	V
		15540	43.89	-10.11	54	49.35	39.02	12.05	56.53	107	305	A	V
													V
													V
													V
												V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (Harmonic @ 3m)

WIFI+BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz + 802.11ax HE20 Full CH 36 5180MHz		4960	54.44	-19.56	74	43.83	31.66	6.41	27.46	100	209	P	H
		7440	43.73	-30.27	74	55.54	36.98	8.73	57.52	-	-	P	H
		10360	58.06	-10.14	68.2	64.75	40.1	9.78	56.57	100	221	P	H
		15540	44.25	-29.75	74	49.71	39.02	12.05	56.53	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
		4960	53.82	-20.18	74	43.21	31.66	6.41	27.46	400	154	P	V
		7440	43.84	-30.16	74	55.65	36.98	8.73	57.52	-	-	P	V
		10360	64.2	-4	68.2	70.89	40.1	9.78	56.57	100	283	P	V
		15540	56.9	-17.1	74	62.36	39.02	12.05	56.53	100	283	P	V
		15540	40.97	-13.03	54	46.43	39.02	12.05	56.53	100	283	P	V
													V
													V
													V
													V
												V	
												V	
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												



2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

802.11g_Tx_Ch11 + 802.11ax HE20_Tx_Ch36 (Harmonic @ 3m)

WIFI Ant. Simultaneously	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)
802.11g CH 11 2462MHz + 802.11ax HE20 Full CH 36 5180MHz		4924	53.22	-20.78	74	42.81	31.55	6.33	27.47	100	192	P	H
		4924	43.22	-10.78	54	32.81	31.55	6.33	27.47	100	192	A	H
		7386	43.88	-30.12	74	55.64	36.93	8.75	57.44	-	-	P	H
		10360	55.78	-12.42	68.2	62.47	40.1	9.78	56.57	100	220	P	H
		15540	49.87	-24.13	74	55.33	39.02	12.05	56.53	239	99	P	H
		15540	38.13	-15.87	54	43.59	39.02	12.05	56.53	239	99	A	H
													H
													H
													H
													H
													H
		4924	53.38	-20.62	74	42.97	31.55	6.33	27.47	350	187	P	V
		4924	43.02	-10.98	54	32.61	31.55	6.33	27.47	350	187	A	V
		7386	43.7	-30.3	74	55.46	36.93	8.75	57.44	-	-	P	V
		10360	63.85	-4.35	68.2	70.54	40.1	9.78	56.57	100	242	P	V
		15540	57.6	-16.4	74	63.06	39.02	12.05	56.53	100	304	P	V
		15540	43.21	-10.79	54	48.67	39.02	12.05	56.53	100	304	A	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Emission above 18GHz

BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (SHF)

[illegible]

Emission below 1GHz

BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (LF)

BLE+WIFI Ant. Simultaneously	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)
BLE CH 39 2480MHz + 802.11ax HE20 Full CH 36 5180MHz		70.74	23.12	-16.88	40	41.86	12.5	0.92	32.16	-	-	P	H
		180.35	26.36	-17.14	43.5	42.18	15.04	1.25	32.11	-	-	P	H
		311.3	25.92	-20.08	46	36.83	19.53	1.62	32.06	-	-	P	H
		727.43	32.47	-13.53	46	34.87	27.33	2.33	32.06	-	-	P	H
		896.21	33.72	-12.28	46	33.61	28.97	2.54	31.4	-	-	P	H
		992.24	33.26	-20.74	54	30.8	30.36	2.64	30.54	-	-	P	H
													H
													H
													H
													H
													H
													H
		71.71	29.04	-10.96	40	47.7	12.58	0.92	32.16	-	-	P	V
		179.38	20.65	-22.85	43.5	36.4	15.11	1.25	32.11	-	-	P	V
		399.57	21.83	-24.17	46	29.84	21.97	1.9	31.88	-	-	P	V
		561.56	26.58	-19.42	46	30.34	26.18	2.13	32.07	-	-	P	V
		711.91	32.13	-13.87	46	35.24	26.64	2.34	32.09	-	-	P	V
		991.27	32.93	-21.07	54	30.49	30.36	2.63	30.55	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.												

Note symbol

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



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

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
3+4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
2. Margin(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
2. 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”.



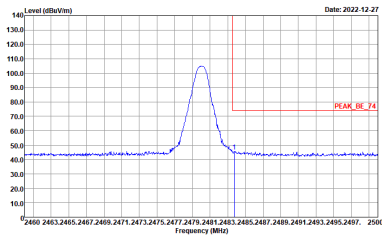
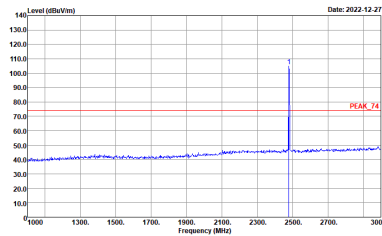
Appendix B. Radiated Spurious Emission Plots

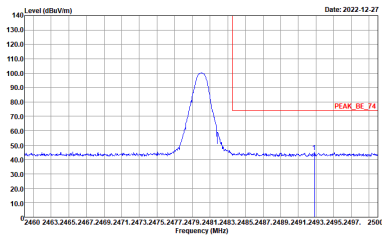
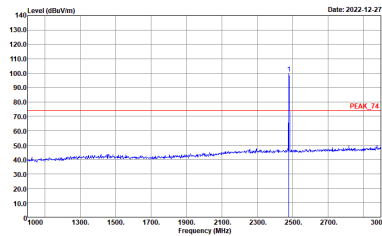
Test Engineer :	Mancy Chou, Jacky Hong and Rain Lee	Temperature :	20~25°C
		Relative Humidity :	50~60%

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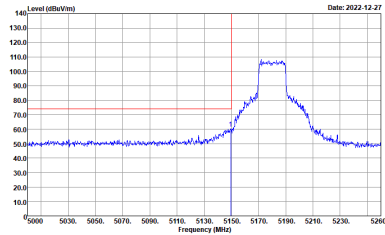
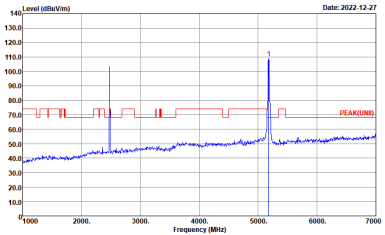
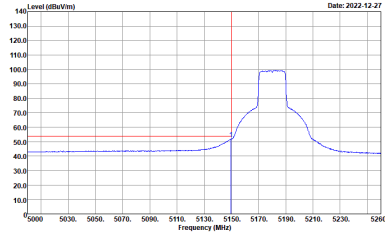
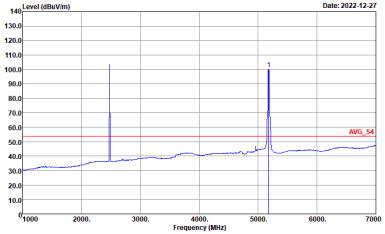
2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

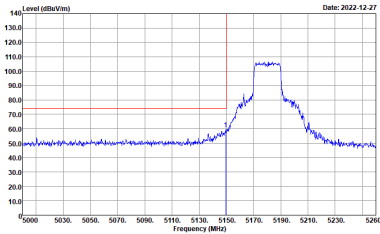
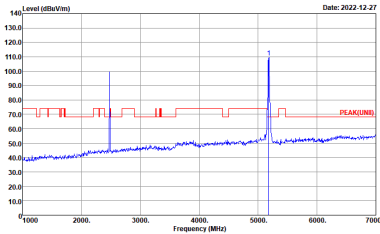
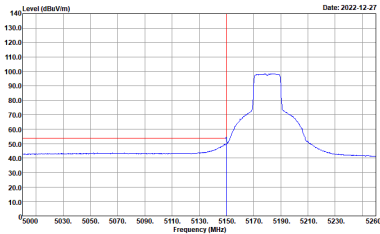
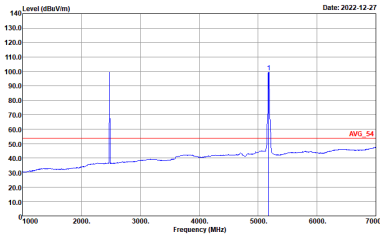
BT_Tx_Ch78 + 802.11ax HE20_Tx_Ch36 (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
3+4	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BC_74 3m HORN_91200_1241 HORIZONTAL RBW:1000.000KHz VSW:3000.000KHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1241 HORIZONTAL RBW:1000.000KHz VSW:3000.000KHz SWT:Auto

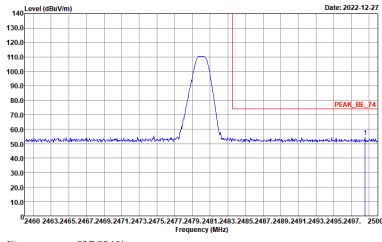
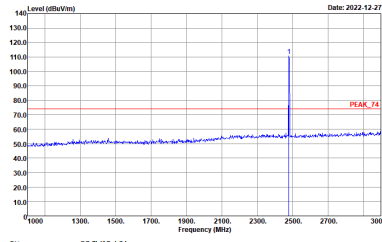
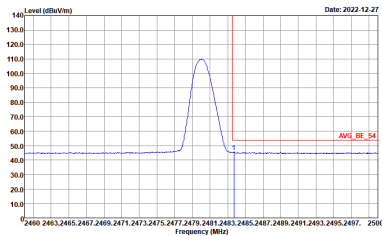
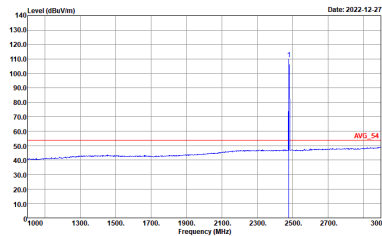
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
3+4	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BC_74 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

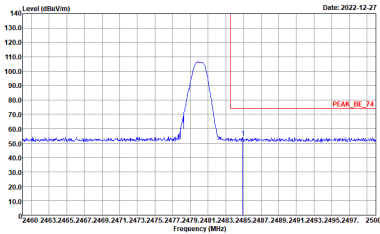
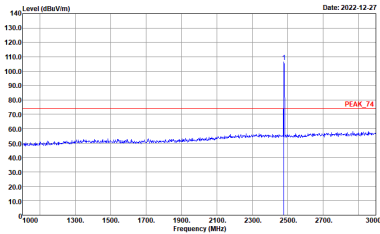
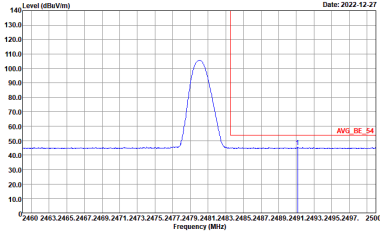
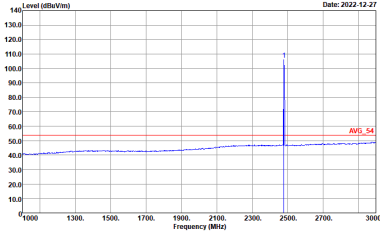
**BT_Tx_Ch78 + 802.11ax HE20_Tx_Ch36 (Band Edge @ 3m)**

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH36 5180MHz	
3+4	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK(UNII) 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto

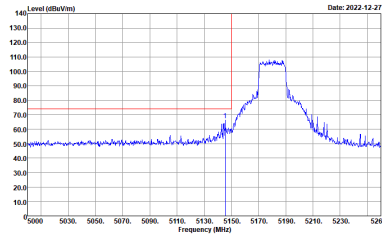
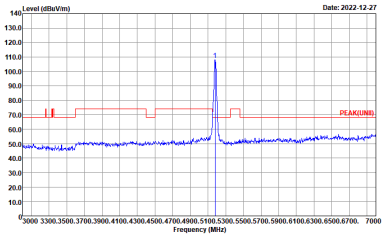
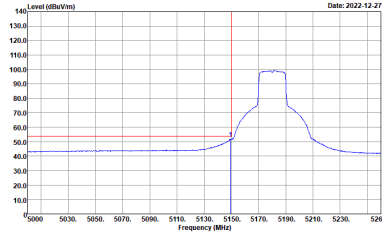
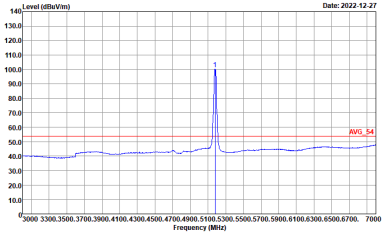
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH36 5180MHz	
3+4	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK(FUND) 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto	 Site : 03CH13-HY Condition : AVG_54 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto

2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz
BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (Band Edge @ 3m)

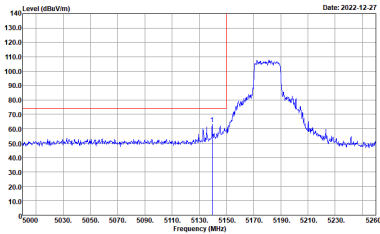
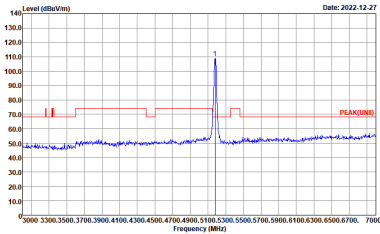
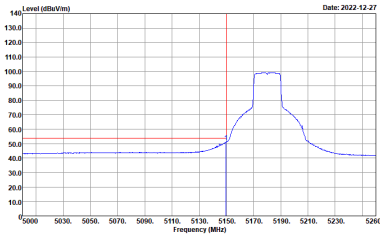
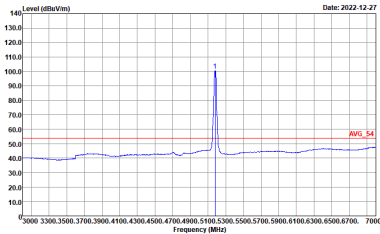
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
3+4	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200_1241 HORIZONTAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1241 HORIZONTAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL RBW:1000.000kHz VBW:3.000kHz SWT:Auto	 Site : 03CH13-HY Condition : AVG_54 3m HORN_91200_1241 HORIZONTAL RBW:1000.000kHz VBW:3.000kHz SWT:Auto
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
3+4	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
	 Site : 03CH13-HY Condition : AV6_BE_54 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH13-HY Condition : AV6_54 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto

BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH36 5180MHz	
3+4	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK(UNII) 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto

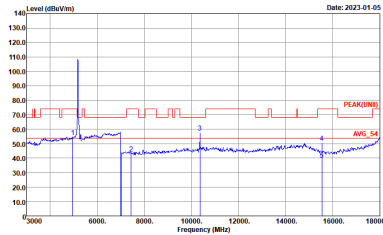
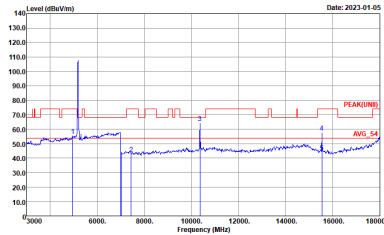


WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH36 5180MHz	
3+4	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH13-HY Condition : PEAK(LINE) 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto	 Site : 03CH13-HY Condition : AVG_54 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto
Avg.		

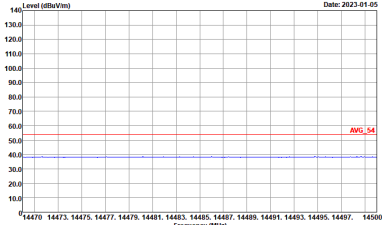
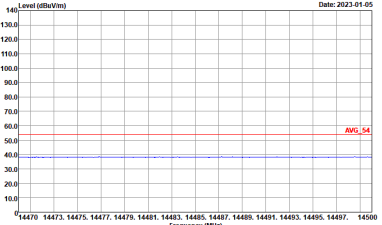
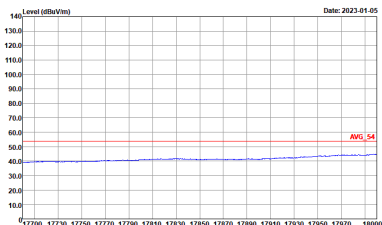
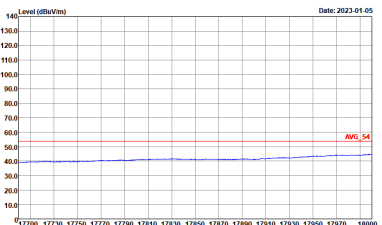


2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

BT_Tx_Ch78 + 802.11ax HE20_Tx_Ch36 (Harmonic @ 3m)

WIFI +BT	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz+802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HV Condition : PEAK(UNIT) 3m HORN_91200_1241 HORIZONTAL :	 Site : 03CH13-HV Condition : PEAK(UNIT) 3m HORN_91200_1241 VERTICAL :

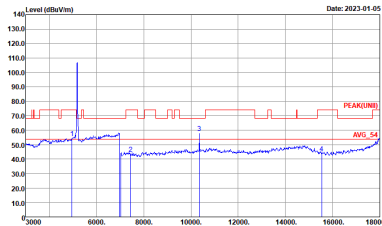
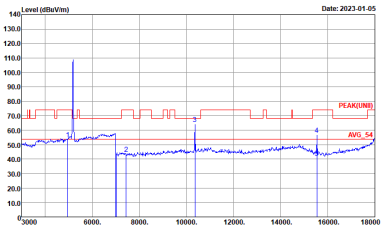


WIFI +BT	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz+802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
Avg.	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL :	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL :
	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL :	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL :

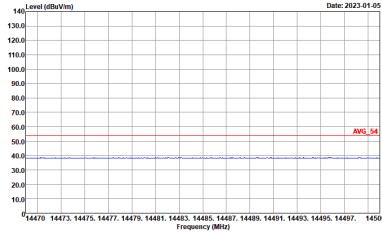
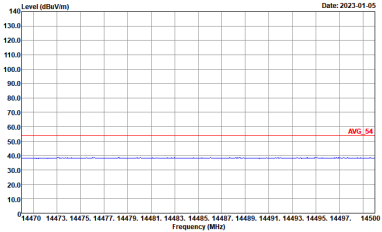
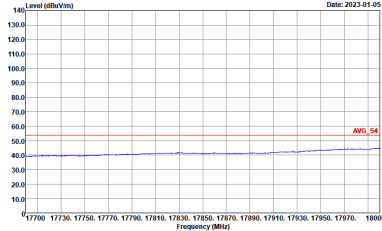
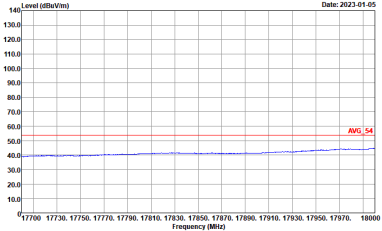


2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (Harmonic @ 3m)

WIFI +BLE	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz +802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-4Y Condition : PEAK(UNIT) 3m HORN_9120D_1241 HORIZONTAL :	 Site : 03CH13-4Y Condition : PEAK(UNIT) 3m HORN_9120D_1241 VERTICAL :

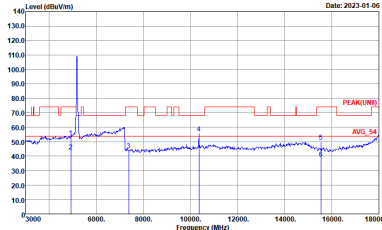
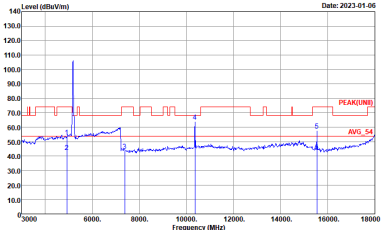


WIFI +BLE	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz +802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
Avg.	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : .	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : .
	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : .	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : .

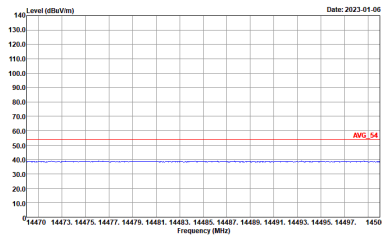
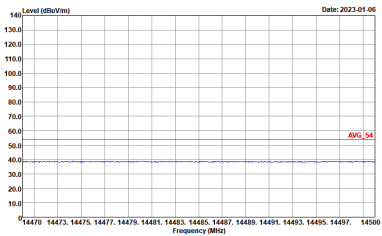
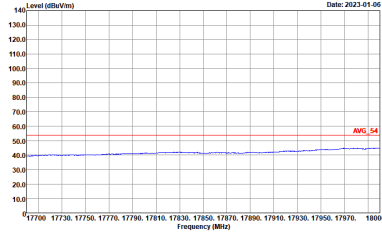
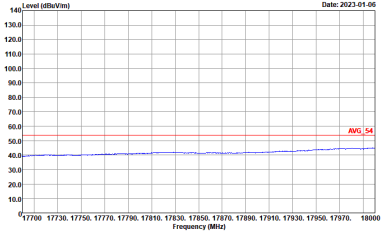


2.4GHz 2402~2480MHz + Band 1 - 5150~5250MHz

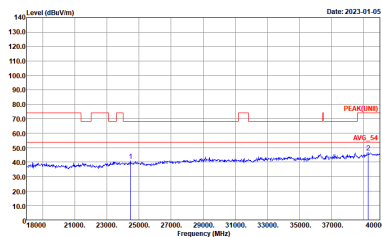
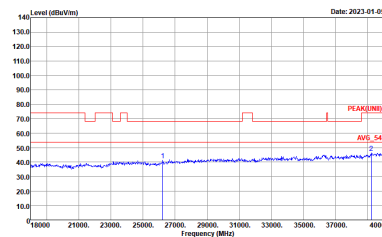
802.11g_Tx_Ch11 + 802.11ax HE20_Tx_Ch36 (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11g CH11 2462MHz +802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-4V Condition : PEAK(UNIT) 3m HORN_9120D_1241 HORIZONTAL :	 Site : 03CH13-4V Condition : PEAK(UNIT) 3m HORN_9120D_1241 VERTICAL :



WIFI	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11g CH11 2462MHz +802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
Avg.	 Site : 03CH13-HY Condition : AV6_54 3m HORN_91200_1241 HORIZONTAL :	 Site : 03CH13-HY Condition : AV6_54 3m HORN_91200_1241 VERTICAL :
	 Site : 03CH13-HY Condition : AV6_54 3m HORN_91200_1241 HORIZONTAL :	 Site : 03CH13-HY Condition : AV6_54 3m HORN_91200_1241 VERTICAL :

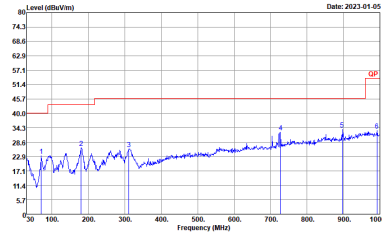
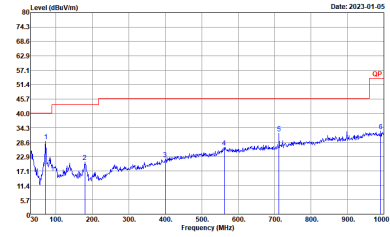
Emission above 18GHz
BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (SHF @ 1m)

WIFI+BLE	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz	
Ant.	BLE CH39 2480MHz +802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK[UNII] 1m SHF ANT_9170_00993 HORIZONTAL	 Site : 03CH15-HY Condition : PEAK[UNII] 1m SHF ANT_9170_00993 VERTICAL



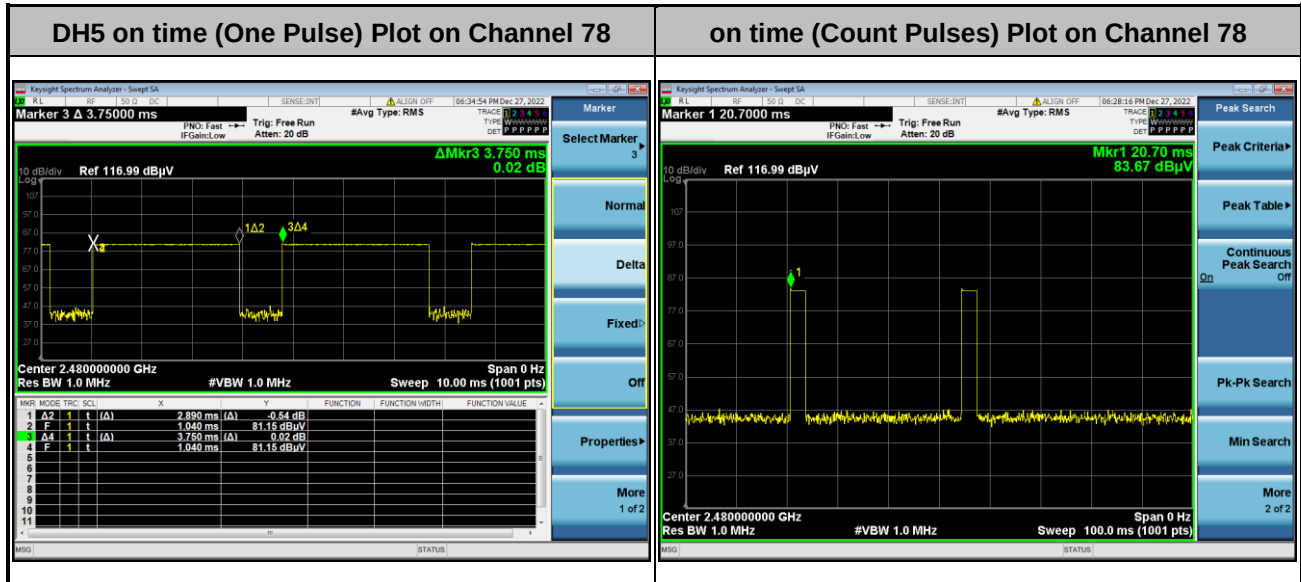
Emission below 1GHz

BLE_Tx_Ch39 + 802.11ax HE20_Tx_Ch36 (LF)

WIFI+BLE	2.4GHz 2400~2483.5MHz+ Band 1 5150~5250MHz	
Ant.	BLE CH39 2480MHz +802.11ax HE20 Full CH36 5180MHz	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH13-HV Condition : QP 3m B1E06_40103 HORIZONTAL :	 Site : 03CH13-HV Condition : QP 3m B1E06_40103 VERTICAL :

Appendix C. Duty Cycle Plots

MIMO <Ant. 3+4>



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.89 / 100 = 5.78 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.76 \text{ dB}$
3. **DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.6 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 57.6 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.89 \text{ ms} \times 2 = 5.76 \text{ ms}$$

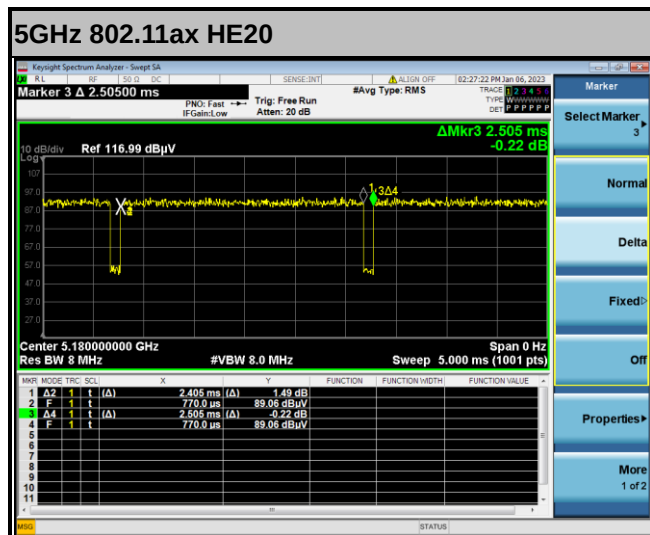
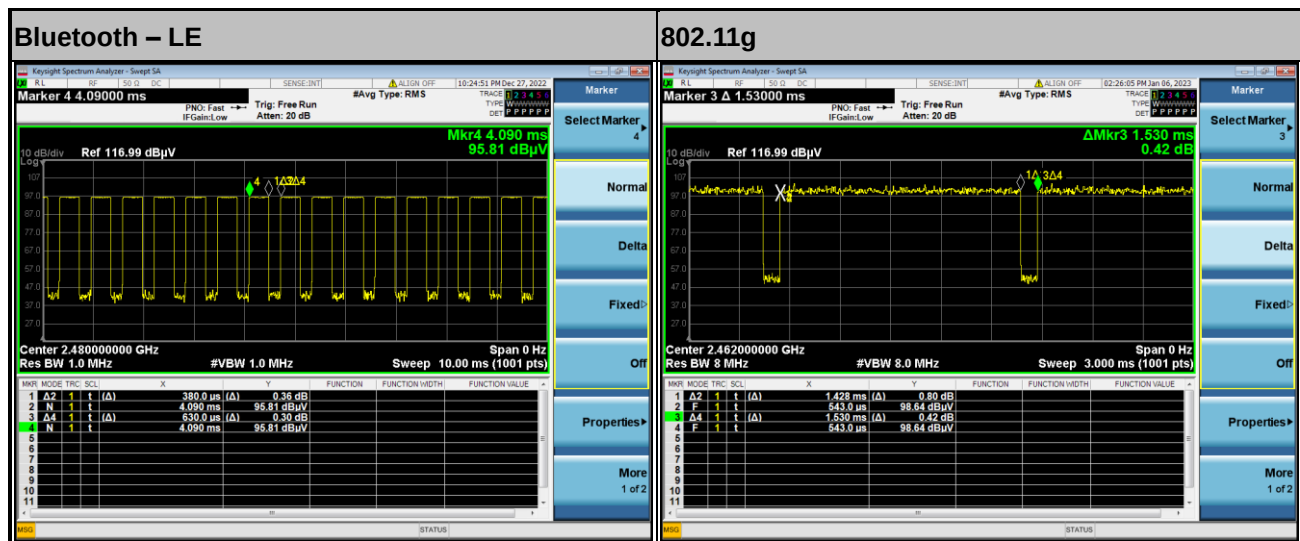
Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.76 \text{ ms}/100 \text{ ms}) = -24.76 \text{ dB}$$



Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
3+4	Bluetooth –LE for 1Mbps	60.32	380	2.63	3kHz
3+4	802.11g	93.33	1428	0.70	1kHz
3+4	5GHz 802.11ax HE20	96.01	2405	0.42	1kHz

MIMO <Ant. 3+4>



—THE END—