

Test Report

Verified code: 057621

Report No.: E20230331478001-13

Customer: Lumi United Technology Co., Ltd

Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District,
Nanshan District, Shenzhen, China

Sample Name: Hub M3

Sample Model: HM-G01E

Receive Sample Date: Aug.02,2023

Test Date: Nov.20,2023 ~ Dec.18,2023

Reference Document: 47 CFR, FCC Part 15 Subpart C
RADIO FREQUENCY DEVICES:Subpart C—Intentional Radiators

Test Result: Pass

Prepared by: Chen Xiaocong
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Reviewed by: Jiang Tao
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Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-01-09

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5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

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TABLE OF CONTENTS

1.	TEST RESULT SUMMARY	6
2.	GENERAL DESCRIPTION OF EUT	7
2.1	APPLICANT	7
2.2	MANUFACTURER	7
2.3	BASIC DESCRIPTION OF EQUIPMENT UNDER TEST.....	7
2.4	CHANNEL LIST	8
2.5	TEST OPERATION MODE.....	8
2.6	LOCAL SUPPORTIVE INSTRUMENTS	8
2.7	CONFIGURATION OF SYSTEM UNDER TEST.....	9
2.8	DUTY CYCLE	10
3.	LABORATORY AND ACCREDITATIONS	11
3.1	LABORATORY	11
3.2	ACCREDITATIONS.....	11
3.3	MEASUREMENT UNCERTAINTY	12
4.	LIST OF USED TEST EQUIPMENT AT GRGT	13
5.	CONDUCTED EMISSION MEASUREMENT.....	14
5.1	LIMITS	14
5.2	TEST PROCEDURES	14
5.3	TEST SETUP.....	15
5.4	DATA SAMPLE.....	15
5.5	TEST RESULTS.....	16
6.	RADIATED SPURIOUS EMISSIONS.....	18
6.1	LIMITS	18
6.2	TEST PROCEDURES	18
6.3	TEST SETUP.....	22
6.4	DATA SAMPLE.....	23
6.5	TEST RESULTS.....	25
7.	6DB BANDWIDTH	40
7.1	LIMITS	40
7.2	TEST PROCEDURES	40
7.3	TEST SETUP.....	40
7.4	TEST RESULTS.....	41
8.	MAXIMUM PEAK OUTPUT POWER.....	46
8.1	LIMITS	46
8.2	TEST PROCEDURES	46
8.3	TEST SETUP.....	46
8.4	TEST RESULT	47
9.	POWER SPECTRAL DENSITY	48
9.1	LIMITS	48
9.2	TEST PROCEDURES	48
9.3	TEST SETUP.....	48
9.4	TEST RESULTS.....	49
10.	CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS.....	54
10.1	LIMITS	54
10.2	TEST PROCEDURES	54

10.3	TEST SETUP.....	54
10.4	TEST RESULTS.....	55
11.	RESTRICTED BANDS OF OPERATION	72
11.1	LIMITS	72
11.2	TEST PROCEDURES	73
11.3	TEST SETUP.....	73
11.4	TEST RESULTS.....	74
	APPENDIX B. PHOTOGRAPH OF THE EUT.....	91

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20230331478001-13	Original Issue	2023-12-26

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1. TEST RESULT SUMMARY

Standard	Item	Limit / Severity	Result
47 CFR, FCC Part 15 Subpart C (§15.247) ANSI C63.10-2020 KDB 558074 D01 15.247 measurement guidance v05r02	Antenna Requirement	§15.203	PASS
	Conducted Emissions	§15.207 (a)	PASS
	Radiated Spurious Emission	§15.247(d) §15.205 §15.209	PASS
	6 dB Bandwidth	§15.247 (a)(2)	PASS
	Maximum Peak Output Power	§15.247(b)(3)	PASS
	Power Spectral Density	§15.247(e)	PASS
	Conducted band edges and Spurious Emission	§15.247(d)	PASS
	Restricted bands of operation	§15.205 §15.209 §15.247(d)	PASS

Note: 1. The EUT antenna is FIFA antenna. The max gain of Antenna is 0dBi which accordance 15.203 is considered sufficient to comply with the provisions of this section.

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2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name: Lumi United Technology Co., Ltd
Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.2 MANUFACTURER

Name: Lumi United Technology Co., Ltd
Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Product Name: Hub M3
Product Model: HM-G01E
Adding Model: HM-G01D
Models Difference: The model NO. HM-G01E & HM-G01D have the same technical construction including circuit diagram, PCB LAYOUT, hardware version and software version identical, except sales area and packaging are different.
Trade Name: Aqara
FCC ID: 2AKIT-HMG01
Power Supply: DC 5V/2A or PoE input 48V/0.27A
Frequency Band: 2412MHz-2462MHz for IEEE 802.11b/g/n HT20;
2422MHz-2452MHz for IEEE 802.11n HT40
Modulation Type: DSSS for IEEE 802.11b mode;
OFDM for IEEE 802.11g/n mode
Antenna Specification: PIFA antenna with 0dBi gain (Max)
Temperature Range: -10 °C ~ 50 °C
Hardware Version: V2.0.5_1060
Software Version: T0
Sample submitting way: ☒ Provided by customer ☐ Sampling
Sample No: E20230331478001-0002, E20230331478001-0006

Note 1: The EUT antenna gain is provided by the applicant. This report is made solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

Note 2: All the tests were performed on the model HM-G01E.

2.4 CHANNEL LIST

CH01 - CH11 for IEEE 802.11b, IEEE 802.11g, IEEE 802.11n HT20							
CH03 – CH9 for IEEE 802.11n HT40							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

2.5 TEST OPERATION MODE

Mode No.	Description of the modes
1	2.4GHz Wi-Fi TX mode

2.6 LOCAL SUPPORTIVE INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Note
Notebook	LENOVO	TianYi 310-14ISK	MP18DLC6	/
Test board	/	/	/	/
Adapter	Jian Aohai	A70-050200U-EU1	/	/
PoE Adapter	UE	PoE35-54A	/	/

No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	Serial cable	1	No	0	0.3m
2	USB-MINI cable	1	Yes	0	1.0m
3	USB-C cable	1	Yes	0	0.8m
4	RJ45 cable	1	No	0	1.5m

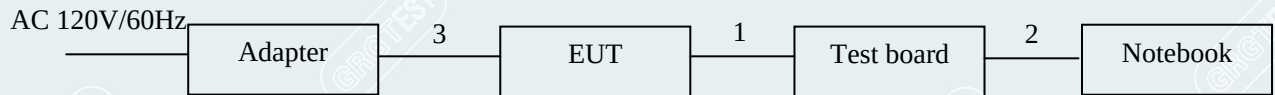
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2.7 CONFIGURATION OF SYSTEM UNDER TEST

For 6 dB Bandwidth & Maximum Peak Output Power & Power Spectral Density & Conducted band edges and Spurious Emission



For Conducted Emissions & Radiated Spurious Emission & Restricted bands of operation



Test software:

Software version
QCOM_V1.0

Power Setting:

Mode	Date Rate	Frequency (MHz)	Antenna 4 Power Setting
IEEE 802.11b	1M	2412	30
		2437	30
		2462	30
IEEE 802.11g	6M	2412	30
		2437	30
		2462	30
IEEE 802.11n HT20	MCS0	2412	30
		2437	30
		2462	30
IEEE 802.11n HT40	MCS0	2422	30
		2437	30
		2452	30

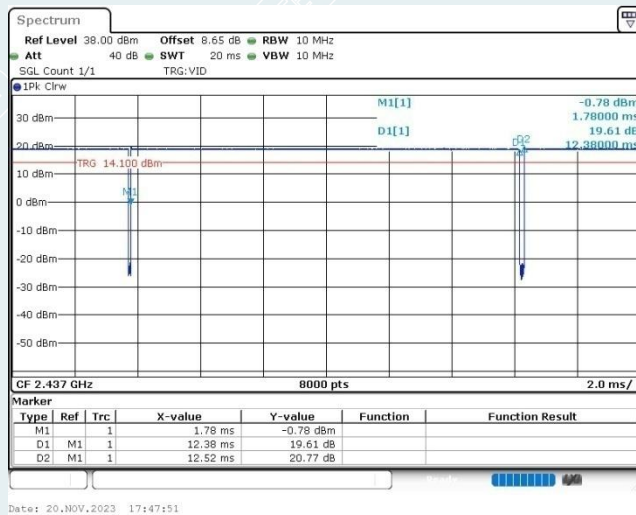
2.8 DUTY CYCLE

Environment: 25.4°C/45%RH/101.0kPa
Tested By: Huang Tianmei

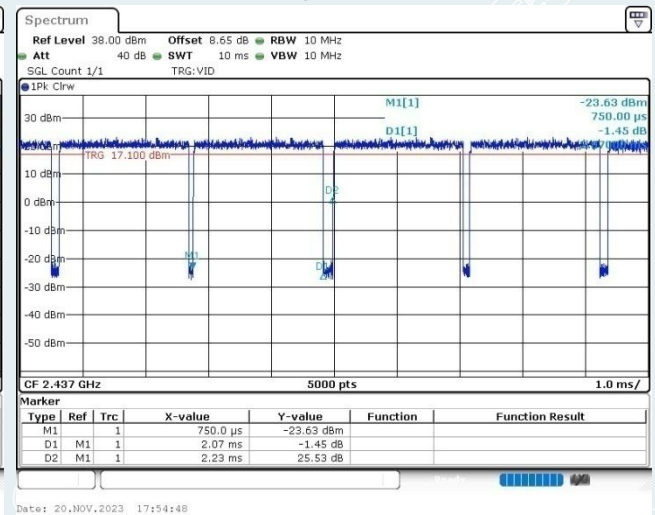
Voltage: DC 5V
Date: 2023-11-20

Test Mode	Antenna	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	T(s)
IEEE 802.11b	Ant4	2437	12.38	12.52	98.88	0.01238
IEEE 802.11g	Ant4	2437	2.07	2.23	92.83	0.00207
IEEE 802.11n HT20	Ant4	2437	1.93	2.10	91.90	0.00193
IEEE 802.11n HT40	Ant4	2437	0.95	1.12	84.82	0.00095

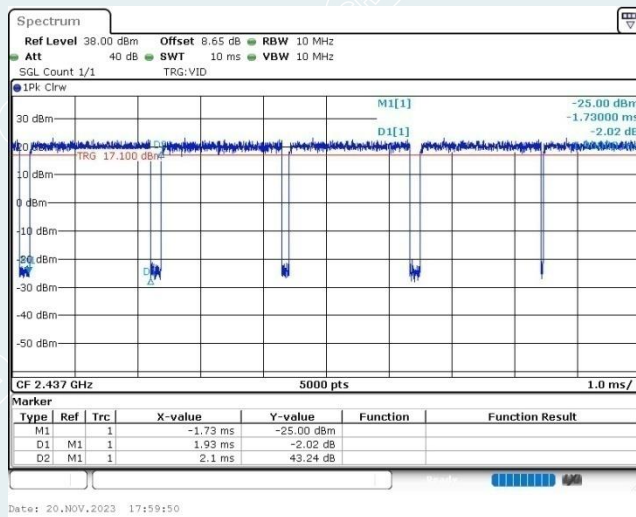
IEEE 802.11b_Ant4_2437MHz



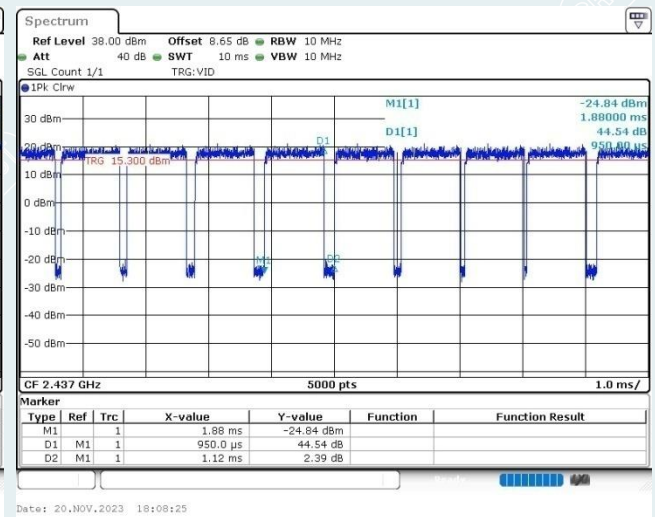
IEEE 802.11g_Ant4_2437MHz



IEEE 802.11n HT20_Ant4_2437MHz



IEEE 802.11n HT40_Ant4_2437MHz



3. LABORATORY AND ACCREDITATIONS

3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

Add : No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District
Shenzhen, 518110, People's Republic of China

P.C. : 518110

Tel : 0755-61180008

Fax : 0755-61180008

3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA A2LA(Certificate#:2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada ISED (Company Number: 24897, CAB identifier:CN0069)

USA FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site,
<http://www.grgtest.com>

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3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Radiated Emission	Coplanar	9kHz~30MHz	4.4dB ¹⁾
	Coaxial	9kHz~30MHz	4.4dB ¹⁾
	Horizontal	30MHz~200MHz	4.6dB ¹⁾
		200MHz~1000MHz	4.8dB ¹⁾
		1GHz~18GHz	5.0dB ¹⁾
		18GHz~26.5GHz	5.2dB ¹⁾
	Vertical	30MHz~200MHz	4.7dB ¹⁾
		200MHz~1000MHz	4.7dB ¹⁾
		1GHz~18GHz	5.1dB ¹⁾
		18GHz~26.5GHz	5.4dB ¹⁾
Conduction Emission		150kHz~30MHz	3.3dB ¹⁾

Measurement	Uncertainty
RF frequency	6.0×10^{-6}
RF power conducted	0.78 dB
Power spectral density	0.78 dB
Occupied channel bandwidth	0.4 dB
Unwanted emission, conducted	0.68 dB
Humidity	6.0 %
Temperature	2.0 °C

Note:

¹⁾ This uncertainty represents an expanded uncertainty expressed at approximately the 95%.

This uncertainty represents an expanded uncertainty factor of $k=2$.

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4. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Conducted Emissions				
EZ-EMC	EZ	CCS-3A1-CE	/	/
EMI Receiver	R&S	ESCI	100783	2024-08-11
LISN(EUT)	R&S	ENV216	101543	2024-09-10
Radiated Spurious Emission&Restricted bands of operation				
Loop Antenna	Schwarzbeck	FMZB 1513-60	1513-60-56	2024-07-15
Preamplifier	SHIRONG ELECTRONIC	DLNA-30M1G-G41	20200928002	2024-10-24
Bi-log Antenna	Schwarzbeck	VULB9160	VULB9160-3402	2024-10-06
Horn Antenna	Schwarzbeck	BBHA 9120D	02143	2024-09-23
Test Receiver	R&S	ESR26	101758	2024-09-22
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-497	2024-09-18
Amplifier	Tonscend	TAP01018048	AP20E8060075	2024-04-11
Amplifier	Tonscend	TAP184050	AP20E806071	2024-04-16
Amplifier	SHIRONG ELECTRONIC	DLNA-1G18G-G40	20200928005	2024-08-17
Test S/W	Tonscend	JS32-RE/5.0.0		
6 dB Bandwidth & Power Spectral Density& Conducted band edges and Spurious Emission				
Spectrum Analyzer	R&S	FSV30	104381	2024-10-13
Automatic power	TONSCEND	JS0806-2	21B8060365	2024-08-04
BT/WIFI System	TONSCEND	JS1120-3	/	/
Output Power				
Pulse power sensor	Anristu	MA2411B	1126150	2024-02-12
Power meter	Anristu	ML2495A	1204003	2024-02-12

Note: The calibration interval of the above test instruments is 12 months.

5. CONDUCTED EMISSION MEASUREMENT

5.1 LIMITS

Frequency range	Limits (dB μ V)	
	Quasi-peak	Average
150kHz~0.5MHz	66~56	56~46
0.5MHz~5MHz	56	46
5MHz~30MHz	60	50

5.2 TEST PROCEDURES

Procedure of Preliminary Test

For measurement of the disturbance voltage the equipment under test (EUT) is connected to the power supply mains and any other extended network via one or more artificial network(s). An EUT, whether intended to be grounded or not, and which is to be used on a table is configured as follows:

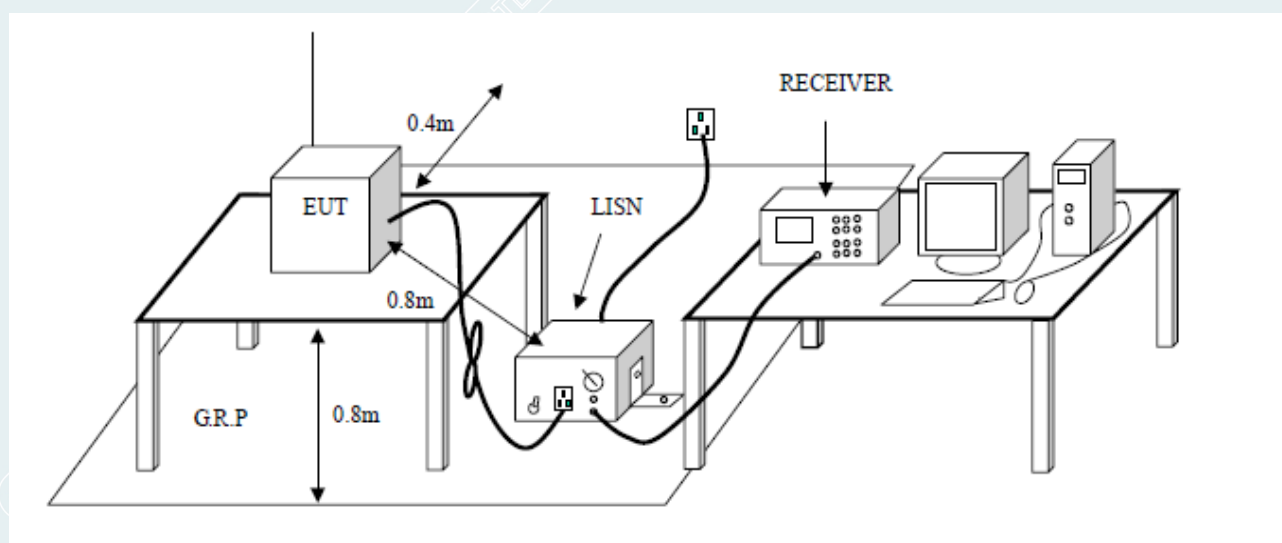
- a) Either the bottom or the rear of the EUT shall be at a controlled distance of 40 cm from a reference ground plane. This ground plane is normally the wall or floor of a shielded room. It may also be a grounded metal plane of at least 2 m by 2 m. This is physically accomplished as follows:
 - 1) Place the EUT on a table of non-conducting material which is at least 80 cm high. Place the EUT so that it is 40 cm from the wall of the shielded room, or
 - 2) place the EUT on a table of non-conducting material which is 40 cm high so that the bottom of the EUT is 40 cm above the ground plane;
- b) All other conductive surfaces of the EUT shall be at least 80 cm from the reference ground plane;
- c) The EUT are placed on the floor that one side of the housings is 40 cm from the vertical reference ground plane and other metallic parts;
- d) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between the ground plane and the table.
- e) I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

The test mode(s) described in Item 2.5 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.5 producing the highest emission level. The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

5.3 TEST SETUP



5.4 DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

Factor = Insertion loss of LISN + Cable Loss
 Result = Quasi-peak Reading/ Average Reading + Factor
 Limit = Limit stated in standard
 Margin = Result (dBuV) – Limit (dBuV)

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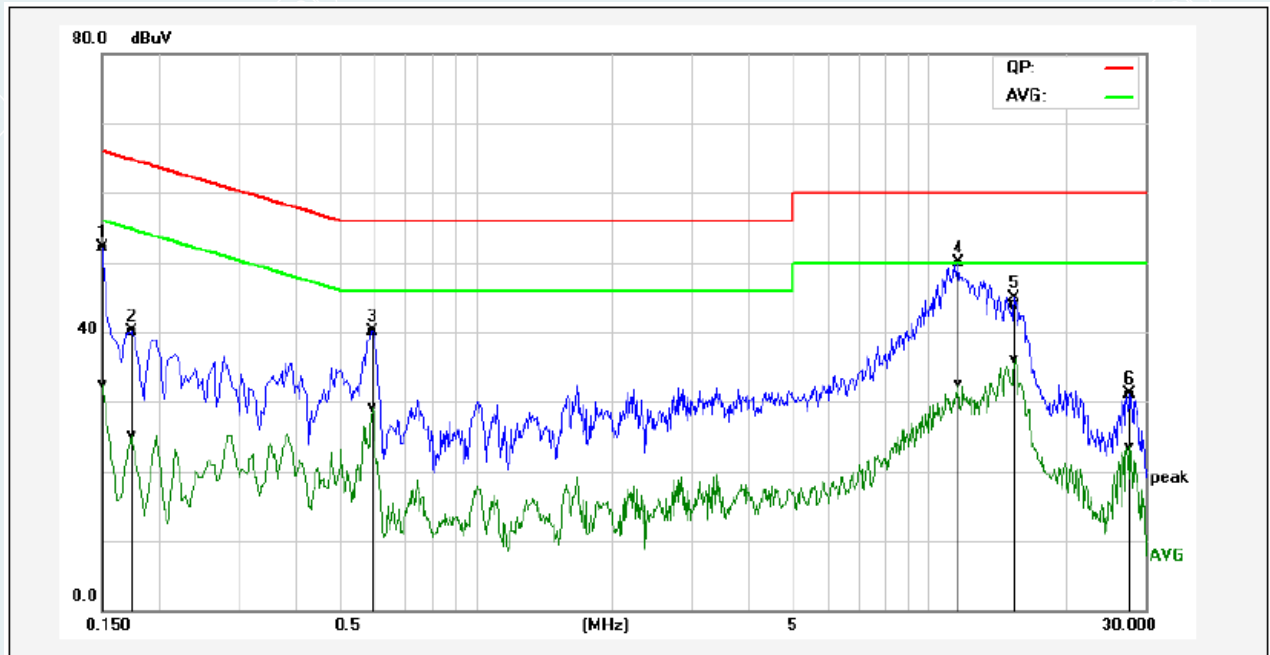
5.5 TEST RESULTS

Note: Pre-scan all modes, the worst power supply is AC 120/60Hz(DC 5V/2A power by Adapter) in the two power supply modes and recorded the worst case results(IEEE 802.11b 2412MHz) in this report.

Power supply: AC 120/60Hz (DC 5V/2A power by Adapter)

Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0006
Mode:	IEEE 802.11b 2412MHz	Voltage:	AC 120V/60Hz
Environment:	24.2°C/52%RH/101.0kPa	Engineer:	Chen Zexin
Test Date:	2023-12-13	Line	L

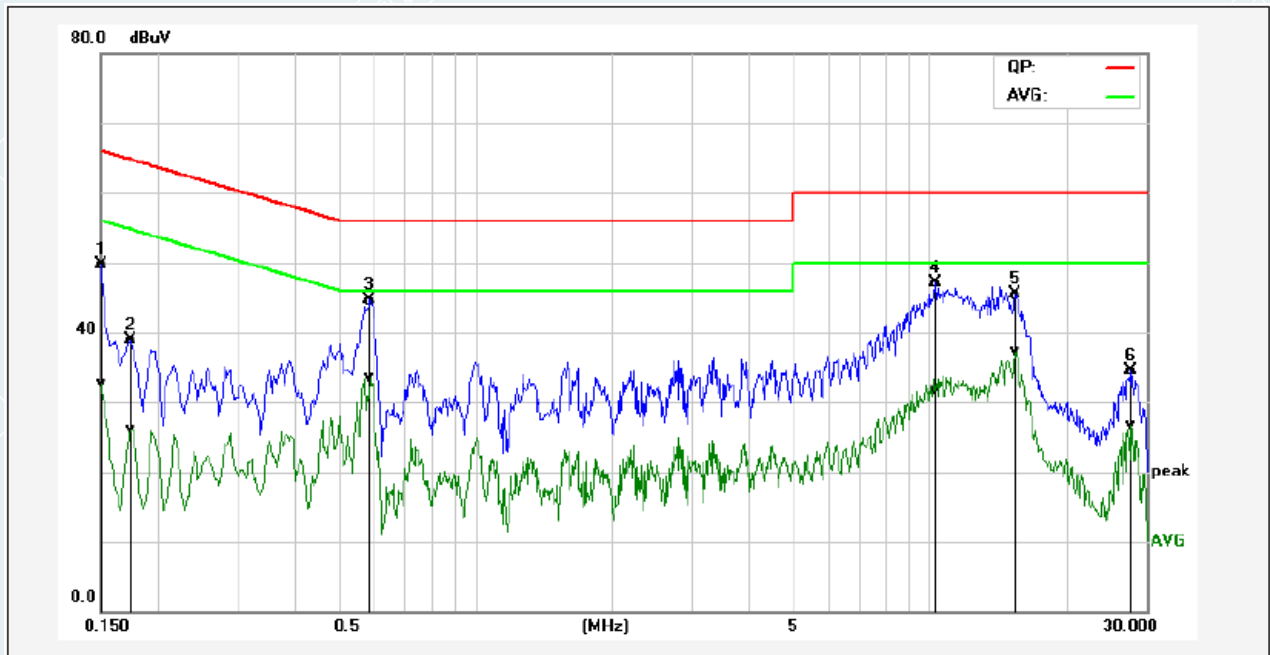
(The chart below shows the highest readings taken from the final data.)



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1500	42.31	22.83	9.75	52.06	32.58	65.99	56.00	-13.93	-23.42	Pass
2	0.1740	30.36	15.48	9.68	40.04	25.16	64.76	54.77	-24.72	-29.61	Pass
3	0.5940	30.31	19.33	9.71	40.02	29.04	56.00	46.00	-15.98	-16.96	Pass
4*	11.6820	40.02	22.59	9.86	49.88	32.45	60.00	50.00	-10.12	-17.55	Pass
5	15.4820	34.06	26.11	9.92	43.98	36.03	60.00	50.00	-16.02	-13.97	Pass
6	27.8020	20.91	13.27	10.23	31.14	23.50	60.00	50.00	-28.86	-26.50	Pass

Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0006
Mode:	IEEE 802.11b 2412MHz	Voltage:	AC 120V/60Hz
Environment:	24.2°C/52%RH/101.0kPa	Engineer:	Chen Zexin
Test Date:	2023-12-13	Line	N

(The chart below shows the highest readings taken from the final data.)



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1500	39.92	22.94	9.70	49.62	32.64	65.99	56.00	-16.37	-23.36	Pass
2	0.1740	29.24	16.52	9.66	38.90	26.18	64.76	54.77	-25.86	-28.59	Pass
3*	0.5899	34.79	23.80	9.68	44.47	33.48	56.00	46.00	-11.53	-12.52	Pass
4	10.3220	37.19	21.83	9.88	47.07	31.71	60.00	50.00	-12.93	-18.29	Pass
5	15.5220	35.24	27.21	10.07	45.31	37.28	60.00	50.00	-14.69	-12.72	Pass
6	27.8020	24.21	16.49	10.30	34.51	26.79	60.00	50.00	-25.49	-23.21	Pass

6. RADIATED SPURIOUS EMISSIONS

6.1 LIMITS

In any 100kHz 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 100kHz 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 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required.

Frequency (MHz)	Quasi-peak(μ V/m)	Measurement distance(m)	Quasi-peak(dB μ V/m)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30~88	100	3	40
88~216	150	3	43.5
216~960	200	3	46
Above 960	500	3	54

NOTE:

- (1) The emission limits for the ranges 9-90kHz and 110-490kHz are based on measurements employing a linear average detector.
- (2) The lower limit shall apply at the transition frequencies.

6.2 TEST PROCEDURES

a) Sequence of testing 9kHz to 30MHz

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.
- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.
- The EUT is placed on a desktop position in the center of the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0 °to 360 °.
- The antenna height is 1.0 meter.
- The antenna is polarized Coplanar and Coaxial.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

- Identified emissions during the pre measurement 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 QP 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 pre measurement and the limit will be stored.

b) Sequence of testing 30MHz to 1GHz

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.

--- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

--- The EUT is placed on a desktop position in the center of the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0 °to 360 °.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 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 rotates from 0 °to 360 °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.

c) Sequence of testing 1GHz to 18GHz**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.
- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.
- The EUT is placed on a desktop position in the center of the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0 ° to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 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 rotates from 0 ° to 360 ° 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 pre measurement with marked maximum final measurements and the limit will be stored.

d) Sequence of testing above 18GHz**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.
- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.
- The EUT is placed on a desktop position in the center of the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0 °to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 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 pre measurement the software maximize the peaks by changing turntable rotates from 0 °to 360 °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 pre measurement with marked maximum final measurements and the limit will be stored.

NOTE:

- (1).The frequency from 9kHz to 150kHz, Set RBW=300Hz(for Peak&AVG), RBW=300Hz(for Peak&AVG). the frequency from 150kHz to 30MHz, Set RBW=9kHz, RBW=9kHz,(for QP Detector).
- (2).The frequency from 30MHz to 1GHz, Set RBW=120kHz, RBW=300kHz,(for QP Detector).
- (3).The frequency above 1GHz, for Peak detector: Set RBW=1MHz, RBW=3MHz.
- (4).The frequency above 1GHz, for Avg detector: Set RBW=1MHz, if the EUT is configured to transmit with duty cycle $\geq 98\%$, set $VBW \leq RBW/100$ (i.e.,10kHz) but not less than 10Hz. if the EUT duty cycle is $< 98\%$, set $VBW \geq 1/T$, Where T is defined in section 2.8.

----- The following blanks -----

6.3 TEST SETUP

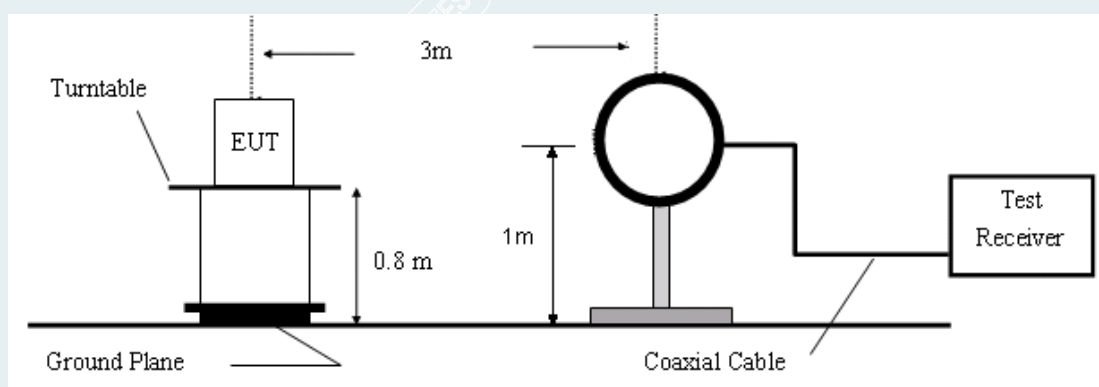


Figure 1. 9kHz to 30MHz radiated emissions test configuration

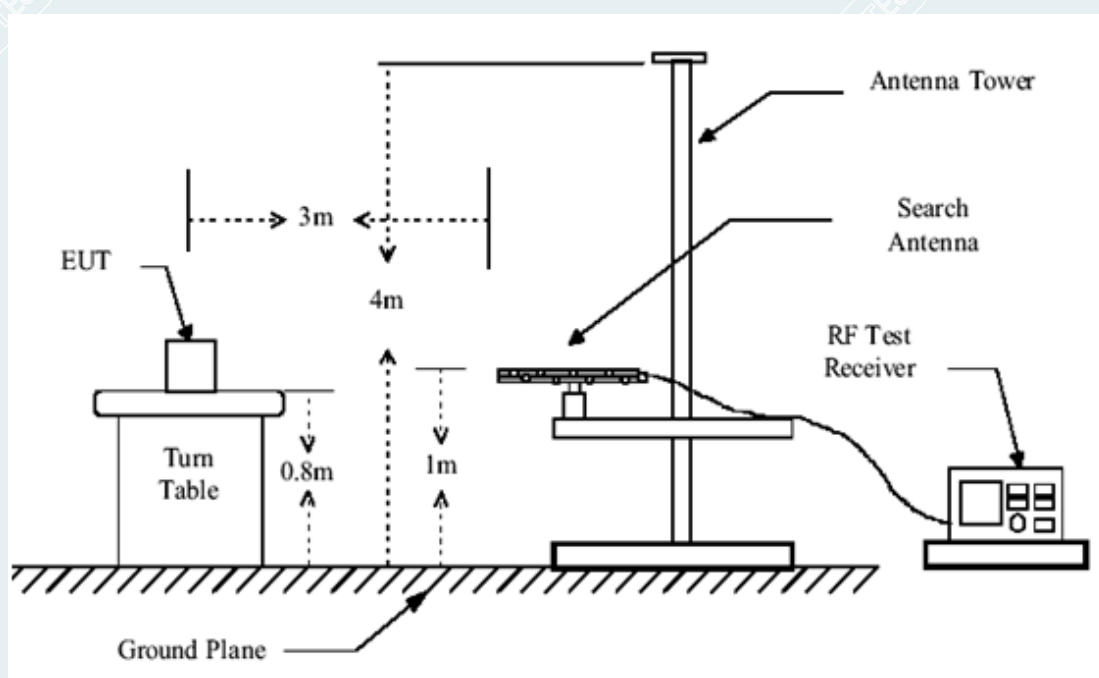


Figure 2. 30MHz to 1GHz radiated emissions test configuration

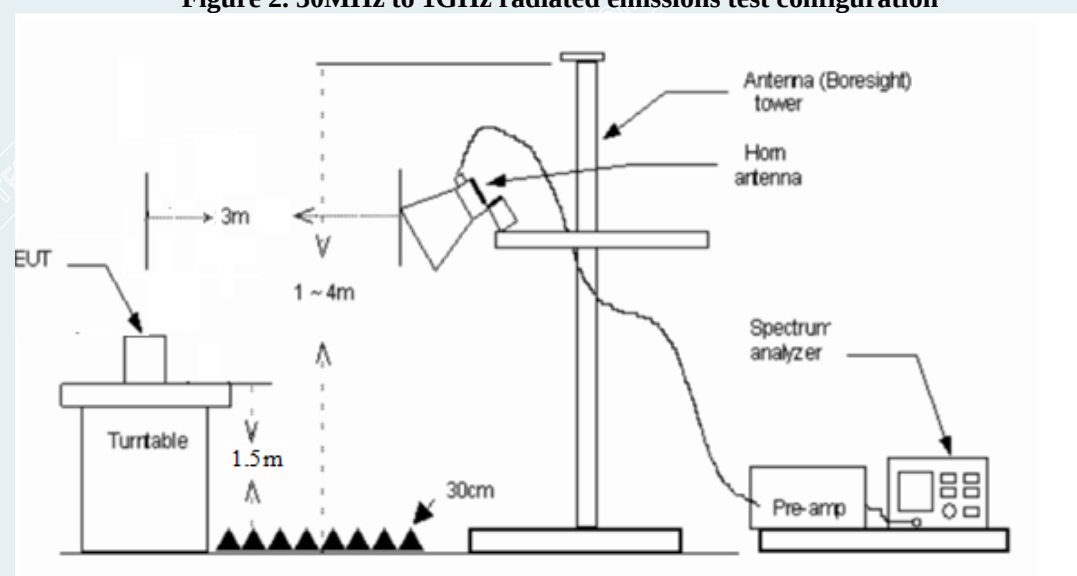


Figure 3. 1GHz to 18GHz radiated emissions test configuration

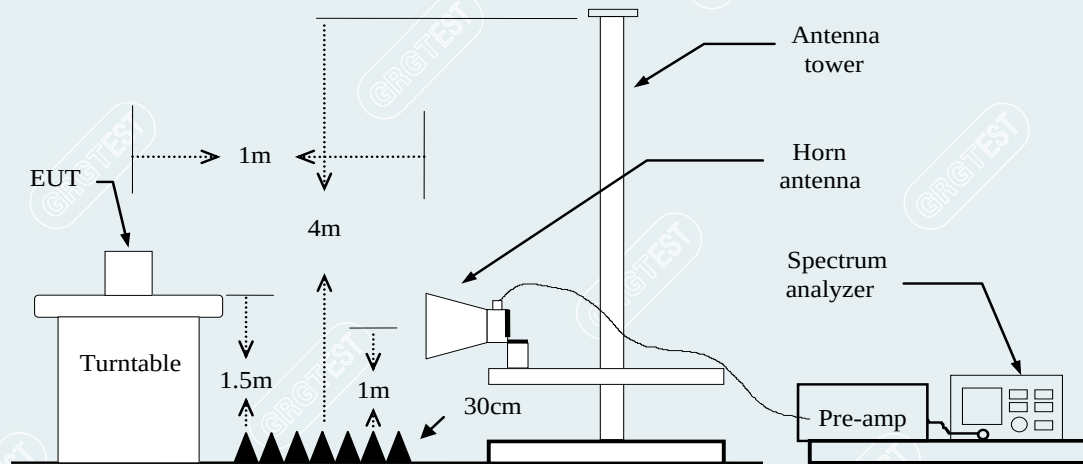


Figure 4.18GHz to 26.5GHz radiated emissions test configuration

6.4 DATA SAMPLE

30MHz to 1GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Heigh (cm)	Detectortype
XXX.XXXX	48.49	-9.91	38.58	47.00	-8.42	100	108	QP

Frequency (MHz)

= Emission frequency in MHz

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Correct Factor (dB/m)

= Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m)

= Reading (dBuV) + Correct Factor (dB/m)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Result (dBuV/m)-Limit (dBuV/m)

Peak

= Peak Reading

QP

= Quasi-peak Reading

----- The following blanks -----

1GHz-18GHz

No.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Remark
xxx	xxxx	78.01	55.30	-22.71	74.00	18.70	100	50	Horizontal	Peak
xxx	xxxx	66.37	43.66	-22.71	54.00	10.34	100	50	Horizontal	AVG

Above 18GHz**Suspected Data List**

NO.	Freq. [MHz]	Reading [dBμV/m]	Level for 1m [dBμV/m]	Level for 3m [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Remark
xxx	xxxx	54.49	42.38	32.84	-12.11	74	41.16	100	211	Horizontal	Peak
xxx	xxxx	43.99	31.88	22.34	-12.11	54	31.66	100	211	Horizontal	AVG

Frequency (MHz)

= Emission frequency in MHz

Reading (dBuV/m)

= Uncorrected Analyzer / Receiver reading

Factor (dB)

= Antenna factor + Cable loss – Amplifier gain

Level for 1m (dBuV/m)

= Reading (dBuV/m) + Factor (dB)

Level for 3m (dBuV/m)

= Level for 1m (dBuV/m) + 20*log(1/3)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Limit (dBuV/m) – Level (dBuV/m)

Polarity

= Antenna polarization

Peak

= Peak Reading

AVG

= Average Reading

----- The following blanks -----

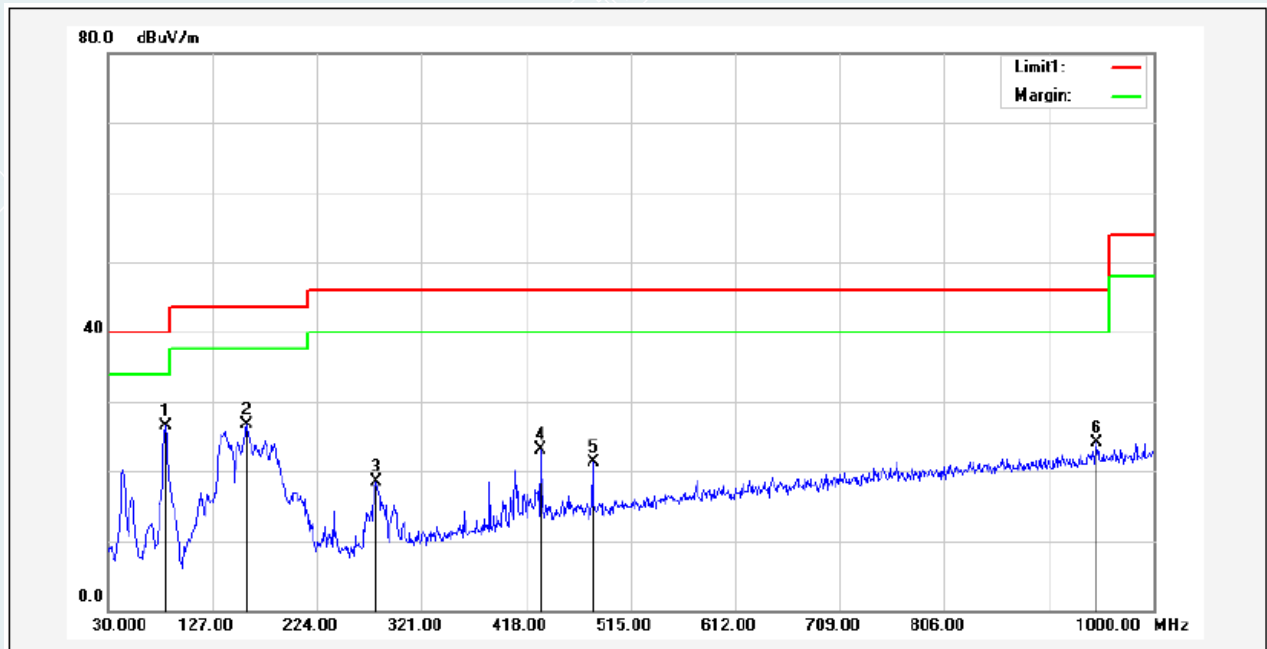
6.5 TEST RESULTS

Below 1GHz

Note: Pre-scan all modes, the worst power supply is AC 120/60Hz(DC 5V/2A power by Adapter). In the two power supply modes, only the worst case(IEEE 802.11n HT20 2462MHz) in the worst power supply is recorded, in this report

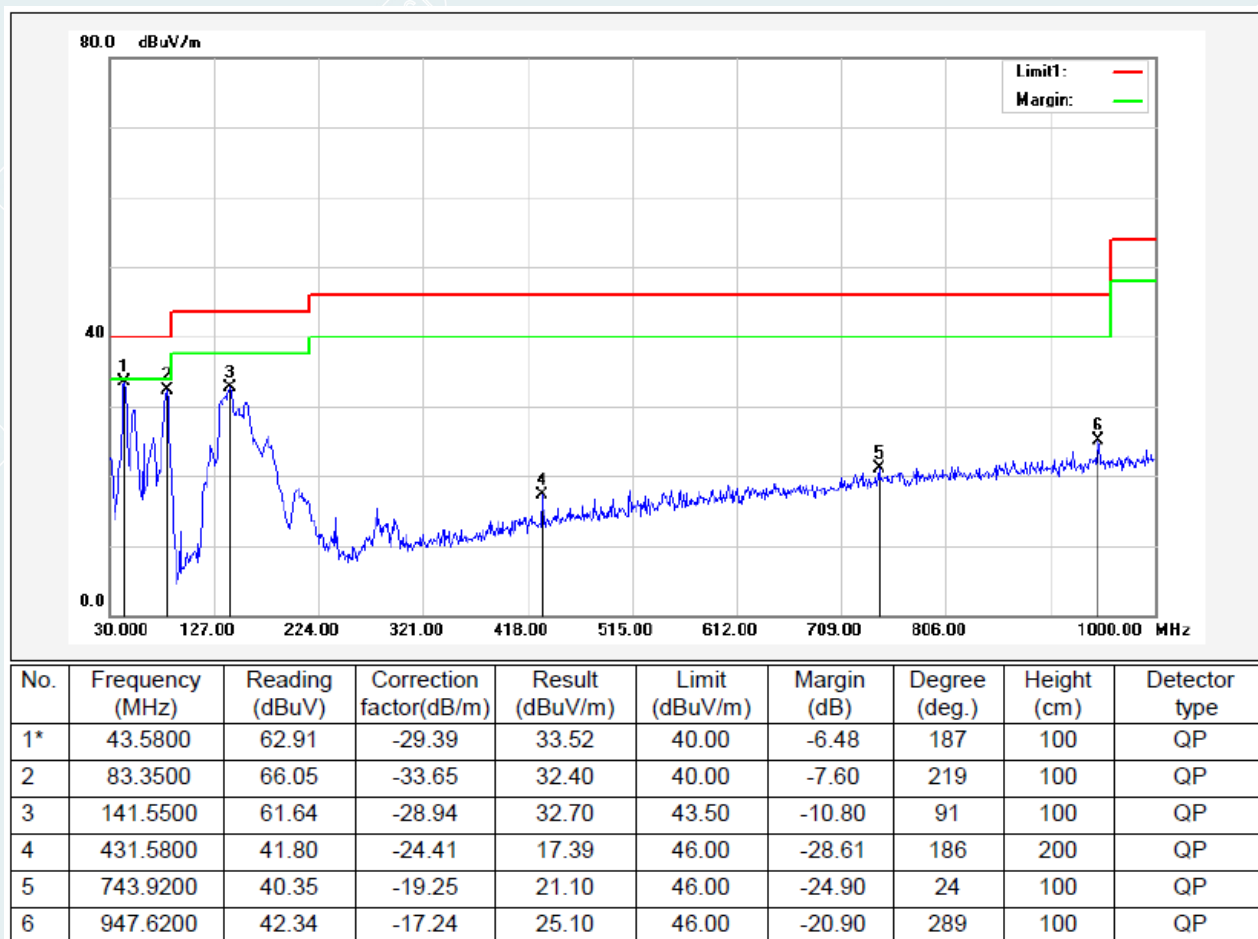
Power supply: AC 120/60Hz (DC 5V/2A power by Adapter)

EUT Name:	Hub M3	Test Mode:	Mode 1
Model:	HM-G01E	Sample No:	E20230331478001-0006
Power supply:	AC 120V/60Hz	Environmental Conditions:	24.3℃/54%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-12-18
Frequency	IEEE 802.11n HT20 2462MHz	Polarity:	Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Detector type
1*	83.3500	60.11	-33.65	26.46	40.00	-13.54	179	200	QP
2	158.0400	55.63	-28.98	26.65	43.50	-16.85	199	200	QP
3	279.2900	47.65	-29.14	18.51	46.00	-27.49	249	100	QP
4	431.5800	47.45	-24.41	23.04	46.00	-22.96	107	100	QP
5	480.0800	44.54	-23.33	21.21	46.00	-24.79	8	200	QP
6	947.6200	41.36	-17.24	24.12	46.00	-21.88	335	200	QP

EUT Name:	Hub M3	Test Mode:	Mode 1
Model:	HM-G01E	Sample No:	E20230331478001-0006
Power supply:	AC 120V/60Hz	Environmental Conditions:	24.3°C/54%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-12-18
Frequency	IEEE 802.11n HT20 2462MHz	Polarity:	Vertical

**Remark:**

- 1 No emission found between lowest internal used/generated frequency to 30MHz.
- 2 Radiated emissions measured in frequency range from 9kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
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.
- 3 The IF bandwidth of Receiver between 30MHz to 1GHz was 120kHz.
- 4 If the margin of the pre test results is greater than 6db, it meets the requirements of quasipeak or average values, and final testing is no longer required.

1GHz-18GHz:

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Pre-scan all modes, the worst power supply is AC 120/60Hz(DC 5V/2A power by Adapter). In the two power supply modes, only the worst power supply mode is recorded in this report.

Mode: IEEE 802.11b

Lowest Frequency (2412MHz)

Environment: 23.5°C/27%RH 101.0kPa

Tested By:Zhang Zishan

Date: 2023-11-27

Voltage:AC 120V/60Hz

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1164.8000	50.89	41.78	-9.11	74.00	32.22	200	237	Horizontal
2	1659.0000	53.47	45.78	-7.69	74.00	28.22	200	210	Horizontal
3	2368.6000	55.80	51.60	-4.20	74.00	12.40	100	158	Horizontal
4	3981.0000	55.79	47.60	-8.19	74.00	26.40	100	109	Horizontal
5	4806.0000	54.14	51.82	-2.32	74.00	22.18	100	12	Horizontal
6	11406.0000	42.03	53.91	11.88	74.00	20.09	200	161	Horizontal

AV Final Data List

NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2363.5610	-4.20	54.05	49.85	54.00	4.15	100	146.9	Horizontal
2	4824.0140	-2.32	47.88	45.56	54.00	8.44	122	204.5	Horizontal
3	11368.7000	11.88	29.01	40.89	54.00	13.11	150	185.5	Horizontal

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1664.0000	55.35	46.89	-8.46	74.00	27.11	200	157	Vertical
2	2166.2000	51.41	47.54	-3.87	74.00	26.46	100	294	Vertical
3	2336.2000	47.75	43.69	-4.06	74.00	20.31	100	265	Vertical
4	2821.2000	49.75	48.19	-1.56	74.00	25.81	100	224	Vertical
5	4806.0000	52.75	50.40	-2.35	74.00	23.60	100	327	Vertical
6	10404.0000	42.70	53.00	10.30	74.00	21.00	100	27	Vertical

AV Final Data List

NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2339.9530	-4.06	46.23	42.17	54.00	11.83	101	264.4	Vertical
2	2821.2000	-1.56	45.25	43.69	54.00	10.31	100	224	Vertical
3	4806.6960	-2.35	48.69	46.34	54.00	7.66	151	338.9	Vertical
4	10404.0000	10.30	34.24	44.54	54.00	9.46	100	27	Vertical

Mode: IEEE 802.11b
 Middle Frequency (2437MHz)
 Environment: 23.5°C/27%RH 101.0kPa
 Tested By:Zhang Zishan

Date: 2023-11-27
 Voltage:AC 120V/60Hz

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1599.8000	64.03	45.70	-18.33	74.00	28.30	100	218	Horizontal
2	2367.4000	65.19	50.99	-14.20	74.00	23.01	100	150	Horizontal
3	3999.0000	56.16	48.10	-8.06	74.00	25.90	100	131	Horizontal
4	4806.0000	53.35	51.03	-2.32	74.00	22.97	100	102	Horizontal
5	4873.5000	53.36	51.21	-2.15	74.00	22.79	100	157	Horizontal
6	12148.5000	40.02	54.19	14.17	74.00	19.81	200	21	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2357.1220	-14.20	53.75	39.55	54.00	14.45	100	151.8	Horizontal
2	3984.1270	-8.06	41.31	33.25	54.00	20.75	110	124.8	Horizontal
3	4806.6960	-2.32	48.91	46.59	54.00	7.41	100	84.1	Horizontal
4	4874.0645	-2.15	48.83	46.68	54.00	7.32	130	164.6	Horizontal
5	12120.0175	14.17	27.71	41.88	54.00	12.12	200	224.6	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1195.8000	62.31	43.21	-19.10	74.00	30.79	100	97	Vertical
2	1659.8000	64.25	45.80	-18.45	74.00	28.20	100	154	Vertical
3	1792.2000	64.44	46.93	-17.51	74.00	27.07	100	292	Vertical
4	3984.0000	54.68	46.14	-8.54	74.00	27.86	100	48	Vertical
5	4797.0000	55.10	52.68	-2.42	74.00	21.32	200	183	Vertical
6	12133.5000	40.29	54.10	13.81	74.00	19.90	100	275	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4806.5800	-2.42	41.94	39.52	54.00	14.48	170	187.3	Vertical
2	12119.6325	13.81	27.61	41.42	54.00	12.58	181	319.7	Vertical

Mode: IEEE 802.11b
 Highest Frequency (2462MHz)
 Environment: 23.5°C/27%RH 101.0kPa
 Tested By:Zhang Zishan

Date: 2023-11-27
 Voltage:AC 120V/60Hz

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1661.0000	62.89	45.20	-17.69	74.00	28.80	100	175	Horizontal
2	1789.4000	60.14	42.57	-17.57	74.00	31.43	100	231	Horizontal
3	2301.6000	63.94	50.89	-13.05	74.00	23.11	100	143	Horizontal
4	2502.0000	63.78	51.02	-12.76	74.00	22.98	100	143	Horizontal
5	4923.0000	52.86	51.14	-1.72	74.00	22.86	100	158	Horizontal
6	12144.0000	39.87	53.96	14.09	74.00	20.04	100	244	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2301.9660	-13.05	54.98	41.93	54.00	12.07	100	144	Horizontal
2	2502.8690	-12.76	52.18	39.42	54.00	14.58	150	155.7	Horizontal
3	4924.0690	-1.72	48.21	46.49	54.00	7.51	132	165	Horizontal
4	12141.3600	14.09	27.60	41.69	54.00	12.31	152	288.6	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1659.4000	65.34	46.89	-18.45	74.00	27.11	200	151	Vertical
2	2162.8000	59.47	45.58	-13.89	74.00	28.42	100	1	Vertical
3	2664.4000	63.59	50.78	-12.81	74.00	23.22	100	217	Vertical
4	4923.0000	54.77	52.60	-2.17	74.00	21.40	100	135	Vertical
5	5329.5000	53.49	53.48	-0.01	74.00	20.52	100	146	Vertical
6	12150.0000	39.80	53.84	14.04	74.00	20.16	200	220	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2657.1900	-12.81	45.10	32.29	54.00	21.71	100	220	Vertical
2	4923.9970	-2.17	47.82	45.65	54.00	8.35	152	127.6	Vertical
3	5312.2235	-0.01	37.51	37.50	54.00	16.50	101	132.7	Vertical
4	12134.3500	14.04	27.53	41.57	54.00	12.43	200	237.8	Vertical

Mode: IEEE 802.11g
 Lowest Frequency (2412MHz)
 Environment: 23.5°C/27%RH 101.0kPa
 Tested By:Zhang Zishan

Date: 2023-11-27
 Voltage:AC 120V/60Hz

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1998.0000	60.58	45.13	-15.45	74.00	28.87	100	96	Horizontal
2	2162.6000	60.14	45.50	-14.64	74.00	28.50	100	25	Horizontal
3	2367.0000	63.85	49.64	-14.21	74.00	24.36	100	152	Horizontal
4	2824.4000	57.96	46.62	-11.34	74.00	27.38	100	232	Horizontal
5	4806.0000	54.21	51.89	-2.32	74.00	22.11	100	20	Horizontal
6	12150.0000	40.08	54.27	14.19	74.00	19.73	200	171	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2367.8910	-14.21	50.41	36.20	54.00	17.80	100	145.8	Horizontal
2	4806.6960	-2.32	48.19	45.87	54.00	8.13	122	93.8	Horizontal
3	12200.1100	14.19	27.74	41.93	54.00	12.07	200	200.5	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1164.2000	62.49	42.52	-19.97	74.00	31.48	200	197	Vertical
2	1659.6000	65.40	46.95	-18.45	74.00	27.05	100	174	Vertical
3	2165.0000	60.54	46.66	-13.88	74.00	27.34	100	340	Vertical
4	2831.2000	59.16	47.63	-11.53	74.00	26.37	100	14	Vertical
5	4806.0000	53.23	50.88	-2.35	74.00	23.12	200	298	Vertical
6	13510.5000	39.09	53.33	14.24	74.00	20.67	200	21	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4806.6960	-2.35	46.89	44.54	54.00	9.46	148	289.5	Vertical
2	13555.6675	14.24	27.09	41.33	54.00	12.67	200	214.7	Vertical