FCC TEST REPORT

Test report
On Behalf of
Shenzhen Zidoo Technology Co., Ltd
For
SMART TV BOX
Model No.: X9S, X8

FCC ID: 2AGN7-X9S

Prepared for :	**Shenzhen Zidoo Technology Co., Ltd** **Room 12 D, Block A, CENTRAL GREAT SEARCHINGS, Xixiang Avenue, BaoAn District, Shenzhen, Guangdong, P.R.C. 518100**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **F1-008, Tai Yi Building, No.1, Haicheng West Road, Xixiang Street, Bao'an District, Shenzhen City, China**
Date of Test:	**September. 25, 2016 ~ September. 29, 2016**
Date of Report:	**September. 29, 2016**
Report Number:	**HK1600920034-E**

TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Zidoo Technology Co., Ltd
Address	:	Room 12 D, Block A, CENTRAL GREAT SEARCHINGS, Xixiang Avenue, BaoAn District, Shenzhen, Guangdong, P.R.C. 518100
Manufacture's Name	:	Shenzhen Zidoo Technology Co., Ltd
Address	:	Room 12 D, Block A, CENTRAL GREAT SEARCHINGS, Xixiang Avenue, BaoAn District, Shenzhen, Guangdong, P.R.C. 518100

Product description

Trade Mark:		zidoo
Product name	:	SMART TV BOX
Model and/or type reference	:	X9S, X8
Standards	:	FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.10: 2013

Date of Test	:	
Date (s) of performance of tests	:	**September. 25, 2016 ~ September. 29, 2016**
Date of Issue	:	**September. 29, 2016**
Test Result	:	**Pass**

Testing Engineer : Eric Xie

(Eric Xie)

Technical Manager : Dora Qin

(Dora Qin)

Authorized Signatory :

(Kait Chen)

Table of Contents **Page**

Table of Contents **Page**

1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
Conducted Emission	COMPLIANT
Hopping Channel Separation	COMPLIANT
Peak Output Power	COMPLIANT
Radiated Spurious Emission	COMPLIANT
Number of Hopping Frequency	COMPLIANT
Dwell Time	COMPLIANT
Bandwidth	COMPLIANT
Band Edge Emission	COMPLIANT
Antenna Requirement	COMPLIANT

1.2 TEST FACILITY

Test Firm : Dongguan Dongdian Testing Service Co., Ltd
Certificated by FCC, Registration No.: 270092

Address : No.17 Zongbu road 2, Songshan Lake Sci&Tech Park, DongGuan City, Guangdong province,523808 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	SMART TV BOX
Model Name	X9S
Serial No	X8
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: X9S.
FCC ID	2AGN7-X9S
Antenna Type	reverse SMA
Antenna Gain	1 dBi
BT Operation frequency	2402-2480MHz
Number of Channels	79CH
Modulation Type	GFSK
Power Source	Adapter model:CS-1203000
Power Rating	DC12V form Adapter with AC 120V/60Hz

Equipment	SMART TV BOX
Model Name	X9S
Serial No	X8
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: X9S.
FCC ID	2AGN7-X9S
Antenna Type	reverse SMA
Antenna Gain	1 dBi
Operation frequency	802.11b/g/n 20:2412~2462 MHz 802.11n 40: 2422~2452MHz
Number of Channels	802.11b/g/n20: 11CH 802.11n 40: 7CH
Modulation Type	CCK/OFDM/DBPSK/DAPSK
Power Source	Adapter model:CS-1203000
Power Rating	DC12V form Adapter with AC 120V/60Hz

Equipment	SMART TV BOX
Model Name	X9S
Serial No	X8
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: X9S.
FCC ID	2AGN7-X9S
Antenna Type	reverse SMA
Antenna Gain	1 dBi
Operation frequency	802.11a/n 20:5180~5240 MHz; 5745~5825 MHz; 802.11n 40: 5190~5230 MHz; 5755~5795 MHz; 802.11ac:5210 MHz; 5755 MHz;
Number of Channels	802.11a/n20: 5.2G:4CH; 5.8G: 5CH 802.11n 40: 5.2G:2CH; 5.8G: 2CH 802.11 ac: 5.2G:1CH; 5.8G: 1CH
Modulation Type	CCK/OFDM/DBPSK/DAPSK
Power Source	Adapter model:CS-1203000
Power Rating	DC12V form Adapter with AC 120V/60Hz

Note: This report only BT test report, WIFI transmitters see the other test report.

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		

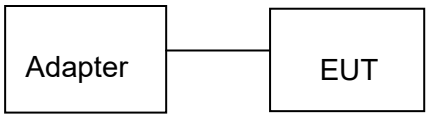
2.2 Operation of EUT during testing

Operating Mode
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 and below 1GHz Radiation testing:

Operation of EUT during Above1GHz Radiation testing:



2.4 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
2.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2016	1 Year
4.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
5.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
6.	Trilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Feb. 19, 2016	1 Year
7.	Pre-amplifier	Compliance Direction	PAP-0203	22008	Feb. 19, 2016	1 Year
8.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
9.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
10.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2016	1 Year
11.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2016	1 Year
12.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
13.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
14.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
15.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2016	1 Year
16.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2016	1 Year
17.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
18.	Power Meter	R&S	NRVD	SEL0069	Feb. 19, 2016	1 Year
19.	Power Sensor	R&S	URV5-Z2	SEL0071	Feb. 19, 2016	1 Year
20.	Power Sensor	R&S	URV5-Z2	SEL0072	Feb. 19, 2016	1 Year
21.	Software EMC32	R&S	EMC32-S	SEL0082	N/A	N/A
22.	Log-periodic Antenna	Amplifier Reasearch	AX9S80	SEL0073	N/A	N/A
23.	Antenna Tripod	Amplifier Reasearch	TP1000A	SEL0074	N/A	N/A
24.	High Gain Horn Antenna(0.8-5GHz)	Amplifier Reasearch	AT4002A	SEL0075	N/A	N/A
25.	Spectrum analyzer	Agilent	N9020A	MY49911048	Feb. 19, 2016	1 Year
26.	Spectrum analyzer	Agilent	E4407B	MY46184326	Feb. 19, 2016	1 Year

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

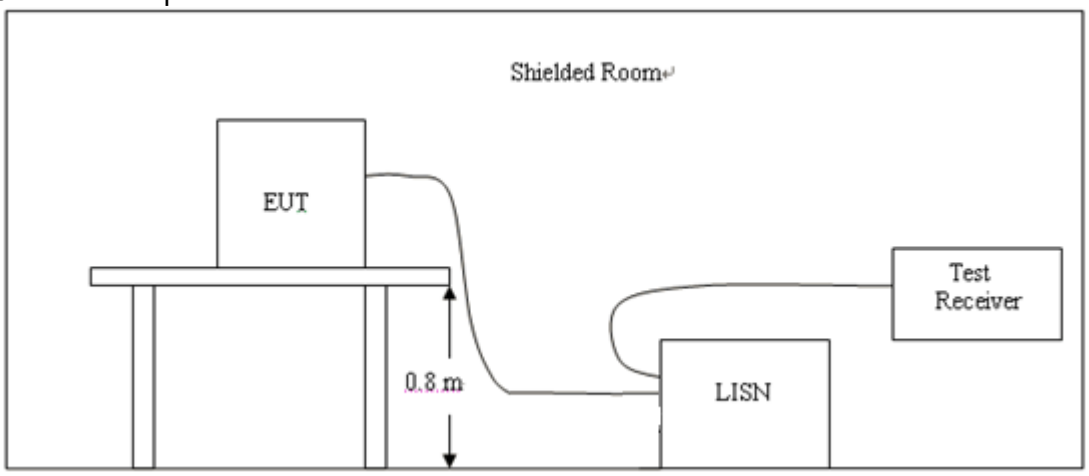
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

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



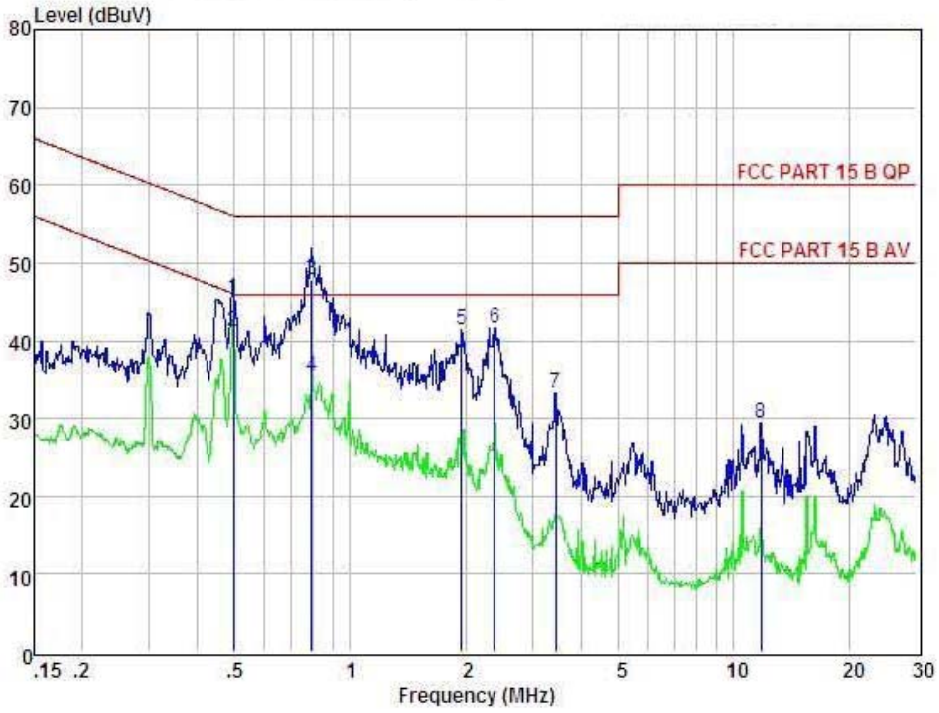
3.3 Test Procedure

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 0.8 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

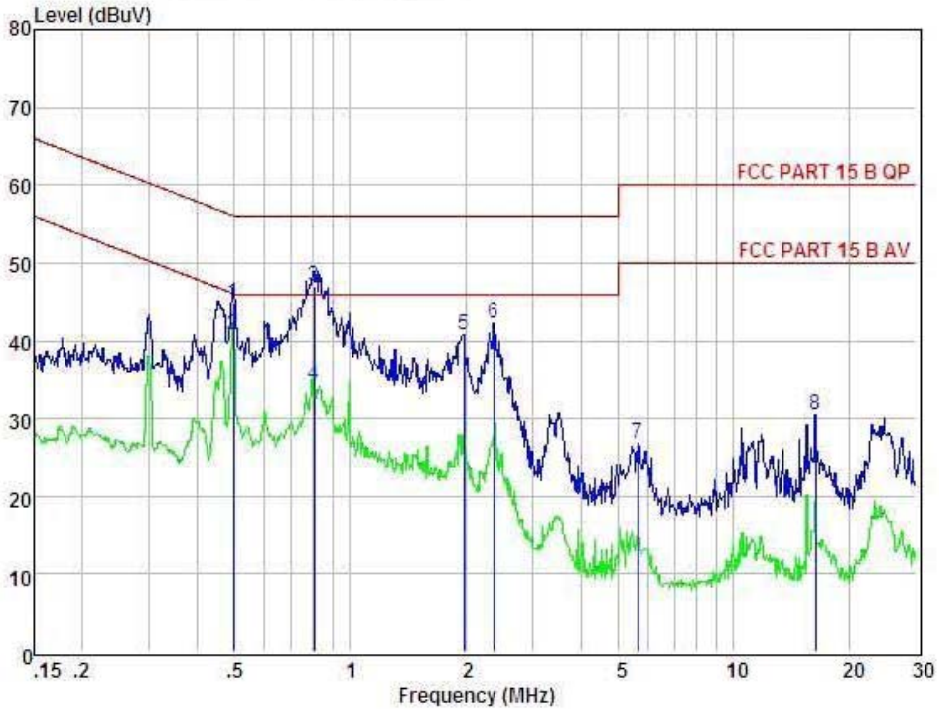
All the test modes completed for test. The worst case of Conducted Emission is CH 2402; the test data of this mode was reported.



Condition : FCC PART 15 B QP POL: LINE Temp: 25℃ Hum: 51 %

Item	Freq	Read Level	LISN Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.50	35.83	0.03	-9.58	0.10	45.54	56.05	-10.51	QP
2	0.50	31.50	0.03	-9.58	0.10	41.21	46.05	-4.84	Average
3	0.79	38.23	0.00	-9.60	0.10	47.93	56.00	-8.07	QP
4	0.79	25.60	0.00	-9.60	0.10	35.30	46.00	-10.70	Average
5	1.95	31.58	0.06	-9.71	0.10	41.45	56.00	-14.55	Peak
6	2.38	31.73	0.06	-9.75	0.11	41.65	56.00	-14.35	Peak
7	3.44	23.26	0.08	-9.84	0.12	33.30	56.00	-22.70	Peak
8	11.81	19.08	0.25	-9.90	0.22	29.45	60.00	-30.55	Peak

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss



Condition : FCC PART 15 B QP POL: NEUTRAL Temp: 25℃ Hum: 51 %

Item	Freq	Read Level	LISN Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.50	35.05	0.03	-9.58	0.10	44.76	56.05	-11.29	QP
2	0.50	31.00	0.03	-9.58	0.10	40.71	46.05	-5.34	Average
3	0.80	37.28	0.02	-9.60	0.10	47.00	56.00	-9.00	QP
4	0.80	24.50	0.02	-9.60	0.10	34.22	46.00	-11.78	Average
5	1.98	30.96	0.06	-9.72	0.10	40.84	56.00	-15.16	Peak
6	2.37	32.26	0.06	-9.75	0.11	42.18	56.00	-13.82	Peak
7	5.62	16.55	0.10	-9.96	0.13	26.74	60.00	-33.26	Peak
8	16.40	20.04	0.26	-9.83	0.28	30.41	60.00	-29.59	Peak

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss

4 RADIATED EMISSION TEST

4.1 Radiation Limit

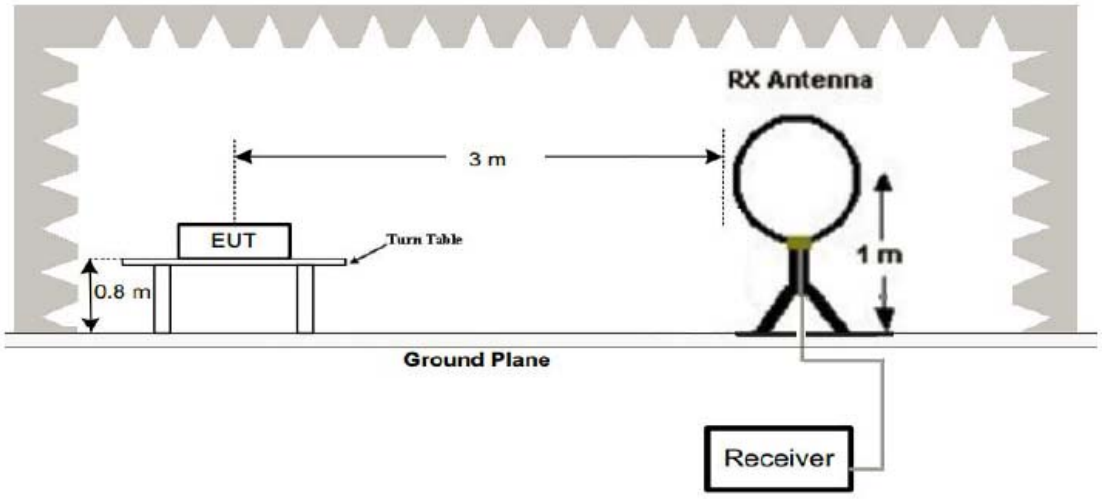
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

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

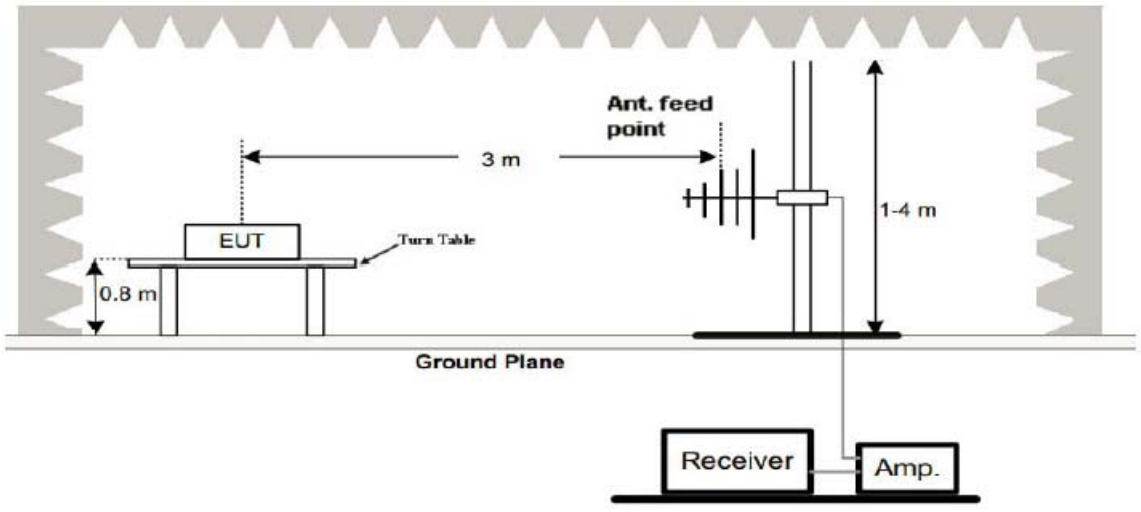
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

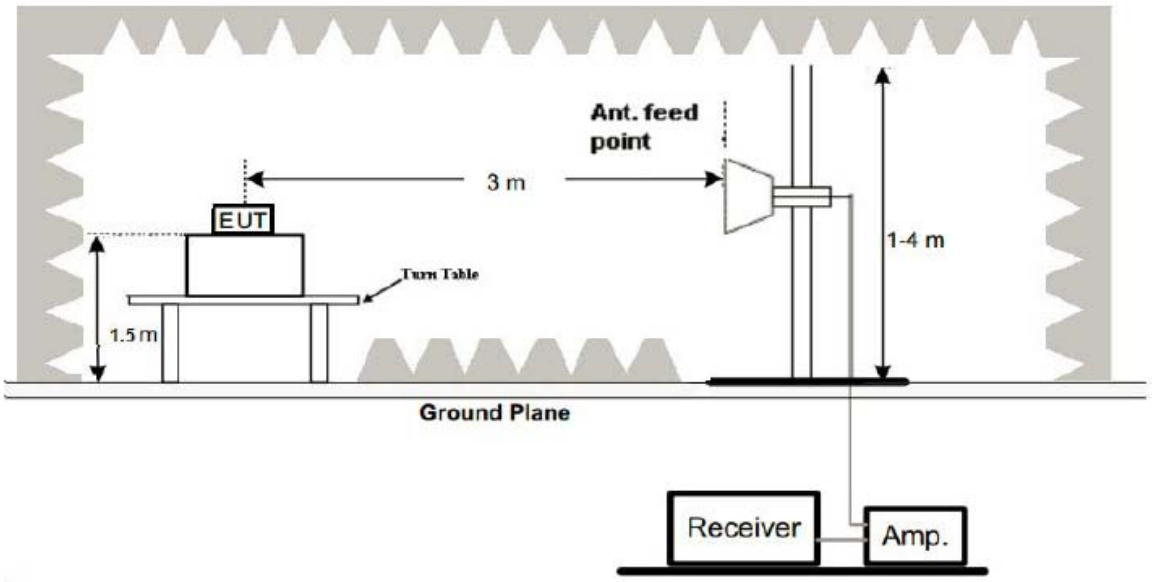
（1）Radiated Emission Test-Up Frequency Below 30MHz



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



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



4.3 Test Procedure

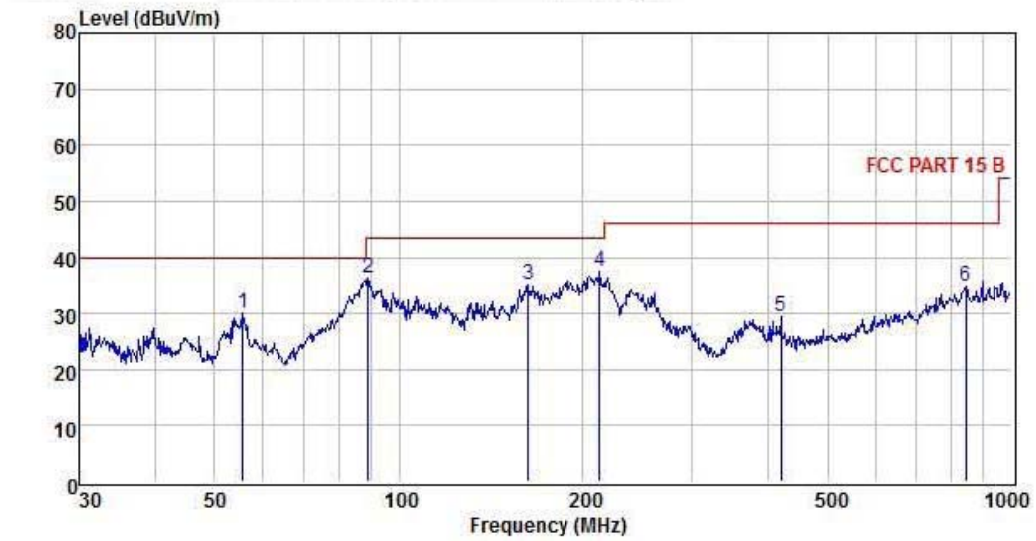
1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum 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
All the test modes completed for test. The worst case of Radiated Emission is CH 2402; the test data of this mode was reported.

Below 1GHz Test Results:
Antenna polarity: H

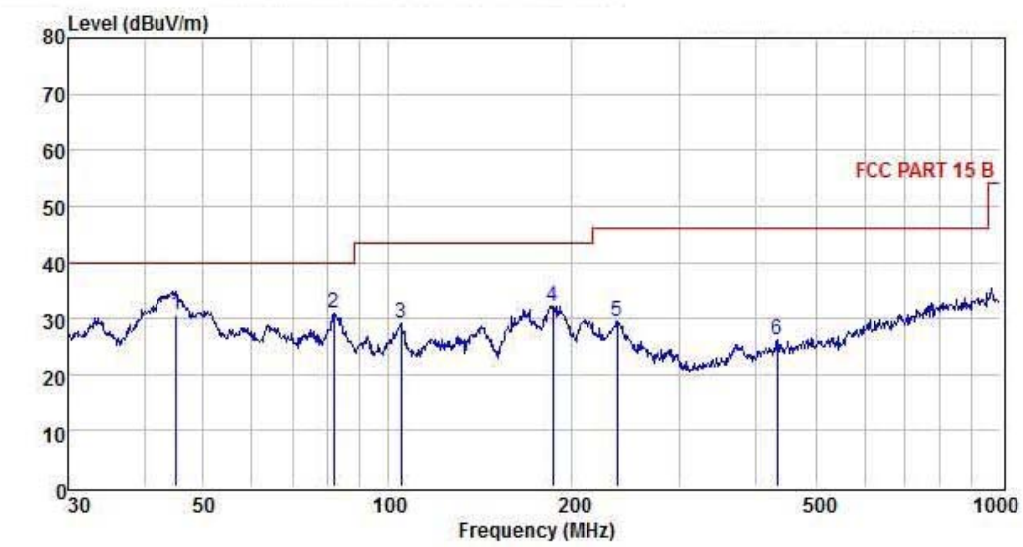


Condition : FCC PART 15 B POL: HORIZONTAL

Item	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dBuV	
1	55.61	47.71	13.07	0.18	30.09	40.00	-9.91	Peak
2	88.96	56.64	9.44	0.33	36.22	43.50	-7.28	Peak
3	162.61	49.78	13.95	0.45	35.03	43.50	-8.47	Peak
4	213.02	55.26	10.18	0.55	37.50	43.50	-6.00	Peak
5	420.58	40.57	15.23	0.81	29.49	46.00	-16.51	Peak
6	842.13	37.05	20.98	1.69	34.88	46.00	-11.12	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Antenna polarity: V



Condition : FCC PART 15 B POL: VERTICAL

Item	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dBuV	
1	45.22	47.03	13.65	0.05	30.77	40.00	-9.23	QP
2	81.78	51.37	9.32	0.17	30.84	40.00	-9.16	Peak
3	104.90	47.98	10.74	0.36	29.04	43.50	-14.46	Peak
4	185.79	49.69	10.95	0.57	32.23	43.50	-11.27	Peak
5	237.48	45.84	11.40	0.50	29.52	46.00	-16.48	Peak
6	434.07	37.10	15.58	0.59	26.05	46.00	-19.95	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

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:

For GFSK: CH Low (2402MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	59.11	-3.64	55.47	74	-18.53	peak
4804	43.43	-3.64	39.79	54	-14.21	AVG
7206	55.20	-0.95	54.25	74	-19.75	peak
7206	39.67	-0.95	38.72	54	-15.28	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	59.70	-3.64	56.06	74	-17.94	peak
4804	44.36	-3.64	40.72	54	-13.28	AVG
7206	55.47	-0.95	54.52	74	-19.48	peak
7206	40.22	-0.95	39.27	54	-14.73	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH Middle (2441MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	59.05	-3.51	55.54	74	-18.46	peak
4882	43.59	-3.51	40.08	54	-13.92	AVG
7323	55.24	-0.82	54.42	74	-19.58	peak
7323	39.56	-0.82	38.74	54	-15.26	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	57.78	-3.51	54.27	74	-19.73	peak
4882	42.45	-3.51	38.94	54	-15.06	AVG
7323	53.25	-0.82	52.43	74	-21.57	peak
7323	37.89	-0.82	37.07	54	-16.93	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH High (2480MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	58.71	-3.43	55.28	74	-18.72	peak
4960	43.24	-3.43	39.81	54	-14.19	AVG
7440	54.81	-0.75	54.06	74	-19.94	peak
7440	39.39	-0.75	38.64	54	-15.36	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	58.74	-3.43	55.31	74	-18.69	peak
4960	43.71	-3.43	40.28	54	-13.72	AVG
7440	54.79	-0.75	54.04	74	-19.96	peak
7440	39.90	-0.75	39.15	54	-14.85	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.
(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.

For 8-DPSK: CH Low (2402MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	60.26	-3.64	56.62	74	-17.38	peak
4804	45.40	-3.64	41.76	54	-12.24	AVG
7206	55.78	-0.95	54.83	74	-19.17	peak
7206	40.27	-0.95	39.32	54	-14.68	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	58.78	-3.64	55.14	74	-18.86	peak
4804	43.89	-3.64	40.25	54	-13.75	AVG
7206	55.46	-0.95	54.51	74	-19.49	peak
7206	39.84	-0.95	38.89	54	-15.11	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH Middle (2441MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	58.98	-3.51	55.47	74	-18.53	peak
4882	43.15	-3.51	39.64	54	-14.36	AVG
7323	55.24	-0.82	54.42	74	-19.58	peak
7323	40.03	-0.82	39.21	54	-14.79	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	59.90	-3.51	56.39	74	-17.61	peak
4882	44.67	-3.51	41.16	54	-12.84	AVG
7323	55.83	-0.82	55.01	74	-18.99	peak
7323	40.74	-0.82	39.92	54	-14.08	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH High (2480MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	58.86	-3.43	55.43	74	-18.57	peak
4960	43.74	-3.43	40.31	54	-13.69	AVG
7440	55.03	-0.75	54.28	74	-19.72	peak
7440	40.50	-0.75	39.75	54	-14.25	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	57.81	-3.43	54.38	74	-19.62	peak
4960	42.12	-3.43	38.69	54	-15.31	AVG
7440	52.59	-0.75	51.84	74	-22.16	peak
7440	36.86	-0.75	36.11	54	-17.89	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.
(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.

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:
For GFSK: Operation Mode: TX CH Low (2402MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	51.89	-5.81	46.08	74	-27.92	peak
2390	/	-5.81	/	54	/	AVG
2400	54.48	-5.84	48.64	74	-25.36	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	51.55	-5.81	45.74	74	-28.26	peak
2390	/	-5.81	/	54	/	AVG
2400	54.25	-5.84	48.41	74	-25.59	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2480MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	51.26	-5.65	45.61	74	-28.39	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	51.53	-5.65	45.88	74	-28.12	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Operation Mode: Hopping mode
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	51.88	-5.81	46.07	74	-27.93	peak
2390	/	-5.81	/	54	/	AVG
2400	55.09	-5.84	49.25	74	-24.75	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	50.85	-5.81	45.04	74	-28.96	peak
2390	/	-5.81	/	54	/	AVG
2400	53.69	-5.84	47.85	74	-26.15	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: Hopping mode
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	51.21	-5.65	45.56	74	-28.44	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	51.72	-5.65	46.07	74	-27.93	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

For 8-DPSK: Operation Mode: TX CH Low (2402MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	51.99	-5.81	46.18	74	-27.82	peak
2390	/	-5.81	/	54	/	AVG
2400	56.25	-5.84	50.41	74	-23.59	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	52.62	-5.81	46.81	74	-27.19	peak
2390	/	-5.81	/	54	/	AVG
2400	57.16	-5.84	51.32	74	-22.68	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2480MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	51.34	-5.65	45.69	74	-28.31	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	51.96	-5.65	46.31	74	-27.69	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Operation Mode: Hopping mode
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	52.67	-5.81	46.86	74	-27.14	peak
2390	/	-5.81	/	54	/	AVG
2400	54.77	-5.84	48.93	74	-25.07	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	51.17	-5.81	45.36	74	-28.64	peak
2390	/	-5.81	/	54	/	AVG
2400	55.52	-5.84	49.68	74	-24.32	peak
2400	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: Hopping mode
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	51.14	-5.65	45.49	74	-28.51	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	50.92	-5.65	45.27	74	-28.73	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)	Bandwidth	(20dB 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 15.249(a): RBW= 30KHz. VBW= 30 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

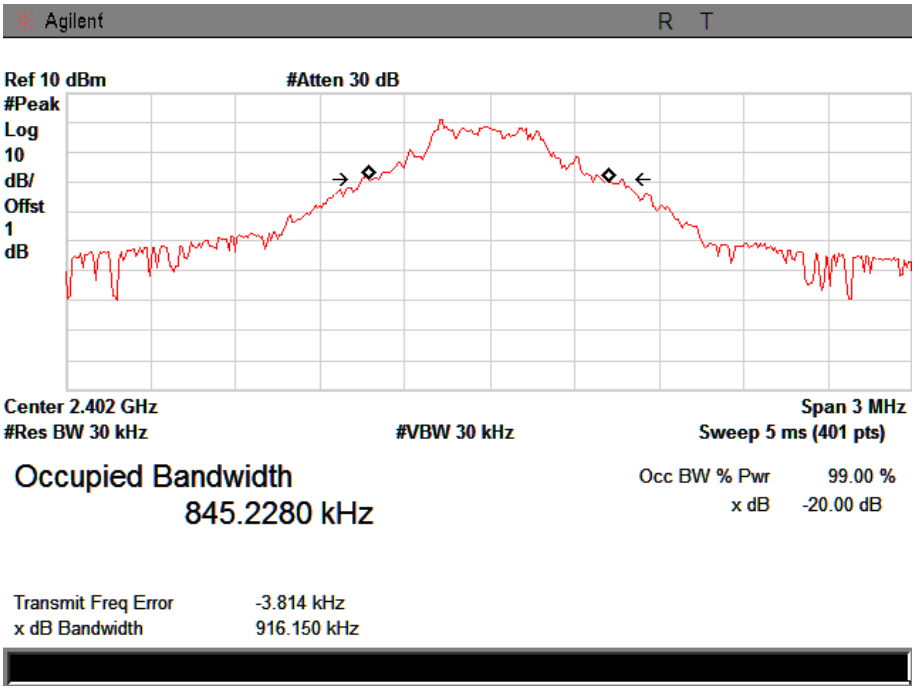
Same as Radiated Emission Measurement

6.4 Test Result

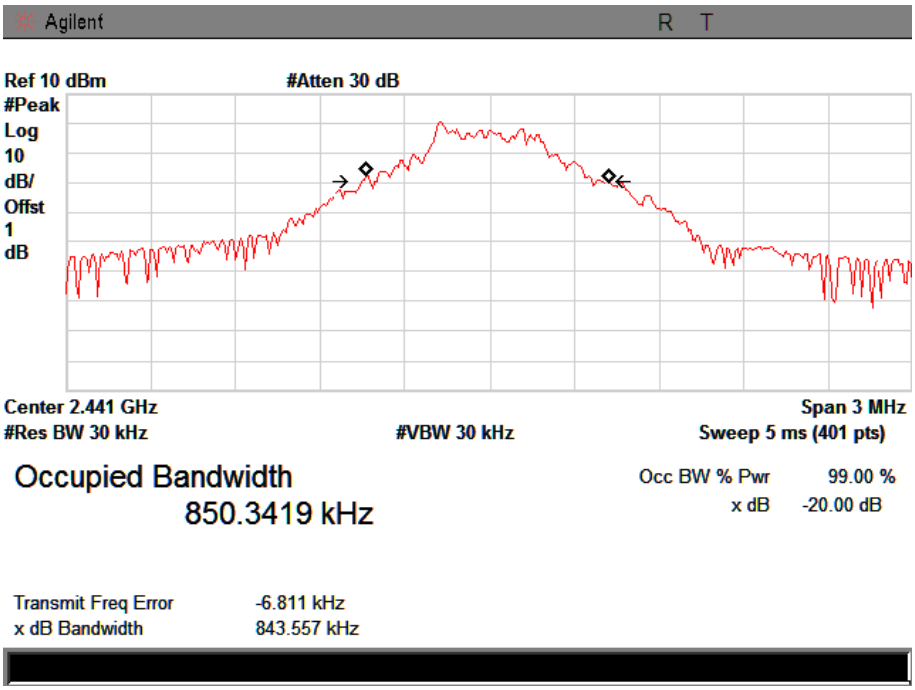
PASS

For GFSK:		
Frequency	20dB Bandwidth (KHz)	Result
2402 MHz	916.150	**PASS**
2441 MHz	843.557	**PASS**
2480 MHz	849.467	**PASS**

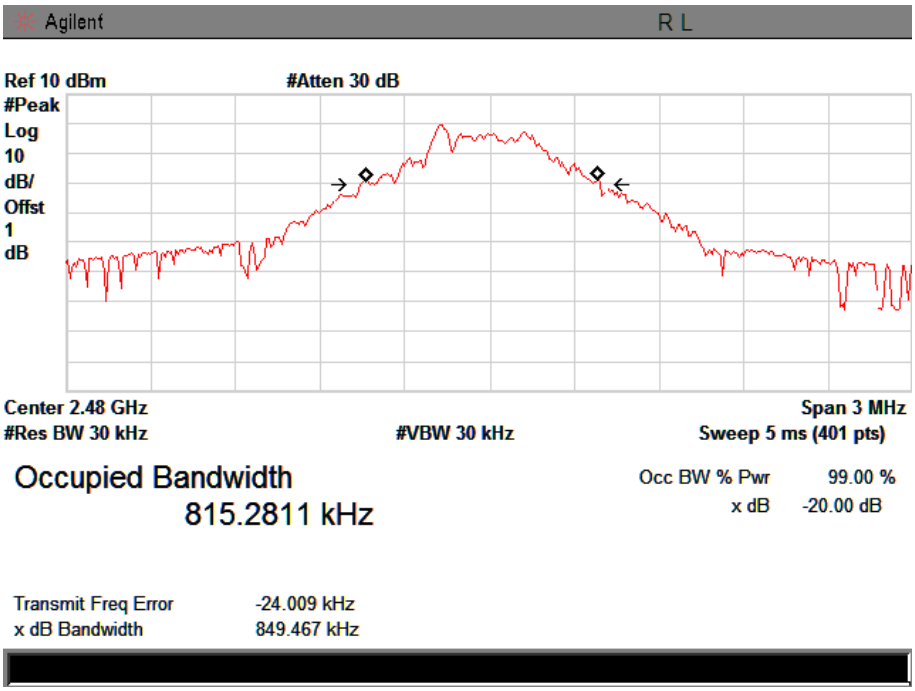
CH: 2402MHz



CH: 2441MHz

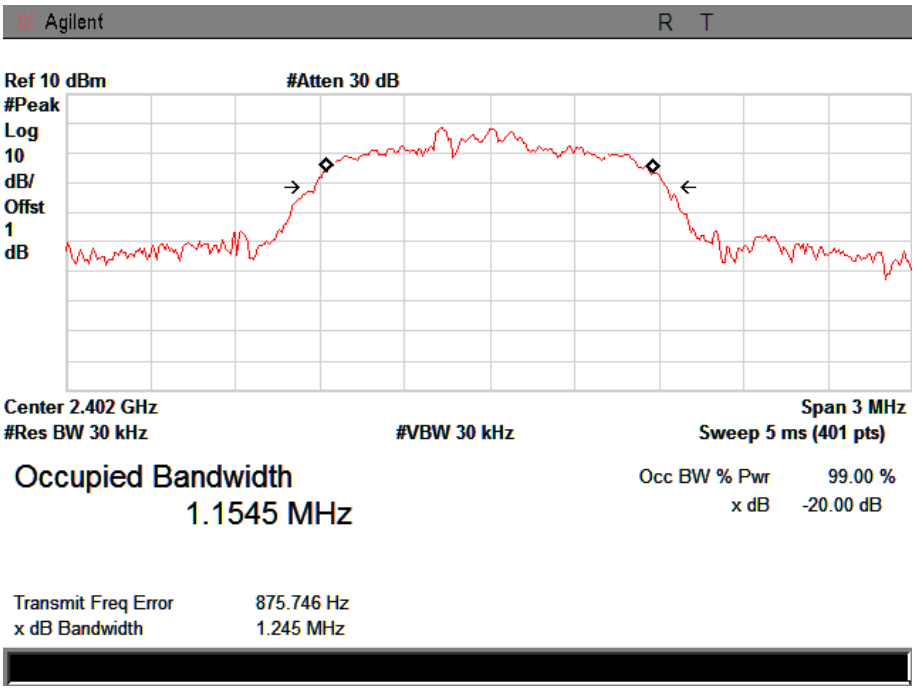


CH: 2480MHz

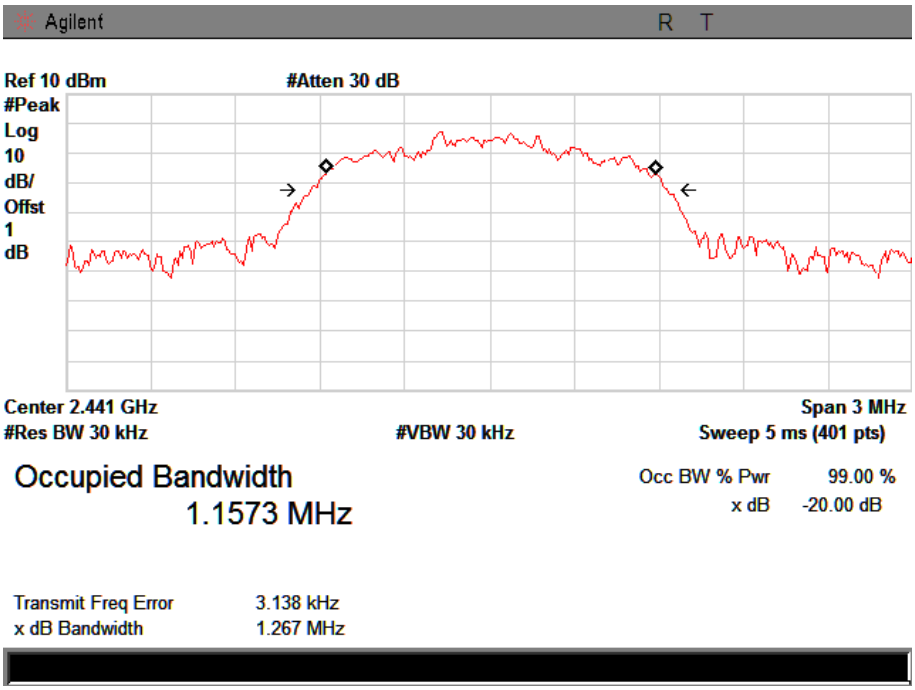


For 8-DPSK:		
Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.245	**PASS**
2441 MHz	1.267	**PASS**
2480 MHz	1.251	**PASS**

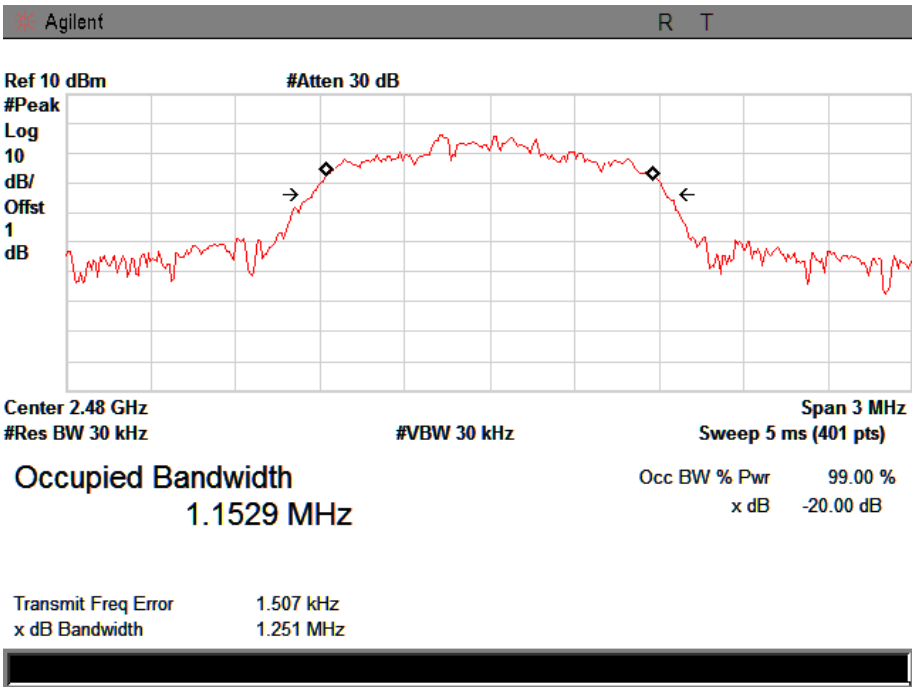
CH: 2402MHz



CH: 2441MHz



CH: 2480MHz



7 NUMBER OF HOPPING CHANNEL

7.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	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 15.249(a): RBW= 100KHz. VBW= 100 KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

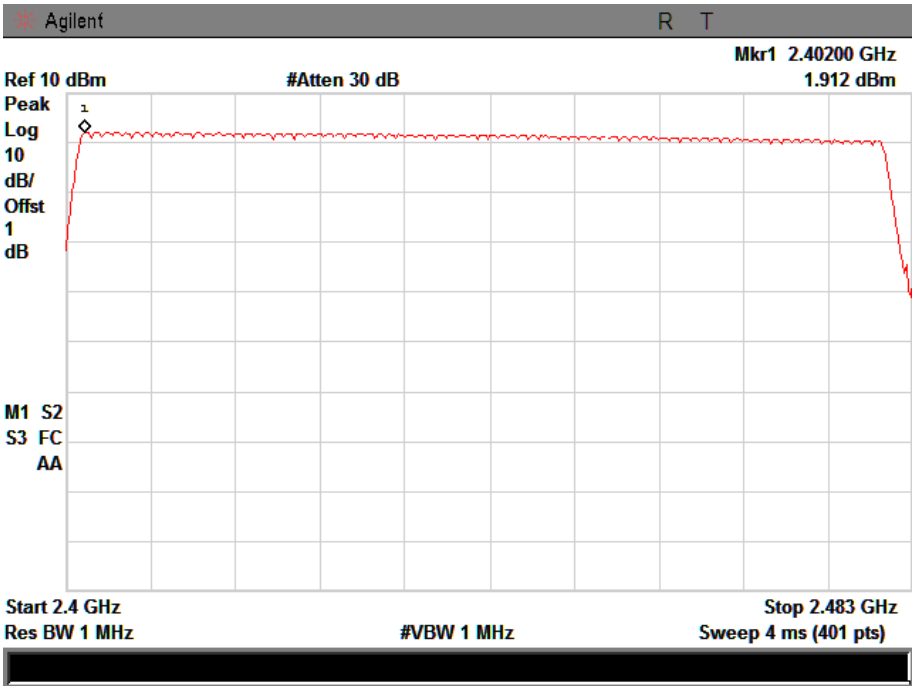
7.3 Measurement Equipment Used

Same as Radiated Emission Measurement

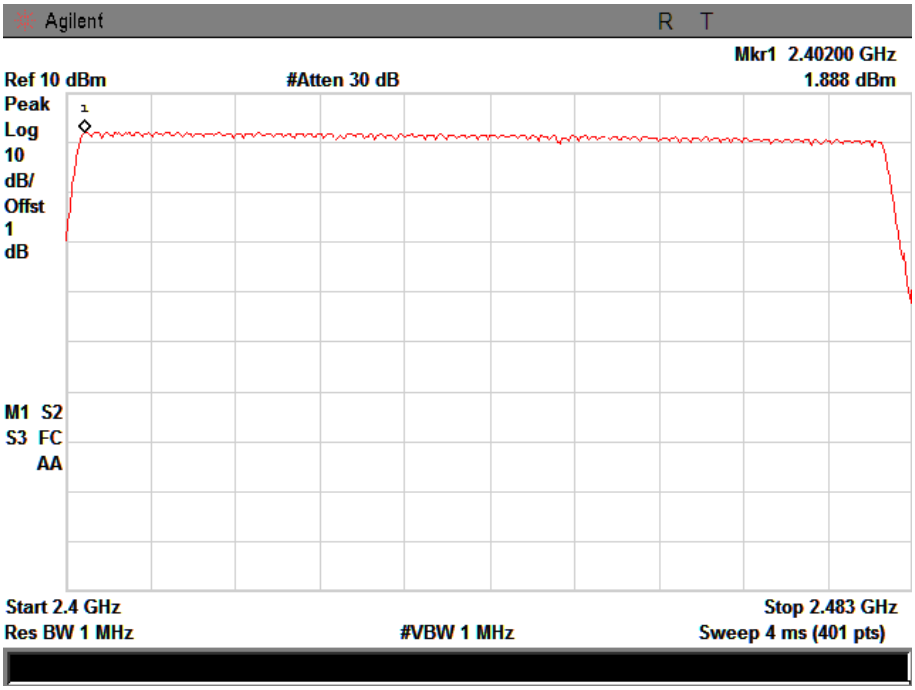
7.4 Test Result

PASS

For GFSK:		
Number of Hopping Channel	Limit	Result
79	≥15	**PASS**



For 8-DPSK:		
Number of Hopping Channel	Limit	Result
79	≥15	**PASS**



8 HOPPING CHANNEL SEPARATION MEASUREMENT

8.1 Test Limit

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 20 dB bandwidth of the hopping channel, whichever is greater.

8.2 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 15.249(a): RBW= 30KHz. VBW= 100 KHz, Span=5MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

8.3 Measurement Equipment Used

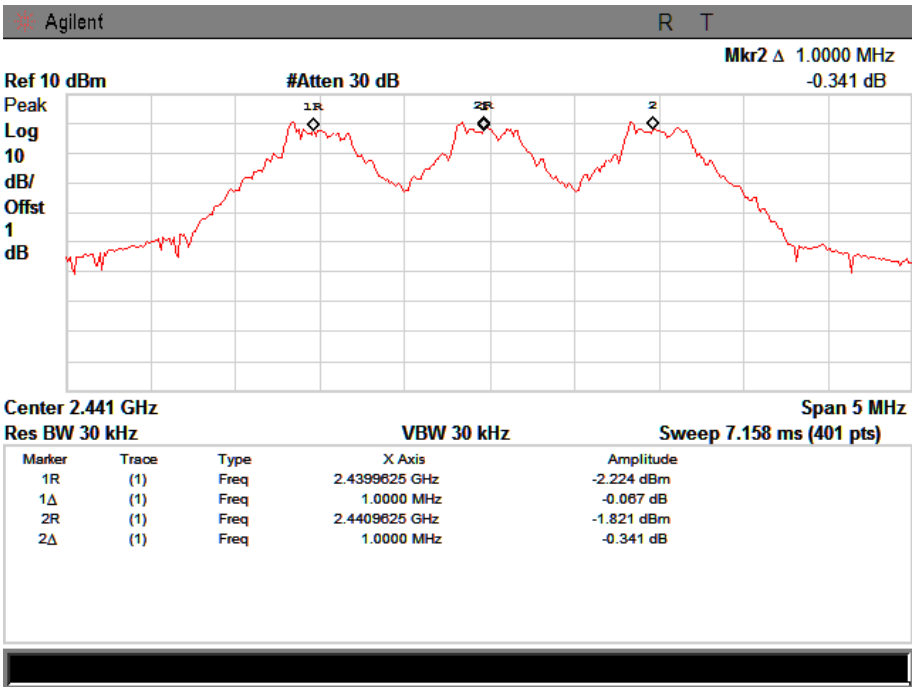
Same as Radiated Emission Measurement

8.4 Test Result

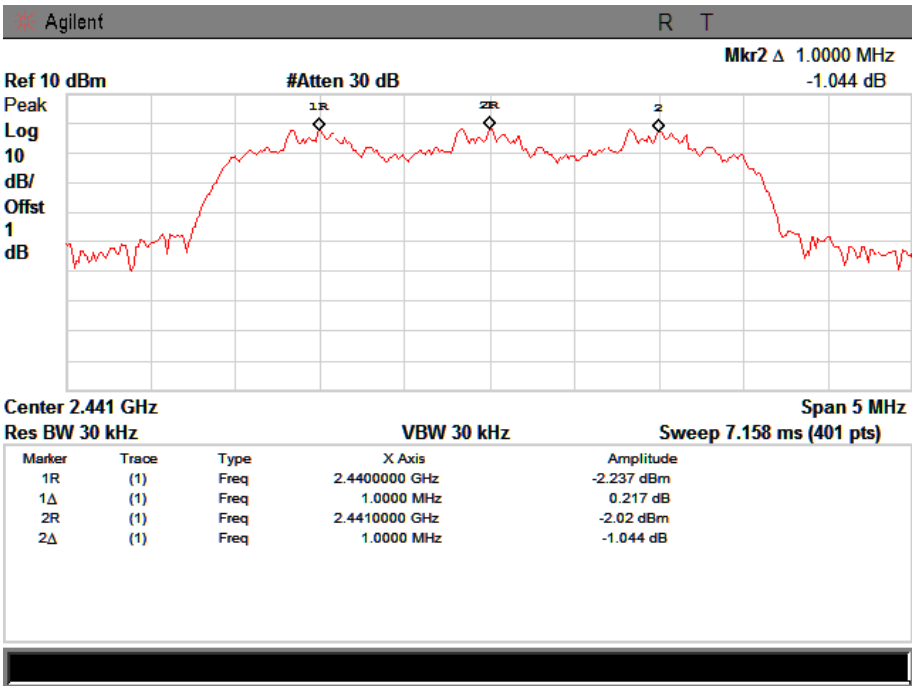
PASS

Mode	Ch. Separation (MHz)	Limit (MHz)	Result
GFSK	1.000	0.916	**PASS**
8-DPSK	1.000	0.845	**PASS**

Ch. Separation Limits: >20dB bandwidth for GFSK



Ch. Separation Limits: >2/3 of 20dB bandwidth for 8-DPSK



9 AVERAGE TIME OF OCCUPANCY

9.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

9.2 Test Procedure

a. The transmitter output (antenna port) was connected to the spectrum analyzer

b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.

c. Use a video trigger with the trigger level set to enable triggering only on full pulses.

d. Sweep Time is more than once pulse time.

e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.

f. Measure the maximum time duration of one single pulse.

g. Set the EUT for DH5, DH3 and DH1 packet transmitting.

h. Measure the maximum time duration of one single pulse.

i. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds.

j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.

k. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.

9.3 Measurement Equipment Used

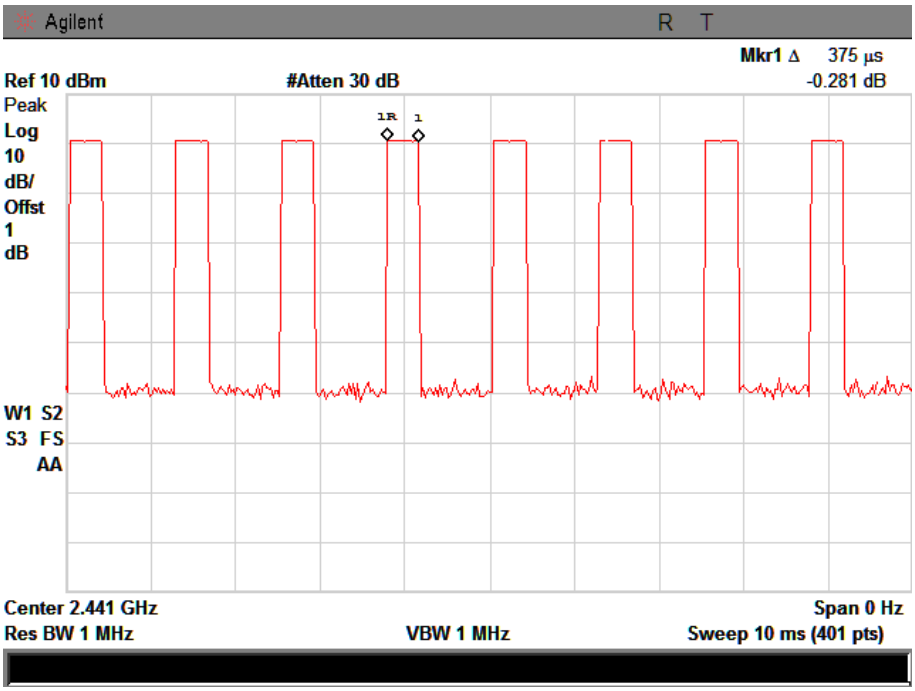
Same as Radiated Emission Measurement

9.4 Test Result

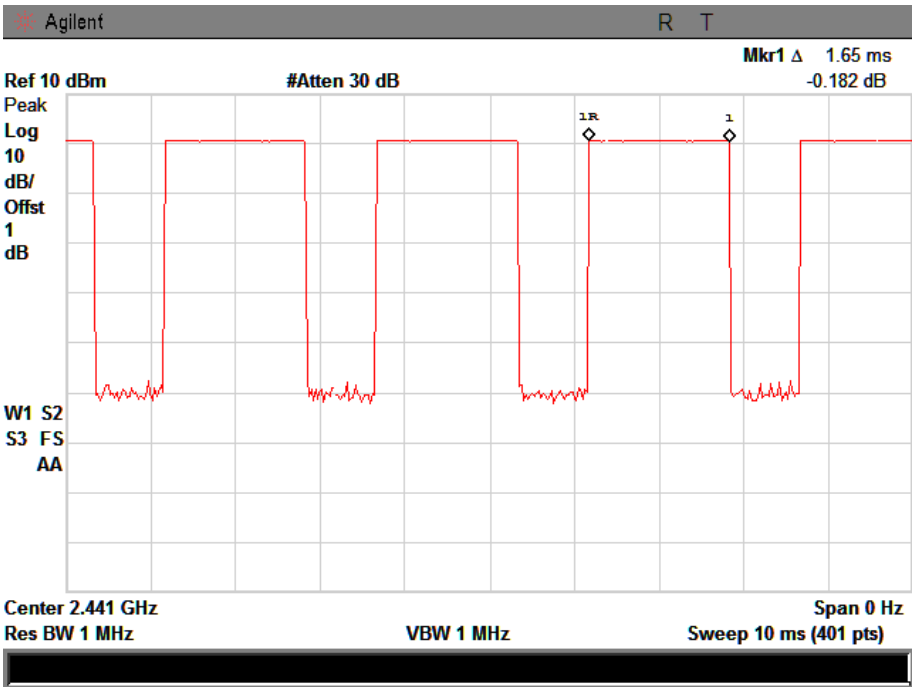
PASS

Data Packet	Frequency (MHz)	Pluse Duration (ms)	Dwell Time (s)	Limit (s)
DH1	2402	0.375	0.120	0.4
DH3	2402	1.650	0.264	0.4
DH5	2402	2.900	0.309	0.4
For GFSK				

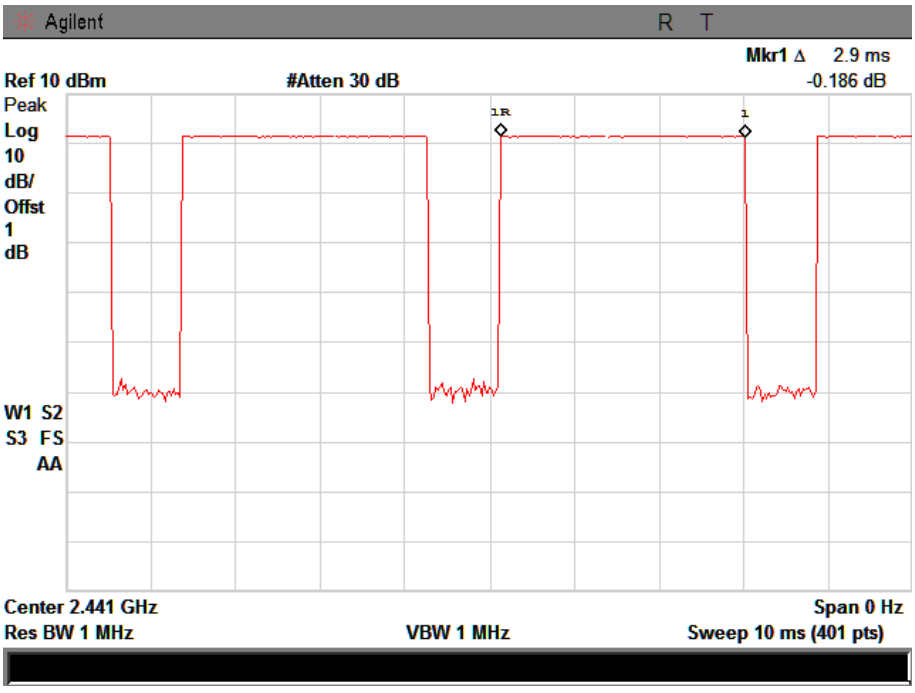
CH39-DH1



CH39-DH3

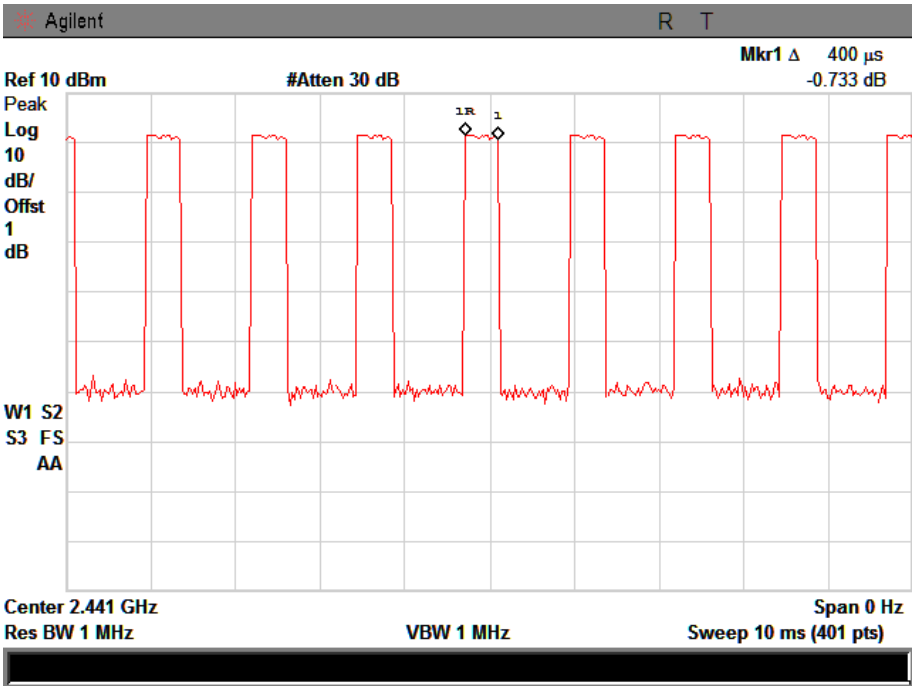


CH39-DH5

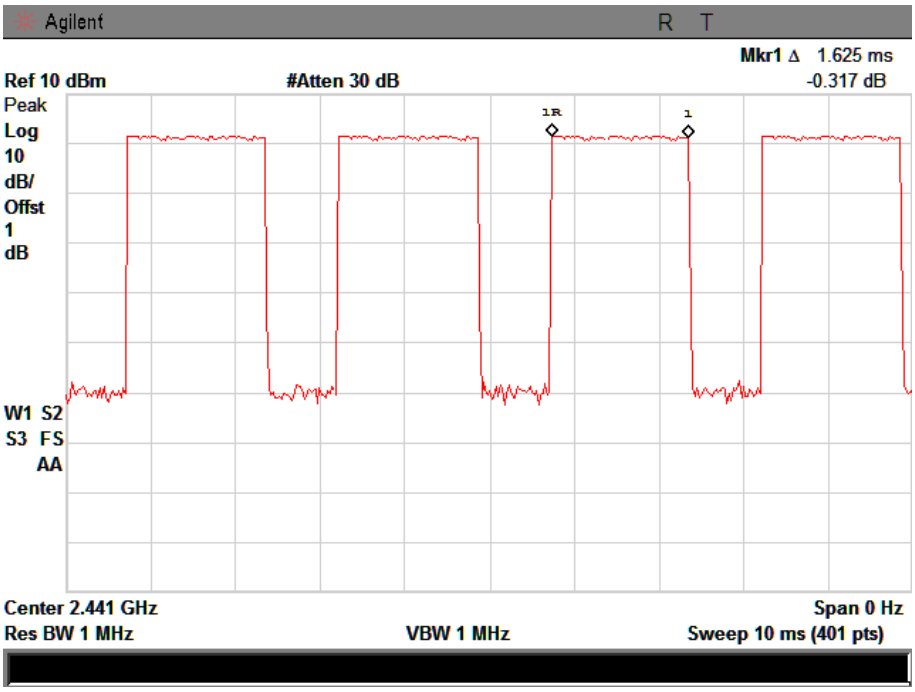


Data Packet	Frequency (MHz)	Pluse Duration (ms)	Dwell Time (s)	Limit (s)
3-DH1	2402	0.400	0.128	0.4
3-DH3	2402	1.625	0.260	0.4
3-DH5	2402	2.900	0.309	0.4
For 8-DPSK				

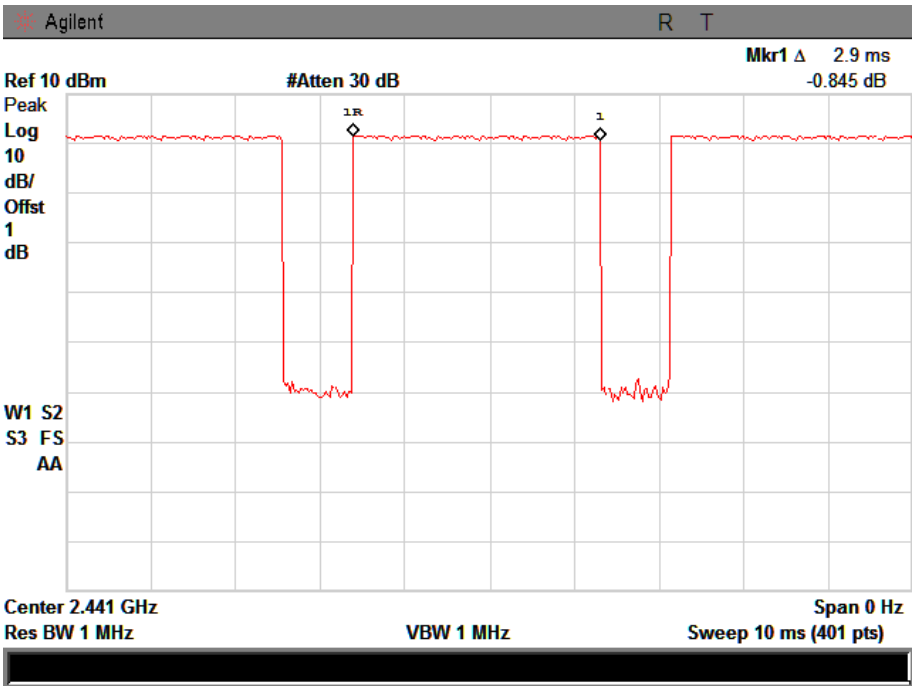
CH39-3DH1



CH39-DH3



CH39-DH5



10 PEAK OUTPUT POWER TEST

10.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(i)	Peak Output Power	0.125 w or 20.96dBm	2400-2483.5	PASS

10.2 Test Procedure

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

10.3 Measurement Equipment Used

Same as Radiated Emission Measurement

10.4 Test Result

PASS

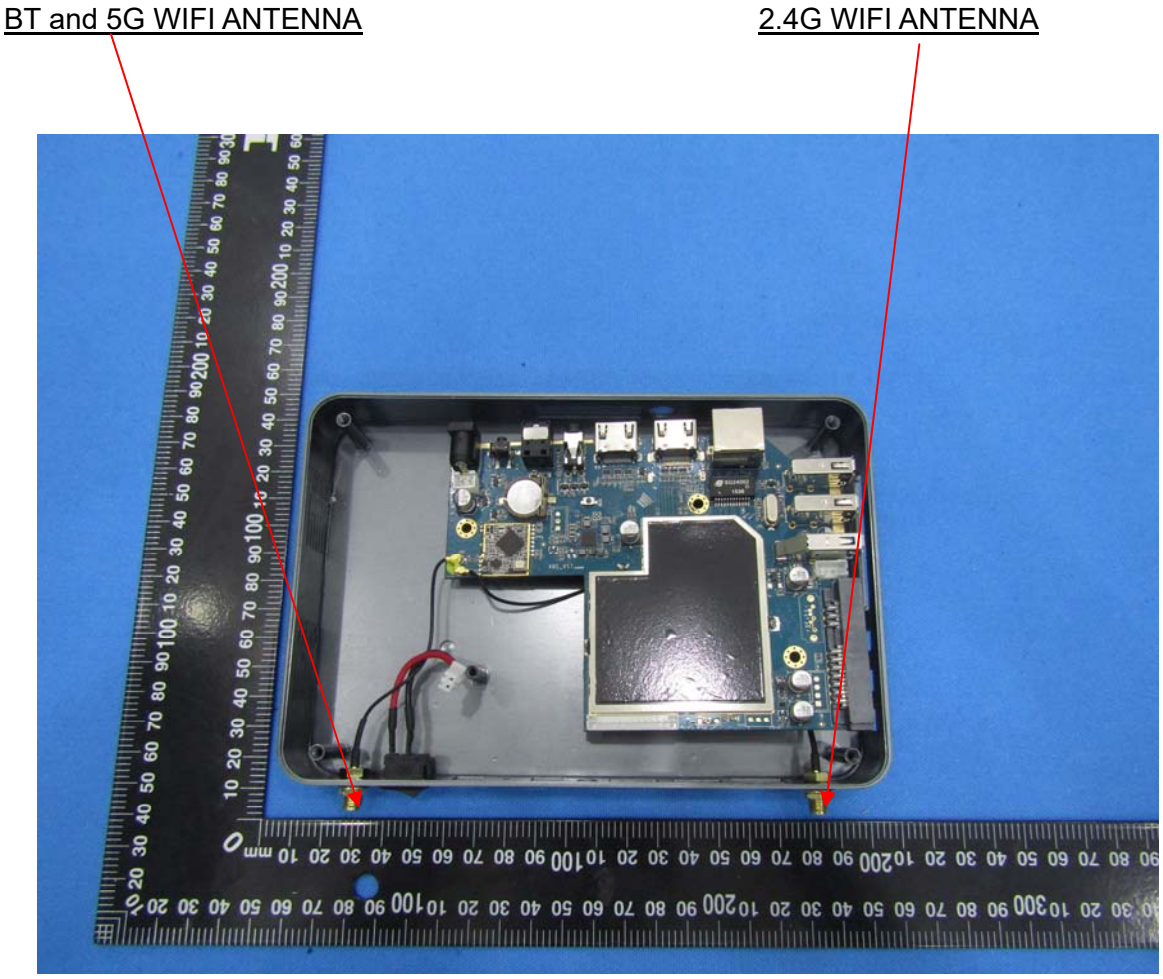
GFSK Mode			
Test Channel	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)	LIMIT dBm
CH01	2402	2.75	30
CH39	2441	2.12	30
CH79	2480	2.48	30
8-DPSK Mode			
CH01	2402	0.16	21
CH39	2441	0.11	21
CH79	2480	0.13	21

11 ANTENNA REQUIREMENT

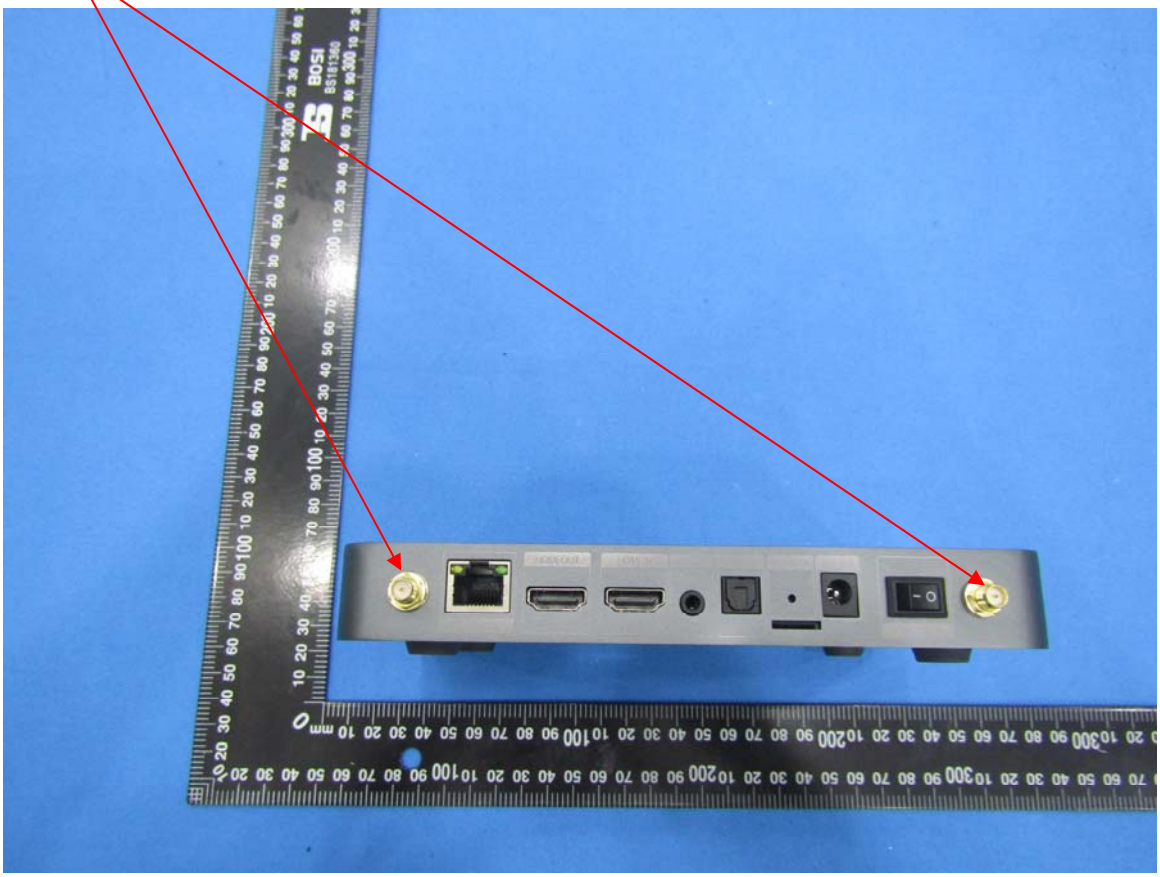
Standard Applicable
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.249, if transmitting antennas 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 is a detachable antenna, using a reverse SMA connector (Provided by non-manufacturers will use the product can not work), considered a special connector accepted by the FCC to comply with rule part 15.203. Please see EUT photos for details, it comply with the standard requirement，The directional gains of antenna used for transmitting is 1dBi.



reverse SMA connector



12 PHOTOGRAPH OF TEST

12.1 Radiated Emission


法电波暗室

12.2 Conducted Emission