

FCC Test Report

Report No.: RWAP202400215A

Applicant: Invixium Access Inc.

Address: 300-111 Gordon Baker Road, Toronto Canada M2H 3R1

Product Name: IXMC410

Product Model: IXMC410

Multiple Models: N/A

Trade Mark: Invixium

FCC ID: S38-IXMC410

Standards: FCC CFR Title 47 Part 15C (§15.247)

Test Date: 2024-03-18

Test Result: Complied

Report Date: 2024-03-26

Reviewed by:

Abel Chen

Approved by:

Jacob Kong

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Project Engineer

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Manager

Prepared by:

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Revision History

Version No.	Issued Date	Description
00	2024-03-26	<i>Original</i>

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1 General Information

1.1 Client Information

Applicant:	Invixium Access Inc.
Address:	111 Gordon Baker Road, Suite 300, Toronto Ontario Canada M2H 3R1
Manufacturer:	Invixium Access Inc.
Address:	111 Gordon Baker Road, Suite 300, Toronto Ontario Canada M2H 3R1

1.2 Product Description of EUT

The EUT is IXMC410 that contains Classic Bluetooth(BDR/EDR), BLE, 2.4G and 5G WLAN radios, this report covers the full testing of the Classic Bluetooth(BDR/EDR) radio.

Sample Serial Number	6E-1(assigned by WATC)
Sample Received Date	2024-02-28
Sample Status	Good Condition
Frequency Range	2402MHz - 2480MHz
Maximum Conducted Peak Output Power	6.76dBm
Modulation Technology	GFSK, $\pi/4$ DQPSK, 8DPSK
Spatial Streams	SISO (1TX, 1RX)
Antenna Gain [#]	2dBi
Power Supply	DC 3.8V
Adapter Information	N/A
Modification	Sample No Modification by the test lab

1.3 Antenna information

15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
Device Antenna information:
The BT antenna is an external antenna with I-PEX MHF4 connector, please see product internal photos for details.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment Class: DTS, FCC ID: S38-IXMC410
FCC Part 15, Subpart E, Equipment Class: NII, FCC ID: S38-IXMC410

1.5 Measurement Uncertainty

Parameter		Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
AC Power Lines Conducted Emissions		±3.14dB
Emissions, Radiated	Below 30MHz	±2.78dB
	Below 1GHz	±4.84dB
	Above 1GHz	±5.44dB
Emissions, Conducted		1.75dB
Conducted Power		0.74dB
Frequency Error		150Hz
Bandwidth		0.34%
Power Spectral Density		0.74dB

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

1.6 Laboratory Location

World Alliance Testing & Certification (Shenzhen) Co., Ltd

No. 1002, East Block, Laobing Building, Xingye Road 3012, Xixiang street, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Tel: +86-755-29691511, Email: qa@watc.com.cn

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 463912, the FCC Designation No. : CN5040.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0160.

1.7 Test Methodology

FCC CFR 47 Part 2

FCC CFR 47 Part 15

KDB 558074 D01 DTS Meas Guidance v05r02

ANSI C63.10-2020

2 Description of Measurement

2.1 Test Configuration

Operating channels:					
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	39	2441	76	2478
1	2403	40	2442	77	2479
...	78	2480
38	2440	/	/

According to ANSI C63.10-2020 chapter 5.6.1 Table 11 requirement, select lowest channel, middle channel, and highest channel in the frequency range in which device operates for testing. The detailed frequency points are as follows:					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	39	2441	78	2480

Test Mode:					
Transmitting mode: Keep the EUT in continuous transmitting with modulation					
Exercise software [#] : QRCT4;cmd.exe					
Mode	Data rate	Power Level Setting [#]			
		Low Channel	Middle Channel	High Channel	
GFSK	1Mbps	8	8	8	
$\pi/4$ DQPSK	2Mbps	8	8	8	
8DPSK	3Mbps	8	8	8	

The exercise software and the maximum power setting that provided by manufacturer.

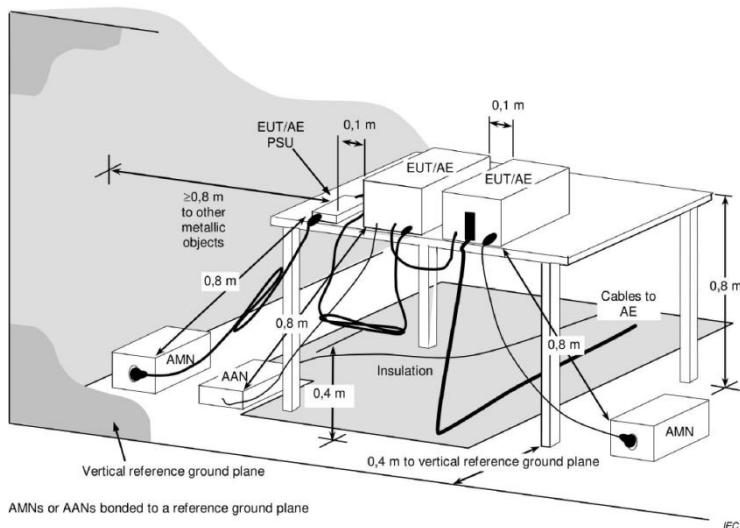
Worst-Case Configuration:			
For radiated emissions, EUT was investigated in three orthogonal orientation, the worst-case orientation was recorded in report			
For AC power line conducted emission and radiated emission 9kHz-1GHz and above 18GHz were performed with the EUT transmits at the channel with highest output power as worst-case scenario.			

2.2 Test Auxiliary Equipment

Manufacturer	Description	Model	Serial Number
TP-Link	POE adapter	TL-POE4824G	Unknown
Invixium	Connector Board	XAM-010-034-01A	Unknown

2.3 Test Setup

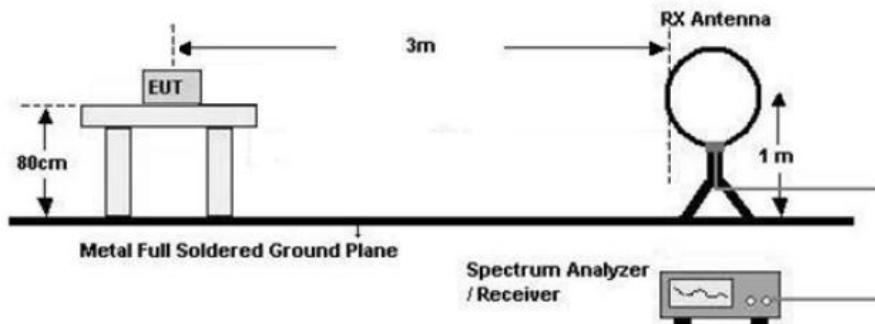
1) Conducted emission measurement:



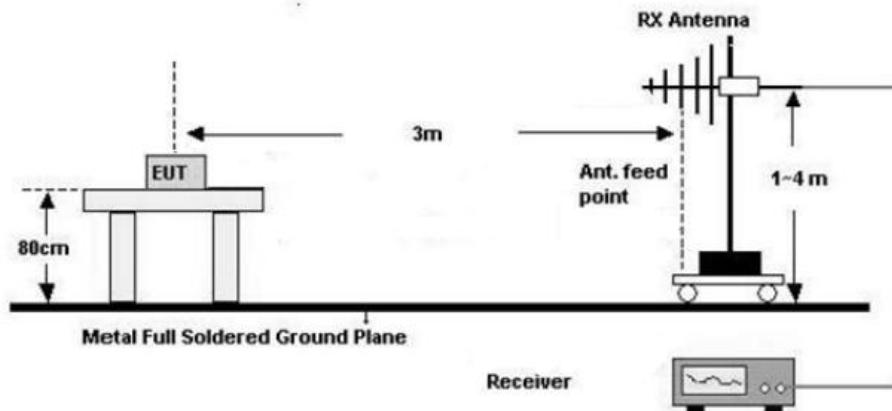
Note: The 0.8 m distance specified between EUT/AE/PSU and AMN/AAN, is applicable only to the EUT being measured. If the device is AE then it shall be >0.8 m.

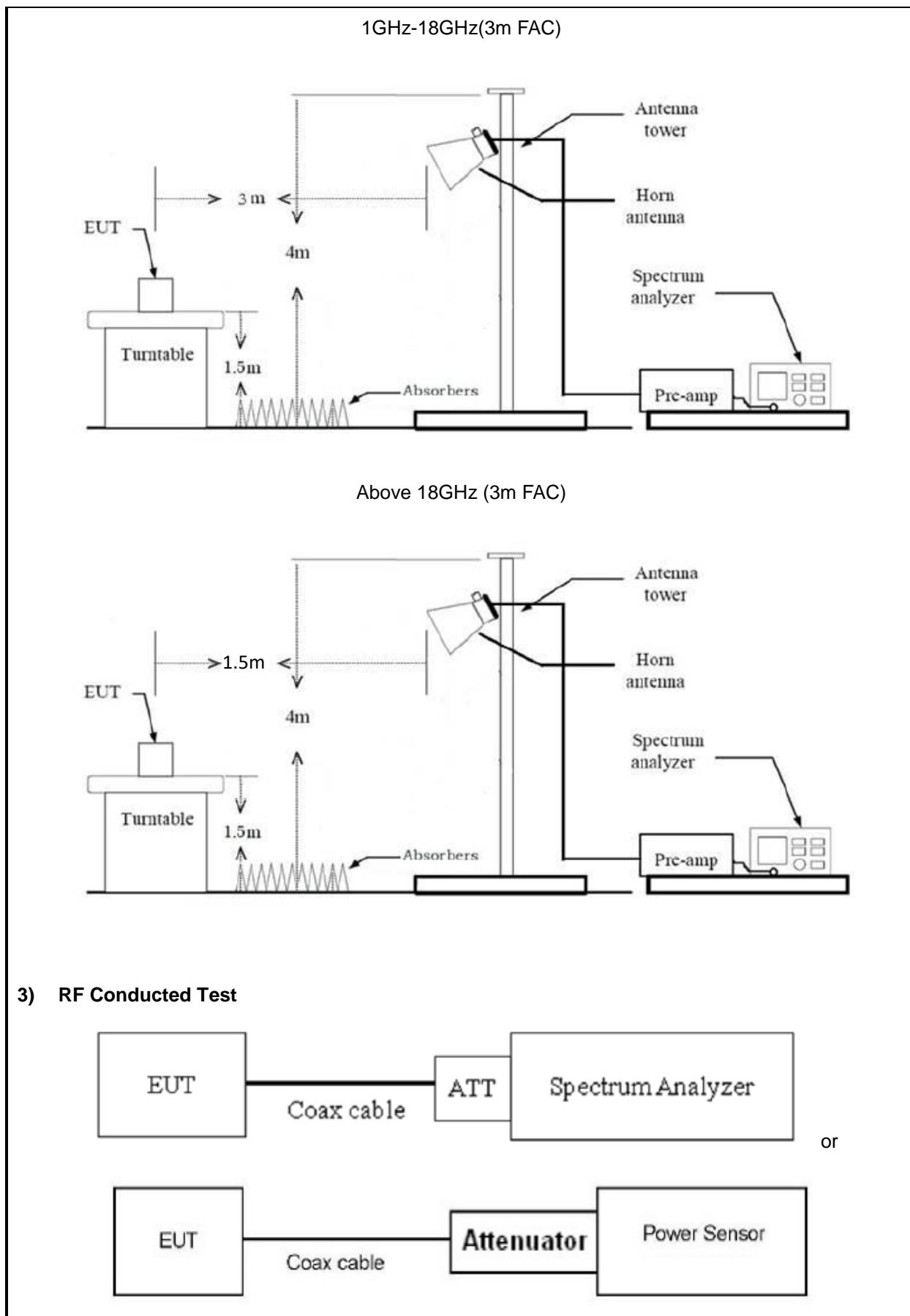
2) Radiated emission measurement:

Below 30MHz (3m SAC)



30MHz-1GHz (3m SAC)





2.4 Test Procedure

Conducted emission:

1. The E.U.T is placed on a non-conducting table 40cm from the vertical ground plane and 80cm above the horizontal ground plane (Please refer to the block diagram of the test setup and photographs).
2. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
3. Line conducted data is recorded for both Line and Neutral

Radiated Emission Procedure:

a) For below 30MHz

1. All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz- 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were $40 \times \log_{10}(\text{test distance} / \text{specification distance})$.
2. Loop antenna use, investigation was done on the three antenna orientations (parallel, perpendicular, ground-parallel)

b) For 30MHz-1GHz:

1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m.
2. EUT works in each mode of operation that needs to be tested. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.

c) For above 1GHz:

1. The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m (1-18GHz) and 1.5 m (above 18GHz).
2. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.
3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
4. Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

RF Conducted Test:

1. The antenna port of EUT was connected to the RF port of the test equipment (Power Meter or

Spectrum analyzer) through Attenuator and RF cable.
2. The cable assembly insertion loss of 7.0dB (including 6.0 dB Attenuator and 1.0 dB cable) was entered as an offset in the power meter. Note: Actual cable loss was unavailable at the time of testing, therefore a loss of 1.0dB was assumed as worst case. This was later verified to be true by laboratory. (if the RF cable provided by client, the cable loss declared by client)
3. The EUT is keeping in continuous transmission mode and tested in all modulation modes.

2.5 Measurement Method

Description of Test	Measurement Method
AC Line Conducted Emissions	ANSI C63.10-2020 Section 6.2
Maximum Conducted Output Power	ANSI C63.10-2020 Section 7.8.5
20 dB Emission Bandwidth	ANSI C63.10-2020 Section 6.9.2
99% Occupied Bandwidth	ANSI C63.10-2020 Section 6.9.3
Channel separation	ANSI C63.10-2020 Section 7.8.2
Number of hopping Frequency	ANSI C63.10-2020 Section 7.8.3
Time of occupancy (dwell time)	ANSI C63.10-2020 Section 7.8.4
100kHz Bandwidth of Frequency Band Edge	ANSI C63.10-2020 Section 7.8.7.2&6.10
Radiated emission	ANSI C63.10-2020 Section 7.8&6.3&6.4&6.5&6.6

2.6 Measurement Equipment

Manufacturer	Description	Model	Management No.	Calibration Date	Calibration Due Date
AC Line Conducted Emission Test					
ROHDE & SCHWARZ	EMI TEST RECEIVER	ESR	101817	2023/7/3	2024/7/2
R&S	LISN	ENV216	101748	2023/8/1	2024/7/31
N/A	Coaxial Cable	NO.12	N/A	2023/7/3	2024/7/2
Farad	Test Software	EZ-EMC	Ver. EMEC-3A1	/	/
Radiated Emission Test					
R&S	EMI test receiver	ESR3	102758	2023/7/3	2024/7/2
ROHDE & SCHWARZ	SPECTRUM ANALYZER	FSV40-N	101608	2023/7/3	2024/7/2

SONOMA INSTRUMENT	Low frequency amplifier	310	186014	2023/7/12	2024/7/11
COM-POWER	preamplifier	PAM-118A	18040152	2023/8/21	2024/8/20
COM-POWER	Amplifier	PAM-840A	461306	2023/8/8	2024/8/7
BACL	Loop Antenna	1313-1A	4010611	2024-2-7	2027-2-6
SCHWARZBECK	Log - periodic wideband antenna	VULB 9163	9163-872	2023/7/7	2024/7/6
Astro Antenna Ltd	Horn antenna	AHA-118S	3015	2023/7/6	2024/7/5
Ducommun technologies	Horn Antenna	ARH-4223-02	1007726-03	2023/7/10	2024/7/9
Oulitong	Band Reject Filter	OBSF-2400-248 3.5-50N	OE02103119	2023/9/15	2024/9/14
N/A	Coaxial Cable	N/A	NO.9	2023/8/8	2024/8/7
N/A	Coaxial Cable	N/A	NO.10	2023/8/8	2024/8/7
N/A	Coaxial Cable	N/A	NO.11	2023/8/8	2024/8/7
Audix	Test Software	E3	191218 V9	/	/
RF Conducted Test					
ANRITSU	USB Power Sensor	MA24418A	12620	2023/7/12	2024/7/11
narda	6dB attenuator	603-06-1	N/A	2023/7/26	2024/7/25

Note: All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or International standards.

3 Test Results

3.1 Test Summary

FCC Rules	Description of Test	Result	Remark
§15.203	Antenna Requirement	Compliance	/
§15.207 (a)	AC Line Conducted Emissions	Compliance	/
§15.247 (a)(1)	20dB Emission Bandwidth	/	See note
-	99% Occupied Bandwidth	/	See note
§15.247 (a)(1)	Channel separation	/	See note
§15.247 (a)(1)(iii)	Number of hopping Frequency	/	See note
§15.247 (a)(1)(iii)	Time of occupancy (dwell time)	/	See note
§15.247(b)(1)	Maximum Conducted Output Power	Report only	/
§15.247(d)	100kHz Bandwidth of Frequency Band Edge	/	See note
§15.205, §15.209, §15.247(d)	Radiated emission	Compliance	/

Note:

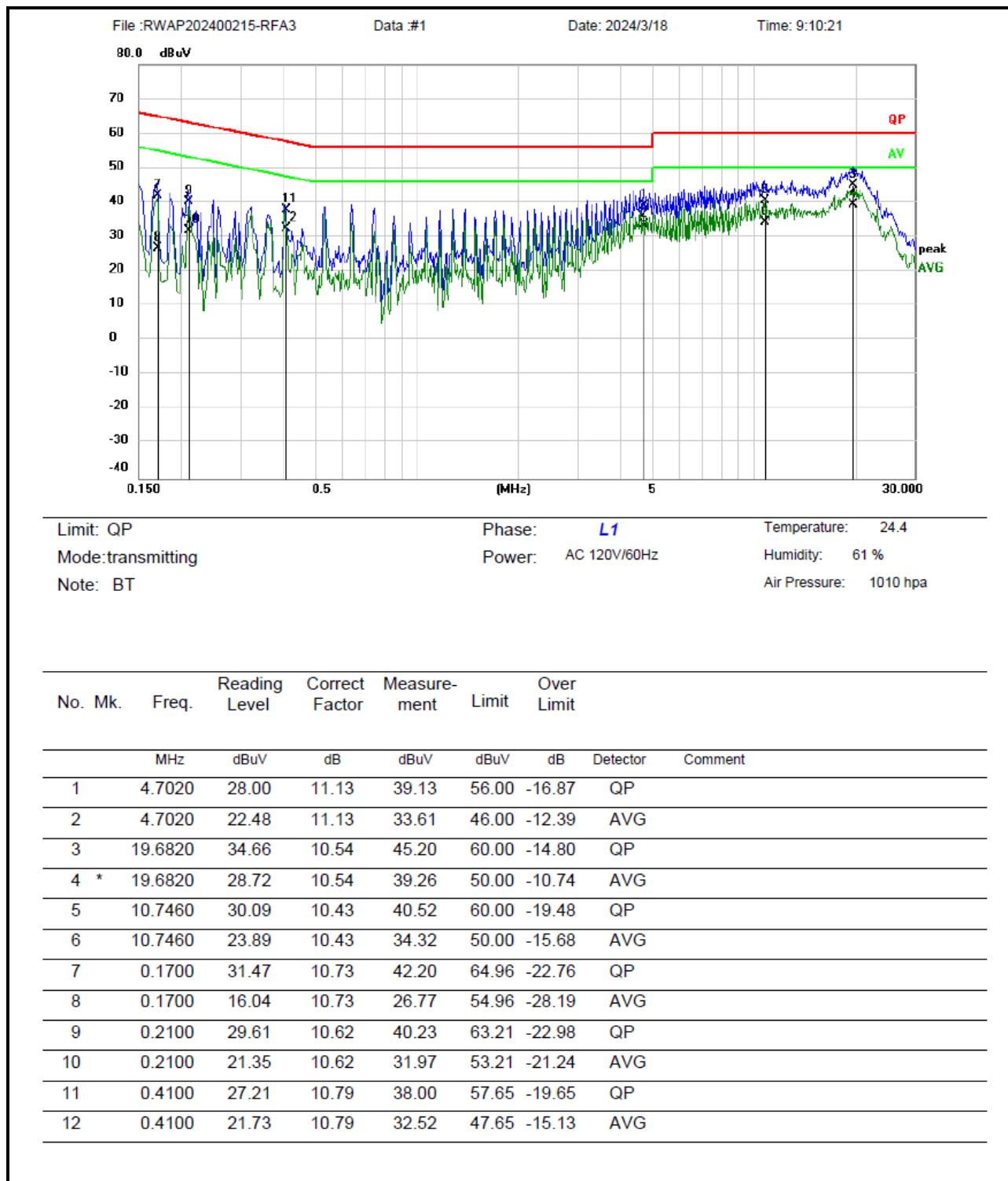
1. This is a CIIPC application for FCC ID: S38-IXMC410, the below changes was made based on the device granted on 01/24/2024 which was provided by the manufacturer:
 - (1) Changing the I/O board.
 - (2) Changing the Antenna.
2. The output power was tested and verify consistence with the original report, test data of those item please refers to the report: RSZ200929002-00B.
3. World Alliance Testing and Certification (Shenzhen) Co., Ltd is responsible for all the information provided in this report, except when information is provided by the customer as identified in this report.

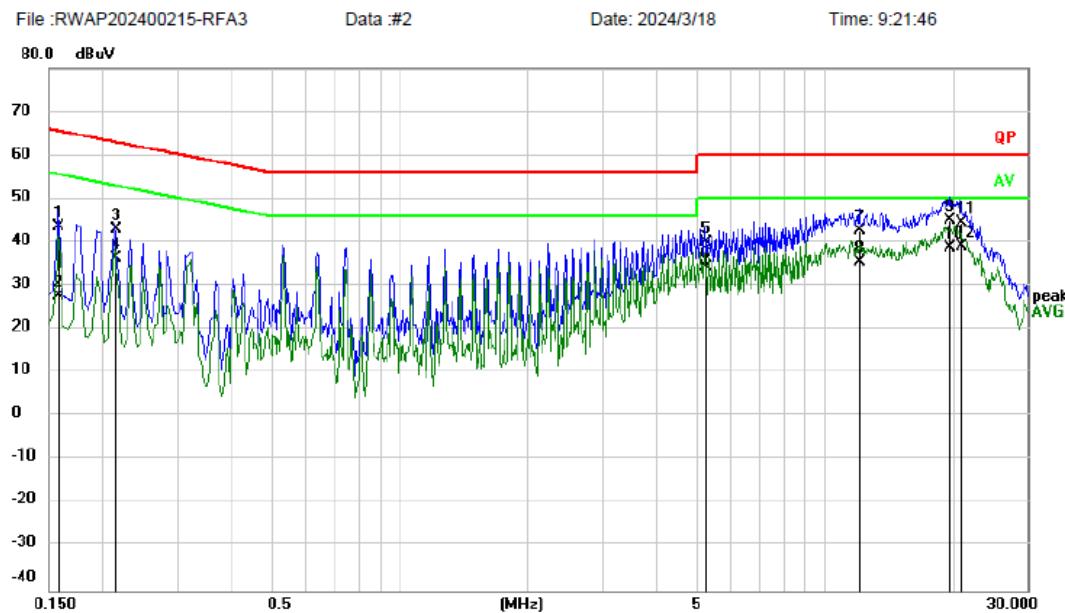
3.2 Limit

Test items	Limit
AC Line Conducted Emissions	See details §15.207 (a)
Conducted Output Power	For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.
Channel separation	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Number of hopping Frequency	Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.
Time of occupancy (dwell time)	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
Spurious Emissions, 100kHz Bandwidth of Frequency Band Edge	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

3.3 AC Line Conducted Emissions Test Data

Test Date:	2024-03-18	Test By:	Lirou Li
Environment condition:	Temperature: 24.4°C; Relative Humidity:61%; ATM Pressure: 101kPa		





Limit: QP Phase: *N* Temperature: 24.4
 Mode:transmitting Power: AC 120V/60Hz Humidity: 61 %
 Note: BT Air Pressure: 1010 hpa

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit	
		MHz	dBuV	dB	dBuV	dB	Detector	Comment
1	0.1580	32.85	10.58	43.43	65.57	-22.14	QP	
2	0.1580	16.93	10.58	27.51	55.57	-28.06	AVG	
3	0.2140	32.58	10.42	43.00	63.05	-20.05	QP	
4	0.2140	25.79	10.42	36.21	53.05	-16.84	AVG	
5	5.2420	29.25	10.56	39.81	60.00	-20.19	QP	
6	5.2420	23.55	10.56	34.11	50.00	-15.89	AVG	
7	12.0780	31.84	10.79	42.63	60.00	-17.37	QP	
8	12.0780	24.62	10.79	35.41	50.00	-14.59	AVG	
9	19.7300	34.30	10.65	44.95	60.00	-15.05	QP	
10	19.7300	28.06	10.65	38.71	50.00	-11.29	AVG	
11	20.9220	33.87	10.65	44.52	60.00	-15.48	QP	
12 *	20.9220	28.44	10.65	39.09	50.00	-10.91	AVG	

Remark:

Measurement (dBuV)= Reading Level (dBuV) + Correct Factor(dB)

Correct Factor(dB)= LISN Voltage Division Factor (dB)+ Cable loss(dB)

Over Limit = Measurement – Limit

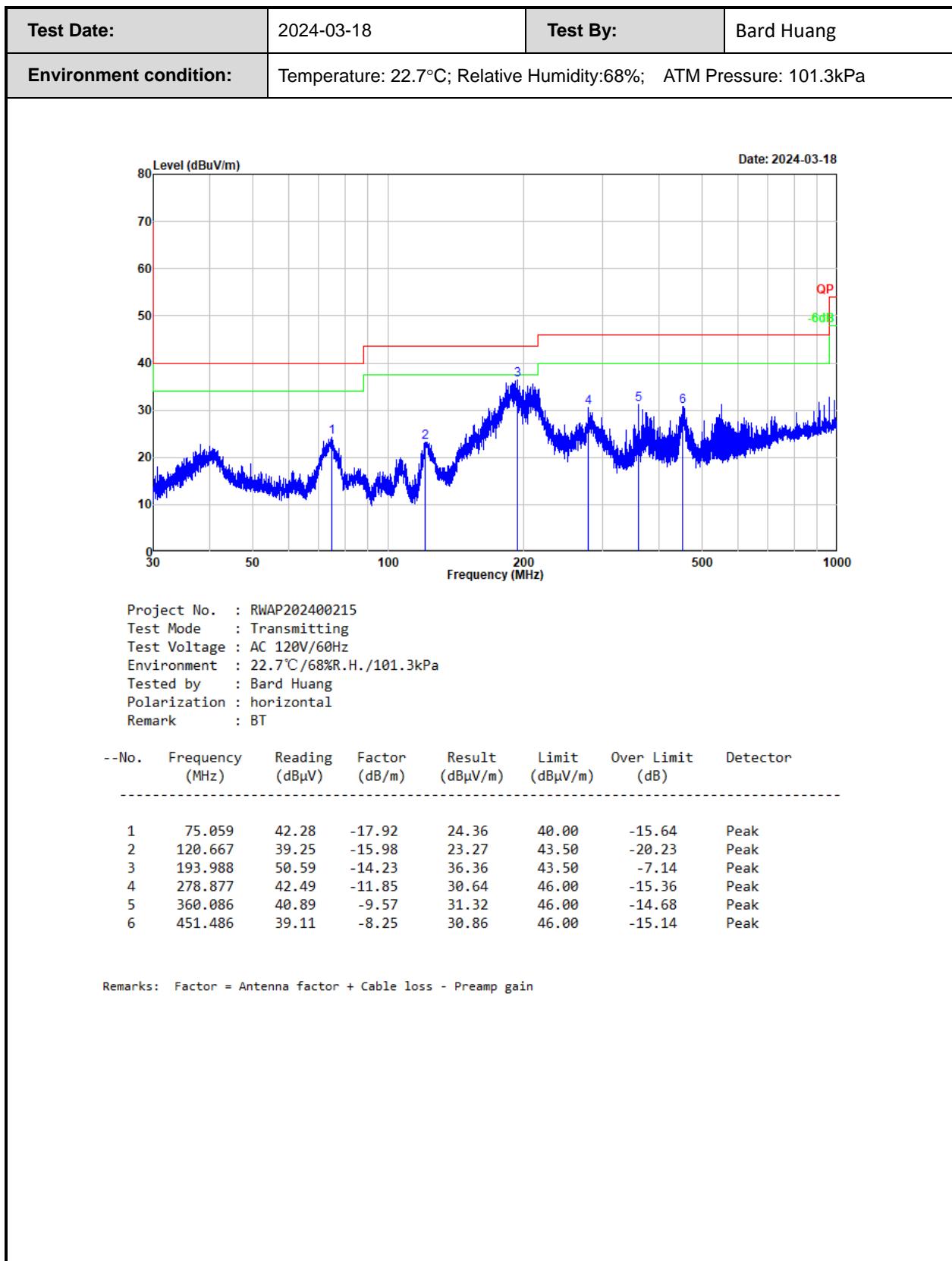
3.4 Radiated emission Test Data

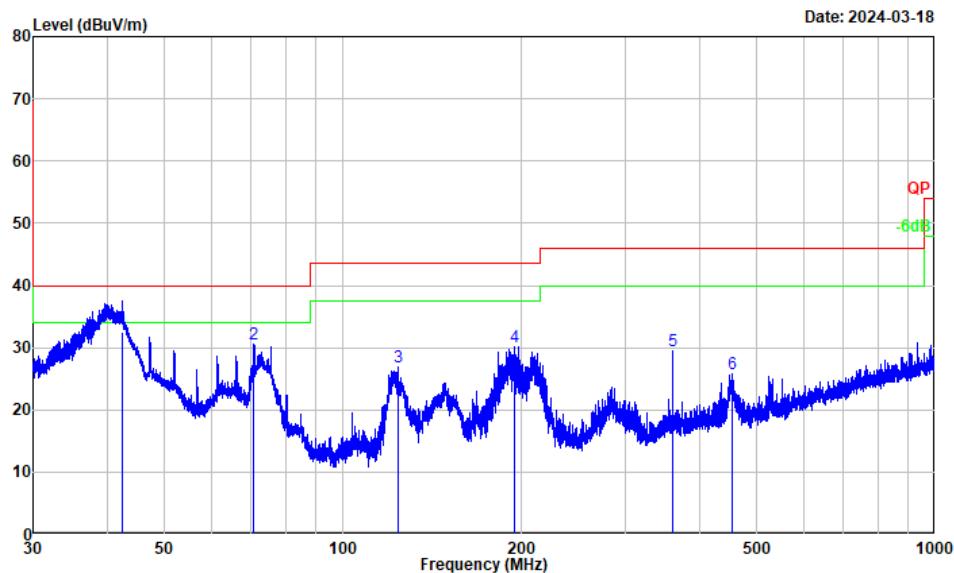
9 kHz-30MHz:

Test Date:	2024-03-18	Test By:	Bard Huang
Environment condition:	Temperature: 22.7°C; Relative Humidity:68%; ATM Pressure: 101.3kPa		

For radiated emissions below 30MHz, there were no emissions found within 20dB of limit.

30MHz-1GHz:





Project No. : RWAP202400215
 Test Mode : Transmitting
 Test Voltage : AC 120V/60Hz
 Environment : 22.7°C/68%R.H./101.3kPa
 Tested by : Bard Huang
 Polarization : vertical
 Remark : BT

--No.	Frequency (MHz)	Reading (dB μ V)	Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Over Limit (dB)	Detector
1	42.453	44.89	-12.45	32.44	40.00	-7.56	QP
2	70.839	47.17	-16.66	30.51	40.00	-9.49	Peak
3	123.938	43.42	-16.62	26.80	43.50	-16.70	Peak
4	195.268	44.32	-14.09	30.23	43.50	-13.27	Peak
5	360.086	39.12	-9.57	29.55	46.00	-16.45	Peak
6	454.265	34.01	-8.24	25.77	46.00	-20.23	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain

Remark:

Result = Reading + Factor

Factor = Antenna factor + Cable loss - Amplifier gain

Over Limit = Result - Limit

Above 1GHz:

Test Date:	2024-03-18	Test By:	Bard Huang
Environment condition:	Temperature: 22.7°C; Relative Humidity:68%; ATM Pressure: 101.3kPa		

Frequency (MHz)	Reading level (dB μ V)	Polar	Corrected Factor (dB/m)	Corrected Amplitude (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Remark
GFSK							
Low Channel							
2390.000	37.38	horizontal	8.25	45.63	54.00	-8.37	Average
2390.000	49.69	horizontal	8.25	57.94	74.00	-16.06	Peak
2390.000	37.15	vertical	8.25	45.40	54.00	-8.60	Average
2390.000	49.38	vertical	8.25	57.63	74.00	-16.37	Peak
4804.000	49.46	horizontal	0.21	49.67	74.00	-24.33	Peak
4804.000	48.81	vertical	0.21	49.02	74.00	-24.98	Peak
Middle Channel							
4882.000	47.82	horizontal	0.45	48.27	74.00	-25.73	Peak
4882.000	47.74	vertical	0.45	48.19	74.00	-25.81	Peak
High Channel							
2483.559	37.06	horizontal	8.25	45.31	54.00	-8.69	Average
2483.559	51.31	horizontal	8.25	59.56	74.00	-14.44	Peak
2483.684	37.26	vertical	8.25	45.51	54.00	-8.49	Average
2483.684	52.41	vertical	8.25	60.66	74.00	-13.34	Peak
4960.000	48.68	horizontal	0.93	49.61	74.00	-24.39	Peak
4960.000	47.85	vertical	0.93	48.78	74.00	-25.22	Peak
$\pi/4$ DQPSK							
Low Channel							
2390.000	37.37	horizontal	8.25	45.62	54.00	-8.38	Average
2390.000	49.42	horizontal	8.25	57.67	74.00	-16.33	Peak
2390.000	37.22	vertical	8.25	45.47	54.00	-8.53	Average
2390.000	50.00	vertical	8.25	58.25	74.00	-15.75	Peak
4804.000	48.28	horizontal	0.21	48.49	74.00	-25.51	Peak
4804.000	49.23	vertical	0.21	49.44	74.00	-24.56	Peak
Middle Channel							
4882.000	48.49	horizontal	0.45	48.94	74.00	-25.06	Peak
4882.000	47.75	vertical	0.45	48.20	74.00	-25.80	Peak
High Channel							
2483.500	37.37	horizontal	8.25	45.62	54.00	-8.38	Average

2483.500	50.55	horizontal	8.25	58.80	74.00	-15.20	Peak
2483.500	37.03	vertical	8.25	45.28	54.00	-8.72	Average
2483.500	50.80	vertical	8.25	59.05	74.00	-14.95	Peak
4960.000	47.18	horizontal	0.93	48.11	74.00	-25.89	Peak
4960.000	49.64	vertical	0.93	50.57	74.00	-23.43	Peak
8DPSK							
Low Channel							
2390.000	37.81	horizontal	8.25	46.06	54.00	-7.94	Average
2390.000	50.22	horizontal	8.25	58.47	74.00	-15.53	Peak
2390.000	37.47	vertical	8.25	45.72	54.00	-8.28	Average
2390.000	48.98	vertical	8.25	57.23	74.00	-16.77	Peak
4804.000	48.54	horizontal	0.21	48.75	74.00	-25.25	Peak
4804.000	48.98	vertical	0.21	49.19	74.00	-24.81	Peak
Middle Channel							
4882.000	48.55	horizontal	0.45	49.00	74.00	-25.00	Peak
4882.000	48.25	vertical	0.45	48.70	74.00	-25.30	Peak
High Channel							
2483.554	37.59	horizontal	8.25	45.84	54.00	-8.16	Average
2483.554	50.49	horizontal	8.25	58.74	74.00	-15.26	Peak
2483.500	37.28	vertical	8.25	45.53	54.00	-8.47	Average
2483.500	49.62	vertical	8.25	57.87	74.00	-16.13	Peak
4960.000	47.57	horizontal	0.93	48.50	74.00	-25.50	Peak
4960.000	47.59	vertical	0.93	48.52	74.00	-25.48	Peak

Remark:

Corrected Amplitude = Reading level + corrected Factor

Corrected Factor = Antenna factor + Cable loss - Amplifier gain

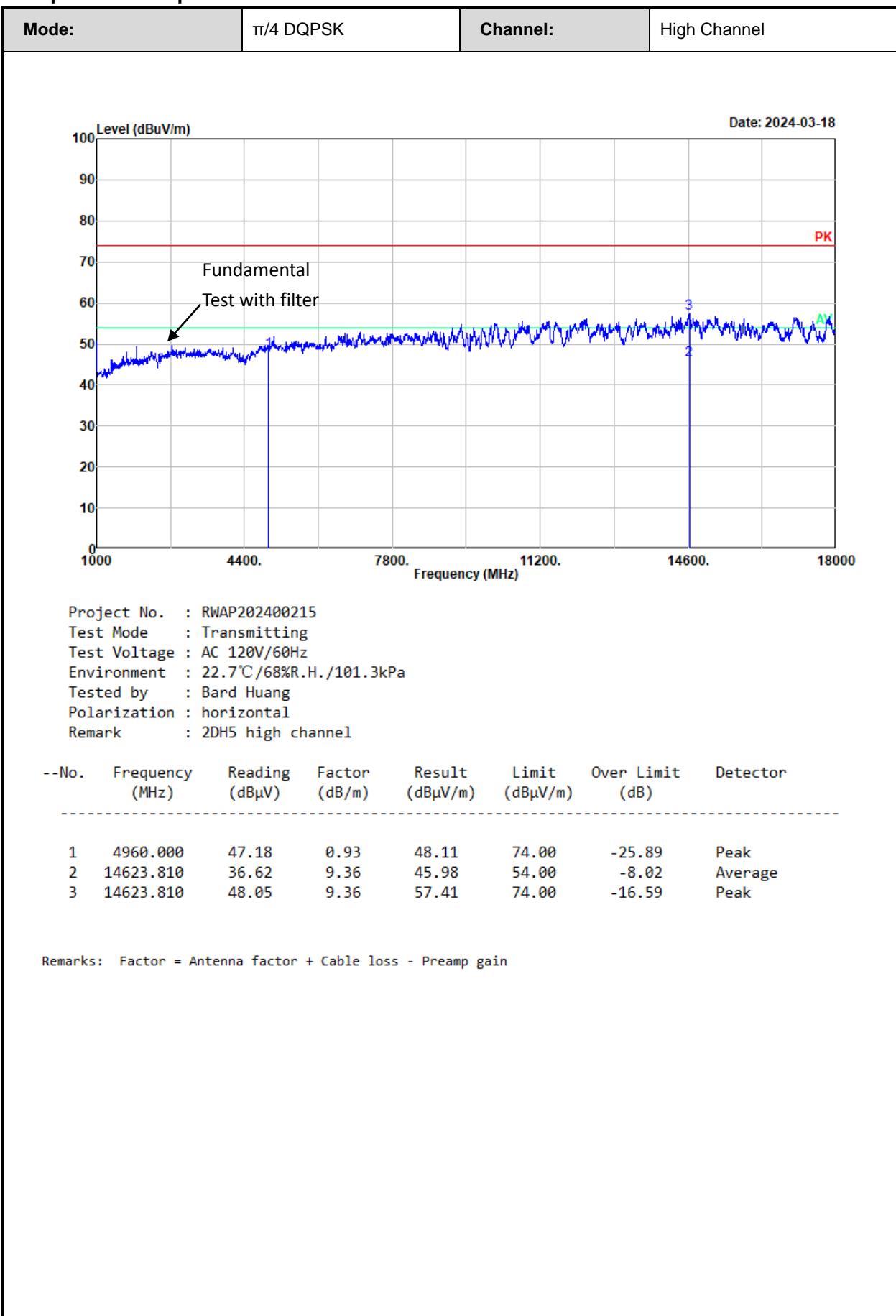
Margin = Corrected Amplitude - Limit

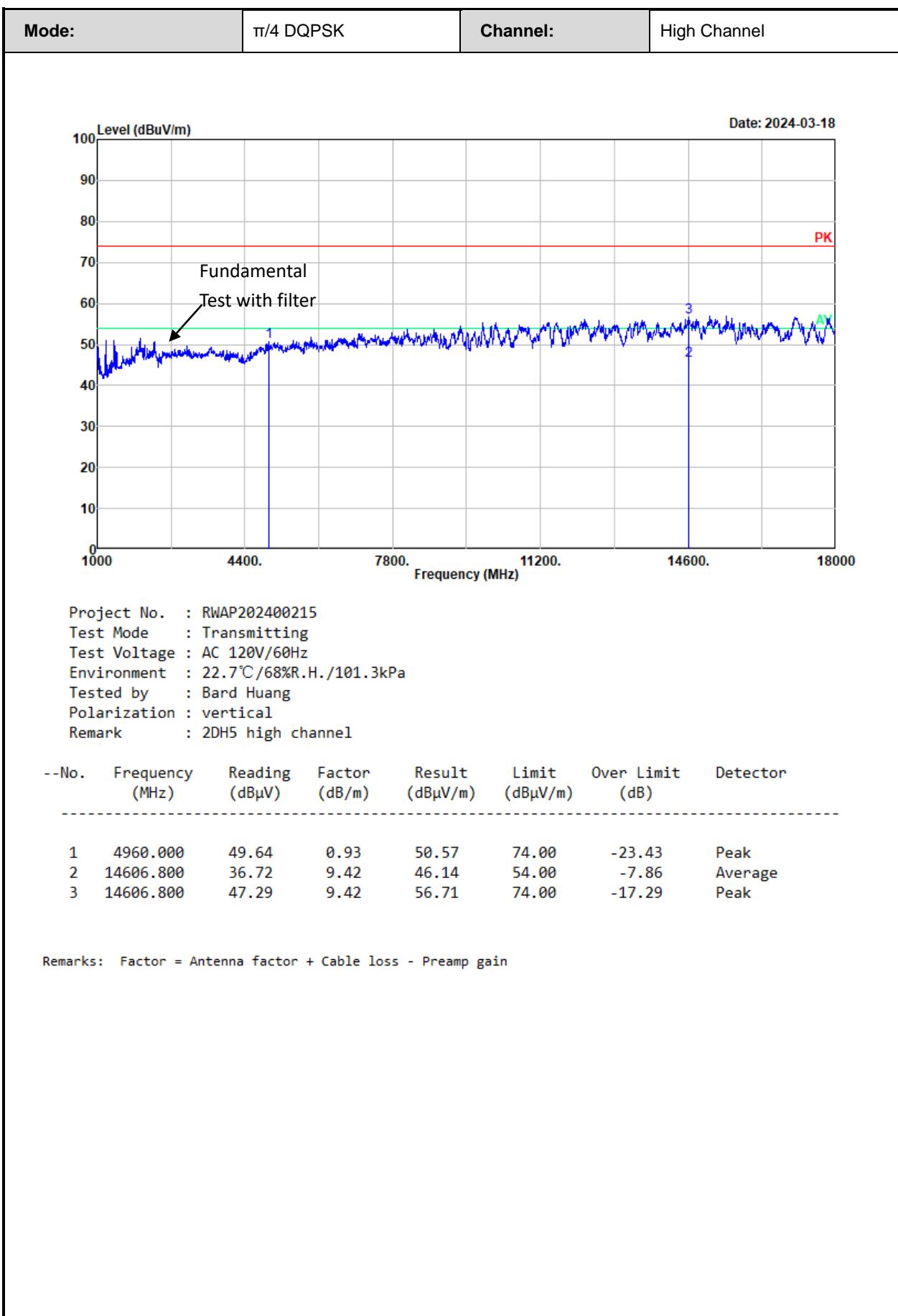
For the test result of Peak below the Peak limit more than 20dB, which can compliance with the average limit, just the Peak level was recorded.

The emission levels of other frequencies that were lower than the limit 20dB, not show in test report.

For emissions in 18GHz-25GHz range, all emissions were investigated and in the noise floor level.

Test plot for example as below:





3.5 RF Conducted Test Data

Test Date:	2024-03-06	Test By:	Baylor Li
Environment condition:	Temperature: 24.9°C; Relative Humidity:54%; ATM Pressure: 101.2kPa		

3.5.1 20 dB Emission Bandwidth and 99% Occupied Bandwidth

Test data please refer to test report: RSZ200929002-00B Page 30~37.

3.5.2 Maximum Conducted Peak Output Power

Test Mode	Channel[MHz]	Result[dBm]	Limit[dBm]	Verdict
GFSK	2402	5.21	20.97	Pass
	2441	5.34	20.97	Pass
	2480	6.76	20.97	Pass
$\pi/4$ DQPSK	2402	4.50	20.97	Pass
	2441	4.59	20.97	Pass
	2480	5.64	20.97	Pass
8DPSK	2402	4.92	20.97	Pass
	2441	4.63	20.97	Pass
	2480	5.61	20.97	Pass

3.5.3 Channel separation

Please refer to test report: RSZ200929002-00B, page 42~43.

3.5.4 Number of hopping Frequency

Please refer to test report: RSZ200929002-00B, page 51~52.

3.5.5 Time of occupancy (dwell time)

Please refer to test report: RSZ200929002-00B, page 44~50.

3.5.6 100 kHz Bandwidth of Frequency Band Edge

Please refer to test report: RSZ200929002-00B, page 53~56.

4 Test Setup Photo

Please refer to the attachment RWAP202400215 Test Setup photo.

5 E.U.T Photo

Please refer to the attachment RWAP202400215 External photo and RWAP202400215 Internal photo.

---End of Report---