



FCC CO-LOCATION RADIO TEST REPORT

FCC ID : 2AFZZK48G
Equipment : Mobile Phone
Brand Name : POCO
Model Name : 2311DRK48G
Applicant : Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road,
Haidian District, Beijing, China, 100085
Manufacturer : Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road,
Haidian District, Beijing, China, 100085
Standard : FCC Part 15 Subpart E §15.407

The product was received on Sep. 27, 2023 and testing was performed from Oct. 02, 2023 to Oct. 18, 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



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History of this test report

Report No.	Version	Description	Issue Date
FR392037G	01	Initial issue of report	Nov. 03, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	3.39 dB under the limit at 10360.00 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/manufacture 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: Lewis Ho

Report Producer: Clio Lo

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature		
General Specs	GSM/WCDMA/LTE/5G NR, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, NFC, and GNSS.	
Sample 1	12+512G (Plastic case)	
Sample 2	8+256G (Plastic case)	
Sample 3	12+512G (PU case)	
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna GPS/Glonass/BDS/Galileo/QZSS: PIFA Antenna NFC: FPC + PIFA Antenna	
Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	Ant. 6: -1.5 Ant. 17: -2.7
5150 MHz ~ 5250 MHz	Peak Gain (dBi)	Ant. 5: -1.4 Ant. 18: -1.1

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

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010 TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. 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). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape) and accessory (Adapter or Earphone), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst plane recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz		5150 MHz ~ 5250 MHz	
802.11ax HE40		802.11a	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
09	2452	36	5180

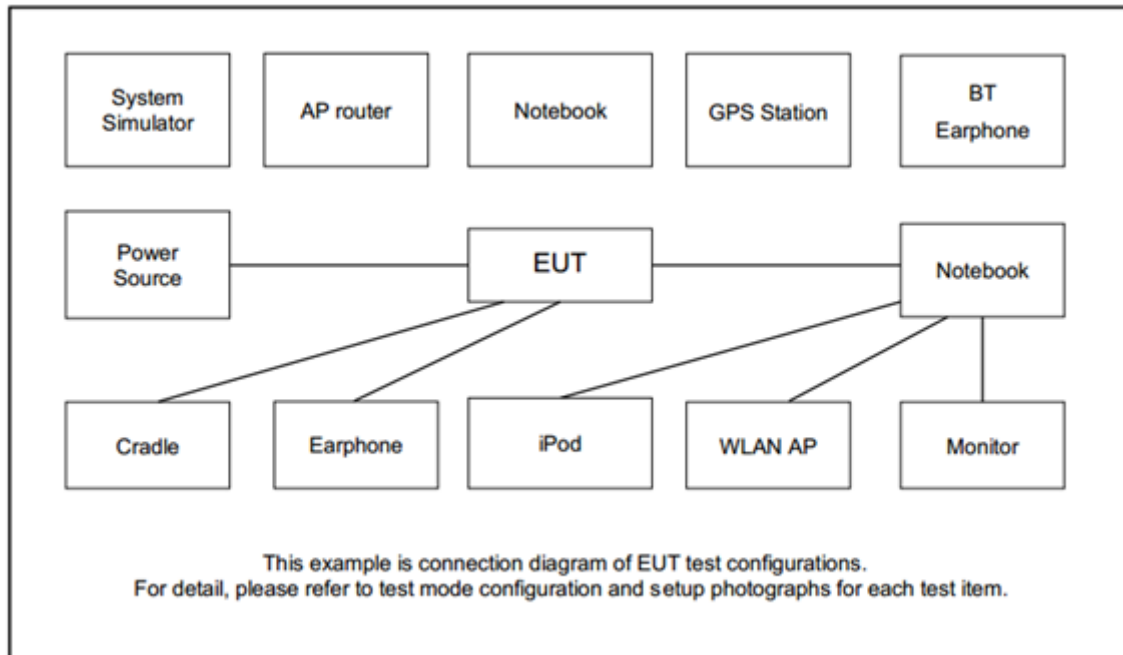
2.2 Test Mode

<Co-Location>

Test Mode	Modulation	Data Rate
Mode 1	WLAN 2.4GHz 802.11ax HE40 for MIMO <Ant. 17+6> + LTE Band 7	6 Mbps
Mode 2	Bluetooth + WLAN 5GHz 802.11a for MIMO <Ant. 5+18> + LTE Band 7	1Mbps + MCS0

Remark: For Radiated Test Cases, the tests were performed with Sample1.

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.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m
2.	Type C-Audio Cable	MI	B41121	N/A	Unshielded, 0.1 m	N/A
3.	Earphone	MI	EM023	N/A	Unshielded, 1.25 m	N/A

2.5 EUT Operation Test Setup

The RF test items, make the EUT (SW: Xiaomi HyperOS 1.0) 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 (dB μ V/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 $\geq$ 3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

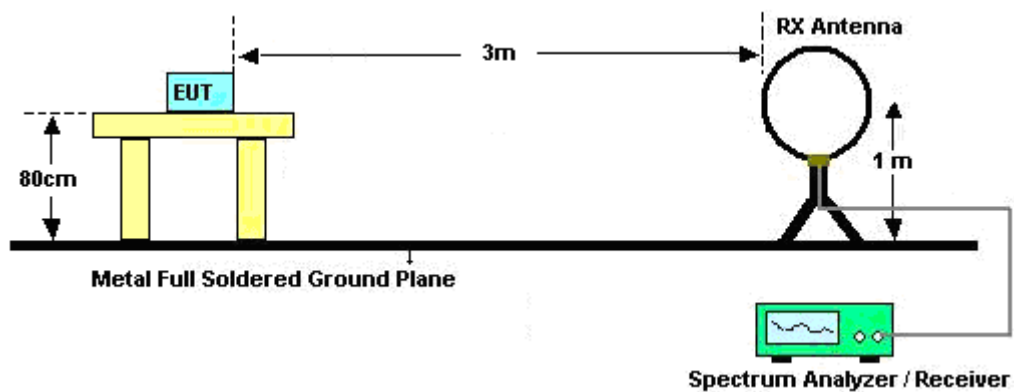
(3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz

- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW $\geq$ $1/T$, 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.

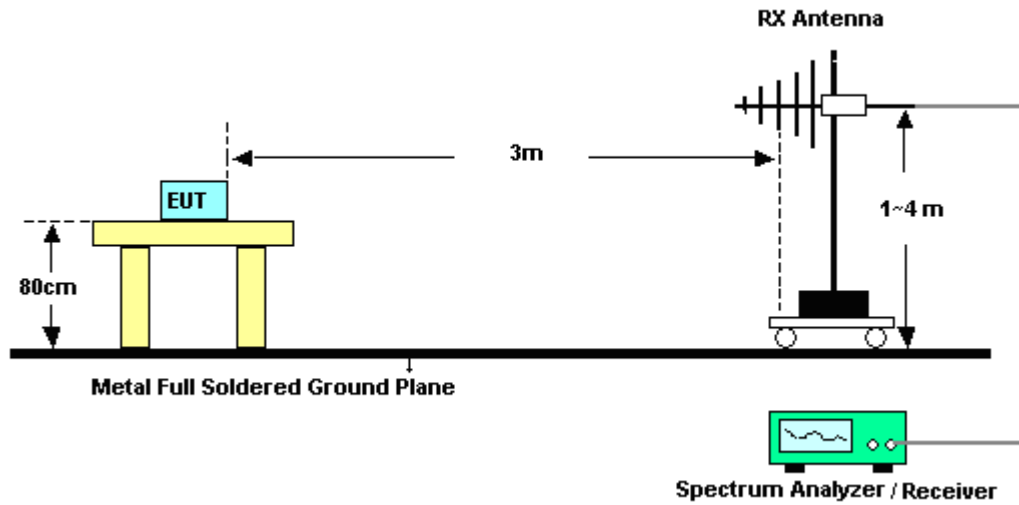
2. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT is set 3 meters away from the receiving antenna which is mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna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

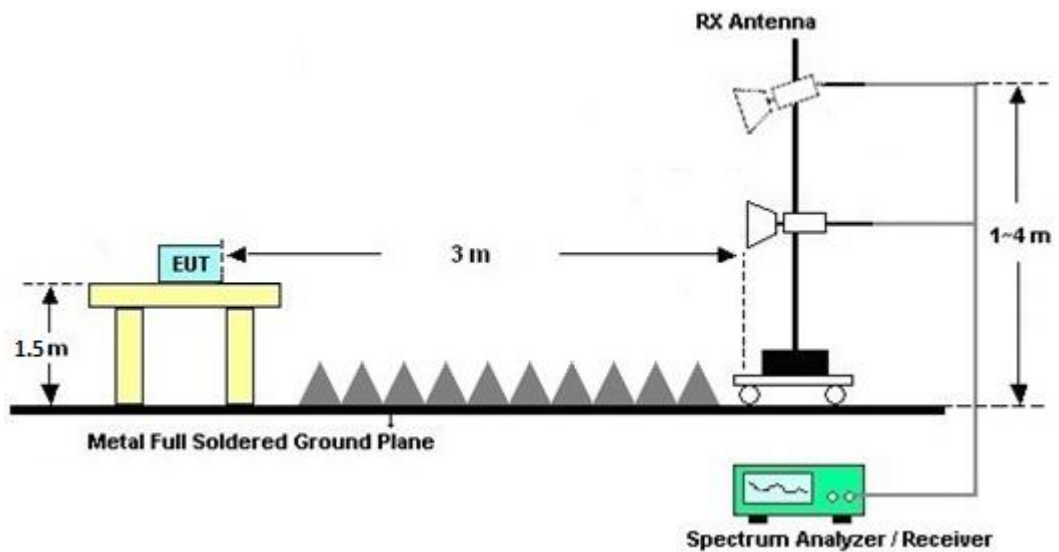
For radiated emissions below 30MHz



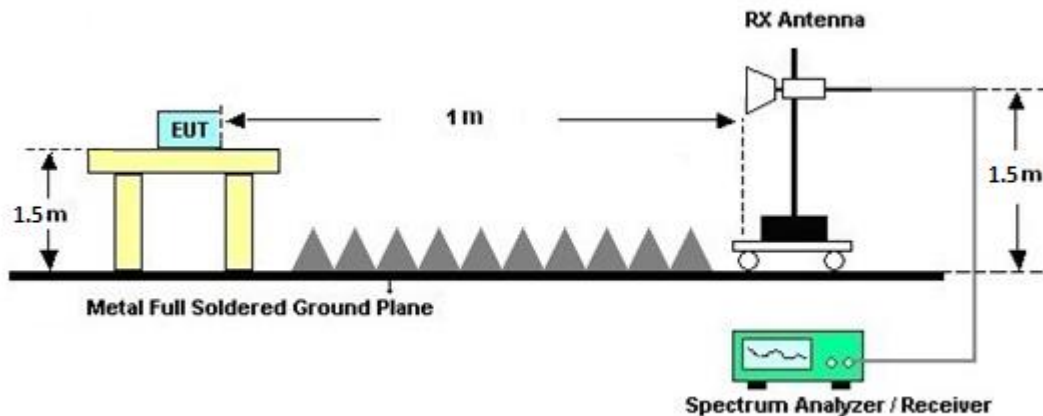
For radiated emissions from 30MHz to 1GHz



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 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-1522	1GHz~18GHz	Mar. 23, 2023	Oct. 02, 2023~ Oct. 18, 2023	Mar. 22, 2024	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00994	18GHz~40GHz	Nov. 04, 2022	Oct. 02, 2023~ Oct. 18, 2023	Nov. 03, 2023	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz~1GHz	Oct. 08, 2022	Oct. 02, 2023~ Oct. 06, 2023	Oct. 07, 2023	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz~1GHz	Oct. 07, 2023	Oct. 07, 2023~ Oct. 18, 2023	Oct. 06, 2024	Radiation (03CH16-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	Oct. 02, 2023~ Oct. 18, 2023	Sep. 11, 2024	Radiation (03CH16-HY)
Radio Communication Analyzer	Anritsu	MT8821C	6272278356	LTE FDD/TDD DLCA/ULCA	Aug. 24, 2023	Oct. 02, 2023~ Oct. 18, 2023	Aug. 23, 2024	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 27, 2023	Oct. 02, 2023~ Oct. 18, 2023	Jun. 26, 2024	Radiation (03CH16-HY)
Preamplifier	EMEC	EM1G18G	060812	1GHz~18GHz	Dec. 26, 2022	Oct. 02, 2023~ Oct. 18, 2023	Dec. 25, 2023	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 09, 2022	Oct. 02, 2023~ Oct. 18, 2023	Dec. 08, 2023	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1GHz	Jul. 03, 2023	Oct. 02, 2023~ Oct. 18, 2023	Jul. 02, 2024	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Dec. 15, 2022	Oct. 02, 2023~ Oct. 18, 2023	Dec. 14, 2023	Radiation (03CH16-HY)
Signal Analyzer	Keysight	N9010B	MY60241055	10Hz~44GHz	Jul. 26, 2023	Oct. 02, 2023~ Oct. 18, 2023	Jul. 25, 2024	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102/SUCOFLEX X 104	EC-A5-300-5 757,805935/4 ,802434/4	30MHz~18GHz	Aug. 08, 2023	Oct. 02, 2023~ Oct. 18, 2023	Aug. 07, 2024	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804011/2,804 012/2	18-40G	Jan. 03, 2023	Oct. 02, 2023~ Oct. 18, 2023	Jan. 02, 2024	Radiation (03CH16-HY)
Hygrometer	TECPEL	DTM-303B	TP200881	N/A	Sep. 08, 2023	Oct. 02, 2023~ Oct. 18, 2023	Sep. 07, 2024	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Oct. 02, 2023~ Oct. 18, 2023	N/A	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Oct. 02, 2023~ Oct. 18, 2023	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Oct. 02, 2023~ Oct. 18, 2023	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Oct. 02, 2023~ Oct. 18, 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 :	Jack tsai, 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	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
17+6		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ax HE40 Full CH 09 2452MHz		2325.96	54.53	-19.47	74	40.38	27.14	17.5	30.49	400	114	P	H
		2388.4	45.88	-8.12	54	31.36	27.38	17.61	30.47	400	114	A	H
	*	2452	101.93	-	-	87.12	27.6	17.66	30.45	400	114	P	H
	*	2452	92.16	-	-	77.35	27.6	17.66	30.45	400	114	A	H
		2485.79	58.23	-15.77	74	43.22	27.76	17.68	30.43	400	114	P	H
		2486.14	48.65	-5.35	54	33.64	27.76	17.68	30.43	400	114	A	H
		2381.96	54.69	-19.31	74	40.24	27.32	17.6	30.47	400	48	P	V
		2389.94	45.19	-8.81	54	30.65	27.4	17.61	30.47	400	48	A	V
	*	2452	98.49	-	-	83.68	27.6	17.66	30.45	400	48	P	V
	*	2452	89.07	-	-	74.26	27.6	17.66	30.45	400	48	A	V
		2486.21	56.56	-17.44	74	41.55	27.76	17.68	30.43	400	48	P	V
		2484.04	47.96	-6.04	54	32.98	27.74	17.68	30.44	400	48	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz + LTE

WIFI (2.4GHz) 802.11ax HE40_Tx_CH09 + LTE_Tx_Band 7 (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)
802.11ax HE40 Full CH 09 2452MHz + LTE B7 H CH BW 20M QPSK Full RB		4904	39.6	-34.4	74	62.06	32.71	11.39	66.56	-	-	P	H
		7356	44.01	-29.99	74	59.77	36.78	13.81	66.35	-	-	P	H
													H
													H
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													H
		4904	40.09	-33.91	74	62.55	32.71	11.39	66.56	-	-	P	V
		7356	43.16	-30.84	74	58.92	36.78	13.81	66.35	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
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													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 with sufficient margin against limit line or noise floor only.												

Emission above 18GHz

WIFI (2.4GHz) 802.11ax HE40_Tx_CH09 + LTE_Tx_Band 7 (SHF)

WIFI	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)
802.11ax HE40 Full CH 09 2452MHz + LTE B7 H CH BW 20M QPSK Full RB SHF		24912	38.96	-35.04	74	55.22	39.66	-2.58	53.34	-	-	P	H
													H
													H
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													H
		25440	39.58	-34.42	74	55.9	39.4	-2.42	53.3	-	-	P	V
													V
													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 with sufficient margin against limit line or noise floor only.												

Emission below 1GHz

WIFI (2.4GHz) 802.11ax HE40_Tx_CH09 + LTE_Tx_Band 7 (LF @ 3m)

WIFI	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)
802.11ax HE40 Full CH 09 2452MHz + LTE B7 H CH BW 20M QPSK Full RB LF		30.27	20.73	-19.27	40	28.18	24.28	0.71	32.44	-	-	P	H
		153.66	22.78	-20.72	43.5	36.4	17.05	1.75	32.42	-	-	P	H
		299.19	24.74	-21.26	46	35.37	19.21	2.57	32.41	-	-	P	H
		438.6	25.42	-20.58	46	31.87	22.92	3.14	32.51	-	-	P	H
		631.1	29.27	-16.73	46	31.85	26.3	3.8	32.68	-	-	P	H
		949.6	33.06	-12.94	46	29.07	30.75	4.76	31.52	-	-	P	H
													H
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													H
		54.84	22.66	-17.34	40	41.5	12.54	1.05	32.43	-	-	P	V
		192.27	19.94	-23.56	43.5	35.48	14.85	1.98	32.37	-	-	P	V
		255.45	20.97	-25.03	46	31.8	19.25	2.34	32.42	-	-	P	V
		436.5	27.3	-18.7	46	33.71	22.96	3.14	32.51	-	-	P	V
		568.1	28.95	-17.05	46	32.05	26	3.53	32.63	-	-	P	V
		923.7	32.98	-13.02	46	30.25	29.8	4.67	31.74	-	-	P	V
													V
													V
													V
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												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.												



2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 78 2480MHz	*	2480	102.88	-	-	97.87	27.7	7.75	30.44	356	183	P	H
	*	2480	78.09	-	-	-	-	-	-	-	-	A	H
		2484	47.17	-26.83	74	42.11	27.74	7.76	30.44	356	183	P	H
		2484	22.38	-31.62	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	107.44	-	-	102.43	27.7	7.75	30.44	102	314	P	V
	*	2480	82.65	-	-	-	-	-	-	-	-	A	V
		2483.8	51.01	-22.99	74	45.95	27.74	7.76	30.44	102	314	P	V
		2483.8	26.22	-27.78	54	-	-	-	-	-	-	A	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.												



Band 1 - 5150~5250MHz

WIFI 802.11a (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.	
5+18		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		5041.08	56.51	-17.49	74	41	33.2	11.68	29.37	100	206	P	H
		5145.6	47.71	-6.29	54	32.38	33	11.8	29.47	100	206	A	H
	*	5180	113.93	-	-	98.59	33	11.84	29.5	100	206	P	H
	*	5180	107.24	-	-	91.9	33	11.84	29.5	100	206	A	H
													H
													H
		5122.72	55.89	-18.11	74	40.56	33	11.78	29.45	100	301	P	V
		5069.68	46.49	-7.51	54	31.06	33.12	11.71	29.4	100	301	A	V
	*	5180	107.32	-	-	91.98	33	11.84	29.5	100	301	P	V
	*	5180	101.41	-	-	86.07	33	11.84	29.5	100	301	A	V
													V
													V
Remark	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 + LTE

Bluetooth_Tx_Ch78 + WIFI (5GHz) 802.11a_Tx_CH36 + LTE_Tx_Band 7 (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)
BT CH 78 2480MHz + 802.11a CH 36 5180MHz + LTE B7 H CH BW 20M QPSK Full RB		4960	56.55	-17.45	74	41.5	32.88	11.54	29.37	100	304	P	H
		4960	31.76	-22.24	54	-	-	-	-	-	-	A	H
		7440	43.49	-30.51	74	59.14	36.44	14.29	66.38	-	-	P	H
		7440	18.7	-35.3	54	-	-	-	-	-	-	A	H
		10360	60.32	-7.88	68.2	72.18	38.7	16.6	67.16	100	250	P	H
		10360	49.74	-4.26	54	61.6	38.7	16.6	67.16	100	250	A	H
		15540	47.12	-26.88	74	56.13	37.54	20.06	66.61	-	-	P	H
													H
													H
													H
													H
													H
		4960	56.61	-17.39	74	41.56	32.88	11.54	29.37	398	23	P	V
		4960	31.82	-22.18	54	-	-	-	-	-	-	A	V
		7440	43.7	-30.3	74	59.35	36.44	14.29	66.38	-	-	P	V
		7440	18.91	-35.09	54	-	-	-	-	-	-	A	V
		10360	60.71	-7.49	68.2	72.57	38.7	16.6	67.16	100	121	P	V
		10360	50.61	-3.39	54	62.47	38.7	16.6	67.16	100	121	A	V
		15540	47.19	-26.81	74	56.2	37.54	20.06	66.61	-	-	P	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

Bluetooth_Tx_Ch78 + WIFI (5GHz) 802.11a_Tx_CH36 + LTE_Tx_Band 7 (SHF)

[illegible]

Emission below 1GHz

Bluetooth_Tx_Ch78 + WIFI (5GHz) 802.11a_Tx_CH36 + LTE_Tx_Band 7 (LF @ 3m)

[illegible]



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.	
17+18		(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”.



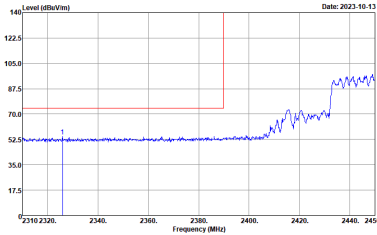
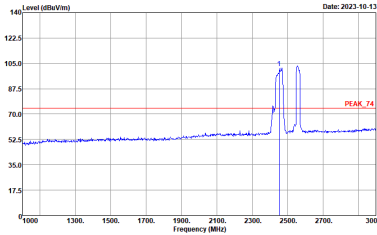
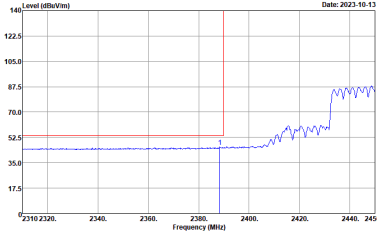
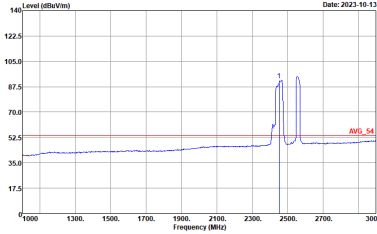
Appendix B. Radiated Spurious Emission Plots

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

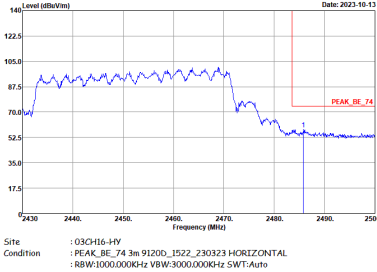
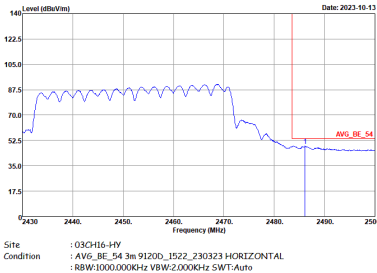
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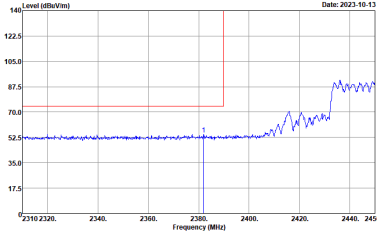
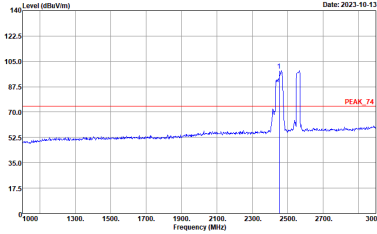
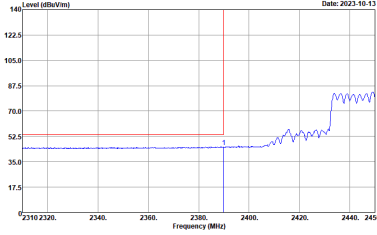
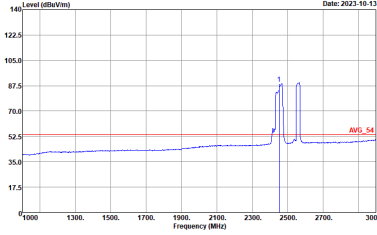
-L	Low channel location
-R	High channel location

2.4GHz 2400~2483.5MHz
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

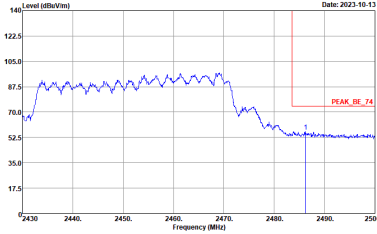
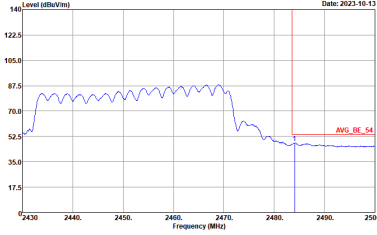
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
17+6	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:2000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:2000KHz SWT:Auto
Avg.		



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
17+6	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 HORIZONTAL RBW:1000.000KHz VBW:2.000KHz SWT:Auto	Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
17+6	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:2.000kHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:2.000kHz SWT:Auto



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
17+6	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:2.000KHz SWT:Auto	Left blank



2.4GHz 2400~2483.5MHz + LTE

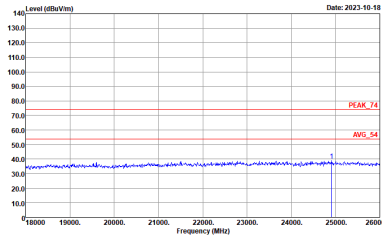
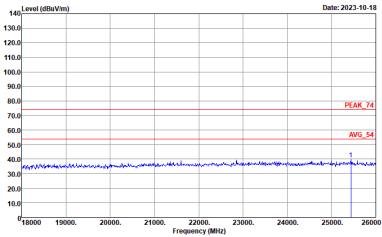
WIFI (2.4GHz) 802.11ax HE40_Tx_CH09 + LTE_Tx_Band 7 (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE40 Full CH09 2452MHz + LTE B7 H CH BW 20M QPSK Full RB	
Simultaneously	Horizontal	Vertical
Peak Avg.	Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_230323 HORIZONTAL :	Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_230323 VERTICAL :



WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE40 Full CH09 2452MHz + LTE B7 H CH BW 20M QPSK Full RB	
Simultaneously	Horizontal	Vertical
14.47G ~14.5G Avg.	Site : 03CH16-HY Condition : AV6_54 3m 91200_1522_230323 HORIZONTAL :	Site : 03CH16-HY Condition : AV6_54 3m 91200_1522_230323 VERTICAL :
	Site : 03CH16-HY Condition : AV6_54 3m 91200_1522_230323 HORIZONTAL :	Site : 03CH16-HY Condition : AV6_54 3m 91200_1522_230323 VERTICAL :

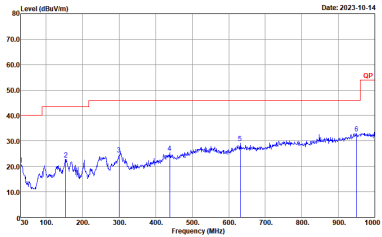
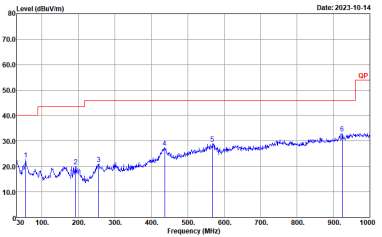
**Emission above 18GHz****WIFI (2.4GHz) 802.11ax HE40_Tx_CH09 + LTE_Tx_Band 7 (SHF @ 1m)**

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11 ax HE40 Full CH09 2452MHz + LTE B7 H CH BW 20M QPSK Full RB SHF	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HY Condition : PEAK_74 1m SHF_00994_221104 HORIZONTAL :	 Site : 03CH16-HY Condition : PEAK_74 1m SHF_00994_221104 VERTICAL :



Emission below 1GHz

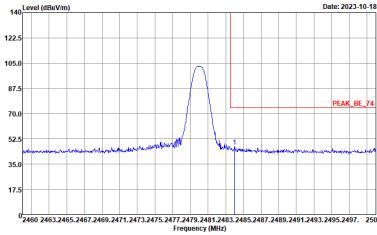
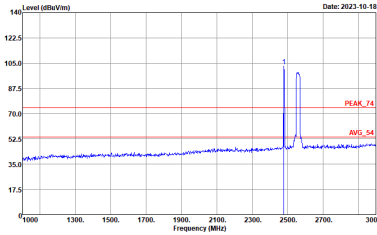
WIFI (2.4GHz) 802.11ax HE40_Tx_CH09 + LTE_Tx_Band 7 (LF)

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11 ax HE40 Full CH09 2452MHz + LTE B7 H CH BW 20M QPSK Full RB LF	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : QP 3m BIL06_47020_231007_H HORIZONTAL : .	 Site : 03CH16-HY Condition : QP 3m BIL06_47020_231007_H VERTICAL : .



2.4GHz 2400~2483.5MHz

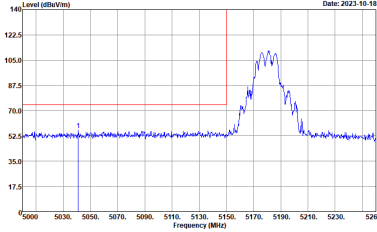
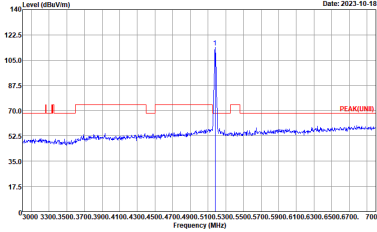
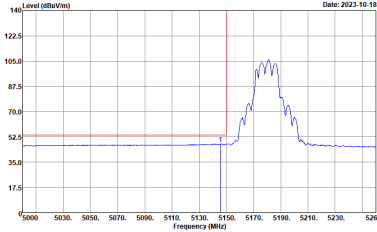
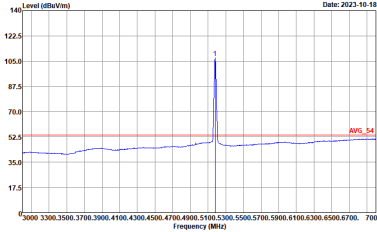
BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

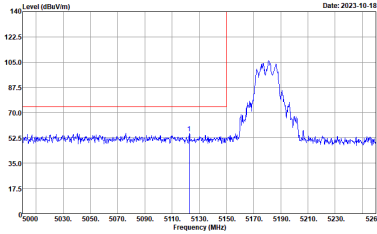
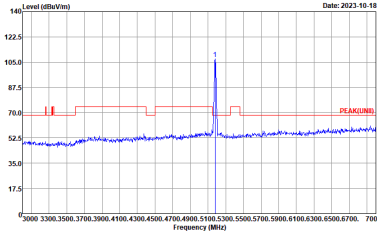
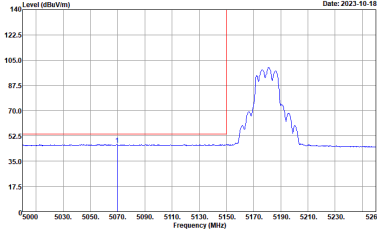
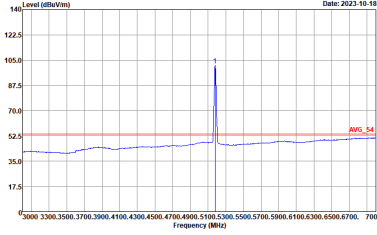


BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak	Level (dBm/Vm) Date: 2023-10-18 Frequency (MHz) Site : 03CH16-HY Condition : PEAK_BF_74 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Level (dBm/Vm) Date: 2023-10-18 Frequency (MHz) Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_230323 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

Band 1 - 5150~5250MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
5+18	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK(LINE) 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:0.750KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 HORIZONTAL : RBW:1000.000KHz VBW:0.750KHz SWT:Auto

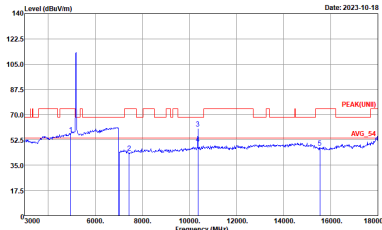
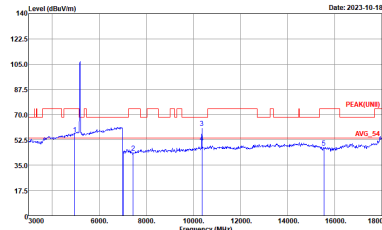


WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
5+18	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK(FUNDI) 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:0.750kHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 VERTICAL : RBW:1000.000kHz VBW:0.750kHz SWT:Auto

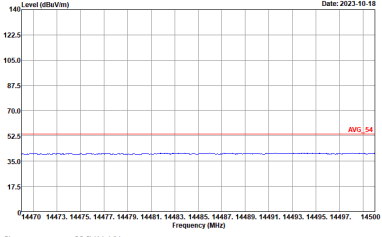
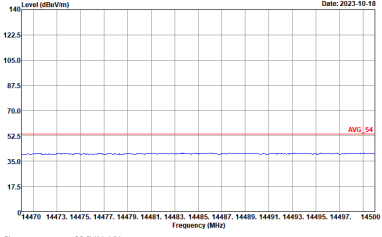
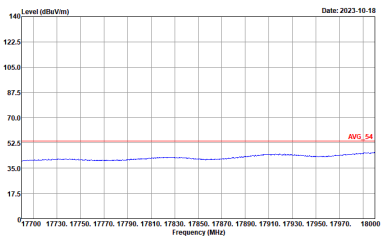
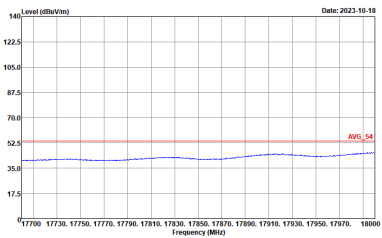


2.4GHz 2400~2483.5MHz + Band 1 5150~5250MHz + LTE

Bluetooth_Tx_Ch78 + WIFI (5GHz) 802.11a_Tx_CH36 + LTE_Tx_Band 7 (Harmonic @ 3m)

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	BT CH 78 2480MHz T + 802.11a CH36 5180MHz + LTE B7 H CH BW 20M QPSK Full RB	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HV Condition : PEAK(UNIT) 3m 91200_1522_230323 HORIZONTAL :	 Site : 03CH16-HV Condition : PEAK(UNIT) 3m 91200_1522_230323 VERTICAL :

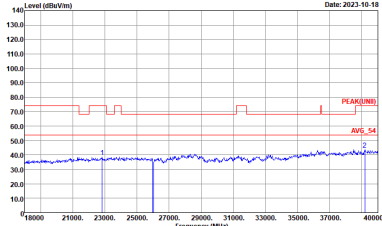


WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	BT CH 78 2480MHz T + 802.11a CH36 5180MHz + LTE B7 H CH BW 20M QPSK Full RB	
Simultaneously	Horizontal	Vertical
14.47G ~14.5G Avg.	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 HORIZONTAL	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 VERTICAL
	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 HORIZONTAL	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_230323 VERTICAL
17.7G ~18G Avg		



Emission above 18GHz

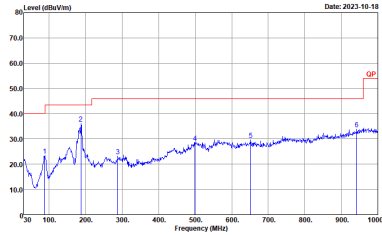
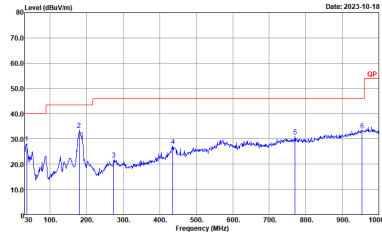
Bluetooth_Tx_Ch78 + WIFI (5GHz) 802.11a_Tx_CH36 + LTE_Tx_Band 7 (SHF @ 1m)

WIFI	5GHz WIFI	
ANT	BT CH 78 2480MHz T + 802.11a CH36 5180MHz + LTE B7 H CH BW 20M QPSK Full RB SHF	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HY Condition : PEAK(UNIT) Im SHF_00994_221104 HORIZONTAL :	 Site : 03CH16-HY Condition : PEAK(UNIT) Im SHF_00994_221104 VERTICAL :



Emission below 1GHz

Bluetooth_Tx_Ch78 + WIFI (5GHz) 802.11a_Tx_CH36 + LTE_Tx_Band 7 (LF)

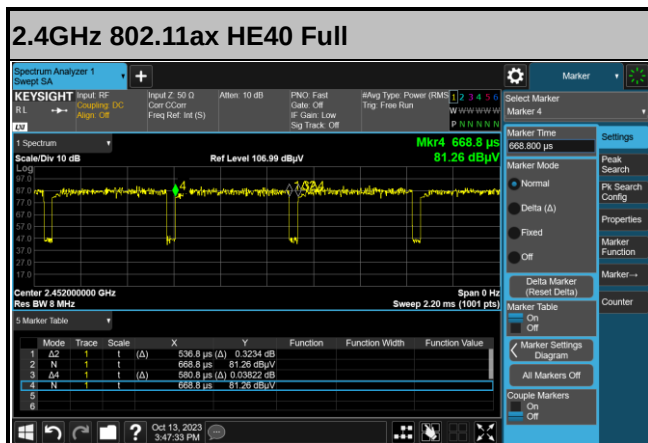
WIFI	5GHz WIFI	
ANT	BT CH 78 2480MHz T + 802.11a CH36 5180MHz + LTE B7 H CH BW 20M QPSK Full RB SHF	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : QP 3m B1LO6_47020_231007_H HORIZONTAL :	 Site : 03CH16-HY Condition : QP 3m B1LO6_47020_231007_H VERTICAL :



Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
17+6	2.4GHz 802.11ax HE40 Full RU	92.42	536.8	1.86	2KHz
5+18	5GHz 802.11a	93.60	1390	0.72	750Hz

MIMO <Ant. 17+6>



MIMO <Ant. 5+18>

