



FCC TEST REPORT

**Test report
On Behalf of
New Times Global Limited
For
Bluetooth Speaker
Model No.: NT-B804
FCC ID: 2ATG5-B804**

Prepared for : New Times Global Limited
RM3410, Hong Kin House, Tsz Hong EST, Tsz Wan Shan, Kowloon, HK

Prepared By : Shenzhen HUAKE Testing Technology Co., Ltd.
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Date of Test: May. 28, 2019 ~ Jun. 14, 2019

Date of Report: Jun. 14, 2019

Report Number: HK1905291216E



TEST RESULT CERTIFICATION

Applicant's name: New Times Global Limited
Address: RM3410, Hong Kin House, Tsz Hong EST, Tsz Wan Shan, Kowloon, HK
Manufacture's Name: Dongguan Voices Electronic Technology Co., Ltd
Address: Block 2, Luyuan Road, Lubian Village, Chashan Town, Dongguan City, China
Product description
Trade Mark: TIFORU
Product name.....: Bluetooth Speaker
Model and/or type reference .: NT-B804
Standards.....: FCC Rules and Regulations Part 15 Subpart C Section 15.249
ANSI C63.10: 2013

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Date of Test:
Date (s) of performance of tests.....: **May. 28, 2019 ~ Jun. 14, 2019**
Date of Issue.....: **Jun. 14, 2019**
Test Result.....: **Pass**

Testing Engineer : Gary Qian
(Gary Qian)
Technical Manager : Eden Hu
(Eden Hu)
Authorized Signatory : Jason Zhou
(Jason Zhou)



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1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

FCC Rule	Description of Test	Result
15.207	. Conducted Emission	Pass
15.205 15.209 15.249	. Radiated Emission	Pass
15.215(c)	. 20dB Bandwidth	Pass
15.205 15.249	Band Edge And Restricted Frequency Bands	Pass

1.2 TEST FACILITY

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

Address 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

1.3 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	Bluetooth Speaker
Model Name	NT-B804
Serial No	N/A
Model Difference	N/A
Antenna Type	PCB onboard antenna
Antenna Gain	0 dBi
BT Operation frequency	2402-2480MHz
Number of Channels	79CH
Modulation Type	GFSK, $\pi/4$ DQPSK, 8DPSK
Power Source	DC3.7V From Battery or DC 5V from adapter with AC 120V/60Hz
Power Rating	DC3.7V From Battery or DC 5V from adapter with AC 120V/60Hz



2.1.1 Carrier Frequency of Channels

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

2.2 Operation of EUT during testing

Operating Mode

Preliminary tests were performed in each mode(hopping and no-hopping) and packet length of BT, and found worst case as bellow, finally test were conducted at those mode and recorded in this report.

Test Items	Worst case
CONDUCTED EMISSIONS TEST	DH5 Middle channel
RADIATED EMISSION TEST	DH5 Middle channel
BAND EDGE	DH5
OCCUPIED BANDWIDTH MEASUREMENT	DH5/2DH5/3DH5
ANTENNA REQUIREMENT	DH5/2DH5/3DH5 Middle channel

The mode is used: **Transmitting mode**

- Low Channel: 2402MHz
- Middle Channel: 2441MHz
- High Channel: 2480MHz



2.3 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation and Above1GHz Radiation testing:



● Adapter

Model: PL0652

Input: 100-240V~, 50/60Hz, 0.5A

Output: 5VDC, 1A



2.4 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 28, 2018	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 28, 2018	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 28, 2018	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 28, 2018	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2018	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 28, 2018	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 28, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 28, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 28, 2018	1 Year
10.	Horn Antenna	Schwarzbeck	9120D	HKE-013	Dec. 28, 2018	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 28, 2018	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 28, 2018	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 28, 2018	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 28, 2018	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2018	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 28, 2018	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 28, 2018	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 28, 2018	3 Year

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

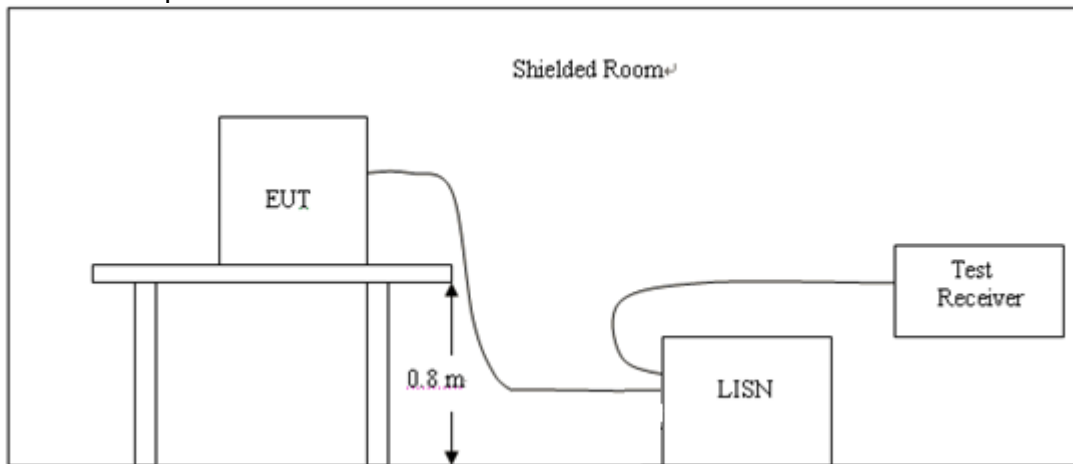
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

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's manual. The EUT is a tabletop system, a wooden table with a height of 0.1 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

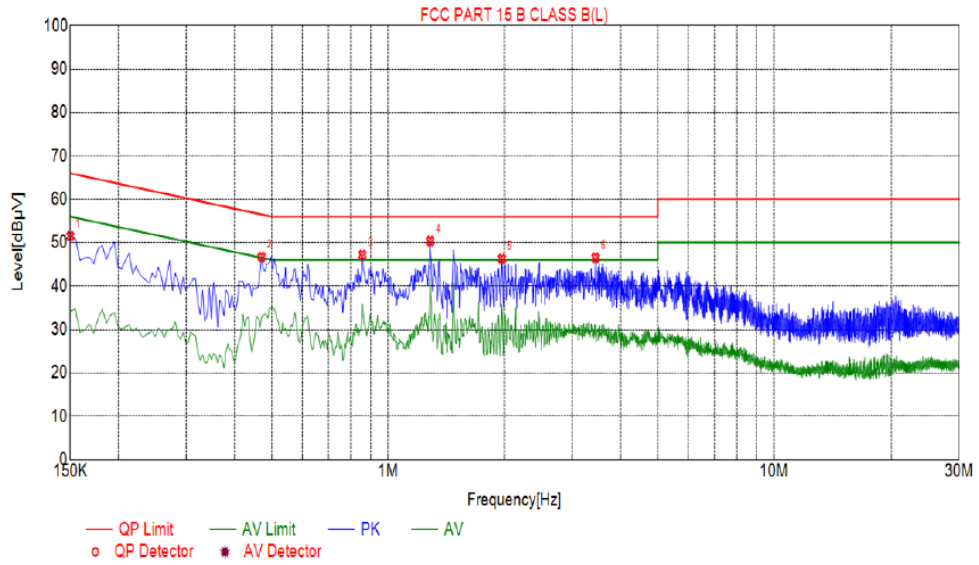
PASS

All the test modes completed for test.



EUT :	Bluetooth Speaker	Model Name. :	NT-B804
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Test Date :	2019-06-13
Test Mode :	BT	Phase :	L
Test Voltage :	DC 5V by Adapter AC 120V/60Hz		

Test Graph

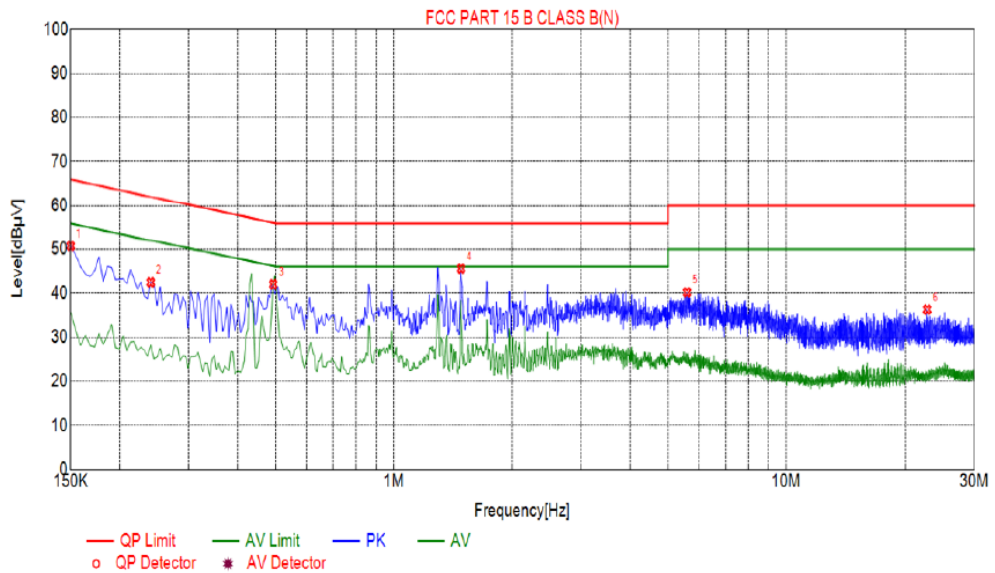


Suspected List						
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector
1	0.1500	51.53	10.03	66.00	14.47	PK
2	0.4695	46.72	10.04	56.52	9.80	PK
3	0.8565	47.21	10.06	56.00	8.79	PK
4	1.2840	50.40	10.09	56.00	5.60	PK
5	1.9725	46.32	10.14	56.00	9.68	PK
6	3.4485	46.54	10.25	56.00	9.46	PK



EUT :	Bluetooth Speaker	Model Name. :	NT-B804
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Test Date :	2019-06-13
Test Mode :	BT	Phase :	N
Test Voltage :	DC 5V by Adapter AC 120V/60Hz		

Test Graph



Suspected List						
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector
1	0.1500	50.77	10.03	66.00	15.23	PK
2	0.2400	42.42	10.03	62.10	19.68	PK
3	0.4920	41.97	10.04	56.13	14.16	PK
4	1.4820	45.52	10.10	56.00	10.48	PK
5	5.5905	40.13	10.25	60.00	19.87	PK
6	22.7310	36.27	10.18	60.00	23.73	PK

4 RADIATED EMISSION TEST

4.1 Radiation Limit

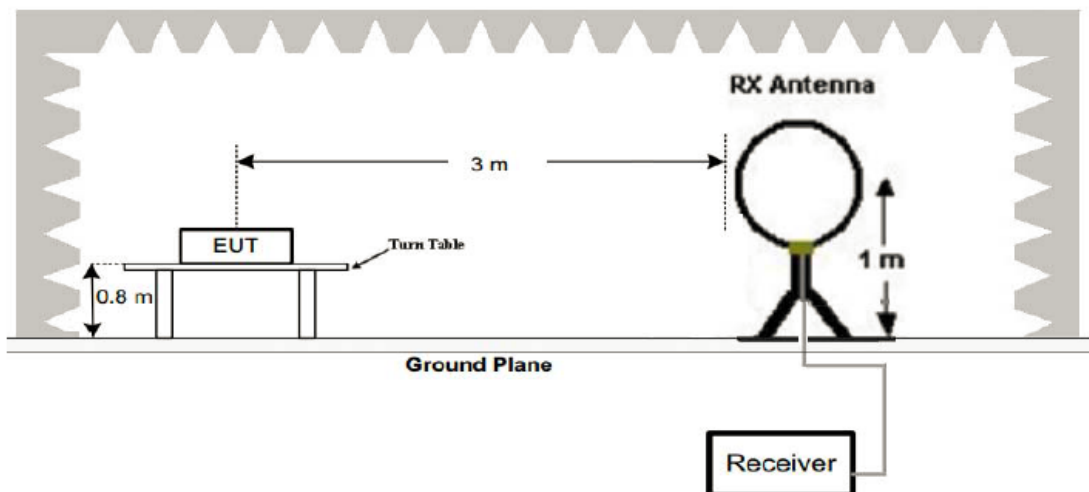
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

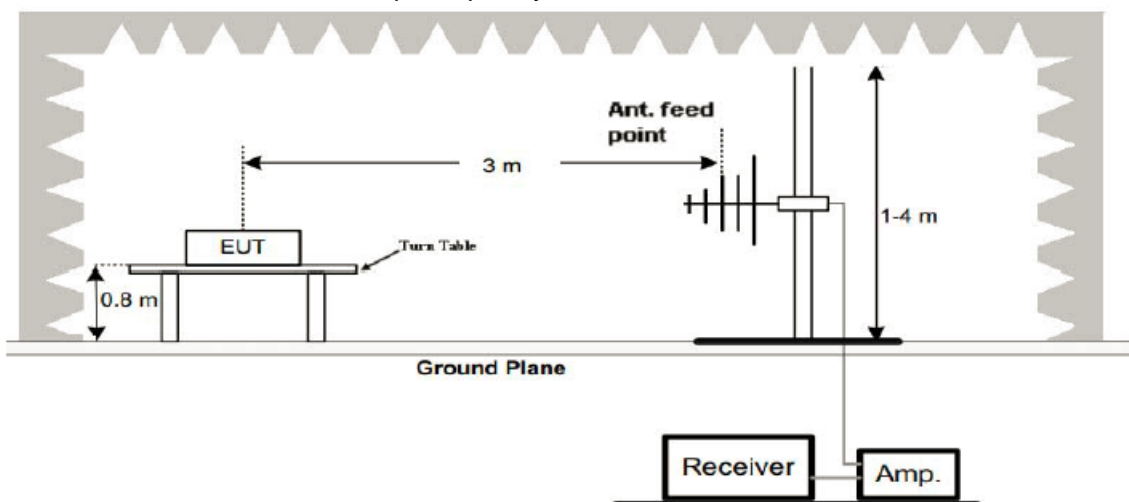
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

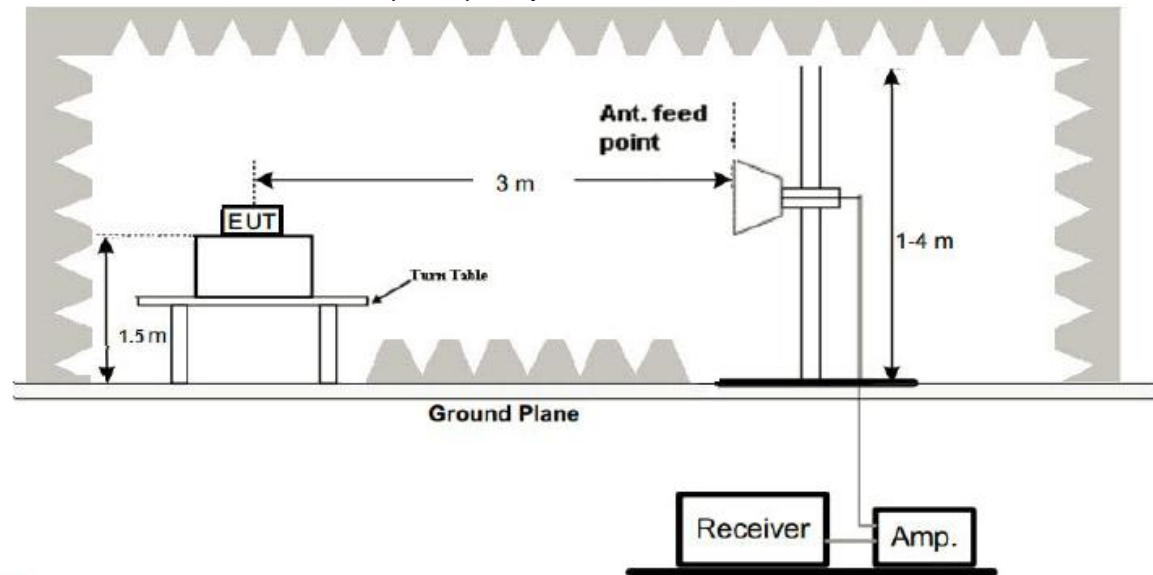
(1) Radiated Emission Test-Up Frequency Below 30MHz



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



(3) Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

1. Below 1GHz measurement the EUT is placed on turntable which is 0.1m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 0.1m 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).

Note:

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

4.4 Test Result

PASS

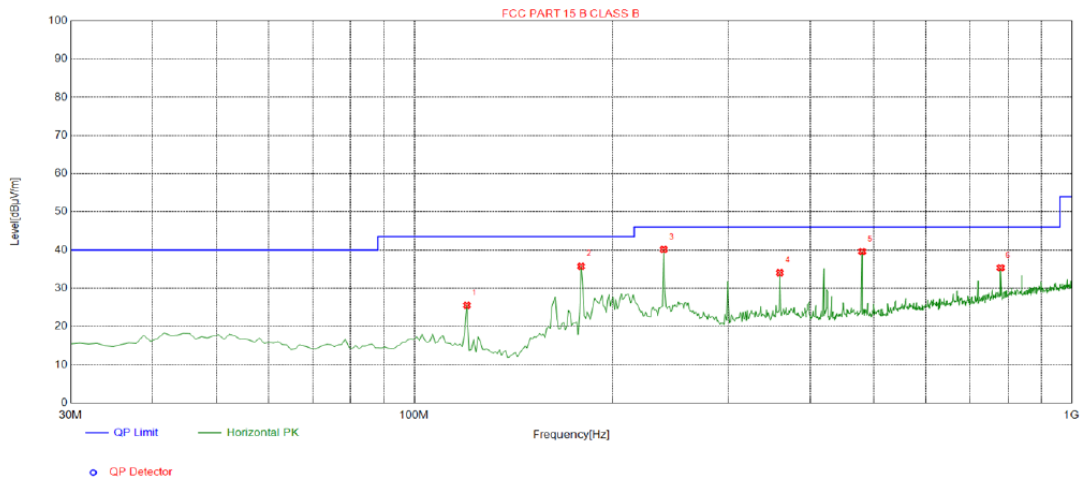
All the test modes completed for test. The worst case of Radiated Emission is CH 2441; the test data of this mode was reported.



Below 1GHz Test Results:

EUT :	Bluetooth Speaker	Model Name :	NT-B804
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2019-06-13
Test Mode :	BT	Polarization :	Horizontal
Test Power :	DC 5V by Adapter AC 120V/60Hz		

Test Graph



Suspected List

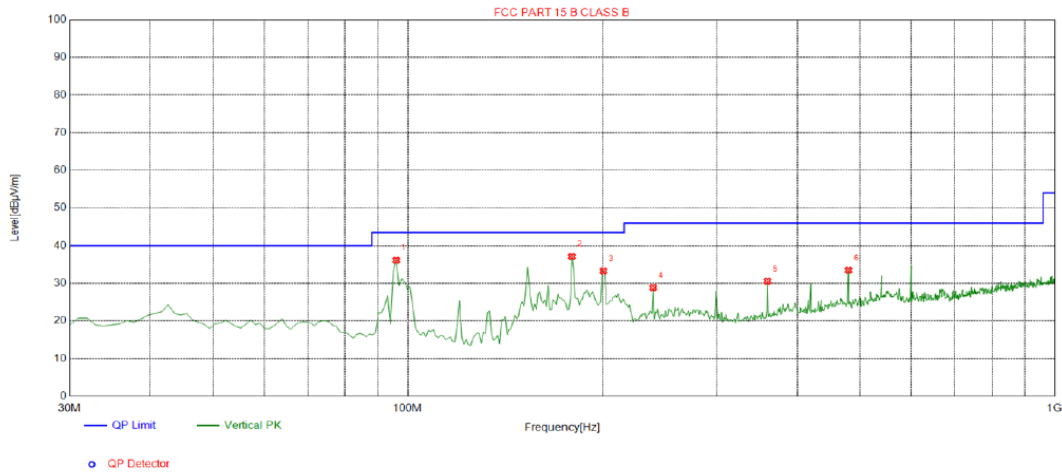
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	120.210	25.55	-17.13	43.50	17.95	100	137	Horizontal
2	179.380	35.75	-16.88	43.50	7.75	100	258	Horizontal
3	239.520	40.16	-13.88	46.00	5.84	100	48	Horizontal
4	359.800	34.06	-11.35	46.00	11.94	100	261	Horizontal
5	480.080	39.64	-8.45	46.00	6.36	100	182	Horizontal
6	779.810	35.38	-3.26	46.00	10.62	100	11	Horizontal

Final Data List



EUT :	Bluetooth Speaker	Model Name :	NT-B804
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2019-06-13
Test Mode :	On	Polarization :	Vertical
Test Power :	DC 5V by Adapter AC 120V/60Hz		

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	95.9600	36.13	-16.07	43.50	7.37	100	202	Vertical
2	179.380	37.13	-16.88	43.50	6.37	100	147	Vertical
3	200.720	33.30	-15.04	43.50	10.20	100	0	Vertical
4	239.520	28.86	-13.88	46.00	17.14	100	186	Vertical
5	359.800	30.57	-11.35	46.00	15.43	100	220	Vertical
6	480.080	33.48	-8.45	46.00	12.52	100	341	Vertical

Final Data List

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.



Above 1 GHz Test Results:GFSK

CH Low (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2402	102.53	-5.84	96.69	114	-17.31	Peak
2402	81.64	-5.84	75.8	94	-18.2	AVG
4804	61.06	-3.64	57.42	74	-16.58	Peak
4804	40.96	-3.64	37.32	54	-16.68	AVG
7206	57.62	-0.95	56.67	74	-17.33	Peak
7206	39.84	-0.95	38.89	54	-15.11	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2402	102.86	-5.84	97.02	114	-16.98	Peak
2402	80.43	-5.84	74.59	94	-19.41	AVG
4804	61.28	-3.64	57.64	74	-16.36	Peak
4804	41.07	-3.64	37.43	54	-16.57	AVG
7206	58.72	-0.95	57.77	74	-16.23	Peak
7206	39.61	-0.95	38.66	54	-15.34	AVG

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



CH Middle (2441MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2441	103.85	-5.71	98.14	114	-15.86	Peak
2441	82.04	-5.71	76.33	94	-17.67	AVG
4882	59.75	-3.51	56.24	74	-17.76	Peak
4882	43.06	-3.51	39.55	54	-14.45	AVG
7323	58.92	-0.82	58.1	74	-15.9	Peak
7323	38.61	-0.82	37.79	54	-16.21	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2441	103.16	-5.71	97.45	114	-16.55	Peak
2441	79.43	-5.71	73.72	94	-20.28	AVG
4882	61.52	-3.51	58.01	74	-15.99	Peak
4882	43.26	-3.51	39.75	54	-14.25	AVG
7323	59.74	-0.82	58.92	74	-15.08	Peak
7323	38.05	-0.82	37.23	54	-16.77	AVG

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



CH High (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2480	102.96	-5.56	97.4	114	-16.6	Peak
2480	78.64	-5.56	73.08	94	-20.92	AVG
4960	59.34	-3.43	55.91	74	-18.09	Peak
4960	41.09	-3.43	37.66	54	-16.34	AVG
7440	61.25	-0.75	60.5	74	-13.5	Peak
7440	39.71	-0.75	38.96	54	-15.04	AVG

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

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2480	101.65	-5.56	96.09	114	-17.91	Peak
2480	80.36	-5.56	74.8	94	-19.2	AVG
4960	61.08	-3.43	57.65	74	-16.35	Peak
4960	42.15	-3.43	38.72	54	-15.28	AVG
7440	59.72	-0.75	58.97	74	-15.03	Peak
7440	41.07	-0.75	40.32	54	-13.68	AVG

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

Above 1 GHz Test Results: $\pi/4$ DQPSK

CH Low (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2402	103.64	-5.84	97.8	114	-16.2	Peak
2402	82.57	-5.84	76.73	94	-17.27	AVG
4804	60.35	-3.64	56.71	74	-17.29	Peak
4804	39.76	-3.64	36.12	54	-17.88	AVG
7206	56.43	-0.95	55.48	74	-18.52	Peak
7206	41.28	-0.95	40.33	54	-13.67	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2402	104.15	-5.84	98.31	114	-15.69	Peak
2402	81.79	-5.84	75.95	94	-18.05	AVG
4804	62.54	-3.64	58.9	74	-15.1	Peak
4804	42.36	-3.64	38.72	54	-15.28	AVG
7206	57.28	-0.95	56.33	74	-17.67	Peak
7206	40.06	-0.95	39.11	54	-14.89	AVG

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



CH Middle (2441MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2441	102.12	-5.71	96.41	114	-17.59	Peak
2441	82.51	-5.71	76.8	94	-17.2	AVG
4882	61.24	-3.51	57.73	74	-16.27	Peak
4882	42.05	-3.51	38.54	54	-15.46	AVG
7323	59.24	-0.82	58.42	74	-15.58	Peak
7323	40.03	-0.82	39.21	54	-14.79	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2441	102.48	-5.71	96.77	114	-17.23	Peak
2441	81.32	-5.71	75.61	94	-18.39	AVG
4882	60.54	-3.51	57.03	74	-16.97	Peak
4882	41.75	-3.51	38.24	54	-15.76	AVG
7323	61.28	-0.82	60.46	74	-13.54	Peak
7323	39.75	-0.82	38.93	54	-15.07	AVG

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



CH High (2480MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2480	103.15	-5.56	97.59	114	-16.41	Peak
2480	80.64	-5.56	75.08	94	-18.92	AVG
4960	61.27	-3.43	57.84	74	-16.16	Peak
4960	42.35	-3.43	38.92	54	-15.08	AVG
7440	62.02	-0.75	61.27	74	-12.73	Peak
7440	41.28	-0.75	40.53	54	-13.47	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2480	103.95	-5.56	98.39	114	-15.61	Peak
2480	81.46	-5.56	75.9	94	-18.1	AVG
4960	62.53	-3.43	59.1	74	-14.9	Peak
4960	43.12	-3.43	39.69	54	-14.31	AVG
7440	61.75	-0.75	61	74	-13	Peak
7440	43.06	-0.75	42.31	54	-11.69	AVG

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



Above 1 GHz Test Results: 8DPSK

CH Low (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2402	104.29	-5.84	98.45	114	-15.55	Peak
2402	83.54	-5.84	77.7	94	-16.3	AVG
4804	63.34	-3.64	59.7	74	-14.3	Peak
4804	42.57	-3.64	38.93	54	-15.07	AVG
7206	58.74	-0.95	57.79	74	-16.21	Peak
7206	41.06	-0.95	40.11	54	-13.89	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2402	103.75	-5.84	97.91	114	-16.09	Peak
2402	84.68	-5.84	78.84	94	-15.16	AVG
4804	61.37	-3.64	57.73	74	-16.27	Peak
4804	43.12	-3.64	39.48	54	-14.52	AVG
7206	59.48	-0.95	58.53	74	-15.47	Peak
7206	42.06	-0.95	41.11	54	-12.89	AVG

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



CH Middle (2441MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2441	102.57	-5.71	96.86	114	-17.14	Peak
2441	81.46	-5.71	75.75	94	-18.25	AVG
4882	62.37	-3.51	58.86	74	-15.14	Peak
4882	41.06	-3.51	37.55	54	-16.45	AVG
7323	59.72	-0.82	58.9	74	-15.1	Peak
7323	40.35	-0.82	39.53	54	-14.47	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2441	102.86	-5.71	97.15	114	-16.85	Peak
2441	81.34	-5.71	75.63	94	-18.37	AVG
4882	63.25	-3.51	59.74	74	-14.26	Peak
4882	41.76	-3.51	38.25	54	-15.75	AVG
7323	60.06	-0.82	59.24	74	-14.76	Peak
7323	39.71	-0.82	38.89	54	-15.11	AVG

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



CH High (2480MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2480	102.95	-5.56	97.39	114	-16.61	Peak
2480	79.32	-5.56	73.76	94	-20.24	AVG
4960	61.07	-3.43	57.64	74	-16.36	Peak
4960	42.58	-3.43	39.15	54	-14.85	AVG
7440	63.94	-0.75	63.19	74	-10.81	Peak
7440	41.28	-0.75	40.53	54	-13.47	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2480	103.54	-5.56	97.98	114	-16.02	Peak
2480	81.25	-5.56	75.69	94	-18.31	AVG
4960	62.54	-3.43	59.11	74	-14.89	Peak
4960	41.79	-3.43	38.36	54	-15.64	AVG
7440	60.37	-0.75	59.62	74	-14.38	Peak
7440	42.19	-0.75	41.44	54	-12.56	AVG

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



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.



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.

RESTRICTED BANDS

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

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
10.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

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

2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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: GFSK Low (2402MHz)

Horizontal (Worst case)



Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2310	56.32	-5.81	50.51	74	-23.49	Peak
2310	41.39	-5.81	35.58	54	-18.42	AVG
2390	54.07	-5.84	48.23	74	-25.77	Peak
2390	41.69	-5.84	35.85	54	-18.15	AVG
2400	58.24	-5.95	52.29	74	-21.71	Peak
2400	40.61	-5.95	34.66	54	-19.34	AVG

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

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2310	59.46	-5.81	53.65	74	-20.35	Peak
2310	43.12	-5.81	37.31	54	-16.69	AVG
2390	57.28	-5.84	51.44	74	-22.56	Peak
2390	42.09	-5.84	36.25	54	-17.75	AVG
2400	58.35	-5.95	52.4	74	-21.6	Peak
2400	43.94	-5.95	37.99	54	-16.01	AVG

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



Operation Mode: GFSK High (2480MHz)

Horizontal (Worst case)

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2483.5	55.49	-5.81	49.68	74	-24.32	Peak
2483.5	42.16	-5.81	36.35	54	-17.65	AVG
2500	54.32	-6.06	48.26	74	-25.74	Peak
2500	41.09	-6.06	35.03	54	-18.97	AVG

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

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2483.5	56.28	-5.81	50.47	74	-23.53	Peak
2483.5	42.37	-5.81	36.56	54	-17.44	AVG
2500	54.01	-6.06	47.95	74	-26.05	Peak
2500	41.82	-6.06	35.76	54	-18.24	AVG

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

Operation Mode: $\pi/4$ DQPSK Low (2402MHz)

Horizontal (Worst case)

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2310	55.36	-5.81	49.55	74	-24.45	Peak
2310	42.15	-5.81	36.34	54	-17.66	AVG
2390	54.83	-5.84	48.99	74	-25.01	Peak
2390	40.06	-5.84	34.22	54	-19.78	AVG
2400	55.56	-5.95	49.61	74	-24.39	Peak
2400	41.27	-5.95	35.32	54	-18.68	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2310	57.92	-5.81	52.11	74	-21.89	Peak
2310	44.13	-5.81	38.32	54	-15.68	AVG
2390	56.28	-5.84	50.44	74	-23.56	Peak
2390	43.15	-5.84	37.31	54	-16.69	AVG
2400	58.14	-5.95	52.19	74	-21.81	Peak
2400	44.06	-5.95	38.11	54	-15.89	AVG

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



Operation Mode: $\pi/4$ DQPSK High (2480MHz)
Horizontal (Worst case)

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2483.5	56.24	-5.81	50.43	74	-23.57	Peak
2483.5	43.37	-5.81	37.56	54	-16.44	AVG
2500	55.18	-6.06	49.12	74	-24.88	Peak
2500	43.65	-6.06	37.59	54	-16.41	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2483.5	55.37	-5.81	49.56	74	-24.44	Peak
2483.5	43.68	-5.81	37.87	54	-16.13	AVG
2500	56.32	-6.06	50.26	74	-23.74	Peak
2500	42.06	-6.06	36	54	-18	AVG

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



Operation Mode: 8DPSK Low (2402MHz)

Horizontal (Worst case)

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2310	55.17	-5.81	49.36	74	-24.64	Peak
2310	43.06	-5.81	37.25	54	-16.75	AVG
2390	54.28	-5.84	48.44	74	-25.56	Peak
2390	43.76	-5.84	37.92	54	-16.08	AVG
2400	57.29	-5.95	51.34	74	-22.66	Peak
2400	45.07	-5.95	39.12	54	-14.88	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2310	58.43	-5.81	52.62	74	-21.38	Peak
2310	45.12	-5.81	39.31	54	-14.69	AVG
2390	55.13	-5.84	49.29	74	-24.71	Peak
2390	43.76	-5.84	37.92	54	-16.08	AVG
2400	59.15	-5.95	53.2	74	-20.8	Peak
2400	44.09	-5.95	38.14	54	-15.86	AVG

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



Operation Mode: 8DPSK High (2480MHz)
Horizontal (Worst case)

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2483.5	55.73	-5.81	49.92	74	-24.08	Peak
2483.5	44.06	-5.81	38.25	54	-15.75	AVG
2500	57.2	-6.06	51.14	74	-22.86	Peak
2500	43.72	-6.06	37.66	54	-16.34	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
2483.5	57.69	-5.81	51.88	74	-22.12	Peak
2483.5	43.17	-5.81	37.36	54	-16.64	AVG
2500	56.28	-6.06	50.22	74	-23.78	Peak
2500	43.06	-6.06	37	54	-17	AVG

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

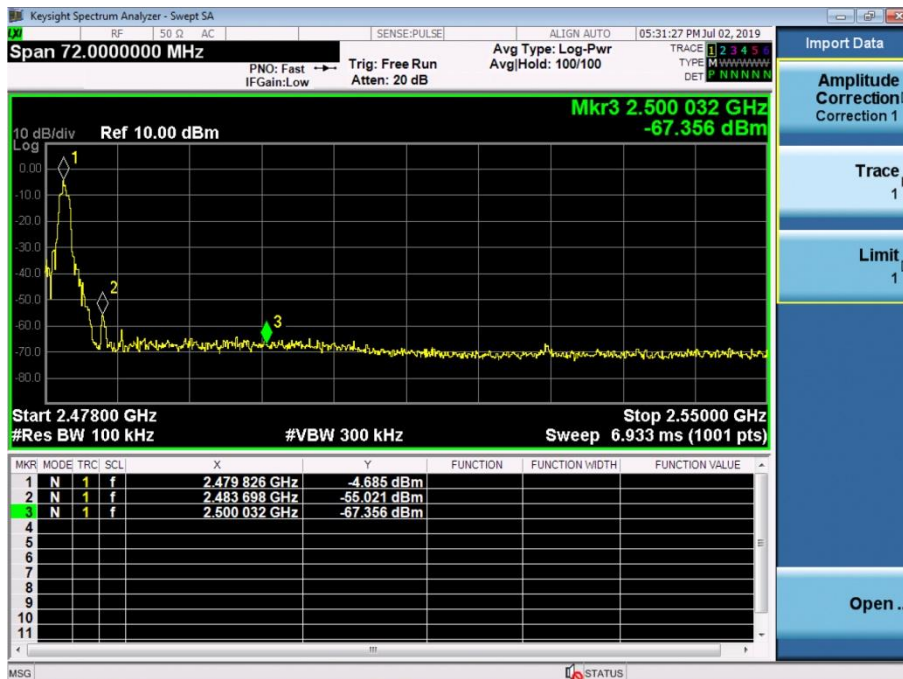


Conduction: GFSK

2402



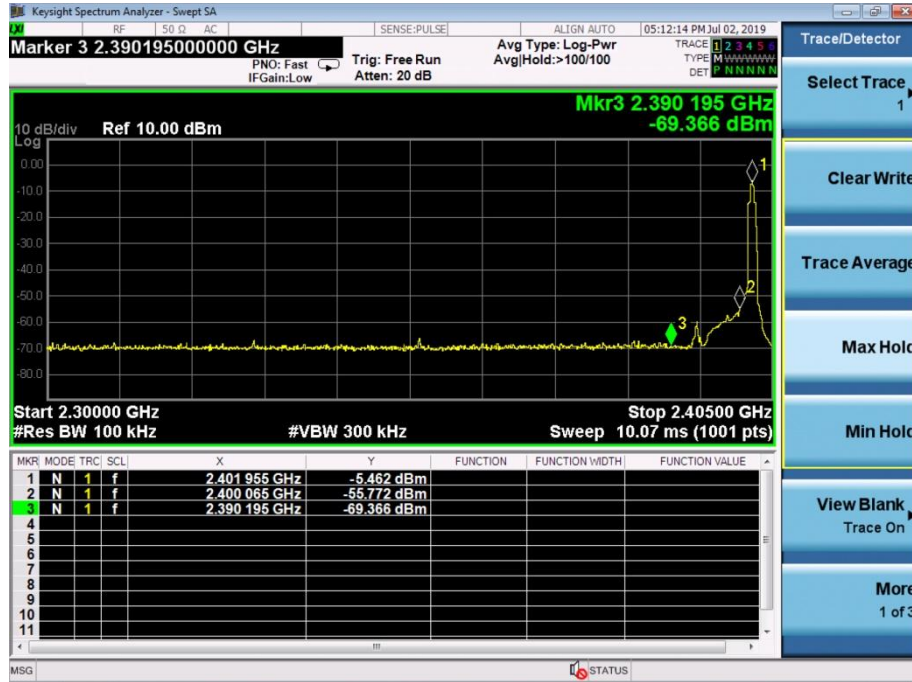
2480



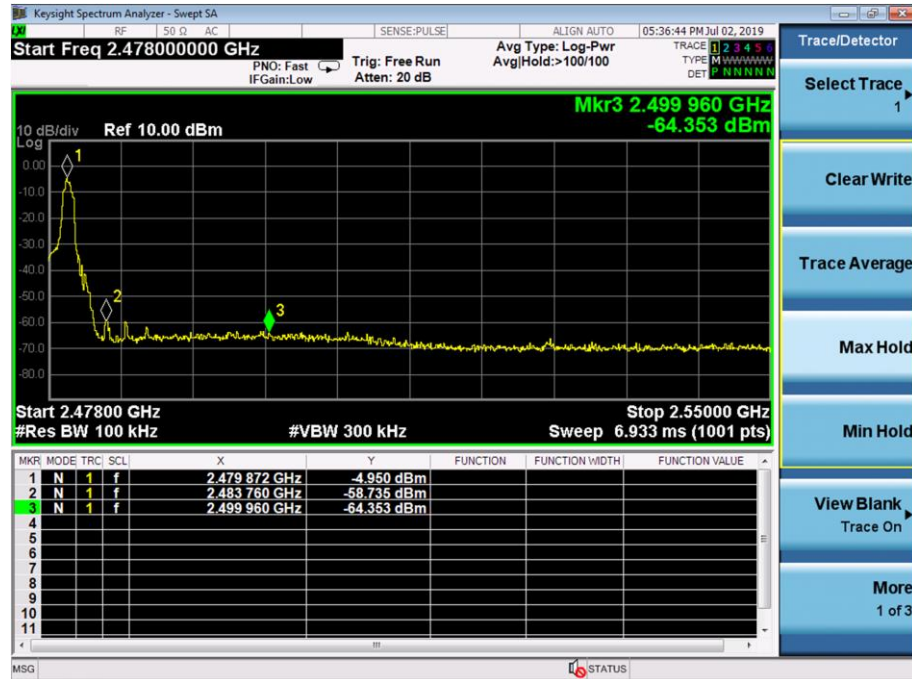


Conduction: $\pi/4$ DQPSK

2402



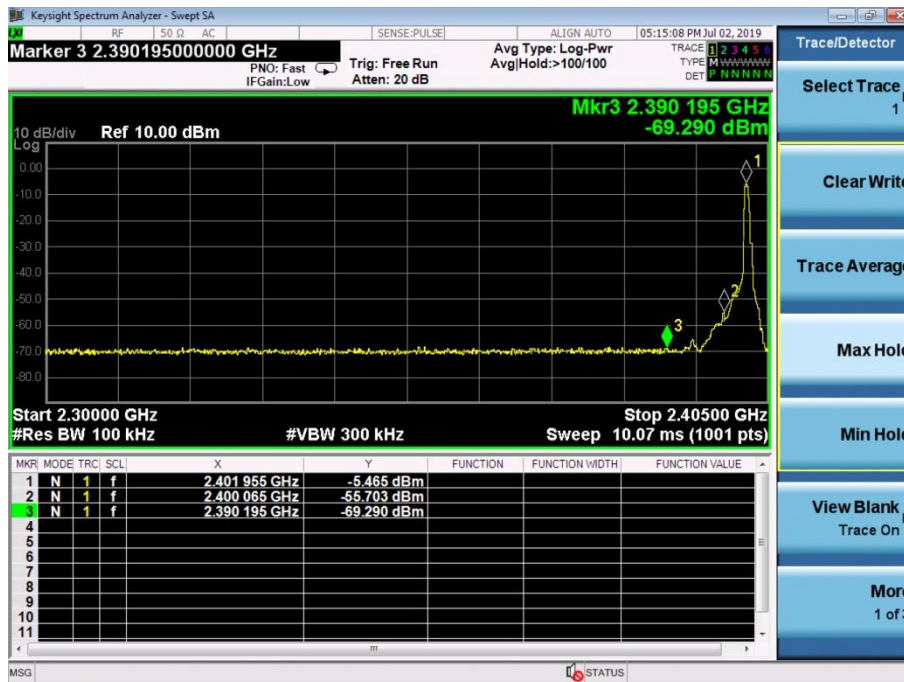
2480



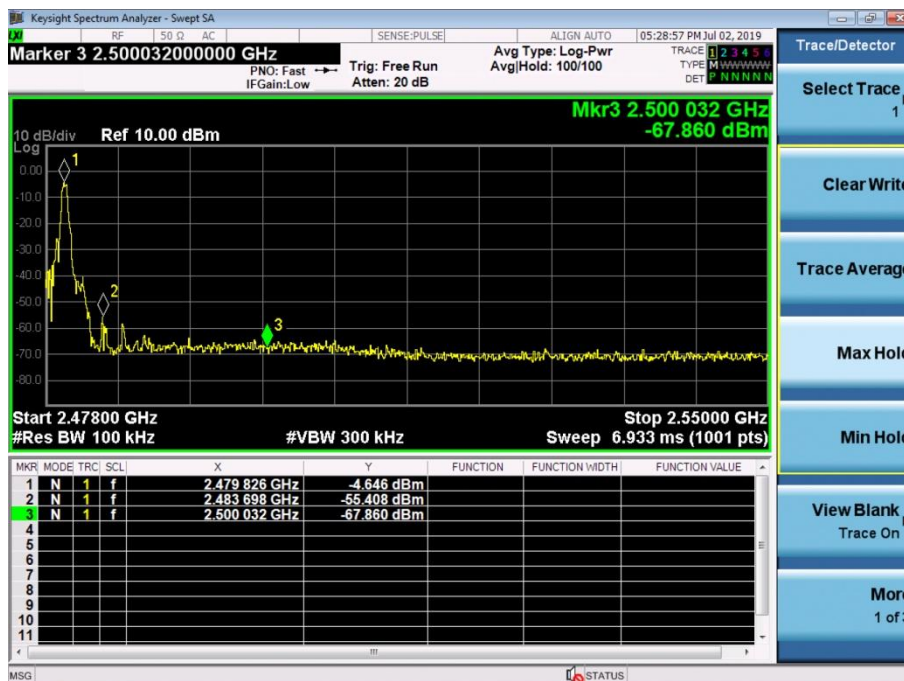


Conduction: 8DPSK

2402



2480





6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Setup

Same as Radiated 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= 100KHz. VBW= 300 KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

6.3 Measurement Equipment Used

Same as Radiated Emission Measurement

6.4 Test Result

PASS

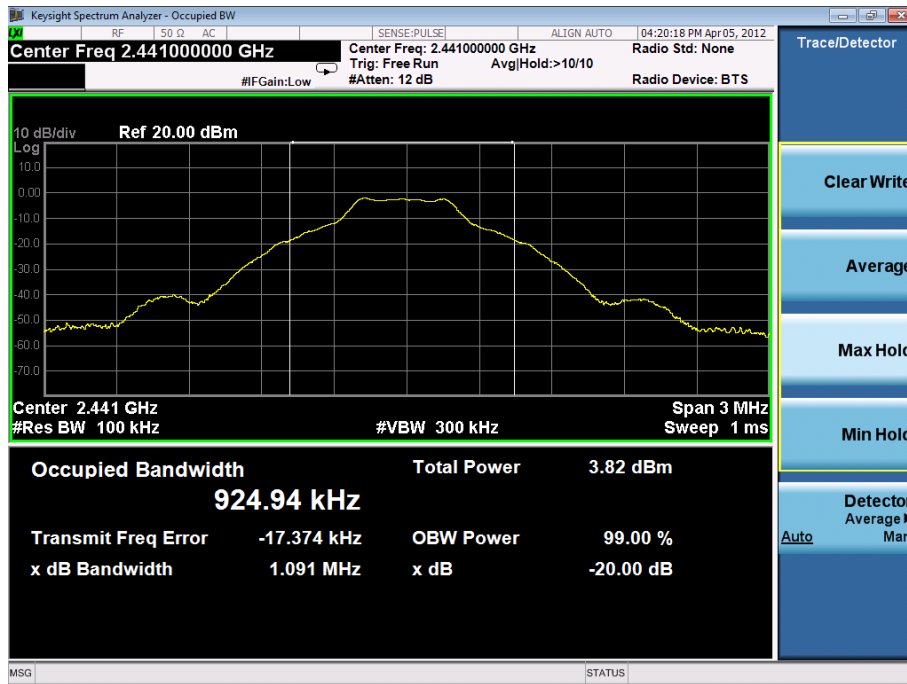
Modulation Type	Frequency	20dB Bandwidth (MHz)	Result
GFSK	2402 MHz	1.019	PASS
	2441 MHz	0.925	PASS
	2480 MHz	0.996	PASS

CH: 2402MHz

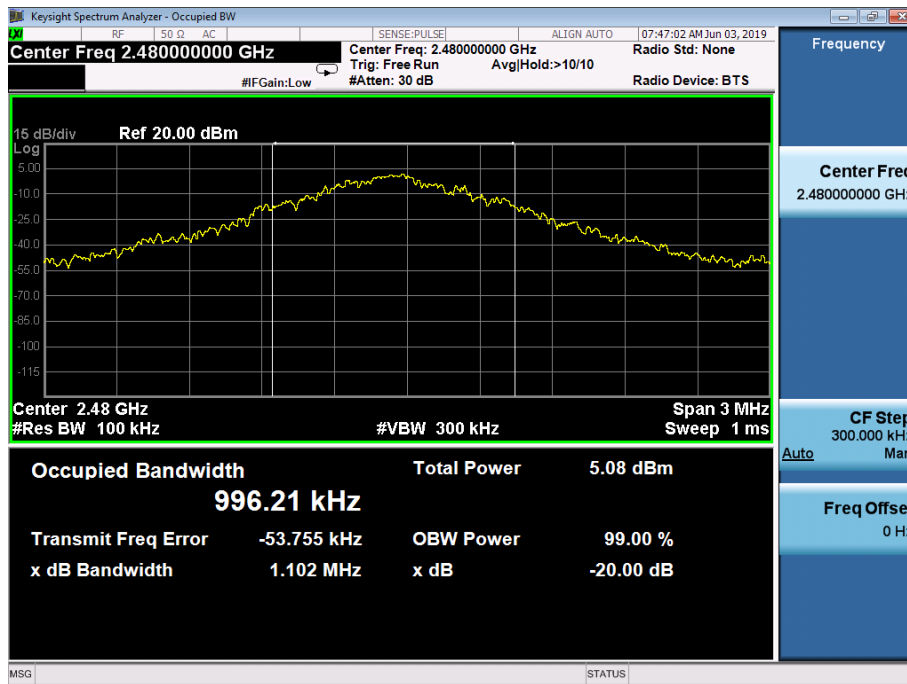




CH: 2441MHz



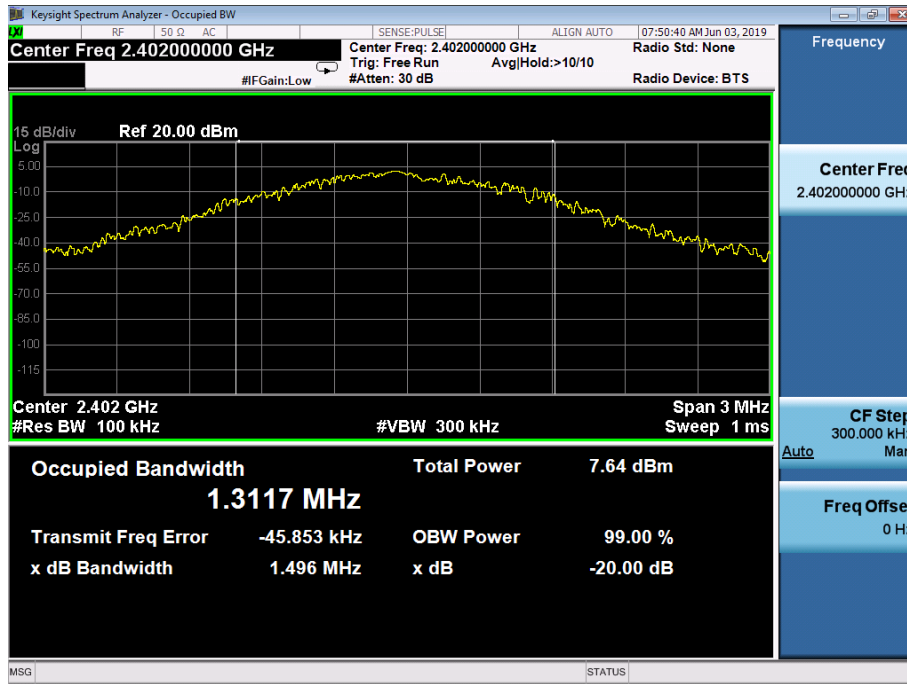
CH: 2480MHz





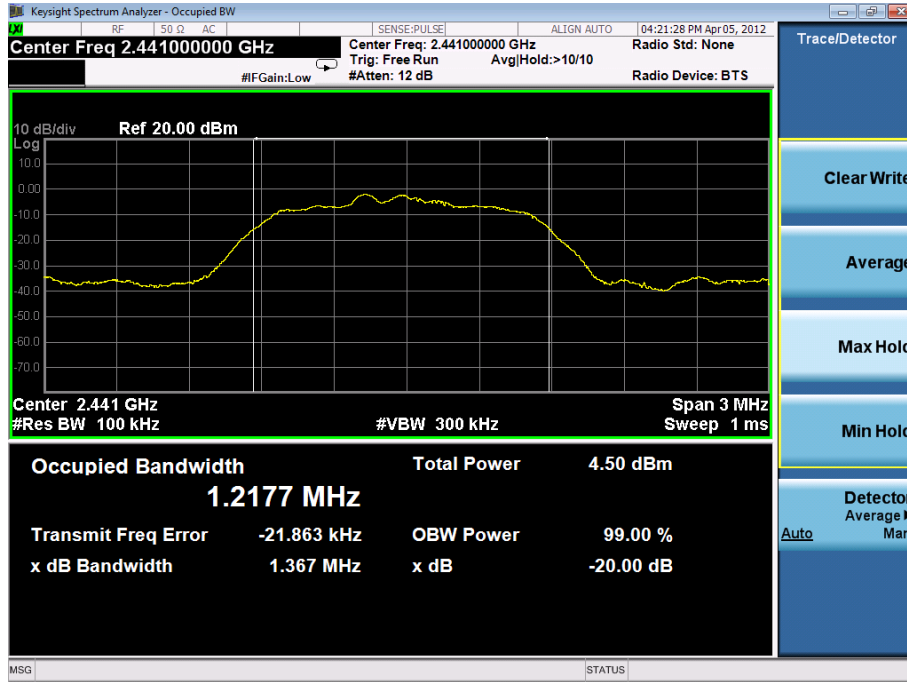
Modulation Type	Frequency	20dB Bandwidth (MHz)	Result
$\pi/4$ DQPSK	2402 MHz	1.312	PASS
	2441 MHz	1.218	PASS
	2480 MHz	1.141	PASS

CH: 2402MHz

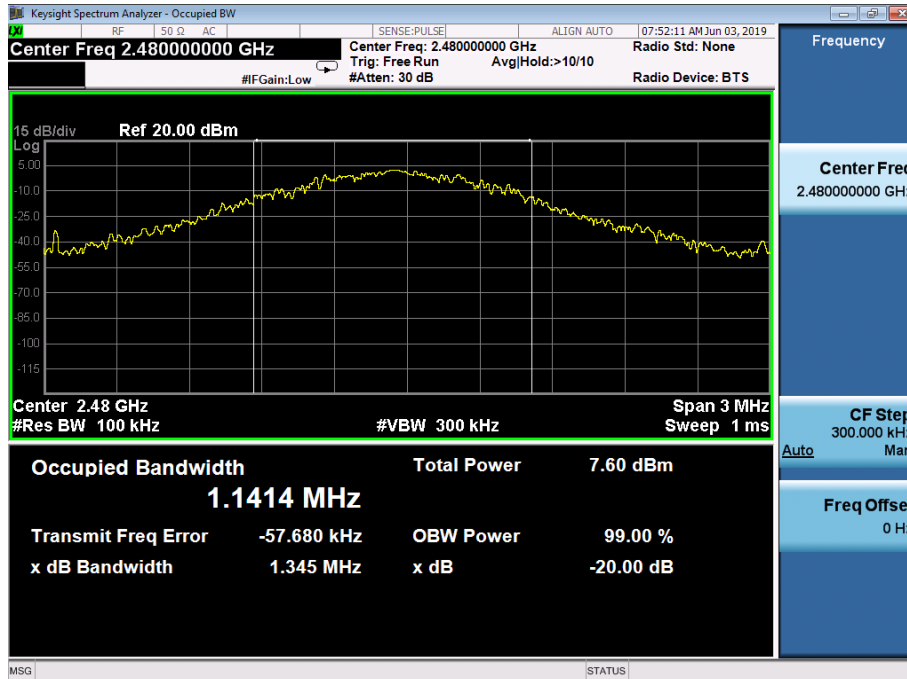




CH: 2441MHz



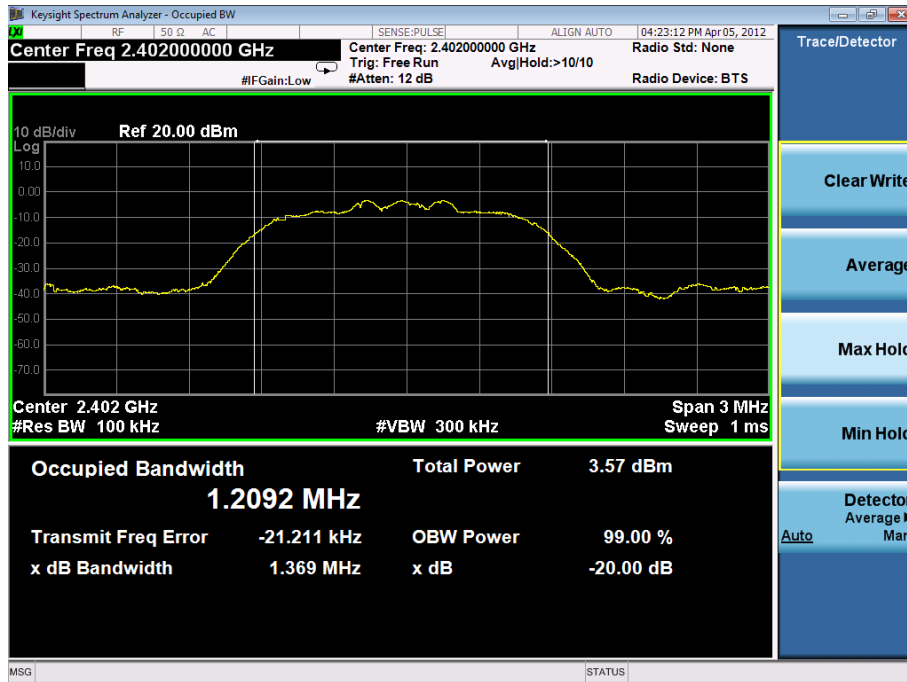
CH: 2480MHz





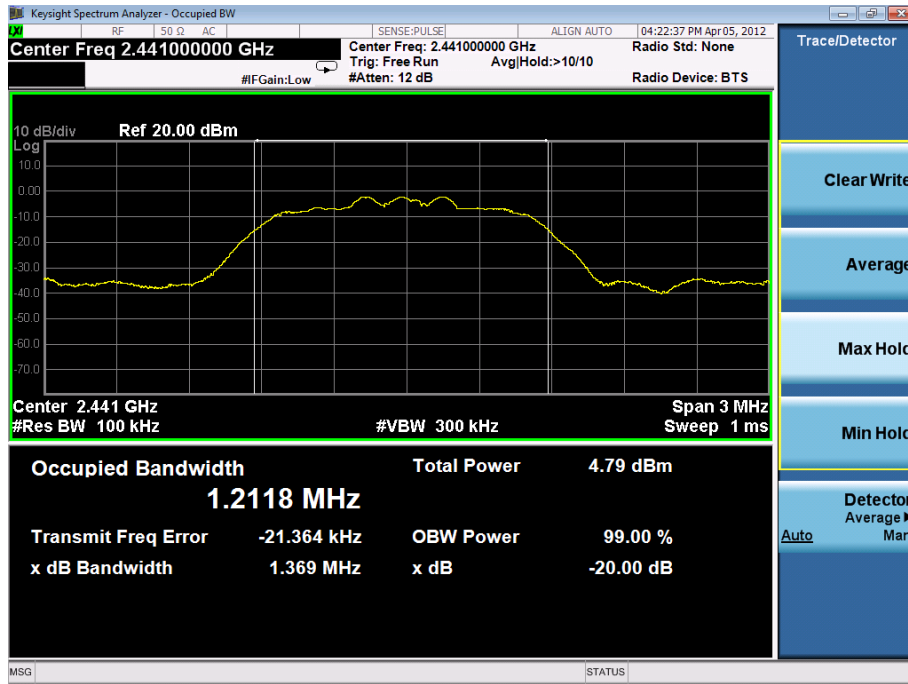
Modulation Type	Frequency	20dB Bandwidth (MHz)	Result
8DPSK	2402 MHz	1.209	PASS
	2441 MHz	1.212	PASS
	2480 MHz	1.214	PASS

CH: 2402MHz

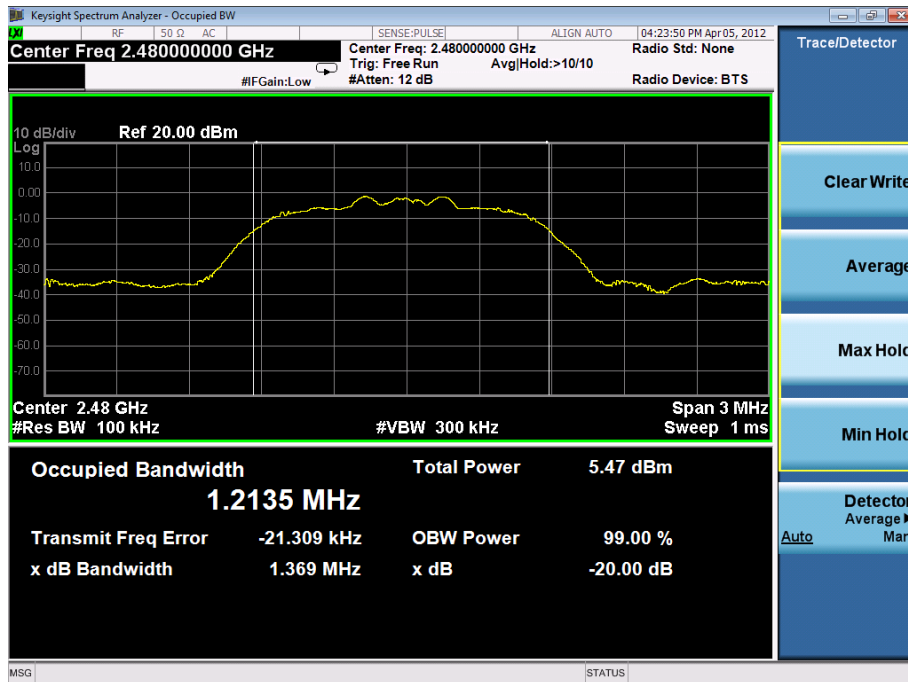




CH: 2441MHz



CH: 2480MHz



7 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. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

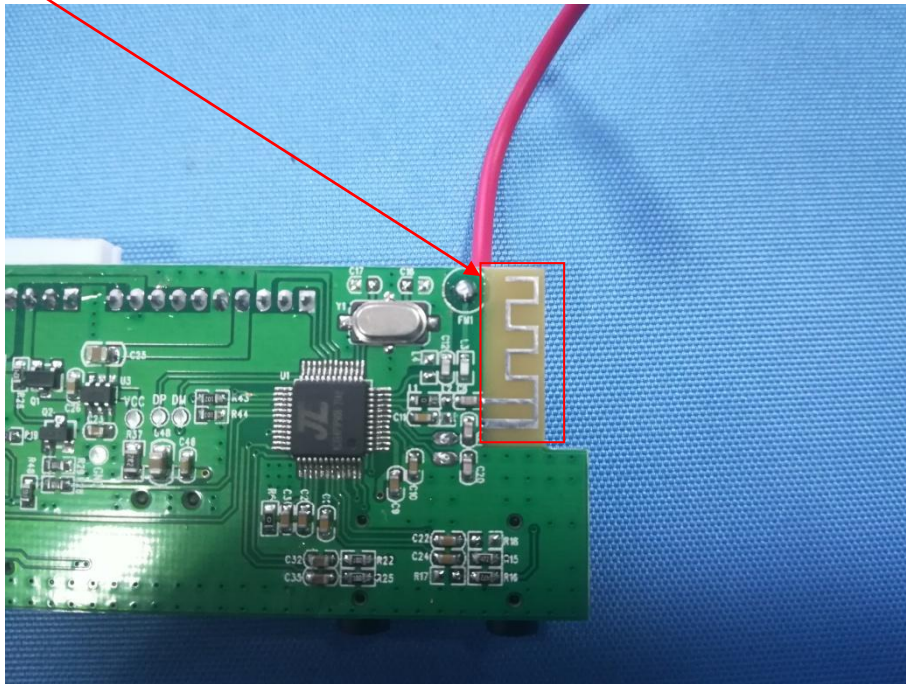
Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

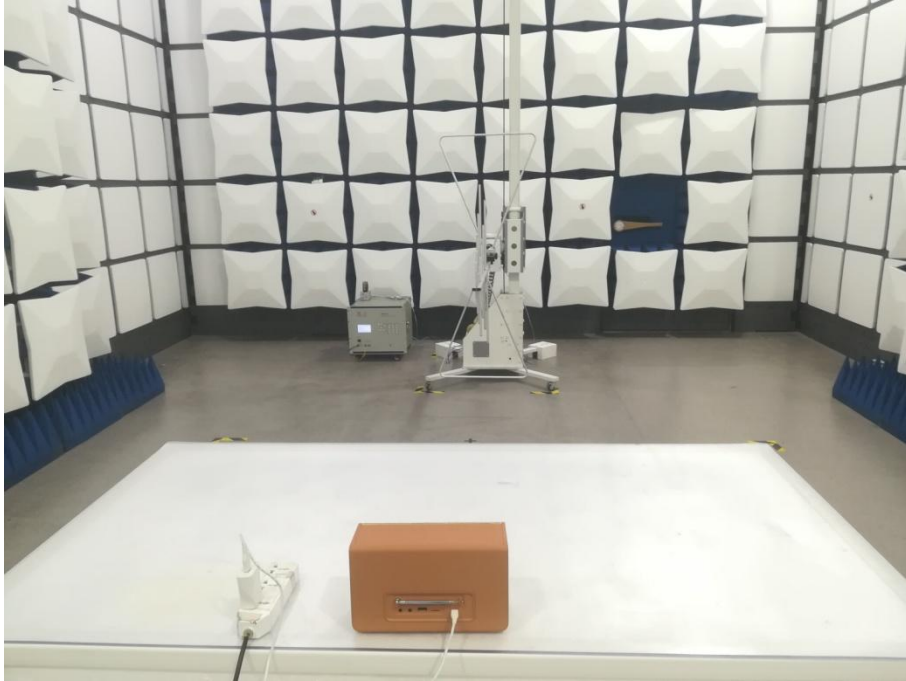
The antenna used in this product is a PCB Antenna, The directional gains of antenna used for transmitting is 0dBi.

ANTENNA



8 PHOTOGRAPH OF TEST

8.1 Radiated Emission



8.2 Conducted Emission





EUT
Photo 1



Photo 2

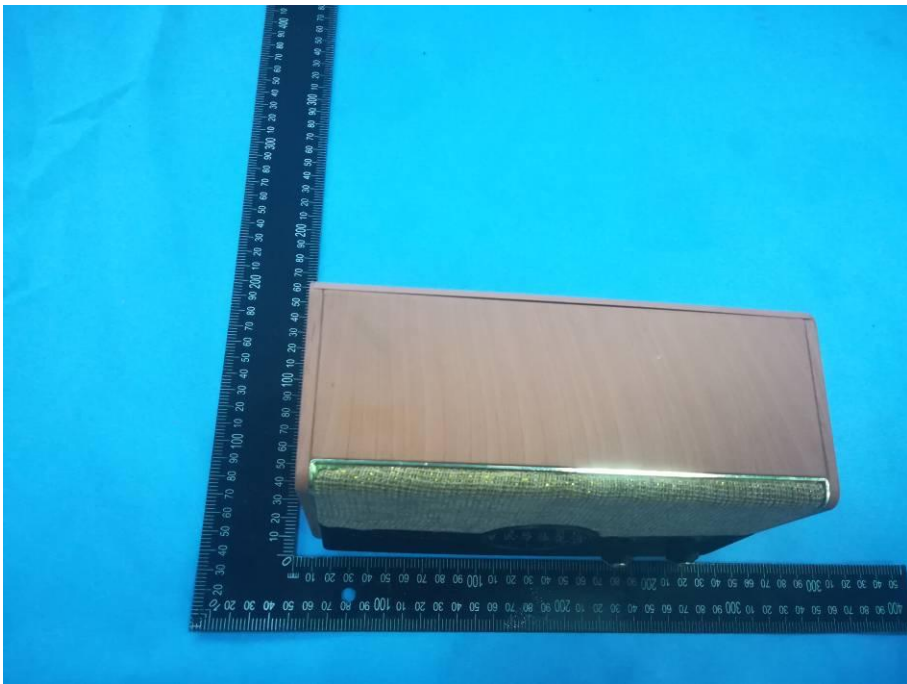


Photo 3



Photo 4

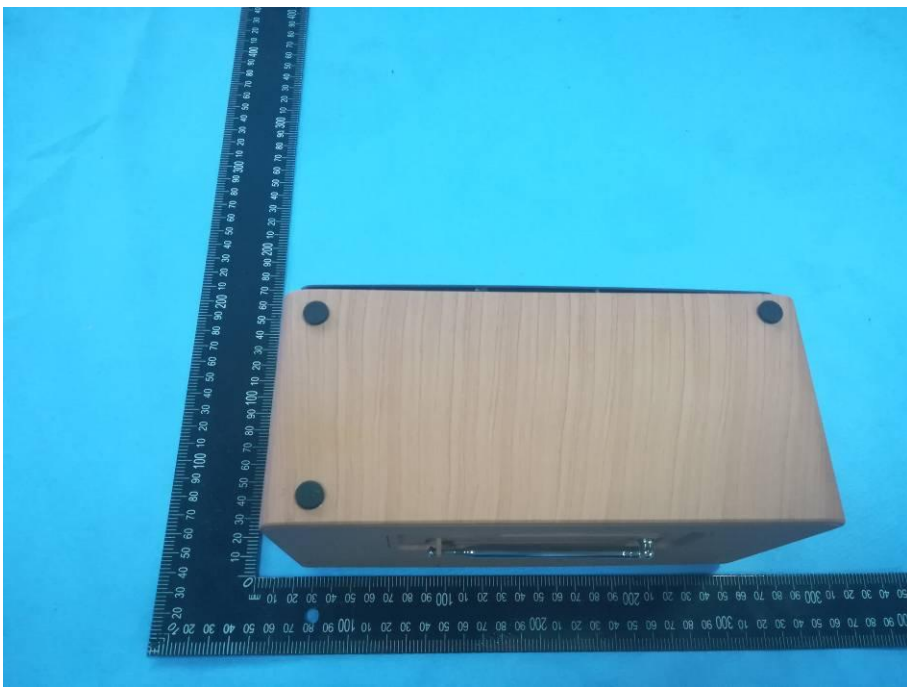


Photo 5

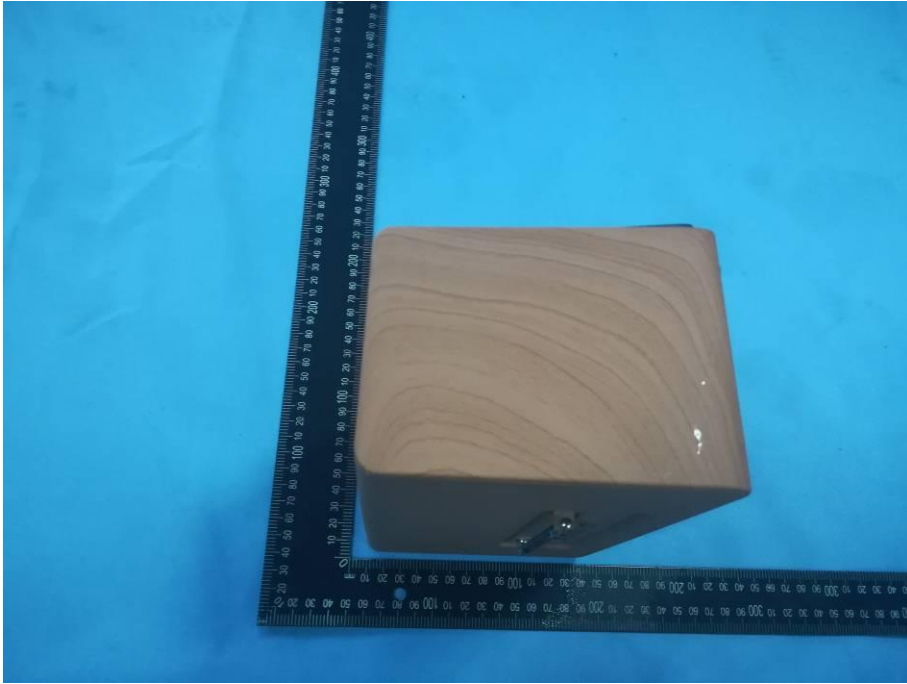


Photo 6

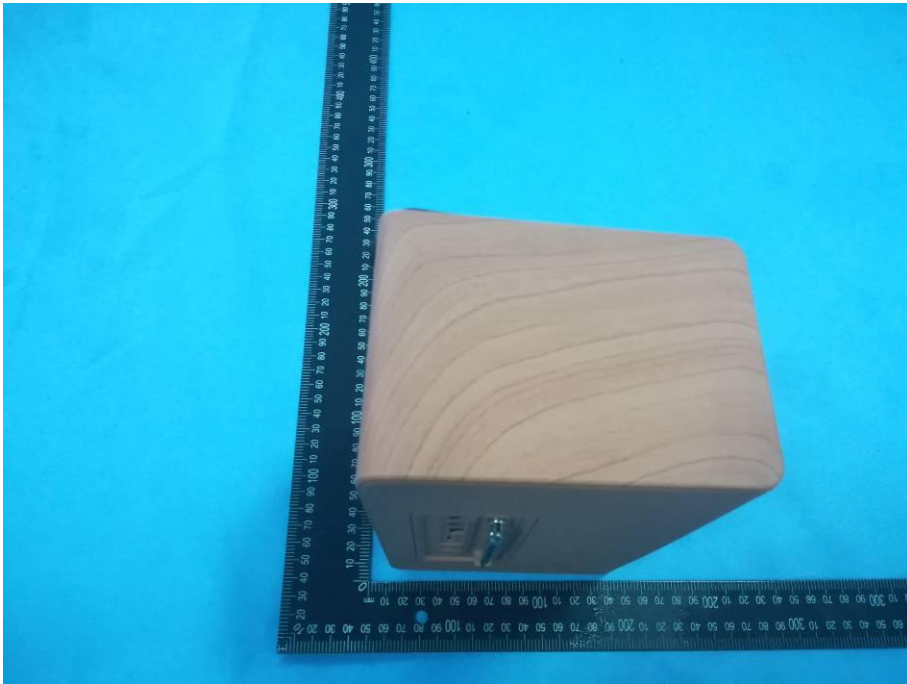


Photo 7

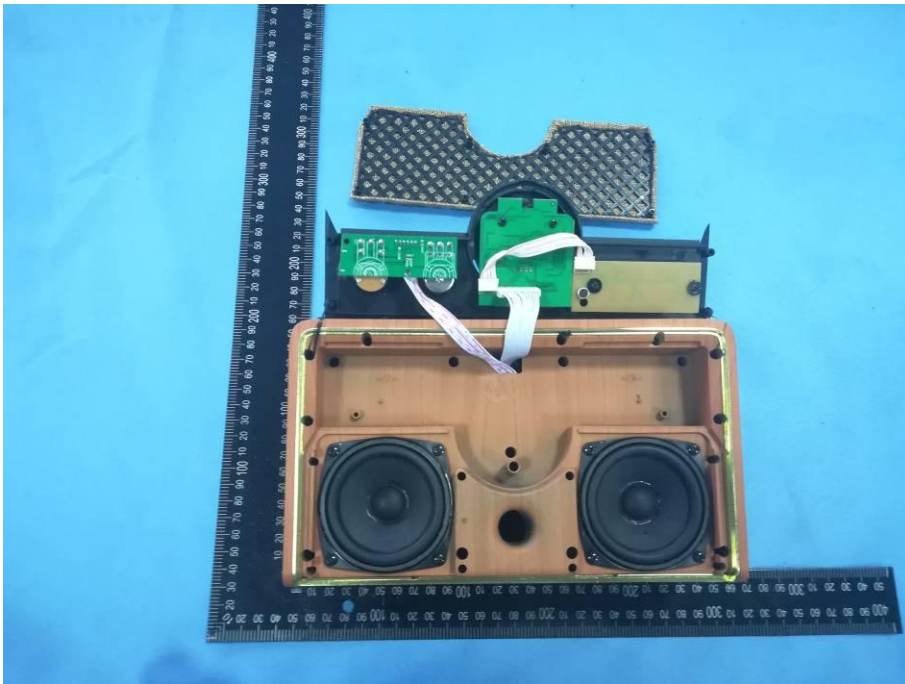


Photo 8

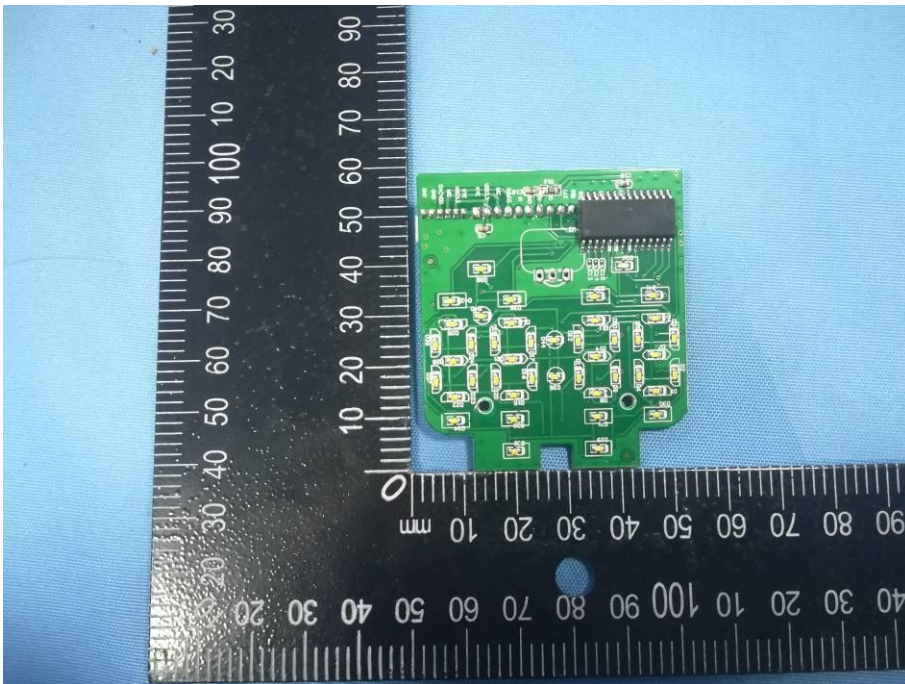




Photo 9

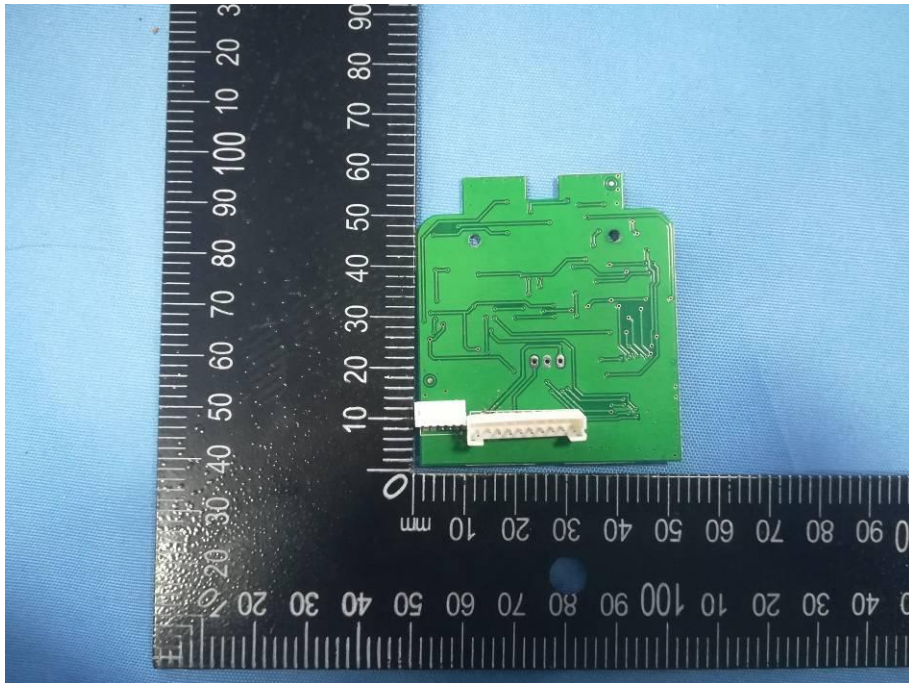


Photo 10

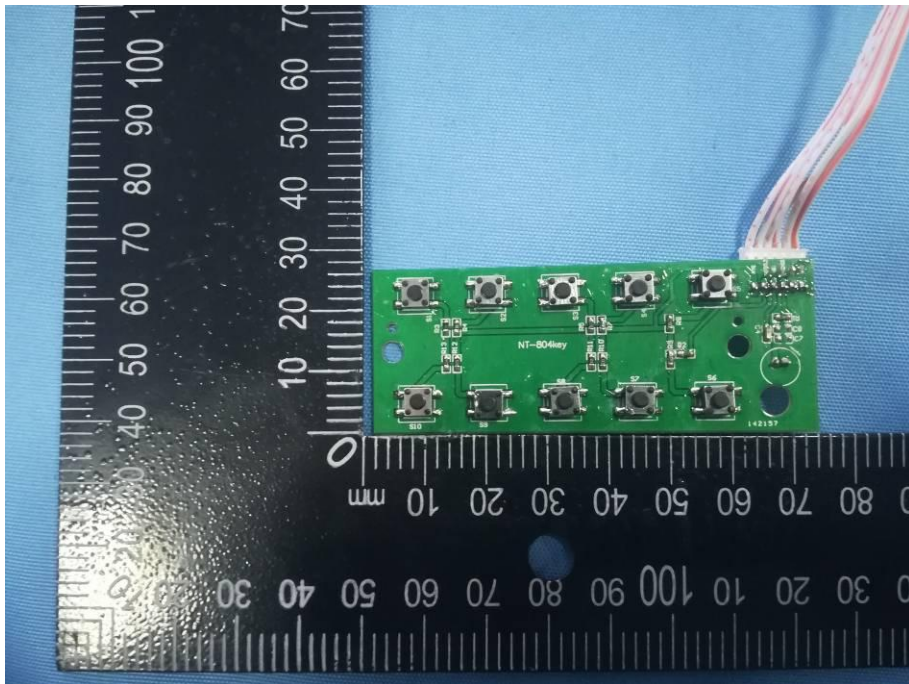


Photo 11

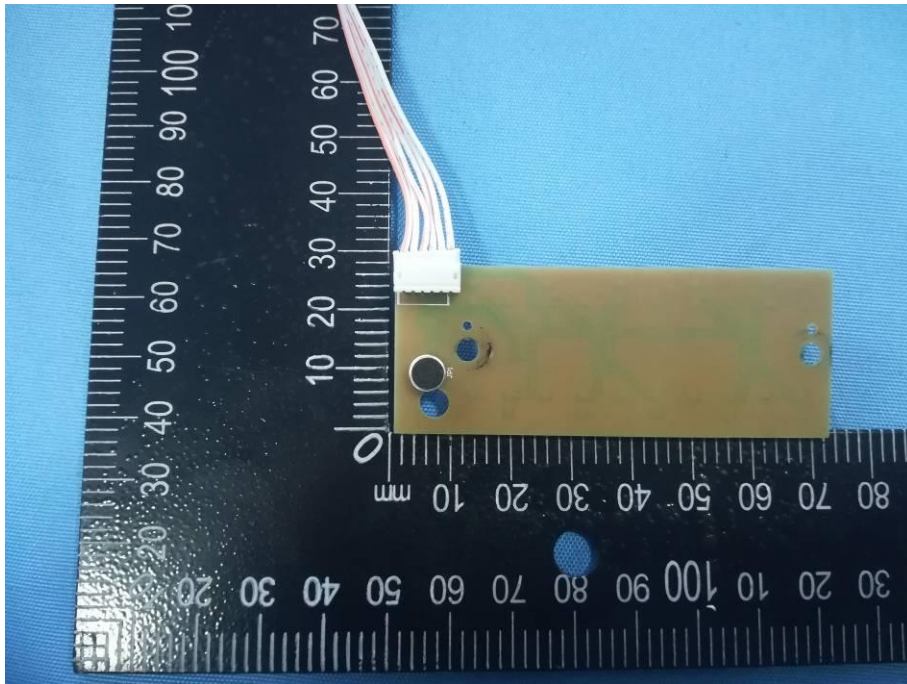


Photo 12

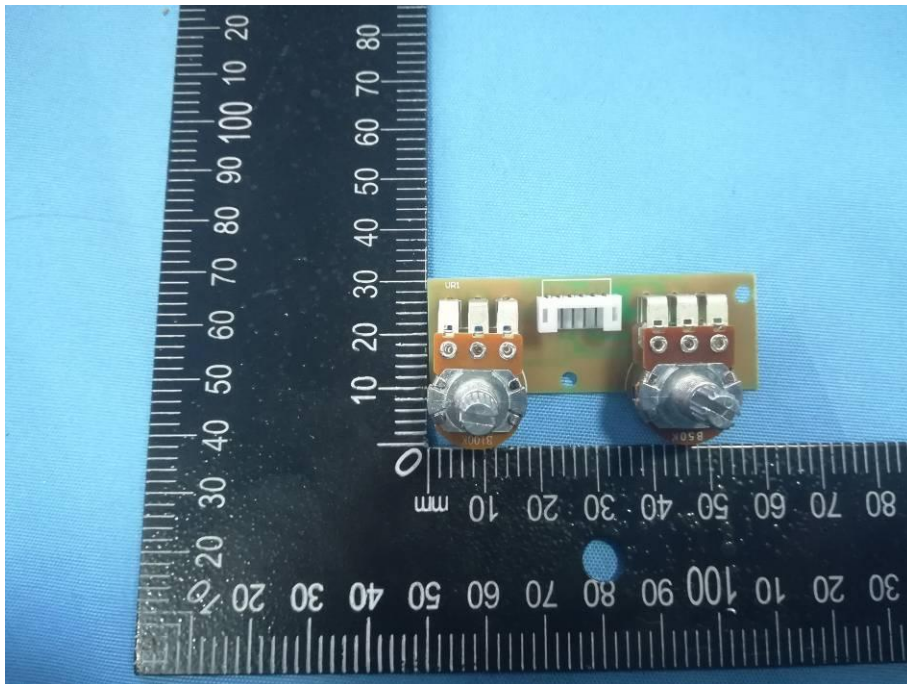


Photo 13

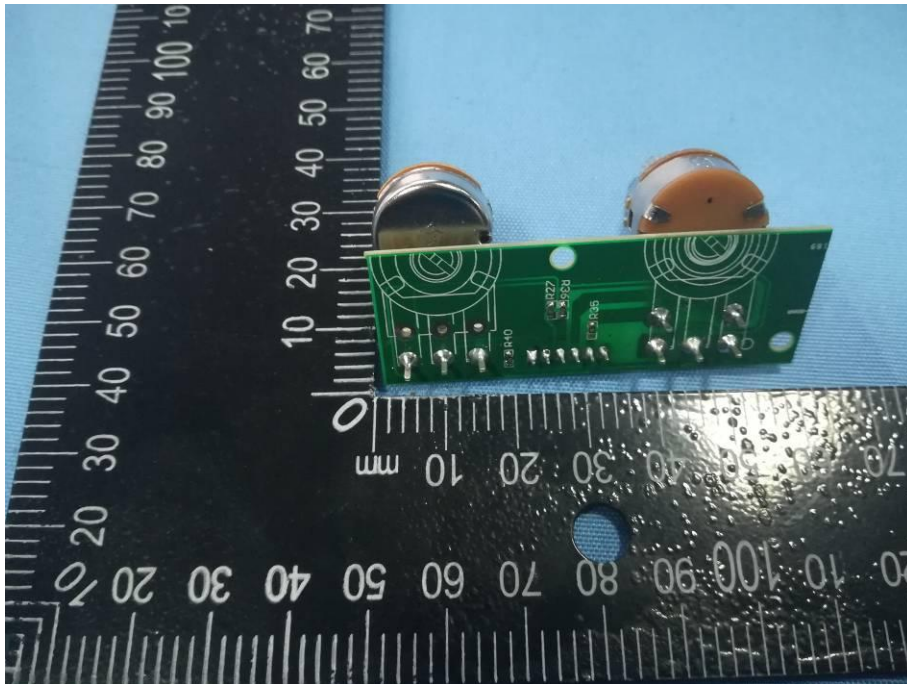


Photo 14

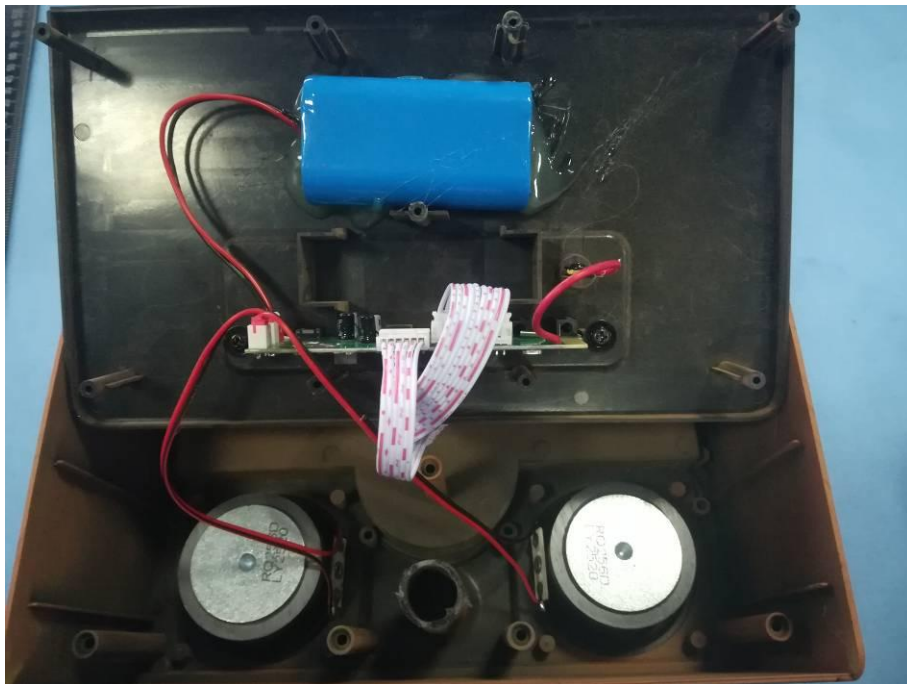


Photo 15

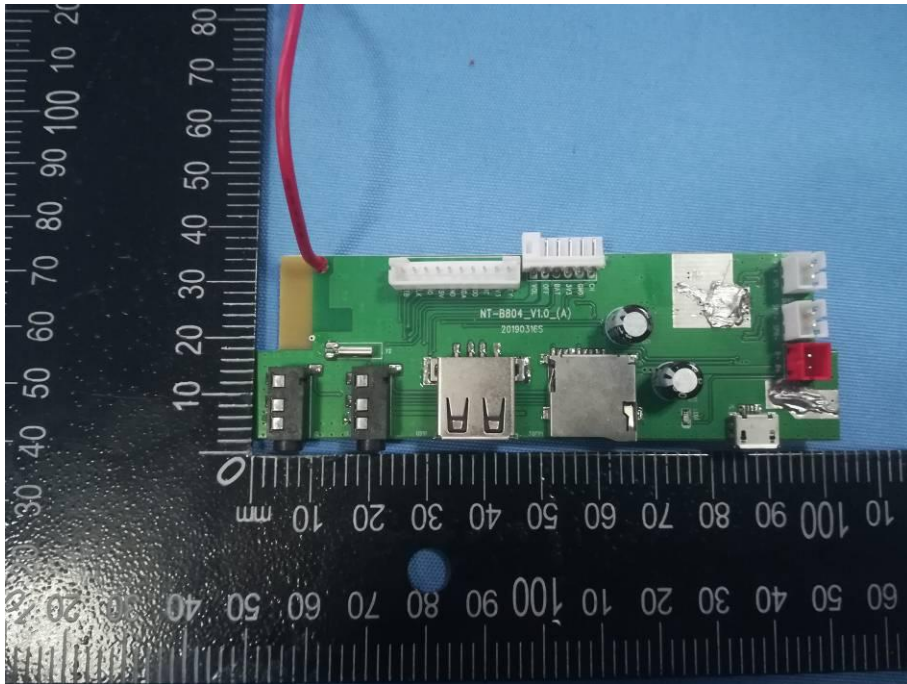


Photo 16

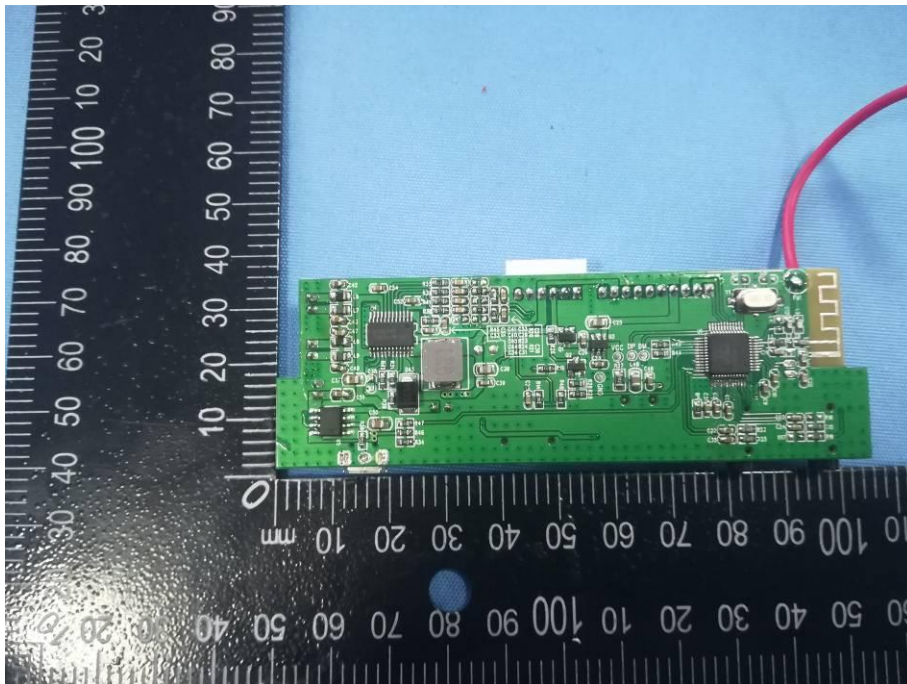




Photo 17

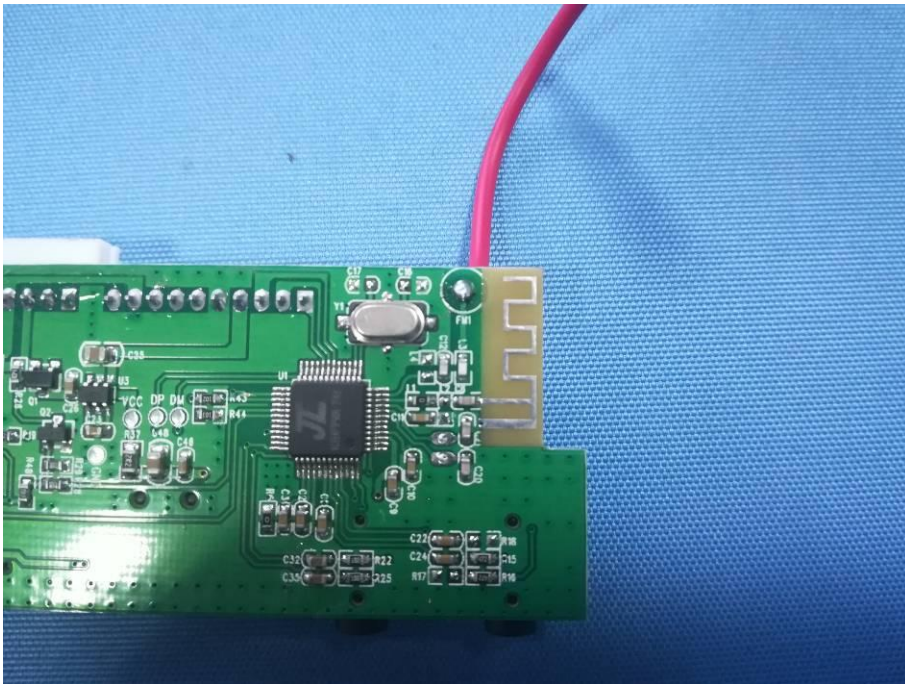


Photo 18

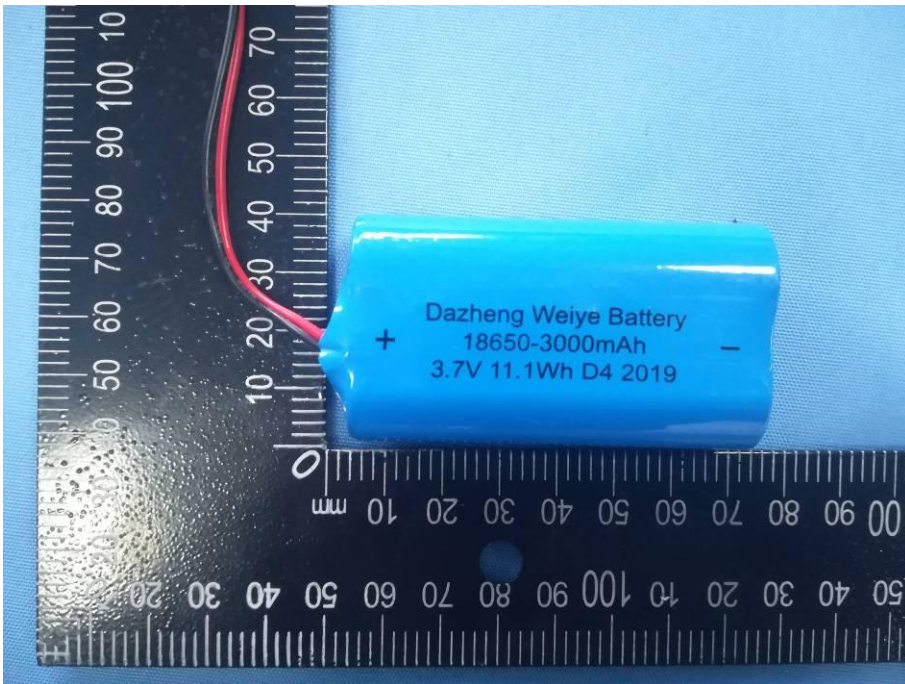
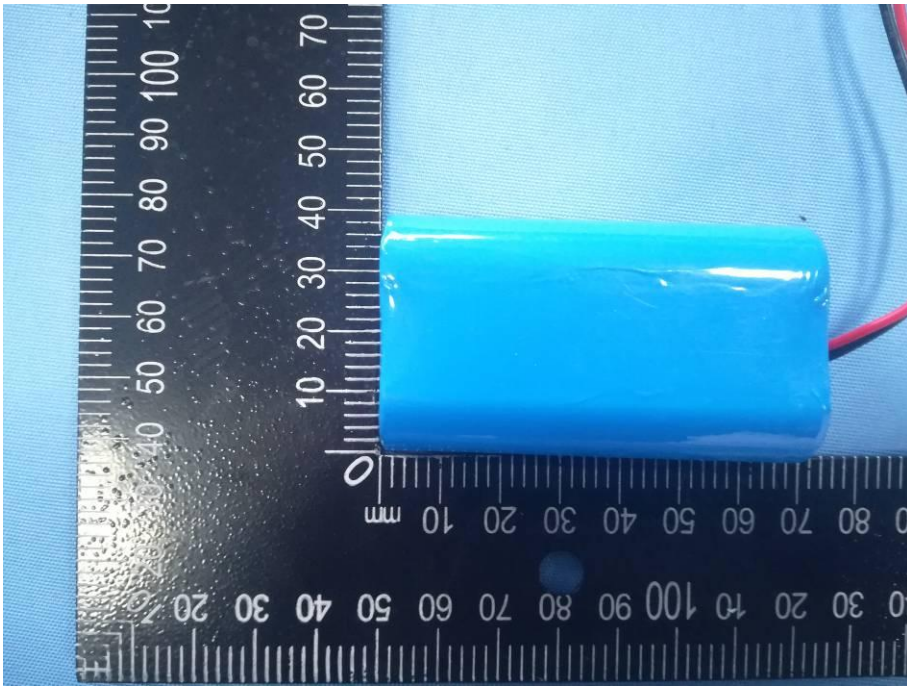




Photo 19



--The end of report--