

FCC RADIO TEST REPORT

FCC ID: 2AGZ8-7199891

Product Name : Drone

Trade Mark : N/A

Main Model : 7199-89WH

Additional Model : N/A

Report No. : UNIA20080608ER-01

Prepared for

DOWELLIN TOYS FACTORY

1 Road FengXin ChengHai District, ShanTou City,GuangDong, 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.....: DOWELLIN TOYS FACTORY
Address.....: 1 Road FengXin ChengHai District, ShanTou City,GuangDong, China
Manufacturer.....: DOWELLIN TOYS FACTORY
Address.....: 1 Road FengXin ChengHai District, ShanTou City,GuangDong, China

Product description

Product Name.....: Drone
Trade Mark.....: N/A
Model Name.....: 7199-89WH
Test Methods.....: FCC Rules and Regulations Part 15 Subpart C Section 15.247
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.....: Aug. 06, 2020 ~ Aug. 28, 2020
Date of Issue.....: Aug. 28, 2020
Test Result.....: Pass

Prepared by:

Bob Liao

Bob liao/Editor

Reviewer:

Kahn Yang

Kahn yang/Supervisor

Approved & Authorized Signer:

Liuze

Liuze/Manager

Table of Contents

Page

1 TEST SUMMARY	5
2 GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF EUT	8
2.2 CARRIER FREQUENCY OF CHANNELS	9
2.3 TEST MODE	9
2.4 TEST SETUP	9
2.5 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL	10
2.6 MEASUREMENT INSTRUMENTS LIST	11
3 CONDUCTED EMISSION	12
3.1 TEST LIMIT	12
3.2 TEST SETUP	12
3.3 TEST PROCEDURE	13
3.4 TEST RESULT	13
4 RADIATED EMISSION	16
4.1 TEST LIMIT	16
4.2 TEST SETUP	17
4.3 TEST PROCEDURE	18
4.4 TEST RESULT	18
5 OCCUPIED BANDWIDTH	30
5.1 TEST LIMIT	30
5.2 TEST PROCEDURE	30
5.3 EQUIPMENT USED	30
5.4 TEST RESULT	30
6 POWER SPECTRAL DENSITY	34
6.1 TEST LIMIT	34
6.2 TEST PROCEDURE	34
6.3 EQUIPMENT USED	34
6.4 TEST RESULT	34
7 PEAK OUTPUT POWER	38
7.1 TEST LIMIT	38
7.2 TEST PROCEDURE	38
7.3 EQUIPMENT USED	38
7.4 TEST RESULT	38
8 OUT OF BAND EMISSIONS	39
8.1 TEST LIMIT	39

Table of Contents

Page

8.2 TEST SETUP	39
8.3 TEST PROCEDURE	39
8.4 TEST RESULT	39
9 ANTENNA REQUIREMENT	45
10 PHOTO OF TEST	46
10.1 RADIATED EMISSION	46
10.2 CONDUCTED EMISSION	47

1 TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

ITEM	STANGARD	RESULT
CONDUCTED EMISSION	FCC Part 15.207	COMPLIANT
RADIATED EMISSION	FCC Part 15.209(a)	COMPLIANT
OCCUPIED BANDWIDTH	FCC Part 15.247(a)(2)	COMPLIANT
POWER SPECTRAL DENSITY	FCC Part 15.247(e)	COMPLIANT
PEAK OUTPUT POWER	FCC Part 15.247(b)	COMPLIANT
OUT OF BAND EMISSIONS	FCC Part 15.247(d)	COMPLIANT
CONDUCTED SPURIOUS EMISSION	FCC Part 15.247(d)	COMPLIANT
ANTENNA REQUIREMENT	FCC Part 15.203	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. This approval result is accepted by MRA of APLAC.

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

A2LA Certificate Number: 4747.01

The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 21947

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

1.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95%.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	ANSI	9kHz ~ 150kHz	2.96	
		150kHz ~ 30MHz	2.44	

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	ANSI	9kHz ~ 30MHz	2.50	
		30MHz ~ 1000MHz	4.80	
		1000MHz ~ 6000MHz	4.13	

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	Drone
Trade Mark:	N/A
Main Model:	7199-89WH
Additional Model:	N/A
Model Difference:	N/A
FCC ID:	2AGZ8-7199891
Operation Frequency:	802.11b/g/n20: 2417MHz
Number of Channels:	802.11b/g/n20: 1CH
Modulation Type:	CCK, OFDM, DBPSK, DAPSK
Antenna Type:	Internal Antenna
Antenna Gain:	2dBi
Battery:	DC 3.7V, 600mAh
Adapter:	N/A
Power Source:	DC 5.0V from adapter with AC 120(240)V/60Hz

2.2 CARRIER FREQUENCY OF CHANNELS

Channel List for 802.11b/g/n(20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2417						

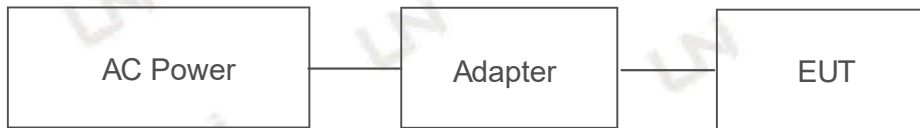
2.3 TEST MODE

The EUT was programmed to be in continuously transmitting mode. (Dutycycle>98%)

Channel List for 802.11b/g/n(20MHz)	
Test Channel	Test Frequency (MHz)
CH01	2417

2.4 TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation and Above1GHz Radiation testing:



2.5 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Note
E-1	Drone	N/A	7199-89WH	EUT
E-2	Adapter	XIAOMI	MDY-08-EF	AE

Item	Shielded Type	Ferrite Core	Length	Note

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in 『Length』 column.
3. “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Conduction Emissions Measurement					
1	Conducted Emission Test Software	EZ-EMC	Ver.CCS-3A1-CE	N/A	N/A
2	AMN	Schwarzbeck	NNLK8121	8121370	2020.10.15
3	AMN	ETS	3810/2	00020199	2020.10.15
4	AAN	TESEQ	T8-Cat6	38888	2020.10.15
5	Pulse Limiter	CYBRTEK	EM5010	E115010056	2021.05.25
6	EMI Test Receiver	Rohde&Schwarz	ESCI	101210	2020.10.15
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2020.10.08
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2022.03.01
4	PREAMP	HP	8449B	3008A00160	2020.10.21
5	PREAMP	HP	8447D	2944A07999	2021.05.25
6	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2020.10.15
7	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2020.10.15
8	Signal Generator	Agilent	E4421B	MY4335105	2020.10.15
9	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2020.10.15
10	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2020.10.15
11	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2021.05.25
12	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2021.05.25
13	RF power divider	Anritsu	K241B	992289	2020.10.28
14	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2020.11.19
15	Active Loop Antenna	Com-Power	AL-130R	10160009	2021.05.25
16	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2021.05.25
17	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2021.05.25
18	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2020.10.23
19	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2021.05.25
20	Signal Generator	Agilent	N5183A	MY47420153	2021.05.25
21	Spectrum Analyzer	Rohde&Schwarz	FSP 40	100501	2021.05.25
22	Power Meter	KEYSIGHT	N1911A	MY50520168	2021.05.25
23	Frequency Meter	VICTOR	VC2000	997406086	2021.05.25
24	DC Power Source	HYELEC	HY5020E	055161818	2021.05.25

3 CONDUCTED EMISSION

3.1 TEST LIMIT

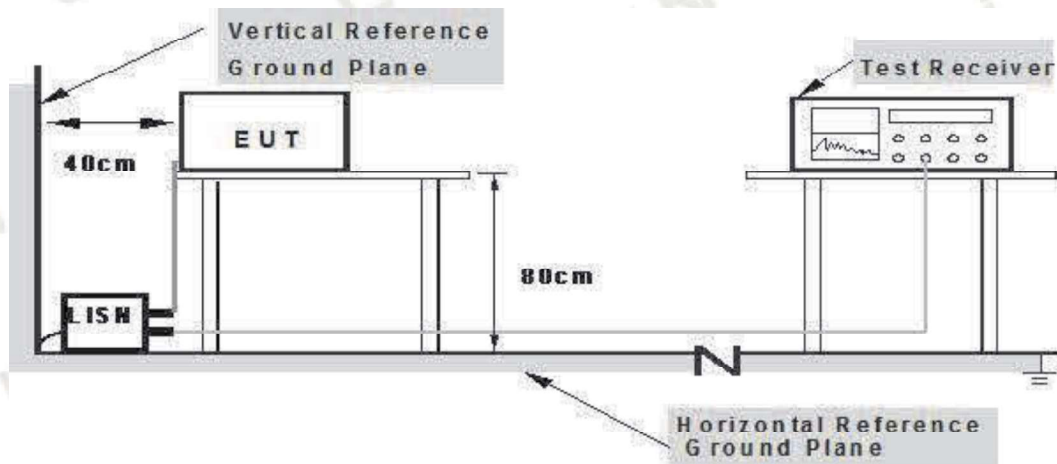
For unintentional device, according to § 15.207(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dB μ V)			
	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



- Note: 1. Support units were connected to second LISN.**
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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 placed on a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSIC63.10.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer/Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

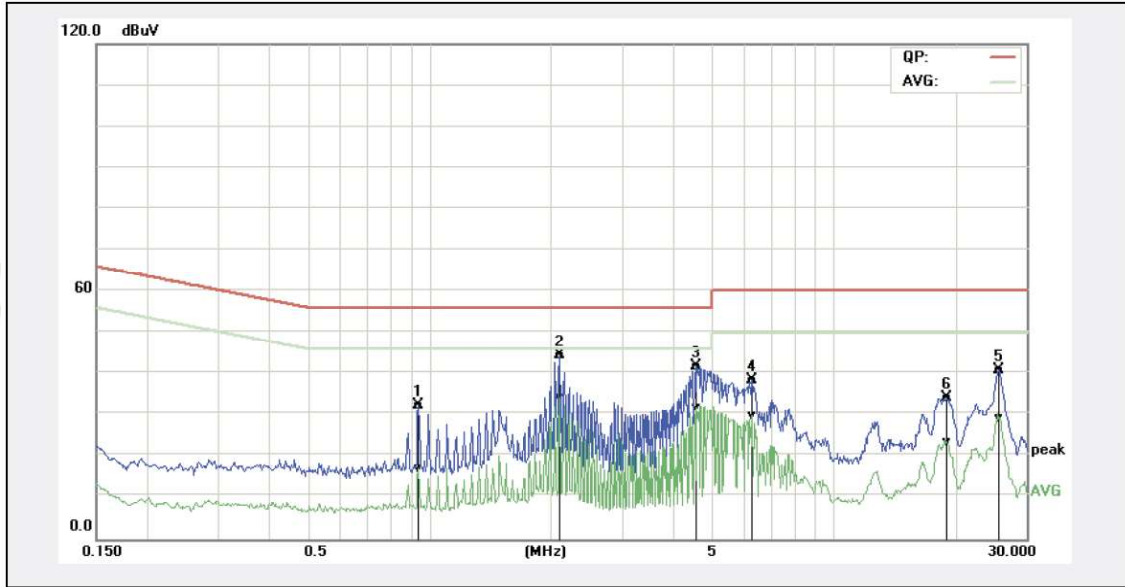
3.4 TEST RESULT

PASS

Remark:

All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.

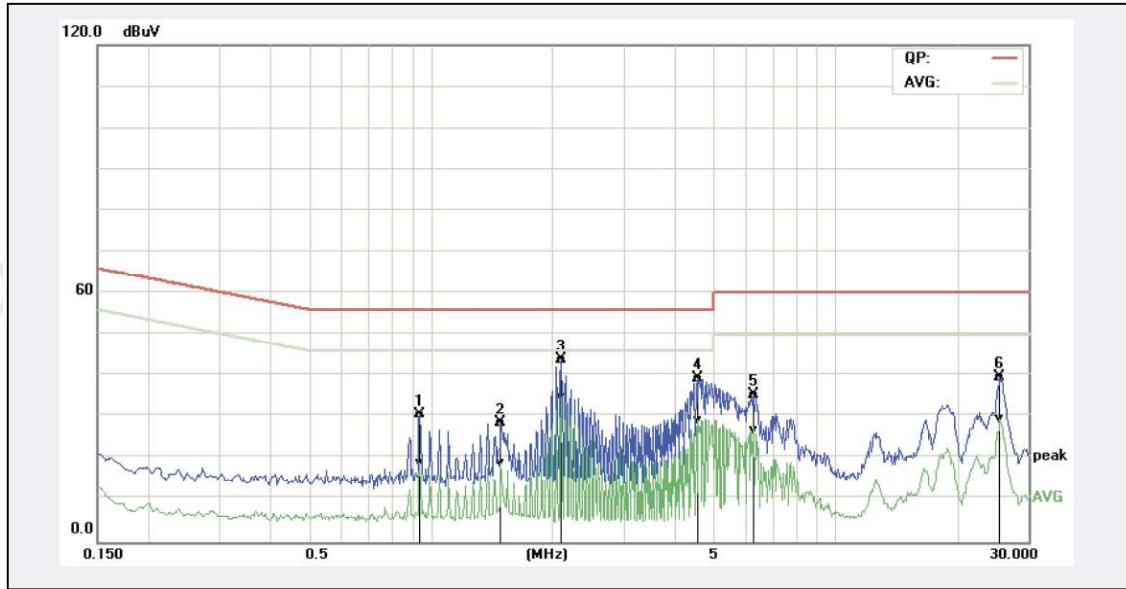
Temperature:	24°C	Relative Humidity:	48%
Test Date:	Aug. 18, 2020	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Line
Test Mode:	Transmitting mode of 802.11b 2417MHz		



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	0.9420	22.60	7.33	9.85	32.45	17.18	56.00	46.00	-23.55	-28.82	Pass
2*	2.1020	34.63	24.58	9.89	44.52	34.47	56.00	46.00	-11.48	-11.53	Pass
3P	4.5939	32.03	22.09	9.94	41.97	32.03	56.00	46.00	-14.03	-13.97	Pass
4P	6.3100	28.71	19.77	9.95	38.66	29.72	60.00	50.00	-21.34	-20.28	Pass
5P	25.6299	40.30	28.66	0.68	40.98	29.34	60.00	50.00	-19.02	-20.66	Pass
6P	19.0380	33.87	23.19	0.50	34.37	23.69	60.00	50.00	-25.63	-26.31	Pass

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

Temperature:	24°C	Relative Humidity:	48%
Test Date:	Aug. 18, 2020	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral
Test Mode:	Transmitting mode of 802.11b 2417MHz		



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	0.9420	21.03	9.06	9.85	30.88	18.91	56.00	46.00	-25.12	-27.09	Pass
2P	1.4940	18.79	9.33	9.86	28.65	19.19	56.00	46.00	-27.35	-26.81	Pass
3*	2.1060	34.03	24.92	9.89	43.92	34.81	56.00	46.00	-12.08	-11.19	Pass
4P	4.5939	29.55	19.30	9.94	39.49	29.24	56.00	46.00	-16.51	-16.76	Pass
5P	6.2540	25.75	16.84	9.94	35.69	26.78	60.00	50.00	-24.31	-23.22	Pass
6P	25.5180	39.07	28.83	0.67	39.74	29.50	60.00	50.00	-20.26	-20.50	Pass

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

4 RADIATED EMISSION

4.1 TEST LIMIT

For unintentional device, according to §15.209(a), except for Class B digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F (kHz)	-	Quasi-peak	300
0.490MHz-1.705MHz	24000/F (kHz)	-	Quasi-peak	30
1.705MHz-30MHz	30	-	Quasi-peak	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3
		74.0	Peak	3

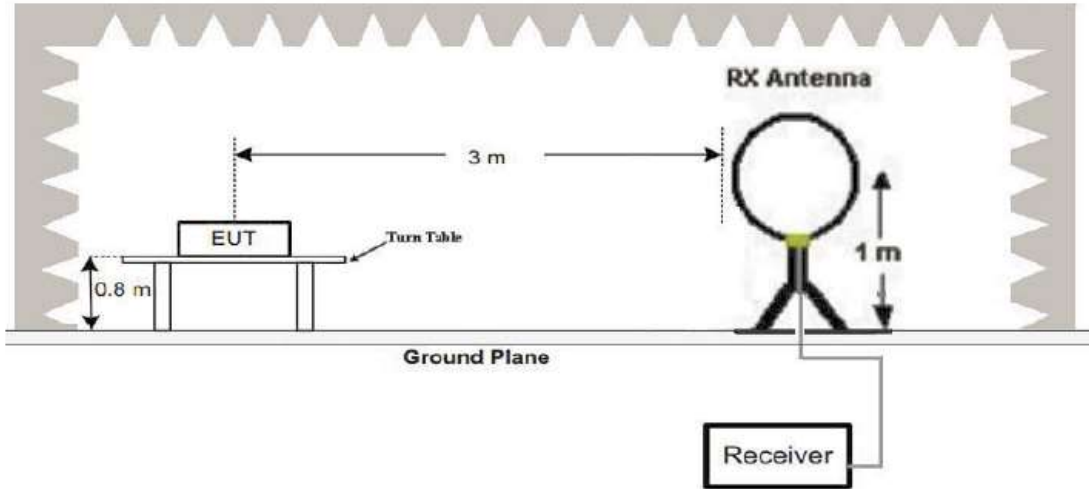
Limit calculation and transfer to 3m distance as showed in the following table:

Frequency (MHz)	Limit (dBuV/m)	Distance (m)
0.009-0.490	$20\log(2400/F(KHz))+40\log(300/3)$	3
0.490-1.705	$20\log(24000/F(KHz))+40\log(30/3)$	3
1.705-30.0	69.5	3
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

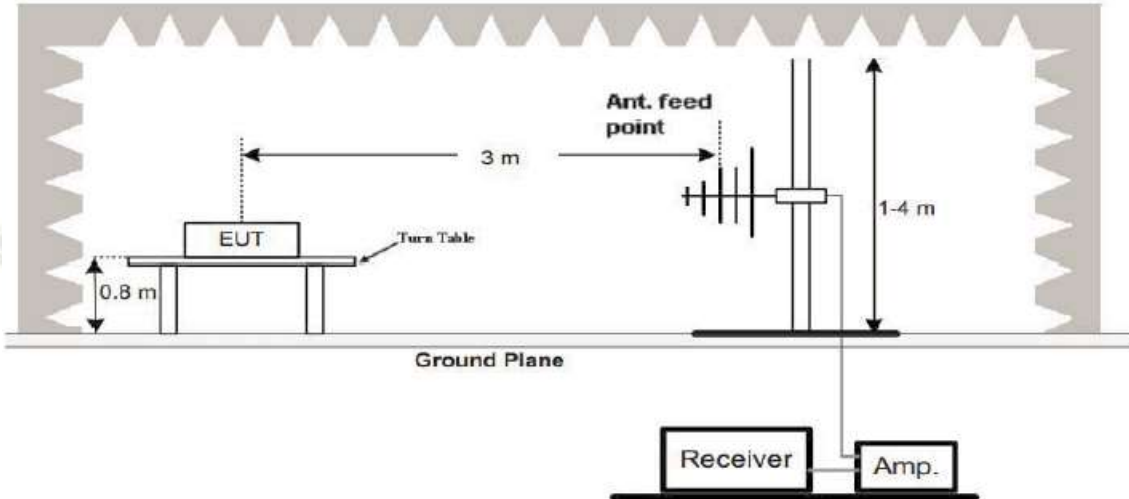
For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 TEST SETUP

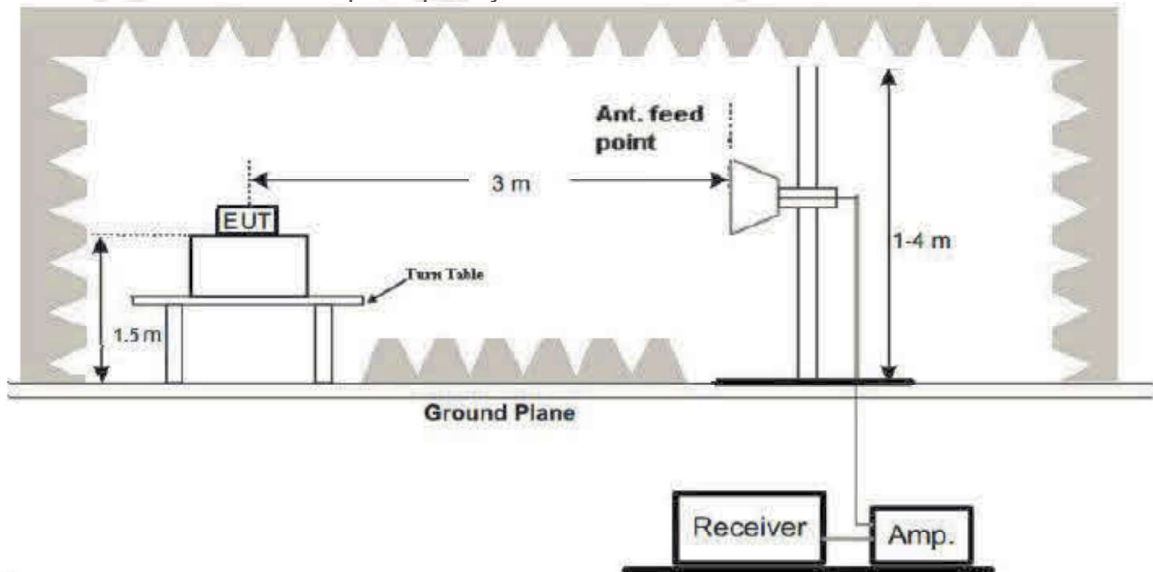
1. Radiated Emission Test-Up Frequency Below 30MHz



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

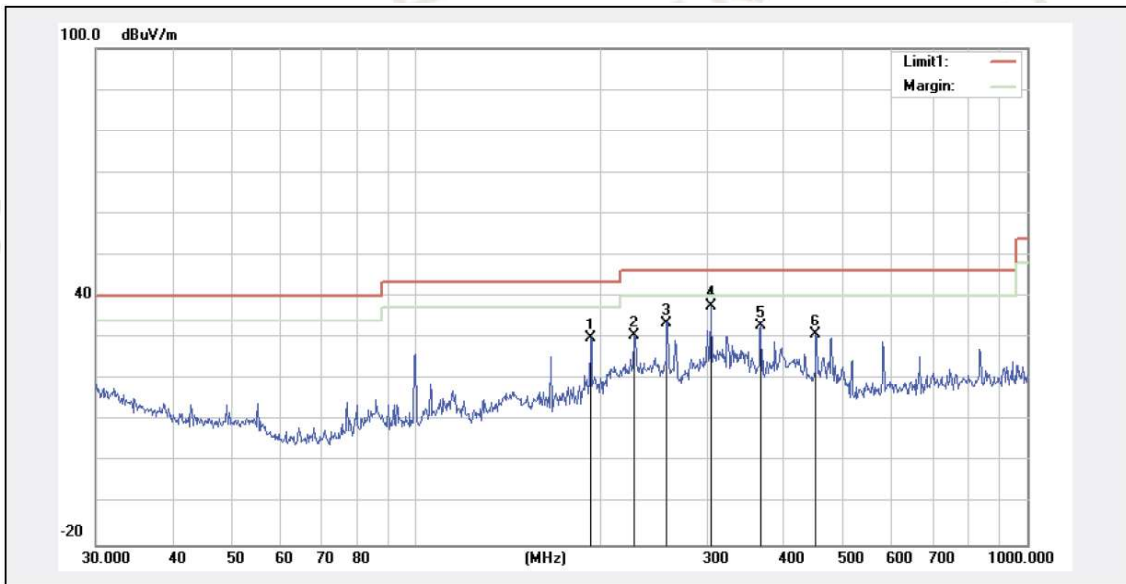
PASS

Remark:

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, and test data recorded in this report.

Below 1GHz Test Results:

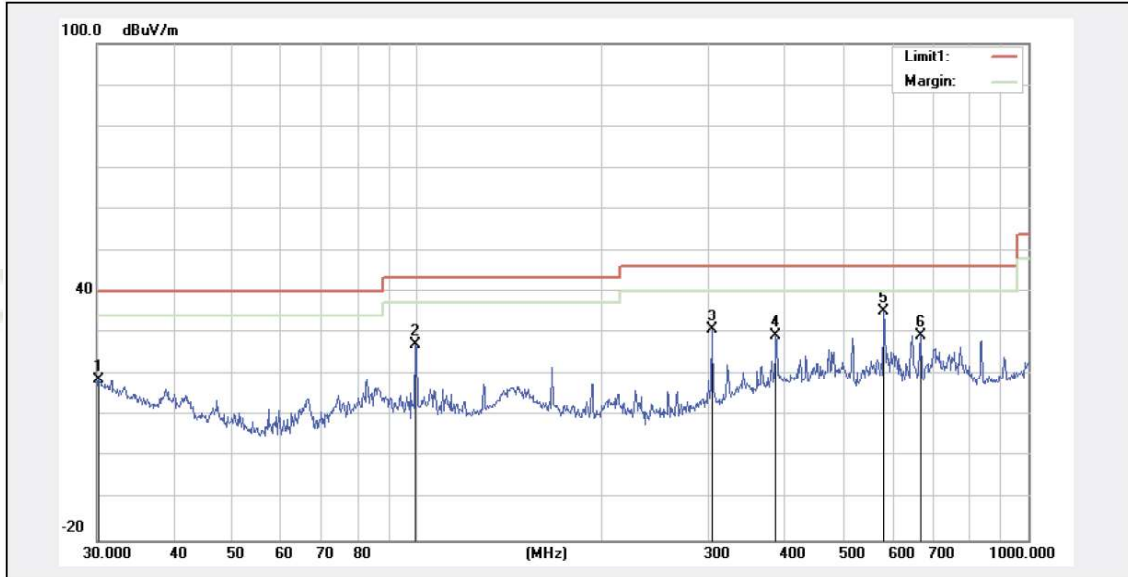
Temperature:	24°C	Relative Humidity:	48%
Test Date:	Aug. 18, 2020	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Horizontal
Test Mode:	Transmitting mode of 802.11b 2417MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	193.0945	47.66	-17.73	29.93	43.50	-13.57	100	100	peak
2	227.6906	48.84	-18.29	30.55	46.00	-15.45	60	100	peak
3	257.4222	50.43	-16.78	33.65	46.00	-12.35	150	100	peak
4*	303.5437	52.85	-15.01	37.84	46.00	-8.16	200	100	peak
5	366.8231	47.06	-14.00	33.06	46.00	-12.94	220	100	peak
6	451.1350	43.06	-12.33	30.73	46.00	-15.27	180	100	peak

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

Temperature:	24°C	Relative Humidity:	48%
Test Date:	Aug. 18, 2020	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Vertical
Test Mode:	Transmitting mode of 802.11b 2417MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	30.2111	26.25	-7.31	18.94	40.00	-21.06	60	100	peak
2	99.5281	46.54	-19.20	27.34	43.50	-16.16	120	100	peak
3	303.5437	45.87	-15.01	30.86	46.00	-15.14	100	100	peak
4	386.6338	42.93	-13.43	29.50	46.00	-16.50	90	100	peak
5*	580.7026	45.44	-10.10	35.34	46.00	-10.66	150	100	peak
6	668.1423	38.86	-9.39	29.47	46.00	-16.53	200	100	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, emission are more than 20dB below the limit form 9kHz to 30MHz
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:

CH01 of 802.11b Mode (2417MHz):

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4834	61.55	-3.64	57.91	74	-16.09	PK
4834	50.27	-3.64	46.63	54	-7.37	AV
7251	57.89	-0.95	56.94	74	-17.06	PK
7251	46.81	-0.95	45.86	54	-8.14	AV

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
4834	61.38	-3.64	57.74	74	-16.26	PK
4834	49.96	-3.64	46.32	54	-7.68	AV
7251	57.72	-0.95	56.77	74	-17.23	PK
7251	46.75	-0.95	45.80	54	-8.20	AV

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

CH01 of 802.11g Mode (2417MHz):

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4834	60.46	-3.64	56.82	74	-17.18	PK
4834	49.43	-3.64	45.79	54	-8.21	AV
7251	56.80	-0.95	55.85	74	-18.15	PK
7251	46.08	-0.95	45.13	54	-8.87	AV

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

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4834	60.31	-3.64	56.67	74	-17.33	PK
4834	49.38	-3.64	45.74	54	-8.26	AV
7251	56.75	-0.95	55.80	74	-18.20	PK
7251	45.95	-0.95	45.00	54	-9.00	AV

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

CH01 of 802.11n/H20 Mode (2417MHz):

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4834	60.52	-3.64	56.88	74	-17.12	PK
4834	49.29	-3.64	45.65	54	-8.35	AV
7251	56.72	-0.95	55.77	74	-18.23	PK
7251	45.99	-0.95	45.04	54	-8.96	AV

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
4834	60.47	-3.64	56.83	74	-17.17	PK
4834	49.32	-3.64	45.68	54	-8.32	AV
7251	56.83	-0.95	55.88	74	-18.12	PK
7251	46.11	-0.95	45.16	54	-8.84	AV

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. 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.

CH01 of 802.11b Mode (2417MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	56.44	-5.81	50.63	74	-23.37	PK
2310	/	-5.81	/	54	/	AV
2390	61.58	-5.84	55.74	74	-18.26	PK
2390	45.77	-5.84	39.93	54	-14.07	AV
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
2310	56.39	-5.81	50.58	74	-23.42	PK
2310	/	-5.81	/	54	/	AV
2390	62.20	-5.84	56.36	74	-17.64	PK
2390	45.53	-5.84	39.69	54	-14.31	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	56.87	-5.65	51.22	74	-22.78	PK
2483.5	/	-5.65	/	54	/	AV
2500	56.75	-5.72	51.03	74	-22.97	PK
2500	/	-5.72	/	54	/	AV

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

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	56.95	-5.65	51.30	74	-22.70	PK
2483.5	/	-5.65	/	54	/	AV
2500	56.80	-5.72	51.08	74	-22.92	PK
2500	/	-5.72	/	54	/	AV

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

CH01 of 802.11g Mode (2417MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	56.70	-5.81	50.89	74	-23.11	PK
2310	/	-5.81	/	54	/	AV
2390	62.06	-5.84	56.22	74	-17.78	PK
2390	44.90	-5.84	39.06	54	-14.94	AV
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
2310	56.81	-5.81	51.00	74	-23.00	PK
2310	/	-5.81	/	54	/	AV
2390	62.11	-5.84	56.27	74	-17.73	PK
2390	44.85	-5.84	39.01	54	-14.99	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	56.86	-5.65	51.21	74	-22.79	PK
2483.5	/	-5.65	/	54	/	AV
2500	57.45	-5.72	51.73	74	-22.27	PK
2500	/	-5.72	/	54	/	AV

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

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	56.79	-5.65	51.14	74	-22.86	PK
2483.5	/	-5.65	/	54	/	AV
2500	57.33	-5.72	51.61	74	-22.39	PK
2500	/	-5.72	/	54	/	AV

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

CH01 of 802.11n/H20 Mode (2417MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	57.12	-5.81	51.31	74	-22.69	PK
2310	/	-5.81	/	54	/	AV
2390	62.10	-5.84	56.26	74	-17.74	PK
2390	45.29	-5.84	39.45	54	-14.55	AV
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
2310	56.89	-5.81	51.08	74	-22.92	PK
2310	/	-5.81	/	54	/	AV
2390	62.09	-5.84	56.25	74	-17.75	PK
2390	45.33	-5.84	39.49	54	-14.51	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	57.07	-5.65	51.42	74	-22.58	PK
2483.5	/	-5.65	/	54	/	AV
2500	56.80	-5.72	51.08	74	-22.92	PK
2500	/	-5.72	/	54	/	AV

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

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	57.10	-5.65	51.45	74	-22.55	PK
2483.5	/	-5.65	/	54	/	AV
2500	56.76	-5.72	51.04	74	-22.96	PK
2500	/	-5.72	/	54	/	AV

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

5 OCCUPIED BANDWIDTH

5.1 TEST LIMIT

FCC Part15(15.247), Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

5.2 TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on FCC Part15 C Section 15.247: RBW=100kHz, VBW=300kHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

5.3 EQUIPMENT USED

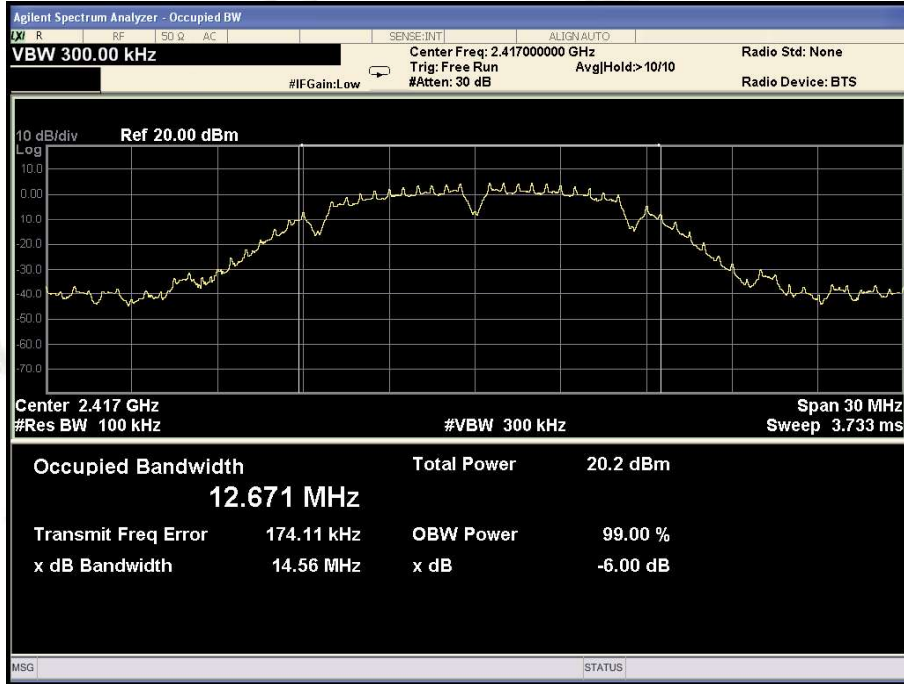
Same as Radiated Emission Measurement.

5.4 TEST RESULT

PASS

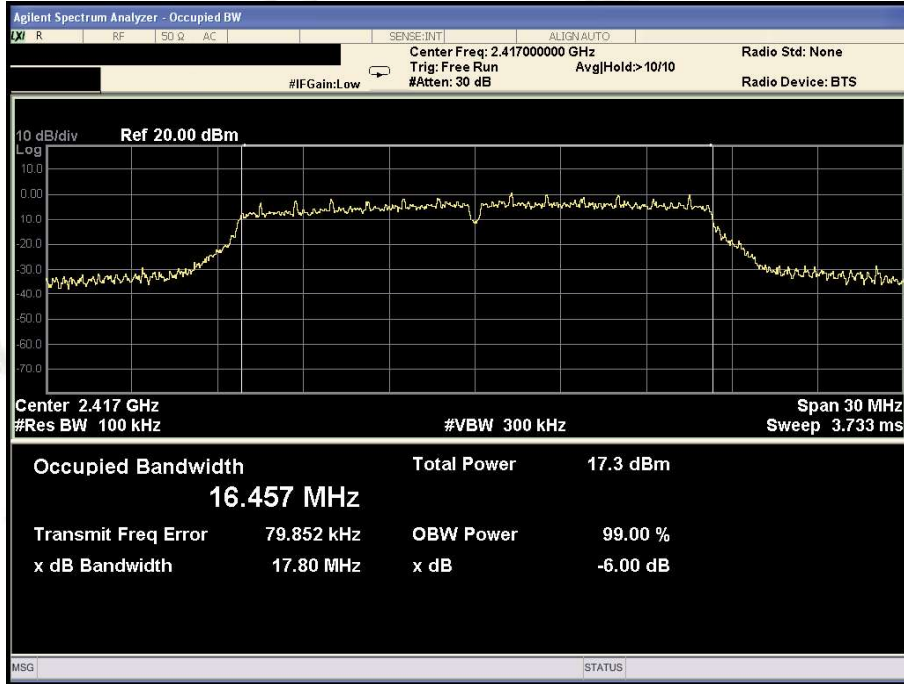
TX 802.11b Mode			
Frequency (MHz)	6dB Bandwidth (MHz)	Channel Separation (kHz)	Result
2417	14.56	>=500	PASS

CH01: 2417MHz



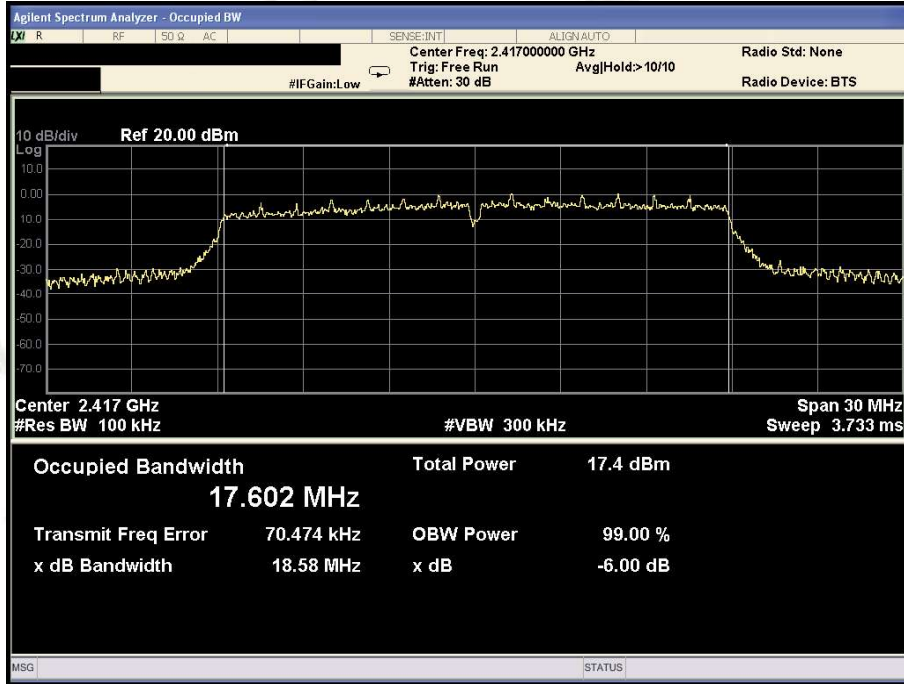
TX 802.11g Mode			
Frequency (MHz)	6dB Bandwidth (MHz)	Channel Separation (kHz)	Result
2417	17.80	>=500	PASS

CH01: 2417MHz



TX 802.11n/HT20 Mode			
Frequency (MHz)	6dB Bandwidth (MHz)	Channel Separation (kHz)	Result
2417	18.58	>=500	PASS

CH01: 2417MHz



6 POWER SPECTRAL DENSITY

6.1 TEST LIMIT

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

6.2 TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on FCC Part15 C Section 15.247: RBW=3kHz, VBW=10kHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

6.3 EQUIPMENT USED

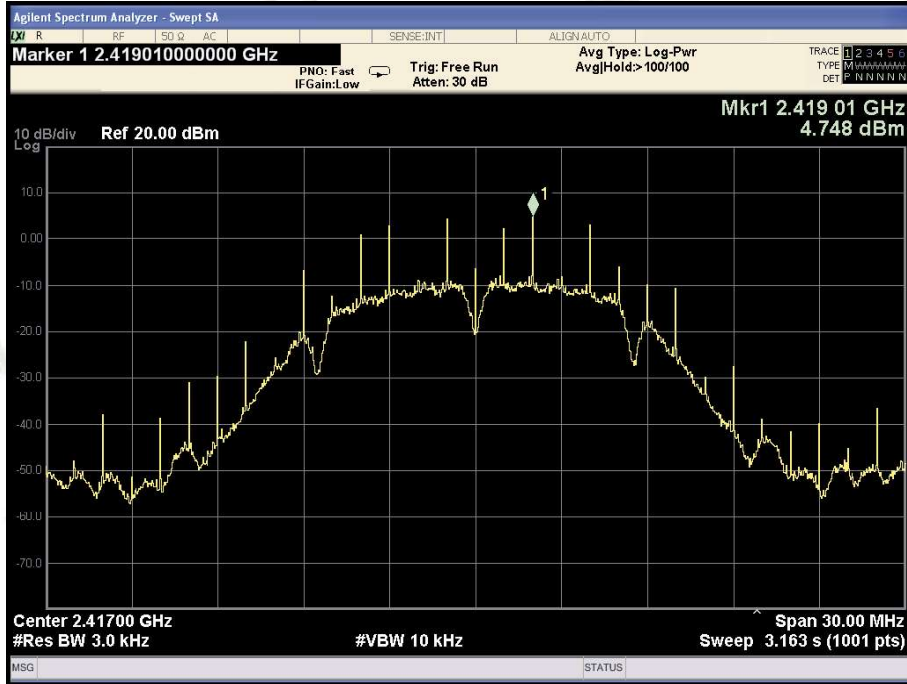
Same as Radiated Emission Measurement.

6.4 TEST RESULT

PASS

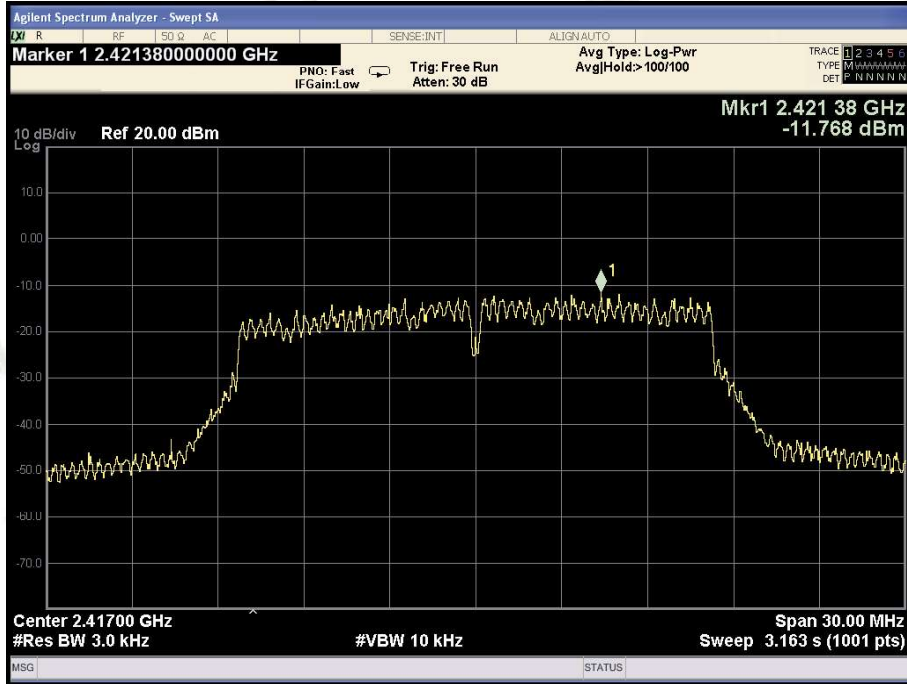
TX 802.11b Mode			
Frequency (MHz)	Power Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2417	4.748	8	PASS

CH01: 2417MHz



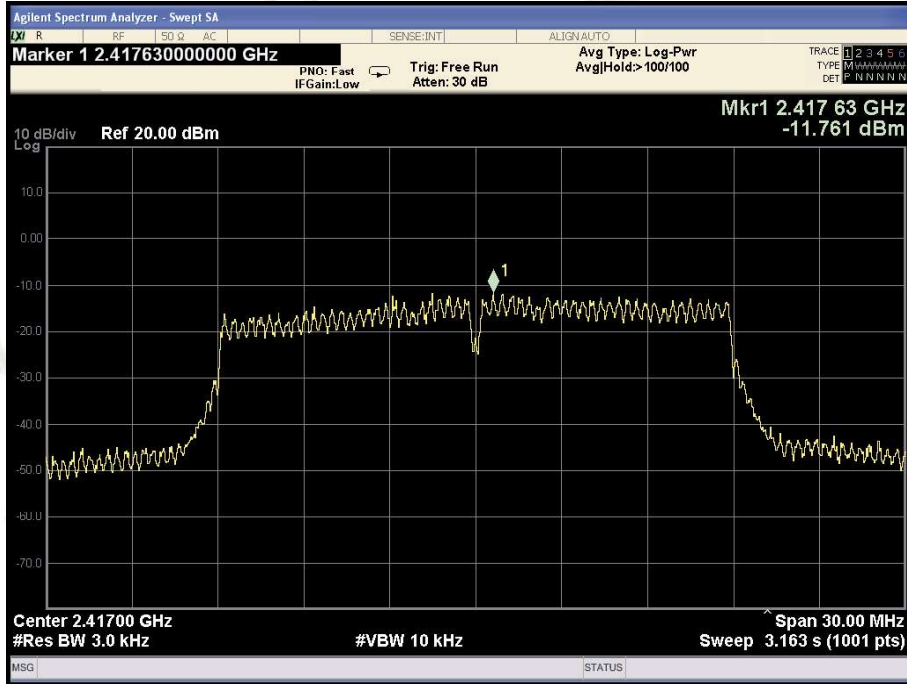
TX 802.11g Mode			
Frequency (MHz)	Power Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2417	-11.768	8	PASS

CH01: 2417MHz



TX 802.11n/HT20 Mode			
Frequency (MHz)	Power Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2417	-11.761	8	PASS

CH01: 2417MHz



7 PEAK OUTPUT POWER

7.1 TEST LIMIT

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

7.2 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.

7.3 EQUIPMENT USED

Same as Radiated Emission Measurement.

7.4 TEST RESULT

PASS

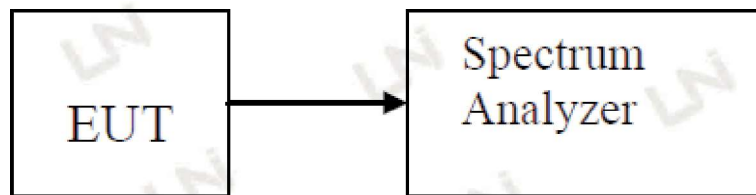
Test Mode	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)	LIMIT (dBm)
802.11b	2417	12.18	30
802.11g	2417	11.07	30
802.11n/HT20	2417	10.96	30

8 OUT OF BAND EMISSIONS

8.1 TEST LIMIT

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

8.2 TEST SETUP



8.3 TEST PROCEDURE

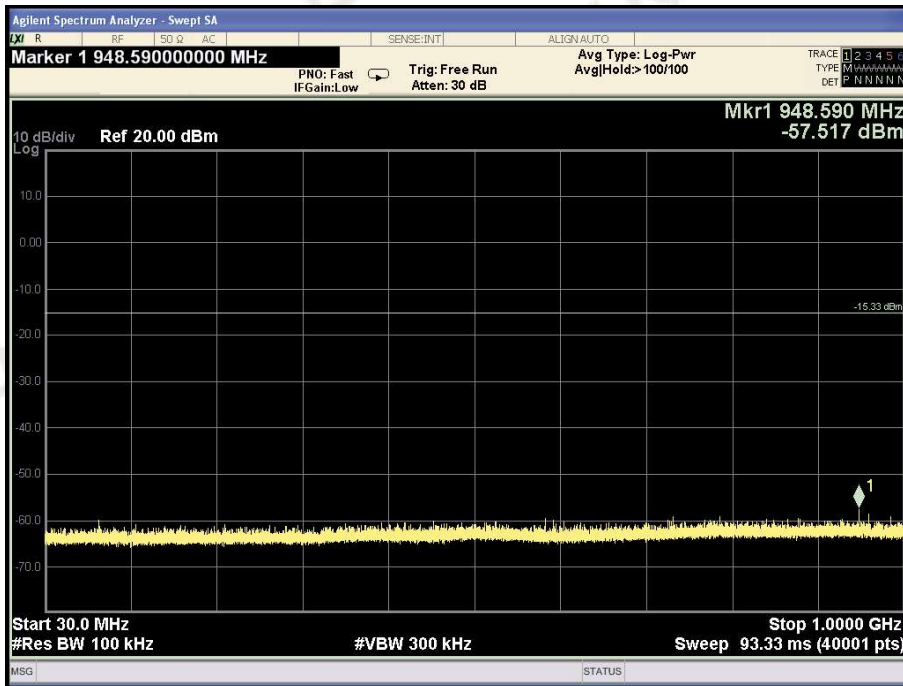
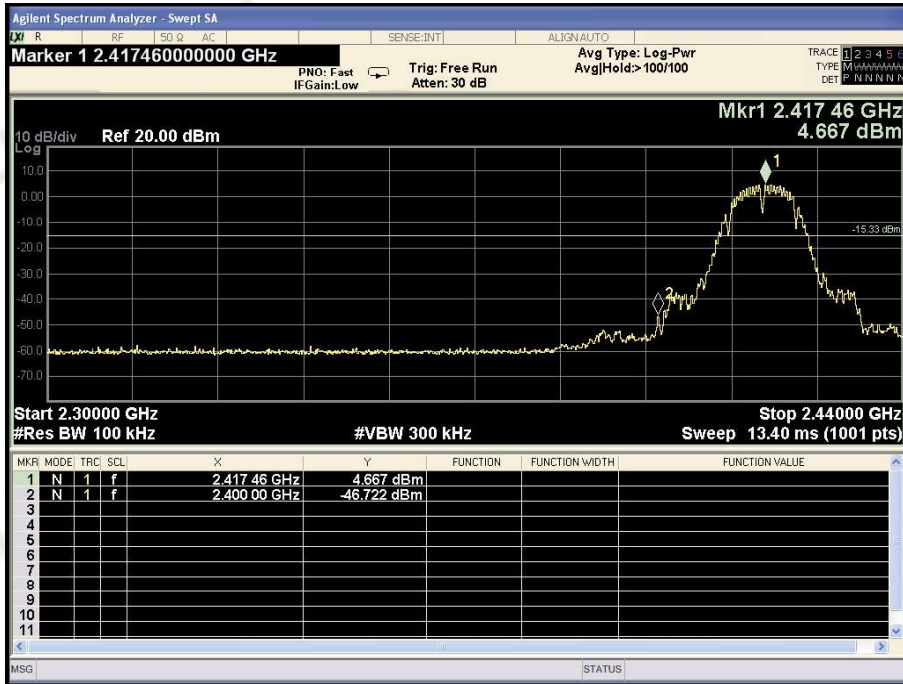
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as TX operation and connect directly to the spectrum analyzer.
3. Based on FCC Part15 C Section 15.247: RBW=100kHz, VBW=300kHz.
4. Set detected by the spectrum analyzer with peak detector.

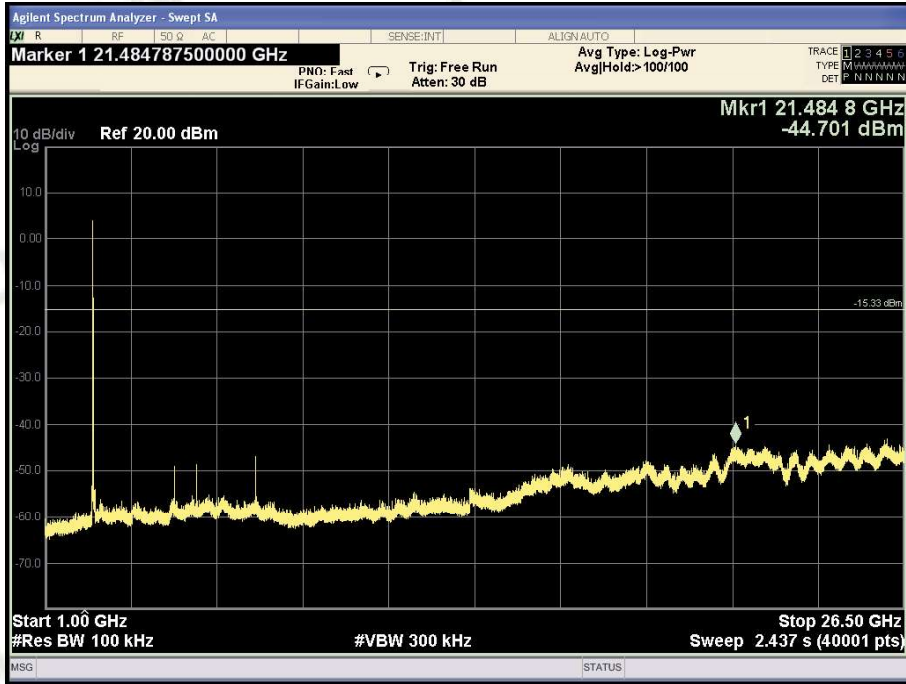
8.4 TEST RESULT

PASS

TX 802.11b Mode:

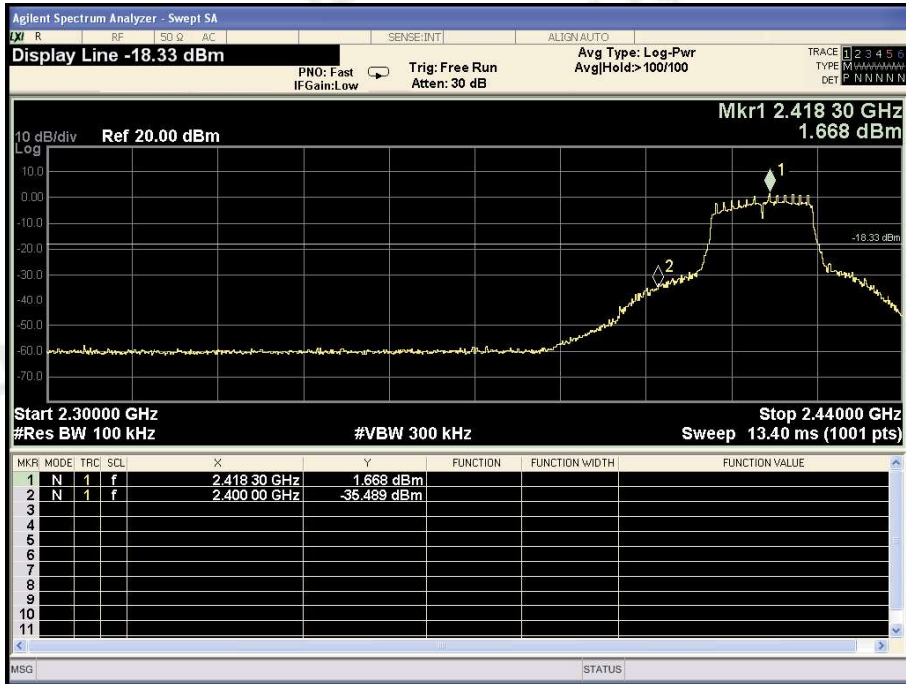
CH01: 2417MHz

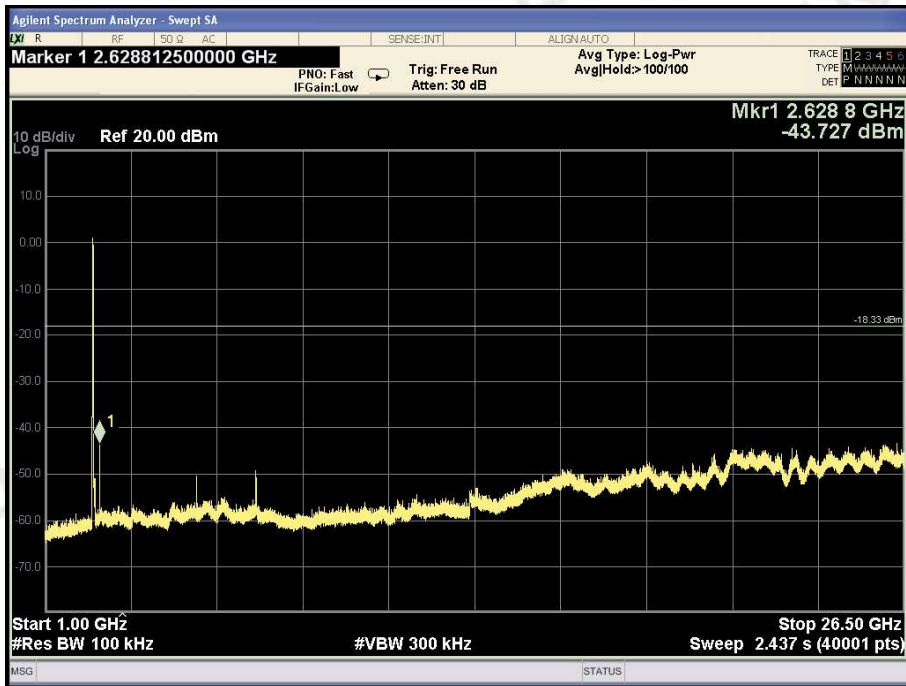
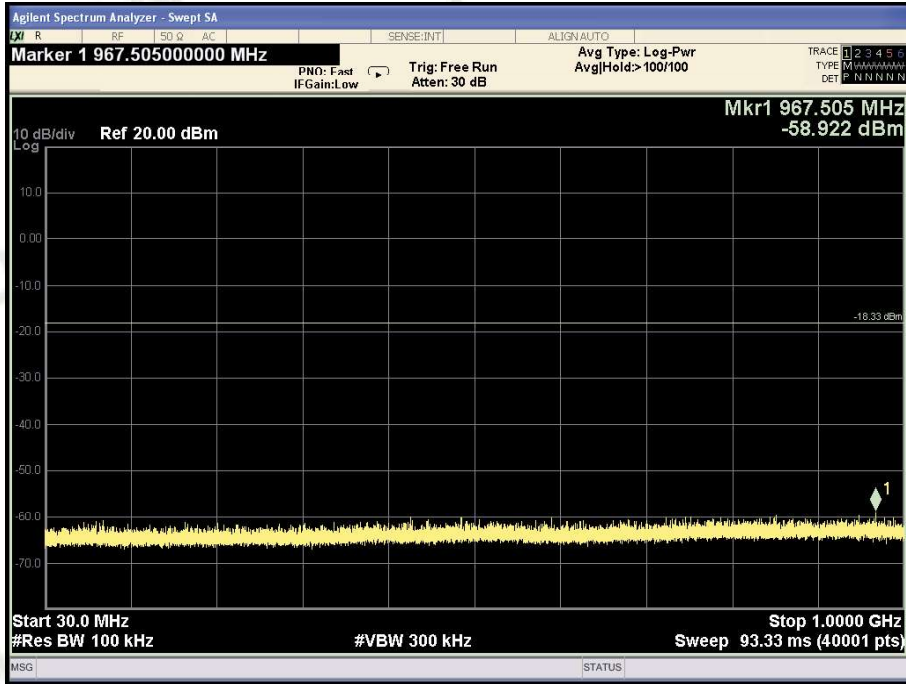




TX 802.11g Mode:

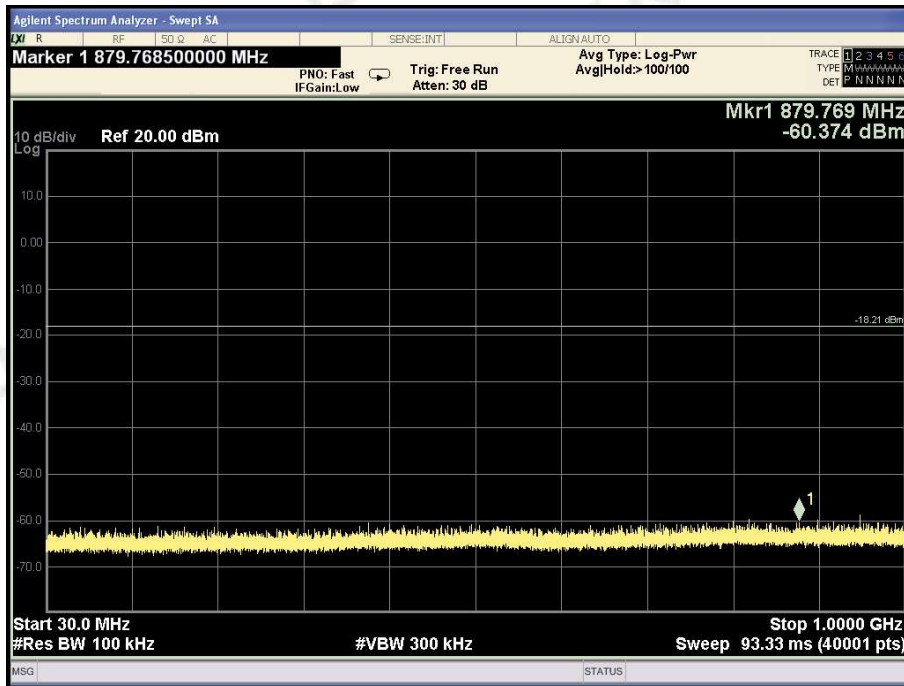
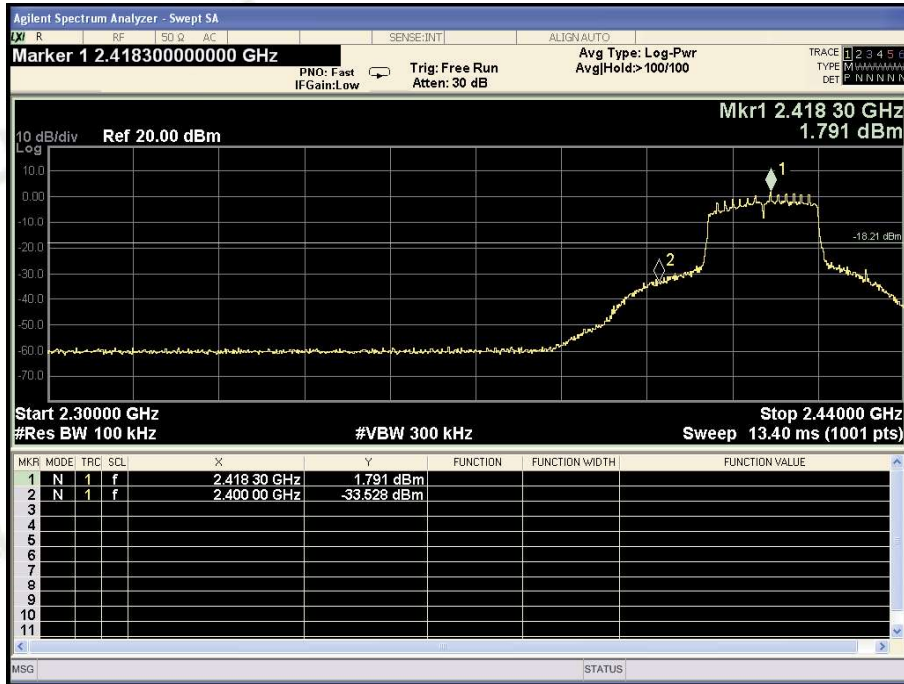
CH01: 2417MHz

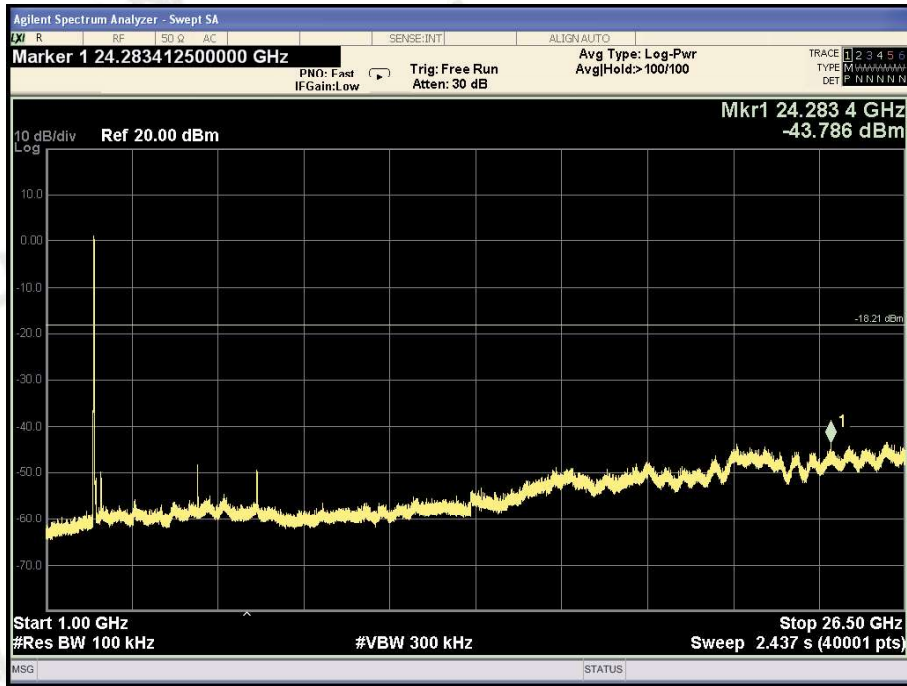




TX 802.11n/HT20 Mode:

CH01: 2417MHz





9 ANTENNA REQUIREMENT

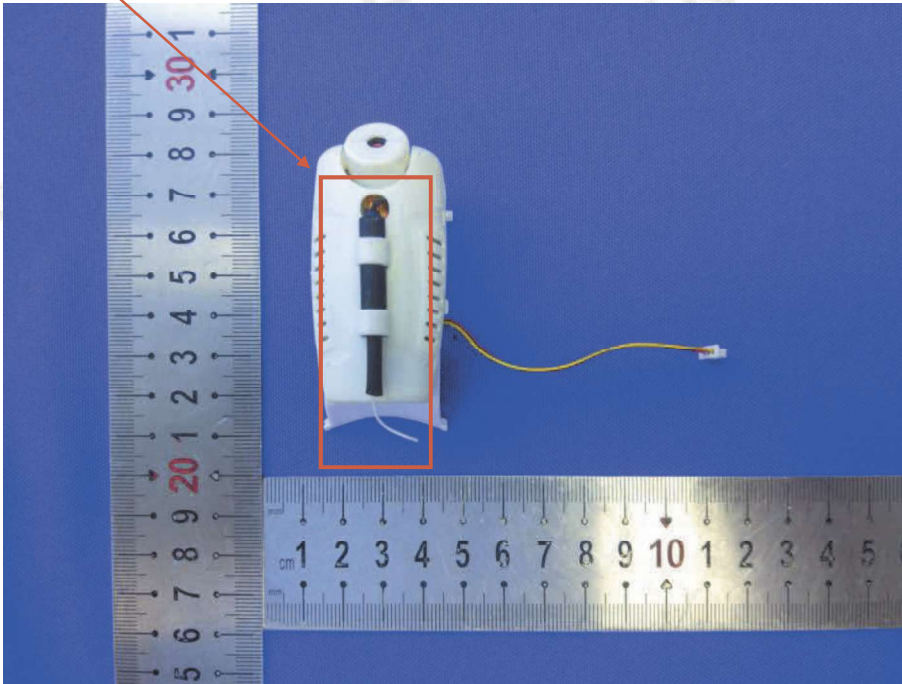
Standard Applicable:

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Connected Construction

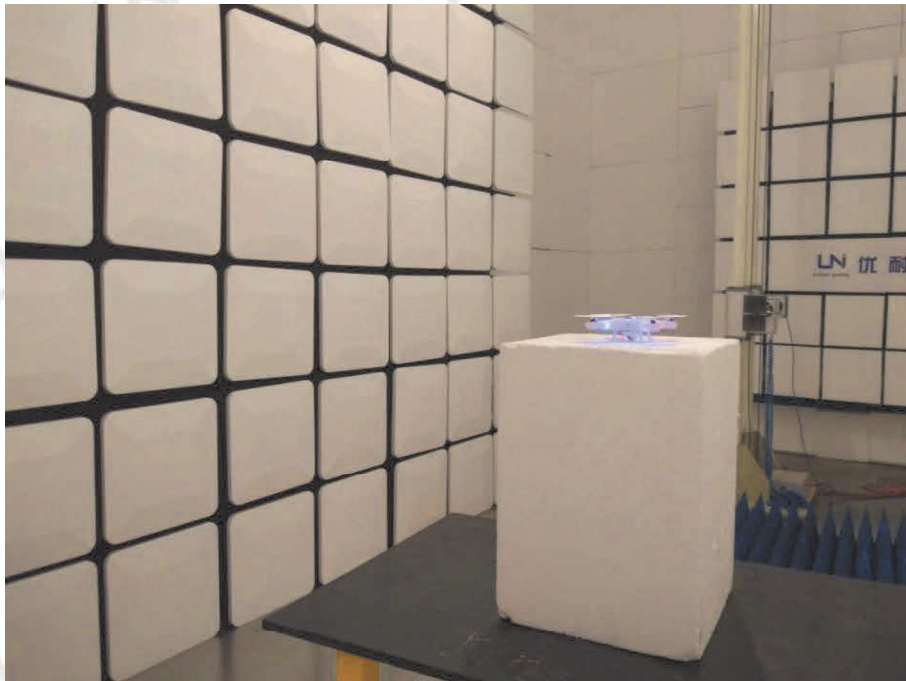
The antenna used in this product is an Internal Antenna, The directional gains of antenna used for transmitting is 2dBi.

ANTENNA:



10 PHOTO OF TEST

10.1 RADIATED EMISSION



10.2 CONDUCTED EMISSION



End of Report