

APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Dongguan City Feng Rui Electronic Technology Co., Ltd

Smart Robot Sweeper

Model No.: FR-9AI, FR-9AI Ice blue, FR-9AI Navy Blue, FR-9AI orange, FR-9AI brown, FR-9AI black, FR-9AI Geometric pattern, FR-9AI Blue and white porcelain, FR-9AI coffee color, FR-9AI Brushed rose gold, FR-9AI Brushed tuhao gold, FR-9AI Grey, FR-9AI Rose gold, FR-9AI Local tyrants gold, FR-9AI Red, FR-9AI Champagne gold, FR-9AI Wormwood green, FR-9AI Dark brown, FR-9AI sapphire, FR-9AI Bean paste green, FR-9AI Pink, FR-9AI Sea blue, FR-9AI Brushed pink, FR-9AI Bright yellow, FR-9AI Cherry Blossom powder, FR-9AI Dazzle colour geometry, FR-9AI silver, FR-9AI violet, FR-9AI purple

FCC ID: 2AXSL-FR9AI

Prepared for : Dongguan City Feng Rui Electronic Technology Co., Ltd
Address : Fengguan Road NO.133 B building of Tiantangwei village,
Fenggang town, Dongguan city, Guangdong province, China

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Report No. : RTZ200806002-00
Date of Test : Aug. 10, 2020-Sep. 17, 2020
Date of Report : Sep. 29, 2020

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Test Report Certification

Applicant : Dongguan City Feng Rui Electronic Technology Co., Ltd
Address : Fengguan Road NO.133 B building of Tiantangwei village,
Fenggang town, Dongguan city, Guangdong province, China

Manufacturer : Dongguan City Feng Rui Electronic Technology Co., Ltd
Address : Fengguan Road NO.133 B building of Tiantangwei village,
Fenggang town, Dongguan city, Guangdong province, China

Product : Smart Robot Sweeper

Model No. : FR-9AI(Main test model)

Trade name : /

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

The EUT was tested according to DTS test procedure of April 02, 2019 KDB558074 D01 DTS Meas Guidance v0502 for compliance to FCC 47CFR 15.247 requirements.

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : Aug.10, 2020—Sep. 17, 2020
Date of Report : Sep 29, 2020

Prepared by :

Black Ding

(Black Ding, Engineer)

Approve & Authorized Signer :

Tim. Zhang

(Tim. Zhang, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Smart Robot Sweeper
Model Number	:	FR-9AI, FR-9AI orange, FR-9AI Bean paste green, FR-9AI Ice blue, FR-9AI brown, FR-9AI Dark brown, FR-9AI black, FR-9AI Pink, FR-9AI purple, FR-9AI Geometric pattern, FR-9AI coffee color, FR-9AI Brushed tuhao gold, FR-9AI Bright yellow, FR-9AI violet, FR-9AI silver, FR-9AI Sea blue, FR-9AI Brushed pink, FR-9AI Local tyrants gold, FR-9AI Champagne gold, FR-9AI Wormwood green, FR-9AI sapphire, FR-9AI Dazzle colour geometry, FR-9AI Brushed rose gold, FR-9AI Rose gold, FR-9AI Cherry Blossom powder, FR-9AI Navy Blue, FR-9AI Blue and white porcelain, FR-9AI Grey (Note: These samples are identical in interior structure, electrical circuits and components, and just model number is different for the marketing requirement. So we prepare FR-9AI for test only.)
Frequency Range	:	802.11b/g/n(20MHz): 2412-2462MHz 802.11n(40MHz): 2422-2452MHz
Number of Channels	:	802.11b/g/n (20MHz):11 802.11n (40MHz):7
GANT MAX	:	2.5dBi
Type of Antenna	:	Integral Antenna
Rating	:	DC 19V(Powered by Adapter) or Battery(DC 14.8V)
Adapter information	:	Model : K25V190100U Input: 100-240V~ 50/60Hz 0.6A; Output: 19.0V $\overline{\overline{\overline{\quad}}}$ 1.0A
Data Rate	:	802.11b: 11, 5.5, 2, 1 Mbps 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11n: up to 150Mbps
Modulation Type	:	DSSS, OFDM
Applicant	:	Dongguan City Feng Rui Electronic Technology Co., Ltd
Address	:	Fengguan Road NO.133 B building of Tiantangwei village, Fenggang town, Dongguan city, Guangdong province, China

Manufacturer : Dongguan City Feng Rui Electronic Technology Co., Ltd
Address : Fengguan Road NO.133 B building of Tiantangwei village, Fenggang town, Dongguan city, Guangdong province, China
Date of sample received : Aug. 10, 2020
Date of Test : Aug. 10, 2020—Sep. 17, 2020
Sample No. : RTZ200806002-00-S1

1.2.Special Accessory and Auxiliary Equipment

N/A

1.3.Laboratory Accreditation and Relationship to Customer

EMC Lab : Recognition of accreditation by Federal Communications Commission (FCC)
The Designation Number is CN1189
The Registration Number is 708358

Listed by Innovation, Science and Economic Development Canada (ISED)
The Registration Number is 5077A-2

Accredited by China National Accreditation Service for Conformity Assessment (CNAS)
The Registration Number is CNAS L3193

Accredited by American Association for Laboratory Accreditation (A2LA)
The Certificate Number is 4297.01

Name of Firm : Shenzhen Accurate Technology Co., Ltd.
Site Location : 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.4.Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.72dB, k=2
(Mains ports, 9kHz-30MHz)

Radiated emission expanded uncertainty = 4.28dB, k=2
(30MHz-1000MHz)

Radiated emission expanded uncertainty = 4.98dB, k=2
(1G-18GHz)

Radiated emission expanded uncertainty = 5.06dB, k=2
(18G-26.5GHz)

2. MEASURING DEVICE AND TEST EQUIPMENT

2.1.For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Rohde&Schwarz	FSV40	101495	Jan. 04, 2020	1 Year
2.	Test Receiver	Rohde& Schwarz	ESR	101817	Jan. 04, 2020	1 Year
3.	Log-periodic antenna	Schwarzbeck	VULB9163	9163-323	Jan. 05, 2020	1 Year
4.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1067	Jan. 05, 2020	1 Year
5.	Pre-Amplifier	Agilent	8447D	294A10619	Jan. 04, 2020	1 Year
6.	Pre-Amplifier	Rohde&Schwarz	CBLU11835 40-01	3791	Jan. 04, 2020	1 Year
7.	50 Coaxial Switch	Anritsu Corp	MP59B	6200283933	Jan. 04, 2020	1 Year
8.	Vertical Active Monopole Antenna	Schwarzbeck	VAMP 9243	9243-370	Jan. 04, 2020	1 Year
9.	Open Switch and Control Unit	Rohde & Schwarz	OSP120 + OSP-B157	101244 + 100866	Jan. 04, 2020	1 Year
Radiated Emission Measurement Software: EZ_EMC V1.1.4.2						

2.2.The Equipment Used to Measure Conducted Disturbance (L.I.S.N)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCS30	100307	Jan.04, 2020	1 Year
2.	L.I.S.N.	Schwarzbeck	NLSK8126	8126431	Jan.04, 2020	1 Year
3.	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100305	Jan.04, 2020	1 Year
4.	50Ω Coaxial Switch	Anritsu Corp	MP59B	6100237248	Jan.04, 2020	1 Year
Conducted Emission Measurement Software: ES-K1 V1.71						

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: **1.802.11b Transmitting mode**

Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

2.802.11g Transmitting mode

Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

3.802.11n (20MHz) Transmitting mode

Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

4.802.11n (40MHz) Transmitting mode

Low Channel: 2422MHz

Middle Channel: 2437MHz

High Channel: 2452MHz

3.2.Carrier Frequency of Channels

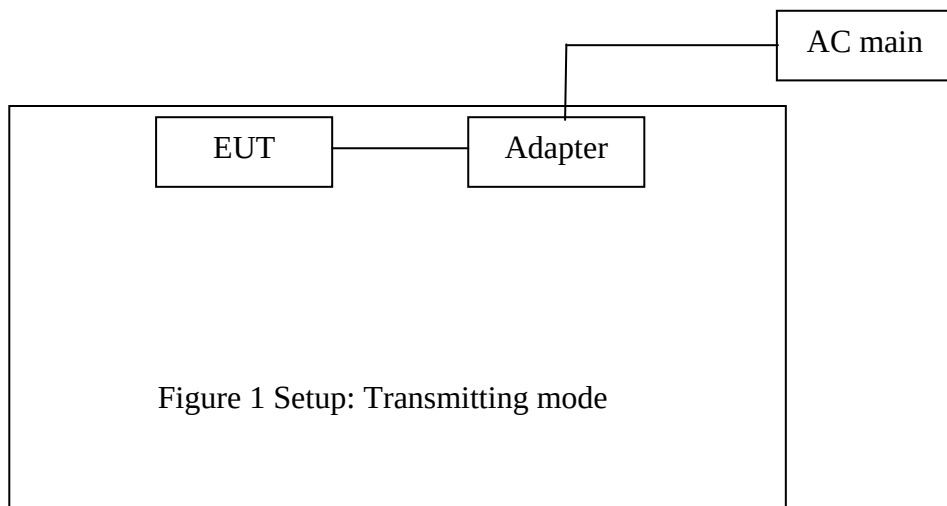
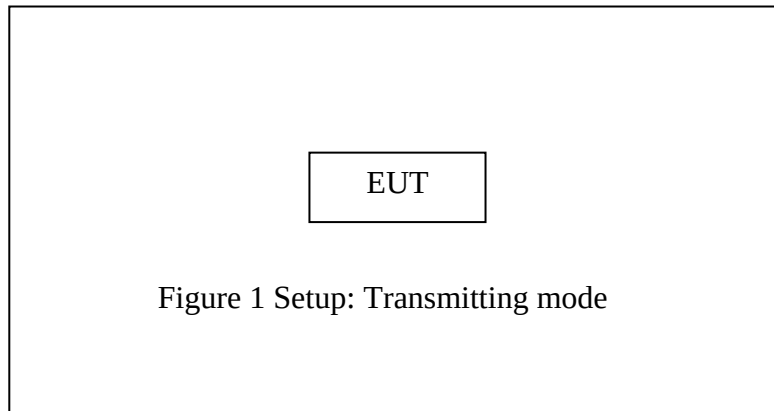
802.11b, 802.11g, 802.11n (20MHz)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437	---	---

802.11n (40MHz)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
---	---	07	2442
---	---	08	2447
03	2422	09	2452
04	2427	---	---
05	2432	---	---
06	2437	---	---

3.3.Configuration and peripherals



Note: When we test Conducted Emission and Radiated Emission, we place the EUT on a 10 cm board

3.4.Test mode

Test Mode	Test Modes Description
11B	IEEE 802.11b with data rate of 1 Mbps
11G	IEEE 802.11g with data rate of 6 Mbps
11N20MHz	IEEE 802.11n with data date of MCS0 and bandwidth of 20 MHz
11N40MHz	IEEE 802.11n with data date of MCS0 and bandwidth of 40 MHz

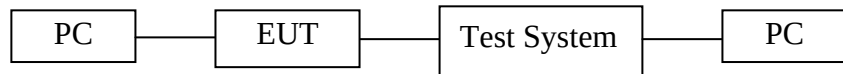
NOTE: Worst cases for each IEEE 802.11 mode are selected to perform tests.

4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	AC power Line Conducted Emission Test	Compliant
Section 15.247(a)(2)	6dB Occupied Bandwidth Test	Compliant
KDB558074 D01 DTS Meas Guidance v0502	Duty cycle	Compliant
KDB558074 D01 DTS Meas Guidance v0502	OBW	Compliant
Section 15.247(b)(3)	Maximum peak conducted output power	Compliant
Section 15.247(e)	Power Spectral Density Test	Compliant
Section 15.205 Section 15.209	Radiated Spurious Emissions Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.203	Antenna Requirement	Compliant

5. 6DB OCCUPIED BANDWIDTH TEST

5.1. Block Diagram of Test Setup



5.2. The Requirement For Section 15.247(a)(1)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB band-width shall be at least 500 kHz

5.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX modes measure it. The transmit frequency range are 2412-2462MHz and 2422-2452MHz. We select three frequencies of high, medium and low channel in each frequency band for testing.

5.5. Test Procedure

5.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

5.5.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

5.6.Test Result

The test was performed with 802.11b			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	10.120	> 0.5MHz
Middle	2437	10.120	> 0.5MHz
High	2462	10.120	> 0.5MHz

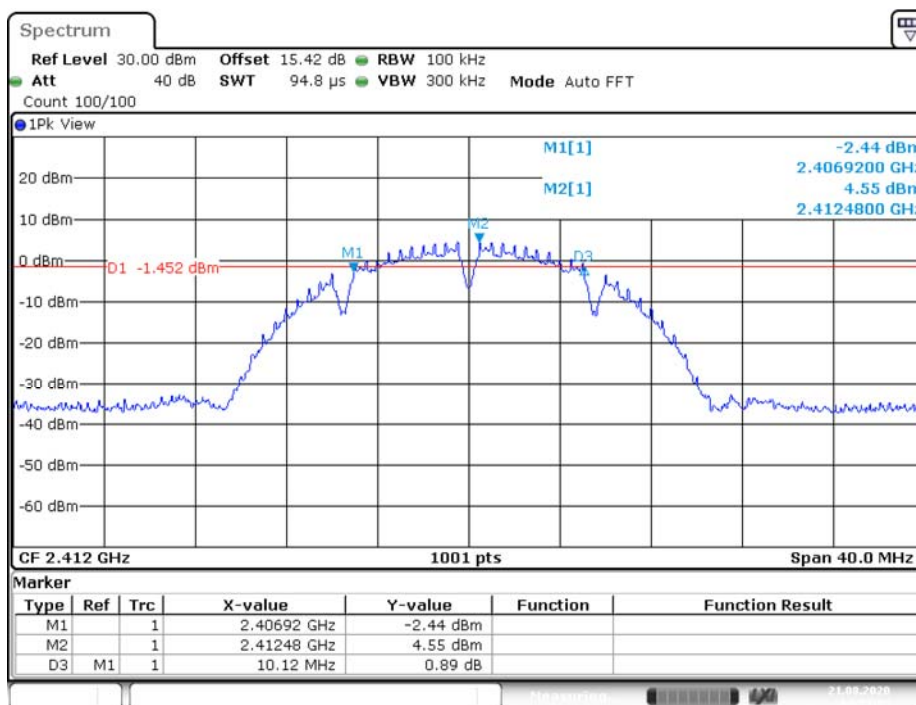
The test was performed with 802.11g			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	16.400	> 0.5MHz
Middle	2437	16.400	> 0.5MHz
High	2462	16.400	> 0.5MHz

The test was performed with 802.11n (Bandwidth: 20 MHz)			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	17.600	> 0.5MHz
Middle	2437	17.160	> 0.5MHz
High	2462	17.400	> 0.5MHz

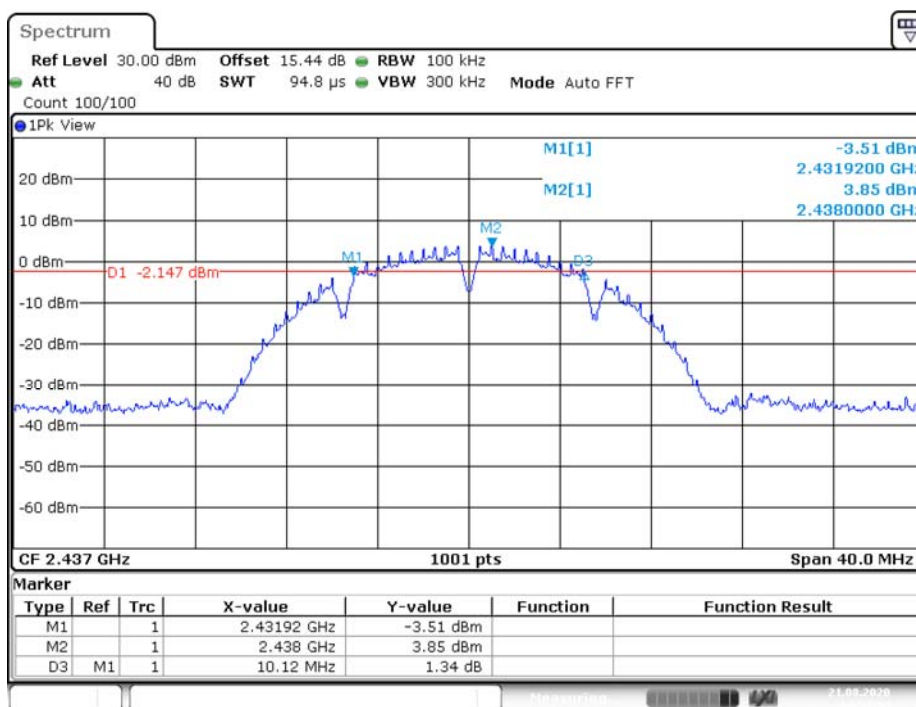
The test was performed with 802.11n (Bandwidth: 40 MHz)			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2422	35.280	> 0.5MHz
Middle	2437	35.280	> 0.5MHz
High	2452	35.280	> 0.5MHz

The spectrum analyzer plots are attached as below.

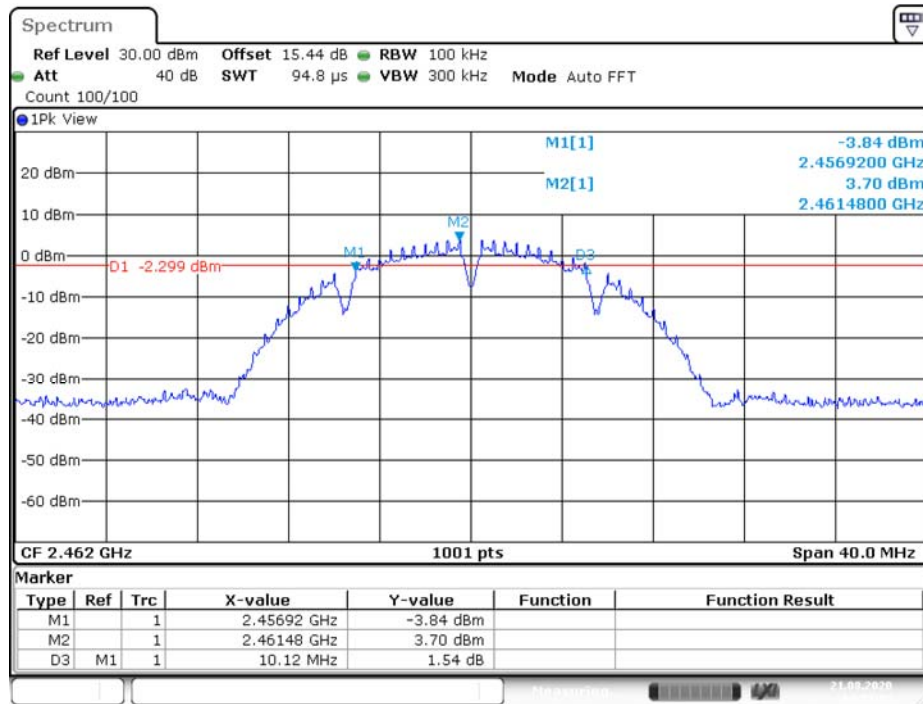
6dB Bandwidth 802.11b Channel Low 2412MHz



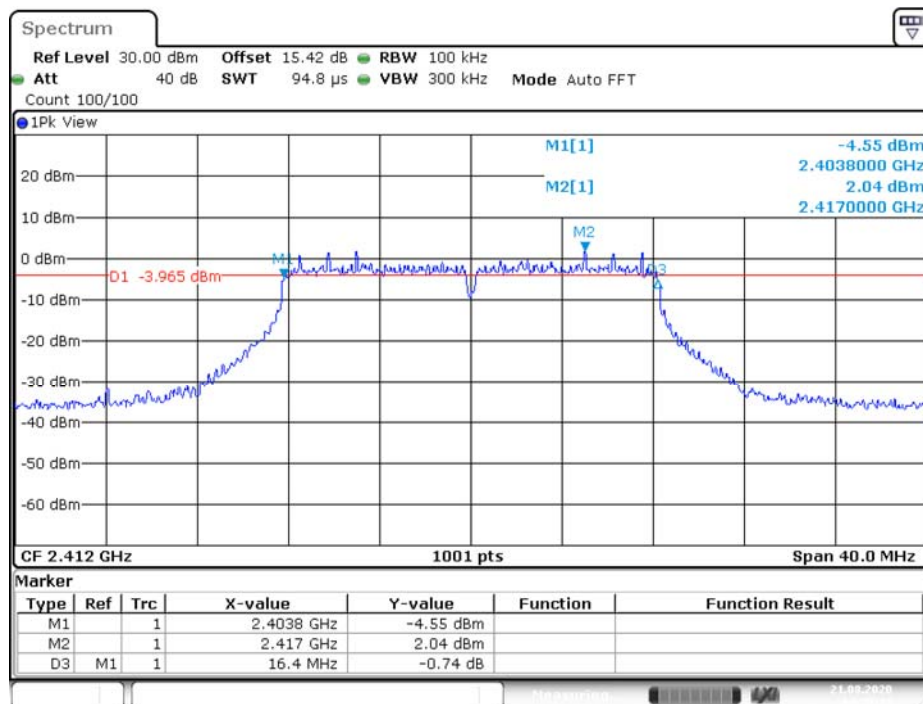
802.11b Channel Middle 2437MHz



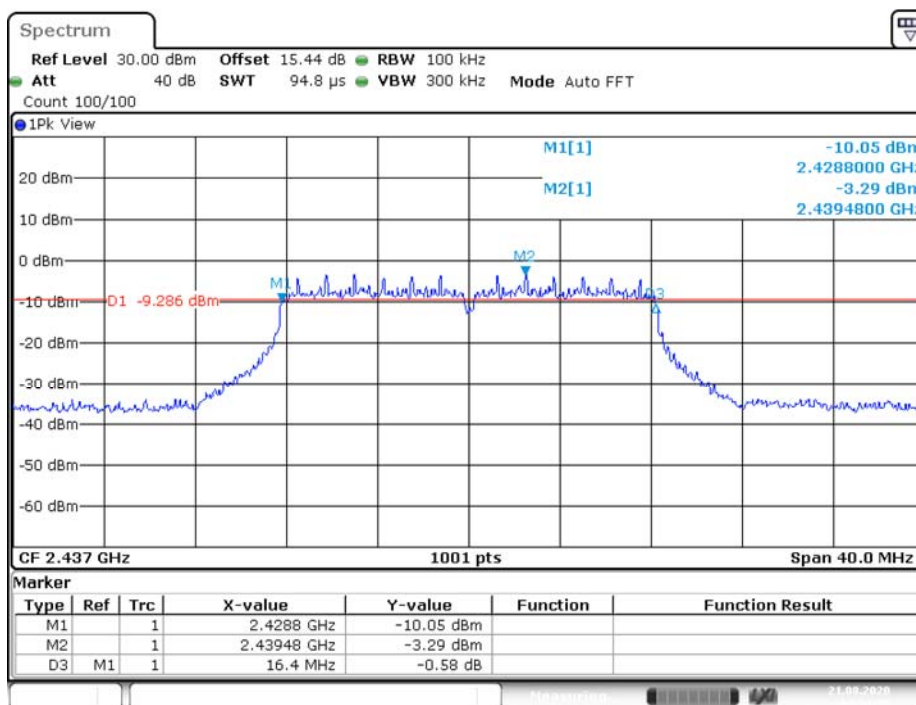
802.11b Channel High 2462MHz



802.11g Channel Low 2412MHz

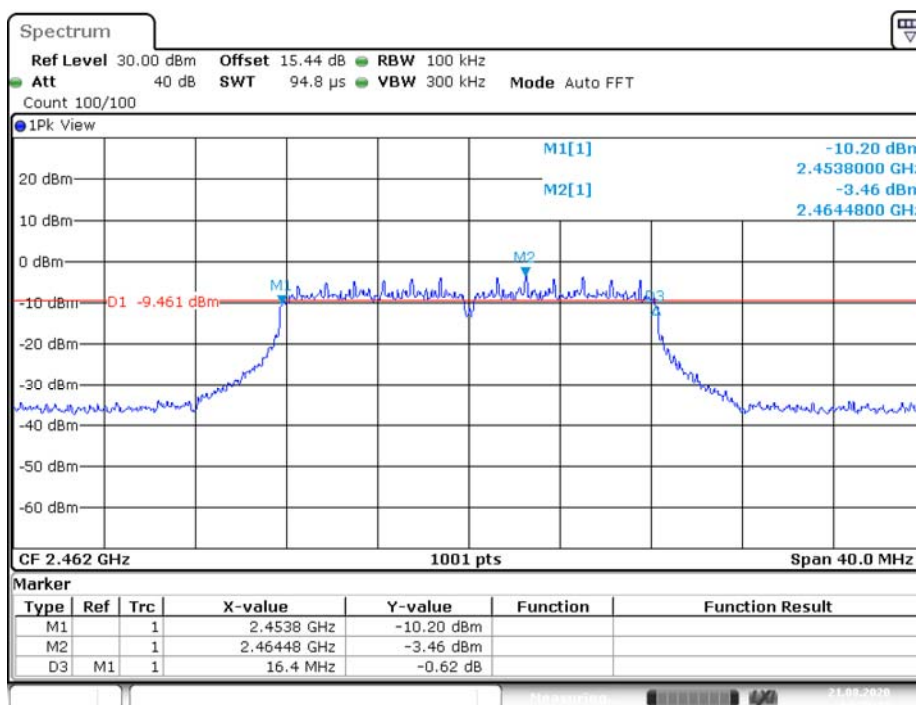


802.11g Channel Middle 2437MHz



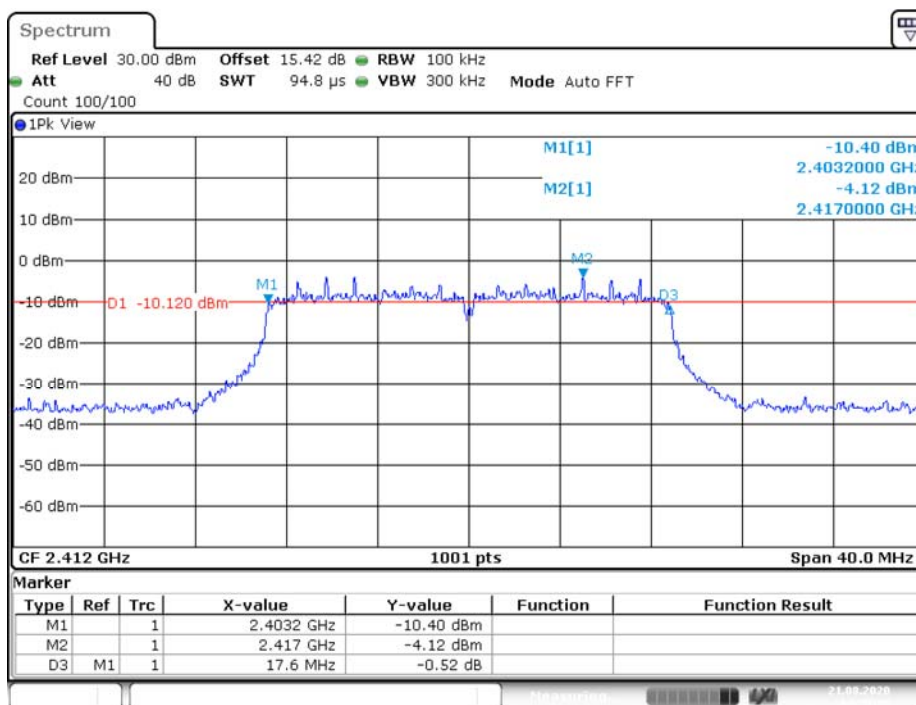
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802.11g Channel High 2462MHz



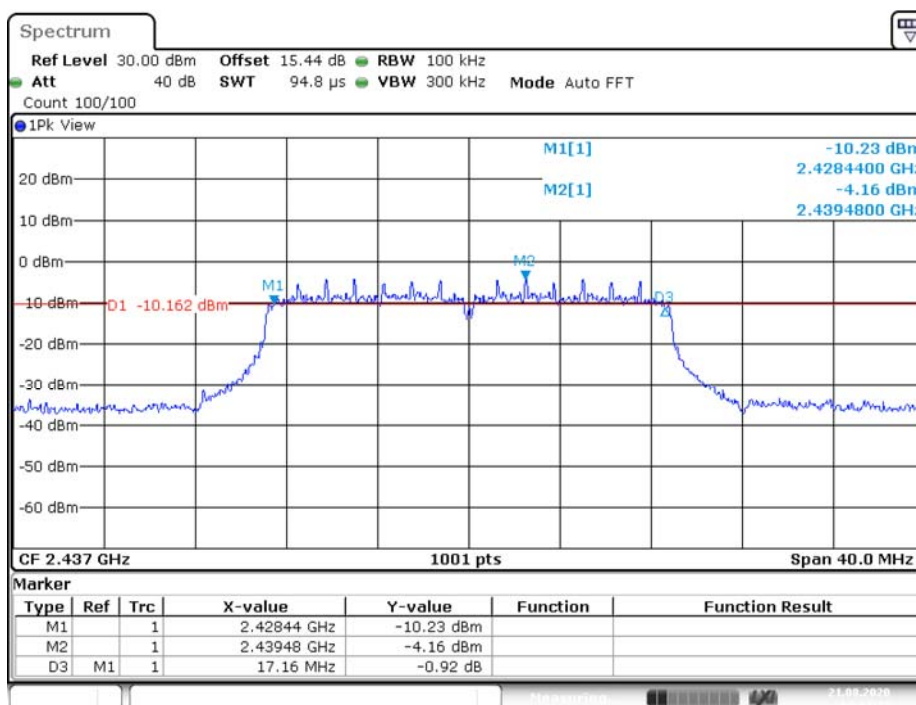
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802.11n Channel Low 2412MHz (20MHz)



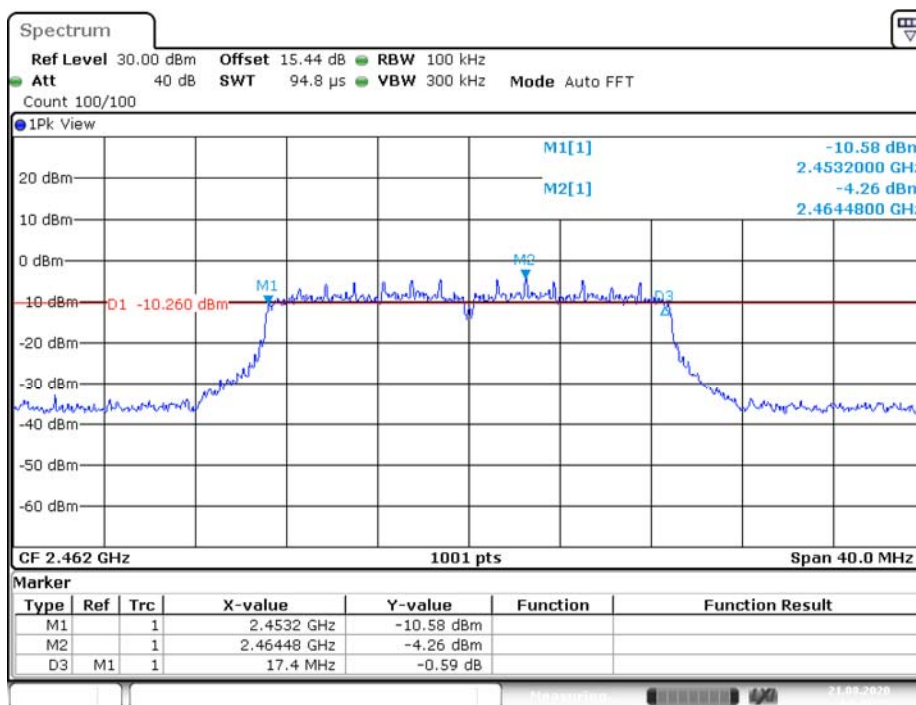
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802.11n Channel Middle 2437MHz(20MHz)

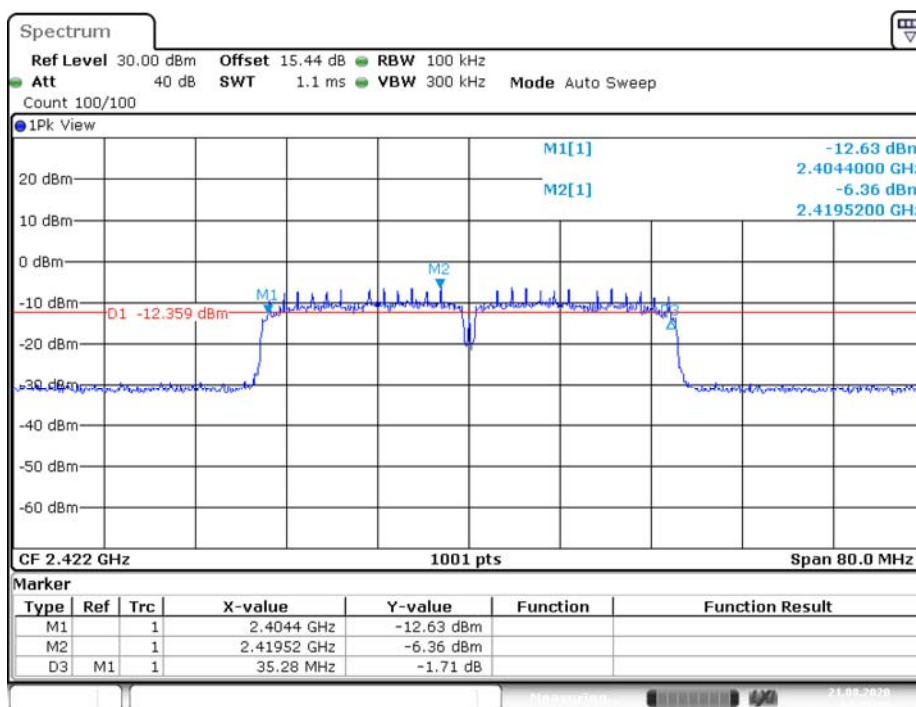


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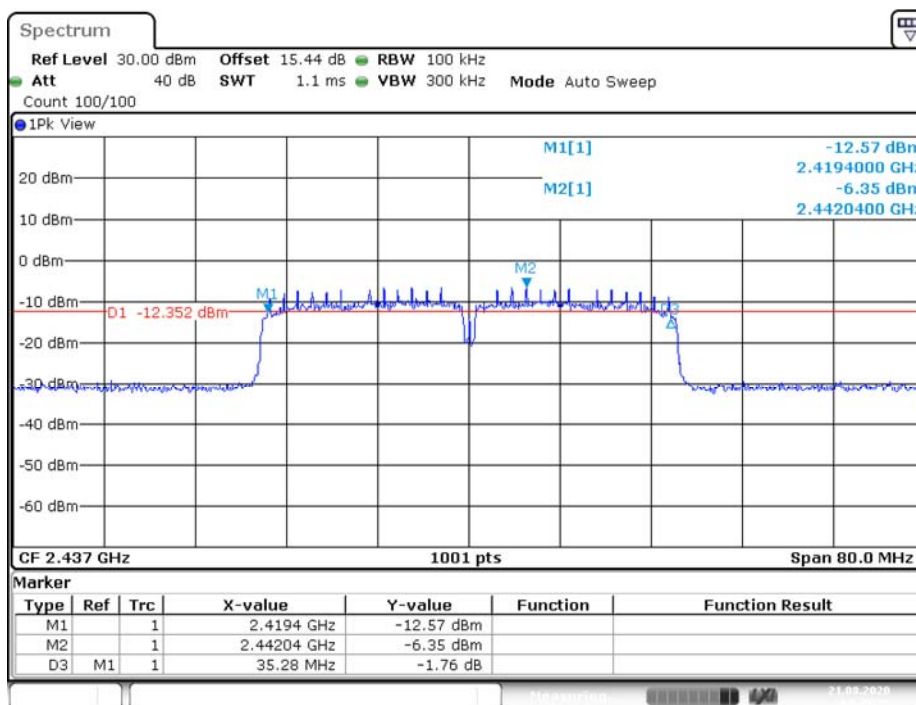
802.11n Channel High 2462MHz(20MHz)



802.11n Channel Low 2422MHz (40MHz)

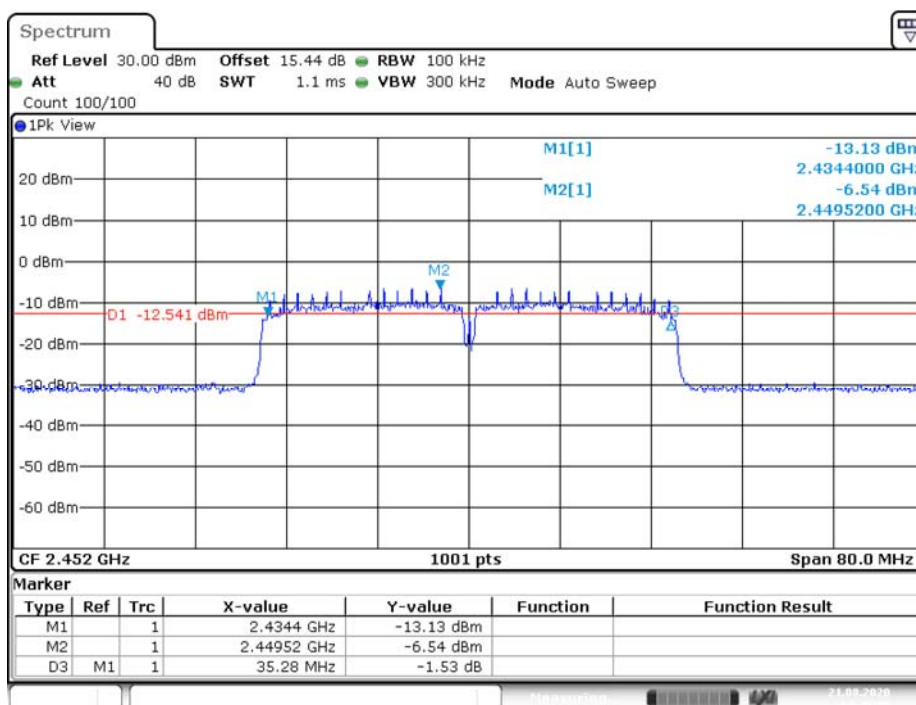


802.11n Channel Middle 2437MHz(40MHz)



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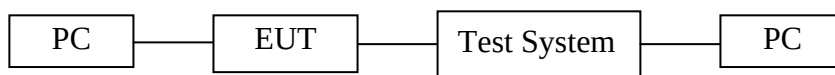
802.11n Channel High 2452MHz(40MHz)



Date: 21.AUG.2020 14:49:10

6. 99% OCCUPIED BANDWIDTH

6.1. Block Diagram of Test Setup



6.2. EUT Configuration on Measurement

The following equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.3. Operating Condition of EUT

6.3.1. Setup the EUT and simulator as shown as Section 6.1.

6.3.2. Turn on the power of all equipment.

6.3.3. Let the EUT work in TX modes measure it. The transmit frequency range are 2412-2462MHz and 2422-2452MHz. We select three frequencies of high, medium and low channel in each frequency band for testing.

6.4. Test Procedure

6.4.1. The transmitter output was connected to the spectrum analyzer through a low loss cable. The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

6.4.2. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

6.4.3. A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

6.4.4. Set SPA "Meas" function, Select "Occupied Bandwidth" function, Select "99% Power Bandwidth". The frequency of the upper and lower markers indicating the edges of the transmitters "99% Power" emission bandwidth shall be recorded to automate by SPA.

6.5.Measurement Result

The test was performed with 802.11b		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2412	15.904
Middle	2437	15.984
High	2462	16.024

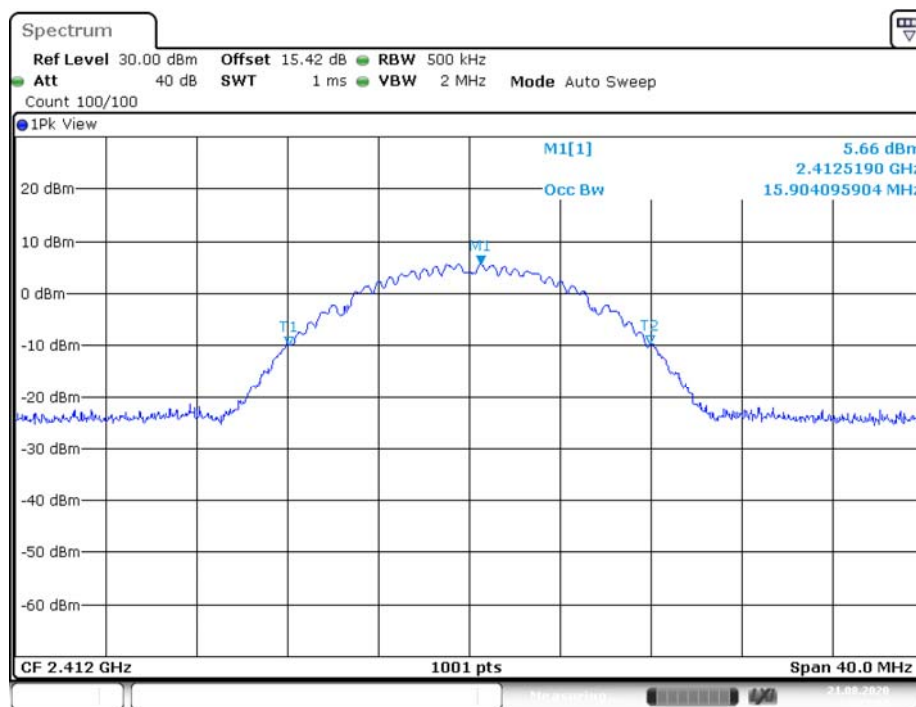
The test was performed with 802.11g		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2412	18.022
Middle	2437	18.701
High	2462	18.022

The test was performed with 802.11n (Bandwidth: 20 MHz)		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2412	19.141
Middle	2437	19.221
High	2462	19.221

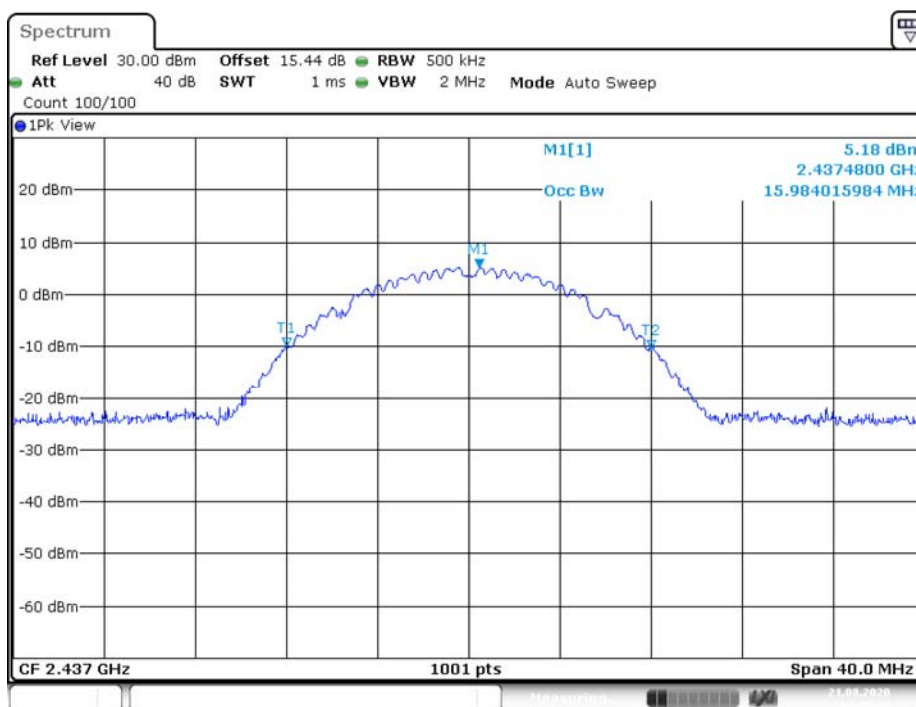
The test was performed with 802.11n (Bandwidth: 40 MHz)		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2422	37.083
Middle	2437	37.243
High	2452	37.323

The spectrum analyzer plots are attached as below.

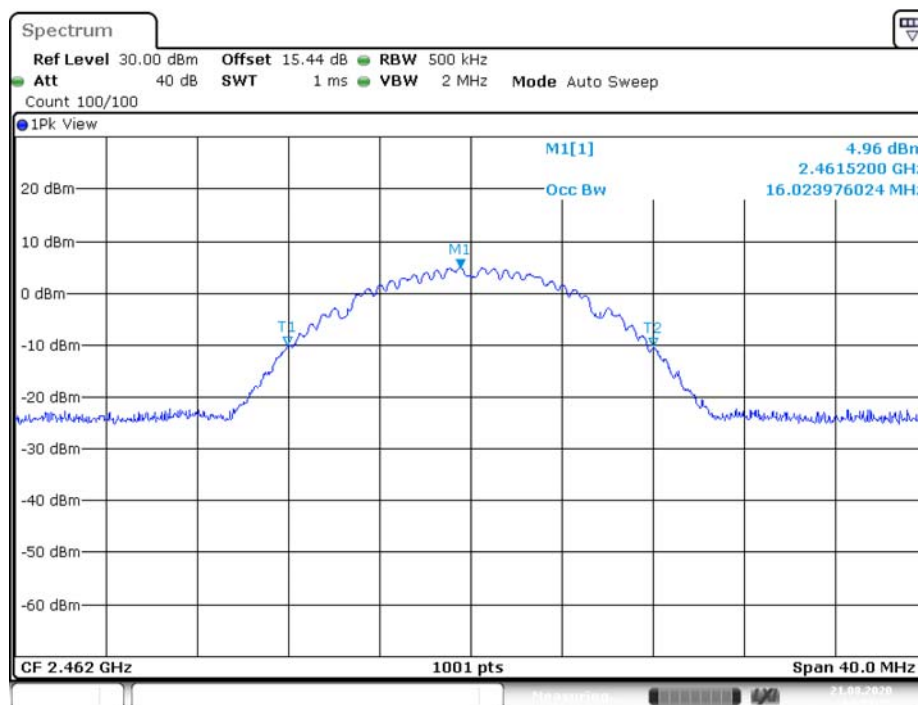
802.11b Low Channel 2412MHz



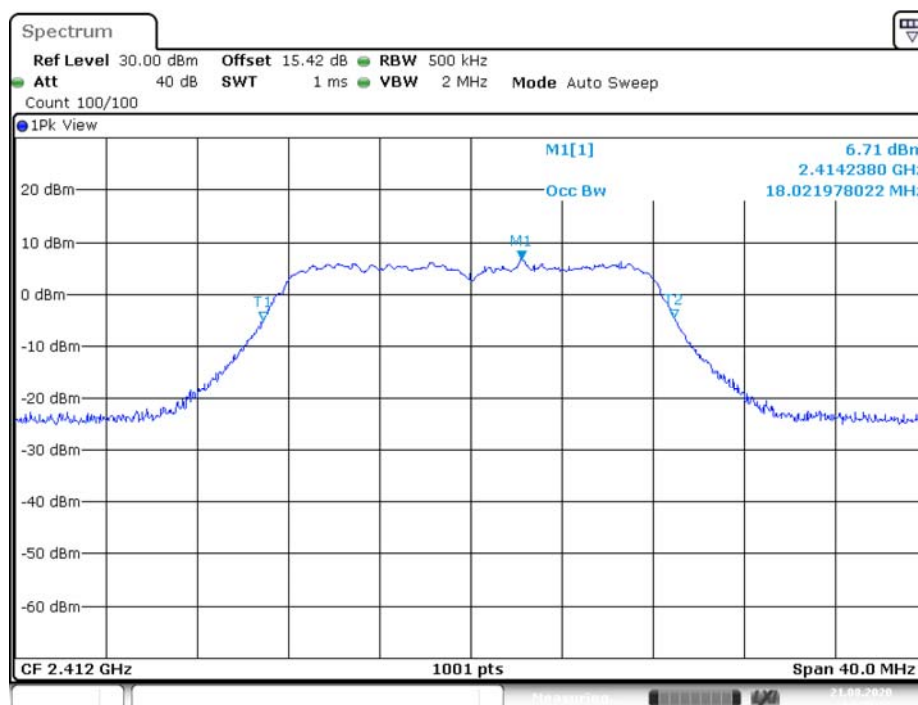
802.11b Middle Channel 2437MHz



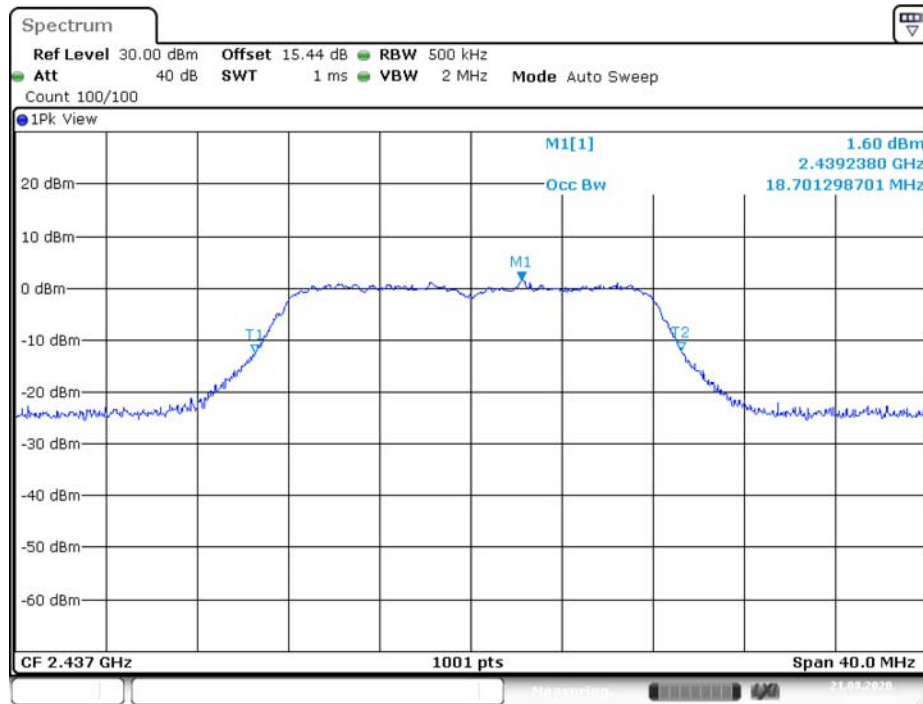
802.11b High Channel 2462MHz



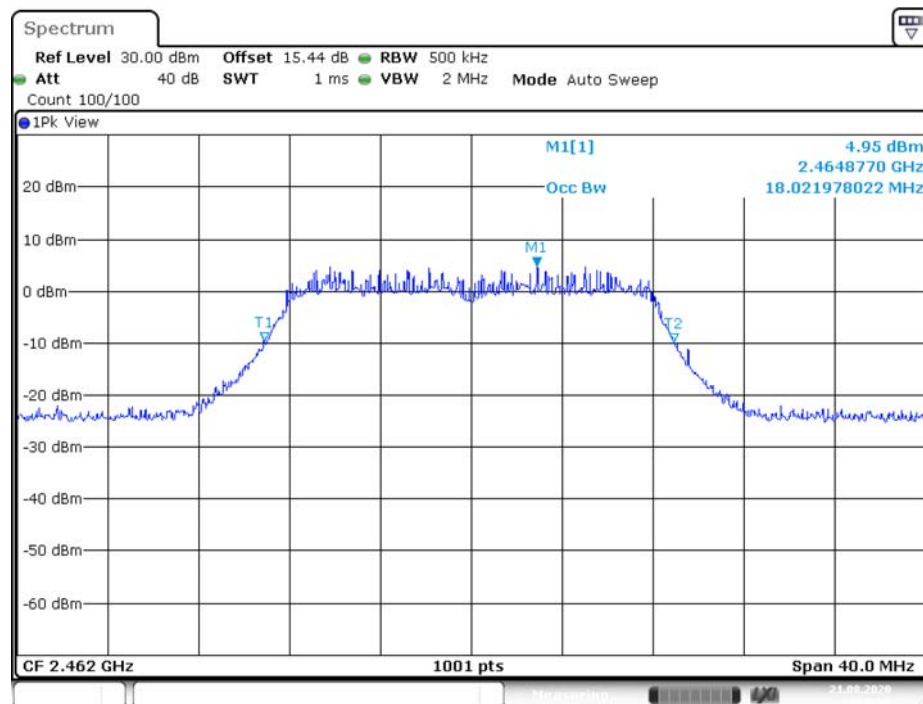
802.11g Channel Low 2412MHz



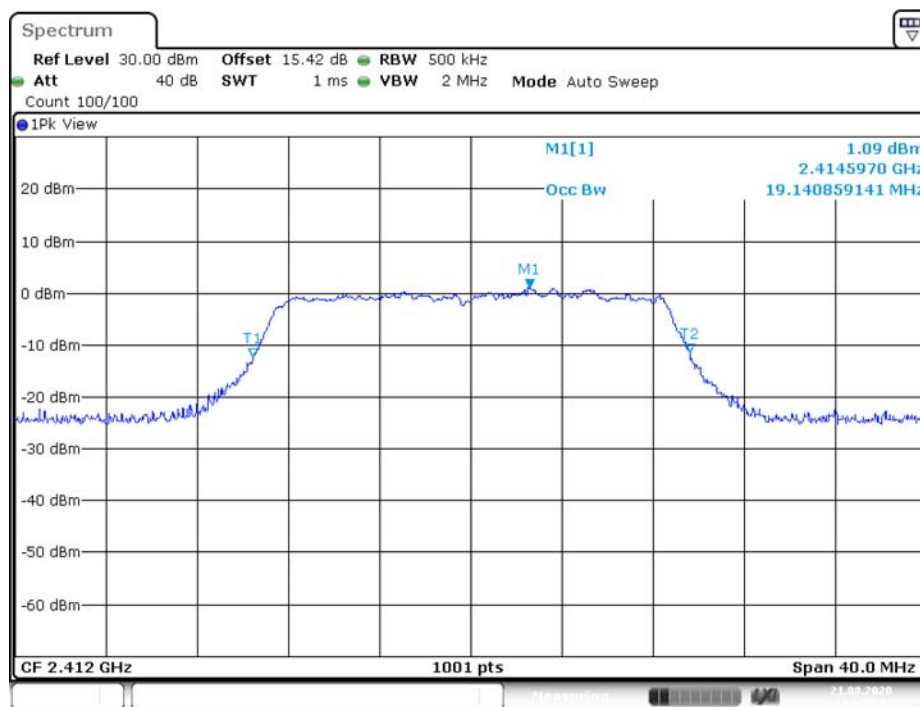
802.11g Middle Channel 2437MHz



802.11g High Channel 2462MHz

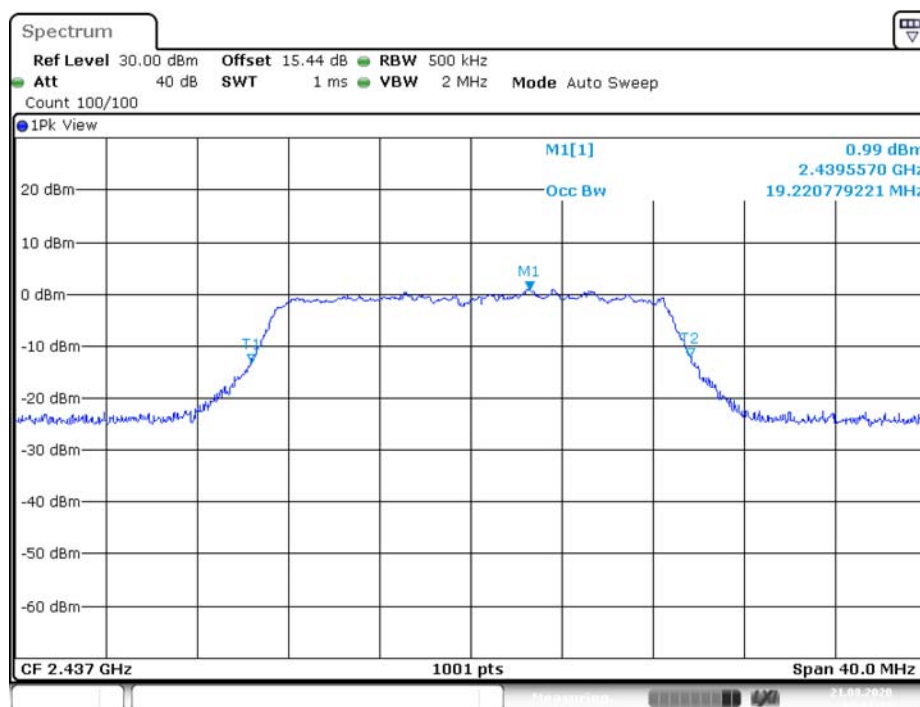


802.11n(20MHz) Low Channel 2412MHz



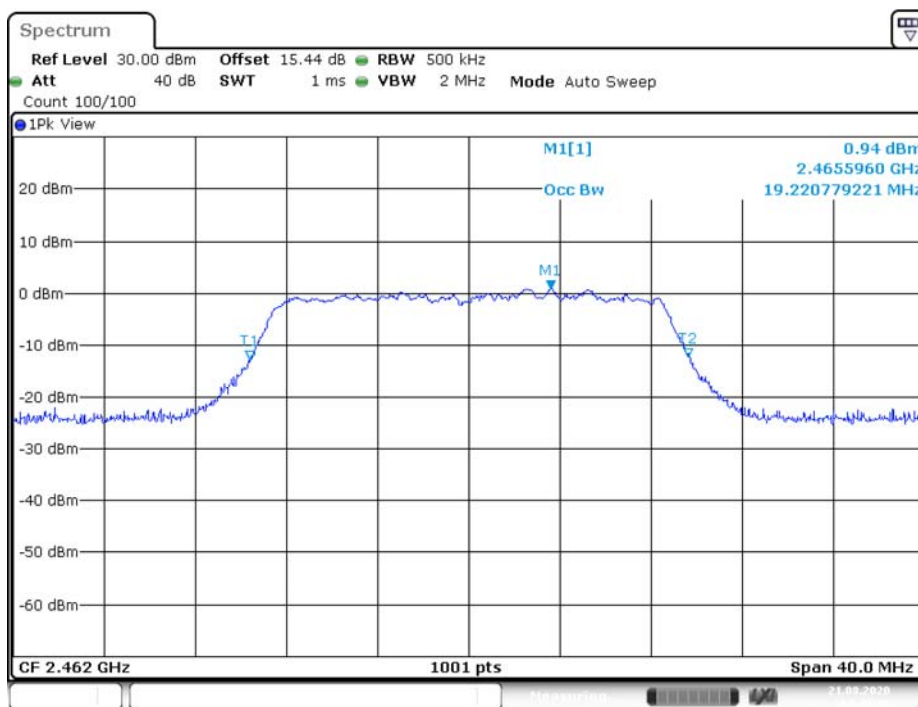
Date: 21.AUG.2020 14:39:41

802.11n(20MHz) Middle Channel 2437MHz

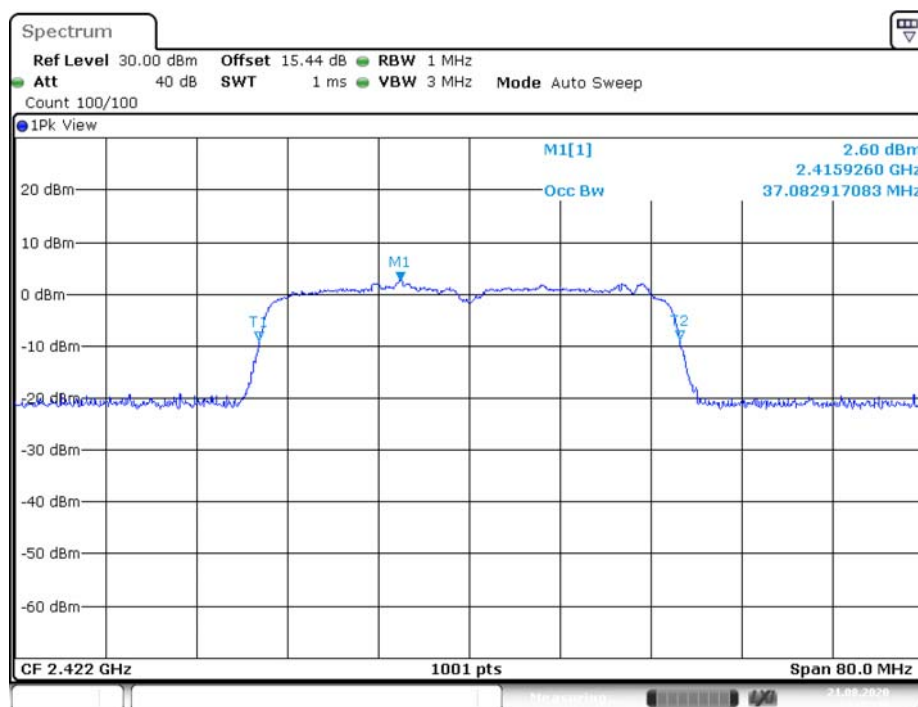


Date: 21.AUG.2020 14:41:48

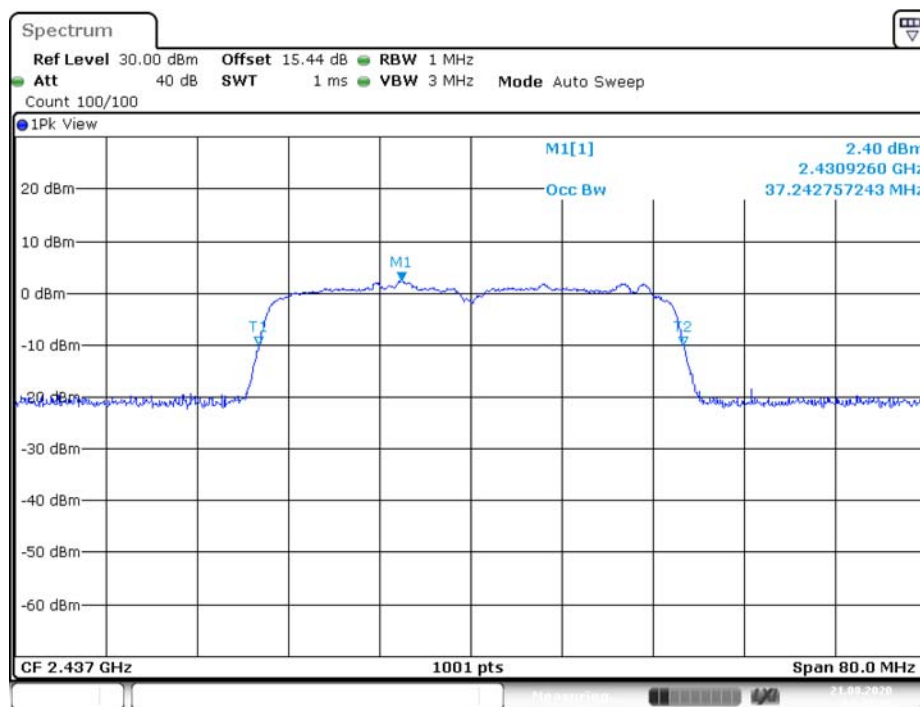
802.11n(20MHz) High Channel 2462MHz



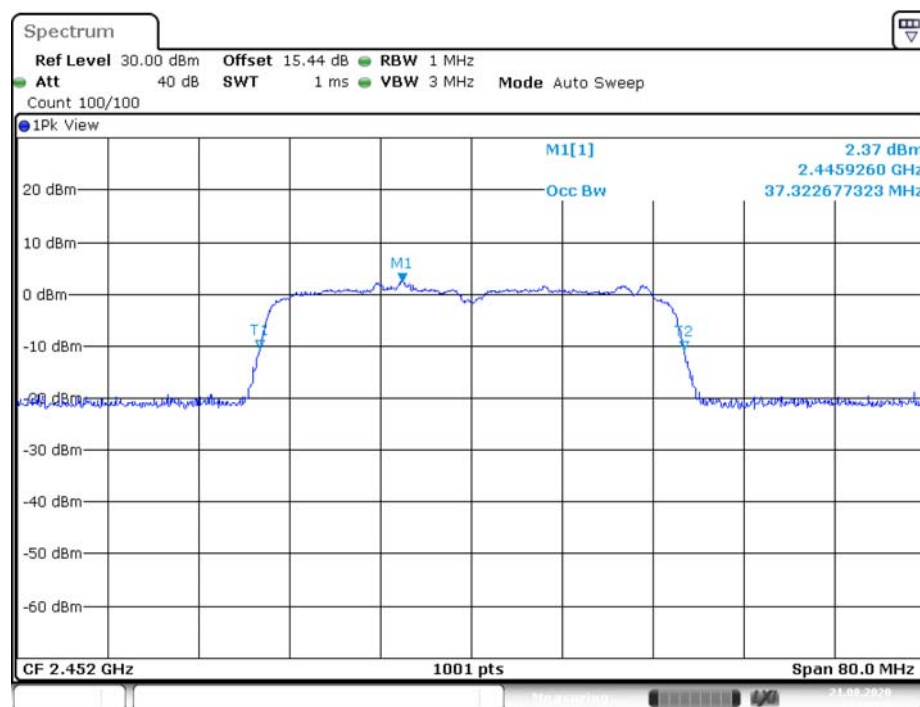
802.11n(40MHz) Low Channel 2422MHz



802.11n(40MHz) Middle Channel 2437MHz



802.11n(40MHz) High Channel 2452MHz



7. DUTY CYCLE MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.3. Operating Condition of EUT

7.3.1. Setup the EUT and simulator as shown as Section 7.1.

7.3.2. Turn on the power of all equipment.

7.3.3. Let the EUT work in TX modes measure it. The transmit frequency range are 2412-2462MHz and 2422-2452MHz. We select three frequencies of high, medium and low channel in each frequency band for testing.

7.4. Test Procedure

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

1. A diode detector and an oscilloscope that together have sufficiently short response time to permit accurate measurements of the on- and off-times of the transmitted signal.
2. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on- and off-times of the transmitted signal
 - a. Set the center frequency of the instrument to the centre frequency of the transmission
 - b. Set $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value(10MHz).
 - c. Set detector = Peak or average.
 - d. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100.
(For example, if VBW and/or RBW are limited to 3MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

7.5.Test Result

The test was performed with 802.11b			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	98.93%	0.05

The test was performed with 802.11g			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	93.93%	0.27

The test was performed with 802.11n20			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	93.50%	0.29

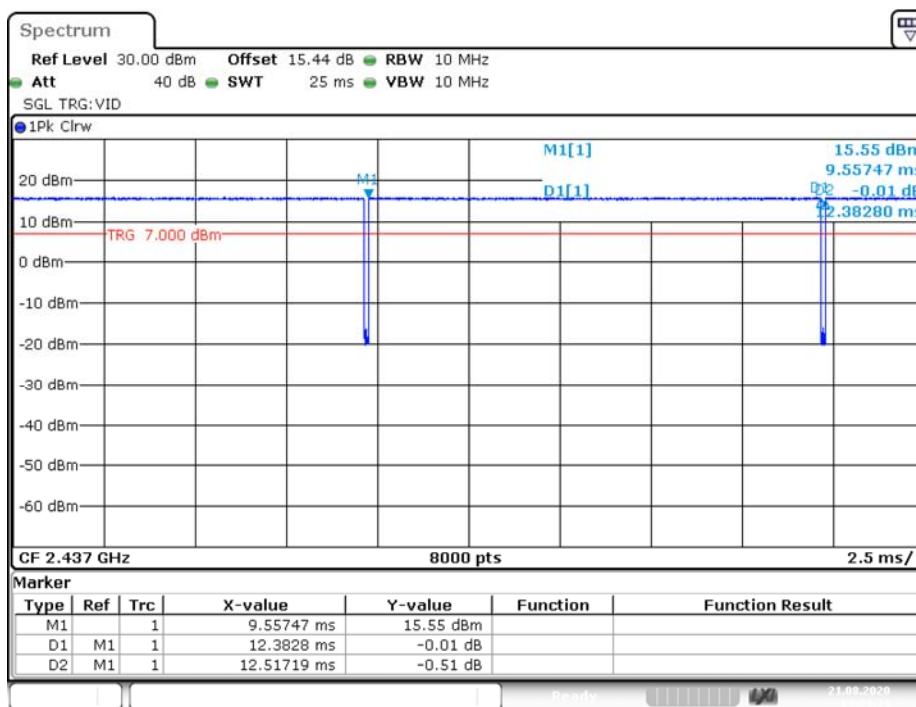
The test was performed with 802.11n40			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	87.70%	0.57

Note: The duty cycle's parameter settings for each mode(802.11b,g,n) are the same, Therefore, other channels can refer to the test data of the middle channel.

The spectrum analyzer plots are attached as below.

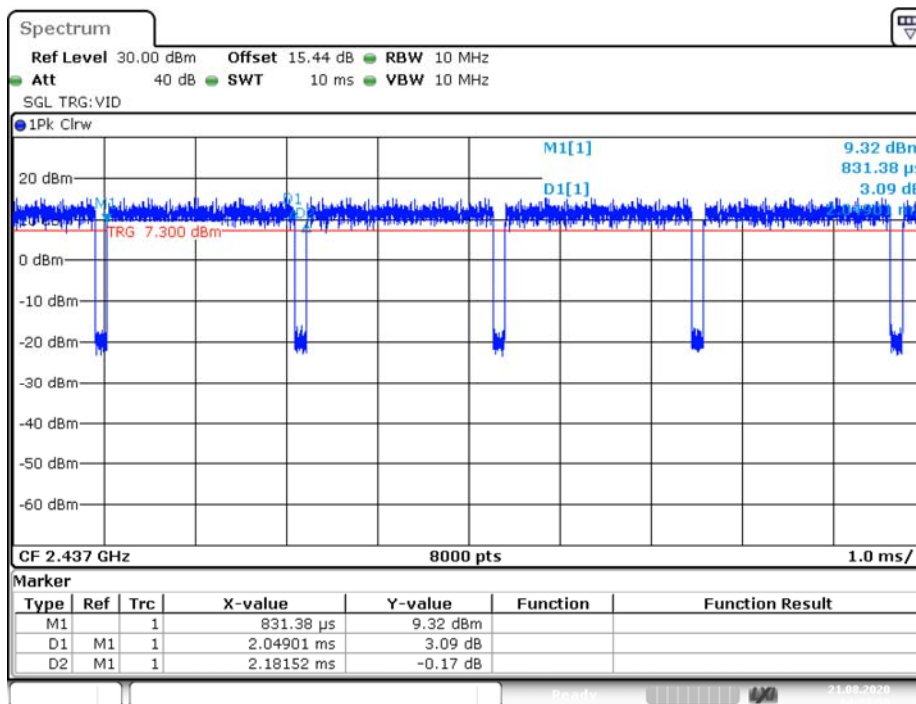
Duty cycle

802.11b Channel Middle 2437MHz



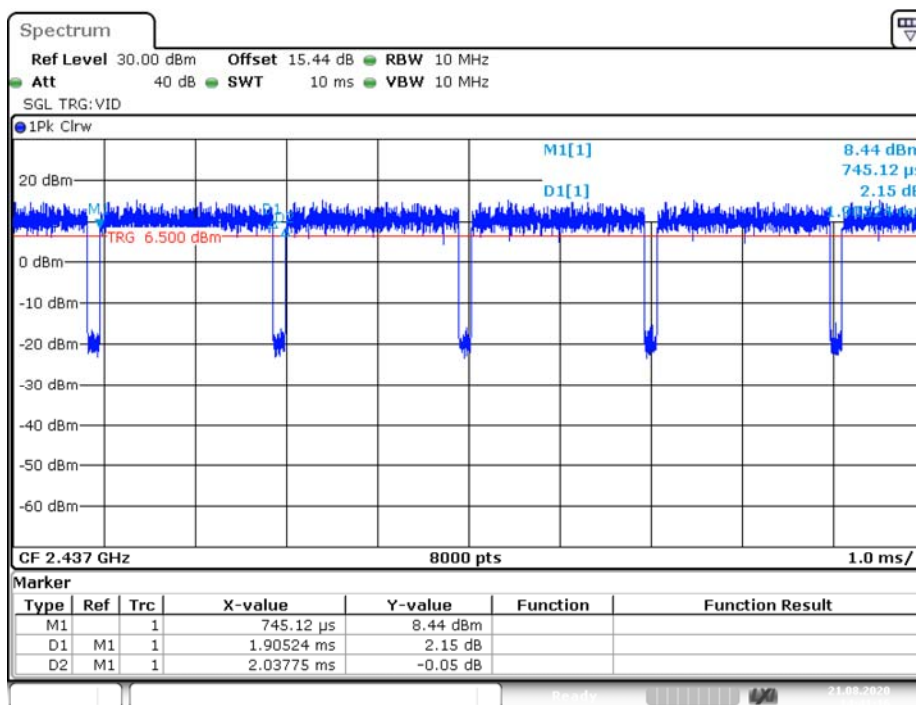
Date: 21.AUG.2020 14:24:34

802.11g Channel Middle 2437MHz



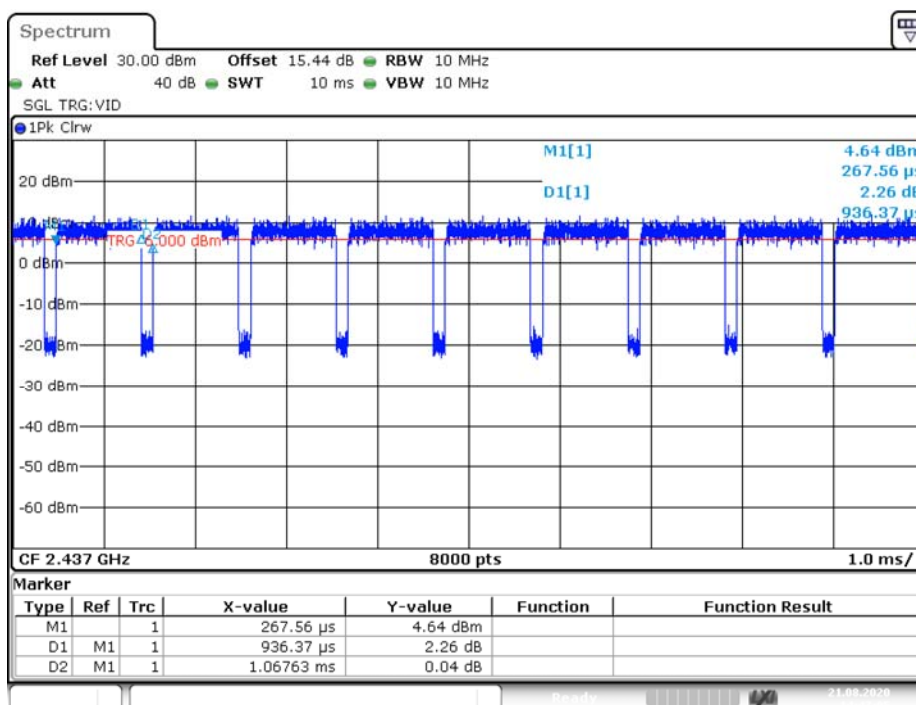
Date: 21.AUG.2020 14:33:50

802.11n20 Channel Middle 2437MHz



Date: 21.AUG.2020 14:41:17

802.11n40 Channel Middle 2437MHz



Date: 21.AUG.2020 14:47:06

8. POWER SPECTRAL DENSITY TEST

8.1. Block Diagram of Test Setup



8.2. The Requirement For Section 15.247(e)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3. EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4. Operating Condition of EUT

8.4.1. Setup the EUT and simulator as shown as Section 8.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX modes measure it. The transmit frequency range are 2412-2462MHz and 2422-2452MHz. We select three frequencies of high, medium and low channel in each frequency band for testing.

8.5. Test Procedure

8.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.5.2. Measurement Procedure PKPSD:

This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.

5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

8.5.3.Measurement the maximum power spectral density.

8.6.Test Result

PASS

Note: Power Spectral Density(dBm/10kHz)> Power Spectral Density(dBm/3kHz).
If Power Spectral Density(dBm/10kHz)< Limits, then Power Spectral Density (dBm/3kHz) must be less than Limits.

The test was performed with 802.11b			
Channel	Frequency (MHz)	Power Spectral Density(dBm/10kHz)	Limits (dBm/3kHz)
Low	2412	1.16	8 dBm
Middle	2437	1.17	8 dBm
High	2462	0.94	8 dBm

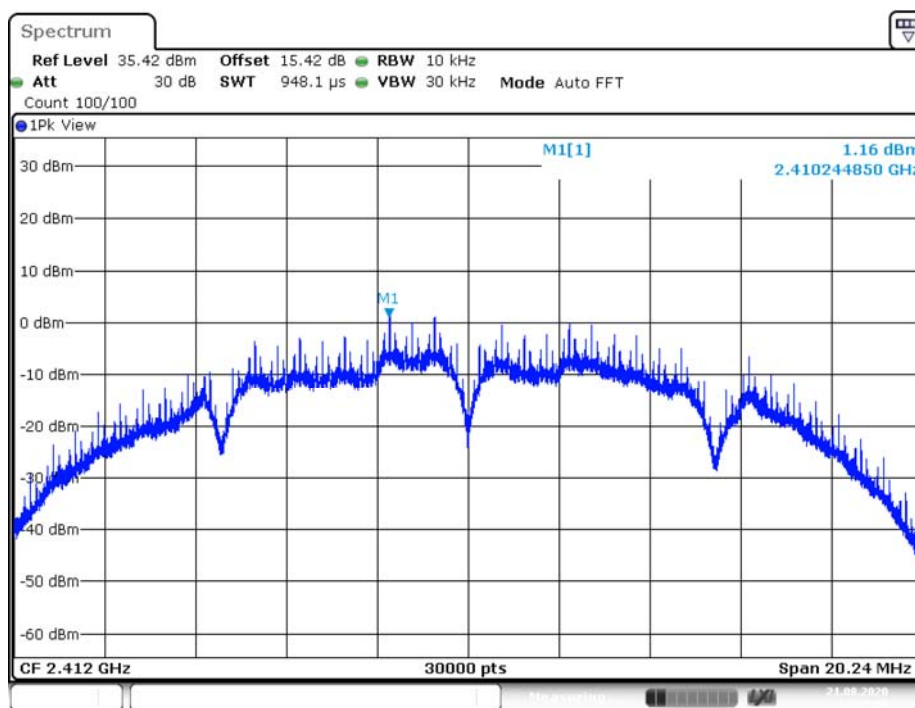
The test was performed with 802.11g			
Channel	Frequency (MHz)	Power Spectral Density(dBm/10kHz)	Limits (dBm/3kHz)
Low	2412	-11.53	8 dBm
Middle	2437	-13.42	8 dBm
High	2462	-13.07	8 dBm

The test was performed with 802.11n(20MHz)			
Channel	Frequency (MHz)	Power Spectral Density(dBm/10kHz)	Limits (dBm/3kHz)
Low	2412	-13.25	8 dBm
Middle	2437	-13.34	8 dBm
High	2462	-13.49	8 dBm

The test was performed with 802.11n(40MHz)			
Channel	Frequency (MHz)	Power Spectral Density(dBm/10kHz)	Limits (dBm/3kHz)
Low	2422	-15.14	8 dBm
Middle	2437	-15.36	8 dBm
High	2452	-15.29	8 dBm

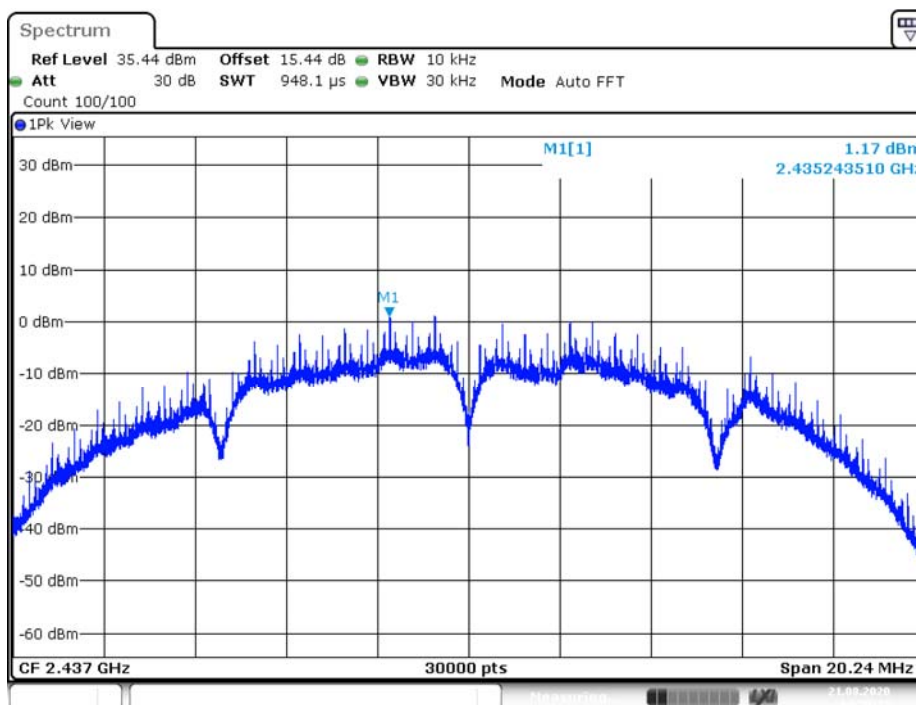
The spectrum analyzer plots are attached as below.

802.11b Low Channel 2412MHz



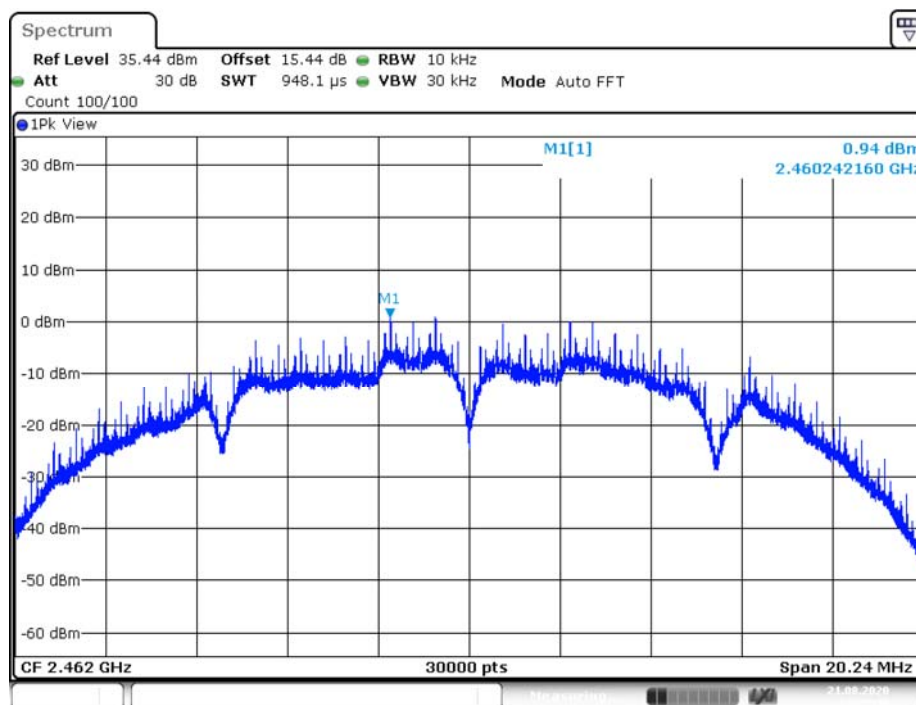
Date: 21.AUG.2020 14:29:06

802.11b Middle Channel 2437MHz



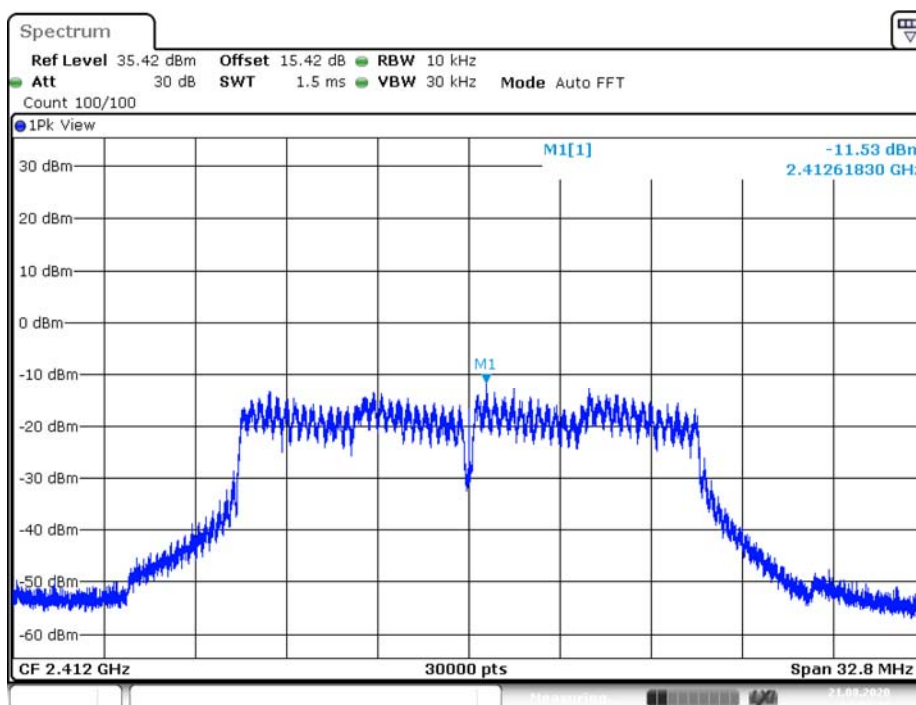
Date: 21.AUG.2020 14:29:27

802.11b High Channel 2462MHz



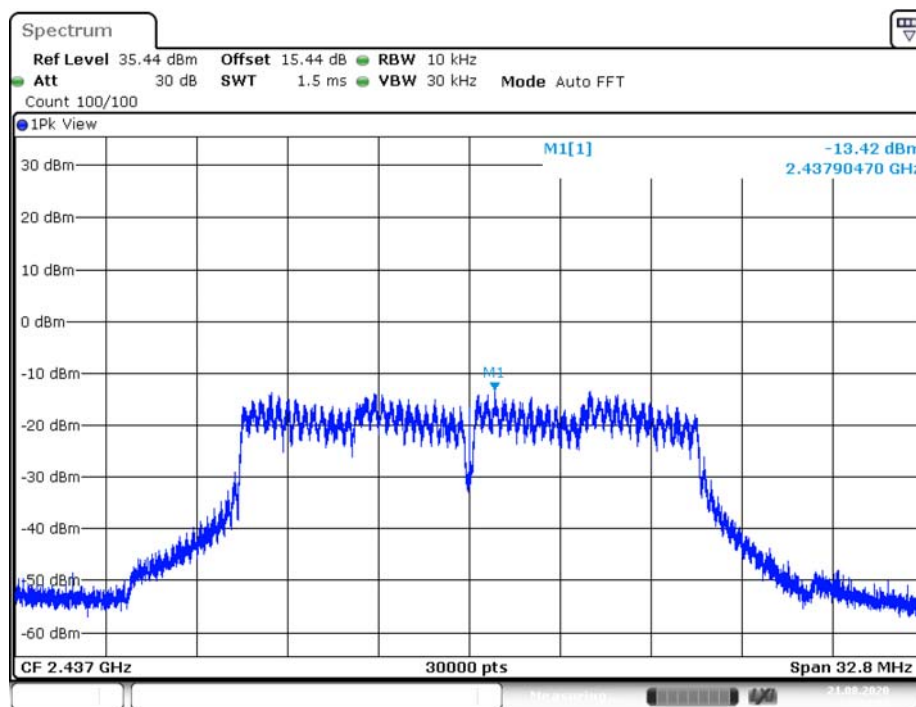
Date: 21.AUG.2020 14:29:49

802.11g Low Channel 2412MHz



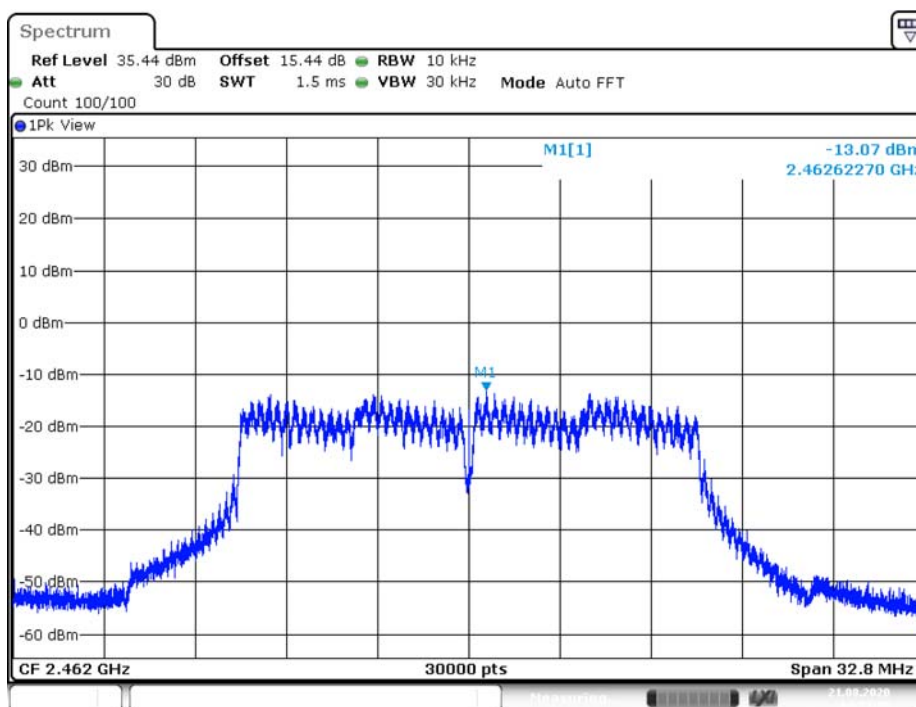
Date: 21.AUG.2020 14:32:24

802.11g Middle Channel 2437MHz



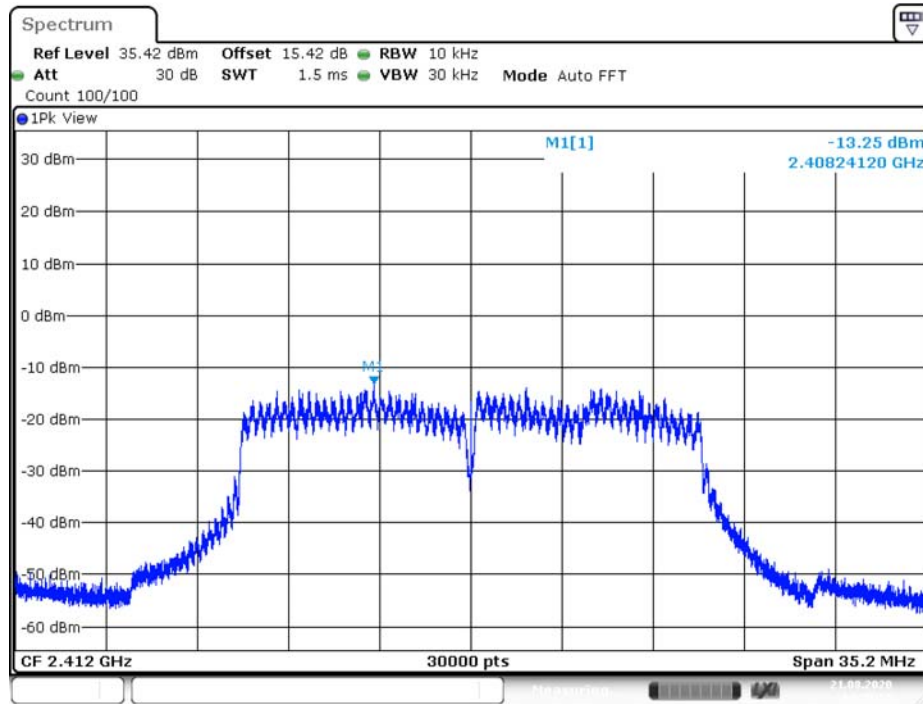
Date: 21.AUG.2020 14:34:32

802.11g High Channel 2462MHz



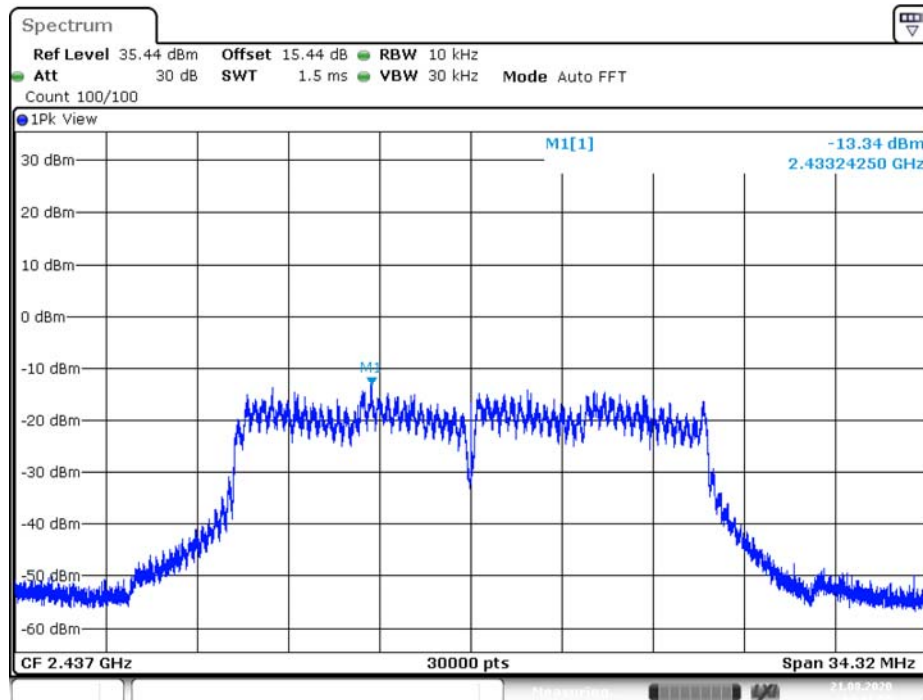
Date: 21.AUG.2020 14:37:10

802.11n(20MHz) Low Channel 2412MHz



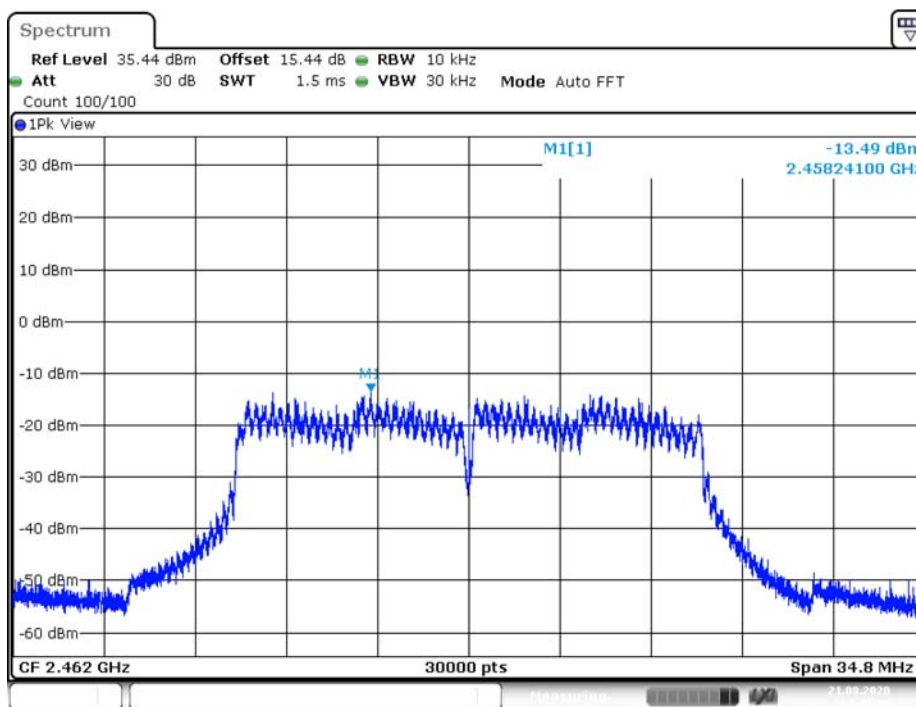
Date: 21.AUG.2020 14:39:52

802.11n(20MHz) Middle Channel 2437MHz



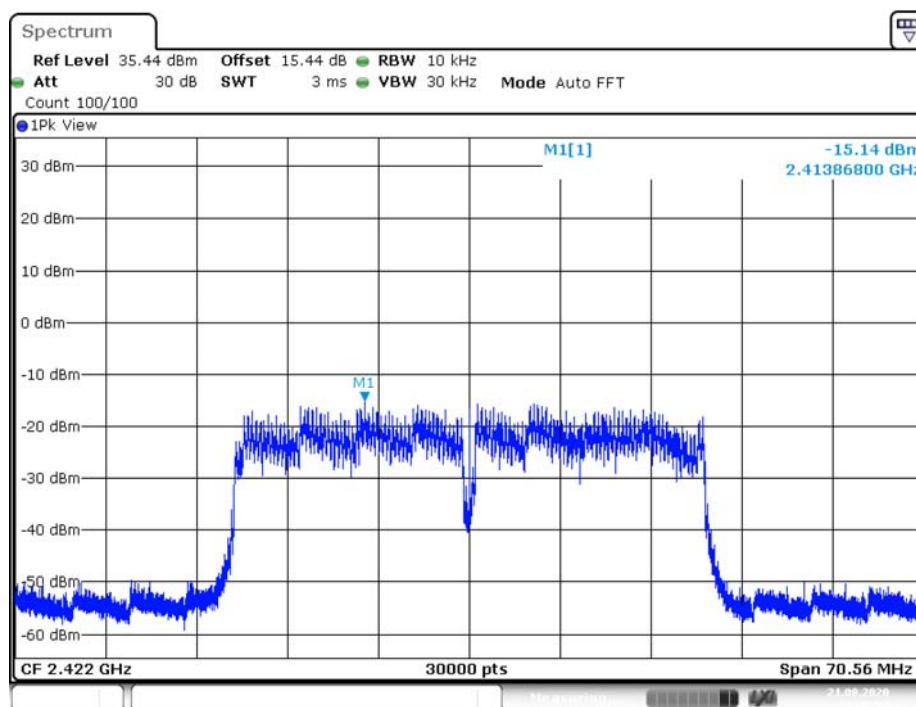
Date: 21.AUG.2020 14:41:59

802.11n(20MHz) High Channel 2462MHz



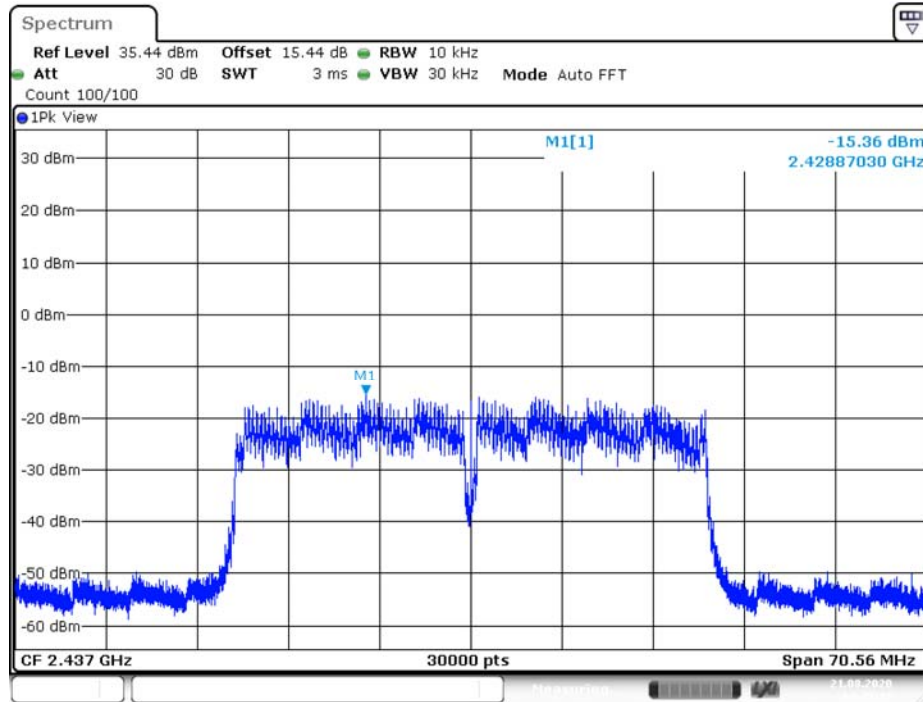
Date: 21.AUG.2020 14:43:48

802.11n(40MHz) Low Channel 2422MHz



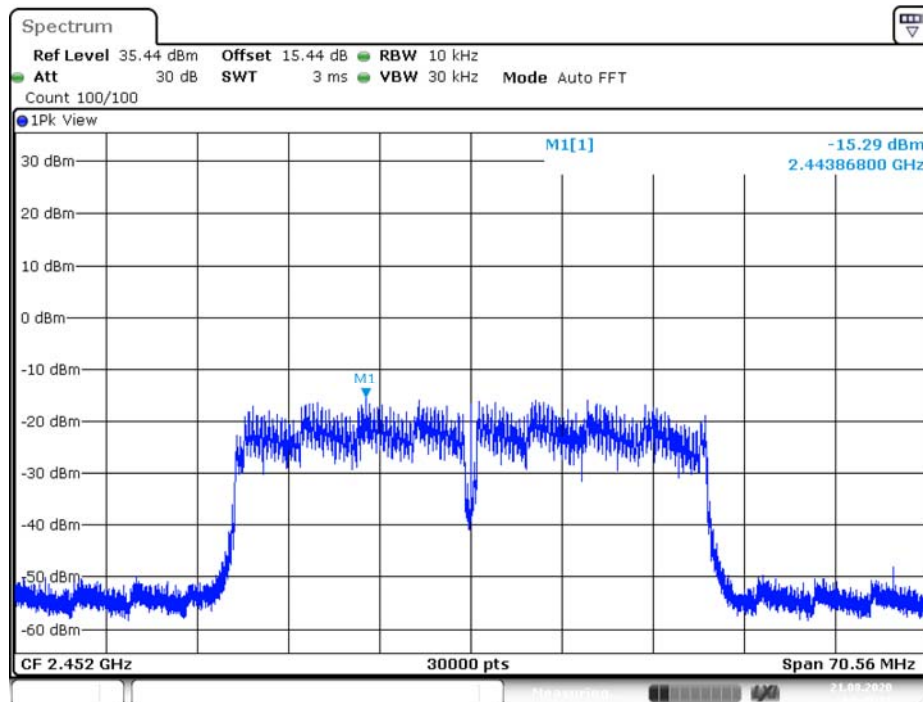
Date: 21.AUG.2020 14:45:52

802.11n(40MHz) Middle Channel 2437MHz



Date: 21.AUG.2020 14:47:47

802.11n(40MHz) High Channel 2452MHz



Date: 21.AUG.2020 14:49:32

9. MAXIMUM PEAK CONDUCTED OUTPUT POWER

9.1. Block Diagram of Test Setup



9.2. The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

9.3. EUT Configuration on Measurement

The equipment is installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4. Operating Condition of EUT

9.4.1. Setup the EUT and simulator as shown as Section 9.1.

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in TX modes measure it. The transmit frequency range are 2412-2462MHz and 2422-2452MHz. We select three frequencies of high, medium and low channel in each frequency band for testing.

9.5. Test Procedure

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

9.6.Test Result

The test was performed with 802.11b

Frequency (MHz)	Peak power (dBm)	Peak power (W)	FCC Limits dBm / W
2412	17.57	0.0571	30 dBm / 1 W
2437	17.70	0.0589	30 dBm / 1 W
2462	17.55	0.0569	30 dBm / 1 W

The test was performed with 802.11g

Frequency (MHz)	Peak power (dBm)	Peak power (W)	FCC Limits dBm / W
2412	16.57	0.0454	30 dBm / 1 W
2437	16.18	0.0415	30 dBm / 1 W
2462	16.01	0.0399	30 dBm / 1 W

The test was performed with 802.11n(20MHz)

Frequency (MHz)	Peak power (dBm)	Peak power (W)	FCC Limits dBm / W
2412	15.71	0.0372	30 dBm / 1 W
2437	15.55	0.0359	30 dBm / 1 W
2462	15.47	0.0352	30 dBm / 1 W

The test was performed with 802.11n(40MHz)

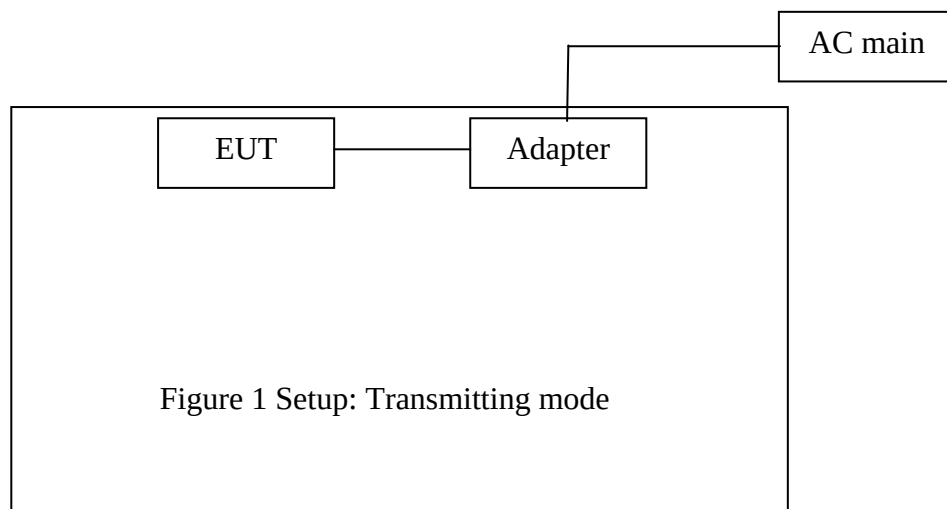
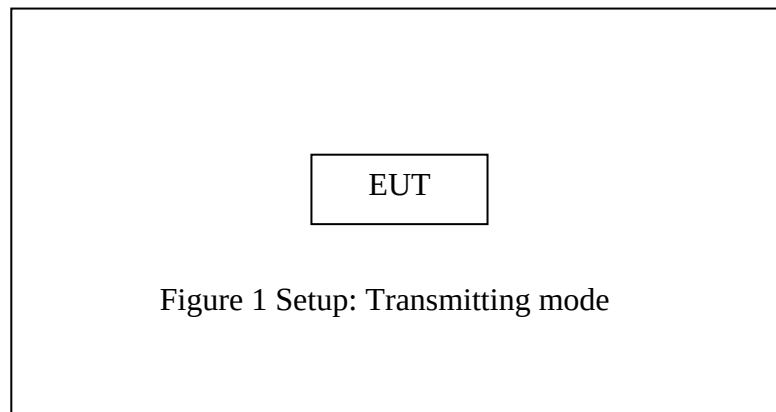
Frequency (MHz)	Peak power (dBm)	Peak power (W)	FCC Limits dBm / W
2422	16.42	0.0439	30 dBm / 1 W
2437	16.26	0.0423	30 dBm / 1 W
2452	16.15	0.0412	30 dBm / 1 W

Peak power is measured by a power meter.

10.RADIATED SPURIOUS EMISSION TEST

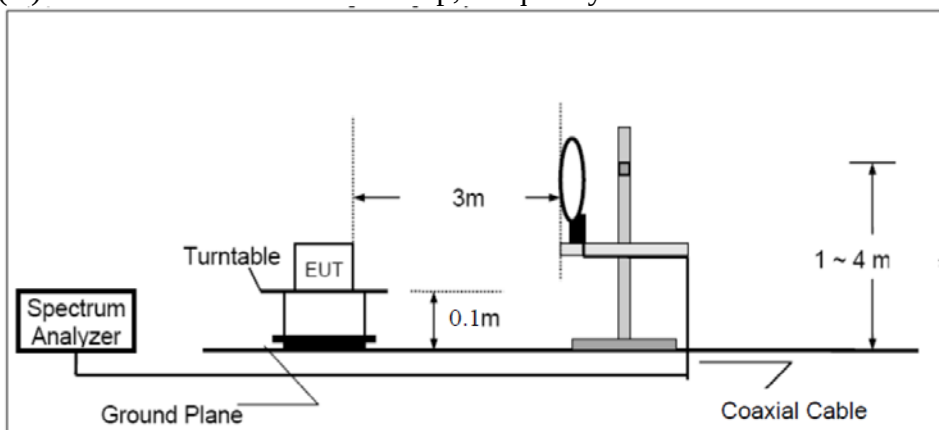
10.1.Block Diagram of Test Setup

10.1.1.Block diagram of connection between the EUT and peripherals

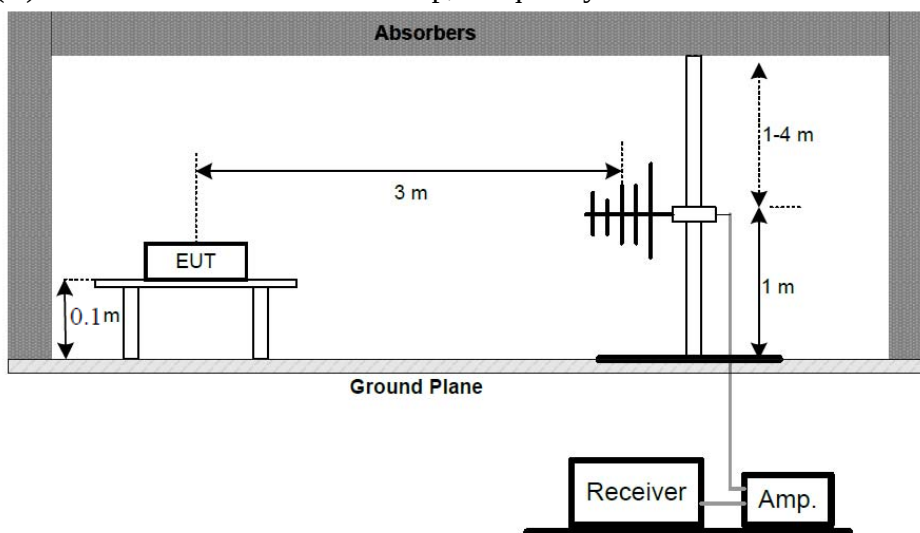


10.1.2. Test Semi-Anechoic Chamber Test Setup Diagram

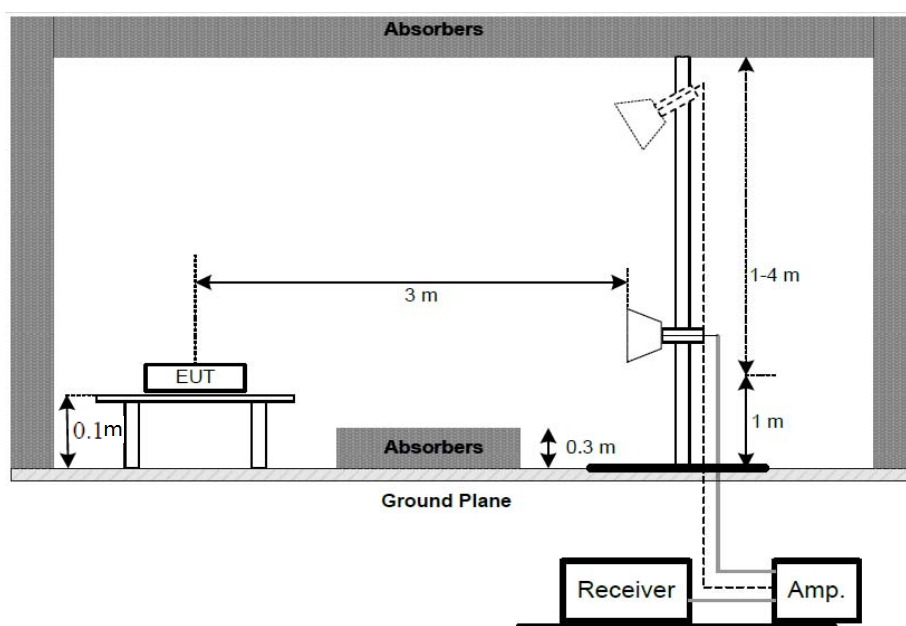
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1GHz



Above 1GHz:



10.2.The Limit For Section 15.247(d)

Section 15.247(d): 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

10.3.Restricted bands of operation

10.3.1.FCC Part 15.205 Restricted bands of operation

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

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

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

²Above 38.6

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

15.35 apply to these measurements.

10.4.Configuration of EUT on Measurement

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.5.Operating Condition of EUT

10.5.1.Setup the EUT and simulator as shown as Section 10.1.

10.5.2.Turn on the power of all equipment.

10.5.3.Let the EUT work in TX modes measure it. The transmit frequency range are 2412-2462MHz and 2422-2452MHz . We select three frequencies of high, medium and low in each frequency band for testing.

10.6.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.1 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 0.1 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The worst-case data rate for this channel to be 1Mbps for 802.11b mode and 6Mbps for 802.11g mode and 150Mbps for 802.11n mode, based on previous with 802.11 WLAN product design architectures.

The frequency range from 30MHz to 25000MHz is checked.

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

During the radiated emission test, the spectrum analyzer was set with the following configurations:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak at frequency below 1GHz.
2. 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.
3. 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.

4. All modes of operation were investigated and the worst-case emissions are reported.

10.7. The Field Strength of Radiation Emission Measurement Results

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

2. *: Denotes restricted band of operation.

3. The EUT is tested radiation emission at each test mode (802.11b/g/n) in three axes. The worst emissions are reflected in the following plots.

4. The radiation emissions from 18-25GHz are not reported, because the test values lower than the limits of 20dB

5. The average measurement was not performed when peak measured data under the limit of average detection.

Below 1GHz



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Site: 2# Chamber

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Fax:+86-0755-26503396

Job No.: DING #1546

Standard: FCC 15.247 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

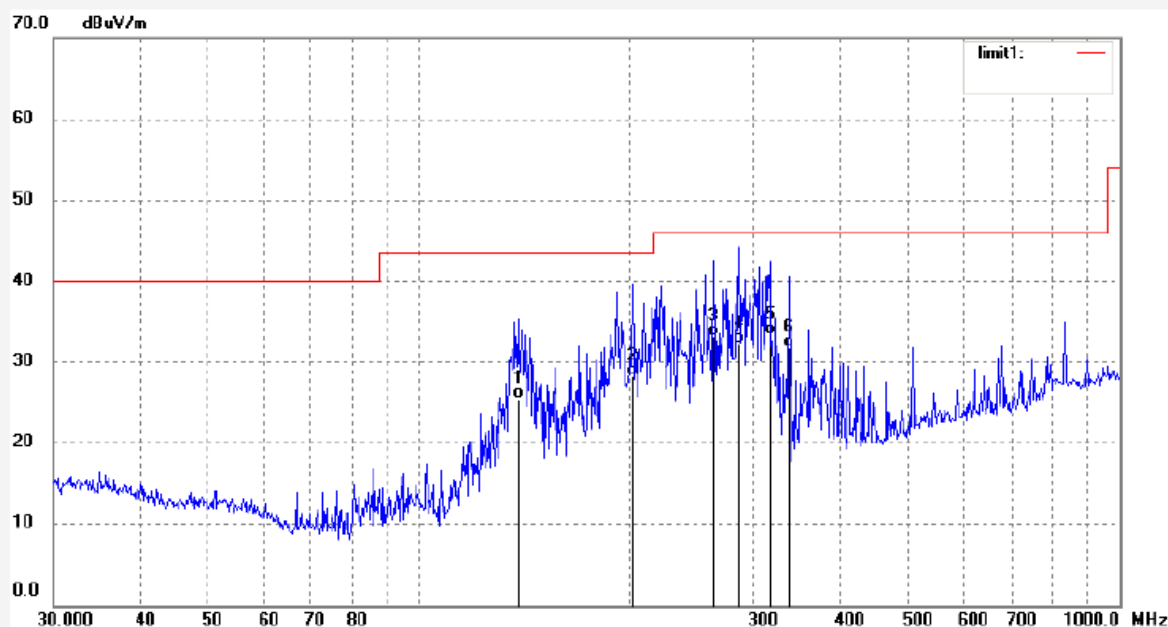
Date: 2020/09/16/

Time: 19/39/32

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	138.3873	41.36	-15.87	25.49	43.50	-18.01	QP	100	72	
2	201.3930	41.68	-13.40	28.28	43.50	-15.22	QP	100	231	
3	262.8955	44.79	-11.55	33.24	46.00	-12.76	QP	100	155	
4	285.9778	42.86	-10.65	32.21	46.00	-13.79	QP	100	43	
5	316.5889	43.15	-9.85	33.30	46.00	-12.70	QP	100	168	
6	337.2155	40.87	-9.18	31.69	46.00	-14.31	QP	100	107	



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Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: DING #1547

Standard: FCC 15.247 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

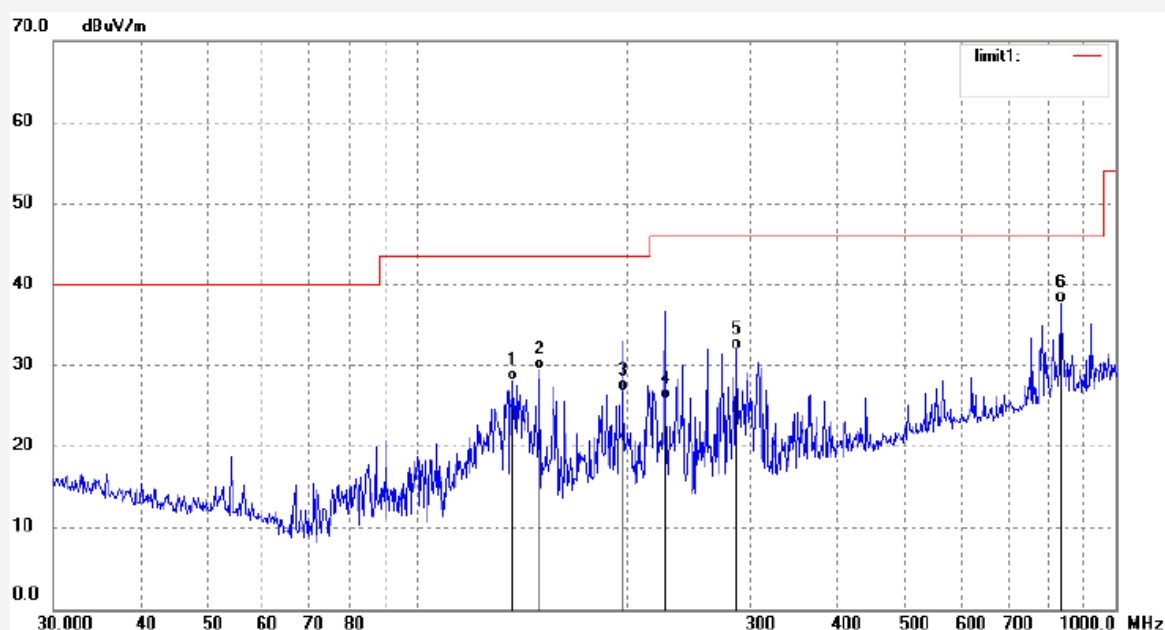
Date: 2020/09/16/

Time: 19/41/46

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	136.9391	43.62	-15.52	28.10	43.50	-15.40	QP	100	254	
2	149.4857	45.66	-16.17	29.49	43.50	-14.01	QP	100	125	
3	196.5098	40.37	-13.47	26.90	43.50	-16.60	QP	100	96	
4	226.0994	38.17	-12.41	25.76	46.00	-20.24	QP	100	116	
5	285.9778	42.67	-10.65	32.02	46.00	-13.98	QP	100	237	
6	833.3170	38.15	-0.41	37.74	46.00	-8.26	QP	100	89	

Above 1GHz(worse case)



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Site: 2# Chamber

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Fax:+86-0755-26503396

Job No.: DING #1459

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2412MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

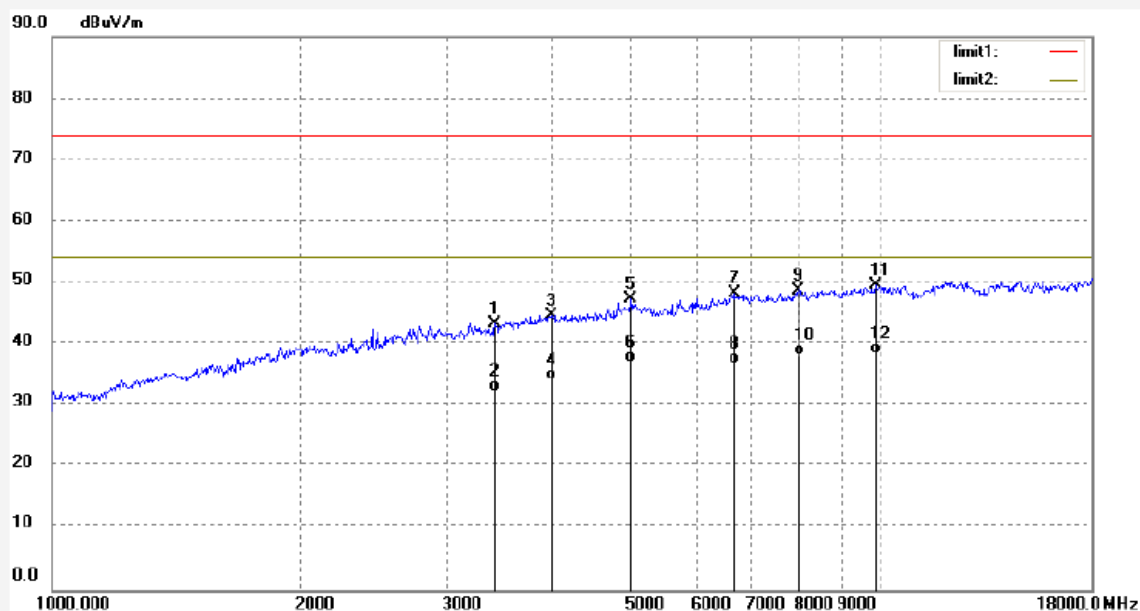
Date: 2020/09/01/

Time: 8/38/03

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3425.674	40.69	2.65	43.34	74.00	-30.66	peak	150	36	
2	3425.674	29.68	2.65	32.33	54.00	-21.67	AVG	150	36	
3	4004.339	39.97	4.62	44.59	74.00	-29.41	peak	150	274	
4	4004.339	29.41	4.62	34.03	54.00	-19.97	AVG	150	274	
5	5002.496	38.62	8.79	47.41	74.00	-26.59	peak	150	191	
6	5002.496	28.33	8.79	37.12	54.00	-16.88	AVG	150	191	
7	6659.763	36.69	11.52	48.21	74.00	-25.79	peak	150	337	
8	6659.763	25.18	11.52	36.70	54.00	-17.30	AVG	150	337	
9	7966.832	33.45	15.31	48.76	74.00	-25.24	peak	150	252	
10	7966.832	22.76	15.31	38.07	54.00	-15.93	AVG	150	252	
11	9866.789	31.56	18.01	49.57	74.00	-24.43	peak	150	108	
12	9866.789	20.34	18.01	38.35	54.00	-15.65	AVG	150	108	



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Fax:+86-0755-26503396

Job No.: DING #1460

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2412MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

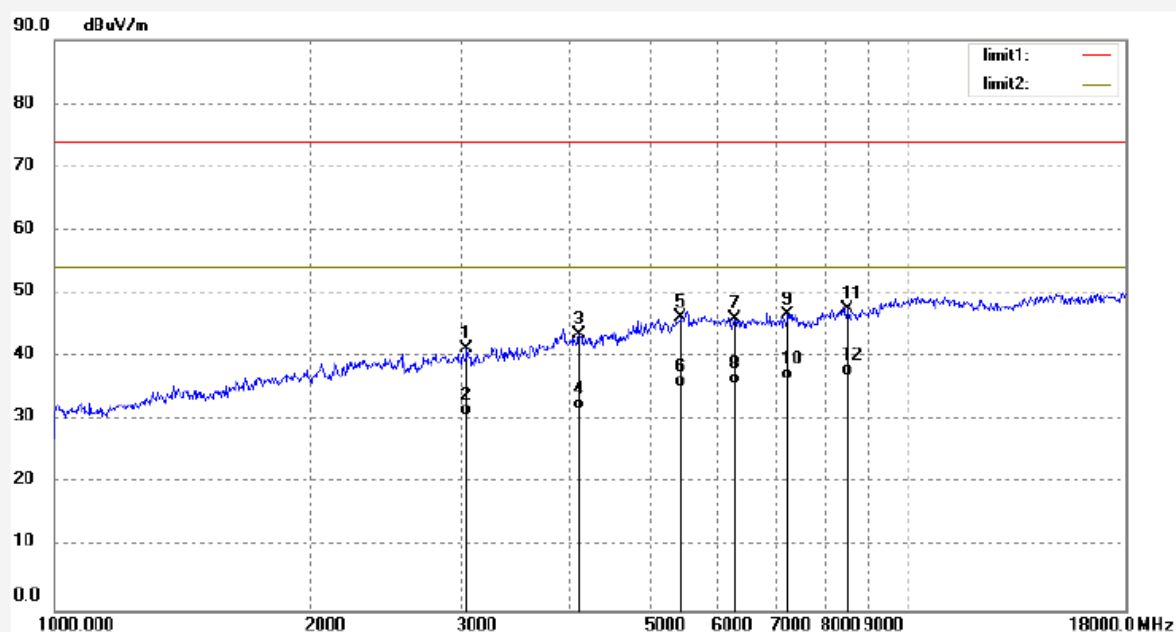
Date: 2020/09/01/

Time: 8/45/15

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3042.846	39.18	2.01	41.19	74.00	-32.81	peak	150	14	
2	3042.846	28.76	2.01	30.77	54.00	-23.23	AVG	150	14	
3	4121.768	38.60	5.02	43.62	74.00	-30.38	peak	150	271	
4	4121.768	26.51	5.02	31.53	54.00	-22.47	AVG	150	271	
5	5408.529	36.90	9.39	46.29	74.00	-27.71	peak	150	336	
6	5408.529	25.93	9.39	35.32	54.00	-18.68	AVG	150	336	
7	6267.553	34.74	11.30	46.04	74.00	-27.96	peak	150	95	
8	6267.553	24.42	11.30	35.72	54.00	-18.28	AVG	150	95	
9	7242.052	35.72	11.05	46.77	74.00	-27.23	peak	150	117	
10	7242.052	25.31	11.05	36.36	54.00	-17.64	AVG	150	117	
11	8514.456	32.44	15.06	47.50	74.00	-26.50	peak	150	125	
12	8514.456	21.87	15.06	36.93	54.00	-17.07	AVG	150	125	



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Job No.: DING #1461

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2437MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

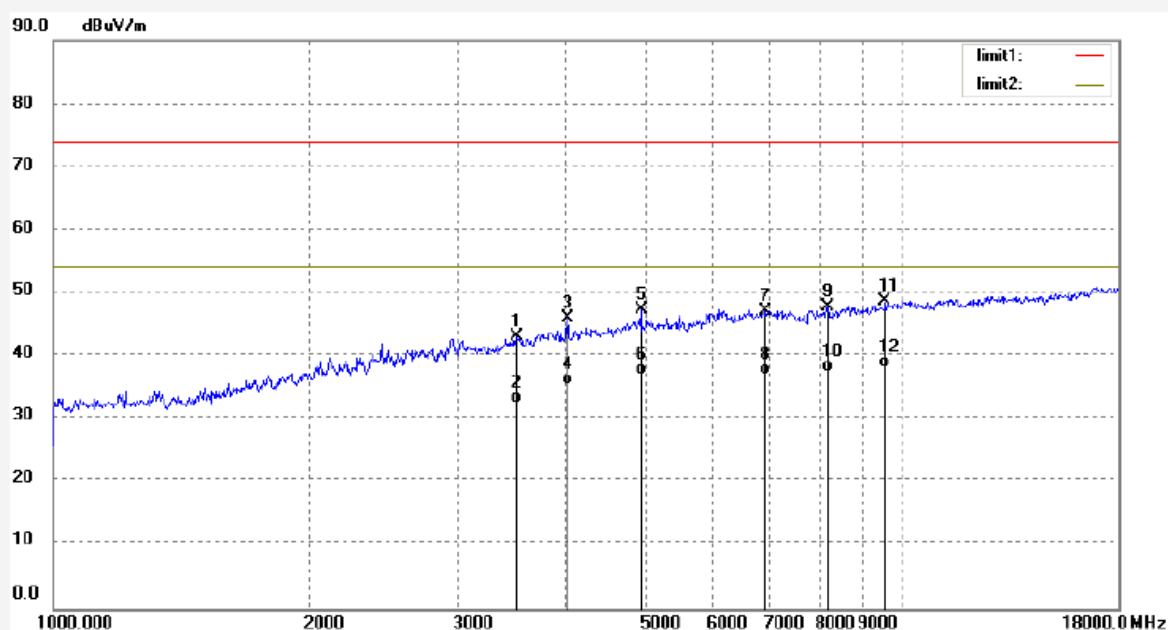
Date: 2020/09/01/

Time: 8/55/00

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3515.957	39.97	3.06	43.03	74.00	-30.97	peak	150	134	
2	3515.957	29.48	3.06	32.54	54.00	-21.46	AVG	150	134	
3	4039.212	41.22	4.76	45.98	74.00	-28.02	peak	150	97	
4	4039.212	30.76	4.76	35.52	54.00	-18.48	AVG	150	97	
5	4930.721	38.98	8.44	47.42	74.00	-26.58	peak	150	116	
6	4930.721	28.49	8.44	36.93	54.00	-17.07	AVG	150	116	
7	6894.806	35.33	11.87	47.20	74.00	-26.80	peak	150	204	
8	6894.806	25.12	11.87	36.99	54.00	-17.01	AVG	150	204	
9	8176.795	32.11	15.60	47.71	74.00	-26.29	peak	150	32	
10	8176.795	21.83	15.60	37.43	54.00	-16.57	AVG	150	32	
11	9558.017	31.18	17.42	48.60	74.00	-25.40	peak	150	189	
12	9558.017	20.75	17.42	38.17	54.00	-15.83	AVG	150	189	



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Job No.: DING #1462

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2437MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

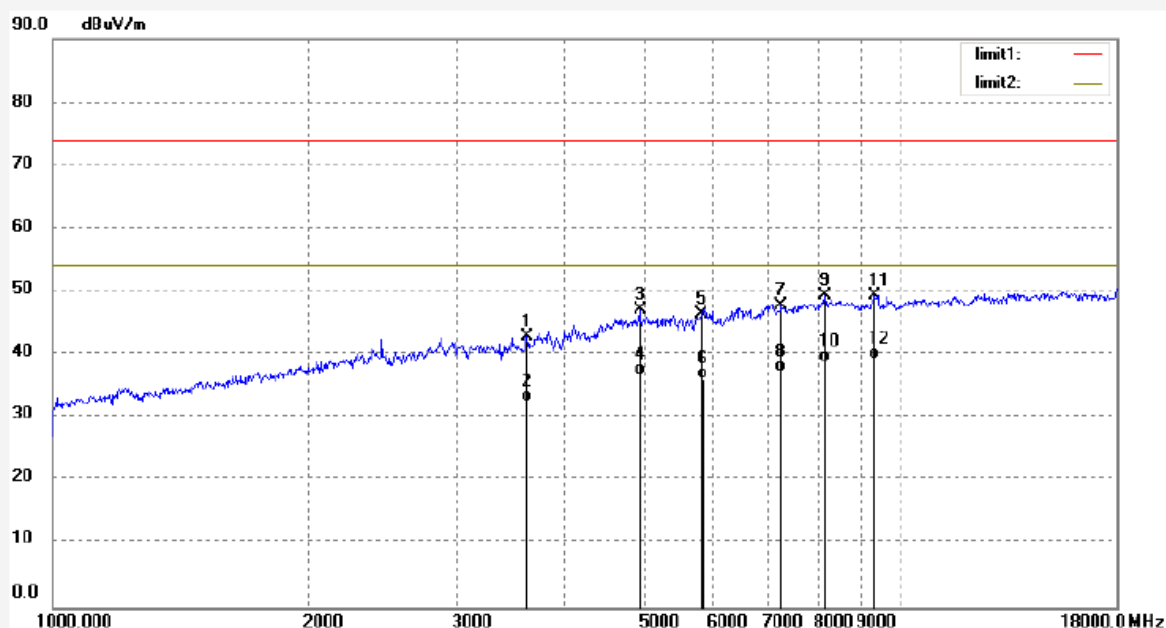
Date: 2020/09/01/

Time: 9/02/19

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3629.540	39.31	3.47	42.78	74.00	-31.22	peak	150	337	
2	3629.540	29.12	3.47	32.59	54.00	-21.41	AVG	150	337	
3	4930.721	38.73	8.44	47.17	74.00	-26.83	peak	150	125	
4	4930.721	28.35	8.44	36.79	54.00	-17.21	AVG	150	125	
5	5830.640	35.67	10.69	46.36	74.00	-27.64	peak	150	34	
6	5830.640	25.42	10.69	36.11	54.00	-17.89	AVG	150	34	
7	7242.052	36.74	11.05	47.79	74.00	-26.21	peak	150	102	
8	7242.052	26.28	11.05	37.33	54.00	-16.67	AVG	150	102	
9	8153.195	33.78	15.60	49.38	74.00	-24.62	peak	150	89	
10	8153.195	23.29	15.60	38.89	54.00	-15.11	AVG	150	89	
11	9339.543	33.04	16.44	49.48	74.00	-24.52	peak	150	156	
12	9339.543	22.78	16.44	39.22	54.00	-14.78	AVG	150	156	



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Job No.: DING #1463

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2462MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

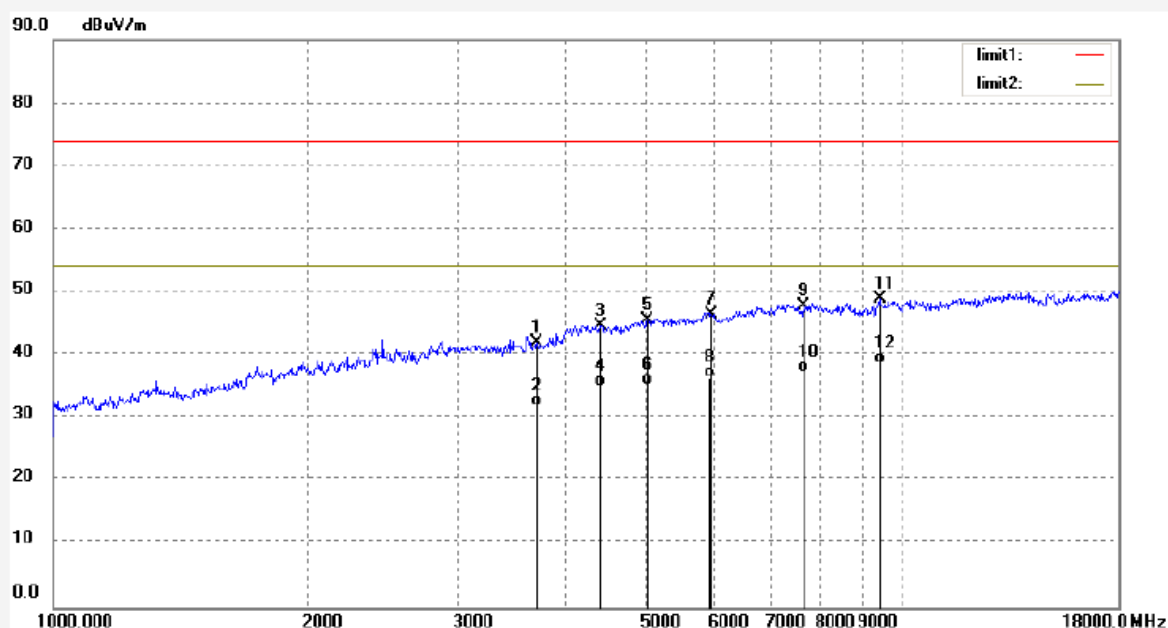
Date: 2020/09/01/

Time: 9/09/03

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3714.443	38.27	3.76	42.03	74.00	-31.97	peak	150	37	
2	3714.443	28.14	3.76	31.90	54.00	-22.10	AVG	150	37	
3	4417.841	39.26	5.51	44.77	74.00	-29.23	peak	150	154	
4	4417.841	29.47	5.51	34.98	54.00	-19.02	AVG	150	154	
5	5016.976	36.81	8.77	45.58	74.00	-28.42	peak	150	220	
6	5016.976	26.35	8.77	35.12	54.00	-18.88	AVG	150	220	
7	5967.033	35.38	11.17	46.55	74.00	-27.45	peak	150	117	
8	5967.033	25.22	11.17	36.39	54.00	-17.61	AVG	150	117	
9	7673.034	34.56	13.16	47.72	74.00	-26.28	peak	150	355	
10	7673.034	23.98	13.16	37.14	54.00	-16.86	AVG	150	355	
11	9420.880	31.84	17.08	48.92	74.00	-25.08	peak	150	78	
12	9420.880	21.47	17.08	38.55	54.00	-15.45	AVG	150	78	



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Job No.: DING #1464

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2462MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

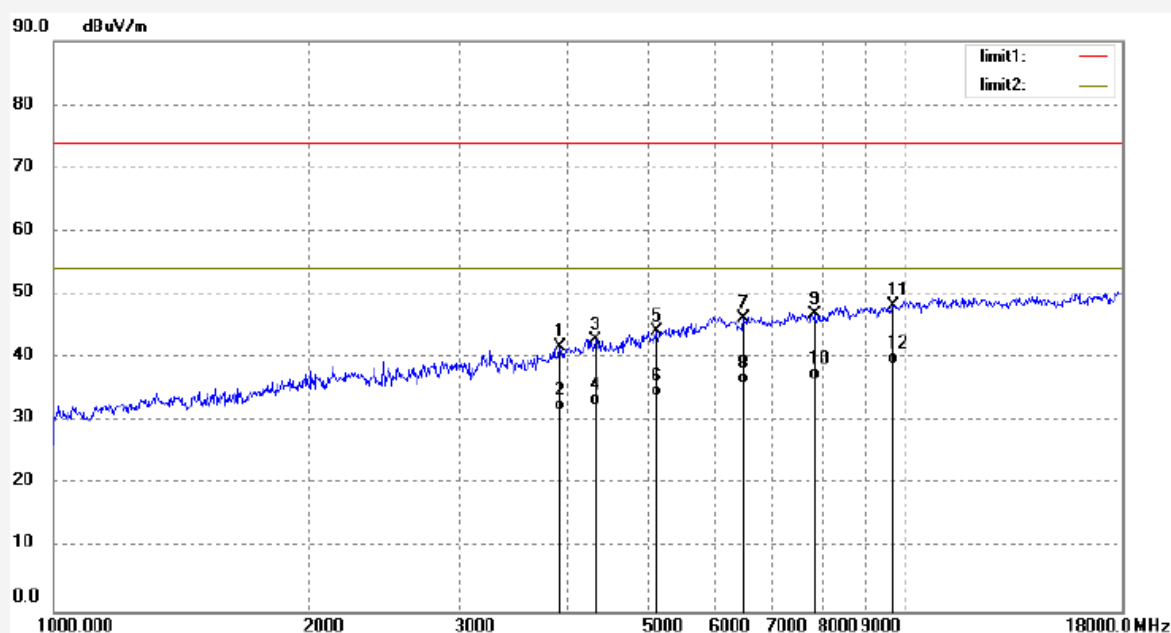
Date: 2020/09/01/

Time: 9/19/15

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3935.493	37.41	4.30	41.71	74.00	-32.29	peak	150	77	
2	3935.493	27.34	4.30	31.64	54.00	-22.36	AVG	150	77	
3	4329.355	37.83	5.05	42.88	74.00	-31.12	peak	150	49	
4	4329.355	27.57	5.05	32.62	54.00	-21.38	AVG	150	49	
5	5104.741	35.51	8.69	44.20	74.00	-29.80	peak	150	158	
6	5104.741	25.15	8.69	33.84	54.00	-20.16	AVG	150	158	
7	6470.026	34.59	11.60	46.19	74.00	-27.81	peak	150	254	
8	6470.026	24.26	11.60	35.86	54.00	-18.14	AVG	150	254	
9	7852.524	32.66	14.27	46.93	74.00	-27.07	peak	150	113	
10	7852.524	22.31	14.27	36.58	54.00	-17.42	AVG	150	113	
11	9697.152	30.68	17.65	48.33	74.00	-25.67	peak	150	207	
12	9697.152	21.33	17.65	38.98	54.00	-15.02	AVG	150	207	

11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



11.2.The Requirement For Section 15.247(d)

Section 15.247(d): 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.4.Operating Condition of EUT

11.4.1.Setup the EUT and simulator as shown as Section 11.1.

11.4.2.Turn on the power of all equipment.

11.4.3.Let the EUT work in TX modes measure it. The transmit frequency range are 2412-2462MHz and 2422-2452MHz. We select three frequencies of high and low channel in each frequency band for testing.

11.5. Test Procedure

Conducted Band Edge:

11.5.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

11.5.2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.

Radiate Band Edge:

11.5.3. The EUT is placed on a turntable, which is 0.1m above the ground plane and worked at highest radiated power.

11.5.4. The turntable was rotated for 360 degrees to determine the position of maximum emission level.

11.5.5. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

11.5.6. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

11.5.7. RBW=1MHz, VBW=1MHz

11.5.8. The band edges was measured and recorded.

11.6. Test Result

The test was performed with 802.11b		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400.0	42.73	> 20dBc
2483.5	51.70	> 20dBc

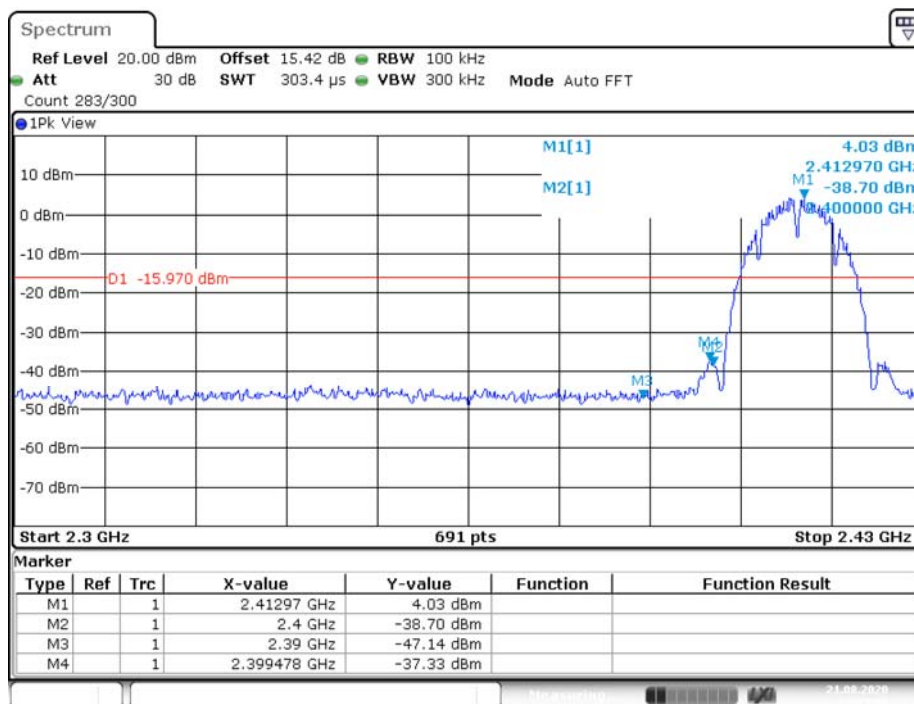
The test was performed with 802.11g		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400.0	31.83	> 20dBc
2483.5	42.87	> 20dBc

The test was performed with 802.11n (20MHz)		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400.0	35.47	> 20dBc
2483.5	42.14	> 20dBc

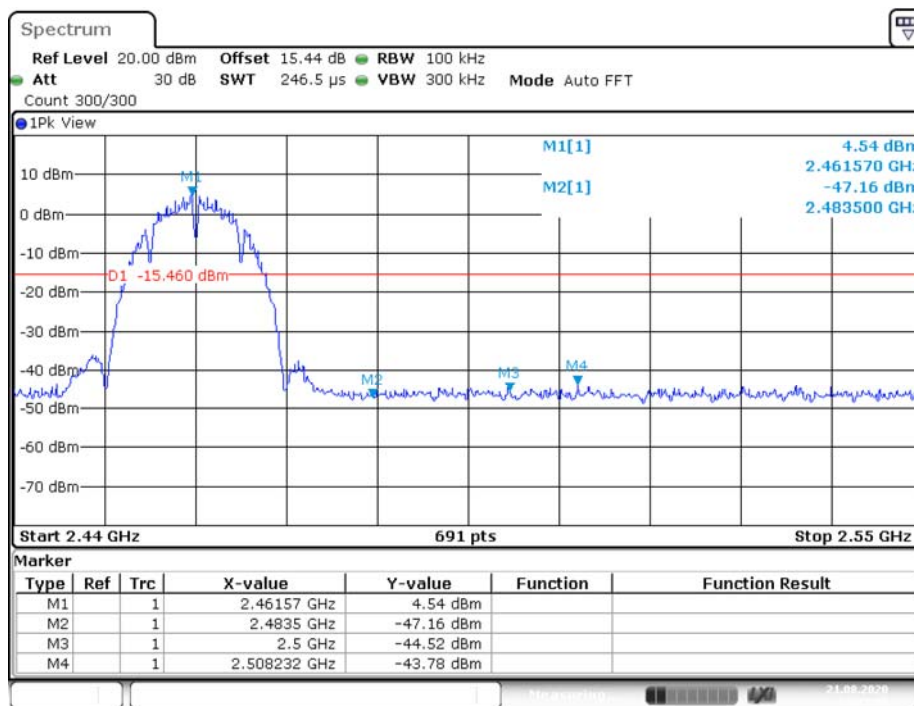
The test was performed with 802.11n (40MHz)		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400.0	38.73	> 20dBc
2483.5	38.88	> 20dBc

The spectrum analyzer plots are attached as below.

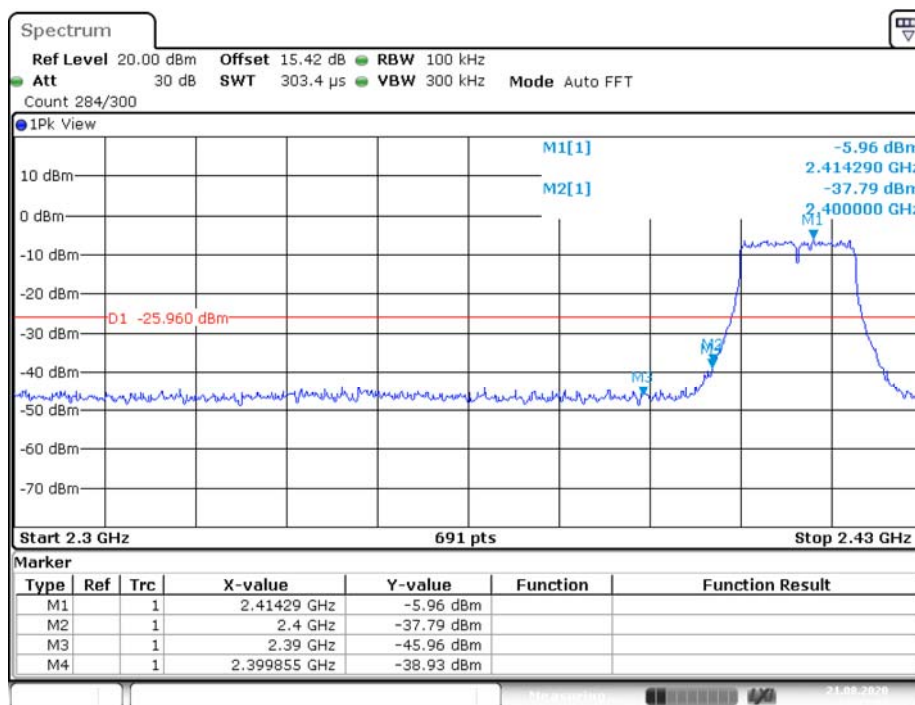
802.11b Low Channel 2412MHz



802.11b High Channel 2462MHz

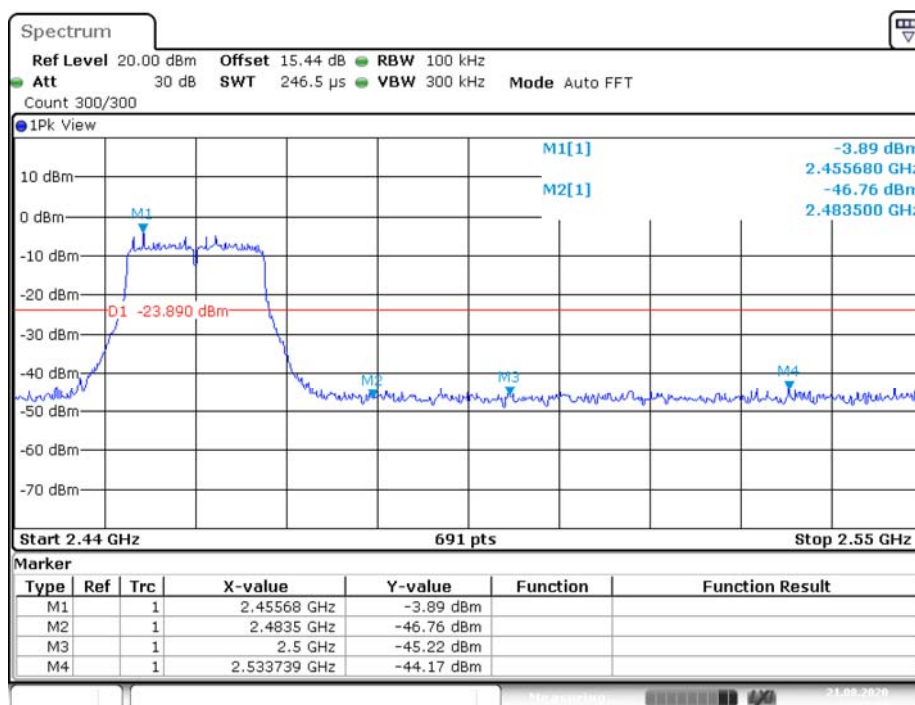


802.11g Low Channel 2412MHz



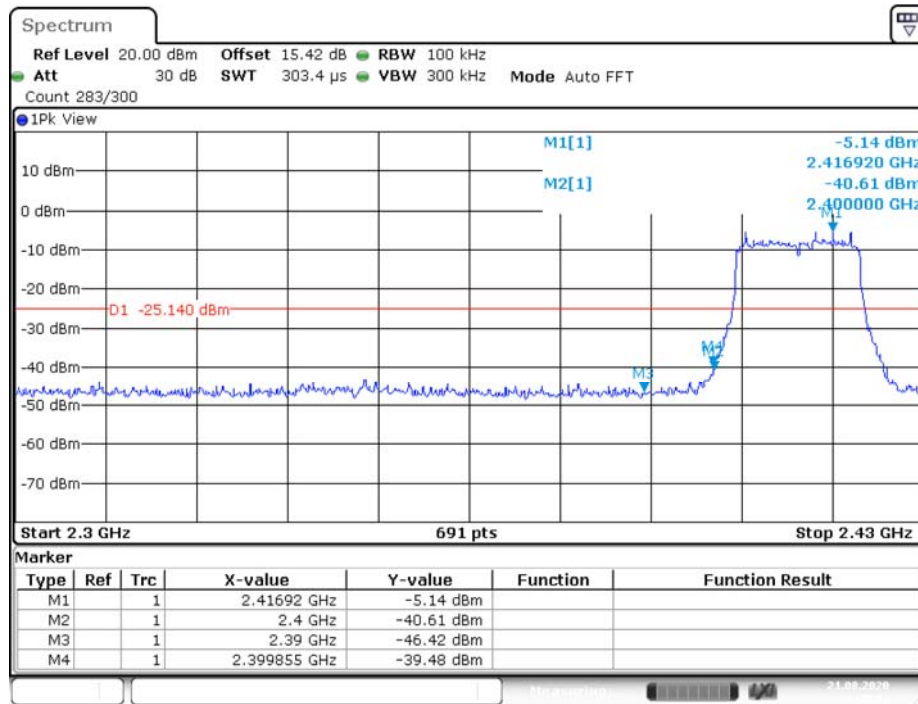
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802.11g High Channel 2462MHz

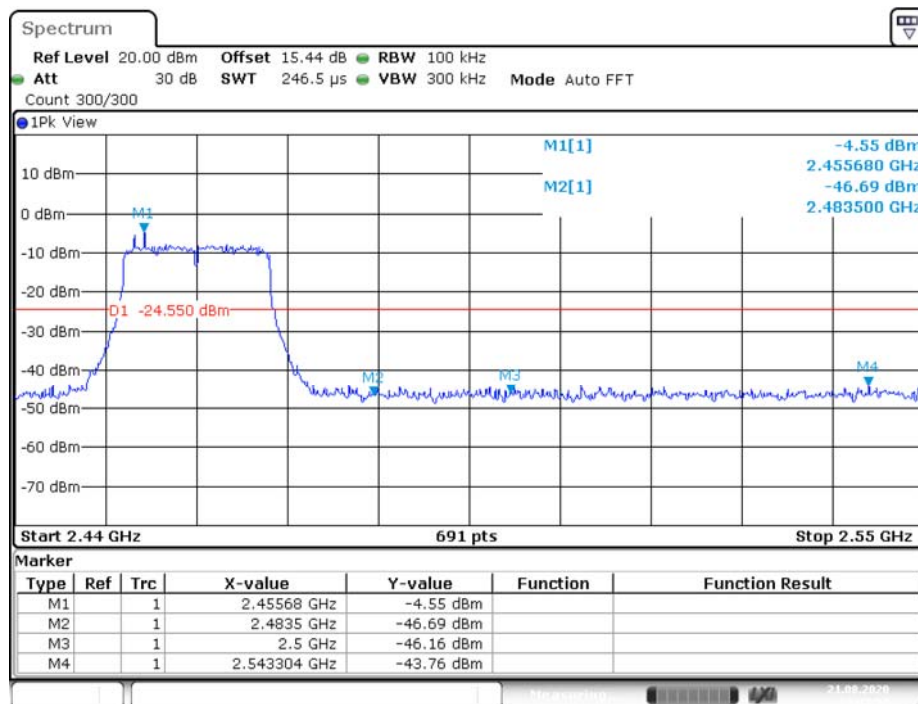


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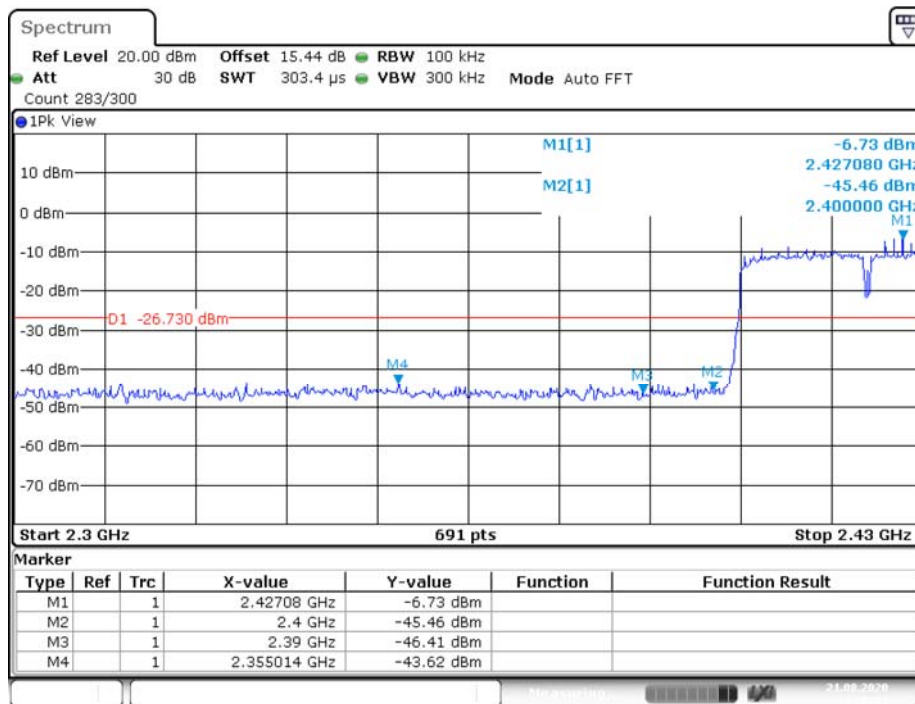
802.11n(20MHz) Low Channel 2412MHz



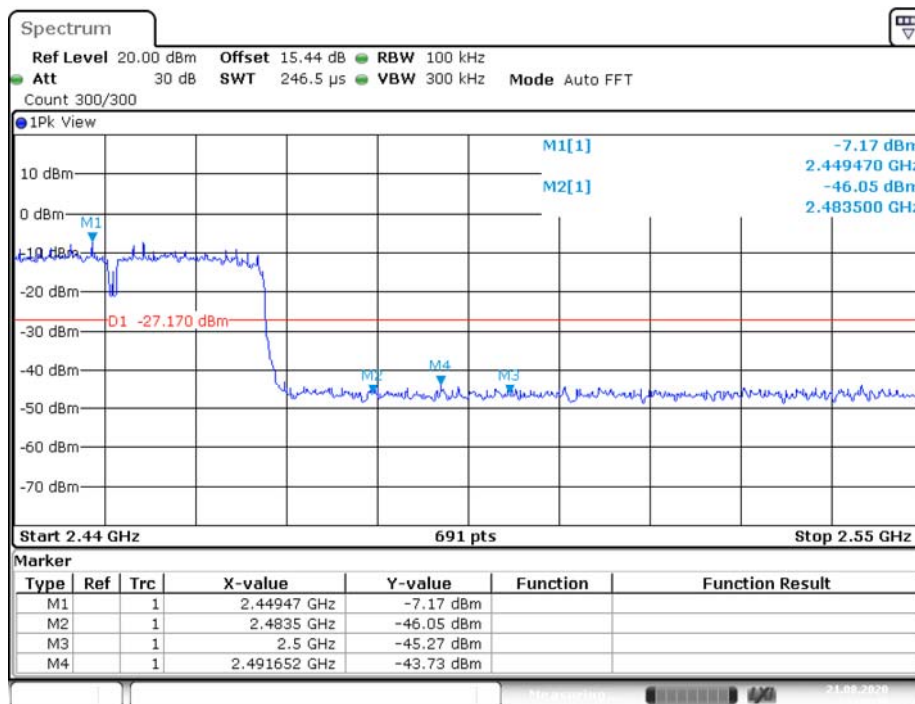
802.11n(20MHz) High Channel 2462MHz



802.11n(40MHz) Low Channel 2422MHz



802.11n(40MHz) High Channel 2452MHz



Radiated Band Edge Result

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:
$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$
3. Display the measurement of peak values.
4. The EUT is tested radiation emission at each test mode (802.11b/g/n) in three axes. The worst emissions are reflected in the following plots.
5. The average measurement was not performed when peak measured data under the limit of average detection.



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Job No.: DING #1504

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2412MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

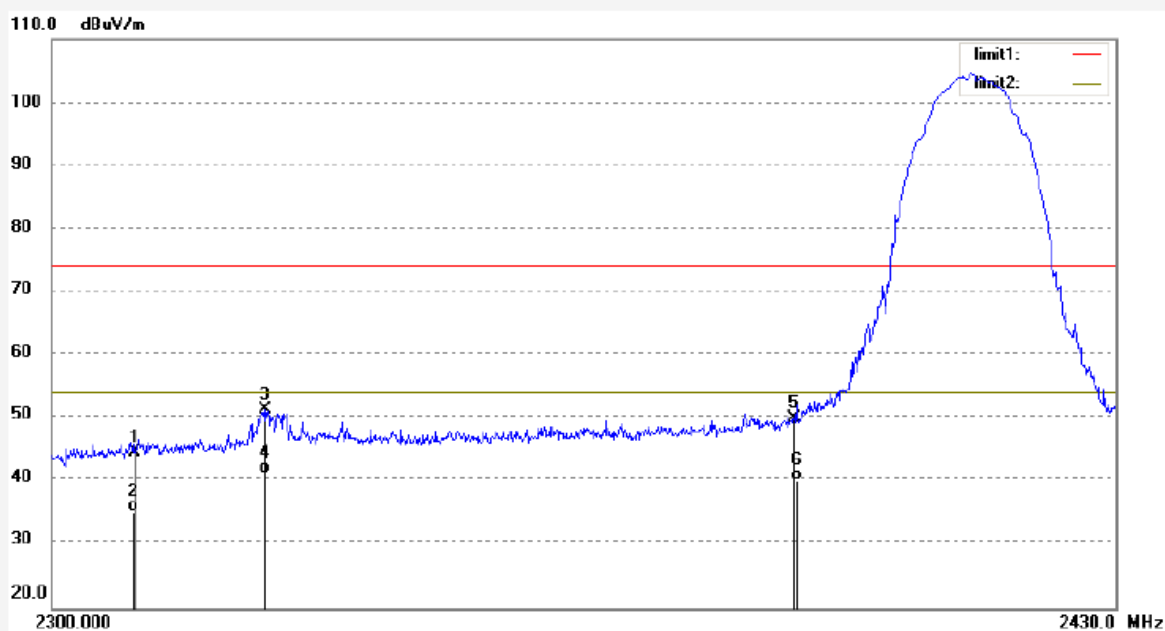
Date: 2020/09/16/

Time: 11/57/25

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2310.000	44.23	0.47	44.70	74.00	-29.30	peak	150	37	
2	2310.000	34.75	0.47	35.22	54.00	-18.78	AVG	150	37	
3	2325.480	50.97	0.47	51.44	74.00	-22.56	peak	150	225	
4	2325.480	40.69	0.47	41.16	54.00	-12.84	AVG	150	225	
5	2390.000	49.23	0.79	50.02	74.00	-23.98	peak	150	10	
6	2390.000	39.34	0.79	40.13	54.00	-13.87	AVG	150	10	

Job No.: DING #1505

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2412MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

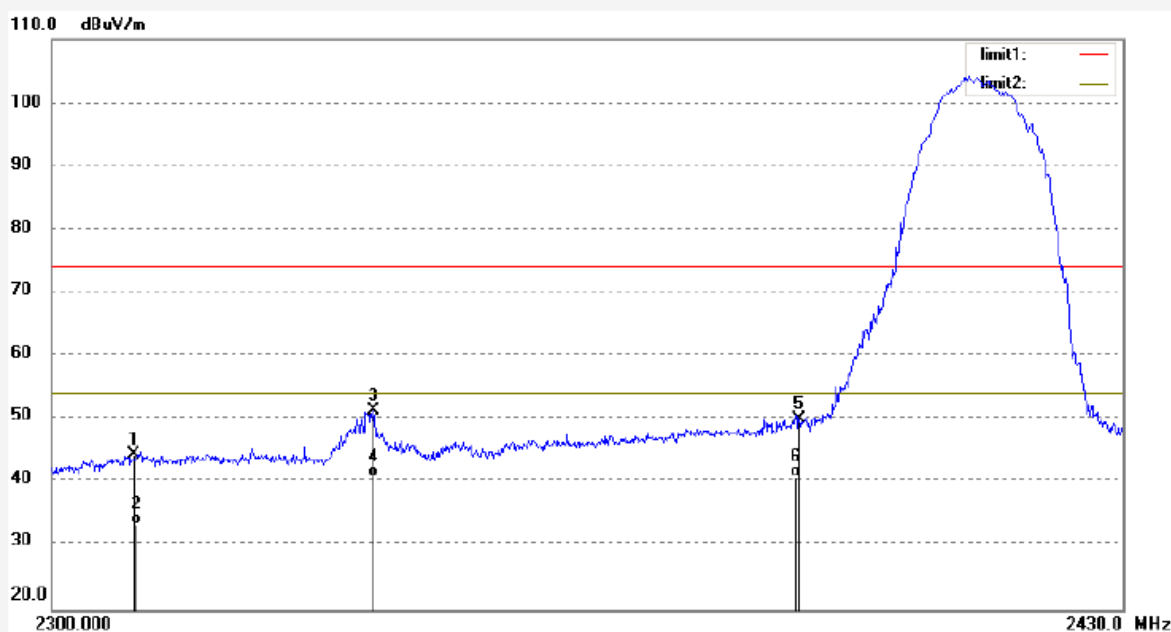
Date: 2020/09/16/

Time: 11/59/35

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2310.000	43.98	0.47	44.45	74.00	-29.55	peak	150	77	
2	2310.000	32.86	0.47	33.33	54.00	-20.67	AVG	150	77	
3	2338.350	50.86	0.47	51.33	74.00	-22.67	peak	150	45	
4	2338.350	40.33	0.47	40.80	54.00	-13.20	AVG	150	45	
5	2390.000	49.18	0.79	49.97	74.00	-24.03	peak	150	229	
6	2390.000	40.02	0.79	40.81	54.00	-13.19	AVG	150	229	



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Job No.: DING #1506

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2462MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

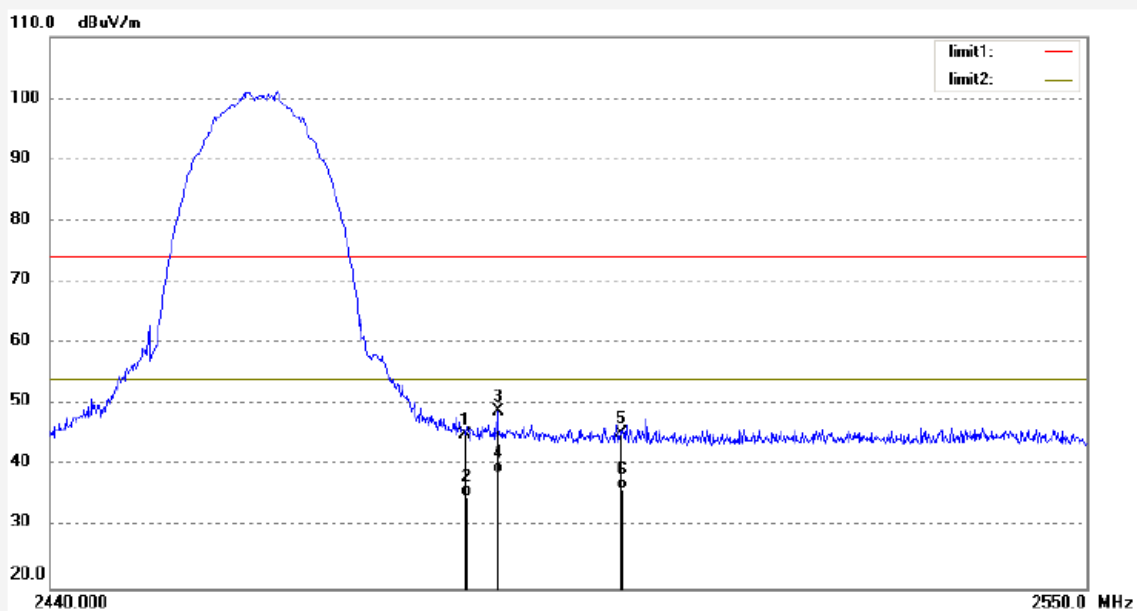
Date: 2020/09/16/

Time: 14/00/45

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	43.92	1.10	45.02	74.00	-28.98	peak	150	73	
2	2483.500	33.75	1.10	34.85	54.00	-19.15	AVG	150	73	
3	2486.970	47.73	1.10	48.83	74.00	-25.17	peak	150	148	
4	2486.970	37.64	1.10	38.74	54.00	-15.26	AVG	150	148	
5	2500.000	44.15	1.10	45.25	74.00	-28.75	peak	150	116	
6	2500.000	34.91	1.10	36.01	54.00	-17.99	AVG	150	116	

Job No.: DING #1507

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11B(2462MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

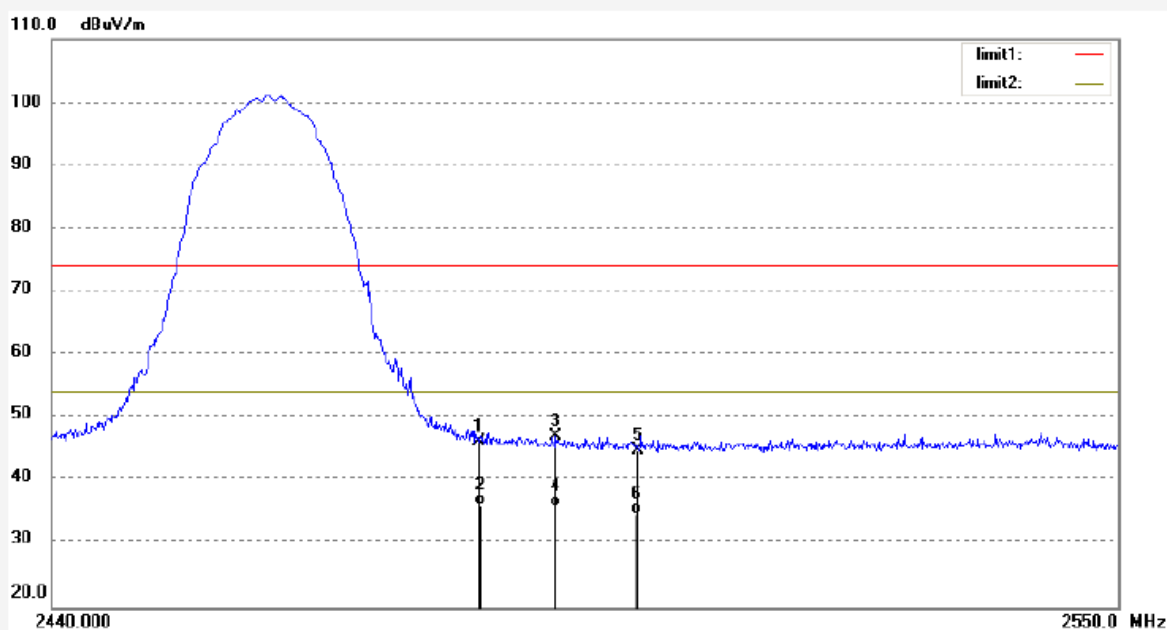
Date: 2020/09/16/

Time: 14/09/31

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	45.01	1.10	46.11	74.00	-27.89	peak	150	251	
2	2483.500	34.95	1.10	36.05	54.00	-17.95	AVG	150	251	
3	2491.480	45.92	1.10	47.02	74.00	-26.98	peak	150	34	
4	2491.480	34.85	1.10	35.95	54.00	-18.05	AVG	150	34	
5	2500.000	43.84	1.10	44.94	74.00	-29.06	peak	150	186	
6	2500.000	33.62	1.10	34.72	54.00	-19.28	AVG	150	186	

Job No.: DING #1516

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11N40(2452MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

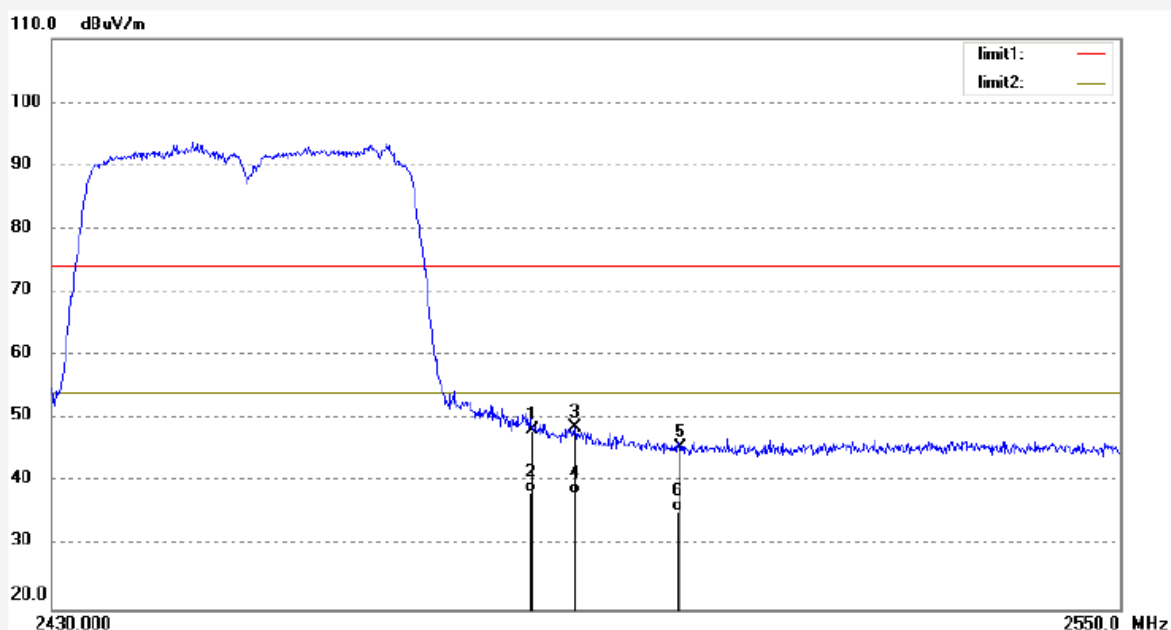
Date: 2020/09/16/

Time: 14/40/34

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	47.21	1.10	48.31	74.00	-25.69	peak	150	247	
2	2483.500	37.15	1.10	38.25	54.00	-15.75	AVG	150	247	
3	2488.080	47.60	1.10	48.70	74.00	-25.30	peak	150	125	
4	2488.080	36.97	1.10	38.07	54.00	-15.93	AVG	150	125	
5	2500.000	44.36	1.10	45.46	74.00	-28.54	peak	150	83	
6	2500.000	34.21	1.10	35.31	54.00	-18.69	AVG	150	83	

Job No.: DING #1517

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11N40(2452MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

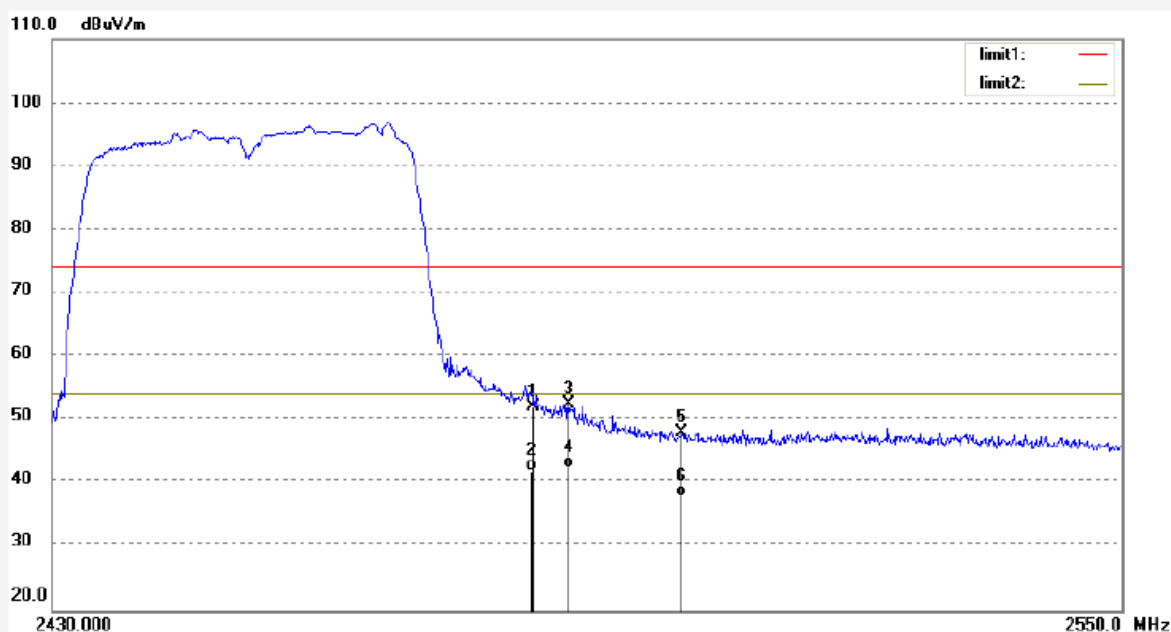
Date: 2020/09/16/

Time: 14/42/48

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	50.96	1.10	52.06	74.00	-21.94	peak	150	58	
2	2483.500	40.87	1.10	41.97	54.00	-12.03	AVG	150	58	
3	2487.240	51.37	1.10	52.47	74.00	-21.53	peak	150	176	
4	2487.240	41.39	1.10	42.49	54.00	-11.51	AVG	150	176	
5	2500.000	46.84	1.10	47.94	74.00	-26.06	peak	150	227	
6	2500.000	36.76	1.10	37.86	54.00	-16.14	AVG	150	227	

Job No.: DING #1518

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11N40(2422MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Horizontal

Power Source: BAT

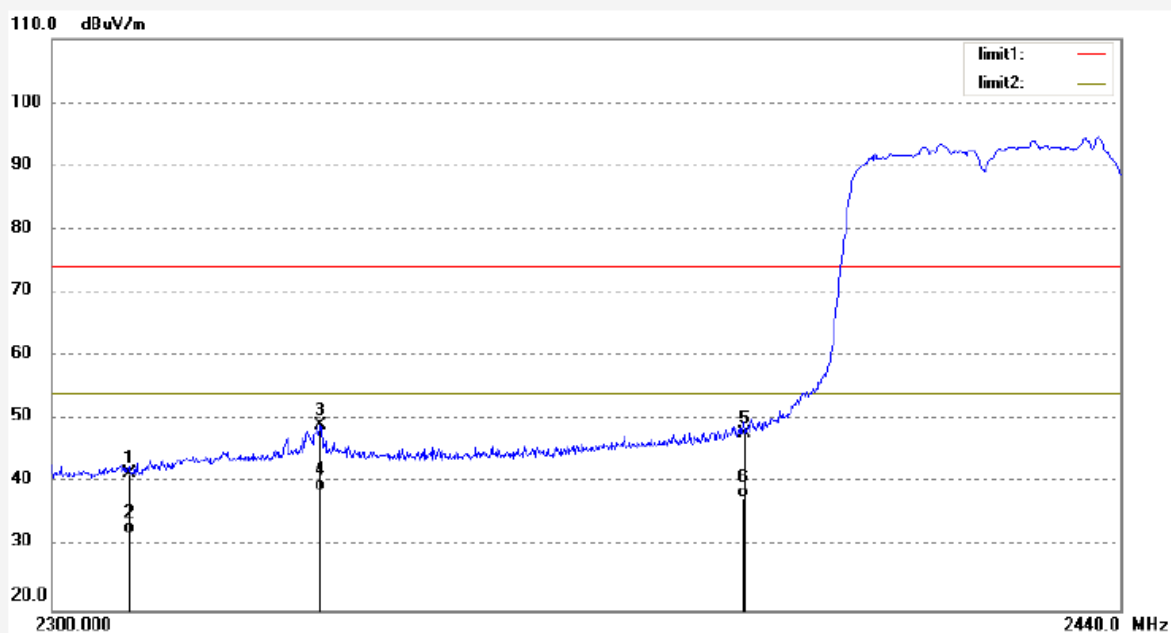
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Time: 14/46/00

Engineer Signature: Black

Distance: 3m

Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2310.000	41.12	0.47	41.59	74.00	-32.41	peak	150	351	
2	2310.000	31.54	0.47	32.01	54.00	-21.99	AVG	150	351	
3	2334.440	48.78	0.46	49.24	74.00	-24.76	peak	150	45	
4	2334.440	38.41	0.46	38.87	54.00	-15.13	AVG	150	45	
5	2390.000	47.04	0.79	47.83	74.00	-26.17	peak	150	73	
6	2390.000	36.87	0.79	37.66	54.00	-16.34	AVG	150	73	

Job No.: DING #1519

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Smart Robot Sweeper

Mode: TX 802.11N40(2422MHz)

Model: FR-9AI

Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd

Polarization: Vertical

Power Source: BAT

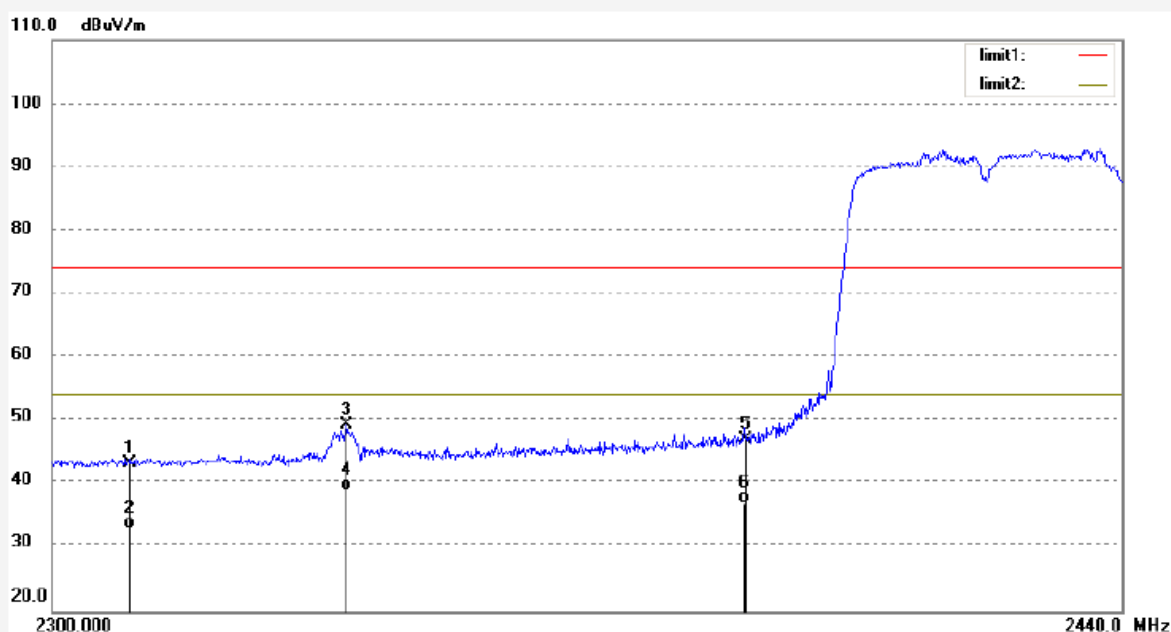
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Time: 14/49/06

Engineer Signature: Black

Distance: 3m

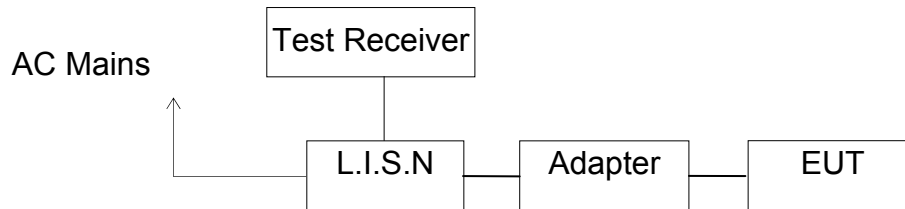
Note: Report No.:RTZ200806002-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2310.000	42.92	0.47	43.39	74.00	-30.61	peak	150	22	
2	2310.000	32.46	0.47	32.93	54.00	-21.07	AVG	150	22	
3	2337.800	48.87	0.47	49.34	74.00	-24.66	peak	300	147	
4	2337.800	38.59	0.47	39.06	54.00	-14.94	AVG	300	147	
5	2390.000	46.31	0.79	47.10	74.00	-26.90	peak	150	357	
6	2390.000	36.14	0.79	36.93	54.00	-17.07	AVG	150	357	

12. POWER LINE CONDUCTED MEASUREMENT

12.1. Block Diagram of Test Setup



(EUT: Smart Robot Sweeper)

12.2. Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0

NOTE1: The lower limit shall apply at the transition frequencies.
 NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

12.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

12.4. Operating Condition of EUT

12.4.1. Setup the EUT and simulator as shown as Section 12.1.

12.4.2. Turn on the power of all equipment.

12.4.3. Let the EUT work in test mode and measure it.

12.5.Test Procedure

The EUT is put on the plane 0.1 m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

12.6.DATA SAMPLE

Frequency (MHz)	Quasi Peak Level (dB μ v)	Average Level (dB μ v)	Transducer value (dB)	QuasiPeak Result (dB μ v)	Average Result (dB μ v)	Quasi Peak Limit (dB μ v)	Average Limit (dB μ v)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	29.4	18.3	11.1	40.5	29.4	56.0	56.0	15.5	16.6	Pass

Transducer value = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Level/Average Level + Transducer value
Limit = Limit stated in standard

Calculation Formula:

Margin = Limit – Reading level value – Transducer value

12.7.Power Line Conducted Emission Measurement Results

PASS.

The frequency range from 150kHz to 30MHz is checked.

Emissions attenuated more than 20 dB below the permissible value are not reported.

The spectral diagrams are attached as below.

ACCURATE TECHNOLOGY CO., LTD

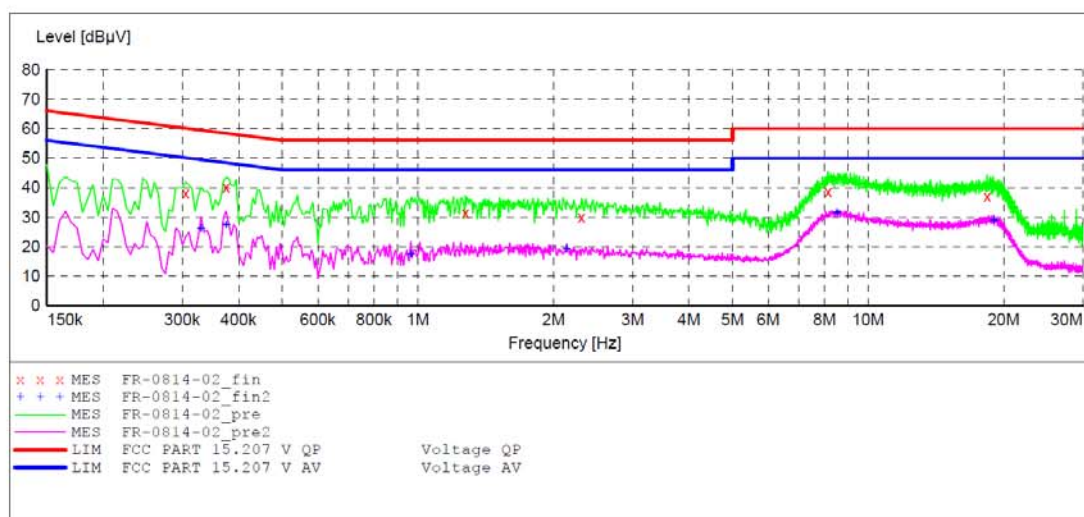
CONDUCTED EMISSION STANDARD FCC PART 15.207

EUT: Smart Robot Sweeper M/N:FR-9AI
 Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd
 Operating Condition: Charging
 Test Site: 1#Shielding Room
 Operator: Black
 Test Specification: L 120V/60Hz
 Comment: Report NO.:RTZ200806002-00
 Start of Test: 8/14/2020 / 11:37:19AM

SCAN TABLE: "V 9K-30MHz fin"

Short Description: SUB STD VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "FR-0814-02_fin"

8/14/2020 11:40AM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.305000	38.00	10.6	60	22.0	QP	L1	GND
0.375000	40.20	10.7	58	17.8	QP	L1	GND
1.275000	31.50	10.9	56	24.5	QP	L1	GND
2.310000	30.00	11.0	56	26.0	QP	L1	GND
8.140000	38.70	11.2	60	21.3	QP	L1	GND
18.370000	37.10	11.4	60	22.9	QP	L1	GND

MEASUREMENT RESULT: "FR-0814-02_fin2"

8/14/2020 11:40AM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.330000	26.20	10.6	50	23.8	AV	L1	GND
0.375000	27.50	10.7	48	20.5	AV	L1	GND
0.965000	17.30	10.8	46	28.7	AV	L1	GND
2.140000	19.10	11.0	46	26.9	AV	L1	GND
8.520000	31.40	11.3	50	18.6	AV	L1	GND
19.015000	28.90	11.4	50	21.1	AV	L1	GND

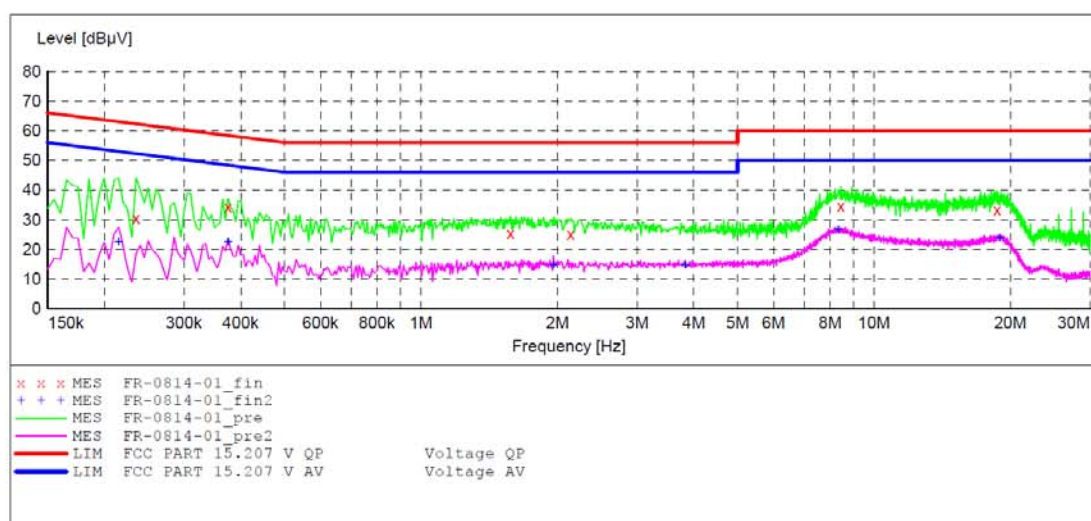
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15.207

EUT: Smart Robot Sweeper M/N:FR-9AI
 Manufacturer: Dongguan City Feng Rui Electronic Technology Co., Ltd
 Operating Condition: Charging
 Test Site: 1#Shielding Room
 Operator: Black
 Test Specification: N 120V/60Hz
 Comment: Report NO.:RTZ200806002-00
 Start of Test: 8/14/2020 / 11:32:19AM

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB_STD_VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 9.0 kHz 150.0 kHz 100.0 Hz QuasiPeak 1.0 s 200 Hz NSLK8126 2008
 Average
 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average



MEASUREMENT RESULT: "FR-0814-01_fin"

8/14/2020 11:36AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.235000	30.40	10.6	62	31.6	QP	N	GND
0.375000	34.20	10.7	58	27.8	QP	N	GND
1.575000	25.20	10.9	56	30.8	QP	N	GND
2.140000	25.10	11.0	56	30.9	QP	N	GND
8.440000	34.60	11.3	60	25.4	QP	N	GND
18.700000	33.30	11.4	60	26.7	QP	N	GND

MEASUREMENT RESULT: "FR-0814-01_fin2"

8/14/2020 11:36AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.215000	22.40	10.5	53	30.6	AV	N	GND
0.375000	22.40	10.7	48	25.6	AV	N	GND
1.960000	14.60	11.0	46	31.4	AV	N	GND
3.830000	14.60	11.1	46	31.4	AV	N	GND
8.340000	26.60	11.3	50	23.4	AV	N	GND
18.940000	23.80	11.4	50	26.2	AV	N	GND

13.ANTENNA REQUIREMENT

13.1.The Requirement

According to 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.

13.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 2.5dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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