TEST REPORT

FCC PART 15 SUBPART C 15.247

Test report
On Behalf of
SHENZHEN DA YAO TECHNOLOGY CO., LTD.
For
Wireless network card
Model No.: DY-AX210-Pro, DY-AX210-Plus, DY-AX200-Pro, DY-AX200-Plus, DY-7265-Pro, DY-7265-Plus, DY-I225-Pro, DY-I225-Plus, NIC-AX210-Pro, NIC-AX210-Plus, NIC-AX200-Pro, NIC-AX200-Plus

FCC ID: 2AYTJAX210-PRO

Prepared for : **SHENZHEN DA YAO TECHNOLOGY CO., LTD.**
Room 901, No. 25001 06, Junxin Road, Niuhu Community, Guanlan Street, Longhua District, Shenzhen, China

Prepared By : **Shenzhen HUAK Testing Technology Co., Ltd.**
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Date of Test: **Jan. 15, 2021 ~ Jan. 22, 2021**
Date of Report: **Jan. 22, 2021**
Report Number: **HK2101180242-3E**

TEST RESULT CERTIFICATION

Applicant's name ..... : SHENZHEN DA YAO TECHNOLOGY CO., LTD.

Address ..... : Room 901, No. 25001 06, Junxin Road, Niuhu Community, Guanlan Street, Longhua District, Shenzhen, China

Manufacture's Name..... : SHENZHEN DA YAO TECHNOLOGY CO., LTD.

Address ..... : Room 901, No. 25001 06, Junxin Road, Niuhu Community, Guanlan Street, Longhua District, Shenzhen, China

Product description

Trade Mark: Heng Tek ®

Product name ..... : Wireless network card

Model and/or type reference : DY-AX210-Pro, DY-AX210-Plus, DY-AX200-Pro, DY-AX200-Plus, DY-7265-Pro, DY-7265-Plus, DY-I225-Pro, DY-I225-Plus, NIC-AX210-Pro, NIC-AX210-Plus, NIC-AX200-Pro, NIC-AX200-Plus

Standards ..... : **47 CFR FCC Part 15 Subpart C 15.247**

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Date of Test .....:

Date (s) of performance of tests .....: Jan. 15, 2021 ~ Jan. 22, 2021

Date of Issue.....: Jan. 22, 2021

Test Result.....: **Pass**

Prepared by: Gary Qian

Project Engineer

Reviewed by: Edan Hu

Project Supervisor

Approved by: Jason Zhou

Technical Director

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Revison History

Revision	Issue Date	Revisions	Revised By
V1.0	Jan. 22, 2021	Initial Issue	Jason Zhou

1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices

1.2. Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	Pass
FCC Part 15.215	20dB Bandwidth& 99% Bandwidth	compliance *
FCC Part 15.247(d)	Spurious RF Conducted Emission	compliance *
FCC Part 15.247(b)	Maximum Peak Output Power	compliance *
FCC Part 15.247 (a) (1)	Pseudorandom Frequency Hopping Sequence	compliance *
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency& Time of Occupancy	compliance *
FCC Part 15.247(a)(1)	Frequency Separation	compliance *
FCC Part 15.205/15.209	Radiated Emissions	Pass
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	compliance *
NOTE 1: For the verdict, the “ compliance *” Test data refers to FCC ID: PD9AX210NG, and report number is: 200611-03.TR05.		

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.:1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,Heping Community, Fuhai Street, Bao'an District, Shenzhen, China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

IC Registration No.: 21210

The 3m alternate test site of Shenzhen HUAK Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 21210 on May 24, 2016.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen HUAK Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for HUAK laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±3.68%	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Wireless network card
Model/Type reference:	DY-AX210-Pro
Serial Model:	DY-AX210-Plus, DY-AX200-Pro, DY-AX200-Plus, DY-7265-Pro, DY-7265-Plus, DY-I225-Pro, DY-I225-Plus, NIC-AX210-Pro, NIC-AX210-Plus, NIC-AX200-Pro, NIC-AX200-Plus
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: DY-AX210-Pro
Power supply:	DC 3.3V
Version:	Supported EDR
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	External Antenna
Antenna gain:	0dBi
Hardware Version:	21.110.20263.10859
Software Version:	OEM_ DRTU_CommonApp_ 00940_21_350120_0W

Note: For more details, refer to the user's manual of the EUT.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.
There are 79 channels provided to the EUT and Channel 00/39/78 was selected for testing.

Operation Frequency：

Channel	Frequency (MHz)
00	2402
01	2403
⋮	⋮
38	2440
39	2441
40	2442
⋮	⋮
77	2479
78	2480

Note: The line display in grey were the channel selected for testing

Preliminary tests were performed in each mode 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	DH5 Middle channel
Radiated Emissions and Band Edge	DH5
Maximum Conducted Output Power	DH5/2DH5/3DH5
20dB Bandwidth&99% Bandwidth	DH5/2DH5/3DH5
Frequency Separation	DH5/2DH5/3DH5 Middle channel
Number of hopping frequency	DH5/2DH5/3DH5
Time of Occupancy (Dwell Time)	DH1/DH3/DH5 Middle channel 2DH1/2DH3/2DH5 Middle channel 3DH1/3DH3/3DH5 Middle channel
Out-of-band Emissions	DH5/2DH5/3DH5

2.4. Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Jun. 18, 2020	1 Year
2.	Receiver	R&S	ESR-7	HKE-010	Jun. 18, 2020	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Jun. 18, 2020	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Jun. 18, 2020	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Jun. 18, 2020	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Jun. 18, 2020	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Jun. 18, 2020	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Jun. 18, 2020	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Jun. 18, 2020	1 Year
10.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Jun. 18, 2020	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Jun. 18, 2020	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Jun. 18, 2020	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Jun. 18, 2020	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Jun. 18, 2020	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Jun. 18, 2020	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Jun. 18, 2020	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Jun. 18, 2020	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Jun. 18, 2020	3 Year
19	Power meter	Agilent	E4419B	HKE-085	Jun. 18, 2020	1 Year
20	Horn Antenna	Schewarzbeck	BBHA 9170	HKE-017	Jun. 18, 2020	1 Year

The calibration interval was one year

2.5. Related Submittal(s) / Grant (s)

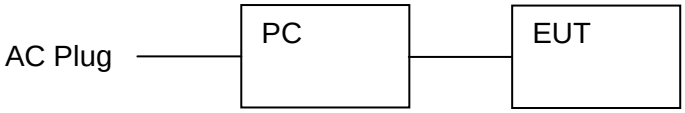
This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

2.7. DESCRIPTION OF TEST SETUP

Operation of EUT during below 1GHz and Above1GHz Radiation testing:



The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

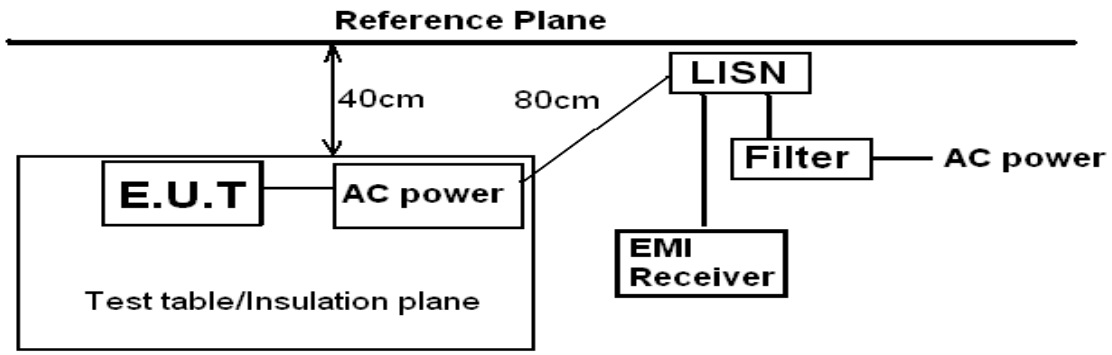
LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS Gen 8.8, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



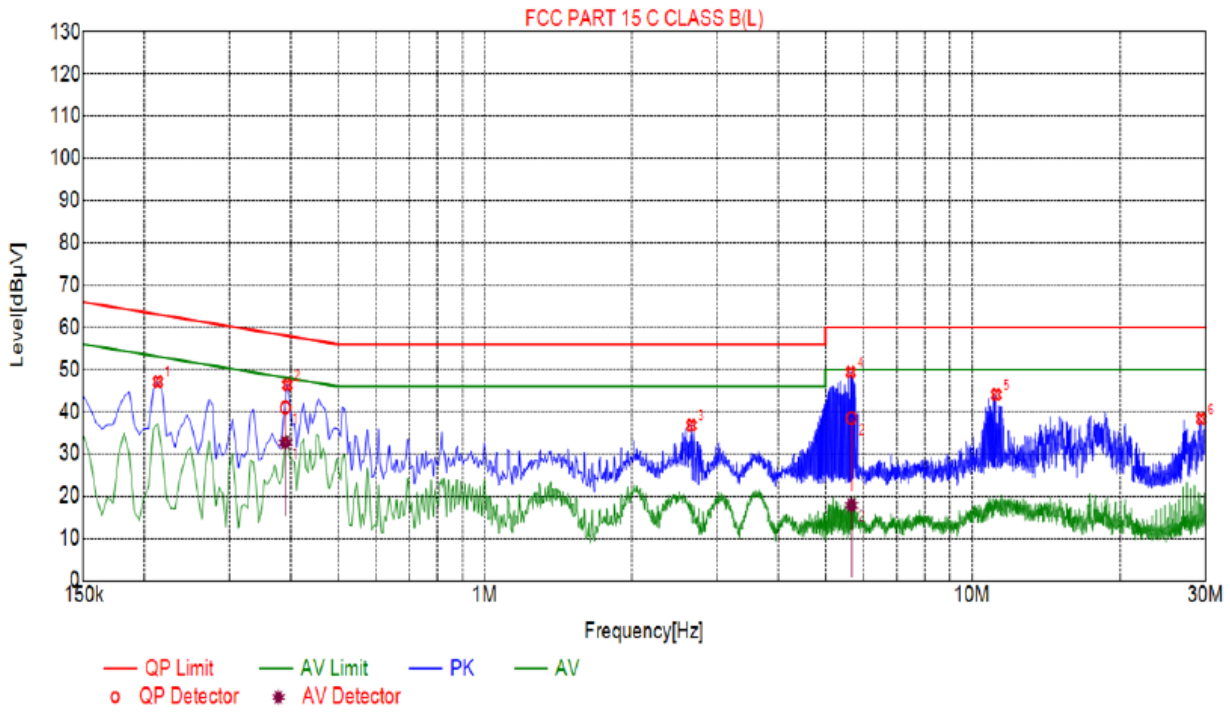
Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

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 C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The 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.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Test Specification: Line



Suspected List								
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Type
1	0.2130	47.11	20.05	63.09	15.98	27.06	PK	L
2	0.3930	46.37	20.04	58.00	11.63	26.33	PK	L
3	2.6565	36.76	20.21	56.00	19.24	16.55	PK	L
4	5.6400	49.36	20.25	60.00	10.64	29.11	PK	L
5	11.2200	44.04	20.01	60.00	15.96	24.03	PK	L
6	29.3460	38.32	20.26	60.00	21.68	18.06	PK	L

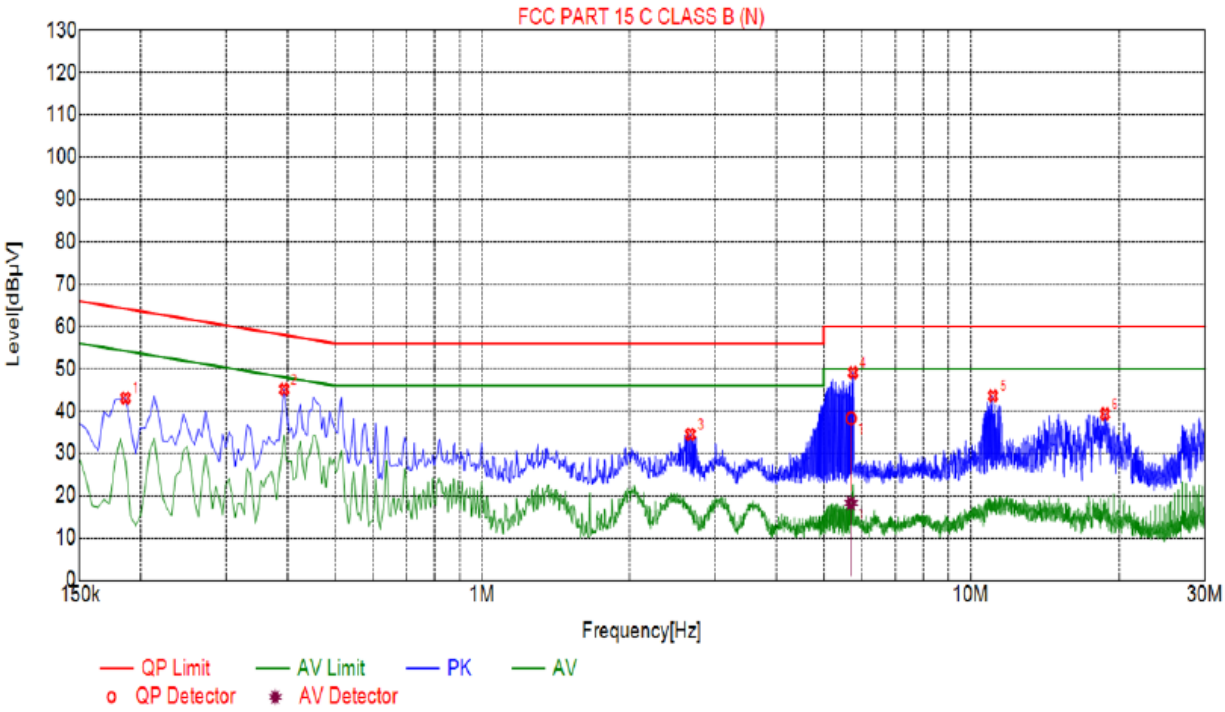
Final Data List											
NO.	Freq. [MHz]	Correction factor[dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	QP Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	AV Reading [dBµV]	Type
1	0.3896	20.04	40.98	58.07	17.09	20.94	32.65	48.07	15.42	12.61	L
2	5.6606	20.25	38.48	60.00	21.52	18.23	17.89	50.00	32.11	-2.36	L

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor

Test Specification: Neutral



Suspected List

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.1860	43.08	20.05	64.21	21.13	23.03	PK	N
2	0.3930	45.12	20.04	58.00	12.88	25.08	PK	N
3	2.6700	34.50	20.21	56.00	21.50	14.29	PK	N
4	5.7480	49.13	20.24	60.00	10.87	28.89	PK	N
5	11.1120	43.58	20.01	60.00	16.42	23.57	PK	N
6	18.7305	39.30	20.06	60.00	20.70	19.24	PK	N

Final Data List

NO.	Freq. [MHz]	Correction factor[dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	QP Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	AV Reading [dBμV]	Type
1	5.6981	20.24	38.27	60.00	21.73	18.03	18.29	50.00	31.71	-1.95	N

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor

3.2. Radiated Emissions and Band Edge

Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission

Unwanted emissions that fall into restricted bands shall comply with the limits specified in RSS-Gen; and U

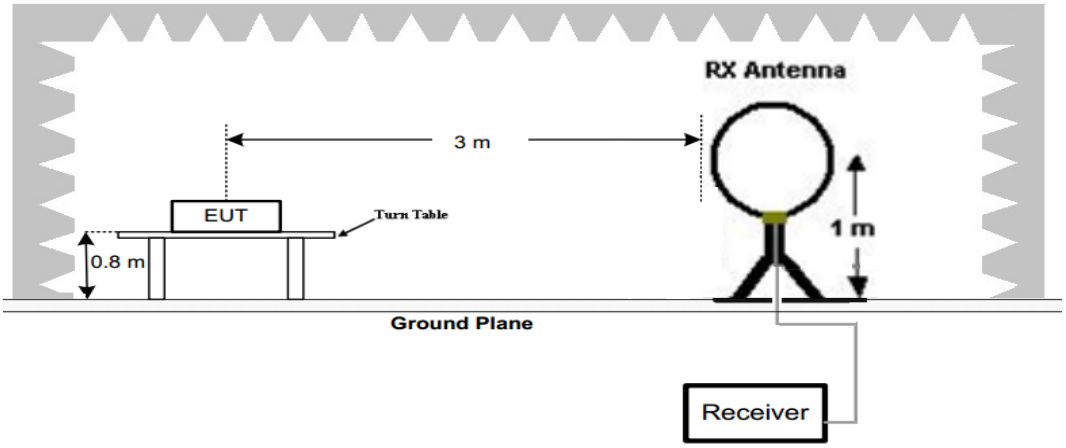
nwanted emissions that do not fall within the restricted frequency bands shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Radiated emission limits

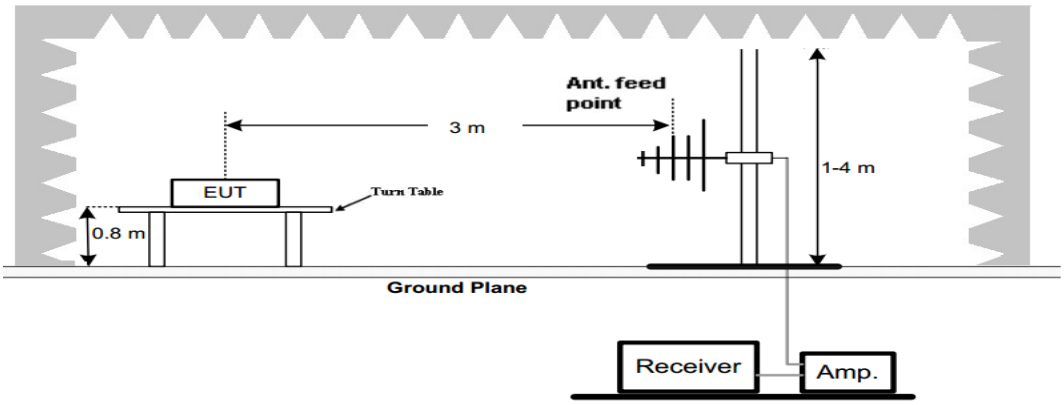
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

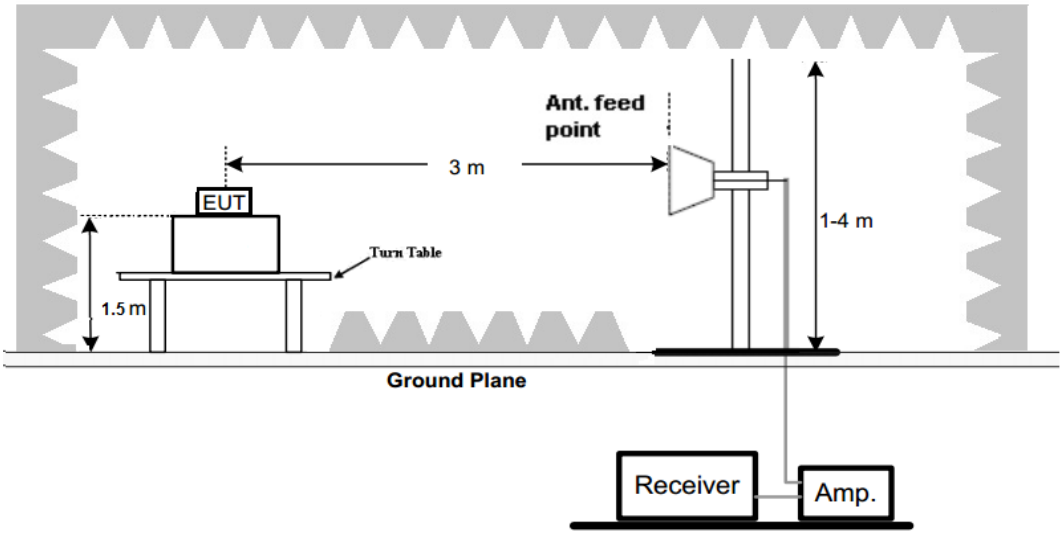
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



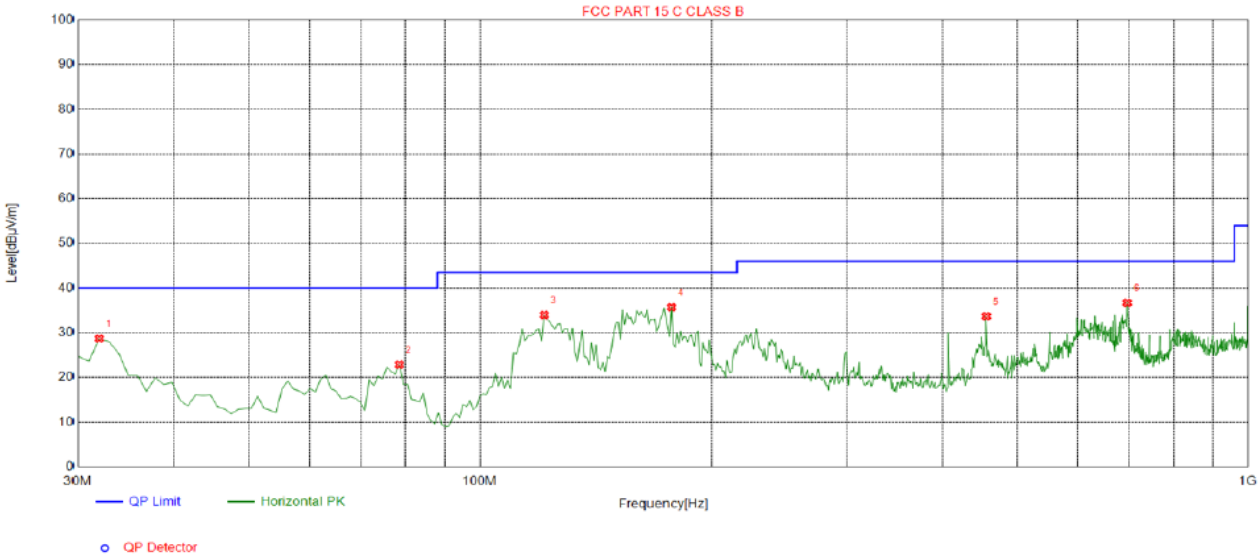
Test Procedure

1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

TEST RESULTS

Remark:
1. Radiated Emission measured at GFSK, π/4 DQPSK and 8DPSK mode from 9 KHz to 10th harmonic of fundamental and recorded worst case at GFSK DH5 mode.
2. There is no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.
3. For below 1GHz testing recorded worst at GFSK DH5 low channel.

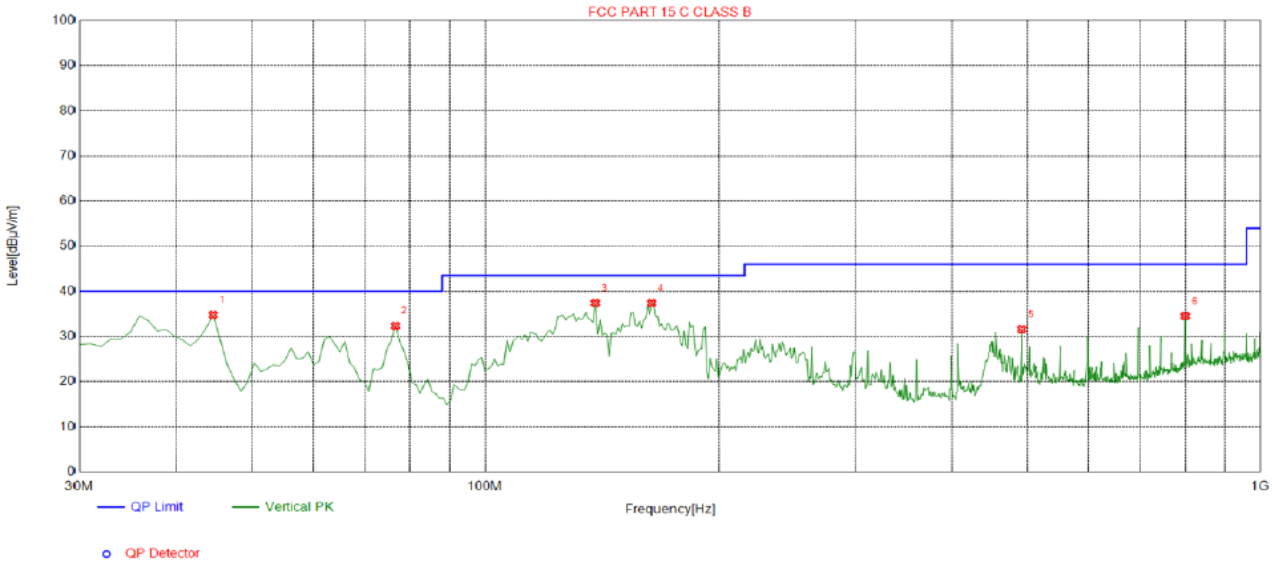
Below 1GHz Test Results:
Antenna polarity: H



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.9419	-16.26	44.96	28.70	40.00	11.30	100	4	Horizontal
2	78.5485	-19.21	42.07	22.86	40.00	17.14	100	180	Horizontal
3	121.2713	-17.29	51.27	33.98	43.50	9.52	100	32	Horizontal
4	177.5876	-16.96	52.67	35.71	43.50	7.79	100	316	Horizontal
5	456.2563	-8.79	42.48	33.69	46.00	12.31	100	348	Horizontal
6	696.0861	-5.12	41.83	36.71	46.00	9.29	100	100	Horizontal

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

Antenna polarity: V



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	44.5646	-13.73	48.49	34.76	40.00	5.24	100	286	Vertical
2	76.6066	-18.86	51.20	32.34	40.00	7.66	100	292	Vertical
3	138.7487	-19.10	56.49	37.39	43.50	6.11	100	60	Vertical
4	163.9940	-17.85	55.22	37.37	43.50	6.13	100	83	Vertical
5	492.1822	-8.50	40.08	31.58	46.00	14.42	100	141	Vertical
6	799.9800	-3.12	37.63	34.51	46.00	11.49	100	250	Vertical

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

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.

For 1GHz to 25GHz

CH Low (2402MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804.00	59.32	-3.65	55.67	74.00	-18.33	peak
4804.00	47.15	-3.65	43.50	54.00	-10.50	AVG
7206.00	56.82	-0.95	55.87	74.00	-18.13	peak
7206.00	43.67	-0.95	42.72	54.00	-11.28	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804.00	58.46	-3.65	54.81	74.00	-19.19	peak
4804.00	46.35	-3.65	42.70	54.00	-11.30	AVG
7206.00	56.78	-0.95	55.83	74.00	-18.17	peak
7206.00	42.55	-0.95	41.60	54.00	-12.40	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH Middle (2441MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4882.00	58.62	-3.54	55.08	74.00	-18.92	peak
4882.00	46.38	-3.54	42.84	54.00	-11.16	AVG
7323.00	56.21	-0.81	55.40	74.00	-18.60	peak
7323.00	43.25	-0.81	42.44	54.00	-11.56	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4882.00	59.34	-3.54	55.80	74.00	-18.20	peak
4882.00	46.32	-3.54	42.78	54.00	-11.22	AVG
7323.00	55.19	-0.81	54.38	74.00	-19.62	peak
7323.00	42.08	-0.81	41.27	54.00	-12.73	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH High (2480MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960.00	58.37	-3.43	54.94	74.00	-19.06	peak
4960.00	46.32	-3.44	42.88	54.00	-11.12	AVG
7440.00	56.72	-0.77	55.95	74.00	-18.05	peak
7440.00	42.14	-0.77	41.37	54.00	-12.63	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960.00	58.34	-3.43	54.91	74.00	-19.09	peak
4960.00	46.47	-3.44	43.03	54.00	-10.97	AVG
7440.00	56.81	-0.77	56.04	74.00	-17.96	peak
7440.00	42.38	-0.77	41.61	54.00	-12.39	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) The emissions are attenuated more than 20dB below the permissible limits are not recorded in the report.
(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.

Radiated Band Edge Test:

Hopping

Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	58.32	-5.81	52.51	74	-21.49	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	56.76	-5.84	50.92	74	-23.08	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	57.14	-5.81	51.33	74	-22.67	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	56.38	-5.84	50.54	74	-23.46	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	57.62	-5.81	51.81	74	-22.19	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	56.22	-6.06	50.16	74	-23.84	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	57.14	-5.81	51.33	74	-22.67	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	55.93	-6.06	49.87	74	-24.13	peak
2500.00	/	-6.06	/	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.						

NO hopping

Operation Mode: TX CH Low (2402MHz)
Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	56.42	-5.81	50.61	74	-23.39	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	55.39	-5.84	49.55	74	-24.45	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	57.14	-5.81	51.33	74	-22.67	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	56.61	-5.84	50.77	74	-23.23	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2480MHz)
Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	58.32	-5.81	52.51	74	-21.49	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	54.19	-6.06	48.13	74	-25.87	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	57.49	-5.81	51.68	74	-22.32	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	56.14	-6.06	50.08	74	-23.92	peak
2500.00	/	-6.06	/	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.						

3.3. Maximum Peak Conducted Output Power

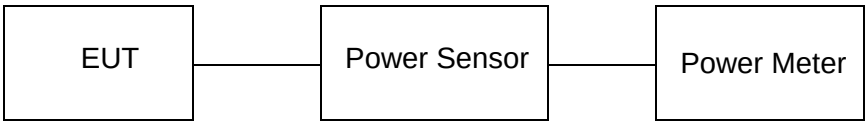
Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

N/A*

Note: Test data refers to FCC ID: PD9AX210NG, and report number is:200611-03.TR05.

3.4. 20dB Bandwidth

Limit

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

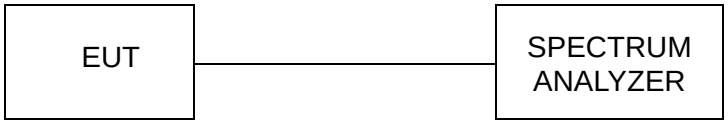
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

RBW=1% to 5% of the OBW
VBW=approximately 3 X RBW
Detector=Peak
Trace Mode: Max Hold

Use the 99% power bandwidth function of the instrument to measure the Occupied Bandwidth and recoded.

Test Configuration



Test Results

N/A*

Note: Test data refers to FCC ID: PD9AX210NG, and report number is:200611-03.TR05.

3.5. Frequency Separation

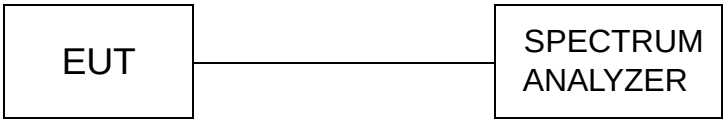
LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300 KHz RBW and 1000 KHz VBW.

TEST CONFIGURATION



TEST RESULTS

N/A*

Note: Test data refers to FCC ID: PD9AX210NG, and report number is:200611-03.TR05.

3.6. Number of hopping frequency

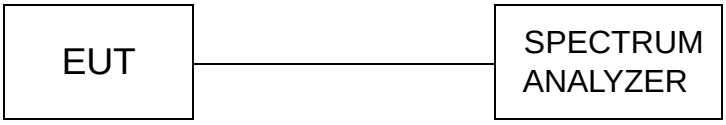
Limit

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz.

Test Configuration



Test Results

N/A*

Note: Test data refers to FCC ID: PD9AX210NG, and report number is:200611-03.TR05.

3.7. Time of Occupancy (Dwell Time)

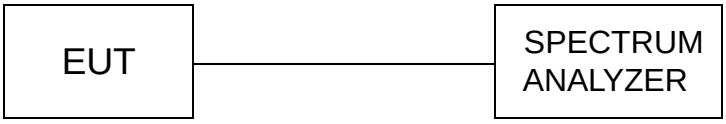
Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 3MHz VBW, Span 0Hz.

Test Configuration



Test Results

N/A*

Note: Test data refers to FCC ID: PD9AX210NG, and report number is:200611-03.TR05

3.8. Out-of-band Emissions

Limit

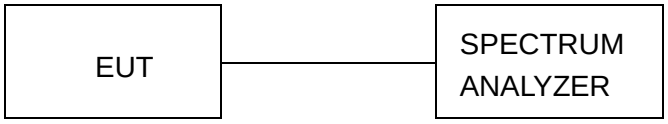
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration



Test Results

N/A*

Note: Test data refers to FCC ID: PD9AX210NG, and report number is:200611-03.TR05

3.9. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

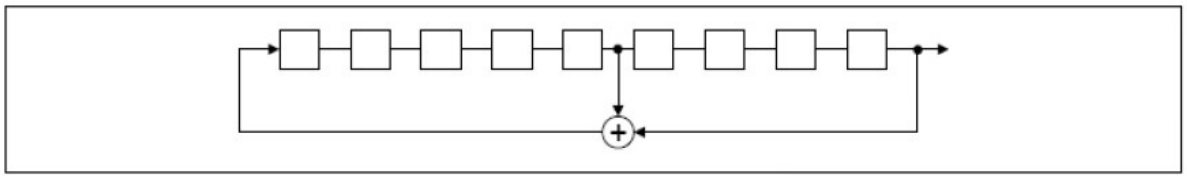
For 47 CFR Part 15C section 15.247 (a) (1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

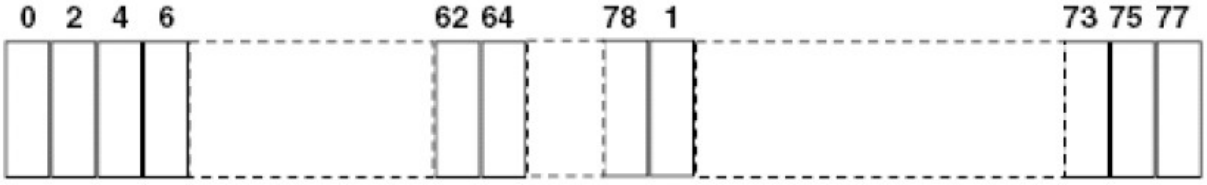
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

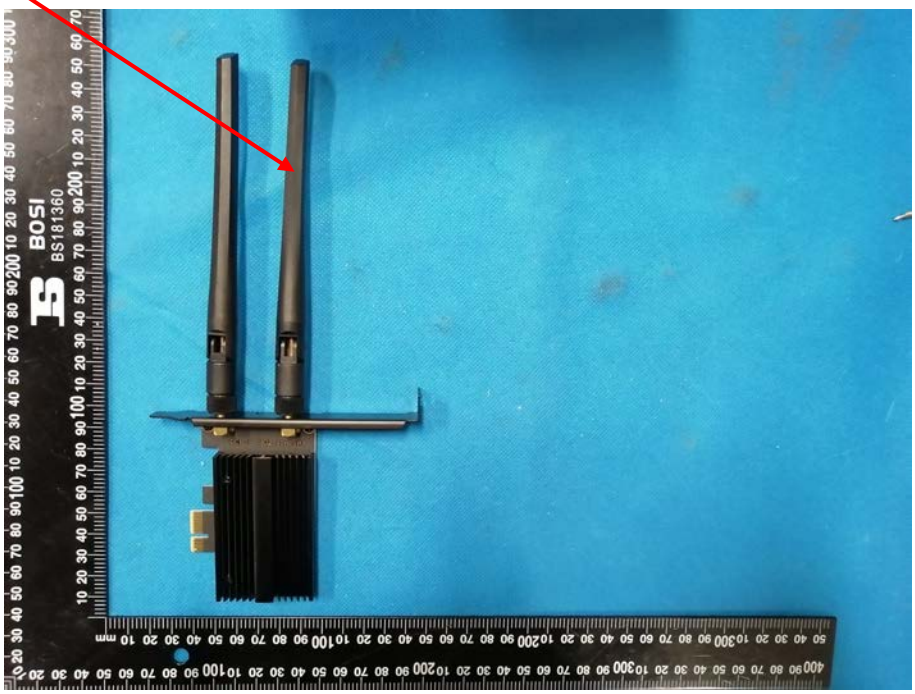
3.10. ANTENNA REQUIREMENT

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 15.247, 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.

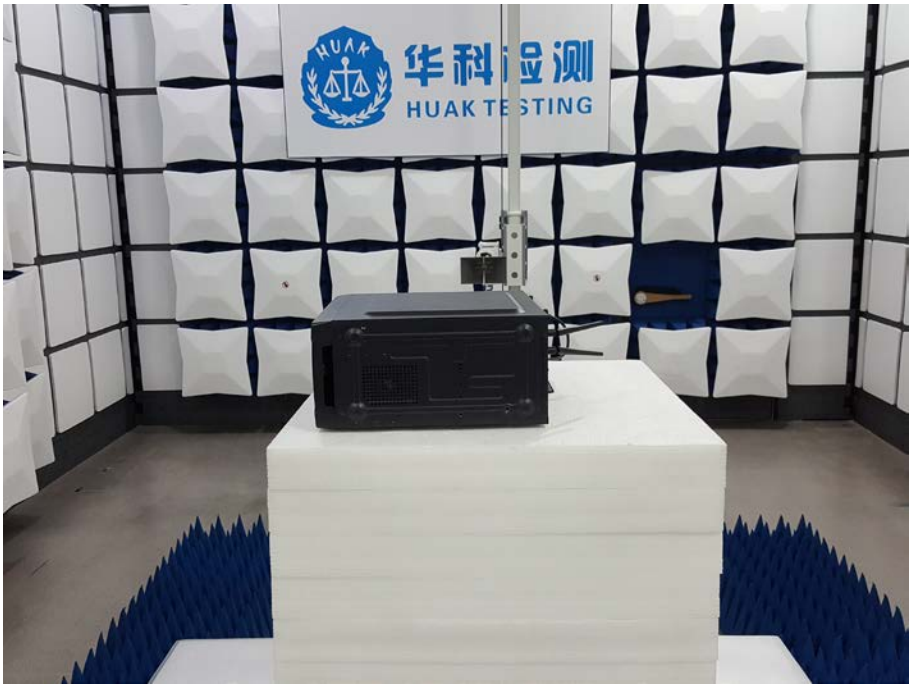
Refer to statement below for compliance.
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

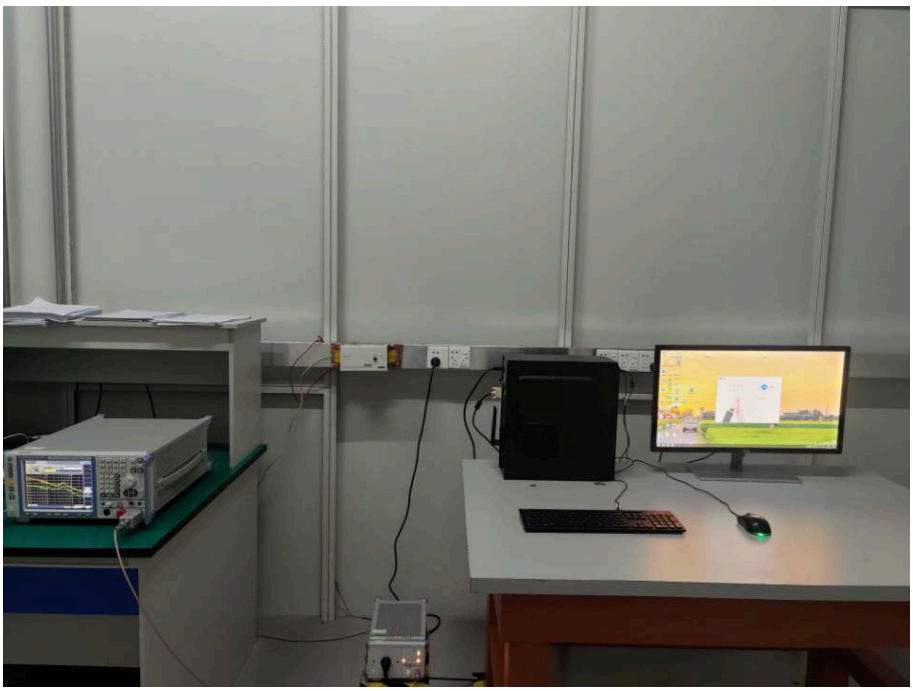
Antenna Connected Construction
The antenna used in this product is a External Antenna, with non-standard SMA connector, need professional installation, not easy to remove. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 0dBi.

ANTENNA



4. Test Setup Photos of the EUT





5. PHOTOS OF THE EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos

---------End of test report---------