FCC RADIO TEST REPORT

FCC ID:2AT7Z-GHUB001

Product: Gravio Hub
Trade Name: Gravio
Model Name: GHUB001
Serial Model: N/A
Report No.: UNIA19072001-6FR-01

Prepared for

Asteria Technology Pte. Ltd.

160 ROBINSON ROAD, #19-05 SBF CENTER, SINGAPORE Singapore

Prepared by

Shenzhen United Testing Technology Co., Ltd.

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

TEST RESULTCERTIFICATION

Applicant's name.....: Asteria Technology Pte. Ltd.

Address.....: 160 ROBINSON ROAD, #19-05 SBF CENTER, SINGAPORE Singapore

Manufacture's Name.....: Asteria Technology Pte. Ltd.

Address.....: 160 ROBINSON ROAD, #19-05 SBF CENTER, SINGAPORE Singapore

Product description

Product name.....: Gravio Hub

Trade Mark.....: Gravio

Model and/or type reference .: GHUB001

Standards.....: FCC Rules and Regulations Part 15 Subpart C Section 15.249, ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., 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.

This report shall not be reproduced except in full, without the written approval of UNI, this document may be altered or revised by Shenzhen United Testing Technology Co., Ltd., personnel only, and shall be noted in the revision of the document.

Date of Test..... :

Date (s) of performance of tests.....: Jul. 20, 2019 ~ Aug. 08 , 2019

Date of Issue.....: Aug. 08 , 2019

Test Result.....: Pass

Prepared by: Kahn.Yang

Kahn yang/Editor

Reviewer: Sherwin Qian

Sherwin Qian/Supervisor

Approved & Authorized Signer: liuze

Liuze/Manager

Table of Contents Page

1 . TEST SUMMARY 4

2 . GENERAL INFORMATION 5

2.1 GENERAL DESCRIPTION OF EUT 5

2.2 Carrier Frequency of Channels 6

2.3 Operation of EUT during testing 6

2.4DESCRIPTION OF TEST SETUP 6

2.5MEASUREMENT INSTRUMENTS LIST 7

3 . CONDUCTED EMISSIONS TEST 8

3.1 Conducted Power Line Emission Limit 8

3.2 Test Setup 8

3.3 Test Procedure 8

3.4 Test Result 8

4 RADIATED EMISSION TEST 11

4.1 Radiation Limit 11

4.2 Test Setup 11

4.3 Test Procedure 12

4.4 Test Result 12

5 BAND EDGE 18

5.1 Limits 18

5.2 Test Procedure 18

5.3 Test Result 18

6 OCCUPIED BANDWIDTH MEASUREMENT 20

6.1 Test Setup 20

6.2 Test Procedure 20

6.3 Measurement Equipment Used 20

6.4 Test Result 20

7 ANTENNA REQUIREMENT 22

8 PHOTOGRAPH OF TEST 23

8.1 Radiated Emission 23

8.2Conducted Emission 24

1. TEST SUMMARY

TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT	STANGARD
CONDUCTED EMISSIONS TEST	COMPLIANT	FCC Part 15.207
RADIATED EMISSION TEST	COMPLIANT	FCC Part 15.209/15.249
BAND EDGE	COMPLIANT	FCC Part 15.249/15.205
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT	FCC Part 15.249
ANTENNA REQUIREMENT	COMPLIANT	FCC Part 15.203

TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co.,Ltd.

Address :2F, Annex Bldg, JiahuangyuanTech Park, #365 Baotian 1 Rd,TiegangCommunity, XixiangStr, Bao'an District, Shenzhen,China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

CNAS-LAB Code: L6964

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The EMC Laboratory 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.

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Gravio Hub
Trade Mark	Gravio
Model Name	GHUB001
Serial No.	N/A
Model Difference	N/A
FCC ID	2AT7Z-GHUB001
Antenna Type	Internet Antenna
Antenna Gain	2dBi
Frequency Range	2405~2480MHz
Number of Channels	16CH
Modulation Type	GFSK
Battery	3V(The battery only supplies power to the Zigbee module when the battery is powered off.)
PowerSource	DC12V

2.2 Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405	9	2445
2	2410	10	2450
3	2415	11	2455
4	2420	12	2460
5	2425	13	2465
6	2430	14	2470
7	2435	15	2475
8	2440	16	2480

2.3 Operation of EUT during testing

Operating Mode
The mode is used: Transmitting mode
Low Channel: 2405MHz
Middle Channel: 2440MHz
High Channel: 2480MHz

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:

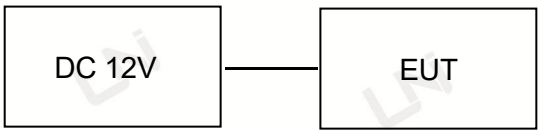


Table forauxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
N/A			

2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
CONDUCTED EMISSIONS TEST					
1	AMN	Schwarzbeck	NNLK8121	8121370	2019.9.9
2	AMN	ETS	3810/2	00020199	2019.9.9
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2019.9.9
4	AAN	TESEQ	T8-Cat6	38888	2019.9.9
RADIATED EMISSION TEST					
1	Horn Antenna	Sunol	DRH-118	A101415	2019.9.29
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2019.9.29
3	PREAMP	HP	8449B	3008A00160	2019.9.9
4	PREAMP	HP	8447D	2944A07999	2019.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2019.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2019.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2019.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2019.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2019.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2019.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2019.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2019.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2020.3.14
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2020.3.14
15	RF power divider	Anritsu	K241B	992289	2019.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2019.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2019.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2019.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2019.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2020.1.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2019.11.02
22	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2020.03.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2019.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2020.05.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2020.05.10
26	Frequency Meter	VICTOR	VC2000	997406086	2020.05.10
27	DC Power Source	HYELEC	HY5020E	055161818	2020.05.10

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

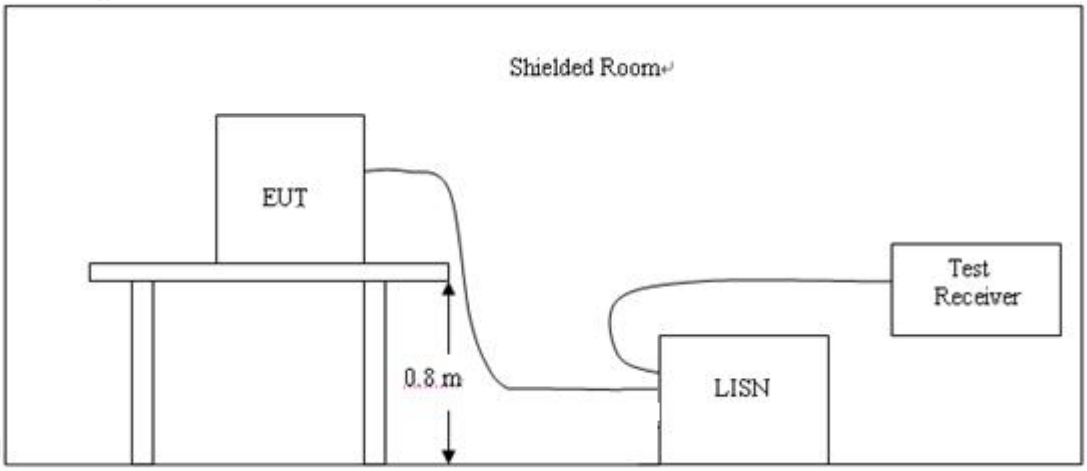
For unintentional device, according to § 15.207(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage(dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56*	56~46*
0.50~5.00	73	60	56	46
5.00~30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 Test Setup



3.3 Test Procedure

1,The equipment was set up as per the test configuration to simulate typical actual usage per the user'smanual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed onthe ground plane as per ANSI C63.10.

2, Support equipment, if needed, was placed as per ANSI C63.10.

3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

4,If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hzpower through a Line Impedance Stabilization Network (LISN) which supplied power source and wasgrounded to the ground plane.

5, All support equipments received AC power from a second LISN, if any.

6, The EUT test program was started. Emissions were measured on each current carrying line of the EUTusing a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has twomonitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.

7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

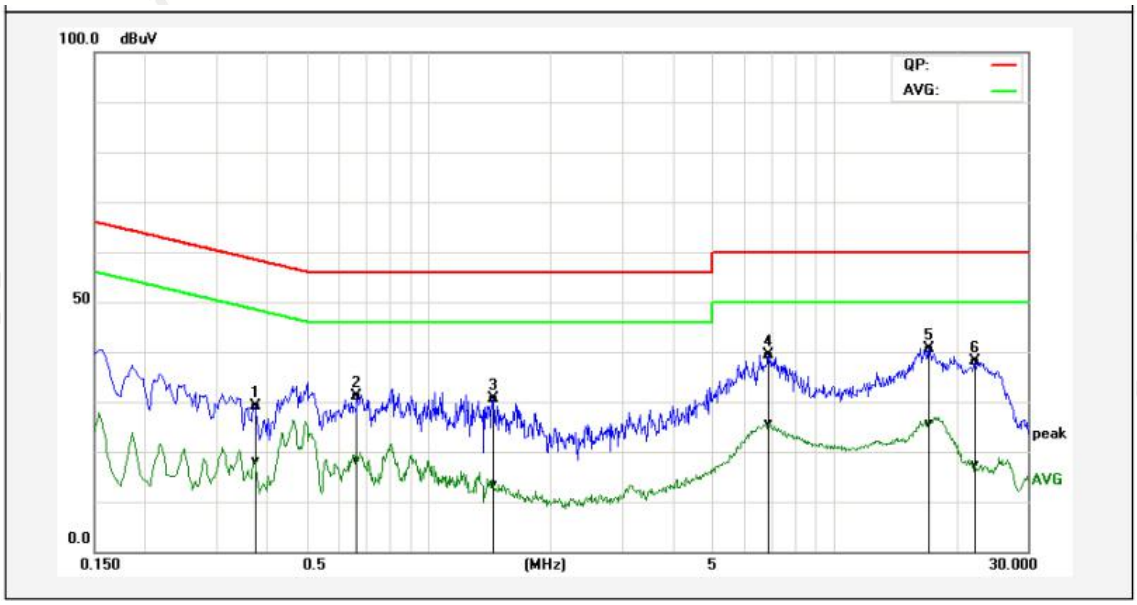
3.4 Test Result

Pass

Remark:

1. Only the worst result of 120V60HZ was reported.
2. All modes of Low, Middle, and High channel were tested, only the worst result of High Channel was reported as below:

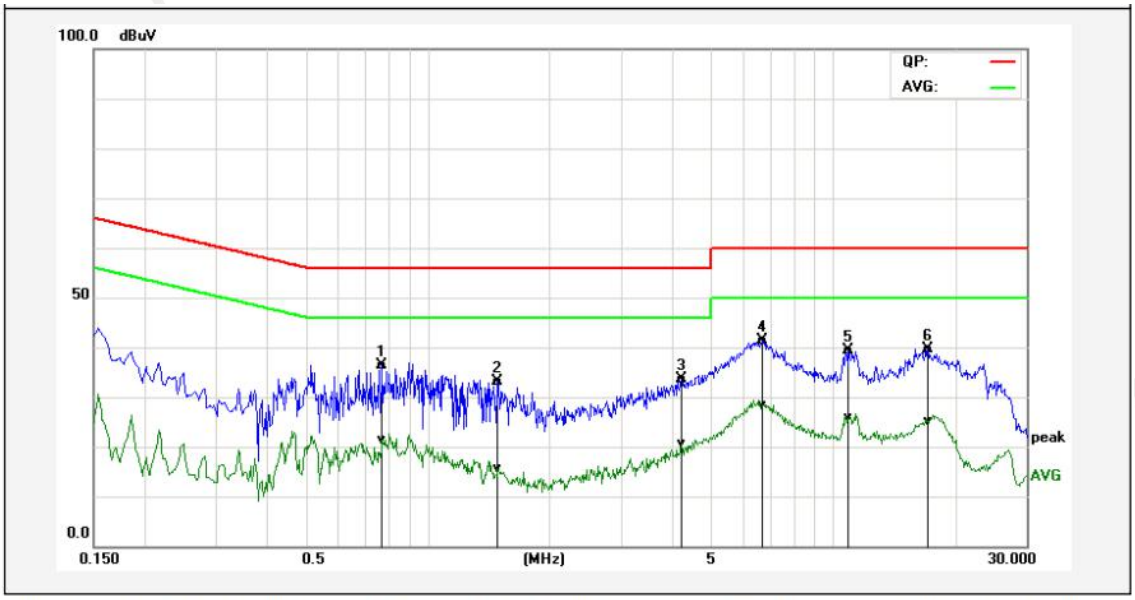
Temperature:	24℃	Relative Humidity:	45%
Test Date:	Aug. 05, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Line
Test Mode:	Transmitting mode of 2480MHz		



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
1P	0.3740	19.39	8.25	9.82	29.21	18.07	58.41	48.41	-29.20	-30.34	Pass
2P	0.6660	21.34	8.44	9.81	31.15	18.25	56.00	46.00	-24.85	-27.75	Pass
3P	1.4460	20.61	3.47	9.90	30.51	13.37	56.00	46.00	-25.49	-32.63	Pass
4P	6.9020	29.42	15.53	9.99	39.41	25.52	60.00	50.00	-20.59	-24.48	Pass
5*	17.1700	40.14	25.32	0.38	40.52	25.70	60.00	50.00	-19.48	-24.30	Pass
6P	22.1980	37.53	16.80	0.54	38.07	17.34	60.00	50.00	-21.93	-32.66	Pass

Remark: Factor = Insertion Loss + Cable Loss, Result=Reading + Factor, Margin=Result – Limit.

Temperature:	24℃	Relative Humidity:	45%
Test Date:	Aug. 05, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral
Test Mode:	Transmitting mode of 2480MHz		



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
1P	0.7740	26.56	11.62	9.84	36.40	21.46	56.00	46.00	-19.60	-24.54	Pass
2P	1.4940	23.30	5.67	9.86	33.16	15.53	56.00	46.00	-22.84	-30.47	Pass
3P	4.2420	23.74	10.58	9.94	33.68	20.52	56.00	46.00	-22.32	-25.48	Pass
4*	6.7220	31.49	18.34	9.95	41.44	28.29	60.00	50.00	-18.56	-21.71	Pass
5P	10.9580	39.06	25.60	0.20	39.26	25.80	60.00	50.00	-20.74	-24.20	Pass
6P	17.1540	39.32	24.67	0.38	39.70	25.05	60.00	50.00	-20.30	-24.95	Pass

Remark: Factor = Insertion Loss + Cable Loss, Result=Reading + Factor, Margin=Result – Limit.

4 RADIATED EMISSION TEST

4.1 Radiation Limit

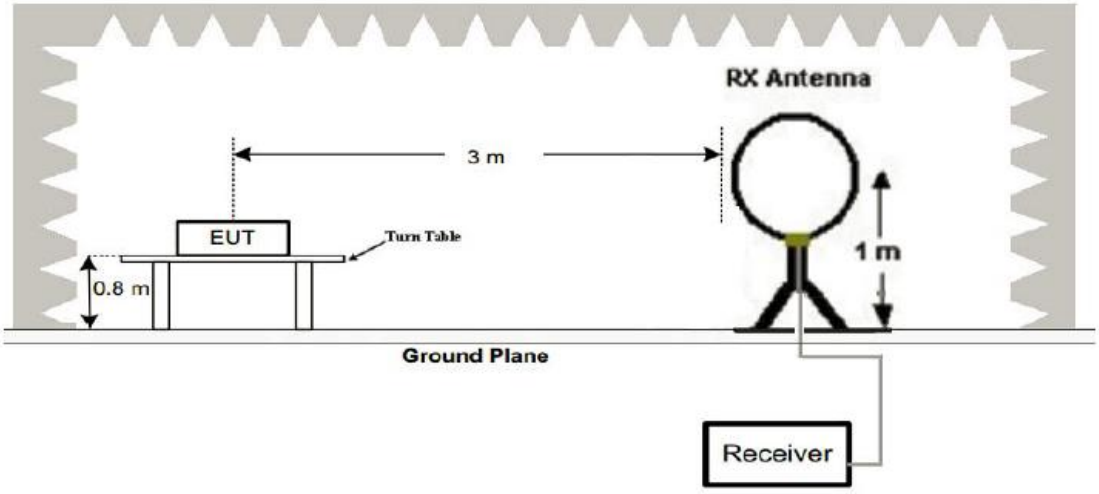
For unintentional device, according to § 15.209(a), except for Class B digital devices, the field strength ofradiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the followingvalues：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

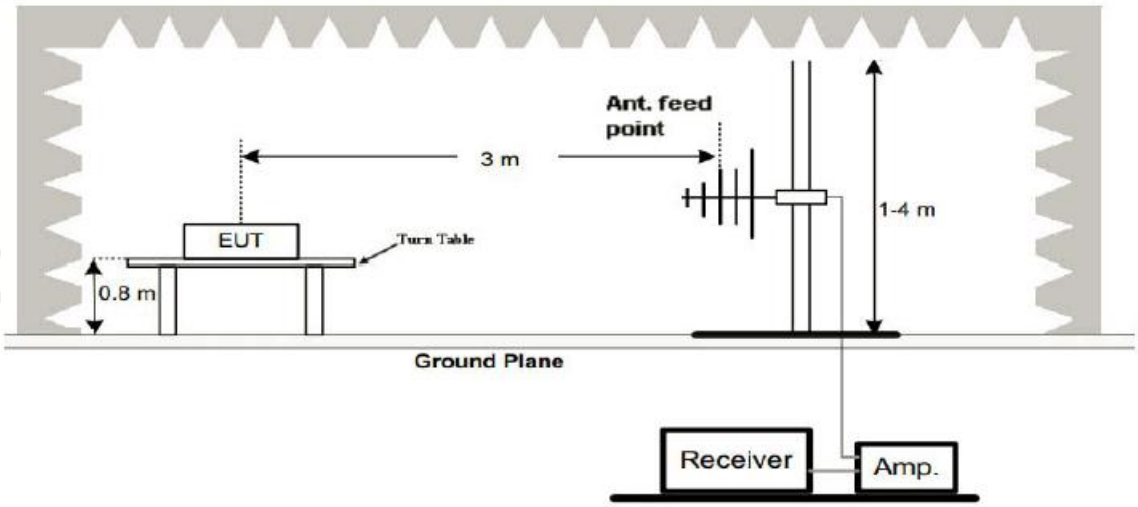
For intentional device, according to § 15.209(a), the general requirement of field strength of radiatedemissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz

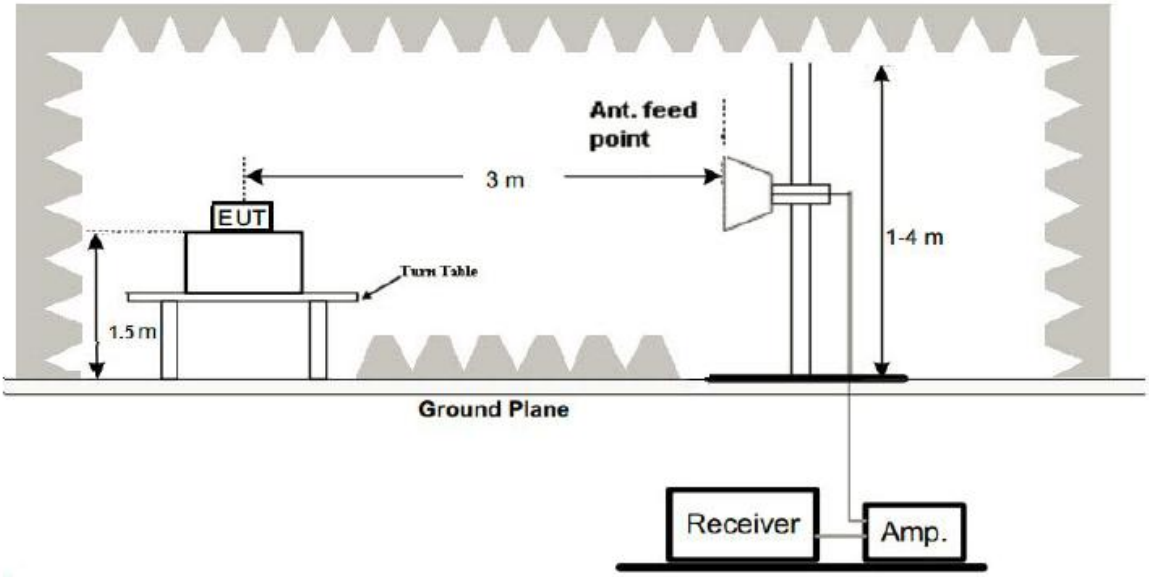


3. Radiated Emission Test-Up Frequency Above 1GHz

For unintentional device, according to § 15.209(a), except for Class B digital devices, the field strength ofradiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the followingvalues：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Detection method
2400-2483.5	3	114	PK
2400-2483.5	3	94	AV

For intentional device, according to § 15.209(a), the general requirement of field strength of radiatedemissions from intentional radiators at a distance of 3 meters shall not exceed the above table.



4.3 Test Procedure

1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highestemissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna bothhorizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9KHz to25GHz per FCC PART 15.33(a).

4.4 Test Result

PASS

Remark:

1. All the test modes completed for test. The worst case of Radiated Emissionis High channel, the test data of this mode was reported.
2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, and test data recorded in this report.
3. Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.

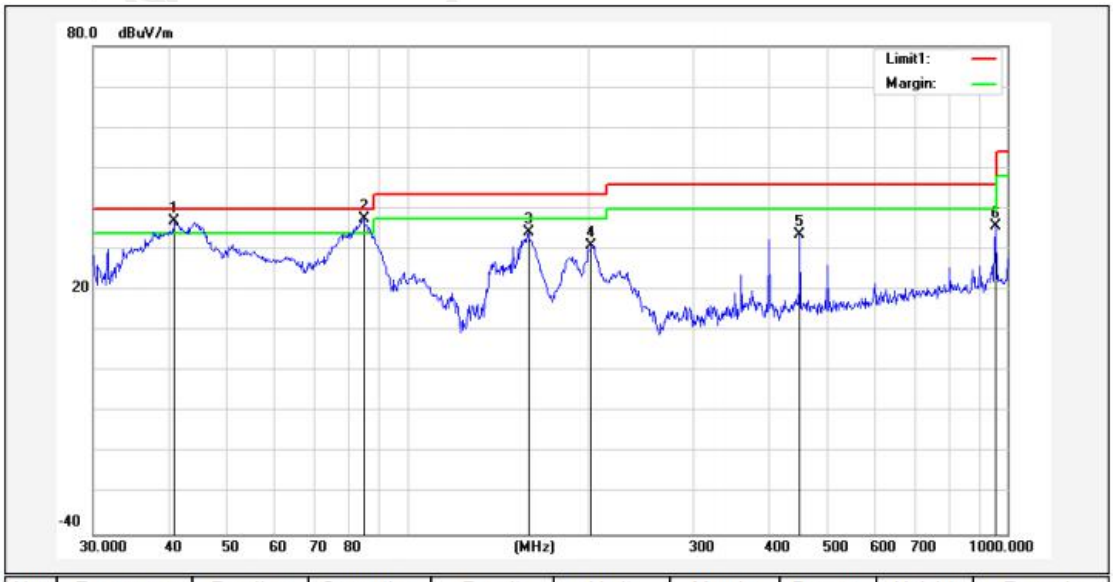
Below 1GHz Test Results:

Temperature:	24℃	Relative Humidity:	45%
Test Date:	Aug. 05, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Horizontal
Test Mode:	Transmitting mode of 2480MHz		

No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	30.1054	41.38	-7.23	34.15	40.00	-5.85			peak
2	43.3534	50.09	-17.99	32.10	40.00	-7.90			peak
3	83.8156	49.81	-20.61	29.20	40.00	-10.80			peak
4	140.3421	47.73	-15.40	32.33	43.50	-11.17			peak
5	158.1123	48.38	-15.84	32.54	43.50	-10.96			peak
6	955.4381	43.24	-5.77	37.47	46.00	-8.53			peak

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24℃	Relative Humidity:	45%
Test Date:	Aug. 05, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Vertical
Test Mode:	Transmitting mode of 2480MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1!	40.9881	53.06	-16.17	36.89	40.00	-3.11			peak
2*	84.7018	57.92	-20.47	37.45	40.00	-2.55			peak
3	159.2251	49.96	-15.82	34.14	43.50	-9.36			peak
4	202.8104	46.91	-16.08	30.83	43.50	-12.67			peak
5	451.1350	46.35	-12.72	33.63	46.00	-12.37			peak
6	955.4381	41.49	-5.77	35.72	46.00	-10.28			peak

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Remark：
(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHzwas verified, and no any emission was found except system noise floor.
(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results:
CH Low (2405MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2405	109.35	-5.84	103.51	114	-10.49	PK
2405	84.69	-5.84	78.85	94	-15.15	AV
4810	60.87	-3.64	57.23	74	-16.77	PK
4810	49.63	-3.64	45.99	54	-8.01	AV
7215	55.86	-0.95	54.91	74	-19.09	PK
7215	46.75	-0.95	45.80	54	-8.20	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2405	109.96	-5.84	104.12	114	-9.88	PK
2405	82.35	-5.84	76.51	94	-17.49	AV
4810	61.62	-3.64	57.98	74	-16.02	PK
4810	50.65	-3.64	47.01	54	-6.99	AV
7215	57.63	-0.95	56.68	74	-17.32	PK
7215	47.16	-0.95	46.21	54	-7.79	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

CH Middle (2440MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2440	109.01	-5.71	103.3	114	-10.7	PK
2440	81.03	-5.71	75.32	94	-18.68	AV
4880	60.98	-3.51	57.47	74	-16.53	PK
4880	48.62	-3.51	45.11	54	-8.89	AV
7320	56.85	-0.82	56.03	74	-17.97	PK
7320	46.75	-0.82	45.93	54	-8.07	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2440	110.32	-5.71	104.61	114	-9.39	PK
2440	81.62	-5.71	75.91	94	-18.09	AV
4880	61.03	-3.51	57.52	74	-16.48	PK
4880	50.32	-3.51	46.81	54	-7.19	AV
7320	56.52	-0.82	55.70	74	-18.30	PK
7320	47.26	-0.82	46.44	54	-7.56	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

CH High (2480MHz)
Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480	109.68	-5.65	104.03	114	-9.97	PK
2480	82.35	-5.65	76.70	94	-17.30	AV
4960	61.21	-3.43	57.78	74	-16.22	PK
4960	50.34	-3.43	46.91	54	-7.09	AV
7440	57.62	-0.75	56.87	74	-17.13	PK
7440	47.35	-0.75	46.60	54	-7.40	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480	109.31	-5.65	103.66	114	-10.34	PK
2480	82.02	-5.65	76.37	94	-17.63	AV
4960	62.09	-3.43	58.66	74	-15.34	PK
4960	51.31	-3.43	47.88	54	-6.12	AV
7440	56.87	-0.75	56.12	74	-17.88	PK
7440	47.39	-0.75	46.64	54	-7.36	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Remark:

(1) Measuring frequencies from 1 GHz to the 25 GHz.
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) 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.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.The resolution bandwidth of test receiver/spectrum analyzer is 1MHzand video bandwidth is 3MHz for peak measurement with peak detectorat frequency above 1GHz.The resolution bandwidth of test receiver/spectrum analyzer is 1MHzand video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
(7)All modes of operation were investigated and the worst-case emissionsare reported.
(8)Fundamental frequency test setting, the primary frequency setting should be RBW >20dB BW , VBW>=3XRBW , PK detector for PK value , RMS detector for AV value .

5 BAND EDGE

5.1 Limits

FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics,shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emissionlimits in §15.209, whichever is the lesser attenuation.

5.2 Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSIC63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT issituated in three orthogonal planes (if appropriate), adjusting the measurement antenna height andpolarization etc. RBW 1MHz VBW 3MHz PK detector for PK value, RBW 1MHz VBW 10Hz PK detector for AV value .The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capturethe highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBW to 300 KHz,to measure the conducted peak band edge.

5.3 Test Result

PASS

Radiated Band Edge Test:

Operation Mode: TX CH Low (2405MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	57.39	-5.81	51.58	74	-22.42	PK
2310	/	-5.81	/	54	/	AV
2390	57.87	-5.84	52.03	74	-21.97	PK
2390	/	-5.84	/	54	/	AV
2400	58.31	-5.84	52.47	74	-21.53	PK
2400	/	-5.84	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	56.23	-5.81	50.42	74	-23.58	PK
2310	/	-5.81	/	54	/	AV
2390	55.36	-5.84	49.52	74	-24.48	PK
2390	/	-5.84	/	54	/	AV
2400	57.28	-5.84	51.44	74	-22.56	PK
2400	/	-5.84	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2480MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	57.61	-5.65	51.96	74	-22.04	PK
2483.5	/	-5.65	/	54	/	AV
2500	57.31	-5.72	51.59	74	-22.41	PK
2500	/	-5.72	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	57.69	-5.65	52.04	74	-21.96	PK
2483.5	/	-5.65	/	54	/	AV
2500	56.87	-5.72	51.15	74	-22.85	PK
2500	/	-5.72	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Setup

Same asRadiated Emission Measurement

6.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on ANSI C63.10 section 6.9.2: RBW=30KHz. VBW=100KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

6.3 Measurement Equipment Used

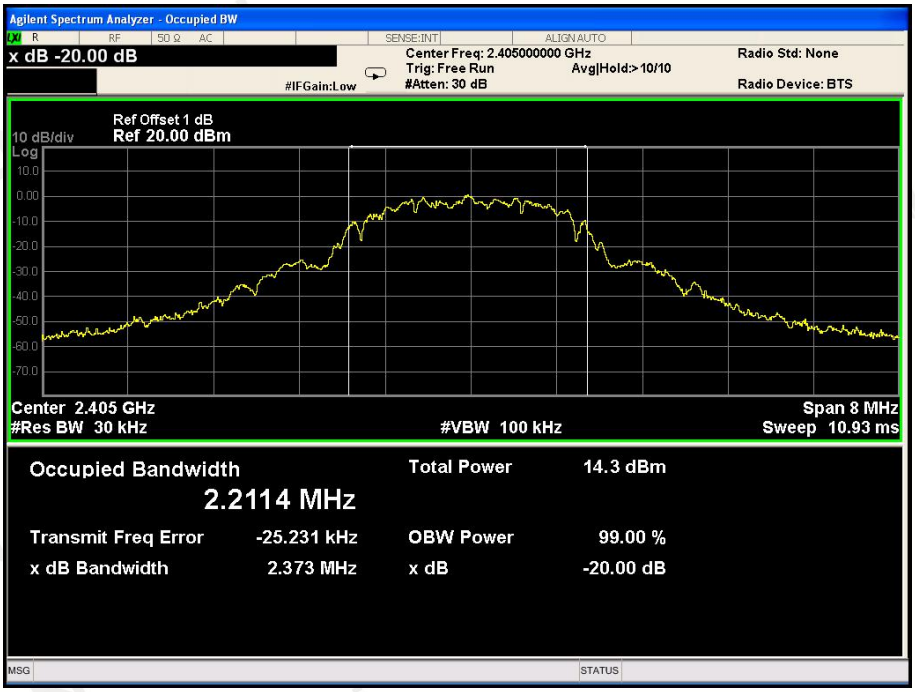
Same asRadiated Emission Measurement

6.4 Test Result

PASS

Frequency (MHz)	20dB Bandwidth (MHz)	Result
2405	2.373	PASS
2440	2.433	PASS
2480	2.527	PASS

CH:2405MHz



CH:2440MHz

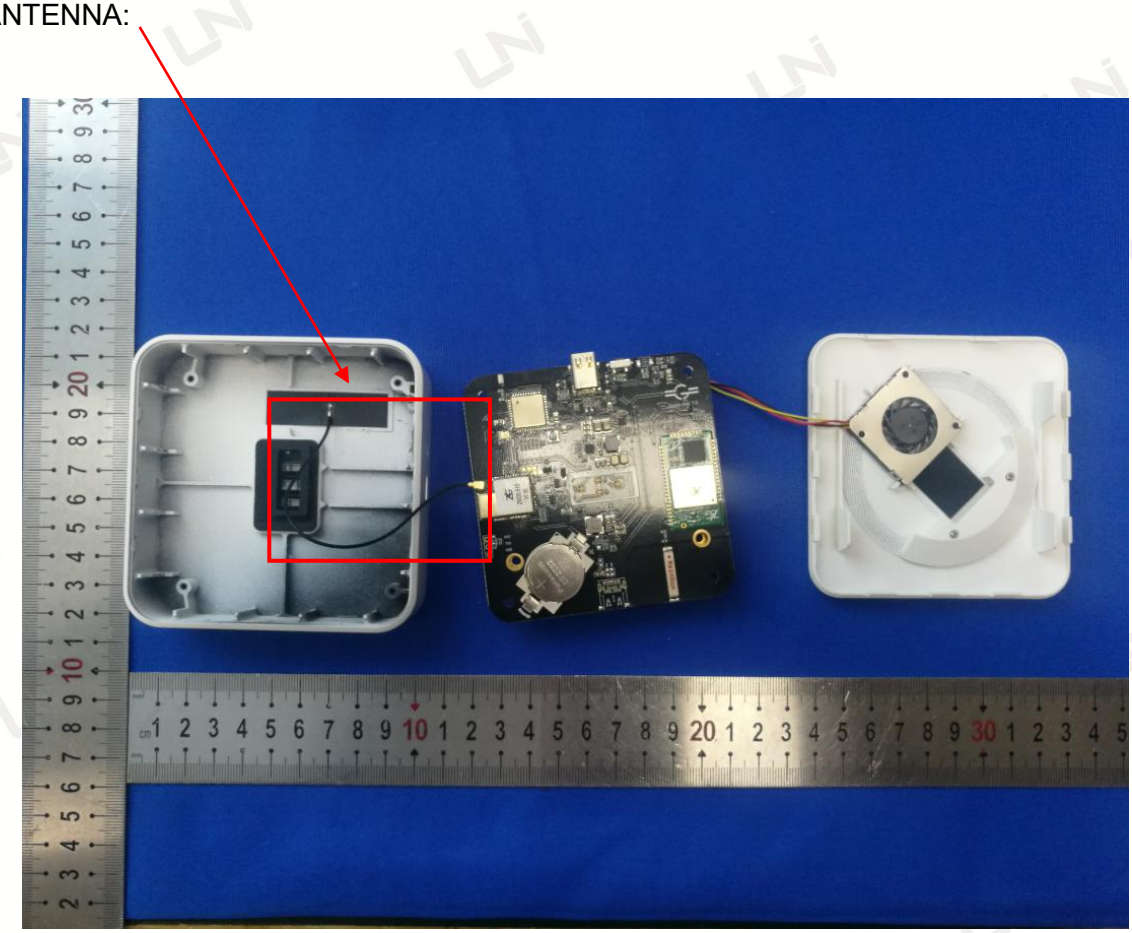
CH:2480MHz

7 ANTENNA REQUIREMENT

Standard Applicable:
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed toensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Connected Construction
The antenna used in this product is a Internet Antenna, The directional gains of antenna used for transmitting is 2dBi.

ANTENNA:



8 PHOTOGRAPH OF TEST

8.1Radiated Emission

8.2Conducted Emission

End of Report