FCC RADIO TEST REPORT

FCC ID: 2APURMUSEN2018

Product： PROGEAR Wireless Sport Earbuds

Trade Name： N/A

Model Name： PROGEAR

Serial Model： T1,T2,T3,T4,T5,T6,T7,T8,T9,T10,T11,T12, T13,T14,T15,T16,T17,T18,T19,T20

Report No.： UNIA2018050836-1FR-01

Prepared for

Shenzhen Musen Technology Co., Ltd

Rm 2899, 28/F, Block C, Electronic Technology Building, Huafanorth Road, Futian, Shenzhen, China

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 RESULT CERTIFICATION

Applicant's name ..... :	Shenzhen Musen Technology Co., Ltd
Address ..... :	Rm 2899, 28/F, Block C, Electronic Technology Building, Huafanorth Road, Futian, Shenzhen, China
Manufacture's Name ..... :	Shenzhen Musen Technology Co., Ltd
Address ..... :	Rm 2899, 28/F, Block C, Electronic Technology Building, Huafanorth Road, Futian, Shenzhen, China
Product description	
Trade Mark ..... :	N/A
Product name..... :	PROGEAR Wireless Sport Earbuds
Model and/or type reference :	PROGEAR,T1,T2,T3,T4,T5,T6,T7,T8,T9,T10,T11,T12,T13,T14, T15,T16,T17,T18,T19,T20
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.....:	May 10, 2018 ~ May 18, 2018
Date of Issue .....:	May 18, 2018
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

2.4 DESCRIPTION OF TEST SETUP 6

2.5 MEASUREMENT 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 25

8 PHOTOGRAPH OF TEST 26

8.1 Radiated Emission 26

8.2 Conducted Emission 27

1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

1.2 TEST FACILITY

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

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, 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: 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=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	PROGEAR Wireless Sport Earbuds
Model Name	PROGEAR
Serial No.	T1,T2,T3,T4,T5,T6,T7,T8,T9,T10,T11,T12,T13,T14,T15, T16,T17,T18,T19,T20
Trade Mark	N/A
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: PROGEAR.
FCC ID	2APURMUSEN2018
Antenna Type	PCB Antenna
Antenna Gain	0dBi
Frequency Range	2402-2480MHz
Number of Channels	79CH
Modulation Type	GFSK, π/4 DQPSK, 8DPSK
Battery	DC 3.7V, 80mAh
Power Source	DC 3.7V from Battery or DC 5V from adapter with AC 120V/60Hz
Adapter Model	M/N: HW-050100C2W Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V, 1A

2.2 Carrier Frequency of Channels

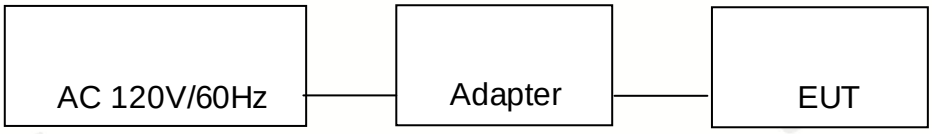
Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	21	2423	42	2444	63	2465
01	2403	22	2424	43	2445	64	2466
02	2404	23	2425	44	2446	65	2467
03	2405	24	2426	45	2447	66	2468
04	2406	25	2427	46	2448	67	2469
05	2407	26	2428	47	2449	68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

2.3 Operation of EUT during testing

Operating Mode
The mode is used: Transmitting mode
Low Channel: 2402MHz
Middle Channel: 2441MHz
High Channel: 2480MHz

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation and Above1GHz Radiation testing:

2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2018.9.29
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2018.9.29
3	PREAMP	HP	8449B	3008A00160	2018.9.9
4	PREAMP	HP	8447D	2944A07999	2018.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2018.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2018.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2018.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2018.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2018.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2018.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2018.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2018.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2019.3.14
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2019.3.14
15	RF power divider	Anritsu	K241B	992289	2018.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2018.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2018.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2018.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2018.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.1.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2018.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.03.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2018.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

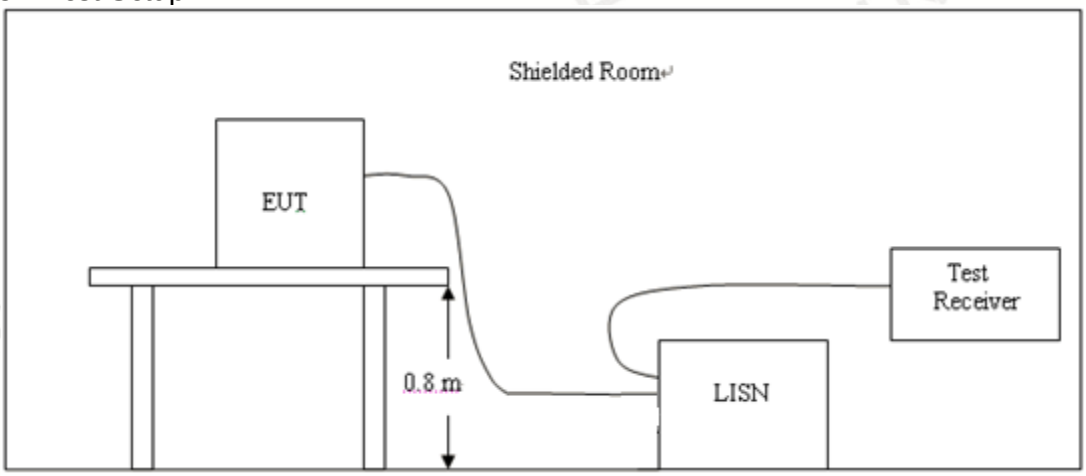
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

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

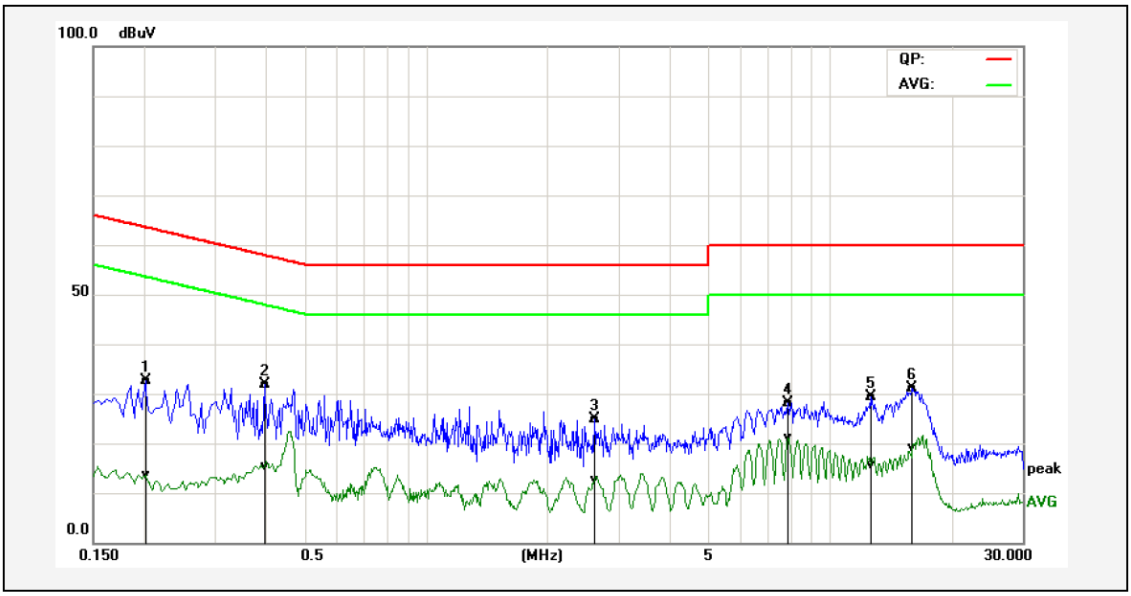
1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
2, Support equipment, if needed, was placed as per ANSI 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 of GFSK, π/4 DQPSK, 8DPSK were tested at Low, Middle, and High channel, only the worst result of GFSK High Channel was reported as below:

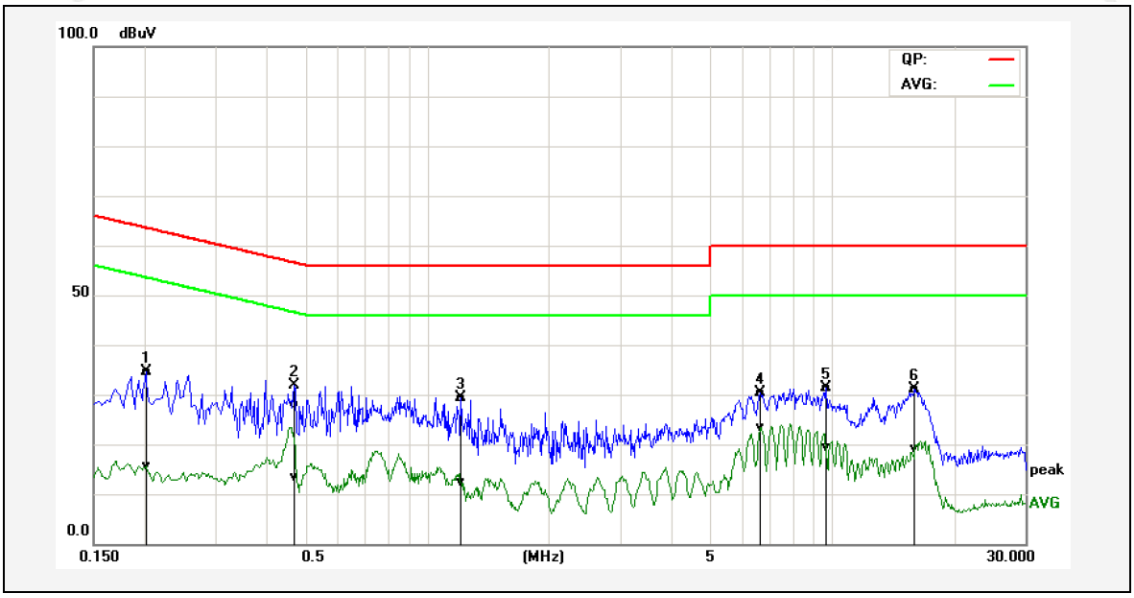
Test Specification: Line



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	0.2020	22.67	3.68	10.05	32.72	13.73	63.52	53.53	-30.80	-39.80	Pass
2*	0.3980	21.75	5.25	10.01	31.76	15.26	57.89	47.90	-26.13	-32.64	Pass
3P	2.6140	14.61	2.55	10.18	24.79	12.73	56.00	46.00	-31.21	-33.27	Pass
4P	7.8900	18.06	11.04	10.10	28.16	21.14	60.00	50.00	-31.84	-28.86	Pass
5P	12.5980	19.06	5.53	10.20	29.26	15.73	60.00	50.00	-30.74	-34.27	Pass
6P	16.0540	20.84	8.74	10.33	31.17	19.07	60.00	50.00	-28.83	-30.93	Pass

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

Test Specification: Neutral



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	0.2020	24.67	5.68	10.05	34.72	15.73	63.52	53.53	-28.80	-37.80	Pass
2P	0.4700	18.07	3.33	10.05	28.12	13.38	56.51	46.51	-28.39	-33.13	Pass
3*	1.2100	19.32	2.32	10.12	29.44	12.44	56.00	46.00	-26.56	-33.56	Pass
4P	6.6500	20.25	13.34	10.09	30.34	23.43	60.00	50.00	-29.66	-26.57	Pass
5P	9.6540	21.19	9.18	10.13	31.32	19.31	60.00	50.00	-28.68	-30.69	Pass
6P	16.0540	20.84	8.74	10.33	31.17	19.07	60.00	50.00	-28.83	-30.93	Pass

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

4 RADIATED EMISSION TEST

4.1 Radiation Limit

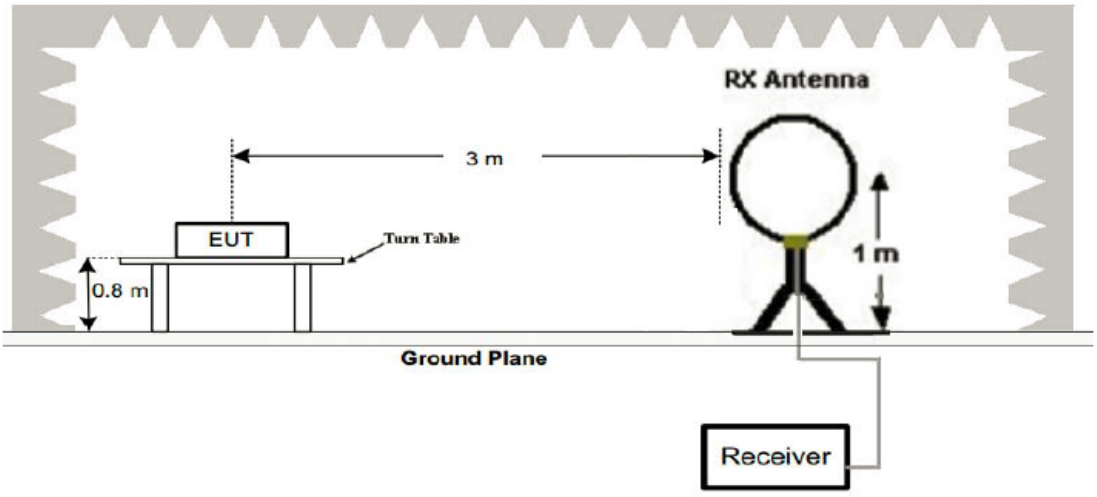
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated (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

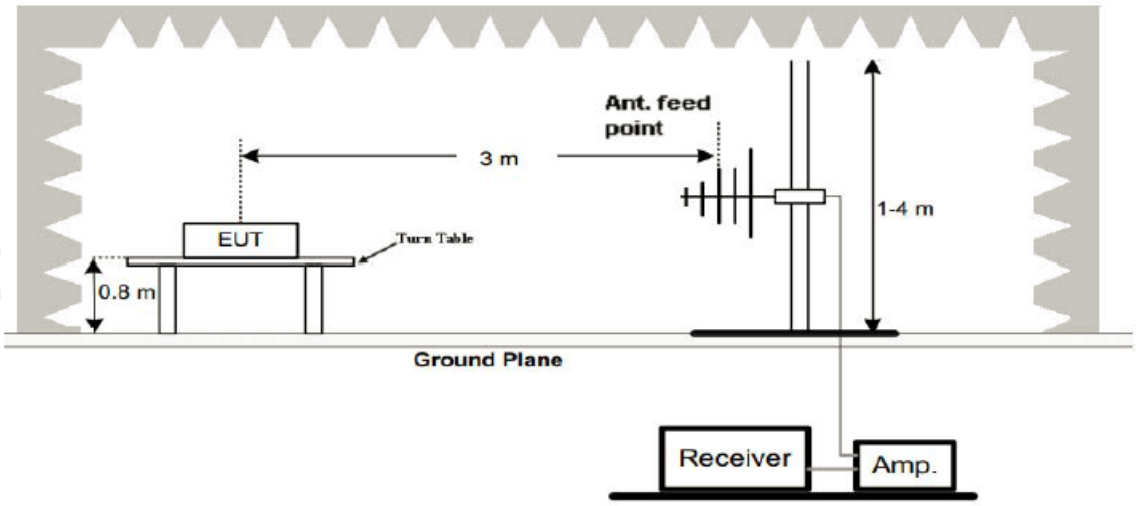
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

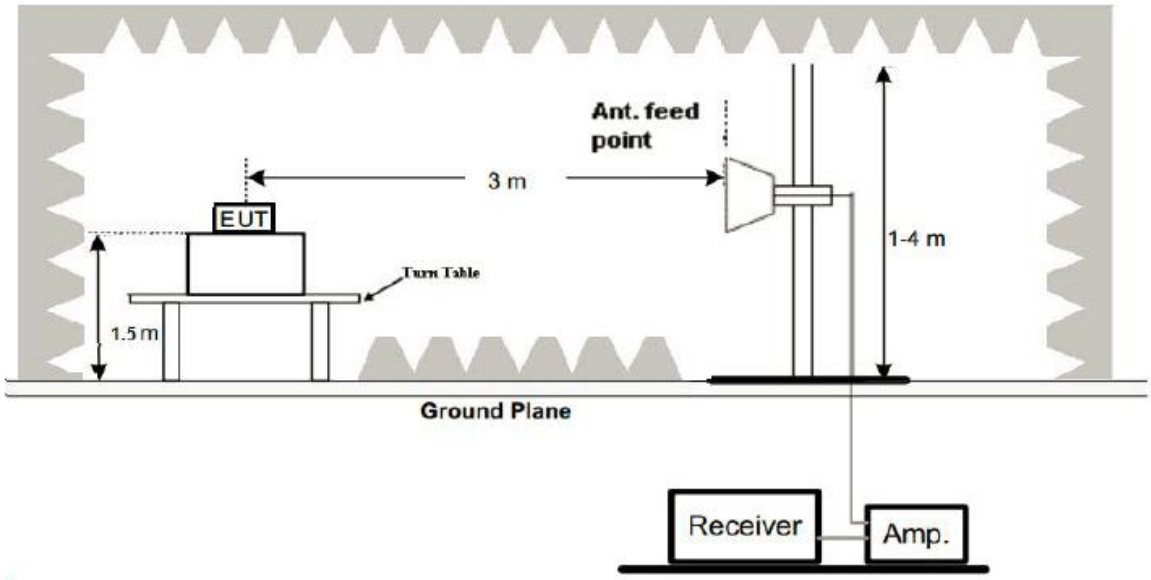
1. Radiated Emission Test-Up Frequency Below 30MHz



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 0.8m 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).

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

4.4 Test Result

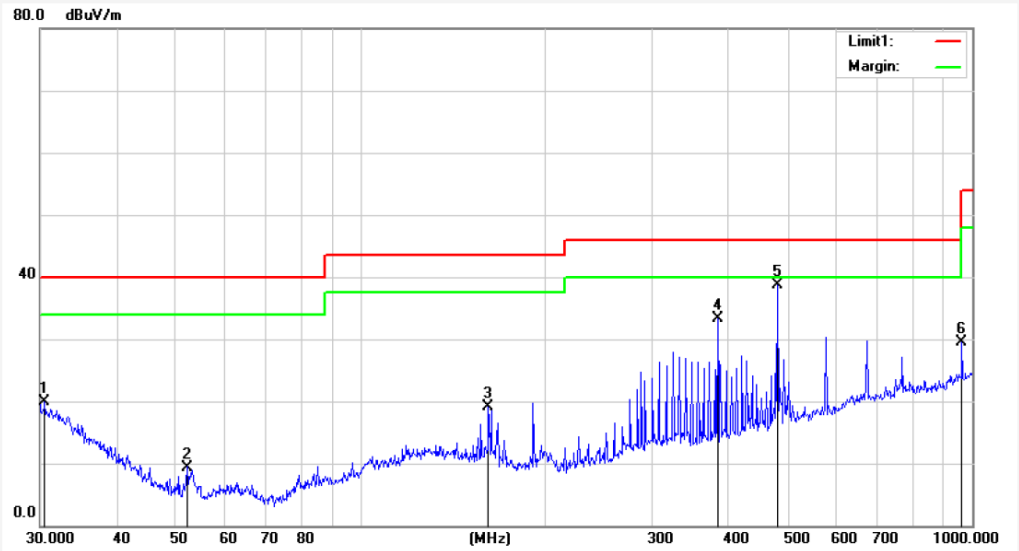
PASS

Remark:

1. All modes of GFSK, π/4 DQPSK, 8DPSK were test at Low, Middle, and High channel, only the worst result of GFSK DH5 Low Channel was reported for below 1GHz test.
2. For BT3.0 above 1GHz test all modes of GFSK, π/4 DQPSK, and 8DPSK were test at Low, Middle, and High channel, only the worst result of GFSK DH5 was reported.
3. 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.
4. 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:

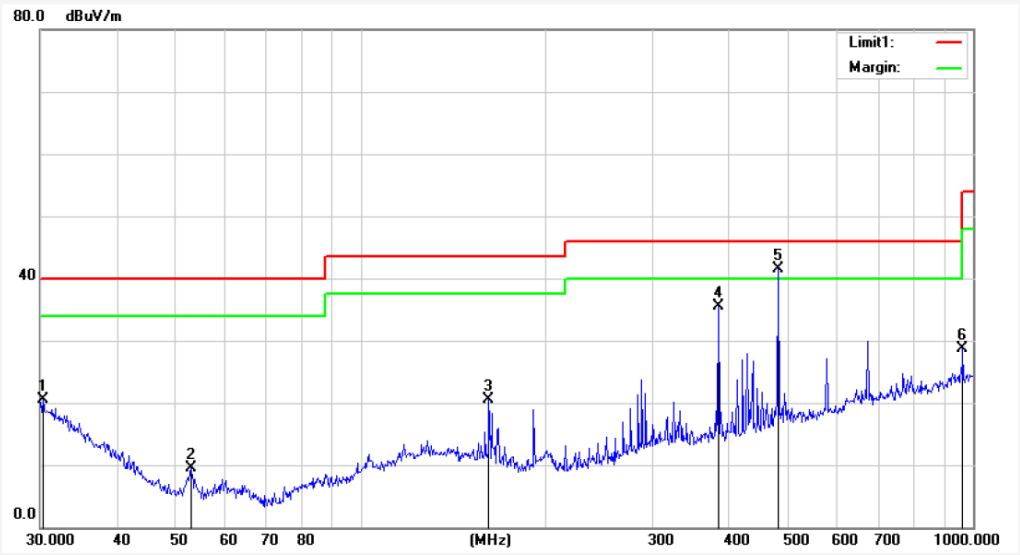
Antenna polarity: H



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	30.5306	27.00	-7.02	19.98	40.00	-20.02			peak
2	52.2080	30.72	-21.32	9.40	40.00	-30.60			peak
3	162.0414	33.67	-14.63	19.04	43.50	-24.46			peak
4	383.9318	44.73	-11.49	33.24	46.00	-12.76			peak
5*	480.5276	48.34	-9.73	38.61	46.00	-7.39			peak
6	962.1623	31.52	-2.09	29.43	54.00	-24.57			peak

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

Antenna polarity: V



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	30.3173	27.36	-6.82	20.54	40.00	-19.46			peak
2	52.9453	30.77	-21.34	9.43	40.00	-30.57			peak
3	162.0414	35.22	-14.63	20.59	43.50	-22.91			peak
4	383.9318	47.06	-11.49	35.57	46.00	-10.43			peak
5*	480.5276	51.22	-9.73	41.49	46.00	-4.51			peak
6	962.1623	30.73	-2.09	28.64	54.00	-25.36			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 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 (BT3.0 GFSK Mode):
CH Low (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2402	113.93	-5.84	108.09	114	-5.91	peak
2402	85.73	-5.84	79.89	94	-14.11	AVG
4804	56.28	-3.64	52.64	74	-21.36	peak
4804	49.32	-3.64	45.68	54	-8.32	AVG
7206	55.02	-0.95	54.07	74	-19.93	peak
7206	45.16	-0.95	44.21	54	-9.79	AVG
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
2402	113.19	-5.84	107.35	114	-6.65	peak
2402	86.08	-5.84	80.24	94	-13.76	AVG
4804	56.89	-3.64	53.25	74	-20.75	peak
4804	48.11	-3.64	44.47	54	-9.53	AVG
7206	54.35	-0.95	53.40	74	-20.60	peak
7206	43.82	-0.95	42.87	54	-11.13	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

CH Middle (2441MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2441	112.13	-5.71	106.42	114	-7.58	peak
2441	84.39	-5.71	78.68	94	-15.32	AVG
4882	58.61	-3.51	55.10	74	-18.90	peak
4882	47.24	-3.51	43.73	54	-10.27	AVG
7323	56.37	-0.82	55.55	74	-18.45	peak
7323	43.55	-0.82	42.73	54	-11.27	AVG
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
2441	111.02	-5.71	105.31	114	-8.69	peak
2441	85.34	-5.71	79.63	94	-14.37	AVG
4882	60.01	-3.51	56.50	74	-17.50	peak
4882	46.83	-3.51	43.32	54	-10.68	AVG
7323	56.91	-0.82	56.09	74	-17.91	peak
7323	40.52	-0.82	39.70	54	-14.30	AVG
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	112.28	-5.65	106.63	114	-7.37	peak
2480	84.56	-5.65	78.91	94	-15.09	AVG
4960	58.70	-3.43	55.27	74	-18.73	peak
4960	48.25	-3.43	44.82	54	-9.18	AVG
7440	56.03	-0.75	55.28	74	-18.72	peak
7440	43.21	-0.75	42.46	54	-11.54	AVG
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	111.83	-5.65	106.18	114	-7.82	peak
2480	86.15	-5.65	80.50	94	-13.50	AVG
4960	60.05	-3.43	56.62	74	-17.38	peak
4960	49.13	-3.43	45.70	54	-8.30	AVG
7440	56.32	-0.75	55.57	74	-18.43	peak
7440	41.83	-0.75	41.08	54	-12.92	AVG
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.

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

Remark: All modes of GFSK, π/4 DQPSK, 8DPSK were tested, only the worst result of GFSK was reported as below:

Radiated Band Edge Test:

Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case):

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	53.61	-5.81	47.80	74	-26.20	peak
2310	/	-5.81	/	54	/	AVG
2390	54.7	-5.84	48.86	74	-25.14	peak
2390	/	-5.84	/	54	/	AVG
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
2310	53.25	-5.81	47.44	74	-26.56	peak
2310	/	-5.81	/	54	/	AVG
2390	52.77	-5.84	46.93	74	-27.07	peak
2390	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2480MHz)

Horizontal (Worst case):

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	53.92	-5.65	48.27	74	-25.73	peak
2483.5	/	-5.65	/	54	/	AVG
2500	55.07	-5.72	49.35	74	-24.65	peak
2500	/	-5.72	/	54	/	AVG
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	54.16	-5.65	48.51	74	-25.49	peak
2483.5	/	-5.65	/	54	/	AVG
2500	52.96	-5.72	47.24	74	-26.76	peak
2500	/	-5.72	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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= 30KHz. VBW= 100 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

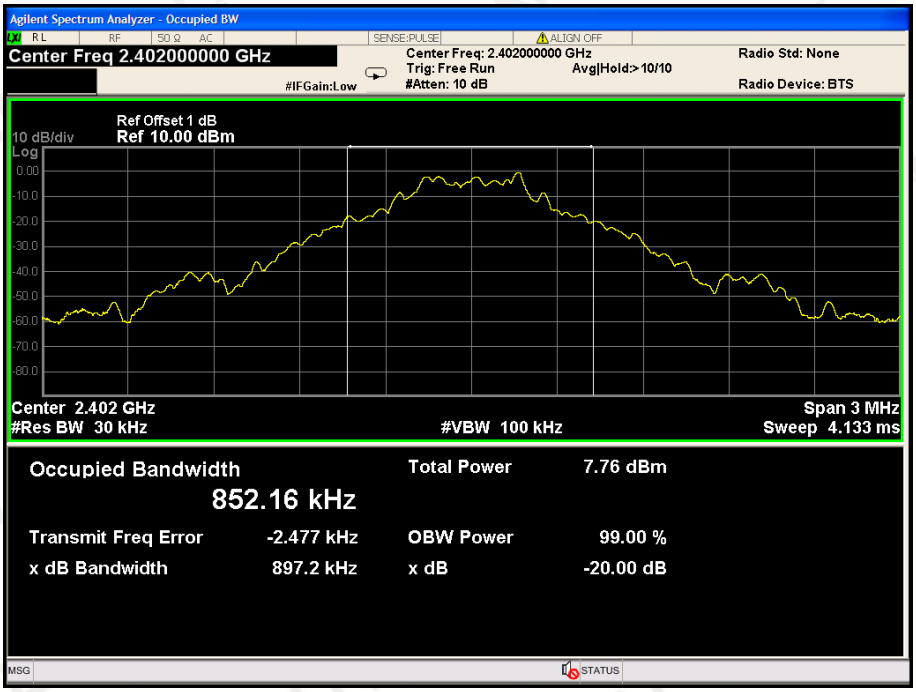
6.4 Test Result

PASS

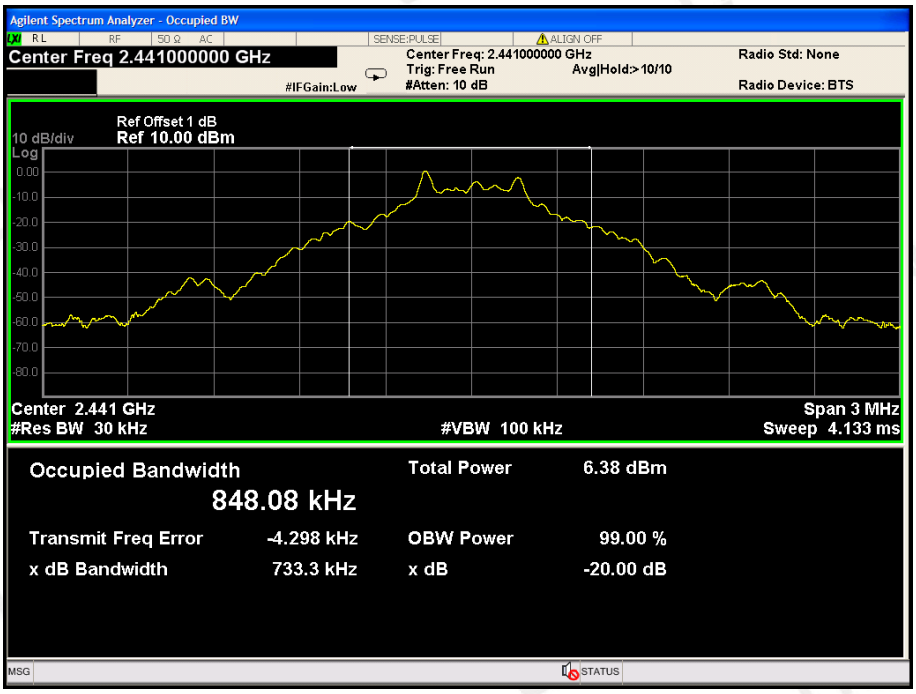
GFSK Modulation:

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	897.2	PASS
2441 MHz	733.3	PASS
2480 MHz	734.8	PASS

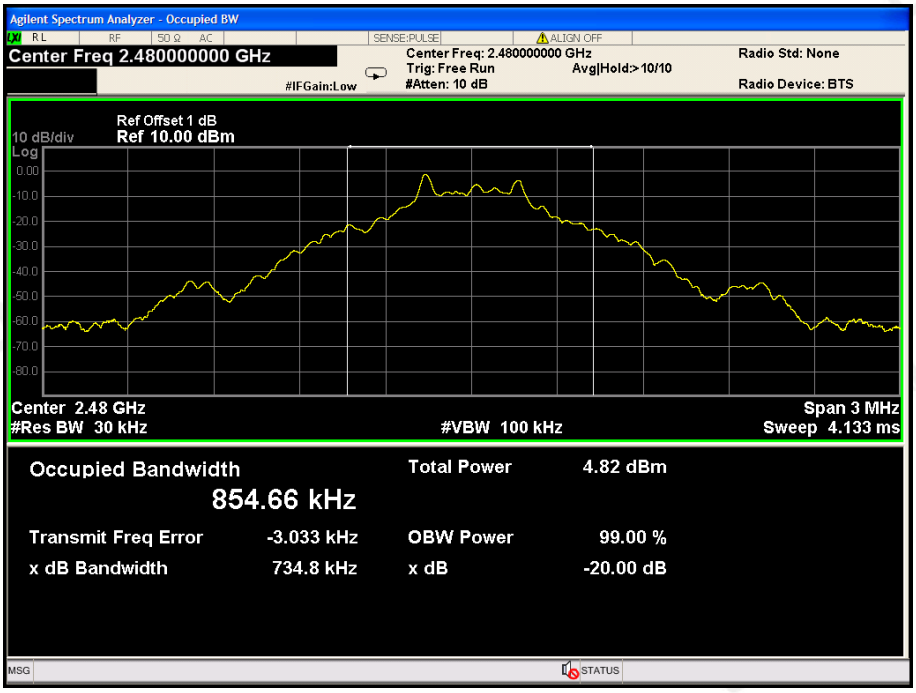
CH: 2402MHz



CH: 2441MHz



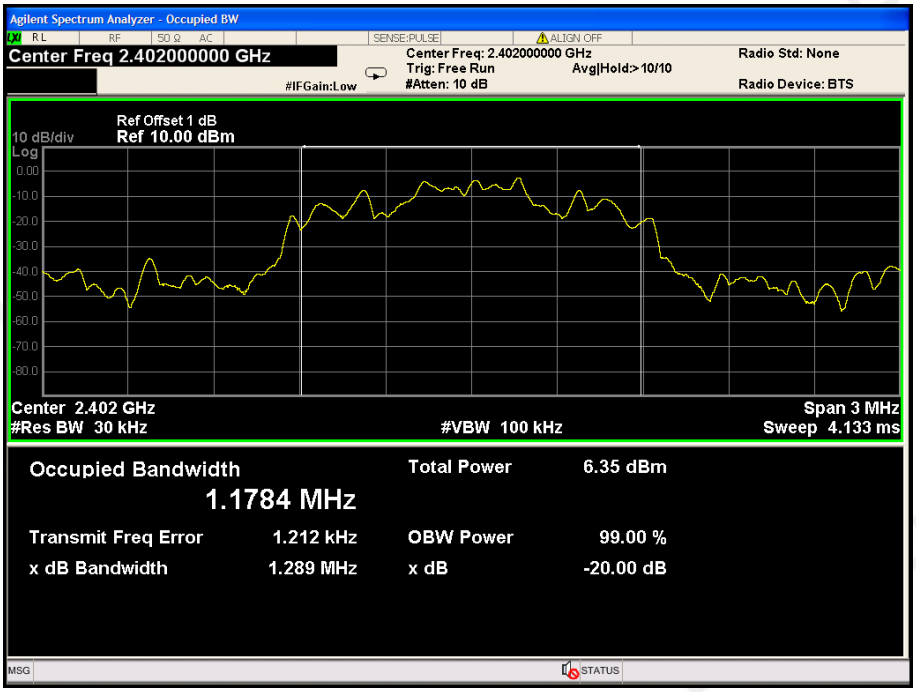
CH: 2480MHz



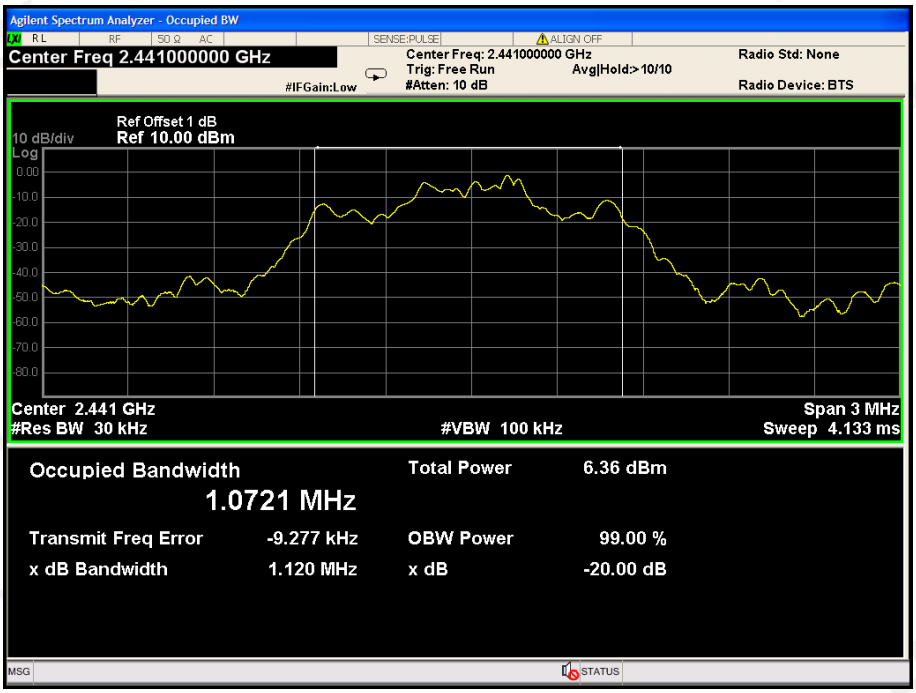
π/4 DQPSK Modulation:

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.289	PASS
2441 MHz	1.120	PASS
2480 MHz	1.138	PASS

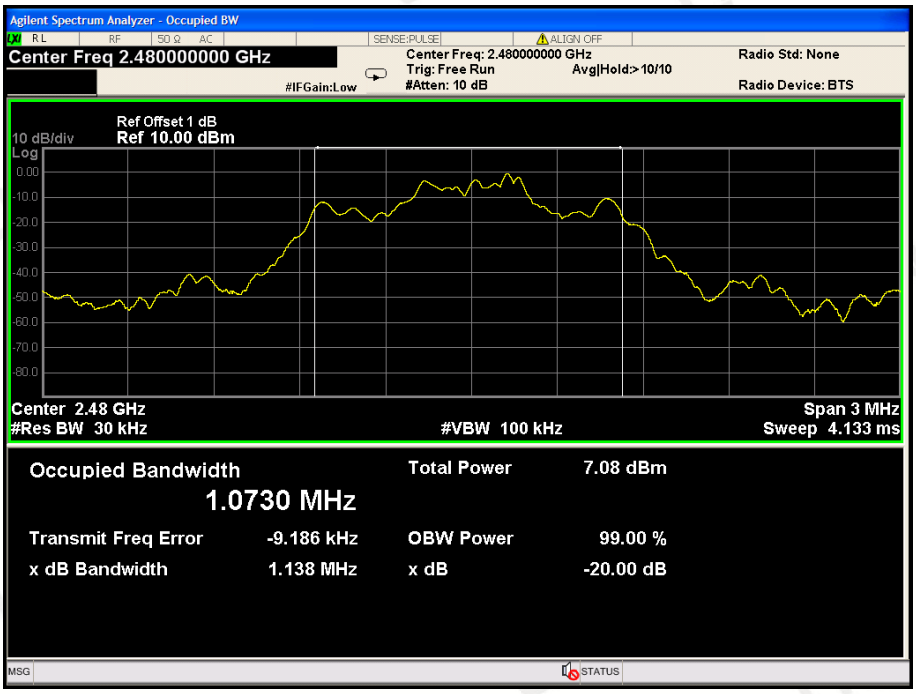
CH: 2402MHz



CH: 2441MHz



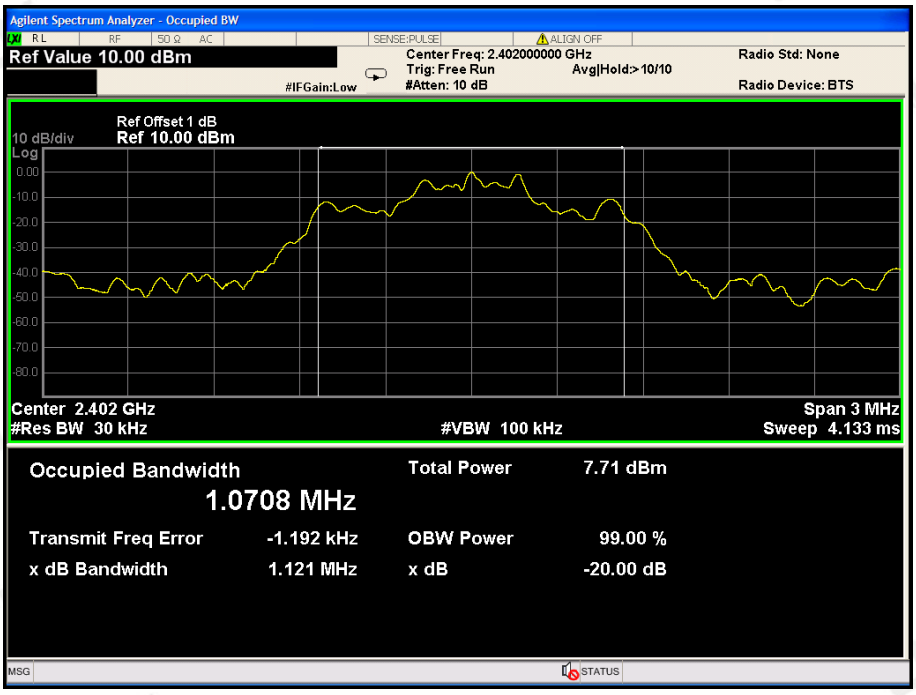
CH: 2480MHz



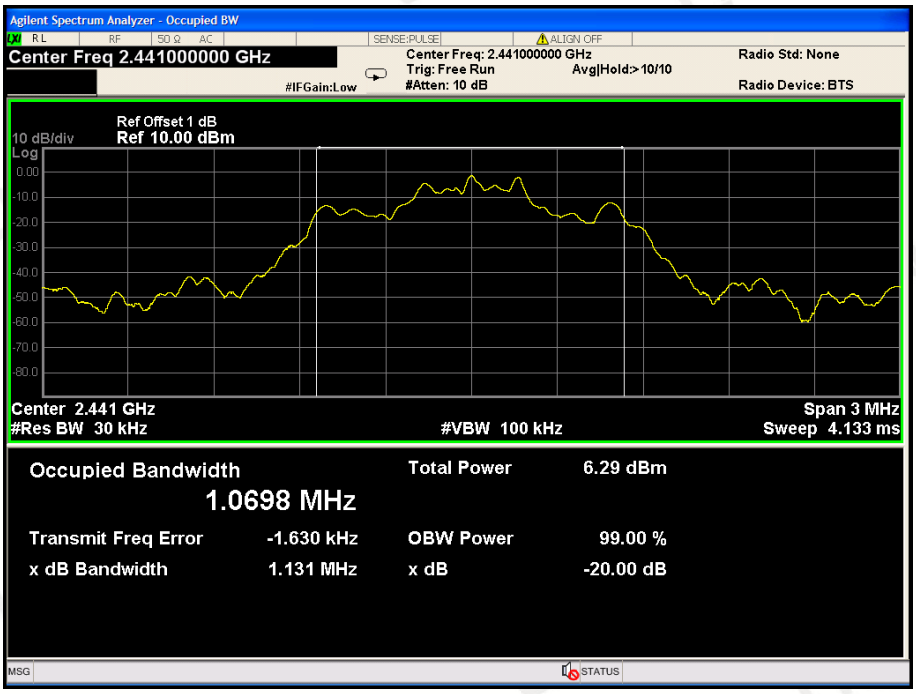
8DPSK Modulation:

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.121	PASS
2441 MHz	1.131	PASS
2480 MHz	1.141	PASS

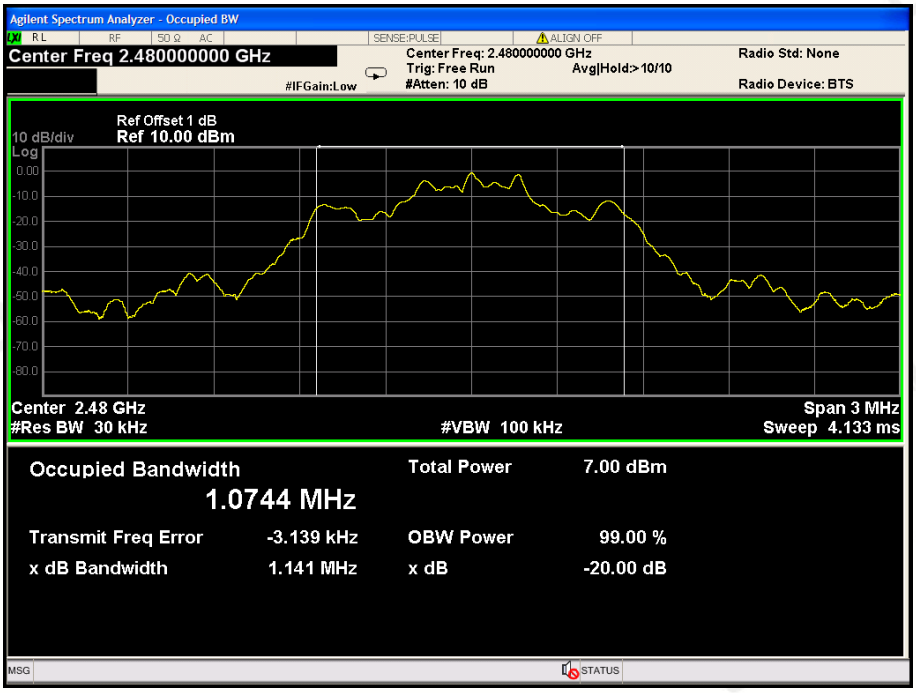
CH: 2402MHz



CH: 2441MHz



CH: 2480MHz

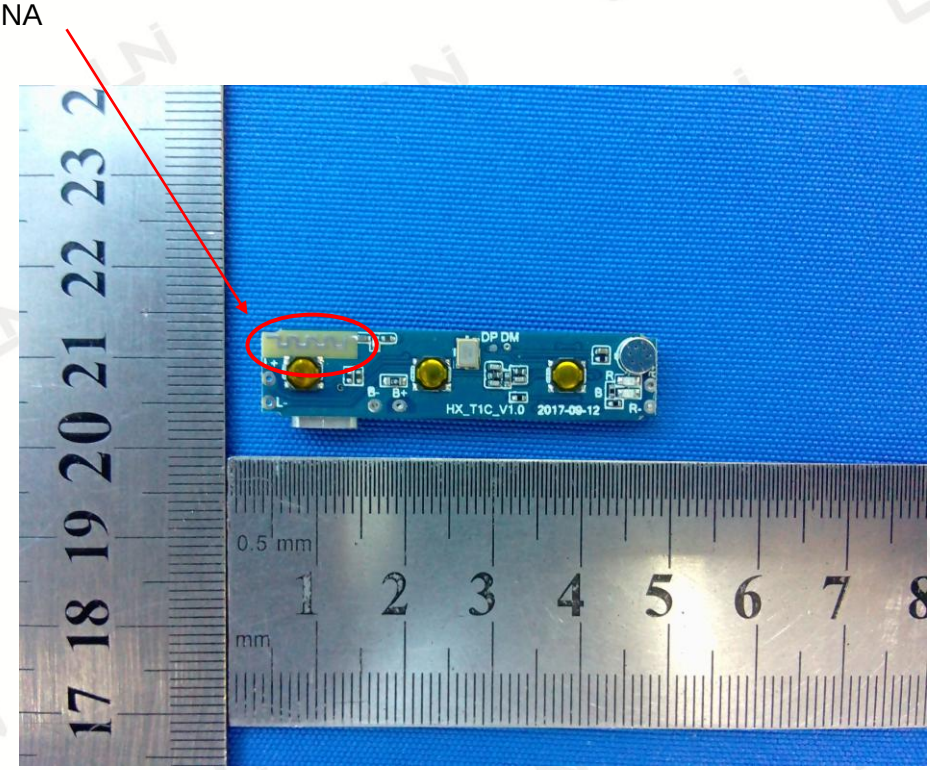


7 ANTENNA REQUIREMENT

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.

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

End of Report