TEST REPORT

Client Information:

Applicant:	Nanjing Magewell Electronics CO., Ltd.
Applicant add.:	14th Floor, Building 3, No.89 Shengli Road, Jiangning Economic and Technological Development Zone, Nanjing, China.
Manufacturer:	Nanjing Magewell Electronics CO., Ltd.
Manufacturer add.:	14th Floor, Building 3, No.89 Shengli Road, Jiangning Economic and Technological Development Zone, Nanjing, China.

Product Information:

Product Name:	WiFi Module
Model No.:	IO1201B
Brand Name:	N/A
FCC ID:	2AP6W-WIFI1201

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Prepared By:

Guangdong Asia Hongke Test Technology Limited

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Date of Receipt:	June 24, 2024	Date of Test:	June 24, 2024~July 17, 2024
Date of Issue:	July 18, 2024	Test Result:	Pass

This device described above has been tested by Guangdong Asia Hongke Test Technology Limited and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Reviewed by: Leon Yi
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Approved by: Sean She
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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	July 18, 2024	Valid	Initial release

2 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	§15.203	Pass
On Time and Duty Cycle	/	/
Maximum Conducted Peak Output Power	§15.247 (b)(3)	Pass
Power Spectral Density	§15.247 (e)	Pass
6dB Bandwidth	§15.247 (a)(2)	Pass
Radiated and Conducted Spurious Emissions	§15.205/15.209	Pass
Emissions at Restricted Band	§15.205/15.209	Pass
Conducted Emissions	§15.207(a)	Pass
RF Exposure	§15.247(i)§2.1091	Pass

Note

1. *Test according to ANSI C63.10:2013.*
2. *The measurement uncertainty is not included in the test result.*
3. *Test results in other test report (RF Exposure Evaluation Report)*

2.1 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the AiT quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

2.2 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	0.009MHz-30MHz	3.10dB	(1)
Radiated Emission	30MHz-1GHz	3.75dB	(1)
Radiated Emission	1GHz-18GHz	3.88dB	(1)
Radiated Emission	18GHz-40GHz	3.88dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	1.20dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

3 Test Facility

The test facility is recognized, certified or accredited by the following organizations:

FCC-Registration No.: 251906 Designation Number: CN1376

Guangdong Asia Hongke Test Technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 31737 CAB identifier: CN0165

The 3m Semi-anechoic chamber of Guangdong Asia Hongke Test Technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 31737

A2LA-Lab Cert. No.: 7133.01

Guangdong Asia Hongke Test Technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

3.3 Test Location

Guangdong Asia Hongke Test Technology Limited

Address: B1/F, Building 11, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Tel.: +86 0755-230967639 Fax.: +86 0755-230967639

4 General Information

EUT Name:	WiFi Module
Model No:	IO1201B
Serial Model:	N/A
Test sample(s) ID:	AiTSZ-240624004-1
Sample(s) Status:	Engineer sample
Serial No.:	N/A
Operation frequency:	802.11n(HT20)/ax(HE20): 2412MHz~2462MHz 802.11n(HT40)/ax(HE40): 2422MHz~2452MHz
Channel Number:	802.11n(HT20)/ax(HT20): 11 802.11n(HT40)/ax(HE40):7
Channel separation:	5MHz
Modulation Technology:	802.11n(HT20)/ax(HE20)/802.11n(HT40)/ax(HE40): Orthogonal Frequency Division Multiplexing (OFDM)
Antenna Type:	External antenna
Antenna gain:	ANT1: 4.5dBi ANT2: 4.5dBi
H/W No.:	N/A
S/W No.:	N/A
Power supply:	DC 5.0V From external circuit
Model different:	N/A
Note:	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

4.1 Test frequencies

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412MHz	5	2432MHz	9	2452MHz
2	2417MHz	6	2437MHz	10	2457MHz
3	2422MHz	7	2442MHz	11	2462MHz
4	2427MHz	8	2447MHz	-	-

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Transmitting mode	Keep the EUT in continuously transmitting mode.		
Test software:	Magewell		
Frequency	2412 MHz	2437 MHz	2462 MHz
Parameters(802.11n20)	Default	Default	Default
Parameters(802.11ax20)	Default	Default	Default
Frequency	2422 MHz	2437 MHz	2452 MHz
Parameters(802.11n40)	Default	Default	Default
Parameters(802.11ax40)	Default	Default	Default

4.2 EUT Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	Notebook	ASUS	CE	S4200	N/A	N/A	N/A
2	Adapter	Powertron Electronics Corp.	CE	PA1030-120I B300	N/A	N/A	N/A
3	USB cable	Matterport	CE	810-00010	N/A	N/A	N/A

4.4 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Guangdong Asia Hongke Test Technology Limited

4.4.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.4.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C, ANSI C63.10-2013.

4.4.3 General Test Procedures

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

4.5 Description of Test Modes

The EUT has been tested under operating condition.

AC main conducted emission pre-test voltage at both AC 120V/60Hz and AC 240V/50Hz, recorded worst case;

AC main conducted emission pre-test at charge from power adapter modes, recorded worst case;

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be IEEE 802.11b mode (LCH).

Verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	IEEE 802.11n(HT20) 802.11ax(HE20)	IEEE 802.11n(HT40) 802.11ax(HE40)
Data rate	MCS0	MCS7

Antenna & Bandwidth

Antenna	Chain 1 (ANT1)		Chain 2 (ANT2)		Simultaneously
Bandwidth Mode	20MHz	40MHz	20MHz	40MHz	/
IEEE 802.11b	☐	☐	☐	☐	☐
IEEE 802.11g	☐	☐	☐	☐	☐
IEEE 802.11n	☑	☑	☑	☑	☑
IEEE 802.11ax	☑	☑	☑	☑	☑

5 Equipment Used during Test

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2023.09.08	2024.09.07
2	EMI Measuring Receiver	R&S	ESR	101160	2023.09.08	2024.09.07
3	Low Noise Pre Amplifier	HP	HP8447E	AiT-F01319	2023.09.08	2024.09.07
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2023.09.08	2024.09.07
5	Passive Loop	ETS	6512	00165355	2022.09.04	2024.09.03
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2021.08.29	2024.08.28
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2021.08.29	2024.08.28
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2023.09.12	2026.09.11
9	EMI Test Receiver	R&S	ESCI	100124	2023.09.08	2024.09.07
10	LISN	Kyoritsu	KNW-242	8-837-4	2023.09.08	2024.09.07
11	LISN	R&S	ESH3-Z5	0357.8810.54-101161-S2	2023.09.08	2024.09.07
12	Pulse Limiter	R&S	ESH3-Z2	03578810.54	2023.09.08	2024.09.07
13	Switch	MFJ Rhinos	MFJ-2702	CZ3457	2023.09.08	2024.09.07
14	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2023.09.08	2024.09.07
15	RF Automatic Test system	MW	MW100-RFCB	21033016	2023.09.08	2024.09.07
16	Signal Generator	Agilent	N5182A	MY50143009	2023.09.08	2024.09.07
17	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2023.09.08	2024.09.07
18	RF Automatic Test system	MW	MW100-RFCB	21033016	2023.09.08	2024.09.07
19	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
20	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
21	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
22	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A

23	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

6 Test results and Measurement Data

6.1 Antenna requirement

6.1.1 Standard 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 shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded. And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi. RSS-Gen Section 6.8 A transmitter can only be sold or operated with antennas with which it was approved. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of RF output power of 10 milliwatts or less, only the portion of the antenna gain that is in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power to demonstrate compliance with the radiated power limits specified in the applicable standard. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power
6.1.2 **EUT Antenna:**
Refer to Section 4(General Information), reference to the Internal photos for details.

6.2 On Time and Duty Cycle

6.2.1 Standard requirement:

None; for reporting purpose only

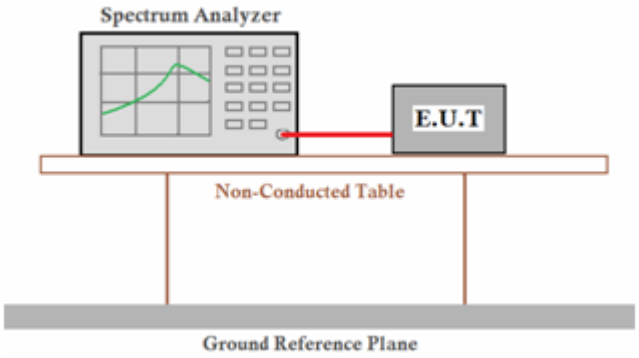
6.2.2 Measuring Instruments and Setting:

Please refer to equipments list in this report. The following table is the setting of the spectrum analyser.

6.2.3 Test Procedures

1. Set the centre frequency of the spectrum analyser to the transmitting frequency;
2. Set the span=0MHz, RBW=8MHz, VBW=50MHz, Sweep time=20.27ms;
3. Detector = peak;
4. Trace mode = Single hold

6.2.4 Test Setup Layout



6.2.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.2.6 Test result

For reporting purpose only.

Please refer to Appendix C.1

6.3 Maximum Conducted Output Peak Power Measurement

6.3.1 Standard requirement:

According to §15.247(b): For systems using digital modulation in the 2400-2483.5 MHz and 5725-5850 MHz band, the limit for maximum peak conducted output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceeds 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter peak output power.

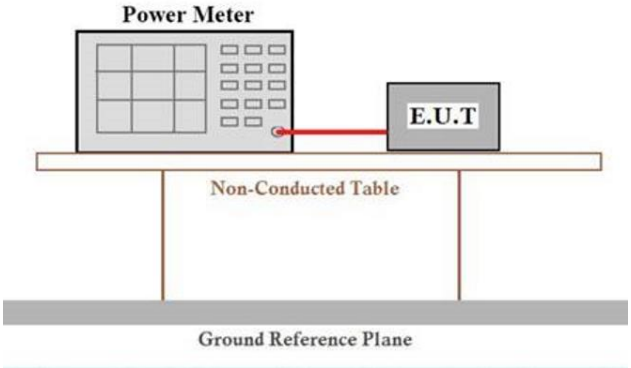
6.3.2 Measuring Instruments:

Please refer to equipment's list in this report.

6.3.3 Test Procedures:

According to KDB558074 D01 15.247 Meas Guidance v05r02 Section 9.1 Maximum peak conducted output power, 9.1.2 The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

6.3.4 Test Setup Layout



6.3.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.3.6 Test result

PASS

Please refer to Appendix C.2.

Remark:

1). Measured output power at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

3). Worst case data at 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40; 6.5Mbps at IEEE 802.11ax HE20; 13Mbps at IEEE 802.11ax HE40

6.4 6 dB Spectrum Bandwidth Measurement

6.4.1 Standard requirement:

According to §15.247(a) (2): For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

6.4.2 Measuring Instruments:

Please refer to equipment's list in this report.

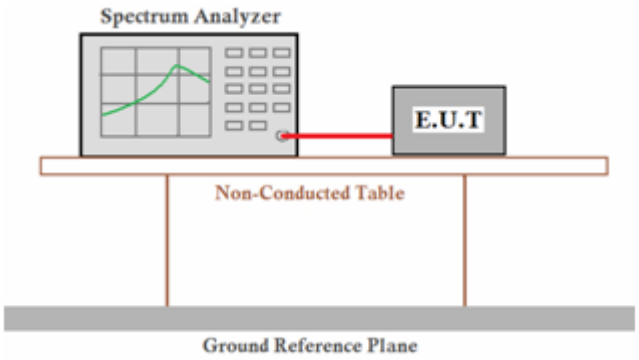
Please refer to equipment list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Span Frequency	30MHz
Detector	Peak

6.4.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth and the video bandwidth were set according to KDB558074.
3. Measured the spectrum width with power higher than 6dB below carrier.

6.4.4 Test Setup Layout



6.4.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.4.6 Test result

PASS

Please refer to Appendix C.3

Remark:

1). Measured 6dB Bandwidth at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

3). Worst case data at 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40; 6.5Mbps at IEEE 802.11ax HE20; 13Mbps at IEEE 802.11ax HE40

6.5 Power Spectral Density

6.5.1 Standard requirement:

According to §15.247(e), RSS-247 section 5.2 b: 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.

6.5.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of Spectrum Analyzer.

6.5.3 Test Procedures

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.

2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.

3. Set the RBW = 3 kHz.

4. Set the VBW ≥ 3*RBW

5. Set the span to 1.5 times the DTS channel bandwidth.

6. Detector = peak.

7. Sweep time = auto couple.

8. Trace mode = max hold.

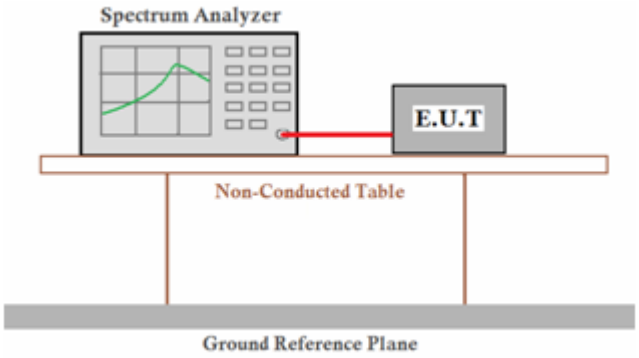
9. Allow trace to fully stabilize.

10. Use the peak marker function to determine the maximum power level.

11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

12. The resulting peak PSD level must shall not be greater than 8dBm in any 3 kHz..

6.5.4 Test Setup Layout



6.5.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.5.6 Test result

PASS

Please refer to Appendix C.5.

Remark:

1). Measured peak power spectrum density at difference data rate for each mode and recorded worst case for each mode;

2). Test results including cable loss;

3). Worst case data at 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40; 6.5Mbps at IEEE 802.11ax HE20; 13Mbps at IEEE 802.11ax HE40

6.6 Conducted Spurious Emissions and Band Edges Test

6.6.1 Standard requirement:

According to §15.247 (d), RSS 247 section 5.5: 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.6.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of the spectrum analyzer.

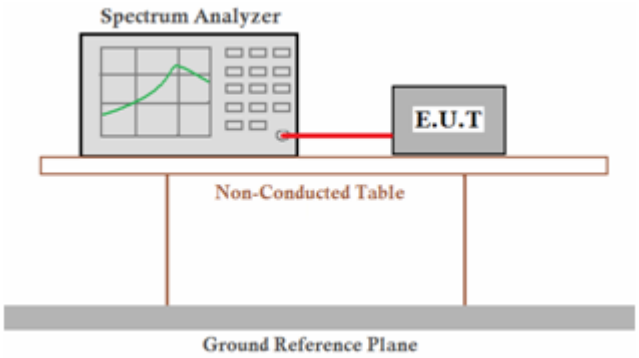
Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
RB / VB (Emission in restricted band)	100KHz/300KHz
RB / VB (Emission in non-restricted band)	100KHz/300KHz

6.6.3 Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9 kHz to 26.5GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

6.6.4 Test Setup Layout



6.6.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.6.6 Test result

PASS

Please refer to Appendix C.6 for conducted band edge emission.

Please refer to Appendix C.7 for conducted spurious emissions;

Remark:

1). Measured at difference data rate for each mode and recorded worst case for each mode.
2). Test results including cable loss;
3). Worst case data at 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40; 6.5Mbps at IEEE 802.11ax HE20; 13Mbps at IEEE 802.11ax HE40
4). Not recorded test plots from 9 KHz to 30 MHz as emission levels 20dB lower than emission limit.

6.7 Radiated Emissions and Radiation Restricted band Measurement

6.8.1 Standard requirement:

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

I

Frequencies (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

6.8.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.8.3 Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.0 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

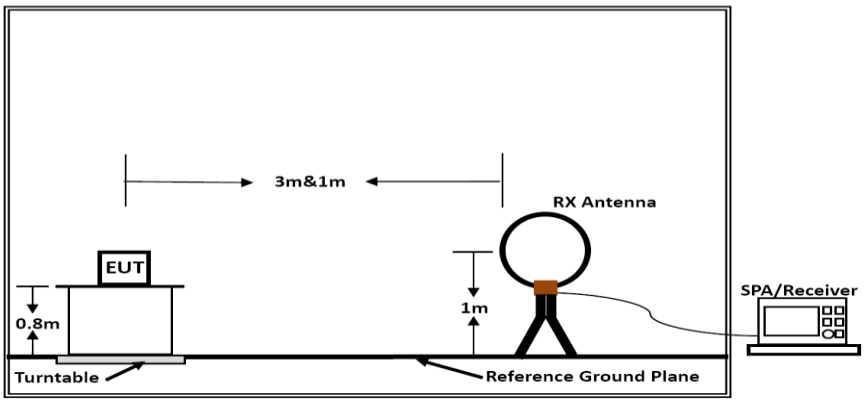
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

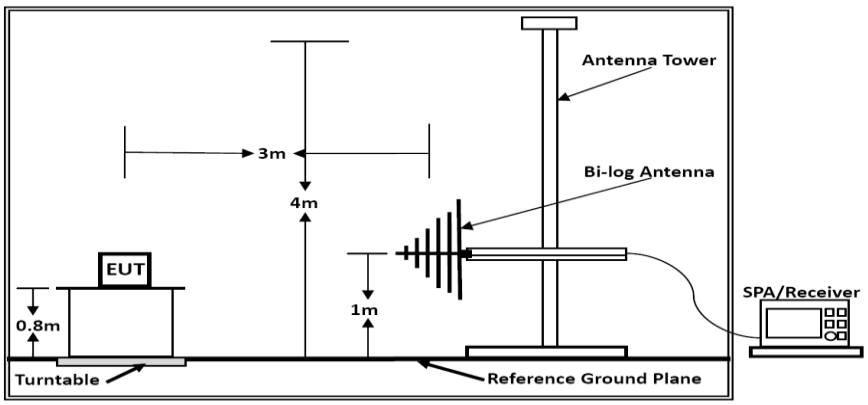
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

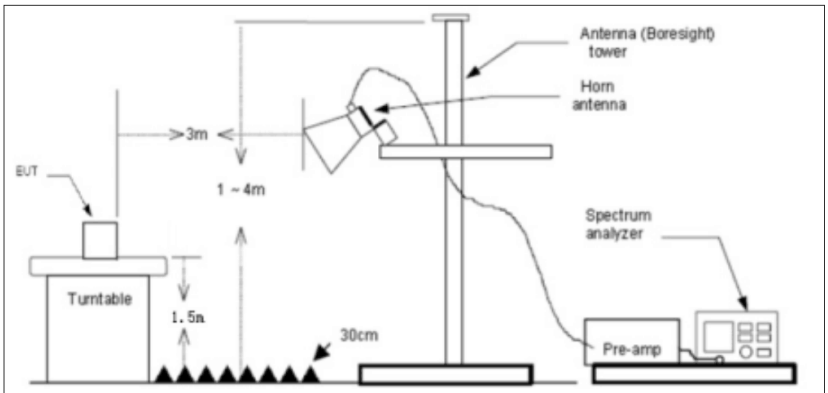
6.8.4 Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

6.8.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.8.6 Test result

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Temperature	25.4℃	Humidity	52.1%
Test Engineer	Leon.yi	Configurations	IEEE 802.11b

Remarks:

1. *Only the worst case Main Antenna test data.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

■ **Results of Radiated Emissions (9 KHz~30MHz)**

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

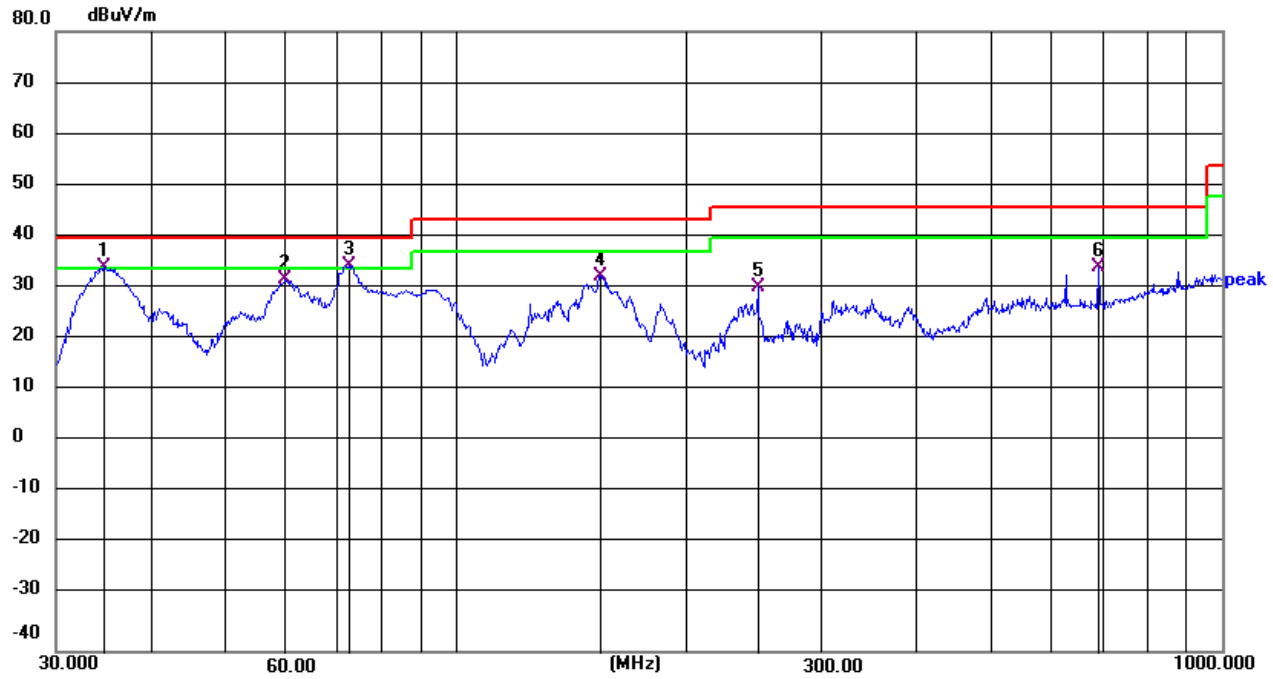
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

■ **Results of Radiated Emissions (30MHz~1GHz)**

Pre-scan all test modes, found worst case at IEEE 802.11n20 (High Channel), recorded the worst case results in this report (IEEE 802.11n20 (High Channel)).

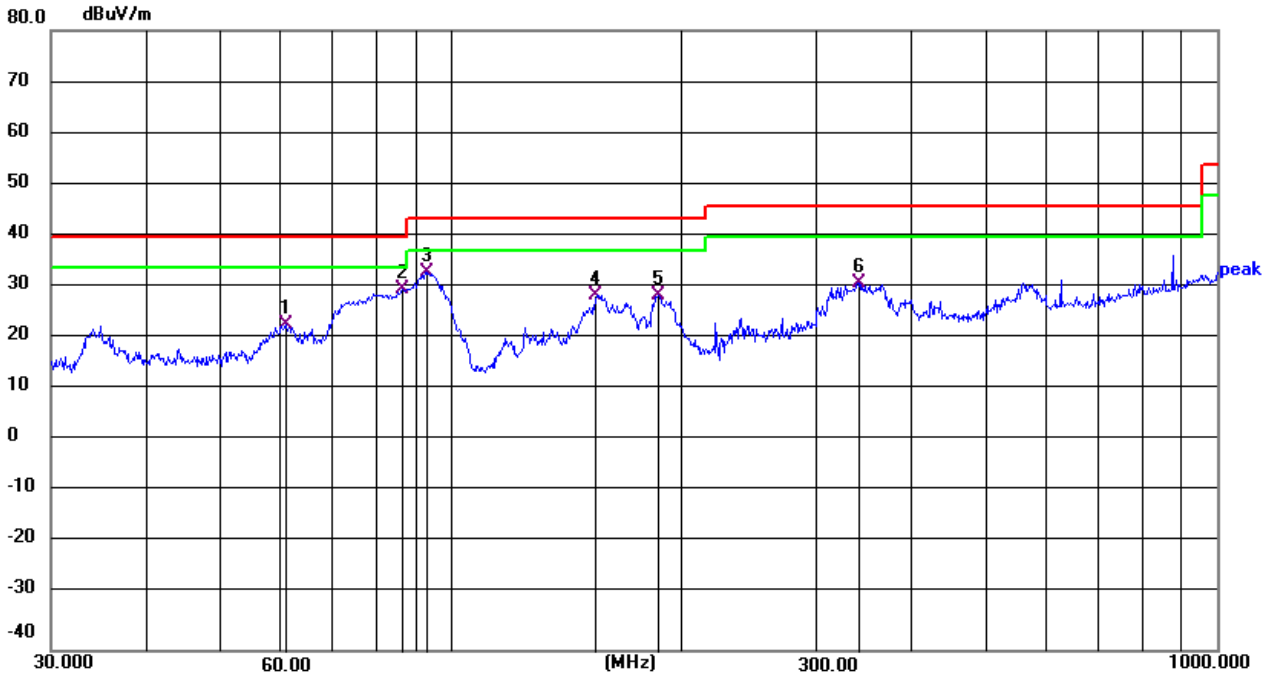
Model name:	IO1201B	Test Date :	2024-07-14
Polarization :	Vertical	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1 !	34.6385	51.64	-17.24	34.40	40.00	-5.60	QP
2	59.8588	49.31	-17.24	32.07	40.00	-7.93	QP
3 *	72.3376	54.11	-19.38	34.73	40.00	-5.27	QP
4	154.8204	49.14	-16.51	32.63	43.50	-10.87	QP
5	247.6819	49.21	-18.64	30.57	46.00	-15.43	QP
6	689.5644	42.89	-8.39	34.50	46.00	-11.50	QP

Model name:	IO1201B	Test Date :	2024-07-14
Polarization :	Horizontal	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	60.9176	40.47	-17.41	23.06	40.00	-16.94	QP
2 *	86.2001	51.04	-20.97	30.07	40.00	-9.93	QP
3	93.1132	54.04	-20.78	33.26	43.50	-10.24	QP
4	154.8204	45.26	-16.51	28.75	43.50	-14.75	QP
5	186.4409	47.95	-19.04	28.91	43.50	-14.59	QP
6	340.7817	47.17	-15.93	31.24	46.00	-14.76	QP

Results for Radiated Emissions (1- 26 GHz)

Note: All the modes have been tested and recorded worst mode in the report. (ANT1)

Test mode:	802.11n(HT20)	Test channel:	Lowest

H

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB/m)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.000	48.72	5.08	53.80	74.00	-20.20	PEAK
4824.000	38.72	5.08	43.80	54.00	-10.20	AVG
7326.000	42.29	7.55	49.84	74.00	-24.16	PEAK
7326.000	33.73	7.55	41.28	54.00	-12.72	AVG

V

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB/m)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.000	47.24	5.08	52.32	74.00	-21.68	PEAK
4824.000	37.97	5.08	43.05	54.00	-10.95	AVG
7236.000	41.31	7.55	48.86	74.00	-25.14	PEAK
7236.000	34.35	7.55	41.90	54.00	-12.10	AVG

Test mode:	802.11n(HT20)	Test channel:	Middle

H

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB/m)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.000	48.15	5.13	53.28	74.00	-20.72	PEAK
4874.000	37.29	5.13	42.42	54.00	-11.58	AVG
7311.000	41.59	7.49	49.08	74.00	-24.92	PEAK
7311.000	33.67	7.49	41.16	54.00	-12.84	AVG

V

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB/m)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.000	46.01	5.13	51.14	74.00	-22.86	PEAK
4874.000	37.28	5.13	42.41	54.00	-11.59	AVG
7311.000	42.40	7.49	49.89	74.00	-24.11	PEAK
7311.000	33.02	7.49	40.51	54.00	-13.49	AVG

Test mode:	802.11n(HT20)	Test channel:	Highest

H

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB/m)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.000	48.52	5.18	53.70	74.00	-20.30	PEAK
4924.000	38.22	5.18	43.40	54.00	-10.60	AVG
7386.000	39.52	7.82	47.34	74.00	-26.66	PEAK
7386.000	31.46	7.82	39.28	54.00	-14.72	AVG

V

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB/m)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.000	46.13	5.18	51.31	74.00	-22.69	PEAK
4924.000	37.80	5.18	42.98	54.00	-11.02	AVG
7386.000	42.79	7.82	50.61	74.00	-23.39	PEAK
7386.000	30.49	7.82	38.31	54.00	-15.69	AVG

Notes:

1). Measuring frequencies from 9 KHz - 10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.
2). Radiated emissions *measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.*
3). Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4). Worst case data at 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40; 6.5Mbps at IEEE 802.11ax HE20; 13Mbps at IEEE 802.11ax HE40
5). Margin=Reading level + Factor – Limit

Radiation Restricted band

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1 *	2384.630	45.46	-5.84	39.62	54.00	-14.38	peak	100	360
2	2390.000	43.25	-5.31	37.94	54.00	-16.06	peak	100	360

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1 *	2378.190	46.27	-5.89	40.38	54.00	-13.62	peak	100	0
2	2390.000	44.58	-6.21	38.37	54.00	-15.63	peak	100	0

Remarks:

1). Margin= Emission Level – Limit

2). Emission Level = Reading + Factor

3). Factor = Antenna Factor + Cable Loss – Pre-amplifie

4). All the modes have been tested and the only shows the worst case 802.11b mode.

5).The PEAK value is less than the AVG limit, the AVG result no need be show in this report.

6.8 Conducted Emissions

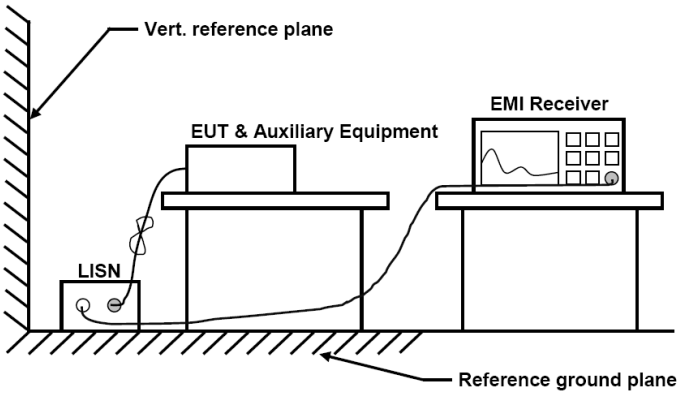
6.9.1 Standard requirement:

According to §15.207 (a), RSS-Gen Issue 5: For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

6.9.2 Test Setup Layout



6.9.3 Test Procedures

The transmitter output is connected to EMI receiver. The resolution bandwidth is set to 9 kHz. The video bandwidth is set to 30 kHz, Sweep time=Auto

The spectrum from 150 kHz to 30MHz is investigated with the transmitter set to the lowest, middle, and highest channels.

6.9.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.9.5 Test result

PASS

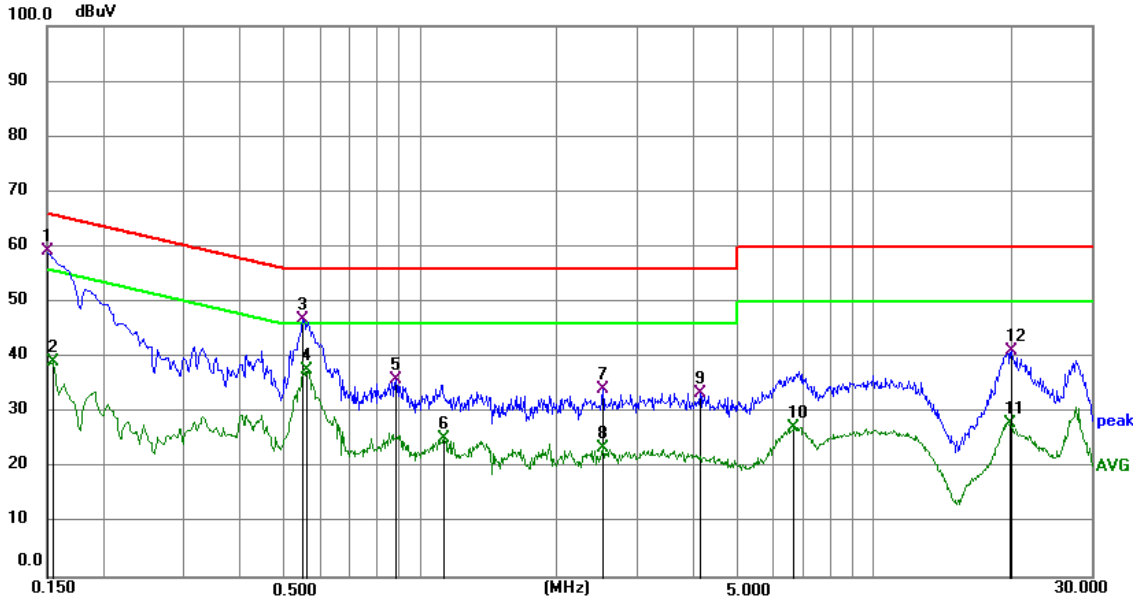
The test data please refer to following page.

Temperature	25.4℃	Humidity	52.1%
Test Engineer	Leon.yi	Configurations	IEEE 802.11b

Measurement data:

AC Conducted Emission of charge from Adapter mode @ AC 120V/60Hz @ IEEE 802.11b (worst case)

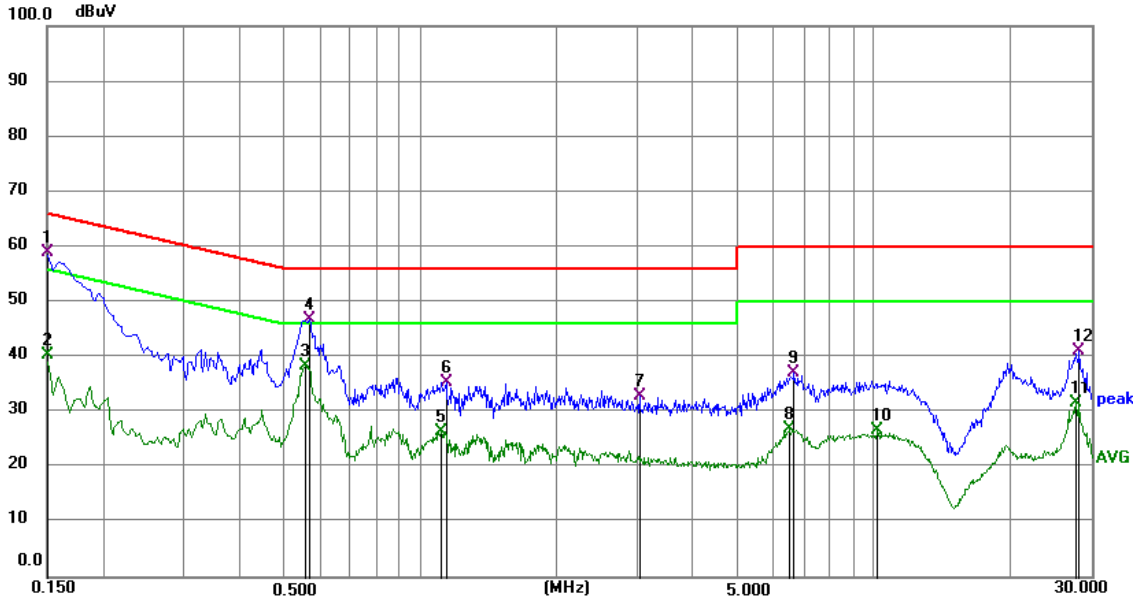
Model name:	IO1201B	Test Date :	2024-07-14
ATM Pressure:	101 kPa	Test by:	Leon.yi
Phase :	Line	Test Result:	☒ Pass ☐ Fail



Remark: Factor =insertion loss of LISN + Cable loss +insertion loss of Pulse Limiter.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	47.23	11.84	59.07	66.00	-6.93	QP
2	0.1545	27.67	11.31	38.98	55.75	-16.77	AVG
3	0.5505	36.11	10.68	46.79	56.00	-9.21	QP
4	0.5639	26.82	10.68	37.50	46.00	-8.50	AVG
5	0.8835	25.18	10.65	35.83	56.00	-20.17	QP
6	1.1265	14.45	10.67	25.12	46.00	-20.88	AVG
7	2.5215	23.25	10.79	34.04	56.00	-21.96	QP
8	2.5215	12.75	10.79	23.54	46.00	-22.46	AVG
9	4.1145	22.48	11.00	33.48	56.00	-22.52	QP
10	6.6570	16.26	11.03	27.29	50.00	-22.71	AVG
11	19.8825	16.20	11.72	27.92	50.00	-22.08	AVG
12	19.9905	29.40	11.72	41.12	60.00	-18.88	QP

Model name:	IO1201B	Test Date :	2024-07-14
ATM Pressure:	101 kPa	Test by:	Leon.yi
Phase :	Neutral	Test Result:	☒ Pass ☐ Fail



Remark: Factor =insertion loss of LISN + Cable loss +insertion loss of Pulse Limiter.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	47.14	11.84	58.98	66.00	-7.02	QP
2	0.1500	28.42	11.84	40.26	56.00	-15.74	AVG
3	0.5595	27.75	10.68	38.43	46.00	-7.57	AVG
4	0.5685	36.14	10.68	46.82	56.00	-9.18	QP
5	1.1085	15.76	10.65	26.41	46.00	-19.59	AVG
6	1.1355	24.81	10.66	35.47	56.00	-20.53	QP
7	3.0390	22.06	10.78	32.84	56.00	-23.16	QP
8	6.5085	15.89	11.01	26.90	50.00	-23.10	AVG
9	6.6435	25.99	11.01	37.00	60.00	-23.00	QP
10	10.1535	15.71	11.01	26.72	50.00	-23.28	AVG
11	27.7710	20.17	11.57	31.74	50.00	-18.26	AVG
12	28.2750	29.56	11.56	41.12	60.00	-18.88	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

7 Test Setup Photographs of EUT

Please refer to separated files for Test Setup Photos of the EUT.

8 External Photographs of EUT

Please refer to separated files for External Photos of the EUT.

9 Internal Photographs of EUT

Please refer to separated files for Internal Photos of the EUT.

------End------