FCC Test Report

Report No.:	RWAZ202300101A
Applicant:	Shenzhen Qianyan Technology LTD
Address:	No.3301, Block C, Section 1, Chuangzhi Yuncheng Building, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen, China
Product Name:	Govee Outdoor String Lights 2
Product Model:	H7039
Multiple Models:	H7038, H7037
Trade Mark:	Govee
FCC ID:	2A7VD-H7039
Standards:	FCC CFR Title 47 Part 15C (§15.247)
Test Date:	2024-01-18 to 2024-02-04
Test Result:	Complied
Report Date:	2024-03-21

Reviewed by: Abel Chen — Abel Chen, Project Engineer

Approved by: Jacob Gong — Jacob Kong, Manager

Prepared by:

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

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NVLAP TESTING NVLAP LAB CODE 600335-0

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Revision History

Version No.	Issued Date	Description
00	*2024-03-21*	*Original*

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1 General Information

1.1 Client Information

Applicant:	Shenzhen Qianyan Technology LTD
Address:	No.3301, Block C, Section 1, Chuangzhi Yuncheng Building, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen Qianyan Technology LTD
Address:	No.3301, Block C, Section 1, Chuangzhi Yuncheng Building, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen, China

1.2 Product Description of EUT

The EUT is Govee Outdoor String Lights 2 that contains 2.4G WLAN and BLE(1M) radios, this report covers the full testing of the 2.4G WLAN radio.

Sample Serial Number	23-3, 23-5, 23-7 for CE&RE(below 1GHz) Test; 23-9 for RE(above 1GHz) test; 23-10 for RF test conducted test (assigned by WATC)
Sample Received Date	2023-12-29
Sample Status	Good Condition
Frequency Range	2412MHz - 2472MHz(802.11b, g, n-HT20)
Maximum Conducted Peak Output Power	10.27dBm
Modulation Technology	DSSS, OFDM
Antenna Gain#	3.98 dBi
Spatial Streams#	SISO (1TX, 1RX)
Power Supply	DC 36V/1500mA from adapter
Operating temperature#	-20 deg.C to +40 deg.C
Adapter Information	Model: BI54G-360150-AdU(IP44) Input: AC100-240V, 50/60Hz, 1.4A Output: DC 36V/1.5A
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 Wi-Fi antenna is an internal antenna which cannot replace by end-user. Please see product internal photos for details.

1.4 Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s)

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)
1	2412	6	2437	11	2462
2	2417	7	2442	12	2467
3	2422	8	2447	13	2472
4	2427	9	2452	/	/
5	2432	10	2457	/	/
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:					
802.11b, 802.11g, 802.11n-HT20					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	7	2442	13	2472

Test Mode:				
Transmitting mode:	Keep the EUT in continuous transmitting with modulation			
Exercise software[#]:	AmebaZ2_mptool			
Mode	**Worst-case Data rate**	**Power Level Setting[#]**		
		Low Channel	**Middle Channel**	**High Channel**
802.11b	1Mbps	36	36	36
802.11g	6Mbps	13	13	13
802.11n-HT20	6.5Mbps	8	8	8
The exercise software and the maximum power setting that provided by manufacturer.				

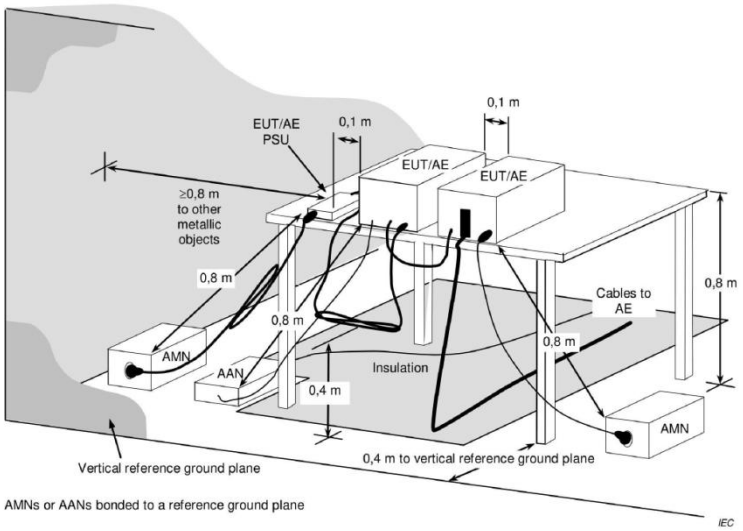
Worst-Case Configuration:
For radiated emissions, EUT was investigated in three orthogonal orientation, the worst-case orientation was recorded in report For AC power line conducted emission and radiated emission 9kHz-1GHz and above 18GHz were performed with the EUT transmits at the channel with highest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

2.2 Test Auxiliary Equipment

Manufacturer	**Description**	**Model**	**Serial Number**
/	/	/	/

2.3 Test Setup

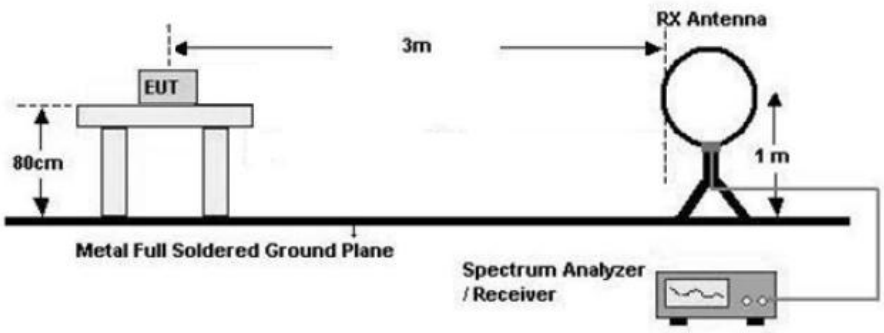
1) Conducted emission measurement:



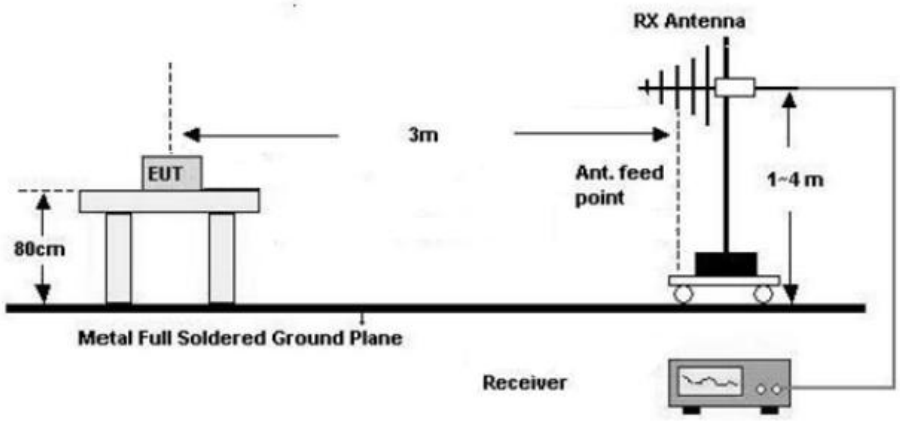
Note: The 0.8 m distance specified between EUT/AE/PSU and AMN/AAN, is applicable only to the EUT being measured. If the device is AE then it shall be >0.8 m.

2) Radiated emission measurement:

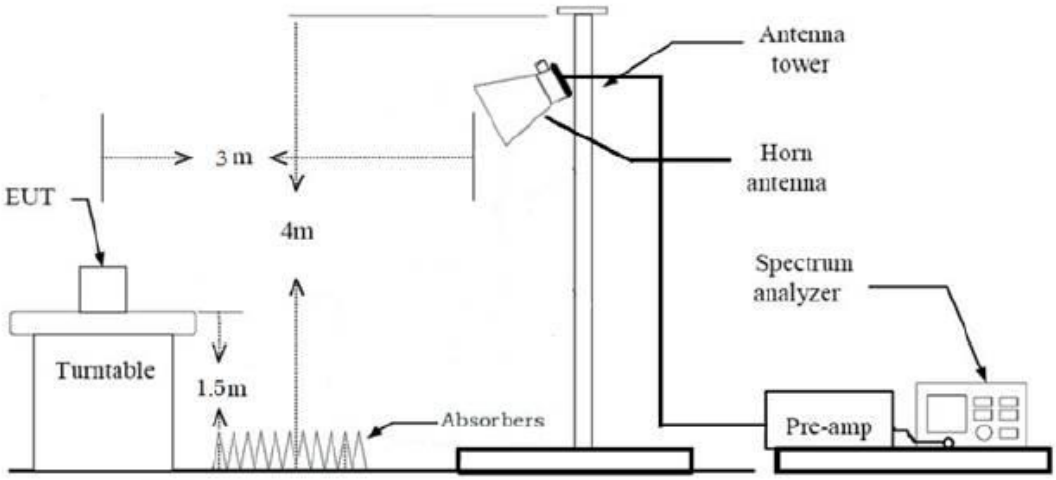
Below 30MHz (3m SAC)



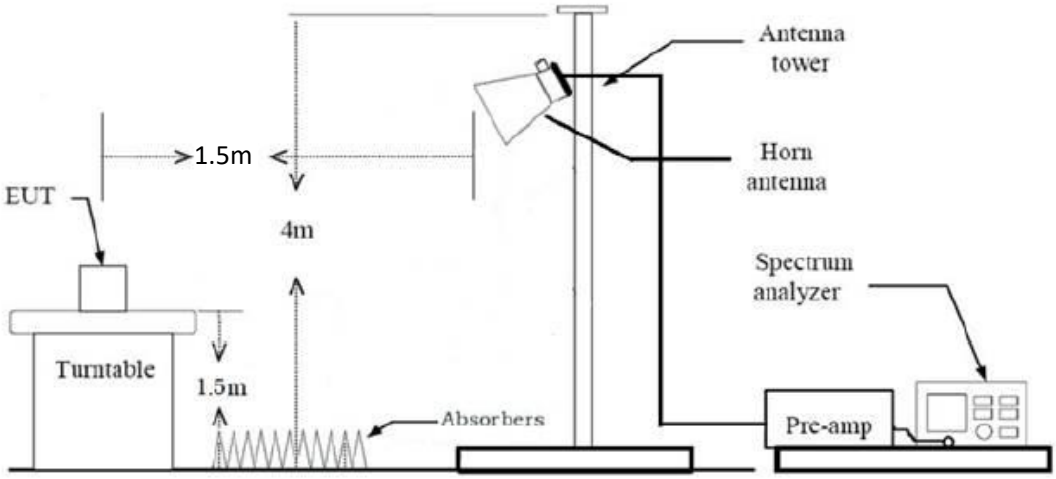
30MHz-1GHz (3m SAC)



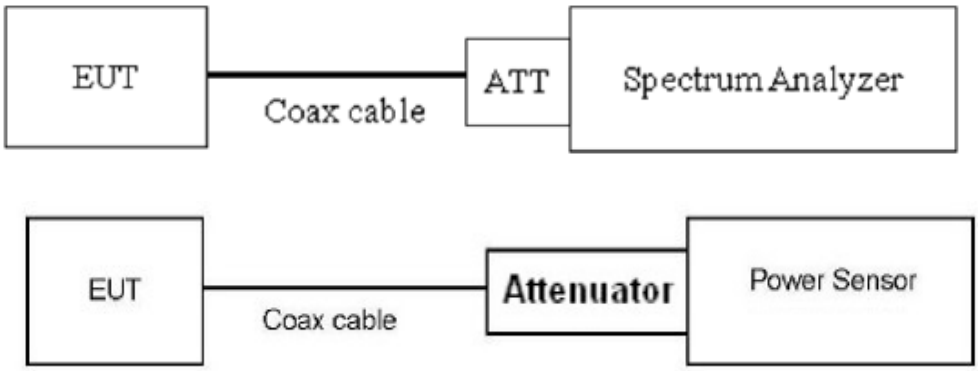
1GHz-18GHz(3m FAC)



Above 18GHz (3m FAC)



3) RF Conducted Test



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*Log (test distance / specification distance).
2. Loop antenna use, investigation was done on the three antenna orientations (parallel, perpendicular, gound-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 6.5dB (including 6.0 dB Attenuator and 0.5dB 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 0.5dB 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 11.9.1.2 PKPM1 Peak power meter method or ANSI C63.10-2020 Section 11.9.2.3.2 Method AVGPM-G
Power Spectral Density	ANSI C63.10-2020 Section 11.10.2 Method PKPSD (peak PSD)
6 dB Emission Bandwidth	ANSI C63.10-2020 Section 11.8.1
99% Occupied Bandwidth	ANSI C63.10-2020 Section 6.9.3
100kHz Bandwidth of Frequency Band Edge	ANSI C63.10-2020 Section 6.10
Radiated emission	ANSI C63.10-2020 Section 11.11&11.12
Duty Cycle	ANSI C63.10-2020 Section 11.6

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
ETS	Passive Loop Antenna	6512	29604	2023/7/7	2024/7/6
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-2400-2483.5-50N	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					
ROHDE& SCHWARZ	SPECTRUM ANALYZER	FSU-26	200680/026	2023/7/12	2024/7/11
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
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(e)	Power Spectral Density	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
-	99% Occupied Bandwidth	Report only
§15.247(d)	100kHz Bandwidth of Frequency Band Edge	Compliance
§15.205, §15.209, §15.247(d)	Radiated emission	Compliance
-	Duty Cycle	Report only

3.2 Limit

Test items	Limit
AC Line Conducted Emissions	See details §15.207 (a)
Conducted Output Power	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.
6dB Emission Bandwidth	The minimum 6 dB bandwidth shall be at least 500 kHz.
Power Spectral Density	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
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)).

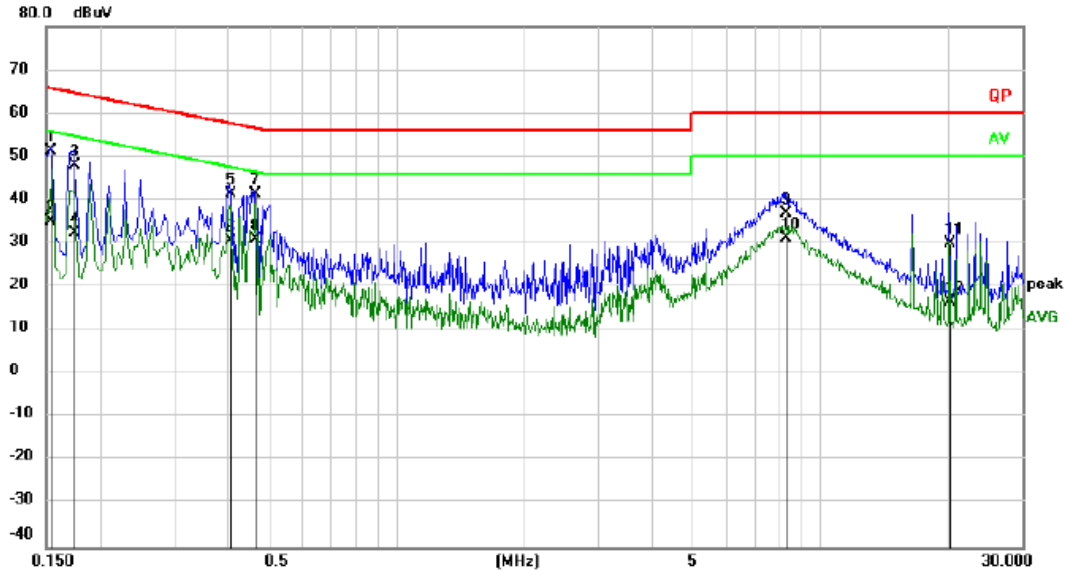
3.3 AC Line Conducted Emissions Test Data

Test Date:	2024-01-18~2024-01-31	Test By:	Lirou Li
Environment condition:	Temperature: 22.4~25.5°C; Relative Humidity:63~72%; ATM Pressure: 101.2kPa		

Model: H7037

Conducted Emission Measurement

File :RWAZ202300101 Data :#17 Date: 2024/1/31 Time: 10:50:33



Limit: QP
Mode:transmitting
Note: 802.11b M Channel

Phase: L1
Power: AC 120V/60Hz

Temperature: 22.4
Humidity: 72 %
Air Pressure: 1012 hpa

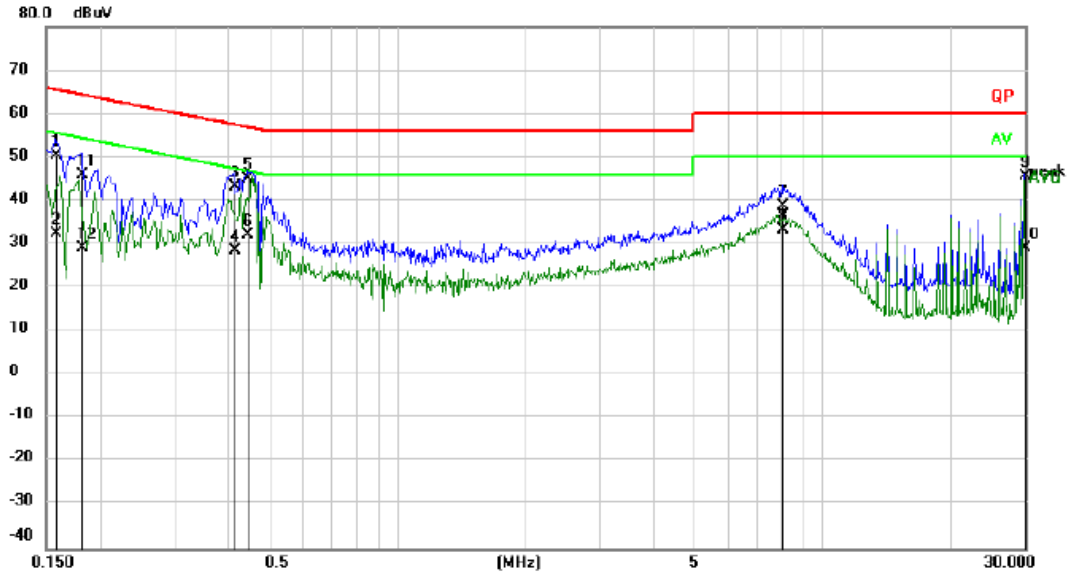
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1539	40.66	10.79	51.45	65.79	-14.34	QP	
2		0.1539	24.50	10.79	35.29	55.79	-20.50	AVG	
3		0.1740	37.24	10.71	47.95	64.77	-16.82	QP	
4		0.1740	21.72	10.71	32.43	54.77	-22.34	AVG	
5		0.4060	30.78	10.79	41.57	57.73	-16.16	QP	
6		0.4060	19.90	10.79	30.69	47.73	-17.04	AVG	
7		0.4660	30.64	10.80	41.44	56.58	-15.14	QP	
8		0.4660	20.15	10.80	30.95	46.58	-15.63	AVG	
9		8.2820	26.12	10.83	36.95	60.00	-23.05	QP	
10		8.2820	20.35	10.83	31.18	50.00	-18.82	AVG	
11		20.2540	19.63	10.54	30.17	60.00	-29.83	QP	
12		20.2540	6.04	10.54	16.58	50.00	-33.42	AVG	

*:Maximum data x:Over limit !:over margin

Engineer Signature: Lirou

Conducted Emission Measurement

File :RWAZ202300101 Data :#18 Date: 2024/1/31 Time: 10:59:06



Limit: QP
Mode:transmitting
Note: 802.11b M Channel

Phase: N
Power: AC 120V/60Hz

Temperature: 22.4
Humidity: 72 %
Air Pressure: 1012 hpa

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1580	40.01	10.58	50.59	65.57	-14.98	QP	
2		0.1580	21.99	10.58	32.57	55.57	-23.00	AVG	
3		0.4140	32.58	10.65	43.23	57.57	-14.34	QP	
4		0.4140	17.87	10.65	28.52	47.57	-19.05	AVG	
5	*	0.4460	34.40	10.68	45.08	56.95	-11.87	QP	
6		0.4460	21.49	10.68	32.17	46.95	-14.78	AVG	
7		8.0740	28.07	10.73	38.80	60.00	-21.20	QP	
8		8.0740	22.49	10.73	33.22	50.00	-16.78	AVG	
9		30.0000	34.77	10.78	45.55	60.00	-14.45	QP	
10		30.0000	18.41	10.78	29.19	50.00	-20.81	AVG	
11		0.1819	35.50	10.48	45.98	64.40	-18.42	QP	
12		0.1819	18.53	10.48	29.01	54.40	-25.39	AVG	

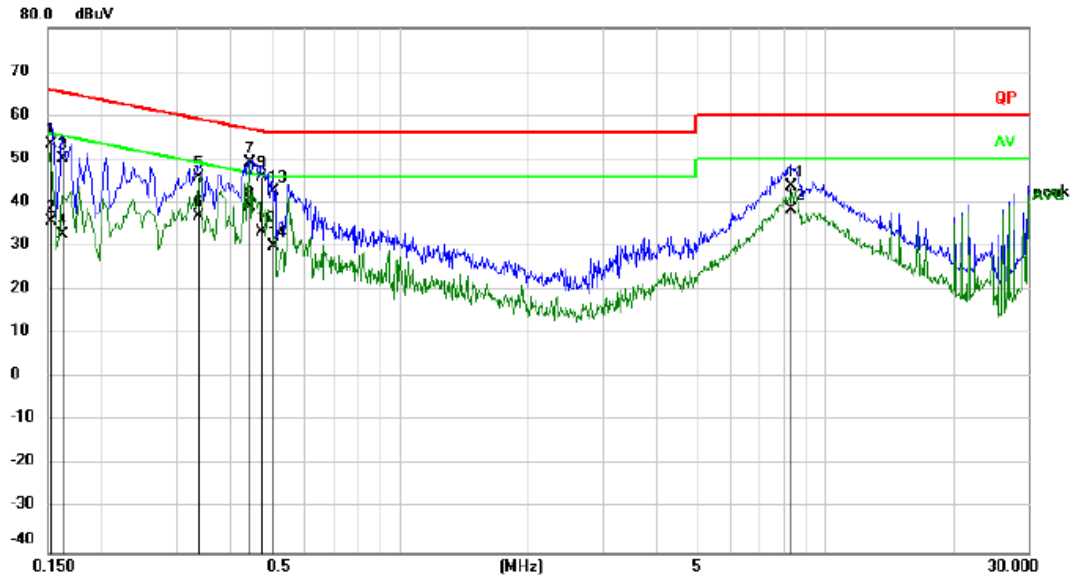
*:Maximum data x:Over limit !:over margin

Engineer Signature: Lirou

Model: H7038

Conducted Emission Measurement

File :RWAZ202300101 Data :#12 Date: 2024/1/31 Time: 10:04:18



Limit: QP
Mode:transmitting
Note: 802.11b M Channel

Phase: L1
Power: AC 120V/60Hz

Temperature: 22.4
Humidity: 72 %
Air Pressure: 1012 hpa

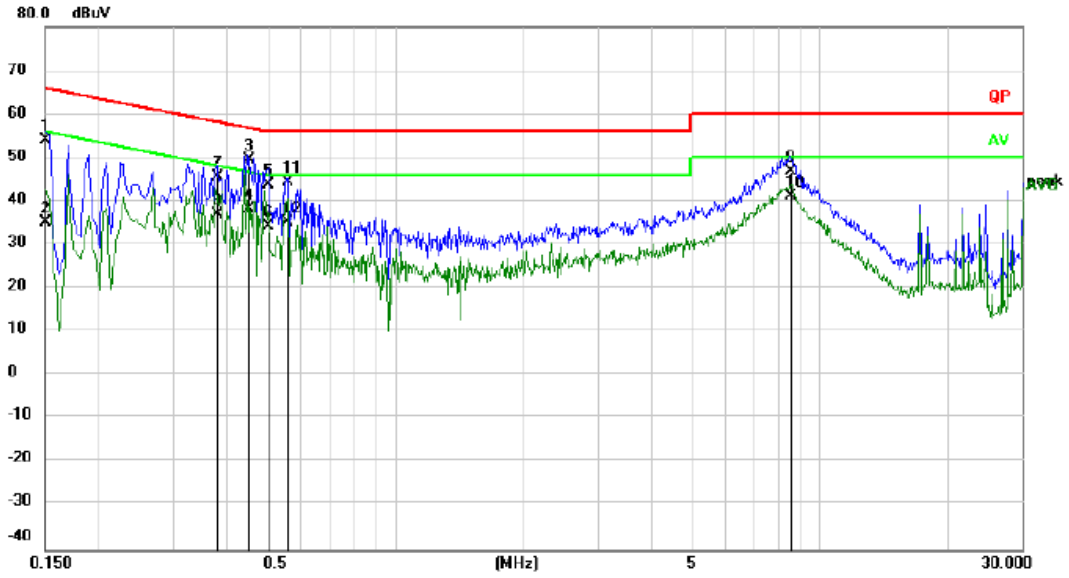
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1524	42.62	10.80	53.42	65.87	-12.45	QP	
2		0.1524	24.88	10.80	35.68	55.87	-20.19	AVG	
3		0.1620	39.44	10.76	50.20	65.36	-15.16	QP	
4		0.1620	22.11	10.76	32.87	55.36	-22.49	AVG	
5		0.3379	35.25	10.73	45.98	59.25	-13.27	QP	
6		0.3379	26.11	10.73	36.84	49.25	-12.41	AVG	
7	*	0.4460	38.47	10.79	49.26	56.95	-7.69	QP	
8		0.4460	28.41	10.79	39.20	46.95	-7.75	AVG	
9		0.4740	35.09	10.80	45.89	56.44	-10.55	QP	
10		0.4740	22.45	10.80	33.25	46.44	-13.19	AVG	
11		8.2900	32.97	10.83	43.80	60.00	-16.20	QP	
12		8.2900	27.60	10.83	38.43	50.00	-11.57	AVG	
13		0.5060	31.97	10.81	42.78	56.00	-13.22	QP	
14		0.5060	19.27	10.81	30.08	46.00	-15.92	AVG	

*:Maximum data x:Over limit !:over margin

Engineer Signature: Lirou

Conducted Emission Measurement

File :RWAZ202300101 Data :#11 Date: 2024/1/31 Time: 9:55:50



Limit: QP
Mode:transmitting
Note: 802.11b M Channel

Phase: N
Power: AC 120V/60Hz

Temperature: 22.4
Humidity: 72 %
Air Pressure: 1012 hpa

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	43.33	10.61	53.94	66.00	-12.06	QP	
2		0.1500	24.43	10.61	35.04	56.00	-20.96	AVG	
3	*	0.4500	38.95	10.68	49.63	56.88	-7.25	QP	
4		0.4500	27.43	10.68	38.11	46.88	-8.77	AVG	
5		0.5020	33.26	10.71	43.97	56.00	-12.03	QP	
6		0.5020	23.39	10.71	34.10	46.00	-11.90	AVG	
7		0.3820	34.98	10.63	45.61	58.24	-12.63	QP	
8		0.3820	26.20	10.63	36.83	48.24	-11.41	AVG	
9		8.5060	36.18	10.73	46.91	60.00	-13.09	QP	
10		8.5060	30.30	10.73	41.03	50.00	-8.97	AVG	
11		0.5580	33.67	10.67	44.34	56.00	-11.66	QP	
12		0.5580	24.57	10.67	35.24	46.00	-10.76	AVG	

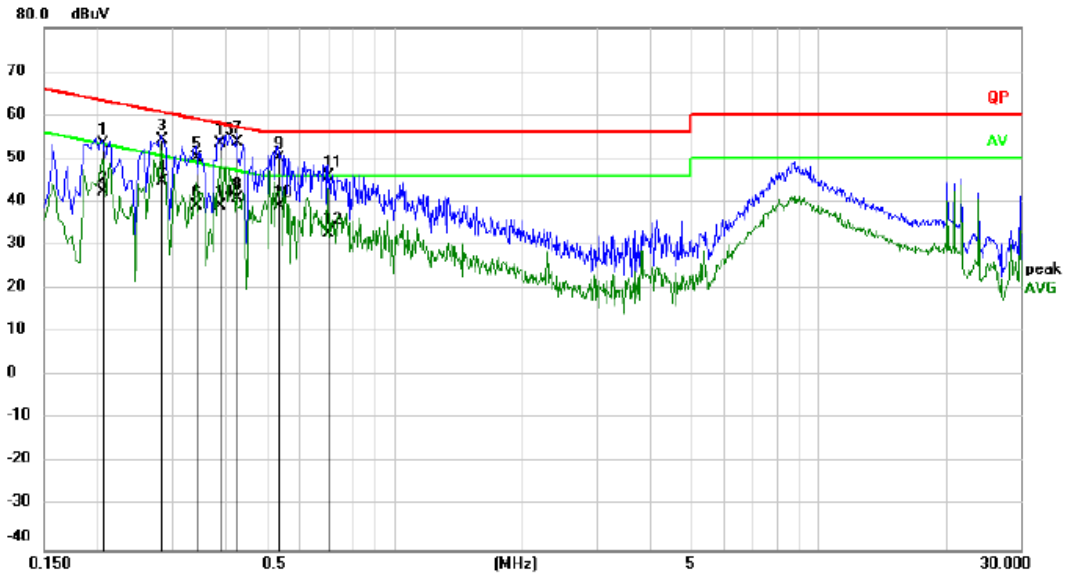
*:Maximum data x:Over limit !:over margin

Engineer Signature: Lirou

Model: H7039

Conducted Emission Measurement

File :RWAZ202300101 Data :#6 Date: 2024/1/18 Time: 17:54:59



Limit: QP
Mode:transmitting
Note: 802.11b M Channel

Phase: L1
Power: AC 120V/60Hz

Temperature: 25.5
Humidity: 63 %
Air Pressure: 1012 hpa

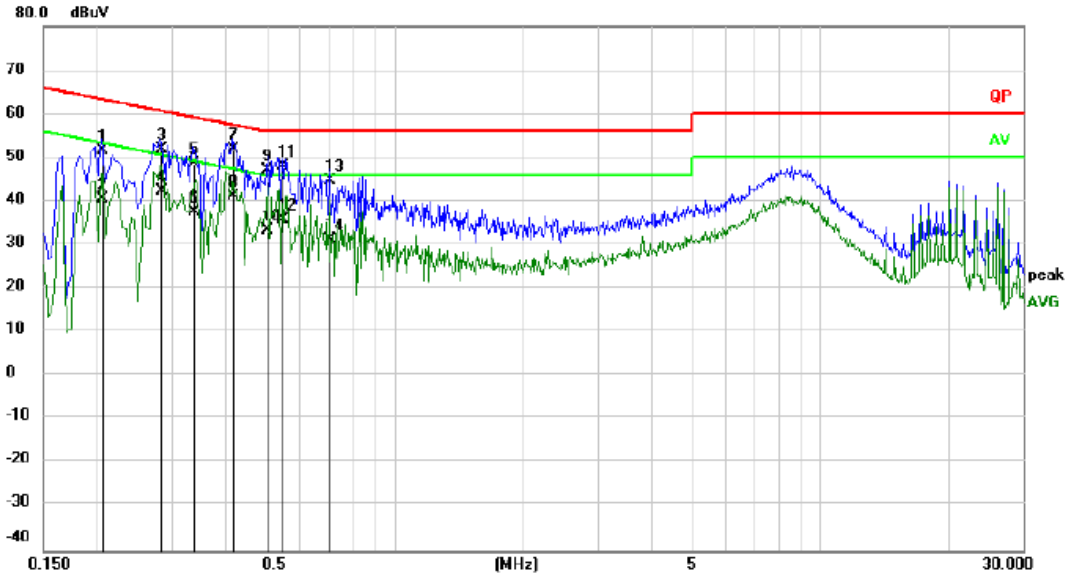
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2060	42.81	10.61	53.42	63.37	-9.95	QP	
2		0.2060	31.84	10.61	42.45	53.37	-10.92	AVG	
3		0.2819	43.54	10.68	54.22	60.76	-6.54	QP	
4		0.2819	34.11	10.68	44.79	50.76	-5.97	AVG	
5		0.3420	39.45	10.73	50.18	59.15	-8.97	QP	
6		0.3420	28.28	10.73	39.01	49.15	-10.14	AVG	
7	*	0.4260	42.83	10.79	53.62	57.33	-3.71	QP	
8		0.4260	30.03	10.79	40.82	47.33	-6.51	AVG	
9		0.5340	39.20	10.82	50.02	56.00	-5.98	QP	
10		0.5340	28.17	10.82	38.99	46.00	-7.01	AVG	
11		0.6980	35.12	10.85	45.97	56.00	-10.03	QP	
12		0.6980	21.96	10.85	32.81	46.00	-13.19	AVG	
13		0.3899	42.55	10.78	53.33	58.07	-4.74	QP	
14		0.3899	28.16	10.78	38.94	48.07	-9.13	AVG	

*:Maximum data x:Over limit !:over margin

Engineer Signature: Lirou

Conducted Emission Measurement

File :RWAZ202300101 Data :#5 Date: 2024/1/18 Time: 17:47:52



Limit: QP Phase: N Temperature: 25.5

Mode:transmitting Power: AC 120V/60Hz Humidity: 63 %

Note: 802.11b M Channel Air Pressure: 1012 hpa

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2060	41.26	10.42	51.68	63.37	-11.69	QP	
2		0.2060	30.09	10.42	40.51	53.37	-12.86	AVG	
3		0.2819	41.38	10.51	51.89	60.76	-8.87	QP	
4		0.2819	31.71	10.51	42.22	50.76	-8.54	AVG	
5		0.3379	38.20	10.58	48.78	59.25	-10.47	QP	
6		0.3379	27.05	10.58	37.63	49.25	-11.62	AVG	
7	*	0.4180	41.31	10.66	51.97	57.49	-5.52	QP	
8		0.4180	30.44	10.66	41.10	47.49	-6.39	AVG	
9		0.5020	36.57	10.71	47.28	56.00	-8.72	QP	
10		0.5020	22.71	10.71	33.42	46.00	-12.58	AVG	
11		0.5460	37.36	10.67	48.03	56.00	-7.97	QP	
12		0.5460	24.93	10.67	35.60	46.00	-10.40	AVG	
13		0.7060	34.16	10.56	44.72	56.00	-11.28	QP	
14		0.7060	20.77	10.56	31.33	46.00	-14.67	AVG	

*:Maximum data x:Over limit !:over margin Engineer Signature: Lirou

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:

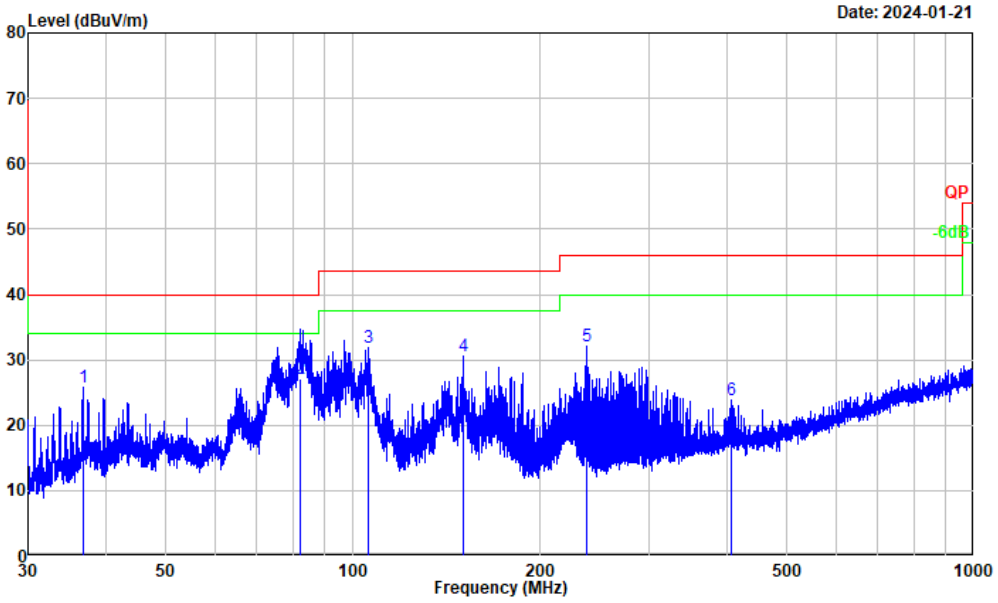
Test Date:	2024-01-21	**Test By:**	Bard Huang
Environment condition:	Temperature: 24.9°C; Relative Humidity:49%; ATM Pressure: 100.9kpa		

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

30MHz-1GHz:

Test Date:	2024-01-21	**Test By:**	Bard Huang
Environment condition:	Temperature: 24.9°C; Relative Humidity:49%; ATM Pressure: 100.9kpa		

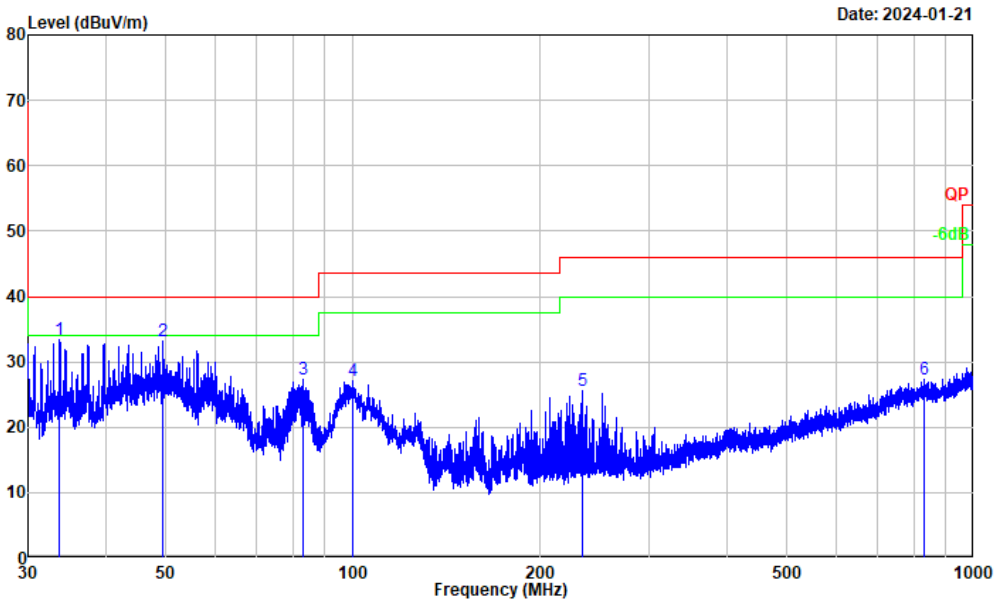
Model: H7037



Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.9℃/49%R.H./100.9kPa
Tested by : Bard Huang
Polarization : horizontal
Remark : 802.11b Middle Channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	36.750	39.88	-14.15	25.73	40.00	-14.27	Peak
2	82.503	44.69	-17.65	27.04	40.00	-12.96	QP
3	105.827	45.90	-13.95	31.95	43.50	-11.55	Peak
4	150.736	47.86	-17.39	30.47	43.50	-13.03	Peak
5	237.789	44.75	-12.75	32.00	46.00	-14.00	Peak
6	408.051	32.38	-8.48	23.90	46.00	-22.10	Peak

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

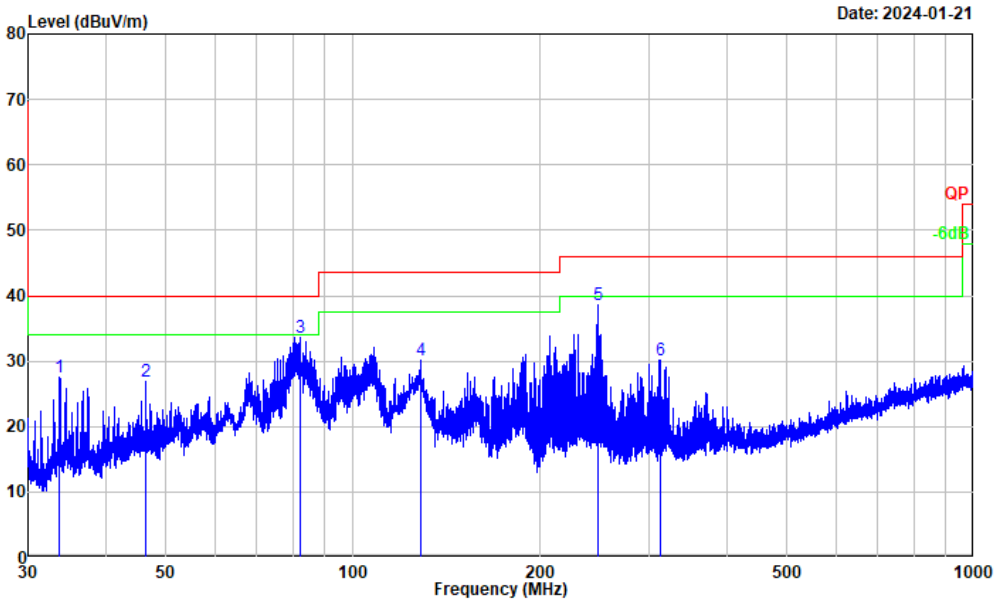


Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.9℃/49%R.H./100.9kPa
Tested by : Bard Huang
Polarization : vertical
Remark : 802.11b Middle Channel

--No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Detector
1	33.725	48.52	-15.09	33.43	40.00	-6.57	Peak
2	49.511	45.28	-12.16	33.12	40.00	-6.88	Peak
3	83.011	44.92	-17.55	27.37	40.00	-12.63	Peak
4	100.185	41.23	-14.19	27.04	43.50	-16.46	Peak
5	234.785	38.33	-12.83	25.50	46.00	-20.50	Peak
6	830.400	28.94	-1.62	27.32	46.00	-18.68	Peak

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

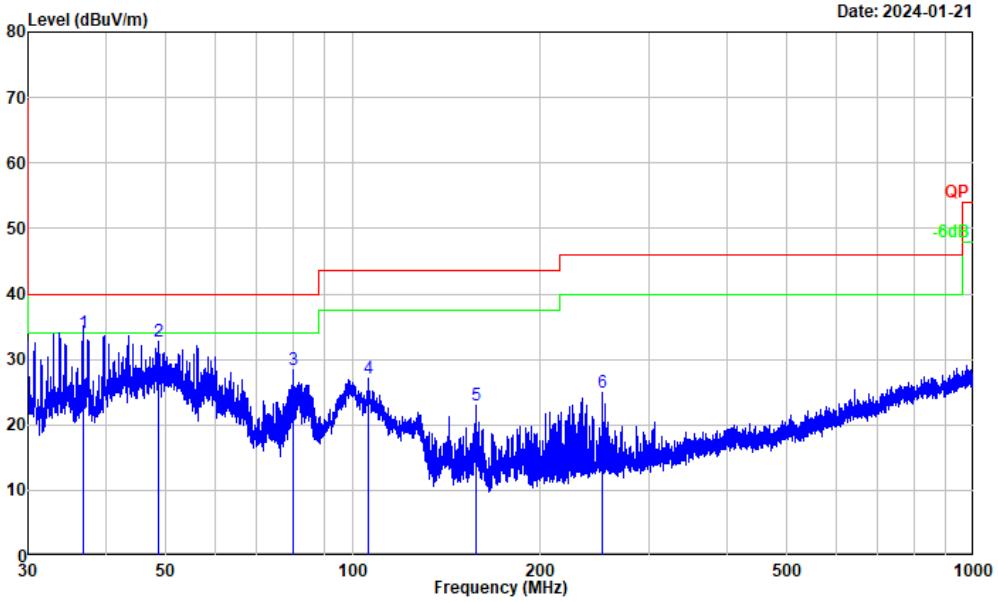
Model: H7038



Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.9℃/49%R.H./100.9kPa
Tested by : Bard Huang
Polarization : horizontal
Remark : 802.11b Middle Channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	33.754	42.52	-15.07	27.45	40.00	-12.55	Peak
2	46.503	38.98	-12.18	26.80	40.00	-13.20	Peak
3	82.467	51.27	-17.68	33.59	40.00	-6.41	Peak
4	128.619	47.27	-17.15	30.12	43.50	-13.38	Peak
5	248.225	50.96	-12.46	38.50	46.00	-7.50	Peak
6	312.727	41.26	-11.02	30.24	46.00	-15.76	Peak

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

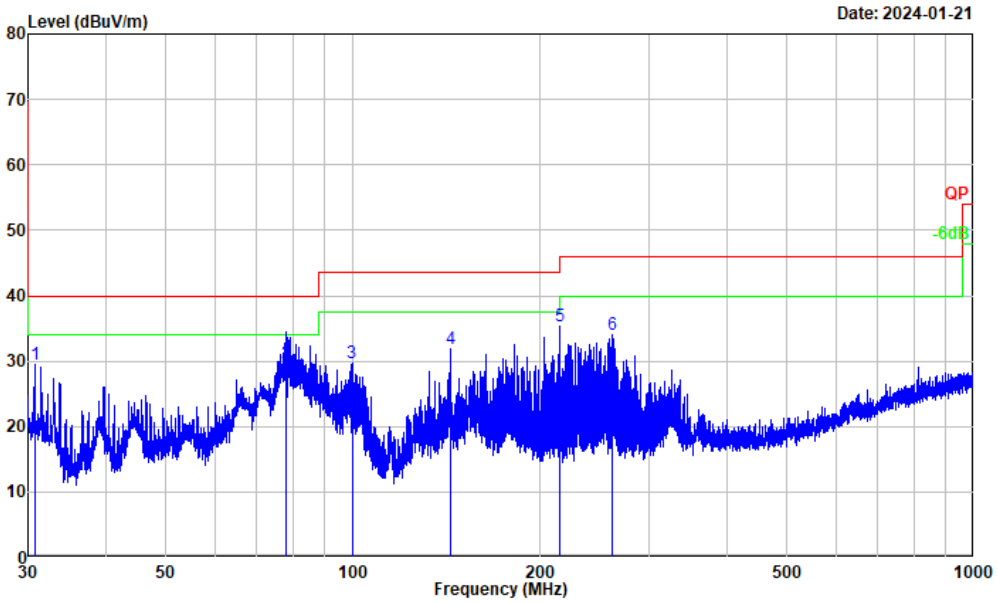


Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.9℃/49%R.H./100.9kPa
Tested by : Bard Huang
Polarization : vertical
Remark : 802.11b Middle Channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	36.766	48.09	-14.14	33.95	40.00	-6.05	QP
2	48.757	44.89	-12.17	32.72	40.00	-7.28	Peak
3	80.010	46.47	-18.08	28.39	40.00	-11.61	Peak
4	105.734	40.96	-13.95	27.01	43.50	-16.49	Peak
5	158.251	39.97	-16.98	22.99	43.50	-20.51	Peak
6	252.727	37.40	-12.38	25.02	46.00	-20.98	Peak

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

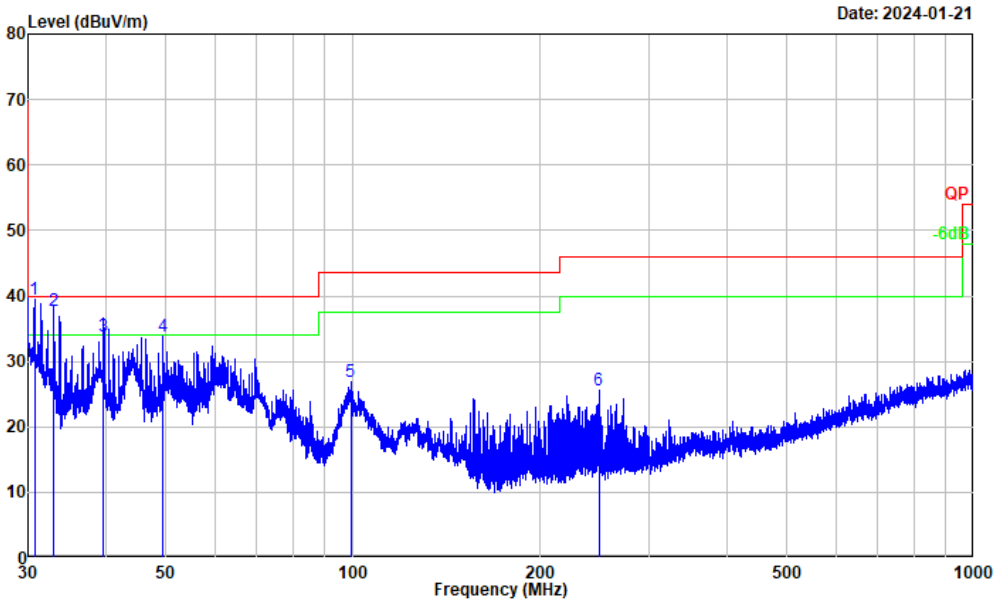
Model: H7039



Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.9℃/49%R.H./100.9kPa
Tested by : Bard Huang
Polarization : horizontal
Remark : 802.11b Middle Channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	30.745	44.78	-15.23	29.55	40.00	-10.45	Peak
2	77.968	47.80	-18.19	29.61	40.00	-10.39	QP
3	99.746	44.01	-14.24	29.77	43.50	-13.73	Peak
4	144.019	49.54	-17.60	31.94	43.50	-11.56	Peak
5	215.268	49.18	-13.82	35.36	43.50	-8.14	Peak
6	261.746	46.33	-12.21	34.12	46.00	-11.88	Peak

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



Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.9℃/49%R.H./100.9kPa
Tested by : Bard Huang
Polarization : vertical
Remark : 802.11b Middle Channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	30.719	54.60	-15.23	39.37	40.00	-0.63	QP
2	33.008	52.80	-15.14	37.66	40.00	-2.34	QP
3	39.732	47.00	-13.20	33.80	40.00	-6.20	QP
4	49.511	46.06	-12.16	33.90	40.00	-6.10	Peak
5	99.223	41.24	-14.35	26.89	43.50	-16.61	Peak
6	248.988	38.02	-12.45	25.57	46.00	-20.43	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:	2024-02-02	Test By:	Bard Huang
Environment condition:	Temperature: 23.7°C; Relative Humidity:72%; ATM Pressure:100.9kPa		

Frequency (MHz)	Reading level (dBμV)	Polar	Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
802.11b							
Low Channel							
2390.000	37.04	horizontal	8.25	45.29	54.00	-8.71	Average
2390.000	48.82	horizontal	8.25	57.07	74.00	-16.93	Peak
2390.000	36.97	vertical	8.25	45.22	54.00	-8.78	Average
2390.000	49.72	vertical	8.25	57.97	74.00	-16.03	Peak
4824.000	48.68	horizontal	0.26	48.94	74.00	-25.06	Peak
4824.000	48.55	vertical	0.26	48.81	74.00	-25.19	Peak
Middle Channel							
4884.000	48.89	horizontal	0.46	49.35	74.00	-24.65	Peak
4884.000	48.66	vertical	0.46	49.12	74.00	-24.88	Peak
High Channel							
2484.252	42.08	horizontal	8.25	50.33	54.00	-3.67	Average
2484.252	52.83	horizontal	8.25	61.08	74.00	-12.92	Peak
2483.500	39.26	vertical	8.25	47.51	54.00	-6.49	Average
2483.500	50.20	vertical	8.25	58.45	74.00	-15.55	Peak
4944.000	48.15	horizontal	0.83	48.98	74.00	-25.02	Peak
4944.000	47.86	vertical	0.83	48.69	74.00	-25.31	Peak
802.11g							
Low Channel							
2390.000	37.20	horizontal	8.25	45.45	54.00	-8.55	Average
2390.000	49.43	horizontal	8.25	57.68	74.00	-16.32	Peak
2390.000	36.89	vertical	8.25	45.14	54.00	-8.86	Average
2390.000	48.84	vertical	8.25	57.09	74.00	-16.91	Peak
4824.000	49.02	horizontal	0.26	49.28	74.00	-24.72	Peak
4824.000	49.51	vertical	0.26	49.77	74.00	-24.23	Peak
Middle Channel							
4884.000	47.86	horizontal	0.46	48.32	74.00	-25.68	Peak
4884.000	48.90	vertical	0.46	49.36	74.00	-24.64	Peak
High Channel							
2483.500	40.26	horizontal	8.25	48.51	54.00	-5.49	Average

2483.500	62.20	horizontal	8.25	70.45	74.00	-3.55	Peak
2483.500	39.10	vertical	8.25	47.35	54.00	-6.65	Average
2483.500	57.76	vertical	8.25	66.01	74.00	-7.99	Peak
4944.000	48.11	horizontal	0.83	48.94	74.00	-25.06	Peak
4944.000	48.30	vertical	0.83	49.13	74.00	-24.87	Peak
802.11n20							
Low Channel							
2390.000	37.25	horizontal	8.25	45.50	54.00	-8.50	Average
2390.000	50.05	horizontal	8.25	58.30	74.00	-15.70	Peak
2390.000	36.74	vertical	8.25	44.99	54.00	-9.01	Average
2390.000	48.67	vertical	8.25	56.92	74.00	-17.08	Peak
4824.000	49.46	horizontal	0.26	49.72	74.00	-24.28	Peak
4824.000	48.20	vertical	0.26	48.46	74.00	-25.54	Peak
Middle Channel							
4884.000	48.28	horizontal	0.46	48.74	74.00	-25.26	Peak
4884.000	48.36	vertical	0.46	48.82	74.00	-25.18	Peak
High Channel							
2483.500	40.49	horizontal	8.25	48.74	54.00	-5.26	Average
2483.500	62.71	horizontal	8.25	70.96	74.00	-3.04	Peak
2483.500	38.41	vertical	8.25	46.66	54.00	-7.34	Average
2483.500	58.19	vertical	8.25	66.44	74.00	-7.56	Peak
4944.000	48.31	horizontal	0.83	49.14	74.00	-24.86	Peak
4944.000	49.48	vertical	0.83	50.31	74.00	-23.69	Peak

Remark:

Corrected Amplitude= Reading level + corrected Factor

Corrected Factor = Antenna factor + Cable loss – Amplifier gain

Margin = Corrected Amplitude – Limit

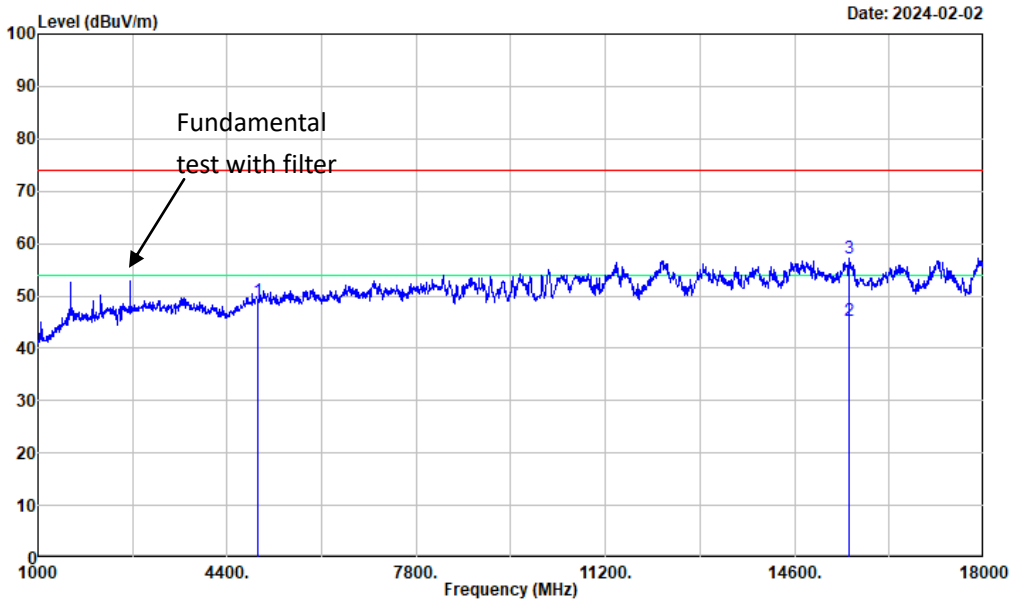
For the test result of Peak below the Peak limit more than 20dB, which can compliance with the average limit, just the Peak level was recorded.

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:

Mode:	802.11n20	Channel:	2472MHz

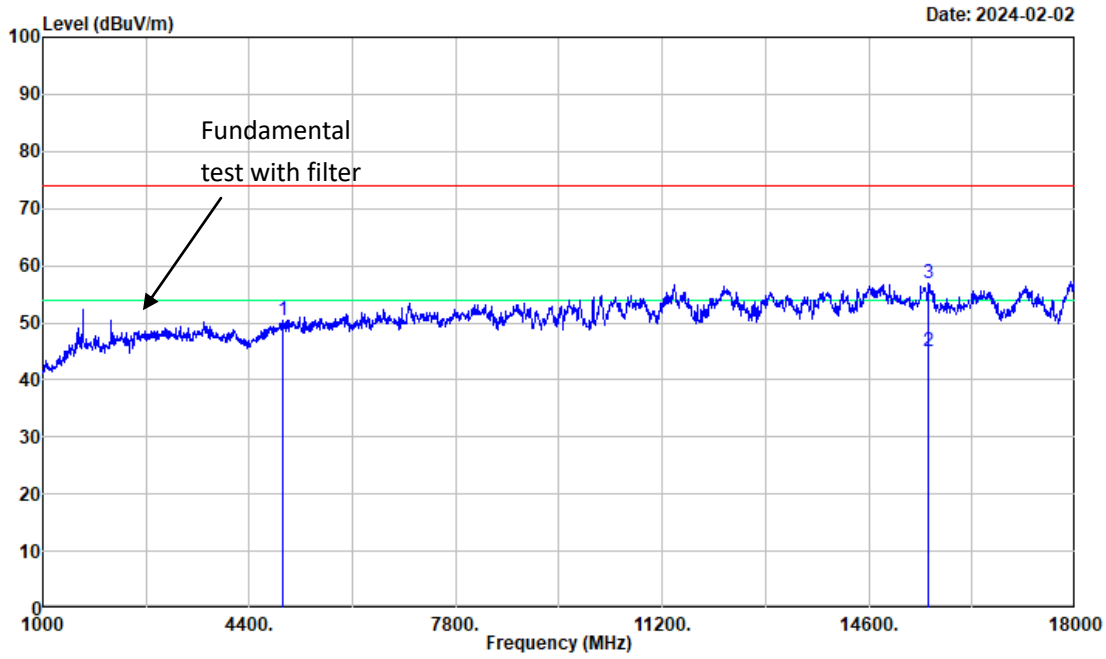


Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 23.7℃/72%R.H./100.9kPa
Tested by : Bard Huang
Polarization : horizontal
Remark : 802.11n high channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	4944.000	48.31	0.83	49.14	74.00	-24.86	Peak
2	15584.790	37.14	8.10	45.24	54.00	-8.76	Average
3	15584.790	49.16	8.10	57.26	74.00	-16.74	Peak

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

Mode:	802.11n20	Channel:	2472MHz



Project No. : RWAZ202300101
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 23.7℃/72%R.H./100.9kPa
Tested by : Bard Huang
Polarization : vertical
Remark : 802.11n high channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	4944.000	49.48	0.83	50.31	74.00	-23.69	Peak
2	15584.790	36.93	8.10	45.03	54.00	-8.97	Average
3	15584.790	48.68	8.10	56.78	74.00	-17.22	Peak

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

3.5 RF Conducted Test Data

Test Date:	2024-02-04	Test By:	Ryan Zhang
Environment condition:	Temperature: 21.3°C; Relative Humidity:75%; ATM Pressure: 101.4kPa		

3.5.1 6dB Emission Bandwidth and 99% Occupied Bandwidth

Test Mode	Antenna	Channel [MHz]	6dB BW [MHz]	99% OBW[MHz]	6dB BW Limit[MHz]	Verdict
11B	Ant1	2412	9.103	14.167	0.5	pass
		2442	9.103	14.167	0.5	pass
		2472	9.103	14.167	0.5	pass
11G	Ant1	2412	16.679	17.244	0.5	pass
		2442	16.538	17.115	0.5	pass
		2472	16.679	17.244	0.5	pass
11N20	Ant1	2412	17.923	18.205	0.5	pass
		2442	17.885	18.205	0.5	pass
		2472	17.756	18.269	0.5	pass

3.5.2 Maximum Conducted Peak Output Power

Test Mode	Antenna	Channel [MHz]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	10.11	30	Pass
		2442	10.27	30	Pass
		2472	10.24	30	Pass
11G	Ant1	2412	2.00	30	Pass
		2442	2.22	30	Pass
		2472	2.23	30	Pass
11N20	Ant1	2412	0.94	30	Pass
		2442	1.07	30	Pass
		2472	1.15	30	Pass

3.5.3 Power Spectral Density

Test Mode	Antenna	Channel [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
11B	Ant1	2412	-23.01	8	Pass
		2442	-22.93	8	Pass
		2472	-22.94	8	Pass
11G	Ant1	2412	-32.35	8	Pass
		2442	-32.13	8	Pass
		2472	-32.35	8	Pass
11N20	Ant1	2412	-34.62	8	Pass
		2442	-33.53	8	Pass
		2472	-33.61	8	Pass

3.5.4 100 kHz Bandwidth of Frequency Band Edge

Test Mode	Antenna	Channel[MHz]	Result	Limit	Verdict
11B	Ant1	2412	Refer test plot	Refer test plot	Pass
		2472	Refer test plot	Refer test plot	Pass
11G	Ant1	2412	Refer test plot	Refer test plot	Pass
		2472	Refer test plot	Refer test plot	Pass
11N20	Ant1	2412	Refer test plot	Refer test plot	Pass
		2472	Refer test plot	Refer test plot	Pass

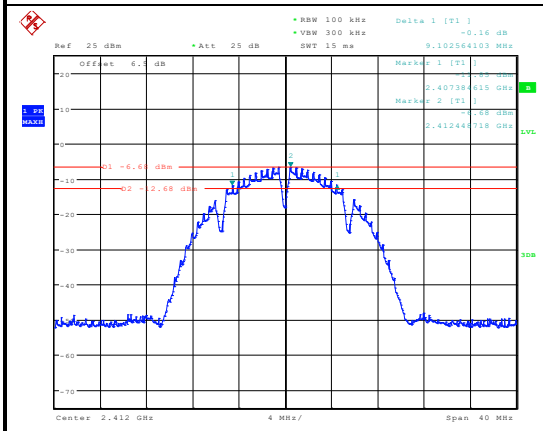
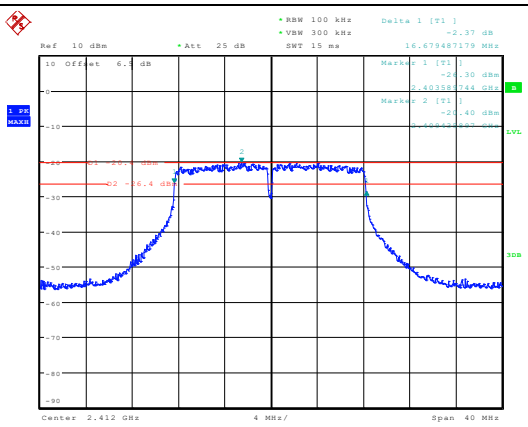
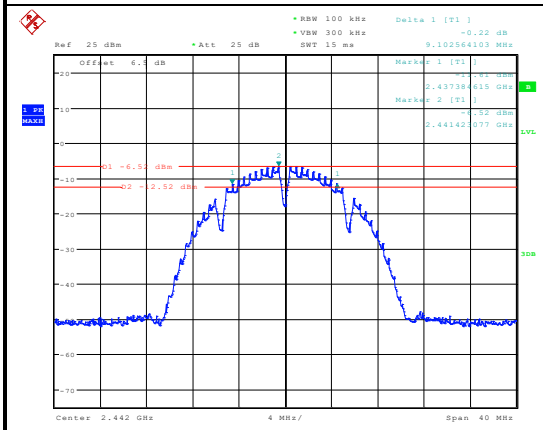
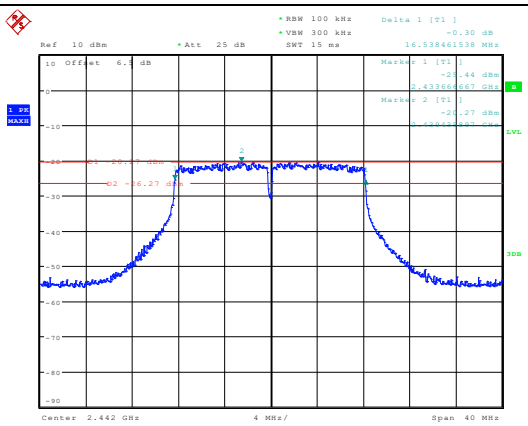
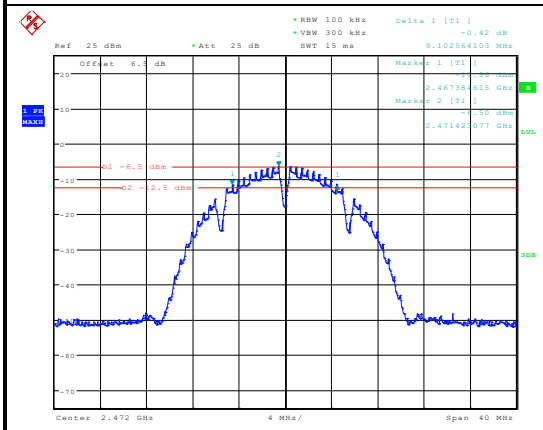
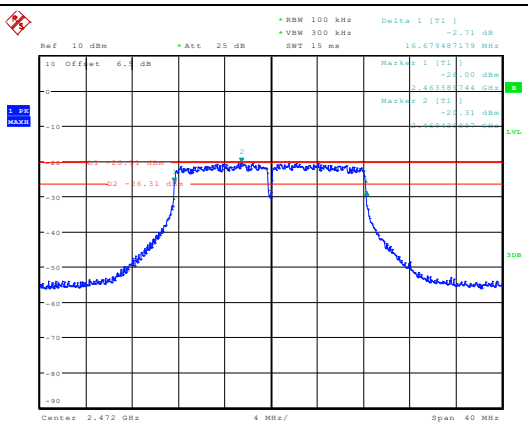
3.5.5 Duty Cycle

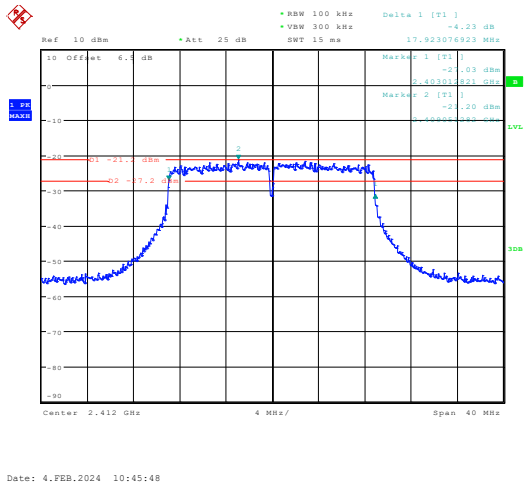
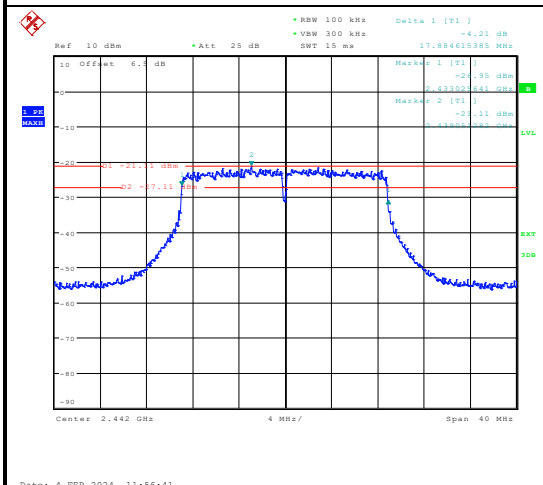
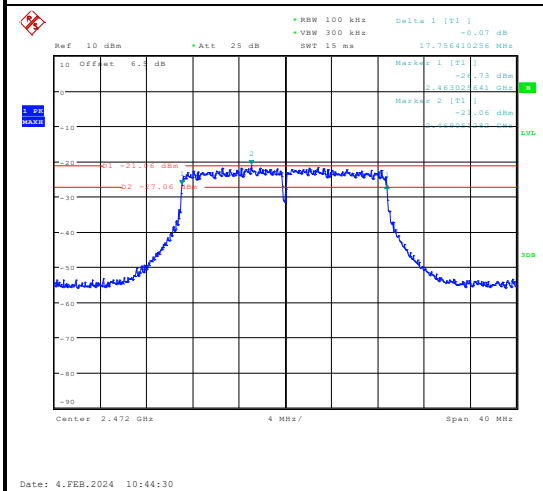
Test Mode	**Antenna**	**Channel [MHz]**	**Ton (ms)**	**Ton+off (ms)**	**Duty Cycle [%]**	**1/T**	**VBW setting* [Hz]**
11B	Ant1	2442	100	100	100	/	10
11G	Ant1	2442	100	100	100	/	10
11N20	Ant1	2442	100	100	100	/	10

Note*: Radiated emission test with average value, the Spectrum analyzer VBW setting information.

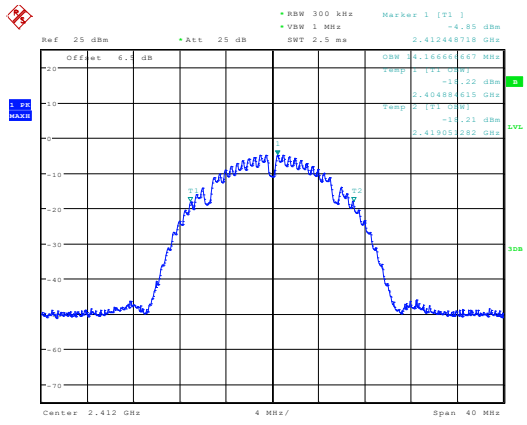
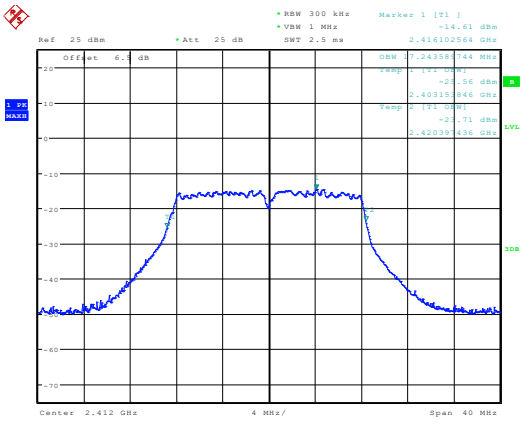
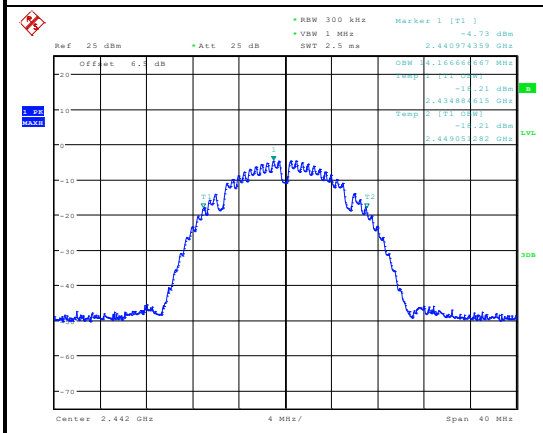
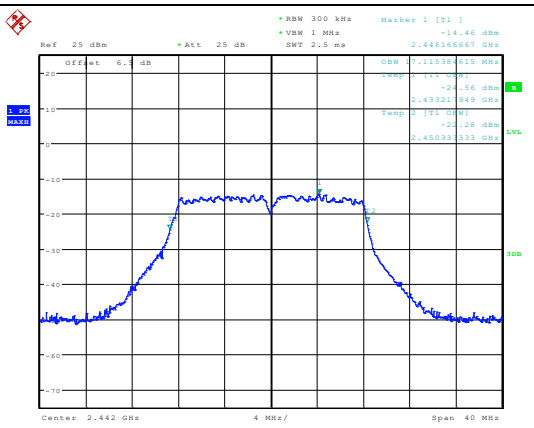
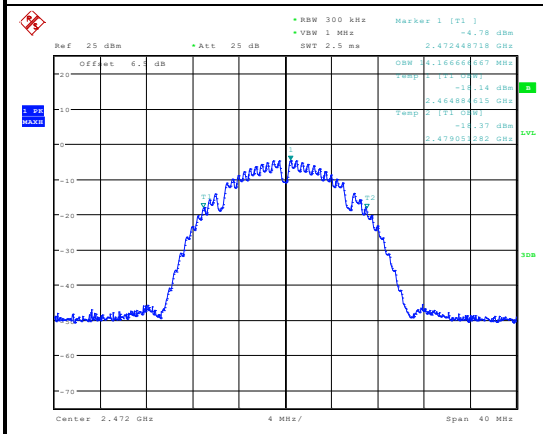
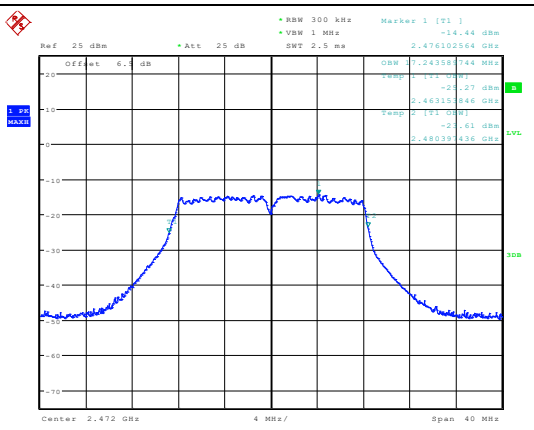
Test Plots:

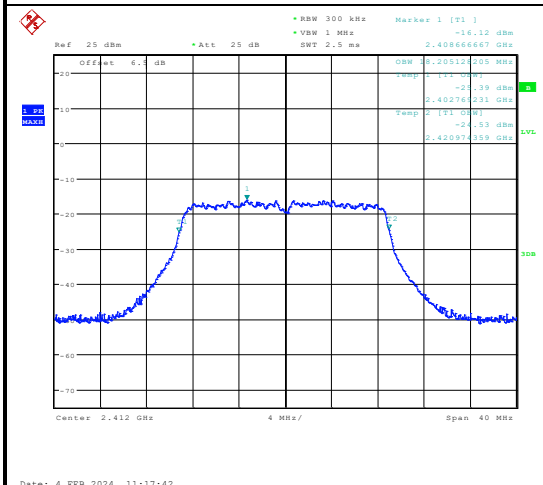
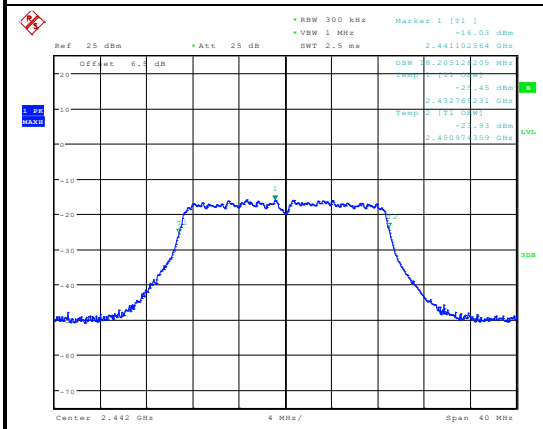
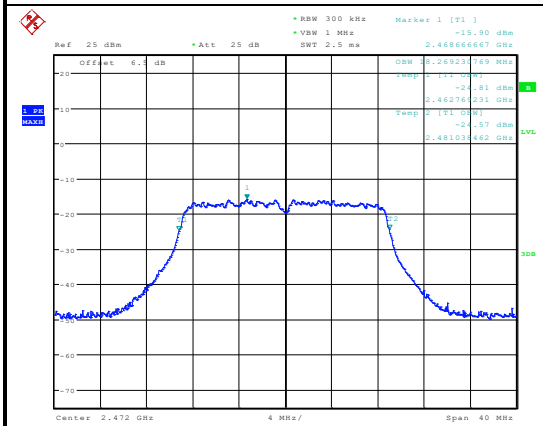
6 dB Emission Bandwidth:

802.11b	802.11g
Lowest channel	Lowest channel
	
Middle channel	Middle channel
	
High channel	High channel
	

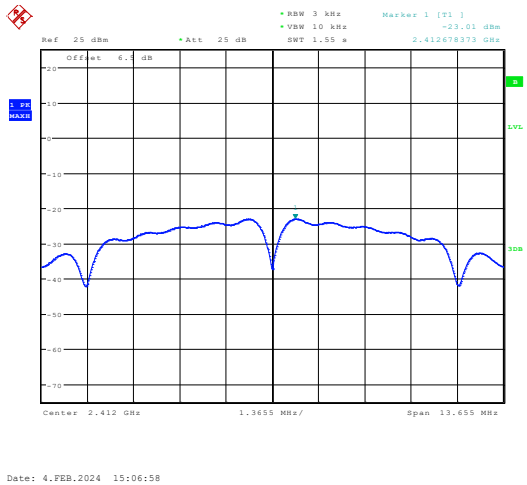
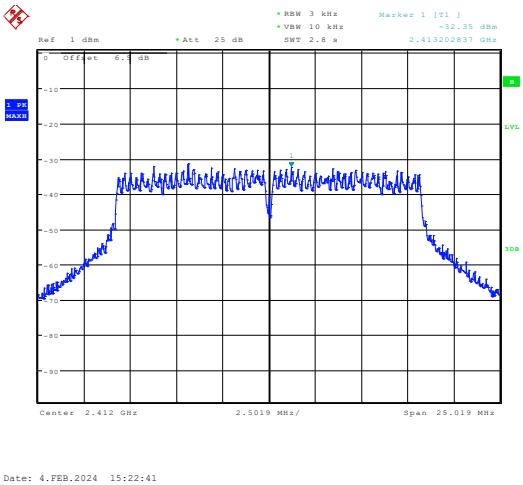
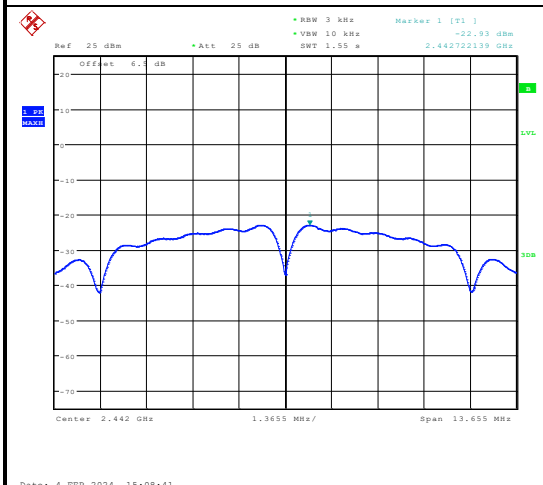
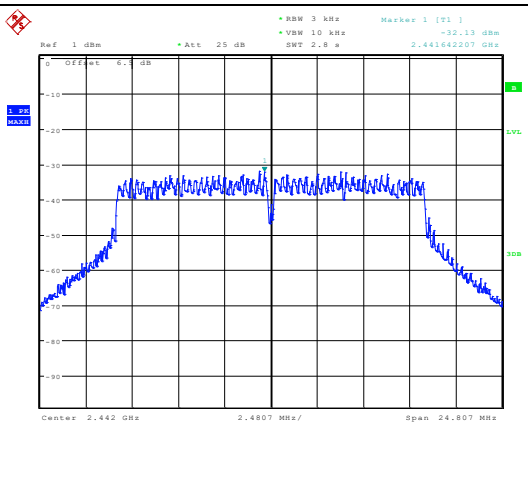
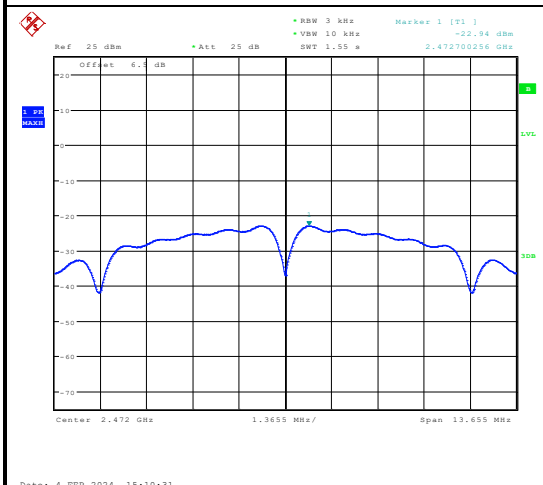
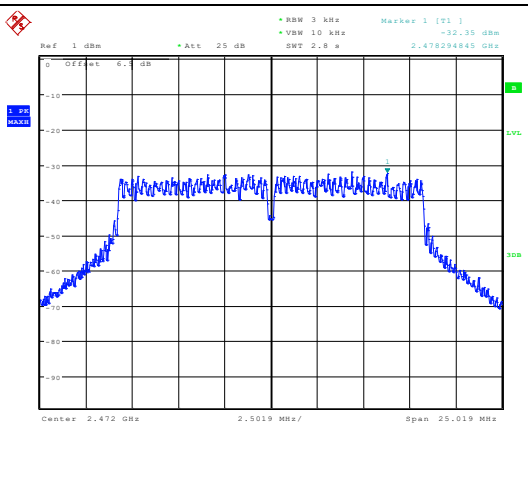
802.11n20	/
Lowest channel	/
	/
Middle channel	/
	/
High channel	/
	/

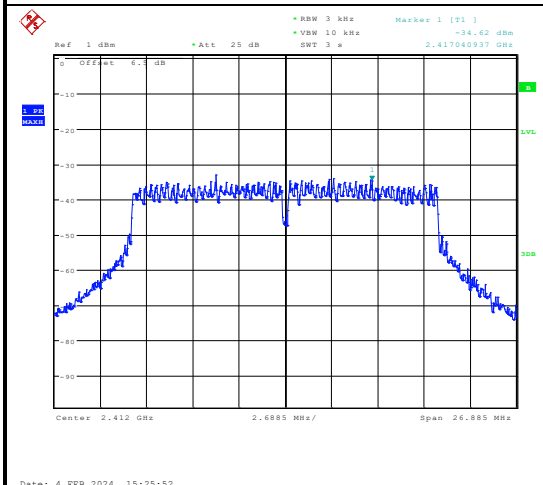
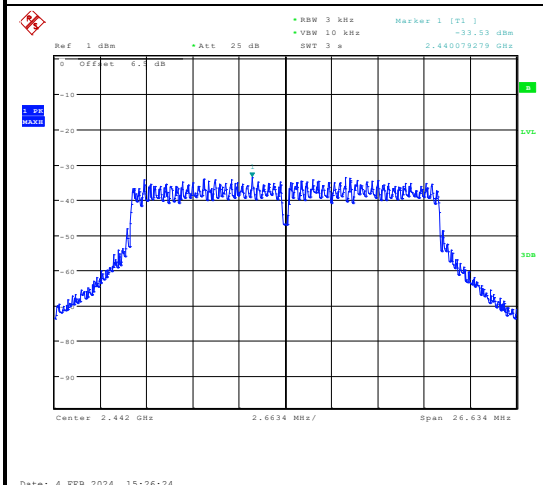
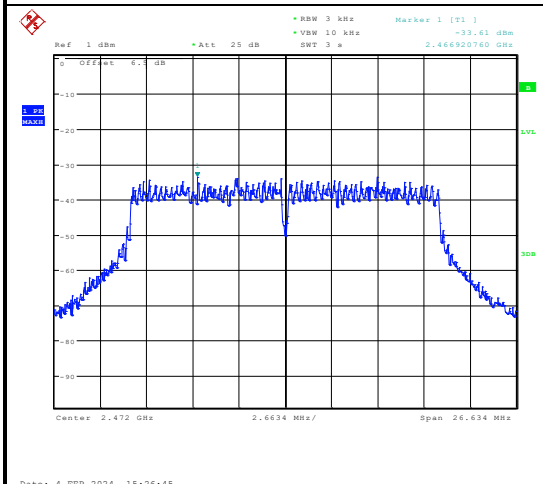
99% Occupied Bandwidth:

802.11b	802.11g
Lowest channel	Lowest channel
	
Middle channel	Middle channel
	
High channel	High channel
	

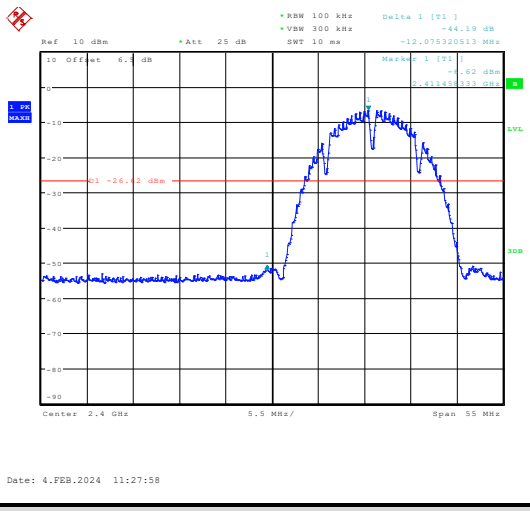
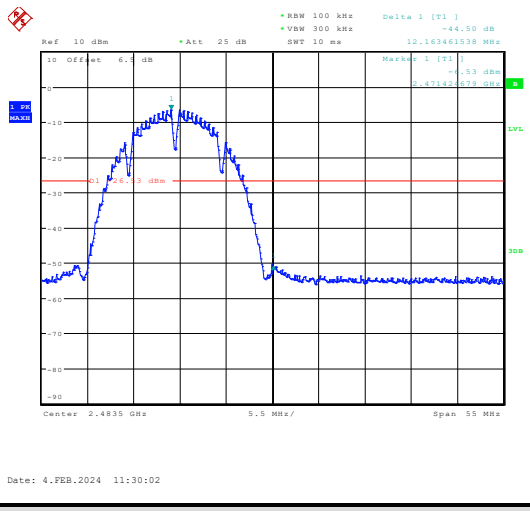
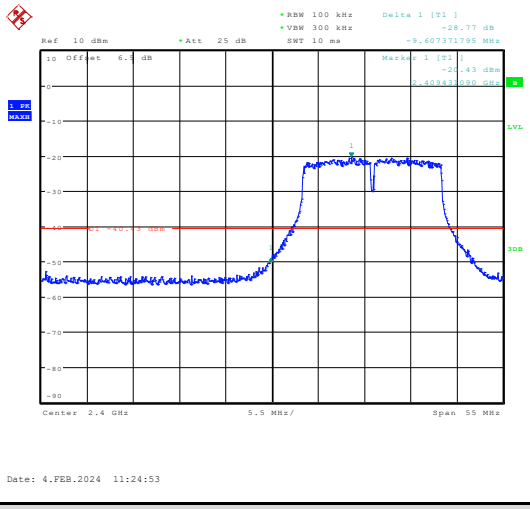
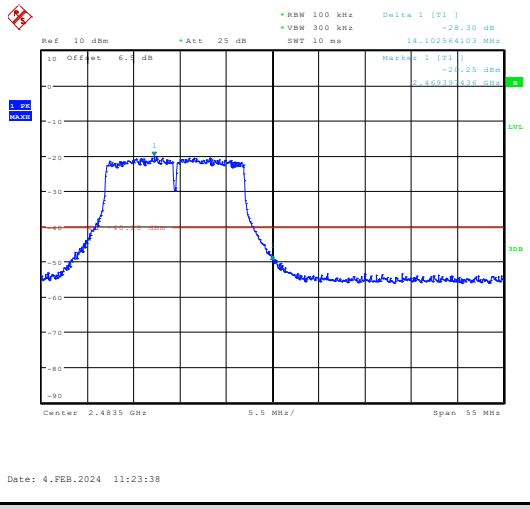
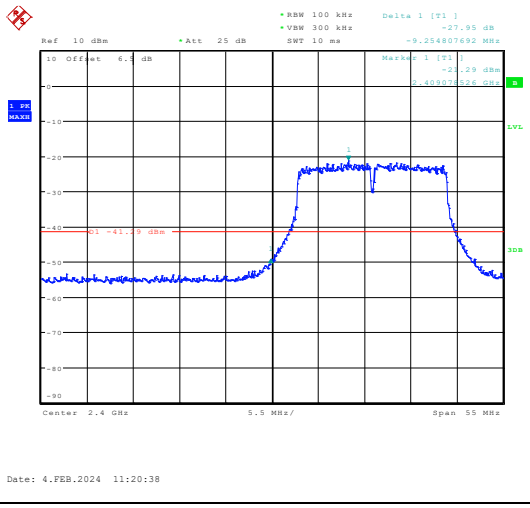
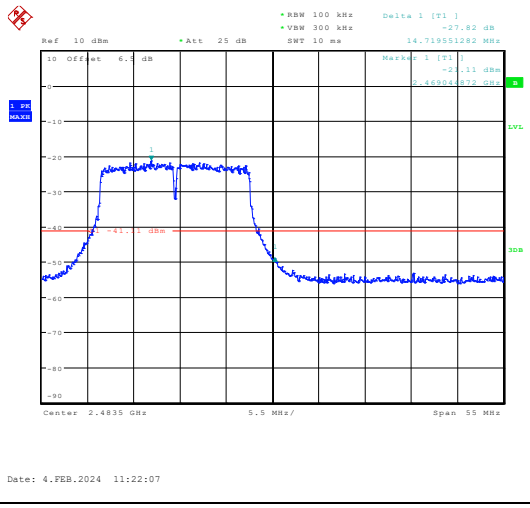
802.11n20	/
Lowest channel	/
	/
Middle channel	/
	/
High channel	/
	/

Power Spectral Density:

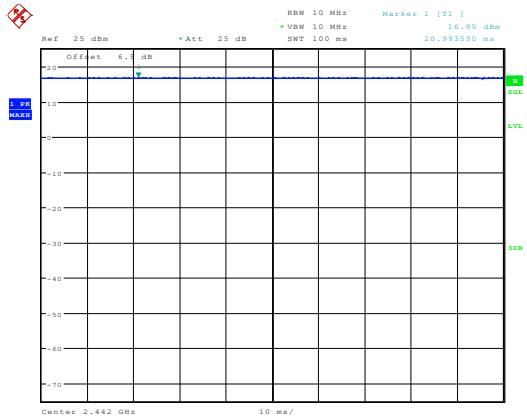
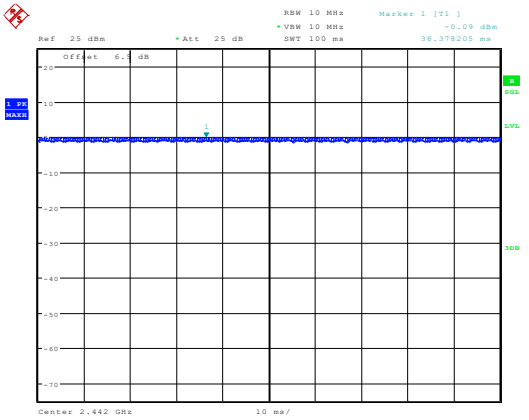
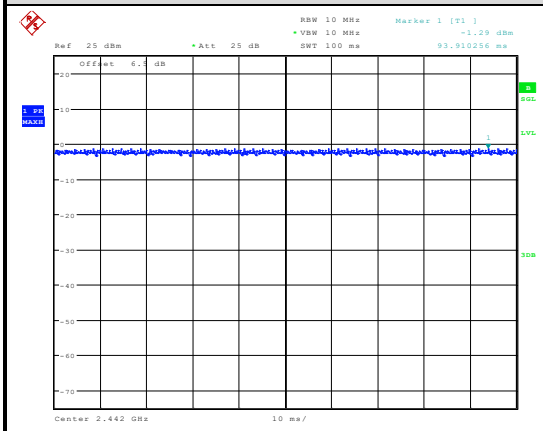
802.11b ANT1	802.11g ANT1
Lowest channel	Lowest channel
	
Middle channel	Middle channel
	
High channel	High channel
	

802.11n20 ANT1	/
Lowest channel	/
	/
Middle channel	/
	/
High channel	/
	/

100kHz Bandwidth of Frequency Band Edge:

802.11b ANT1	
Lowest channel	High channel
	
Date: 4.FEB.2024 11:27:58	Date: 4.FEB.2024 11:30:02
802.11g ANT1	
Lowest channel	High channel
	
Date: 4.FEB.2024 11:24:53	Date: 4.FEB.2024 11:23:38
802.11n20 ANT1	
Lowest channel	High channel
	
Date: 4.FEB.2024 11:20:38	Date: 4.FEB.2024 11:22:07

Duty Cycle:

802.11b	802.11g
	
802.11n20	**/**
	/

4 Test Setup Photo

Please refer to the attachment RWAZ202300101Test Setup photo.

5 E.U.T Photo

Please refer to the attachment:

1. RWAZ202300101 H7037 External photo;
2. RWAZ202300101 H7037 Internal photo;
3. RWAZ202300101 H7038 External photo;
4. RWAZ202300101 H7038 Internal photo;
5. RWAZ202300101 H7039 External photo;
6. RWAZ202300101 H7039 Internal photo

---End of Report---