

Page 1 of 35

Report No.: UNIA19050917FR-02

## FCC RADIO TEST REPORT

## FCC ID: 2AGNC-BT5

Product : Wireless Speaker Trade Name : a audio pro Model Name : BT5 Serial Model : N/A Report No. : UNIA19050917FR-02

### Prepared for

AUDIO PRO AB

Garnisonsgatan 52, 25466, Helsingborg, Sweden

#### **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

深圳市优耐检测技术有限公司 Shenzhen United Testing Technology Co., Ltd. United Testing Technology(Hong Kong) Limited

## **TEST RESULT CERTIFICATION**

Applicant's name:	AUDIO PRO AB	
Address:	Garnisonsgatan 52, 25466, Helsingborg, Sweden	
Manufacture's Name:	AUDIO PRO AB	
Address	Garnisonsgatan 52, 25466, Helsingborg, Sweden	
Product description		
Product name:	Wireless Speaker	
Trade Mark	audio pro	
Model and/or type reference .:	BT5	
Standards	FCC Rules and Regulations Part 15 Subpart C Section 7 ANSI C63.10: 2013	5.247,

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.

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Date of Test	
Date (s) of performance of tests	Apr. 19~26, 2019
Date of Issue	Apr. 30, 2019
Test Result:	Pass

Prepared by:

Reviewer:

Approved & Authorized Signer:

Kahn yang/Editor Sherwin Qian

Sherwin Qian/Supervisor

live

Liuze/Manager

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Page



#### Table of Contents

1. TEST SUMMARY	5
1.1 TEST PROCEDURES AND RESULTS	5
1.2 TEST FACILITY	5
1.3 MEASUREMENT UNCERTAINTY	5
2. GENERAL INFORMATION	6
2.1 GENERAL DESCRIPTION OF EUT	
2.2 Carrier Frequency of Channels	7
2.3 Operation of EUT during testing	
2.4 DESCRIPTION OF TEST SETUP	
2.5 MEASUREMENT INSTRUMENTS LIST	8
3. CONDUCTED EMISSIONS TEST	9
3.1 Conducted Power Line Emission Limit	9
3.2 Test Setup	9
3.3 Test Procedure	
3.4 Test Result	9
4. RADIATED EMISSION TEST	12
4.1 Radiation Limit	
4.2 Test Setup	12
4.3 Test Procedure	13
4.4 Test Result	13
5. BAND EDGE	19
5.1 Limits	19
5.2 Test Procedure	19
5.3 Test Result	19
6. OCCUPIED BANDWIDTH MEASUREMENT	21
6.1 Test Limit	21
6.2 Test Procedure	21
6.3 Measurement Equipment Used	21
6.4 Test Result	21
7. POWER SPECTRAL DENSITY TEST	23
7.1 Test Limit	
7.2 Test Procedure	23
7.3 Measurement Equipment Used	23
7.4 Test Result	23

Page

#### Table of Contents

Page 4 of 35

8. PEAK OUTPUT POWER TEST	
8.1 Test Limit	
8.2 Test Procedure	
8.3 Measurement Equipment Used	
8.4 Test Result	
9. CONDUCTED BANDEGE MEASUREMENT	
9.1 Test Setup	
9.2 Test Procedure	
9.3 Limit	
9.4 Test Result	
10. SPURIOUS RF CONDUCTED EMISSION	
10.1 Test Limit	
10.2 Test Procedure	
10.3 Test Setup	
10.4 Test Result	
11. ANTENNA REQUIREMENT	
12. PHOTOGRAPH OF TEST	

Report No.: UNIA19050917FR-02

#### 1. TEST SUMMARY

#### 1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST CONDUCTED EMISSIONS TEST RADIATED EMISSION TEST BAND EDGE OCCUPIED BANDWIDTH MEASUREMENT PEAK OUTPUT POWER CONDUCTED BANDEGE MEASUREMENT SPURIOUS RF CONDUCTED EMISSION ANTENNA REQUIREMENT RESULT COMPLIANT COMPLIANT COMPLIANT COMPLIANT COMPLIANT COMPLIANT COMPLIANT

#### 1.2 TEST FACILITY

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

Address

Community, Xixiang Str, Bao'an District, Shenzhen, China

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang

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: L6494

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.

#### **1.3 MEASUREMENT UNCERTAINTY**

Measurement Uncertainty

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

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## 2. GENERAL INFORMATION

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#### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Speaker
Trade Mark	audio pro
Model Name	BT5
Serial No.	N/A
Model Difference	N/A
FCC ID	2AGNC-BT5
Antenna Type	PCB Antenna
Antenna Gain	OdBi
Frequency Range	2402-2480MHz
Number of Channels	79 channels for BR+EDR; 40 channels for BLE
Modulation Type	GFSK, Pi/4 QPSK, 8DPSK for BR+EDR; GFSK for BLE
Power Source	AC 100-240V, 50-60Hz 40W

Table for auxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
Notebook	Lenovo	Lenovo G475	GB14477457
Phone	Honor	COL-AL10	8.1.0.181

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#### 2.2 Carrier Frequency of Channels

	Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	
00	2402	10	2422	20	2442	30	2462	
01	2404	11	2424	21	2444	31	2464	
02	2406	12	2426	22	2446	32	2466	
03	2408	13	2428	23	2448	33	2468	
04	2410	14	2430	24	2450	34	2470	
05	2412	15	2432	25	2452	35	2472	
06	2414	16	2434	26	2454	36	2474	
07	2416	17	2436	27	2456	37	2476	
08	2418	18	2438	28	2458	38	2478	
09	2420	19	2440	29	2460	39	2480	

Page 7 of 35

2.3 Operation of EUT during testing

Operating Mode The mode is used: Transmitting mode

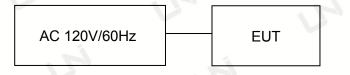
Low Channel: 2402MHz Middle Channel: 2440MHz High Channel: 2480MHz Test SW Version: Blue Test 3

#### 2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation testing:



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## 2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated unti
		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
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	15100041SNO88	2020.3.14
14	RF Power sensor	DARE	RPR3006W	15100041SNO89	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	Schwarzbeck	BBHA 9170	BBHA9170651	2020.03.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2019.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2019.05.10
26	Frequency Meter	VICTOR	VC2000	997406086	2019.05.10
27	DC Power Source	HYELEC	HY5020E	055161818	2019.05.10
		Test	software	0	-
1	E3	Audix	6.101223a	N/A	N/A

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## 3. CONDUCTED EMISSIONS TEST

### 3.1 Conducted Power Line Emission Limit

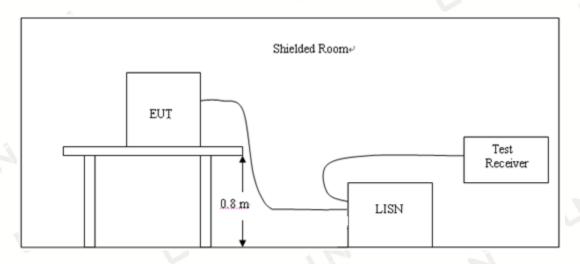
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

	Maximum RF Line Voltage(dBµV)				
Frequency	CLA	SS A	CLASS B		
(MHz)	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's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the 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/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded 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 EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected 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

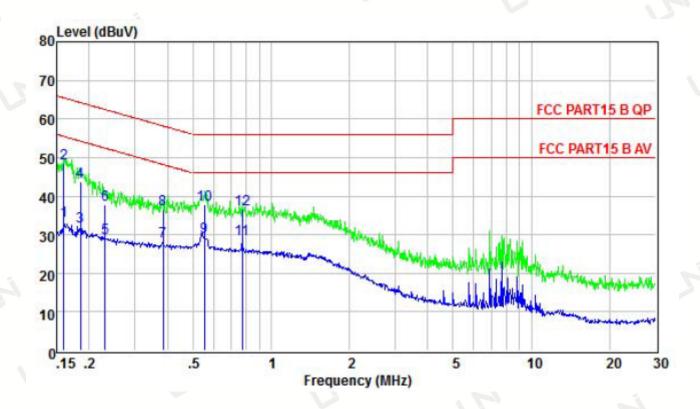
#### Pass

#### Remark:

All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.
All modes of Low, Middle, and High channel were tested, only the worst result of High Channel was reported as below:

#### Page 10 of 35

Temperature:	<b>26℃</b>	Relative Humidity:	48%			
Test Date:	Mar. 26, 2019	Pressure:	1010hPa			
Test Voltage:	AC 120V, 60Hz	Phase:	Line			
Test Mode:	Transmitting mode of GFSK 2480MHz					



	Freq	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
-	MHz	dBuV	dB	dB	dBuV	dB	
1	0.160	33.73	9.69	0.24	55.47	-21.74	Average
2	0.160	48.61	9.69	0.24	65.47	-16.86	QP
3	0.185	32.17	9.66	0.24	54.24	-22.07	Average
4	0.185	43.63	9.66	0.24	64.24	-20.61	QP
5	0.230	29.24	9.63	0.25	52.44	-23.20	Average
6	0.230	37.86	9.63	0.25	62.44	-24.58	QP
7	0.385	28.27	9.60	0.25	48.17	-19.90	Average
8	0.385	36.49	9.60	0.25	58.17	-21.68	QP
9	0.555	29.46	9.59	0.25	46.00	-16.54	Average
10	0.555	37.79	9.59	0.25	56.00	-18.21	QP
11	0.775	28.82	9.60	0.26	46.00	-17.18	Average
12	0.775	36.49	9.60	0.26	56.00	-19.51	QP

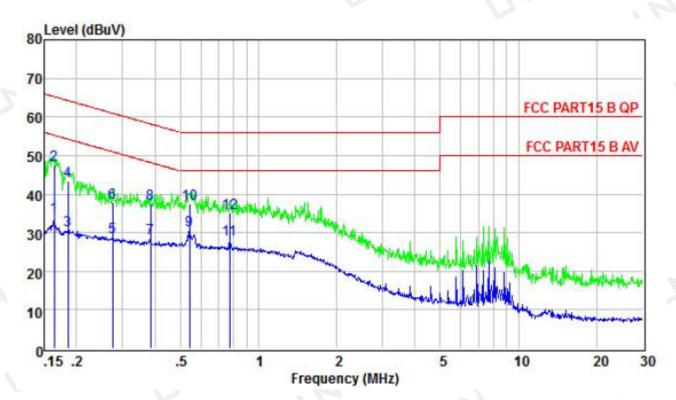
Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result - Limit.

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#### Page 11 of 35

Temperature:	26°C	Relative Humidity:	48%				
Test Date:	Mar. 26, 2019	Pressure:	1010hPa				
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral				
Test Mode:	Mode: Transmitting mode of GFSK 2480MHz						



LISN Cable Limit Over Freq Level Factor Loss Line Limit Remark

	MHz	dBuV	dB	dB	dBuV	dB	-
1	0.164	34.27	9.49	0.24	55.25	-20.98	Average
2	0.164	47.68	9.49	0.24	65.25	-17.57	QP
3	0.185	30.72	9.54	0.24	54.24	-23.52	Average
4	0.185	43.53	9.54	0.24	64.24	-20.71	QP
5	0.274	28.87	9.58	0.25	50.98	-22.11	Average
6	0.274	37.86	9.58	0.25	60.98	-23.12	QP
7	0.385	28.44	9.58	0.25	48.17	-19.73	Average
8	0.385	37.46	9.58	0.25	58.17	-20.71	QP
9	0.544	30.70	9.59	0.25	46.00	-15.30	Average
10	0.544	37.59	9.59	0.25	56.00	-18.41	QP
11	0.775	28.15	9.60	0.26	46.00	-17.85	Average
12	0.775	35.16	9.60	0.26	56.00	-20.84	QP

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

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#### 4. RADIATED EMISSION TEST

#### 4.1 Radiation Limit

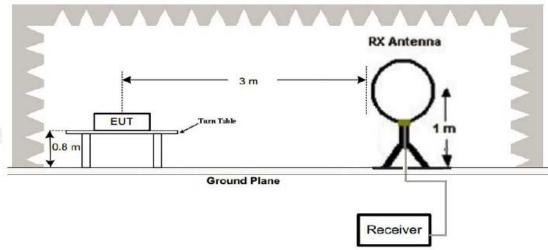
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Distance	Radiated	Radiated
(Meters)	(dBµV/m)	(µV/m)
3	40	100
3	43.5	150
3	46	200
3	54	500
		(Meters)     (dBµV/m)       3     40       3     43.5       3     46

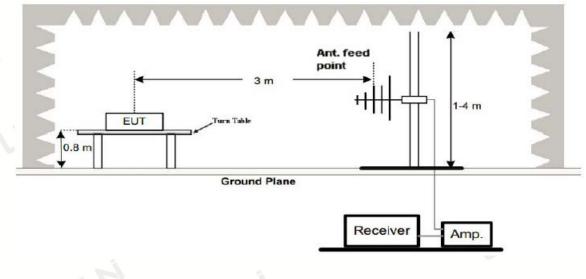
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

#### 4.2 Test Setup

1. Radiated Emission Test-Up Frequency Below 30MHz



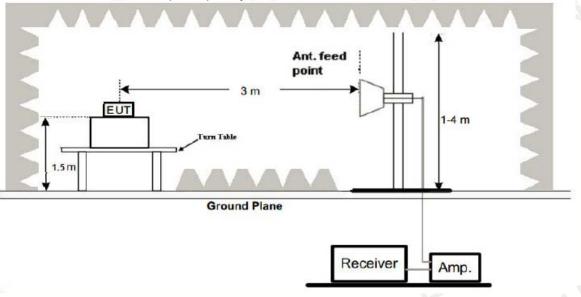
2. Radiated Emission Test-Up Frequency 30MHz~1GHz



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3. Radiated Emission Test-Up Frequency Above 1GHz



- 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 highest emissions.
  - 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 both horizontal and vertical.
  - 6. Repeat above procedures until the measurements for all frequencies are complete.
  - 7. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).
  - 8. The distance between test antenna and EUT as following table states:

Test Fre	equency range	Test Antenna Type	Test Distance
9KH	lz-30MHz	Active Loop Antenna	3
30N	1Hz-1GHz	Bilog Antenna	3
1Gł	Hz-18GHz	Horn Antenna	3
18G	Hz-25GHz	Horn Anternna	1

#### Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

#### 4.4 Test Result

#### PASS

#### Remark:

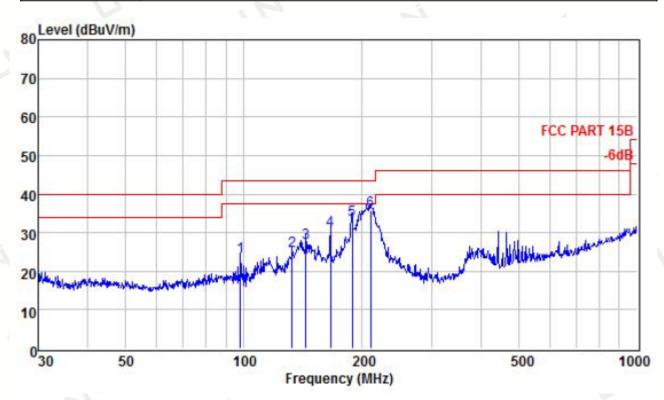
1. All the test modes completed for test. The worst case of Radiated Emission is High channel, the test data of this mode was reported.

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:	<b>22</b> ℃	Relative Humidity:	48%
Test Date:	Mar. 26, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Horizontal
Test Mode:	Transmitting mode of GFSK 2480	MHz	



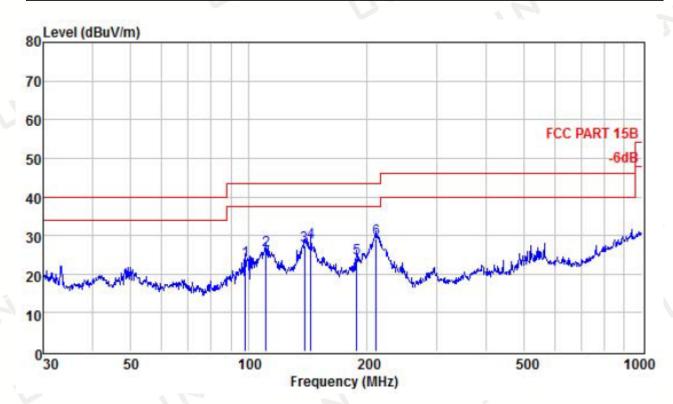
		Antenna Factor			Limit Line		Remark	
	MHz	dB/m	dB	dBuV/m	dBuV/m	dB		-
1	98.142	11.40	0.17	23.82	43.50	-19.68	QP	
2	132.685	14.21	0.22	25.32	43.50	-18.18	QP	
3	143.830	15.31	0.23	27.33	43.50	-16.17	QP	
4	166.068	14.73	0.23	30.74	43.50	-12.76	QP	
5	188.413	12.14	0.27	33.18	43.50	-10.32	QP	
6	210.048	11.45	0.35	35.59	43.50	-7.91	QP	

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

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# LNi

Temperature:	22°C	Relative Humidity:	48%
Test Date:	Mar. 26, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Vertical
Test Mode:	Transmitting mode of GFSK 2480	MHz	4



		Over	Limit		Cable	Intenna	7	
k	Remar	Limit	Line	Level	Loss	Factor	Freq	
		dB	dBuV/m	dBuV/m	dB	dB/m	MHz	
	QP	-20.12	43.50	23.38	0.17	11.23	98.142	1
	QP	-17.18	43.50	26.32	0.19	11.81	110.569	2
	QP	-16.24	43.50	27.26	0.23	15.00	138.387	3
	QP	-15.15	43.50	28.35	0.23	15.31	143.830	4
	QP	-19.27	43.50	24.23	0.27	12.18	187.753	5
	QP	-14.29	43.50	29.21	0.36	11.46	210.786	6
	QP QP	-15.15 -19.27	43.50 43.50	28.35 24.23	0.23	15.31 12.18	143.830 187.753	4

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 30MHz was 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.

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#### Above 1 GHz Test Results: CH Low (2402MHz)

#### Horizontal:

Frequency	Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2402	108.46	-5.84	102.62	114.00	-11.38	PK
2402	83.47	-5.84	77.63	94.00	-16.37	AV
4804	62.33	-3.64	58.69	74.00	-15.31	PK
4804	49.16	-3.64	45.52	54.00	-8.48	AV
7206	59.86	-0.95	58.91	74.00	-15.09	PK
7206	46.74	-0.95	45.79	54.00	-8.21	AV
Remark: Fact	or = Antenna	Factor + Cabl	e Loss – Pre-ampli	ifier. Margin =	Absolute Le	evel – Limit

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2402	110.25	-5.84	104.41	114.00	-9.59	PK
2402	81.51	-5.84	75.67	94.00	-18.33	AV
4804	61.89	-3.64	58.25	74.00	-15.75	PK
4804	50.44	-3.64	46.8	54.00	-7.2	AV
7206	57.96	-0.95	57.01	74.00	-16.99	PK
7206	46.93	-0.95	45.98	54.00	-8.02	AV
Remark: Fact	or = Antenna I	Factor + Cabl	e Loss – Pre-ampli	ifier. Margin =	Absolute Le	evel – Limit

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## CH Middle (2440MHz)

#### Horizontal:

LN

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2440	109.48	-5.71	103.77	114.00	-10.23	РК
2440	85.66	-5.71	79.95	94.00	-14.05	AV
4880	61.35	-3.51	57.84	74.00	-16.16	РК
4880	48.69	-3.51	45.18	54.00	-8.82	AV
7320	61.86	-0.82	61.04	74.00	-12.96	РК
7320	45.38	-0.82	44.56	54.00	-9.44	AV
Remark: Fact	or = Antenna	Factor + Cabl	e Loss – Pre-ampli	ifier. Margin =	Absolute Le	evel – Limit

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2440	107.98	-5.71	102.27	114.00	-11.73	РК
2440	82.76	-5.71	77.05	94.00	-16.95	AV
4880	61.35	-3.51	57.84	74.00	-16.16	РК
4880	49.81	-3.51	46.3	54.00	-7.7	AV
7320	61.97	-0.82	61.15	74.00	-12.85	РК
7320	46.63	-0.82	45.81	54.00	-8.19	AV
Remark: Fact	or = Antenna	Factor + Cabl	e Loss – Pre-ampli	ifier. Margin =	Absolute Le	vel – Limit

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#### CH High (2480MHz) Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2480	108.64	-5.65	102.99	114.00	-11.01	PK
2480	83.95	-5.65	78.3	94.00	-15.7	AV
4960	62.88	-3.43	59.45	74.00	-14.55	РК
4960	49.76	-3.43	46.33	54.00	-7.67	AV
7440	58.49	-0.75	57.74	74.00	-16.26	PK
7440	49.72	-0.75	48.97	54.00	-5.03	AV
Remark: Fact	or = Antenna	Factor + Cabl	e Loss – Pre-ampli	ifier. Margin =	Absolute Le	evel – Limit

#### Vertical:

Reading Result	Factor	Emission Level	Limits	Margin	Detector
(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
107.87	-5.65	102.22	114.00	-11.78	PK
83.46	-5.65	77.81	94.00	-16.19	AV
62.58	-3.43	59.15	74.00	-14.85	РК
47.69	-3.43	44.26	54.00	-9.74	AV
59.79	-0.75	59.04	74.00	-14.96	РК
48.67	-0.75	47.92	54.00	-6.08	AV
	Result     (dBµV)     107.87     83.46     62.58     47.69     59.79	Result Pactor   (dBµV) (dB)   107.87 -5.65   83.46 -5.65   62.58 -3.43   47.69 -3.43   59.79 -0.75	ResultPactorEmission Level(dBµV)(dB)(dBµV/m)107.87-5.65102.2283.46-5.6577.8162.58-3.4359.1547.69-3.4344.2659.79-0.7559.04	ResultPactorEmission LeverEmission Lever(dBµV)(dB)(dBµV/m)(dBµV/m)107.87-5.65102.22114.0083.46-5.6577.8194.0062.58-3.4359.1574.0047.69-3.4344.2654.0059.79-0.7559.0474.00	ResultPactorEmission LevelLimitsMargin(dBμV)(dB)(dBμV/m)(dBμV/m)(dB)107.87-5.65102.22114.00-11.7883.46-5.6577.8194.00-16.1962.58-3.4359.1574.00-14.8547.69-3.4344.2654.00-9.7459.79-0.7559.0474.00-14.96

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 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and 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 emissions are reported.

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#### 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 emission limits 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 ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength. The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the 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 (2402MHz)

Horizontal:

Tienzentan		-				
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2310	50.36	-5.81	44.55	74.00	-29.45	РК
2310	1	-5.81		54.00	1	AV
2390	53.73	-5.84	47.89	74.00	-26.11	PK
2390	1	-5.84	1	54.00	1	AV
2400	50.86	-5.84	45.02	74.00	-28.98	PK
2400	ΎΙ	-5.84	/	54.00	1	AV
_						

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:	in .		1			
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2310	51.63	-5.81	45.82	74.00	-28.18	PK
2310	1	-5.81	1	54.00	1	AV
2390	52.49	-5.84	46.65	74.00	-27.35	РК
2390	1	-5.84	1	54.00		AV
2400	51.79	-5.84	45.95	74.00	-28.05	PK
2400	V ,	-5.84	1	54.00	/	AV
5. C	1		1			

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

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## Operation Mode: TX CH High (2480MHz)

Horizontal:

TIONEONCON							
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
2483.5	51.46	-5.65	45.81	74.00	-28.19	РК	
2483.5	1	-5.65	1	54.00	1	AV	
2500	50.34	-5.72	44.62	74.00	-29.38	PK	
2500	Ι	-5.72		54.00	1	AV	
Remark: Fact	Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

#### Vertical:

vertical.						
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.5	52.06	-5.65	46.41	74.00	-27.59	PK
2483.5		-5.65	1	54.00	1	AV
2500	51.37	-5.72	45.65	74.00	-28.35	РК
2500	1	-5.72	1	54.00	1	AV
Remark: Fact	or = Antenna Facto	or + Cable Lo	oss – Pre-amplifier			



# LNi

#### 6. OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Limit

	FC	CC Part15(15.247), S	ubpart C	À
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

#### 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 FCC Part15 C Section 15.247: RBW=100KHz, VBW=300KHz.
- 4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.
- 6.3 Measurement Equipment Used

Same as Radiated Emission Measurement

#### 6.4 Test Result

PASS

Frequency (MHz)	6dB Bandwidth (MHz)	Result
2402	0.688	PASS
2440	0.699	PASS
2480	0.693	PASS

#### CH: 2402MHz

Keysight Spectrum Analyzer - Occupied B       RF     50 Ω     AC       enter Freg 2.40200000		SENSE:INT	ALIGN AUTO	Radio Std: None	Frequency
	Trig: I	Free Run Avg Hold	1:>10/10		
	#IFGain:Low #Atter	n: 20 dB	ŀ	Radio Device: BTS	T
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0.0					Center Fre
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).0					
enter 2.402 GHz				Span 3 MHz	
Res BW 100 kHz	#	VBW 300 kHz		Sweep 1 ms	- 300.000 Kr
Occupied Bandwid	th	Total Power	5.88 0	dBm	Auto Ma
	.0501 MHz				
					Freq Offs
Transmit Freq Error	-18.929 kHz	% of OBW Pow	er 99.0	00 %	0 H
x dB Bandwidth	687.8 kHz	x dB	-6.00	) dB	

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#### CH: 2440MHz



Page 22 of 35

#### CH: 2480MHz



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### 7. POWER SPECTRAL DENSITY TEST

#### 7.1 Test Limit

FCC Part15(15.247), Subpart C							
Section	Section Test Item Limit		Frequency Range (MHz)	Result			
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS			

#### 7.2 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 FCC Part15 C Section 15.247: RBW=3KHz, VBW=10KHz.
- 4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

#### 7.3 Measurement Equipment Used

Same as Radiated Emission Measurement

#### 7.4 Test Result

PASS

Туре	Channel	Power Spectral Density	Limit (dBm/3KHz)	Result
	0	-15.760		
GFSK	19	-12.703	8.00	Pass
	39	-11.943		

#### CH: 2402MHz



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#### CH: 2440MHz



CH: 2480MHz



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#### 8. PEAK OUTPUT POWER TEST

#### 8.1 Test Limit

FCC Part15(15.247), Subpart C						
Section Test Item		Limit	Frequency Range (MHz)	Result		
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS		

#### 8.2 Test Procedure

The EUT was placed on a turn table which is 0.8m above ground plane.
The EUT was directly connected to the Power meter.

#### 8.3 Measurement Equipment Used

Same as Radiated Emission Measurement.

#### 8.4 Test Result

PASS

Туре	Channel	Peak Output power (dBm)	Limit (dBm)	Result
	0	2.045		
GFSK	19	2.361	30	Pass
	39	2.598		

#### 9. CONDUCTED BANDEGE MEASUREMENT

9.1 Test Setup



#### 9.2 Test Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. Set EUT as TX operation and connect directly to the spectrum analyzer.
- 3. Based on FCC Part15 C Section 15.247: RBW=100KHz, VBW=300KHz.
- 4. Set detected by the spectrum analyzer with peak detector.

#### 9.3 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

#### 9.4 Test Result

PASS

Frequency Band	Delta Peak to band emission(dBc)	>Limit (dBc)	Result
Left-band	42.13	20	Pass
Right-band	57.01	20	Pass



Keysight Spectrum Analyzer - Swept SA				
RF     50 Ω     AC       Start Freq 2.350000000 G		Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6	Frequency
10 dB/div Ref 20.00 dBm	PNO: Fast Ing: Free Ru IFGain:Low Atten: 30 dB	•	2.401 975 GHz -0.117 dBm	Auto Tune
10.0				Center Freq 2.377500000 GHz
-20.0			DL1 -20 12 dBm	<b>Start Freq</b> 2.350000000 GHz
-50.0 -60.0	warman an a		menter M <sup>fw</sup> W	<b>Stop Freq</b> 2.405000000 GHz
Start 2.35000 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 5	Stop 2.40500 GHz .267 ms (1001 pts)	CF Step 5.500000 MHz <u>Auto</u> Man
2 N 1 f 2.40	1 975 GHz -0.117 dBm 0 000 GHz -42.251 dBm 0 000 GHz -59.872 dBm		E	<b>Freq Offset</b> 0 Hz
7 8 9 10 11				Scale Type
MSG	m	STATUS	4	

Keysight Spectrum Analyzer - Swept SA RF 50 Ω AC Start Freq 2.475000000 GH	HZ PNO: Fast	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	TRACE <b>1 2 3 4 5 6</b> TYPE <b>M</b> WWWWW	Frequency
10 dB/div Ref 20.00 dBm	IFGain:Low Atten: 30 dB	-	2.479 950 GHz 1.424 dBm	Auto Tune
				<b>Center Free</b> 2.512500000 GH
-20.0			DL1 -19.58 dBm	<b>Start Fre</b> 2.475000000 GH
-50.0 2	3	hanna an		<b>Stop Fre</b> 2.550000000 GH
Start 2.47500 GHz #Res BW 100 kHz	#VBW 300 kHz		Stop 2.55000 GHz 200 ms (1001 pts)	<b>CF Ste</b> 7.500000 MH <u>Auto</u> Ma
2 N 1 f 2.483 3 N 1 f 2.500 4 5	950 GHz 1.424 dBm 500 GHz -56.589 dBm 000 GHz -60.464 dBm		=	Freq Offse 0 H
6 7 7 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9				Scale Type
	m	STATUS		

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#### Report No.: UNIA19050917FR-02

#### 10. SPURIOUS RF CONDUCTED EMISSION

#### 10.1 Test Limit

1. Below -20dB of the highest emission level in operating band.

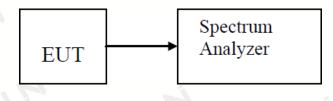
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

3.For below 30MHz,For 9KHz-150kHz,150K-10MHz,We use the RBW 1KHz,10KHz, So the limit need to calculated by "10lg(BW1/BW2)". for example For9KHz-150kHz,RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

#### 10.2 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 9KHz-150kHz, Set RBW=1kHz and VBW= 3KHz; For 150KHz-10MHz, Set RBW=10kHz and VBW= 30KHz:For 10MHz-25GHz, Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and mwasure frequeny range from 9KHz to 25GHz.

#### 10.3 Test Setup



10.4 Test Result

PASS

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#### CH: 2402MHz



Keysight Spe	ctrum Analyzer - S RF 50				SE:INT		ALIGN AUTO				
tart Fre	q 30.0000		PNO: Fast		Run		: Log-Pwr	T	CE 1 2 3 4 5 6 PE M WWWWW ET P N N N N N	F	requency
) dB/div	Ref 20.00	dBm					M	kr1 2.55 -46.8	7 5 GHz 93 dBm		Auto Tun
0.0											<b>Center Fre</b> 15000000 GH
.00 <b></b> D.0 <b></b>										3	Start Fre 0.000000 M⊦
).0 <b></b>									DL1 -20.53 dBm	3.00	<b>Stop Fre</b> 00000000 GF
).0 ).0								• <sup>1</sup>		29 <sup>.</sup> <u>Auto</u>	<b>CF Ste</b> 7.000000 Mi Mi
	Mplander Jones Marile	mplatent	hindration and the second s	holen secretiones	ing all and a fill of the second of	Ladoral Hartstern	Www.ref.waland	Imillitie	happy and had		Freq Offs
).0											Scale Typ
tart 0.03 Res BW			#VBV	/ 300 kHz			Sweep 2	Stop 3 283.9 ms	3.000 GHz (1001 pts)	Log	L

30MHz~3GHz

深圳市优耐检测技术有限公司 Shenzhen United Testing Technology Co.,Ltd. United Testing Technology(Hong Kong) Limited

Page 30 of 35

#### Report No.: UNIA19050917FR-02



Keysight Spect	rum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT	ALIGN	AUTO		
tart Freq	3.000000000	GHz PNO: Fast	Trig: Free Run Atten: 30 dB	Avg Type: Log Avg Hold: 12/1	-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Frequency
0 dB/div	Ref 20.00 dBm				Mkr1	24.538 GHz 46.356 dBm	Auto Tur
10.0							Center Fre 14.000000000 GF
0.0							<b>Start Fre</b> 3.000000000 GF
0.0						DL1 -20.53 dBm	<b>Stop Fre</b> 25.000000000 GR
0.0						hand a charter and a	CF Ste 2.200000000 GF <u>Auto</u> Mi
	montermany	water photoson all the	when which wh	and and a star and a start	Contraction of the		Freq Offs 0 F
'0.0							Scale Typ
tart 3.00 ( Res BW 1		#VBW 3	00 kHz	Sv	St veep 2.10	op 25.00 GHz 3 s (1001 pts)	Log <u>l</u>
3					STATUS		

3GHz~25GHz

CH: 2440MHz



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Keysight Spectr	rum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT	ALIG	N AUTO		
tart Freq	30.000000 MH	Z PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log Avg Hold:>100	g-Pwr	TRACE 1 2 3 4 5 TYPE MWWWW DET P N N N N	<del>41/</del>
dB/div	Ref 20.00 dBm	I Guillew			Mkr1	2.596 1 GH 49.599 dBr	Z Auto Tur n
							Center Fre 1.515000000 G⊦
.00 D.0							Start Fre 30.000000 MH
0.0						DL1 -20.01 dB	<b>Stop Fre</b> 3.000000000 GH
).0 ).0						↓1	CF Ste 297.000000 MH <u>Auto</u> Ma
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0.0							Scale Typ
art 0.030 Res BW 10		#VBW 3	300 kHz	Swe	S eep 283.9	top 3.000 GH ms (1001 pt	z Log <u>L</u> s)
3					STATUS		

30MHz~3GHz

i keysigite sp	ectrum Analyzer - Swept S RF 50 Ω A		SENSE:INT	ALIGN AUTO		
itart Fre	q 3.00000000	) GHz PNO: Fast G IEGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 12/100	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNNN	Frequency
0 dB/div og	Ref 20.00 dBr	n		Μ	kr1 24.648 GHz -46.534 dBm	Auto Tun
10.0						Center Fre 14.000000000 G⊦
0.0						<b>Start Fre</b> 3.000000000 G⊦
D.O					DL1 -20.01 dBm	<b>Stop Fre</b> 25.00000000 GF
D.O					A Martine Martine	CF Ste 2.20000000 GH <u>Auto</u> Ma
0.0 <b>144</b> 44	Melninheiterstehnföhnenne	Howard and the state of the sta	where the spectrum of the second s	and and a second and a second s		Freq Offs 0 ⊦
10.0						Scale Typ
tart 3.00 Res BiM	) GHz 100 kHz	#\/B\/	300 kHz	Sween	Stop 25.00 GHz 2.103 s (1001 pts)	Log <u>L</u>

3GHz~25GHz

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## LNI

#### CH: 2480MHz



	ctrum Analyzer - Swept SA RF 50 Ω AC		SEN	ISE:INT		ALIGN AUTO				ð 🛃
tart Fre	q 30.000000 MH	PNO: Fast	Trig: Free Atten: 30		Avg Type Avg Hold:	: Log-Pwr >100/100	TRAC TYP DE	E 1 2 3 4 5 6 E M WWWW T P N N N N N	Frequ	ency
dB/div	Ref 20.00 dBm					Mk	(r1 2.63 -49.0	4 7 GHz 77 dBm	Au	to Tur
									Cent 1.515000	t <b>er Fre</b> 1000 GH
									Sta 30.000	art Fre 000 MH
.0								DL1 -18.48 dBm	Sto 3.000000	<b>op Fr</b> 1000 GI
.0							1		( 297.000 <u>Auto</u>	CF Ste 000 MI M
	have to the second	of the University of the	<sub>ler</sub> hoodoorstaast	horita <b>i</b> l American	hollo frankliv klasar og og	honbeyth	بى الىلىدىي بىس	ond-Hanakona	Free	q Offs 0 H
).0										le Typ
art 0.03	0 GHz 100 kHz	40 (D)14	/ 300 kHz				Stop 3	.000 GHz 1001 pts)	Log	L

30MHz~3GHz

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Report No.: UNIA19050917FR-02



Keysight Spe	ctrum Analyzer - Swept RF 50 Ω		SENSE:INT	ALIGN AUTO		
tart Fred	q 3.0000000			Avg Type: Log-Pwr Avg Hold: 25/100	TRACE 1 2 3 4 5 TYPE MWWWW DET P N N N N	N
0 dB/div og	Ref 20.00 dE	Im		Ν	/kr1 24.670 GHz -46.158 dBm	Auto Tur
10.0						Center Fre 14.000000000 GF
1.00						Start Fre 3.000000000 Gi
10.0					DL1 -18 48 dBr	<b>Stop Fr</b> 25.000000000 GI
0.0					NA LANAMA	<b>CF Ste</b> 2.200000000 Gi <u>Auto</u> Mi
	wasterwall Afreedally to	~Jagongartyartyonthonautisaattiva	and the second s	hyper and a strategy and a	W MAR IN ANA	Freq Offs 0 1
0.0						Scale Ty
tart 3.00 Res BW		#VBN	300 kHz	Swee	Stop 25.00 GHz 2.103 s (1001 pts	Log <u>l</u>
G				STAT	IS	•

3GHz~25GHz

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#### 11. ANTENNA REQUIREMENT

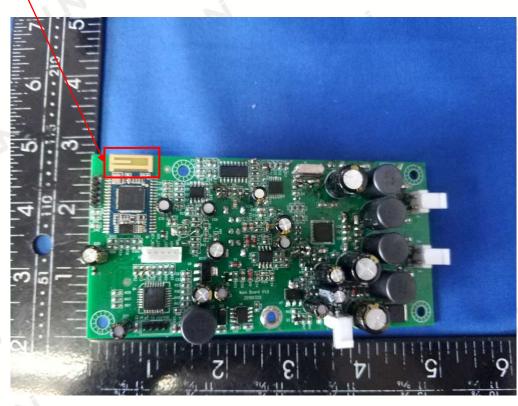
#### Standard Applicable:

For intentional device, according to FCC 47 CFR Section 15.203, 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.

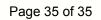
#### Antenna Connected Construction

The antenna used in this product is an PCB Antenna, The directional gains of antenna used for transmitting is 0dBi.

#### BT ANTENNA:



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Report No.: UNIA19050917FR-02

#### 12. PHOTOGRAPH OF TEST

Radiated Emission (Below 1G)







Conducted Emission



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\*\*\*End of Report\*\*\*