

FCC PART 15C TEST REPORT FOR CERTIFICATION

On Behalf of

Shenzhen Proscenic Technology Co., Ltd

Robot Vacuum Cleaner

Model Number: LDS M7

FCC ID: 2ARZX-LDS-M7

Prepared for:	Shenzhen Proscenic Technology Co., Ltd
	Room 502 Jinshun Bulding A block, No 287 Ruyi Road, Ailian Community,
	Longgang District, Shenzhen, China
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
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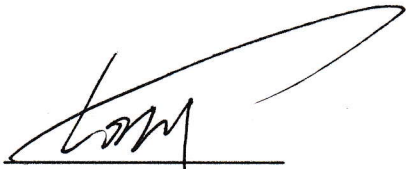
Report Number:	ESTE-R1903020
Date of Test:	Mar. 02 ~ Mar. 06, 2019
Date of Report:	Mar. 07, 2019

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EST Technology Co., Ltd.

Applicant:	Shenzhen Proscenic Technology Co., Ltd		
Address:	Room 502 Jinshun Bulding A block, No 287 Ruyi Road, Ailian Community, Longgang District, Shenzhen, China		
Manufacturer	Shenzhen 3irobotix Co., Ltd.		
Address:	Room 501, 5th floor, block A, Hans Innovation Buliding No 9018, North central Avenue, North Hitech Park, Shenzhen, China		
E.U.T:	Robot Vacuum Cleaner		
Model Number:	LDS M7		
Power Supply:	DC 20V From Adapter Input AC 100-240V ~ 50/60Hz DC 14.8V From Internal Battery		
Test Voltage:	DC 20V From Adapter Input AC 120V/60Hz DC 20V From Adapter Input AC 240V/60Hz		
Trade Name:		Serial No.:	-----
Date of Receipt:	Mar. 01, 2019	Date of Test:	Mar. 02 ~ Mar. 06, 2019
Test Specification:	FCC Rules and Regulations Part 15 Subpart C:2018 ANSI C63.10:2013		
Test Result:	The device described above is tested by EST Technology Co., Ltd.. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart C requirements. This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd.		
		Date: Mar. 07, 2019	
Prepared by:	Reviewed by:	Approved by:	
			
Ring / Assistant	Tony / Engineer	Iceman Hu / Manager	
Other Aspects:	None.		
Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested			
This test report is based on a single evaluation of one sample of above mentioned products, It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.			

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Product Name	:	Robot Vacuum Cleaner
Model Number	:	LDS M7
FCC ID	:	2ARZX-LDS-M7
Modulation	:	IEEE 802.11b mode: DSSS(CCK,QPSK, BPSK) IEEE 802.11g mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT20 mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT40 mode: OFDM (BPSK/QPSK/16QAM/64QAM)
Operation Frequency	:	IEEE 802.11b/g: 2412 ~ 2462 MHz IEEE 802.11n HT20 : 2412 ~ 2462 MHz IEEE 802.11n HT40: 2422 ~ 2452 MHz
Number of channel	:	IEEE 802.11b 2412 ~ 2462 MHz: 11 Channels IEEE 802.11g 2412 ~ 2462 MHz: 11 Channels IEEE 802.11n HT20 2412 ~ 2462 MHz: 11 Channels IEEE 802.11n HT40 2422 ~ 2452 MHz: 7 Channels
Antenna	:	PCB antenna, 1dBi Gain
Sample Type	:	Prototype production

1.2. Difference between Model Numbers

Main type LDS M7							
LDS R2	LDS D550	GT320	GT560	Cocosmart 790T	Cocosmart 970T	811GB	Pro300
LDS R5	LDS D580	GT330	GT600	Cocosmart 800T	Cocosmart 980T	911SE	Pro500
LDS R9	LDS D590	GT350	GT630	Cocosmart 820T	Cocosmart 990T	Viper 520	Pro600
LDS R11	LDS D660	GT400	GT680	Cocosmart 860T		Viper 570	Pro700
LDS M6	LDS D720	GT430	GT700	Cocosmart 880T		Viper 580	
LDS M8		GT490	GT750	Cocosmart 920T			
LDS M10		GT500	GT780	Cocosmart 930T			
LDS D500		GT520		Cocosmart 960T			

The these models have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, except the different model number.

2. SUMMARY OF TEST

2.1. Summary of test result

Description of Test Item	Standard	Results
Power Line Conducted Emission	FCC Part 15: 15.207 ANSI C63.10:2013	PASS
Radiated Emission	FCC Part 15: 15.209 ANSI C63.10:2013 KDB 558074	PASS
Band Edge Compliance	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Conducted spurious emissions	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
6dB Bandwidth	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Peak Output Power	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Power Spectral Density	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Antenna requirement	FCC Part 15: 15.203	PASS
Note: KDB 558074 D01 15.247 Meas Guidance v05		

2.2. Test Facilities

EMC Lab : Certificated by CNAS, CHINA
 Registration No.: L5288
 Date of registration: November 13, 2017

Certificated by FCC, USA
 Designation Number: CN1215
 Test Firm Registration Number: 722932
 Date of registration: November 21, 2017

Certificated by A2LA, USA
 Registration No.: 4366.01
 Date of registration: November 07, 2017

Certificated by Industry Canada
 CAB identifier No.: CN0035
 Date of registration: January 04, 2019

Certificated by VCCI, Japan
 Registration No.: R-13663; C-14103
 Date of registration: July 25, 2017
 This Certificate is valid until: July 24, 2020

Certificated by TUV Rheinland, Germany
 Registration No.: UA 50413872 0001
 Date of registration: July 31, 2018

Certificated by TUV/PS, Shenzhen
 Registration No.: SCN1017
 Date of registration: January 27, 2011

Certificated by Intertek ETL SEMKO
 Registration No.: 2011-RTL-L2-64
 Date of registration: April 28, 2011

Certificated by Nemko, Hong Kong
 Registration No.: 175193
 Date of registration: May 4, 2011

Name of Firm : EST Technology Co., Ltd.

Site Location : Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China

2.3. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	$\pm 3.48\text{dB}$
Uncertainty for spurious emissions test (30MHz-1GHz)	$\pm 4.60\text{ dB(Polarize: H)}$
	$\pm 4.68\text{ dB(Polarize: V)}$
Uncertainty for spurious emissions test (1GHz to 18GHz)	$\pm 4.96\text{dB}$
Uncertainty for radio frequency	7×10^{-8}
Uncertainty for conducted RF Power	0.20dB
Uncertainty for Power density test	0.26dB

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

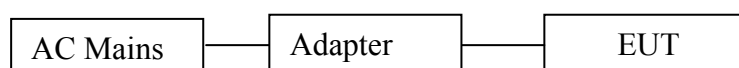
2.4. Assistant equipment used for test

2.4.1. Adapter

M/N	:	NLD120200W1A4
Input	:	AC 100-240V ~ 50/60Hz, 0.6A
Output	:	DC 20V/1.2A

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.1 meter high above ground. EUT was be set into Wi-Fi test mode by software before test.



(EUT: Robot Vacuum Cleaner)

2.6. Test mode

A special test software was used to control EUT work in Continuous TX mode, and select test channel, wireless mode and data rate.

Test mode	Lower channel	Center channel	Upper channel
IEEE 802.11b;IEEE 802.11g;IEEE 802.11n HT20 Transmitting	2412MHz	2437MHz	2462MHz
IEEE 802.11b;IEEE 802.11g;IEEE 802.11n HT20 Receiving	2412MHz	2437MHz	2462MHz
IEEE 802.11n HT40 Transmitting	2422MHz	2437MHz	2452MHz
IEEE 802.11n HT40 Receiving	2422MHz	2437MHz	2452MHz
Duty cycle>98%			

2.7. Channel List

IEEE 802.11b;IEEE 802.11g;IEEE 802.11n HT20					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	6	2437	11	2462
2	2417	7	2442		
3	2422	8	2447		
4	2427	9	2452		
5	2432	10	2457		
IEEE 802.11n HT40					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	6	2437	9	2452
4	2427	7	2442		
5	2432	8	2447		

2.8. Test Equipment

2.8.1. For conducted emission test

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	832354	CEPREI	June 15,18	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	101260	CEPREI	June 15,18	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101100	CEPREI	June 15,18	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.2. For radiated emission test(9 kHz-30MHz)

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	101780	CEPREI	June 15,18	1 Year
Active Loop Antenna	SCHWARZB ECK	FMZB 1519B	1519B-088	N/A	Aug. 01,18	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.3. For radiated emissions test (30-1000MHz)

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	101780	CEPREI	June 15,18	1 Year
Bilog Antenna	Teseq	CBL 6111D	27090	CEPREI	June 15,18	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.4. For radiated emission test(above 1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	BBHA912 0D1002	CEPREI	June 18,18	1 Year
Horn Antenna	SCHWARZB ECK	BBHA9170	BBHA917 0242	CEPREI	June 18,18	1 Year
Signal Amplifier	SCHWARZB ECK	BBV9718	9718-212	CEPREI	June 18,18	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSV	103173	CEPREI	June 15,18	1 Year
PSA Series Spectrum Analyzer	Agilent	E4447A	MY50180 031	CEPREI	June 15,18	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.5. For connect EUT antenna terminal test

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSV	103173	CEPREI	June 15,18	1 Year
Spectrum Analyzer	Agilent	E4408B	MY44211 139	CEPREI	June 15,18	1 Year

3 POWER LINE CONDUCTED EMISSION TEST

3.1. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3.2. Test Procedure

The EUT was placed on a non-metallic table, 10cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). The AC line 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 Test.

The bandwidth of test receiver (R & S ESHS30) is set at 10kHz.

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

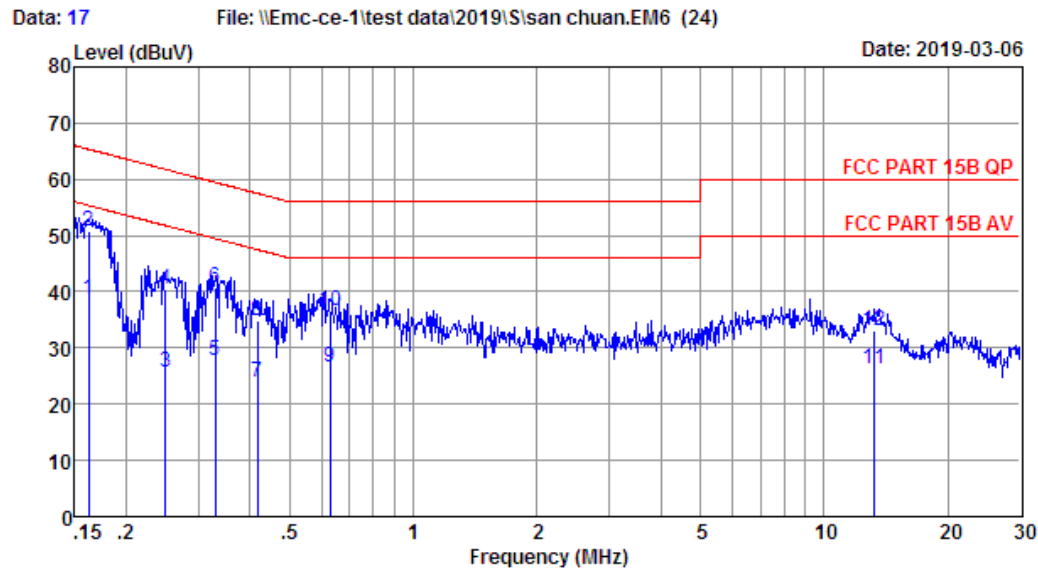
3.3. Test Result

PASS.

3.4. Test data

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Site no : 844 Shield Room Data no. : 17
 Env. / Ins. : Temp:23.3'C Humi:52% Press:101.50kPa LINE Phase : LINE
 Limit : FCC PART 15B QP
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.162	9.59	9.69	19.34	38.62	55.34	16.72	Average
2	0.162	9.59	9.69	31.51	50.79	65.34	14.55	QP
3	0.249	9.61	9.92	6.20	25.73	51.78	26.05	Average
4	0.249	9.61	9.92	21.02	40.55	61.78	21.23	QP
5	0.330	9.62	9.92	8.30	27.84	49.44	21.60	Average
6	0.330	9.62	9.92	21.32	40.86	59.44	18.58	QP
7	0.417	9.63	9.92	4.25	23.80	47.51	23.71	Average
8	0.417	9.63	9.92	15.43	34.98	57.51	22.53	QP
9	0.627	9.63	9.92	7.04	26.59	46.00	19.41	Average
10	0.627	9.63	9.92	17.08	36.63	56.00	19.37	QP
11	13.267	9.88	10.11	6.20	26.19	50.00	23.81	Average
12	13.267	9.88	10.11	12.93	32.92	60.00	27.08	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
 2. Margin= Limit - Emission Level.
 3. If the average limit is met when using a quasi-peak detector,
 the EUT shall be deemed to meet both limits and measurement
 with average detector is unnecessary.

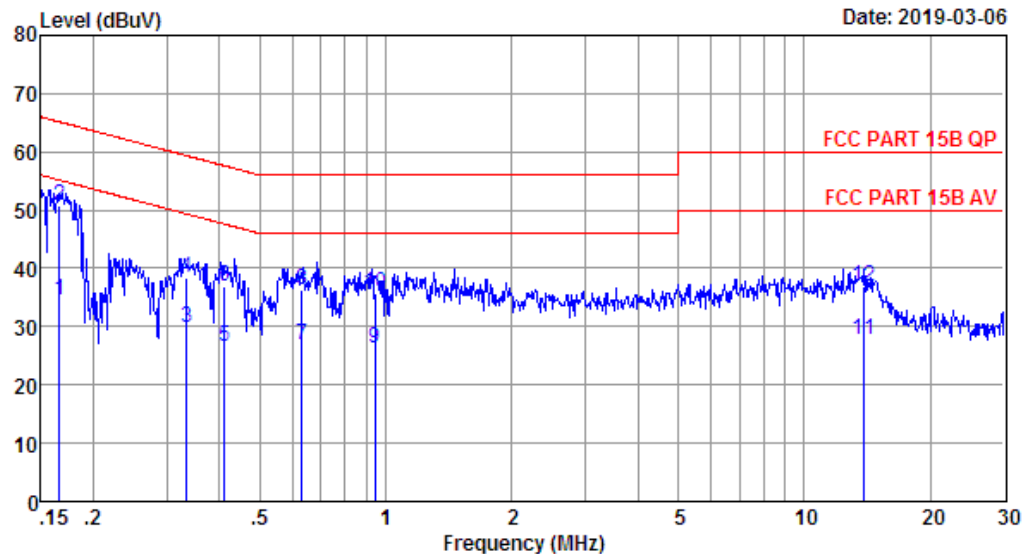
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Date: 2019-03-06



Site no : 844 Shield Room Data no. : 19
 Env. / Ins. : Temp:23.3'C Humi:52% Press:101.50kPa LINE Phase : NEUTRAL
 Limit : FCC PART 15B QP
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.166	9.50	9.69	15.31	34.50	55.16	20.66	Average
2	0.166	9.50	9.69	31.54	50.73	65.16	14.43	QP
3	0.334	9.55	9.92	10.28	29.75	49.35	19.60	Average
4	0.334	9.55	9.92	18.97	38.44	59.35	20.91	QP
5	0.413	9.56	9.92	7.21	26.69	47.59	20.90	Average
6	0.413	9.56	9.92	17.36	36.84	57.59	20.75	QP
7	0.630	9.56	9.92	7.40	26.88	46.00	19.12	Average
8	0.630	9.56	9.92	16.89	36.37	56.00	19.63	QP
9	0.943	9.56	9.94	6.83	26.33	46.00	19.67	Average
10	0.943	9.56	9.94	16.29	35.79	56.00	20.21	QP
11	13.841	9.80	10.11	7.70	27.61	50.00	22.39	Average
12	13.841	9.80	10.11	17.04	36.95	60.00	23.05	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
 2. Margin= Limit - Emission Level.
 3. If the average limit is met when using a quasi-peak detector,
 the EUT shall be deemed to meet both limits and measurement
 with average detector is unnecessary.

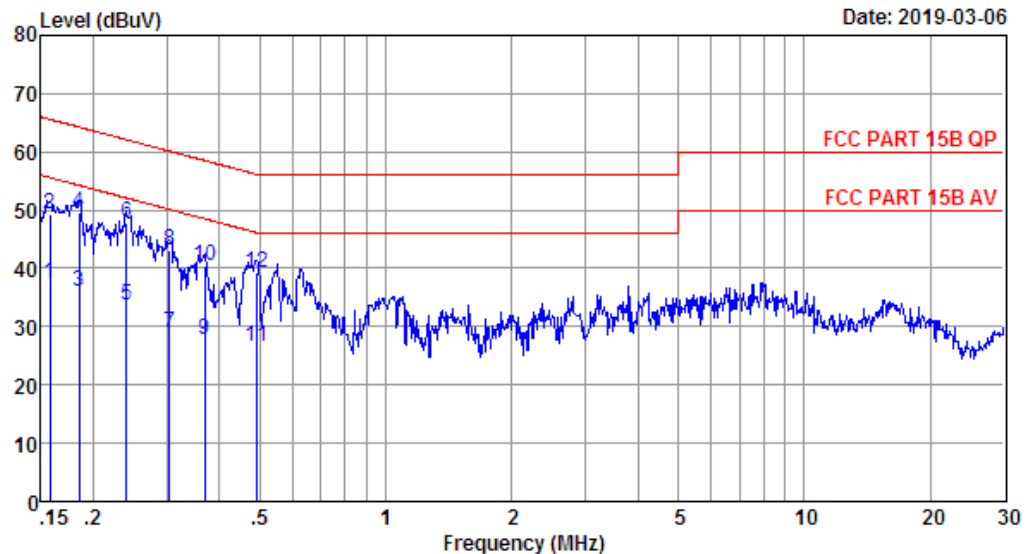
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Data: 21

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Date: 2019-03-06



Site no : 844 Shield Room Data no. : 21
 Env. / Ins. : Temp:23.3'C Humi:52% Press:101.50kPa LINE Phase : LINE
 Limit : FCC PART 15B QP
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 240V/60Hz
 M/N : LDS M7
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.157	9.59	9.69	18.34	37.62	55.60	17.98	Average
2	0.157	9.59	9.69	30.07	49.35	65.60	16.25	QP
3	0.185	9.60	9.77	16.56	35.93	54.24	18.31	Average
4	0.185	9.60	9.77	30.26	49.63	64.24	14.61	QP
5	0.240	9.61	9.92	14.01	33.54	52.08	18.54	Average
6	0.240	9.61	9.92	28.28	47.81	62.08	14.27	QP
7	0.303	9.62	9.92	9.40	28.94	50.15	21.21	Average
8	0.303	9.62	9.92	23.47	43.01	60.15	17.14	QP
9	0.369	9.63	9.92	8.19	27.74	48.52	20.78	Average
10	0.369	9.63	9.92	21.01	40.56	58.52	17.96	QP
11	0.491	9.63	9.92	7.16	26.71	46.14	19.43	Average
12	0.491	9.63	9.92	19.83	39.38	56.14	16.76	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
 2. Margin= Limit - Emission Level.
 3. If the average limit is met when using a quasi-peak detector,
 the EUT shall be deemed to meet both limits and measurement
 with average detector is unnecessary.

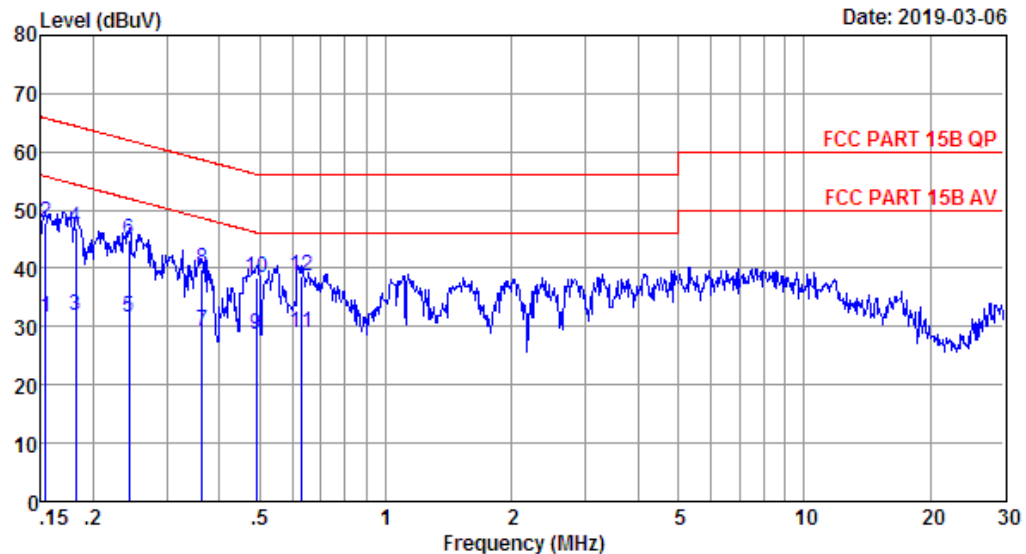
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Data: 23

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Date: 2019-03-06



Site no : 844 Shield Room Data no. : 23
 Env. / Ins. : Temp:23.3'C Humi:52% Press:101.50kPa LINE Phase : NEUTRAL
 Limit : FCC PART 15B QP
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 240V/60Hz
 M/N : LDS M7
 Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.154	9.50	9.69	12.31	31.50	55.78	24.28	Average
2	0.154	9.50	9.69	28.78	47.97	65.78	17.81	QP
3	0.182	9.53	9.77	12.52	31.82	54.42	22.60	Average
4	0.182	9.53	9.77	27.69	46.99	64.42	17.43	QP
5	0.243	9.53	9.92	11.99	31.44	52.00	20.56	Average
6	0.243	9.53	9.92	25.48	44.93	62.00	17.07	QP
7	0.363	9.55	9.92	9.68	29.15	48.65	19.50	Average
8	0.363	9.55	9.92	20.29	39.76	58.65	18.89	QP
9	0.491	9.55	9.92	9.17	28.64	46.14	17.50	Average
10	0.491	9.55	9.92	18.91	38.38	56.14	17.76	QP
11	0.627	9.56	9.92	9.51	28.99	46.00	17.01	Average
12	0.627	9.56	9.92	19.05	38.53	56.00	17.47	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
 2. Margin= Limit - Emission Level.
 3. If the average limit is met when using a quasi-peak detector,
 the EUT shall be deemed to meet both limits and measurement
 with average detector is unnecessary.

4 RADIATED EMISSION TEST

4.1 Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

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)

15.209 Limit

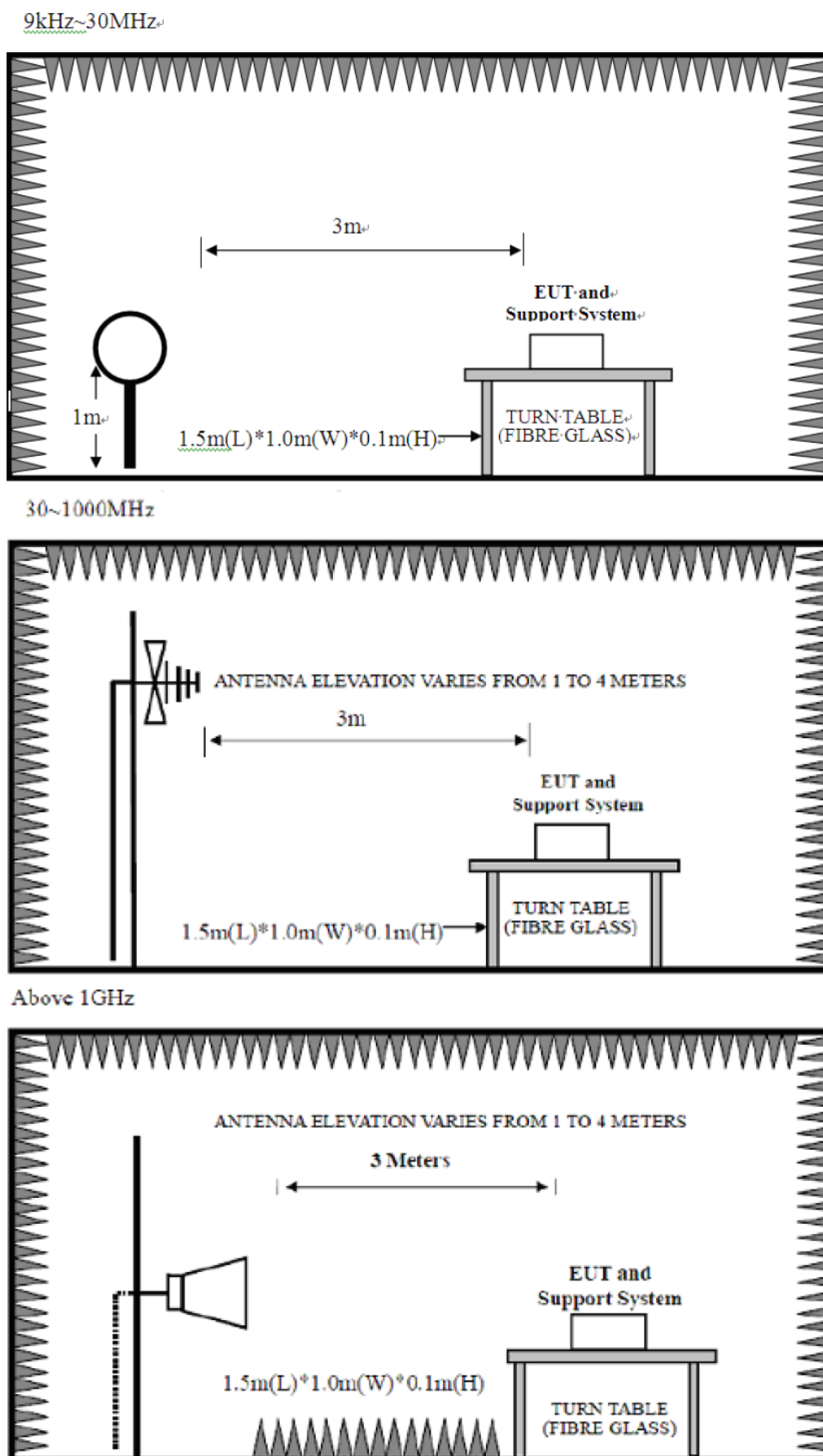
Frequency (MHz)	Field Strength(μ V/m)	Distance(m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark : (1) Emission level $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

4.2. Block Diagram of Test setup



4.3. Test Procedure

EUT was placed on a turn table, which is 0.1 meter high above ground for 9kHz~1000MHz test, and which is 0.1 meter high above ground for above 1GHz test. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

The bandwidth of the EMI test receiver (R&S ESVS10) is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 1MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz

PEAK detector, 1MHz/1MHz for PAEK measurement,

PEAK detector, 1MHz/10Hz for Average measurement

The frequency range from 30MHz to 10th harmonic (25GHz) are checked.

4.4. Test Result

PASS.

- Note: 1、 For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
- 2、 The frequency 2412MHz 、 2422MHz、 2437 MHz、 2452MHz and 2462 MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.
- 3、 IEEE 802.11b/g/n HT20/n HT40 all modes have been tested , only worse case is reported.

4.5. Test Data

9 kHz – 30 MHz

Pass

Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

30-1000 MHz

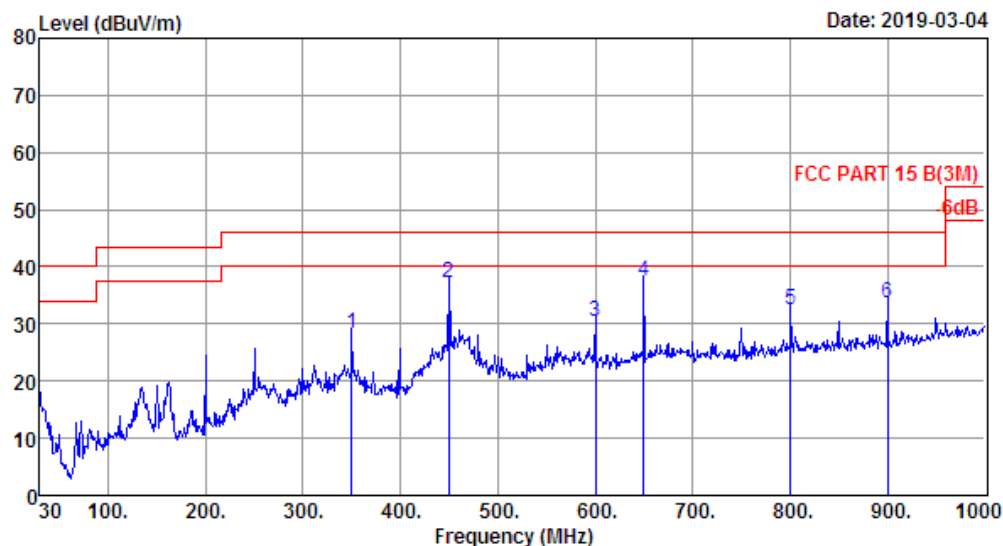
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Data: 3

File: \\Emc-966-1\test data\2019\RF\Sisan chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 3
 Dis. / Ant. : 3m 37062 Ant. pol. : VERTICAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:23.4'; Humi:50%; Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : TX Mode

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	350.10	15.00	2.30	11.07	28.37	46.00	17.63	QP
2	450.01	17.10	2.73	17.36	37.19	46.00	8.81	QP
3	600.36	20.20	3.19	7.15	30.54	46.00	15.46	QP
4	649.83	20.90	3.40	13.08	37.38	46.00	8.62	QP
5	800.18	22.80	3.79	5.76	32.35	46.00	13.65	QP
6	900.09	23.90	4.05	5.80	33.75	46.00	12.25	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

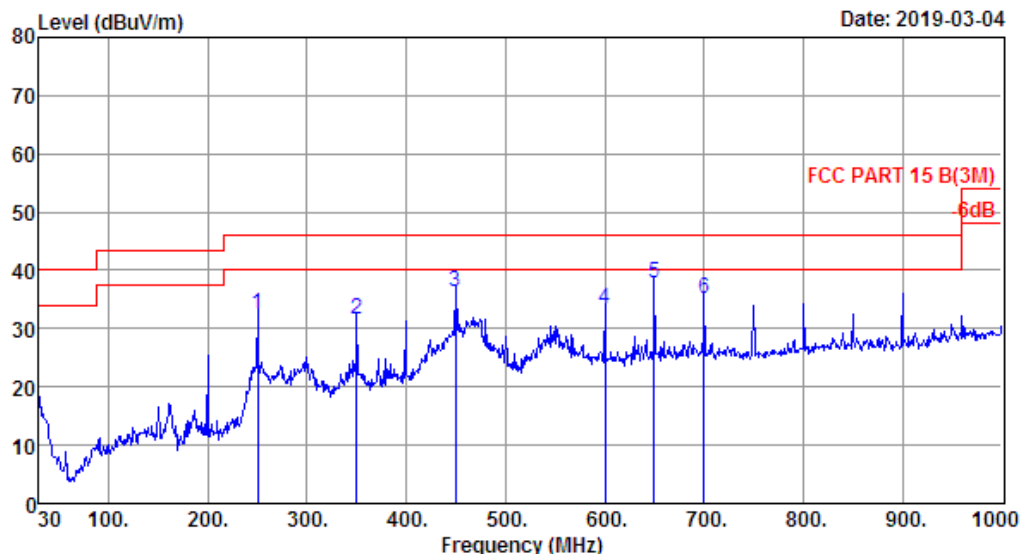
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Data: 4

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 4
 Dis. / Ant. : 3m 37062 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : TX Mode

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBUV)	Emission Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Remark
1	250.19	12.30	1.83	18.20	32.33	46.00	13.67	QP
2	350.10	15.00	2.30	14.32	31.62	46.00	14.38	QP
3	450.01	17.10	2.73	16.41	36.24	46.00	9.76	QP
4	600.36	20.20	3.19	9.93	33.32	46.00	12.68	QP
5	649.83	20.90	3.40	13.51	37.81	46.00	8.19	QP
6	700.27	21.20	3.47	10.40	35.07	46.00	10.93	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

1000-18000 MHz

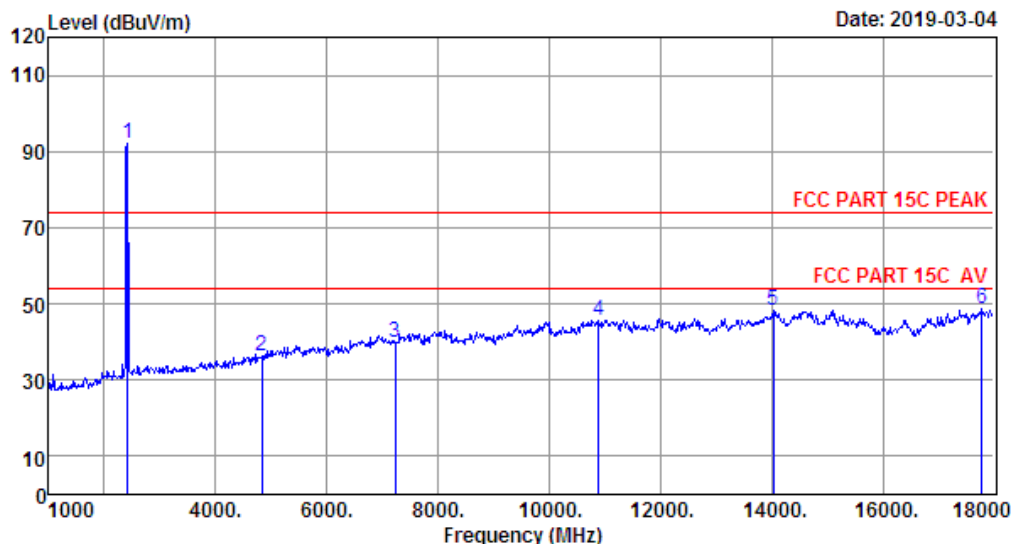
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Data: 31

File: \\Emc-966-1\test data\2019\RF\S\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 31
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH1 2412TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2412.00	27.39	3.23	34.94	96.42	92.10	74.00	-18.10	Peak
2	4824.00	32.09	4.69	35.08	34.53	36.23	74.00	37.77	Peak
3	7236.00	36.63	6.03	33.42	30.65	39.89	74.00	34.11	Peak
4	10894.00	39.78	8.65	33.60	30.92	45.75	74.00	28.25	Peak
5	14039.00	41.67	10.13	32.93	29.45	48.32	74.00	25.68	Peak
6	17779.00	44.12	12.16	31.15	23.43	48.56	74.00	25.44	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

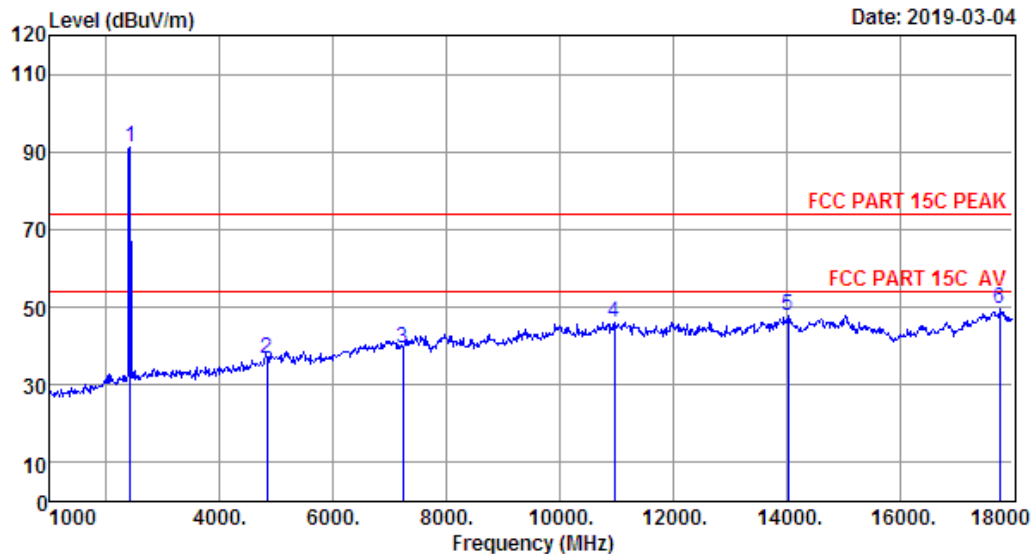
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Data: 32

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 32
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH1 2412TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2412.00	27.39	3.23	34.94	95.48	91.16	74.00	-17.16	Peak
2	4824.00	32.09	4.69	35.08	35.21	36.91	74.00	37.09	Peak
3	7236.00	36.63	6.03	33.42	30.32	39.56	74.00	34.44	Peak
4	10962.00	39.86	8.60	33.50	31.22	46.18	74.00	27.82	Peak
5	14039.00	41.67	10.13	32.93	28.74	47.61	74.00	26.39	Peak
6	17762.00	44.07	12.12	31.16	24.63	49.66	74.00	24.34	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

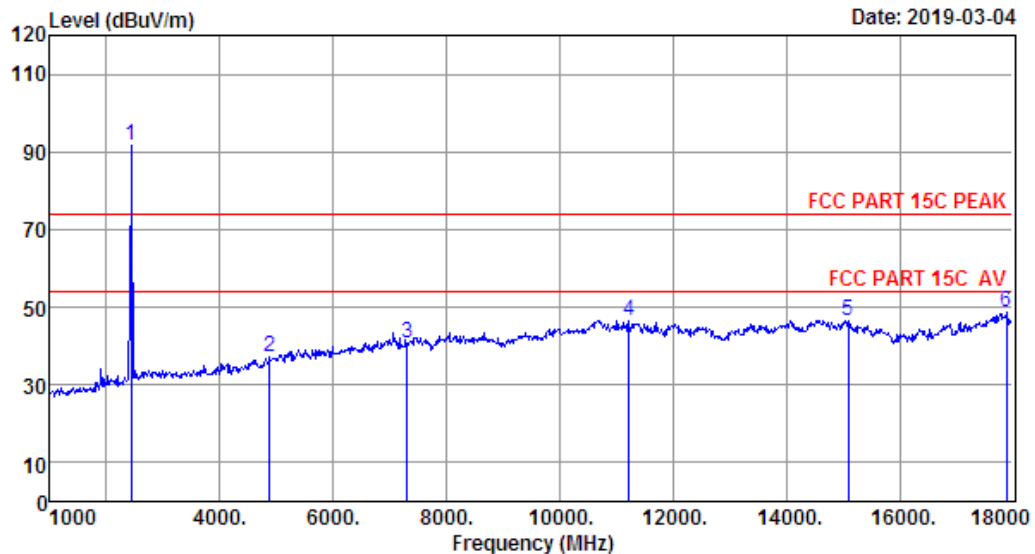
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Data: 33

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 33
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH6 2437TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2437.00	27.48	3.26	35.07	96.03	91.70	74.00	-17.70	Peak
2	4874.00	32.18	4.73	35.14	35.25	37.02	74.00	36.98	Peak
3	7311.00	36.78	6.09	33.31	31.01	40.57	74.00	33.43	Peak
4	11217.00	39.99	8.41	33.07	31.18	46.51	74.00	27.49	Peak
5	15093.00	40.16	10.85	33.23	28.85	46.63	74.00	27.37	Peak
6	17881.00	44.39	12.38	31.33	23.10	48.54	74.00	25.46	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

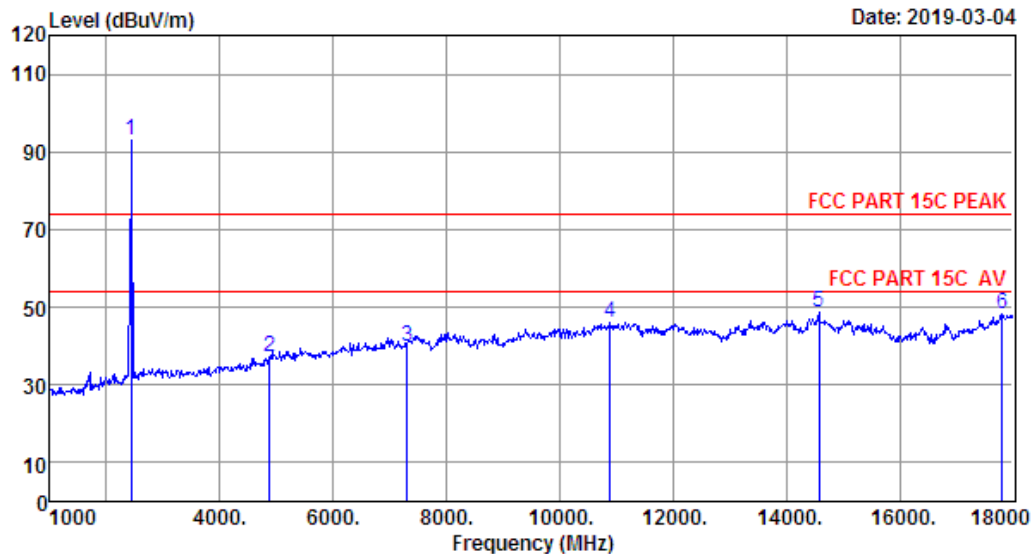
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Data: 34

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 34
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH6 2437TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2437.00	27.48	3.26	35.07	97.28	92.95	74.00	-18.95	Peak
2	4874.00	32.18	4.73	35.14	35.53	37.30	74.00	36.70	Peak
3	7311.00	36.78	6.09	33.31	30.08	39.64	74.00	34.36	Peak
4	10894.00	39.78	8.65	33.60	31.43	46.26	74.00	27.74	Peak
5	14583.00	41.05	10.28	33.58	30.80	48.55	74.00	25.45	Peak
6	17813.00	44.21	12.23	31.17	22.89	48.16	74.00	25.84	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

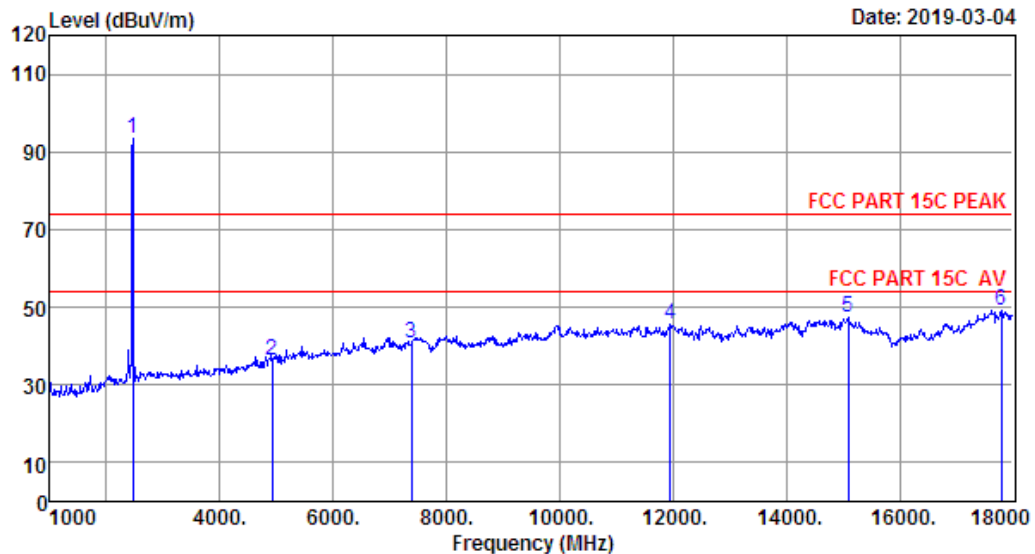
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Data: 35

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 35
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4'; Humi:50%; Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH11 2462TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2462.00	27.52	3.27	35.14	97.99	93.64	74.00	-19.64	Peak
2	4924.00	32.28	4.77	35.20	34.29	36.14	74.00	37.86	Peak
3	7386.00	36.97	6.12	33.17	30.75	40.67	74.00	33.33	Peak
4	11948.00	39.47	8.21	32.50	30.22	45.40	74.00	28.60	Peak
5	15093.00	40.16	10.85	33.23	29.62	47.40	74.00	26.60	Peak
6	17796.00	44.16	12.19	31.13	24.15	49.37	74.00	24.63	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

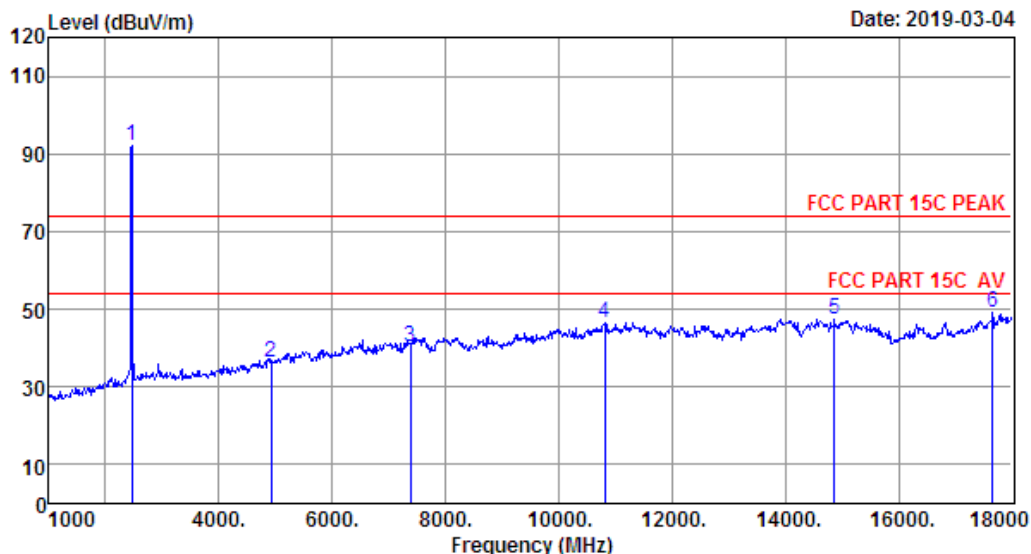
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Data: 36

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 36
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4'; Humi:50%; Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH11 2462TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2462.00	27.52	3.27	35.14	96.62	92.27	74.00	-18.27	Peak
2	4924.00	32.28	4.77	35.20	34.60	36.45	74.00	37.55	Peak
3	7386.00	36.97	6.12	33.17	30.48	40.40	74.00	33.60	Peak
4	10809.00	39.67	8.75	33.70	31.96	46.68	74.00	27.32	Peak
5	14872.00	40.54	10.60	33.55	29.99	47.58	74.00	26.42	Peak
6	17660.00	43.80	11.90	31.25	24.49	48.94	74.00	25.06	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

18000MHz – 25000MHz

Pass

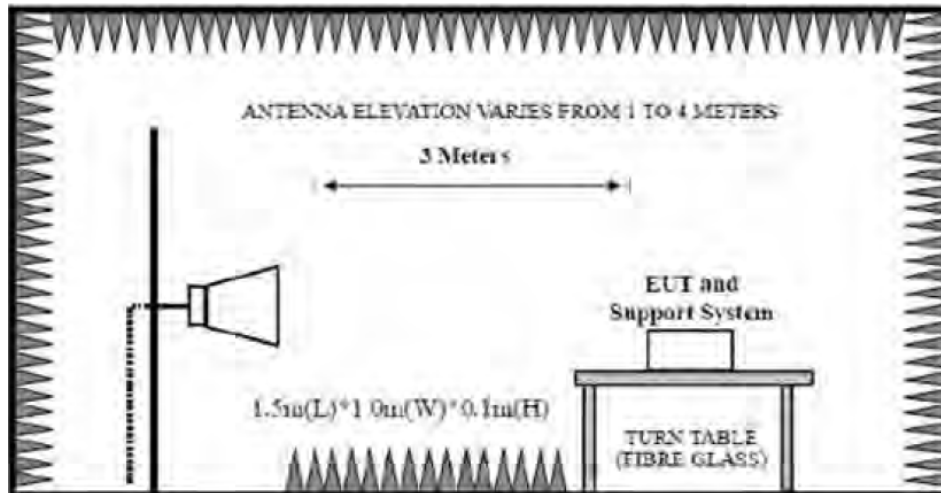
Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

5 BAND EDGE COMPLIANCE TEST

5.1 Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits

5.2 Block Diagram of Test setup



5.3 Test Procedure

EUT was placed on a turn table, which is 0.1 m high above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of emissions

Peak : RBW = 1MHz, VBW = 1MHz, Detector=PEAK detector, Sweep time = auto.

AV : RBW = 1MHz, VBW = 10Hz, Detector=PEAK detector, Sweep time = auto.

5.4 Test Result

Pass (The testing data was attached in the next pages.)

Note: 1、 For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

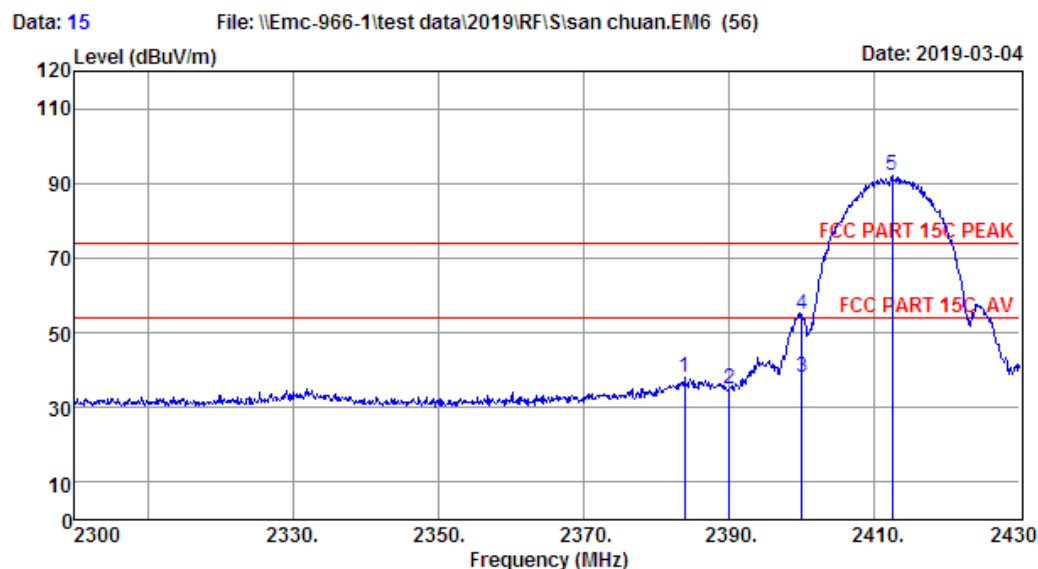
2、 The frequency 2412 MHz 、 2422MHz、 2452MHz and 2462 MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

3、 IEEE 802.11b/g/n HT20/n HT40 all modes have been tested , only worse case is reported.

5.5 Test Data

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Site no. : 1# 966 Chamber Data no. : 15
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH1 2412TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2383.85	27.31	3.20	34.87	42.33	37.97	74.00	36.03	Peak
2	2390.00	27.35	3.21	34.87	39.12	34.81	74.00	39.19	Peak
3	2400.00	27.35	3.21	34.94	42.52	38.14	54.00	15.86	Average
4	2400.00	27.35	3.21	34.94	59.36	54.98	74.00	19.02	Peak
5	2412.45	27.39	3.23	34.94	96.35	92.03	74.00	-18.03	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

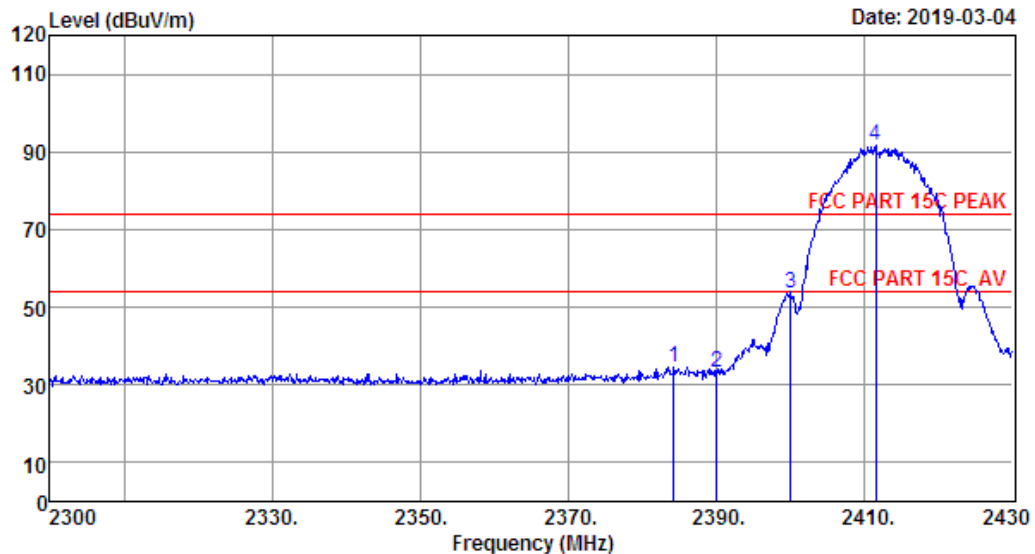
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Data: 16

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 16
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4'; Humi:50%; Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH1 2412TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2384.24	27.31	3.20	34.87	38.99	34.63	74.00	39.37	Peak
2	2390.00	27.35	3.21	34.87	37.58	33.27	74.00	40.73	Peak
3	2400.00	27.35	3.21	34.94	57.89	53.51	74.00	20.49	Peak
4	2411.54	27.39	3.23	34.94	95.98	91.66	74.00	-17.66	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

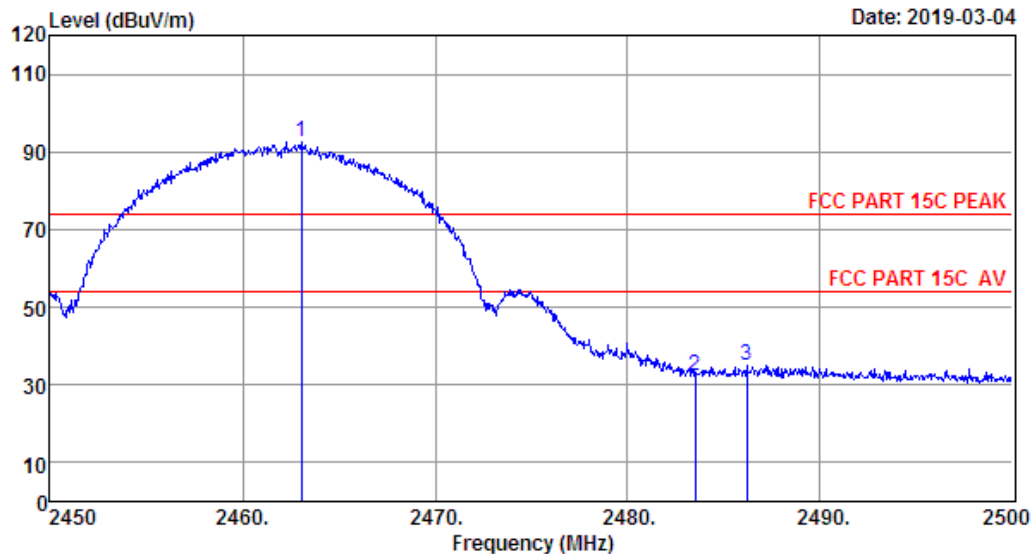
EST Technology

Chilingxiang, Qishantou, Santun,
Houjie, Dongguan, Guangdong, China
Tel: +86-769-83081888
Fax: +86-769-83081878

Data: 17

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 17
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH11 2462TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2463.05	27.52	3.27	35.14	96.74	92.39	74.00	-18.39	Peak
2	2483.50	27.56	3.29	35.21	36.57	32.21	74.00	41.79	Peak
3	2486.20	27.56	3.29	35.21	39.49	35.13	74.00	38.87	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

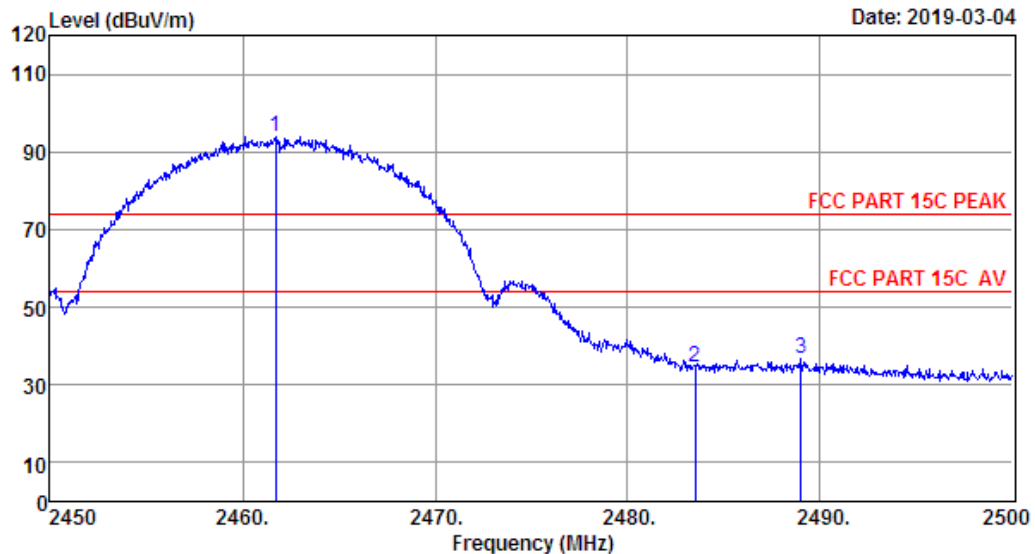
EST Technology

Chilingxiang, Qishantou, Santun,
Houjie, Dongguan, Guangdong, China
Tel: +86-769-83081888
Fax: +86-769-83081878

Data: 18

File: \\Emc-966-1\\test data\\2019\\RF\\S\\san chuan.EM6 (56)

Date: 2019-03-04



Site no. : 1# 966 Chamber Data no. : 18
 Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.4';Humi:50%;Press:101.52kPa
 Engineer : Viking
 EUT : Robot Vacuum Cleaner
 Power : DC 20V From Adapter Input AC 120V/60Hz
 M/N : LDS M7
 Test Mode : IEEE 802.11b CH11 2462TX

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2461.70	27.52	3.27	35.14	98.33	93.98	74.00	-19.98	Peak
2	2483.50	27.56	3.29	35.21	38.75	34.39	74.00	39.61	Peak
3	2489.00	27.60	3.30	35.21	41.16	36.85	74.00	37.15	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. Margin= Limit - Emission Level.
 3. The emission levels that are 20dB below the official limit are not reported.

6 Conducted Spurious Emissions and Band Edges Test

6.1 Limit

According to §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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

6.2 Test Procedure

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

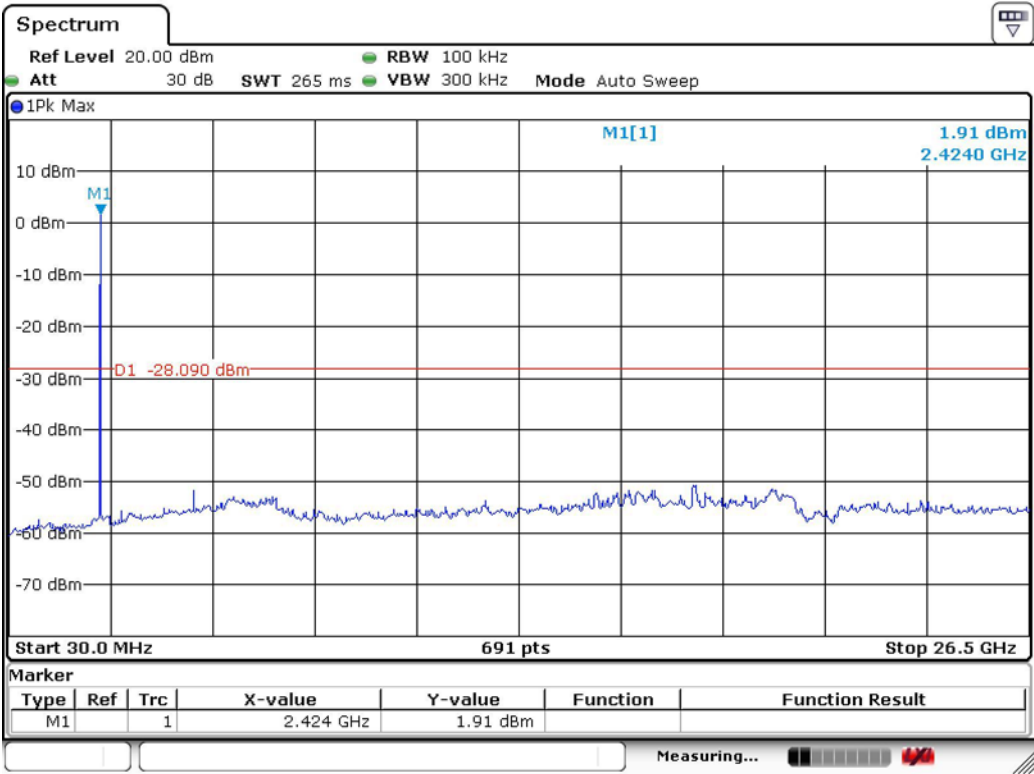
The spectrum from 9 KHz to 26.5GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

6.3 Test Result

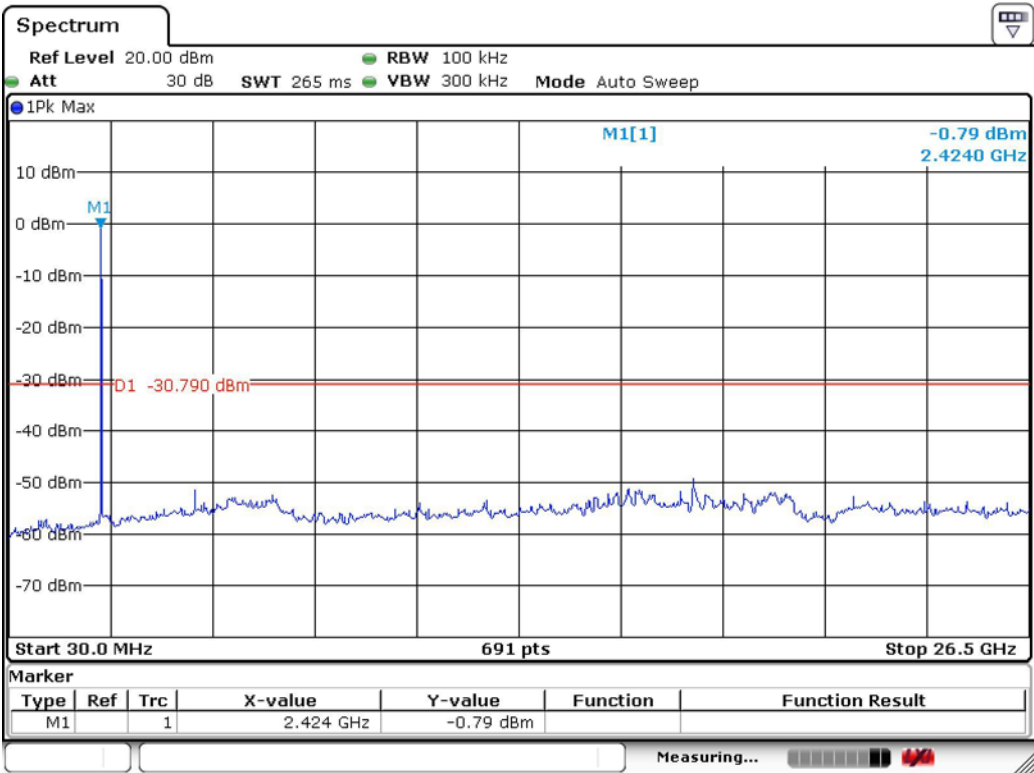
Pass (The testing data was attached in the next pages.)

Note: 1、 IEEE 802.11b/g/n HT20/n HT40 all modes have been tested , only worse case is reported.

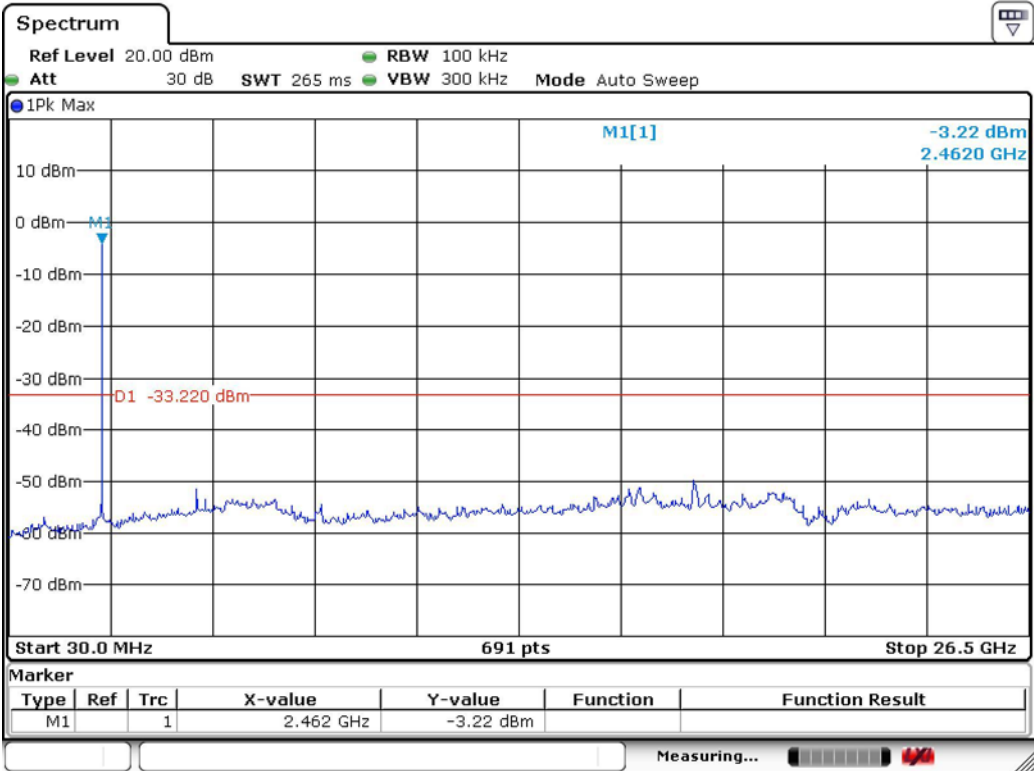
Test Data
Conducted Spurious Emissions
Test Mode: IEEE 802.11b 2412MHz



Test Mode: IEEE 802.11b 2437MHz

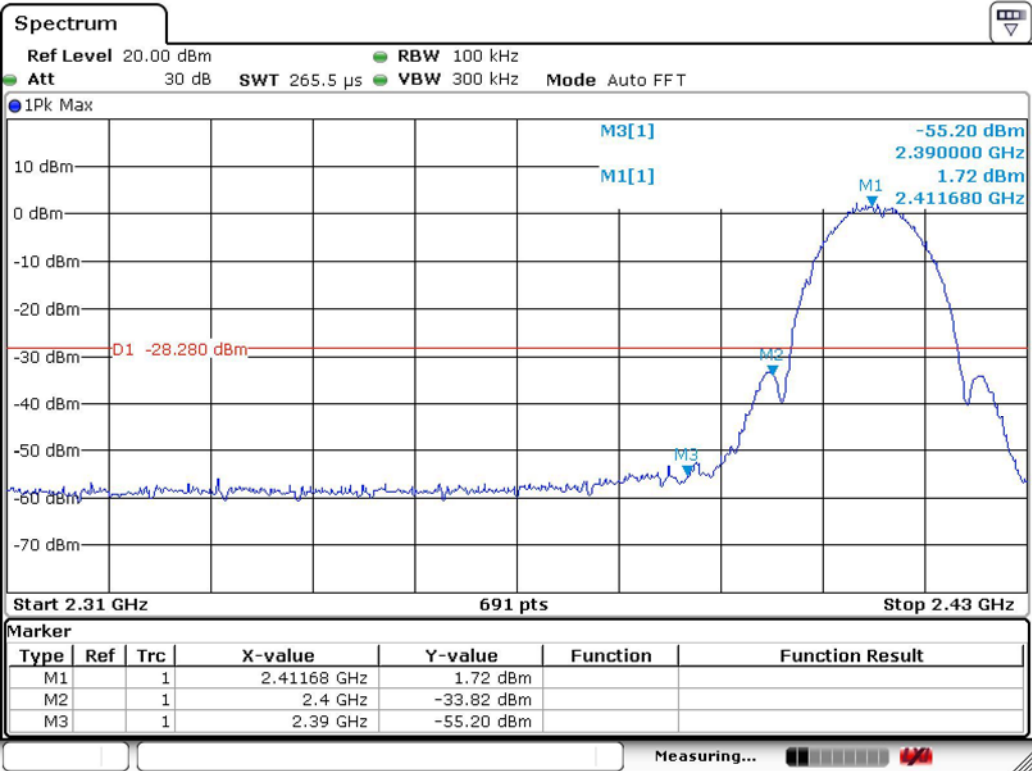


Test Mode: IEEE 802.11b 2462MHz

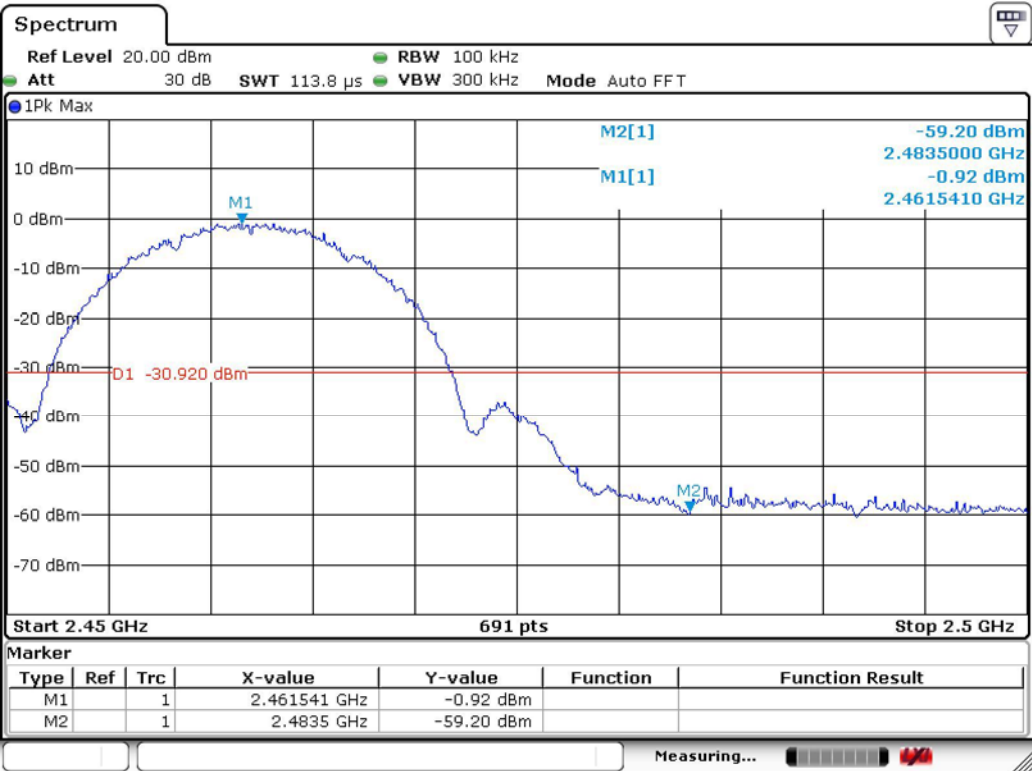


Band-edge measurements for conducted emissions

Test Mode: IEEE 802.11b 2412MHz



Test Mode: IEEE 802.11b 2462MHz



7 6dB & 20dB Bandwidth Test

7.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

7.2 Test Procedure for 6dB

- 1, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.
- 2, Follow the test procedure as described in KDB 558074
 - (1). Set resolution bandwidth (RBW) = 100 kHz.
 - (2). Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
 - (3). Detector = Peak.
 - (4). Trace mode = max hold.
 - (5). Sweep = auto couple.
 - (6). Allow the trace to stabilize.
 - (7). Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.3 Test Procedure for 20dB

- 1, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.
- 2, Follow the test procedure as described in C63.10
 - (1). The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
 - (2). The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.
 - (3). Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (OBW/RBW)]$ below the reference level. Specific guidance is given in 4.1.5.2.
 - (4). Steps a) through c) might require iteration to adjust within the specified tolerances.
 - (5). The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
 - (6). Set detection mode to peak and trace mode to max hold.
 - (7). Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
 - (8). Determine the “-xx dB down amplitude” using $[(\text{reference value}) - \text{xx}]$. Alternatively, this calculation may be made by using the marker-delta function of the instrument.
 - (9). If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).
 - (10). Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “_xx dB down

amplitude” determined in step h). If a marker is below this “-xx dB down amplitude” value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “_xx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

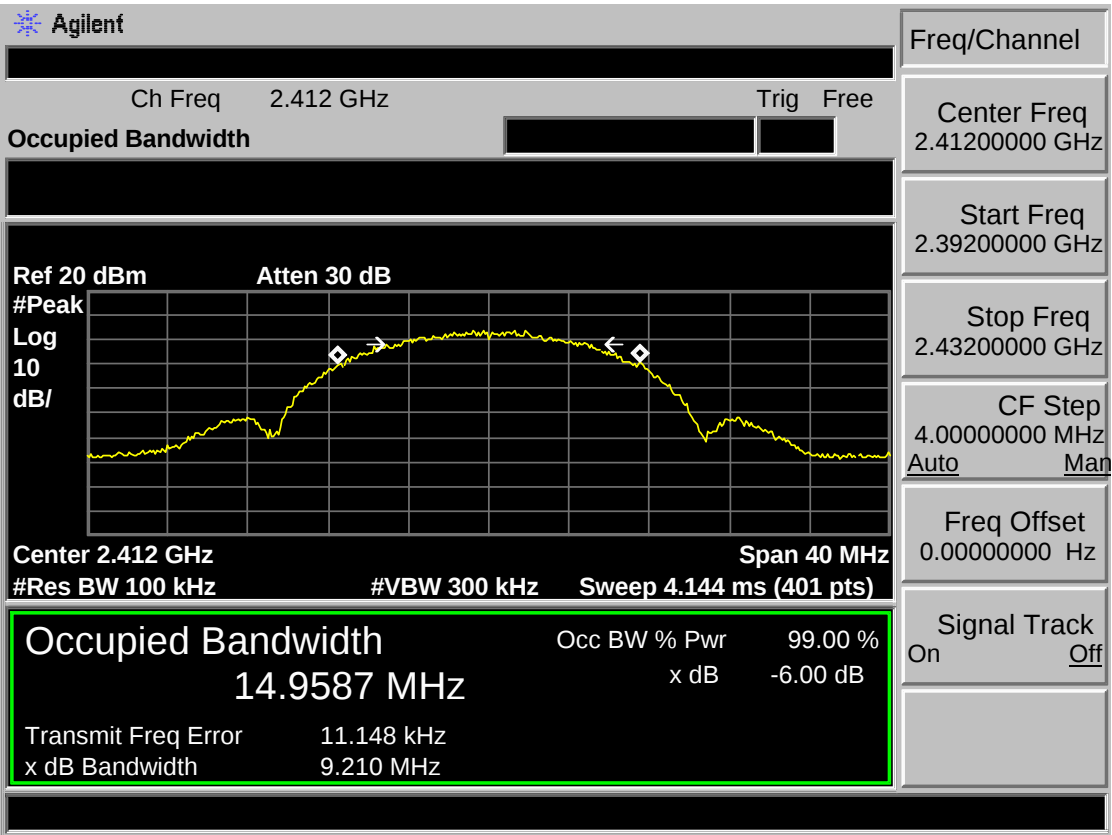
(11). The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

7.4 Test Result

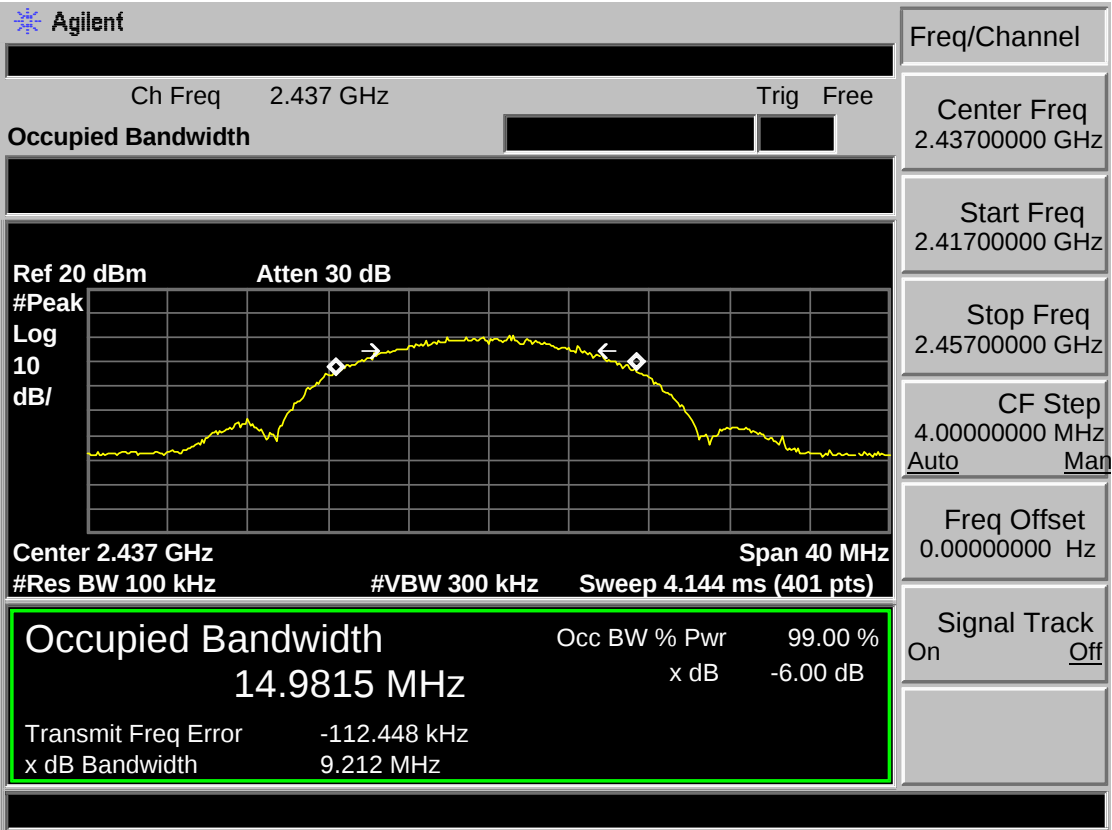
EUT: Robot Vacuum Cleaner					
M/N: LDS M7					
Test date: 2019.03.06		Test site: RF Site		Tested by: Viking	
Test Mode	CH	6dB bandwidth (MHz)	20dB bandwidth (MHz)	Limit	
				6dB BW (KHz)	20dB BW
IEEE 802.11 b	CH1	9.210	17.259	>500	/
	CH6	9.212	17.333	>500	/
	CH11	9.760	17.485	>500	/
IEEE 802.11 g	CH1	16.533	18.605	>500	/
	CH6	16.525	18.542	>500	/
	CH11	16.536	18.513	>500	/
IEEE 802.11 n HT 20	CH1	17.730	20.508	>500	/
	CH6	17.718	20.704	>500	/
	CH11	17.665	20.748	>500	/
IEEE 802.11 n HT 40	CH3	36.050	39.919	>500	/
	CH6	35.871	39.937	>500	/
	CH9	35.873	39.906	>500	/
Conclusion : PASS					

7.5 6dB Test Data

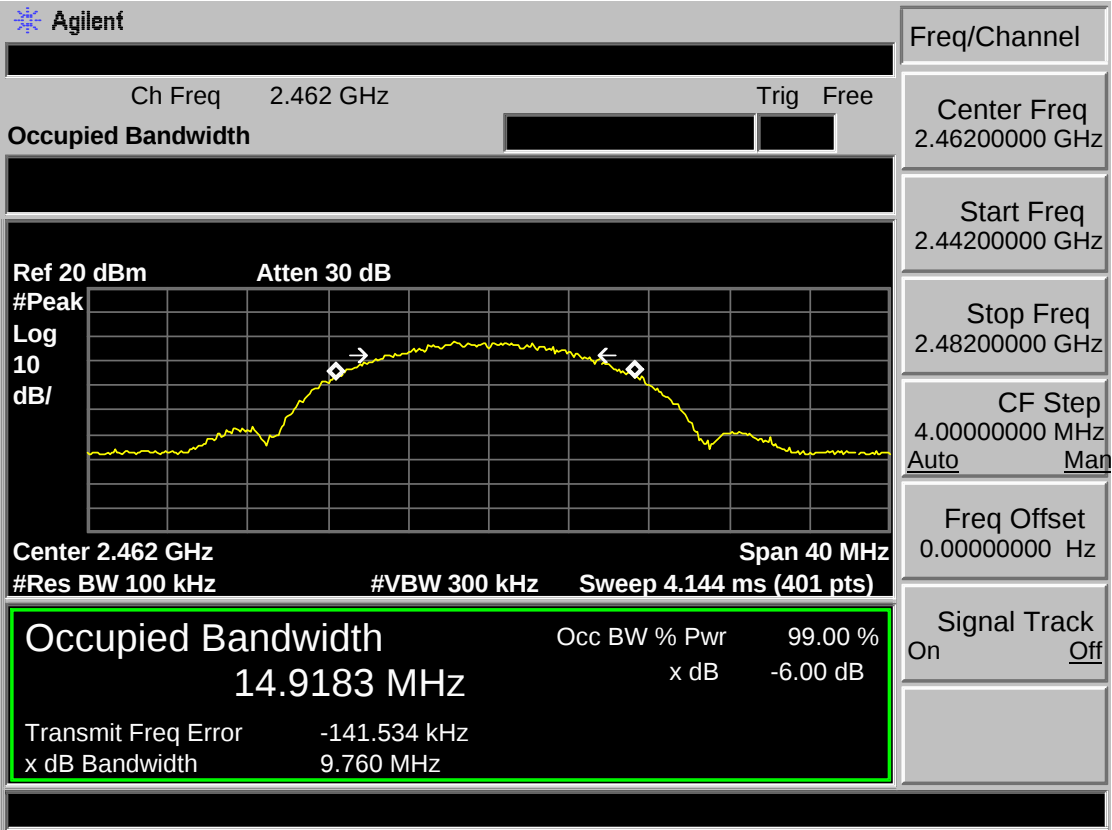
Test Mode: IEEE 802.11b 2412MHz



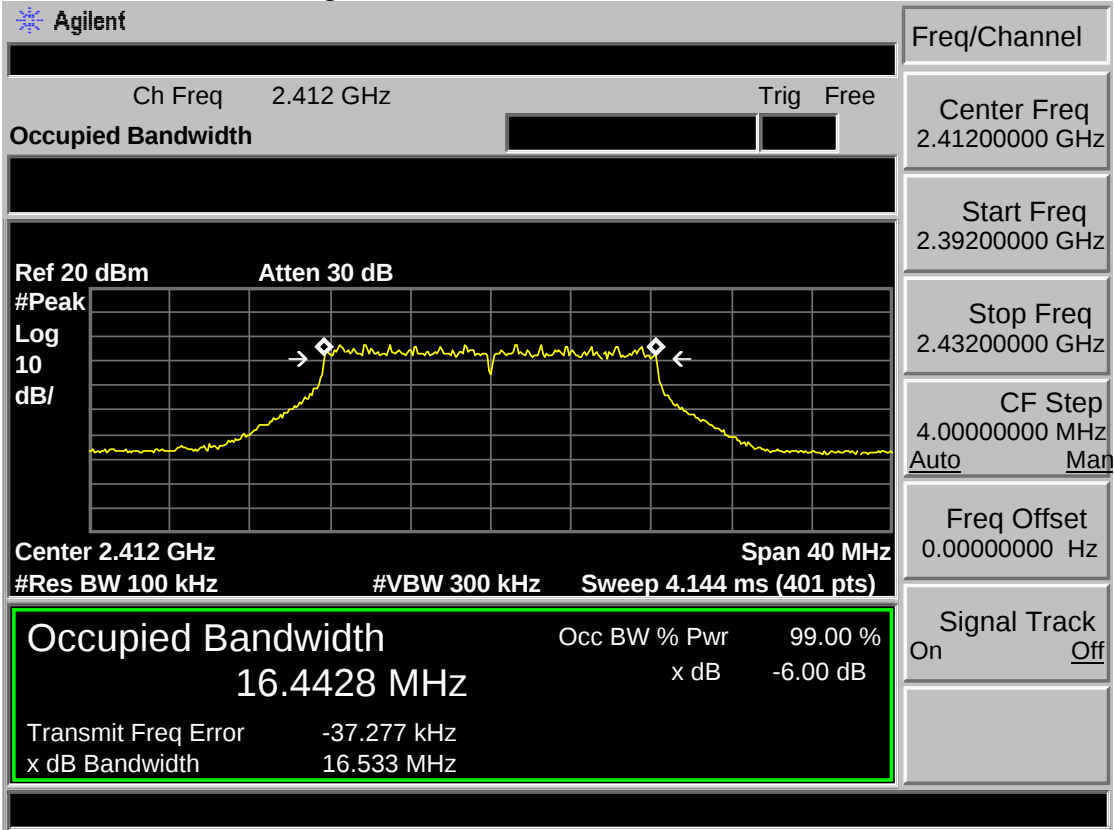
Test Mode: IEEE 802.11b 2437MHz



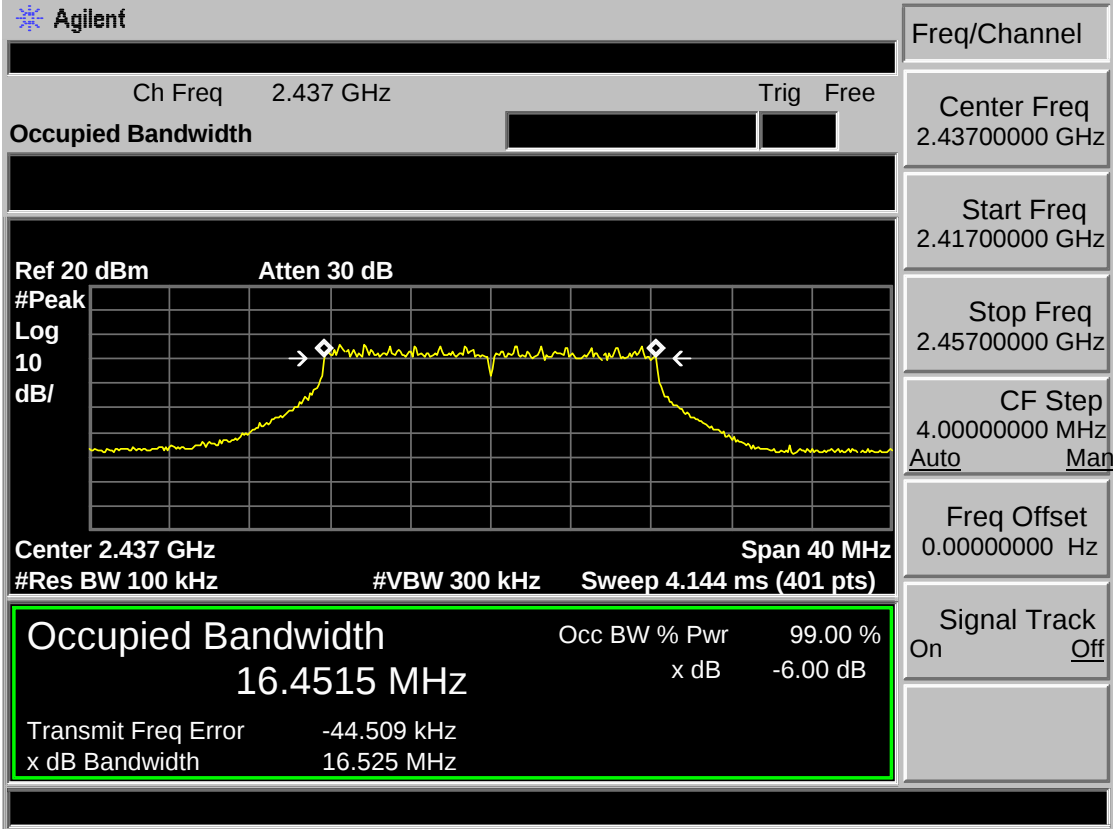
Test Mode: IEEE 802.11b 2462MHz



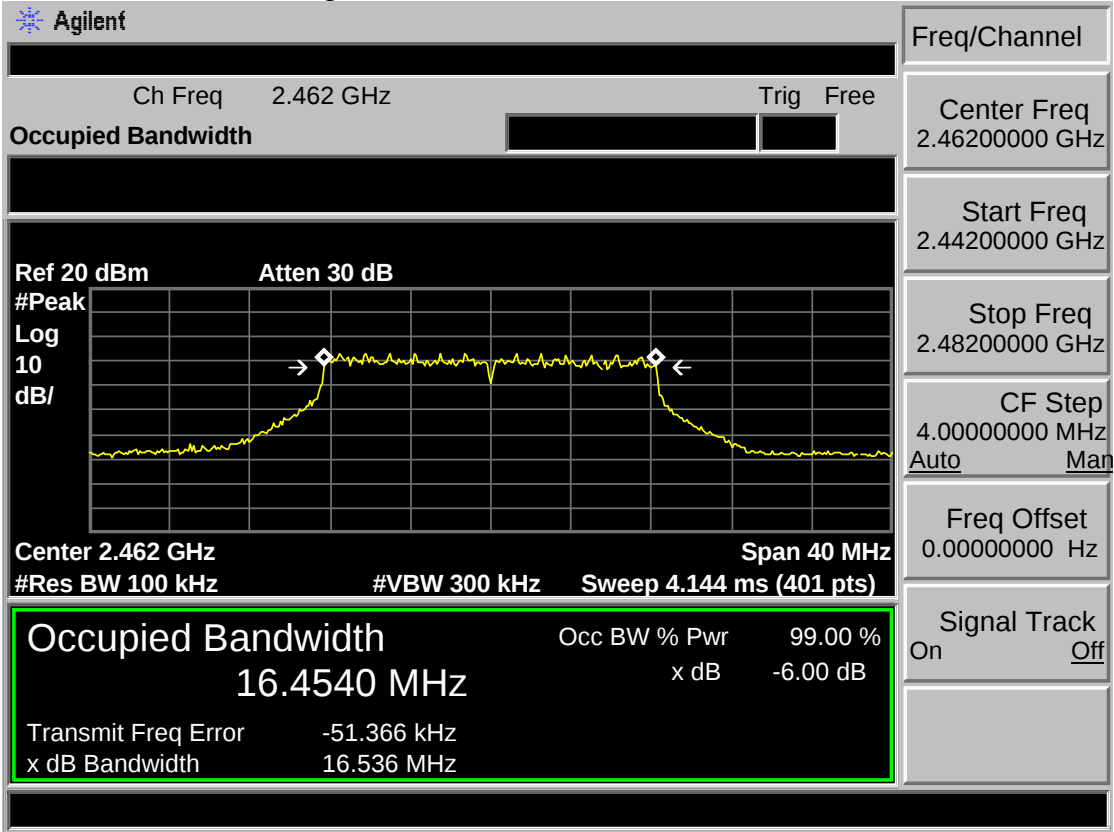
Test Mode: IEEE 802.11g 2412MHz



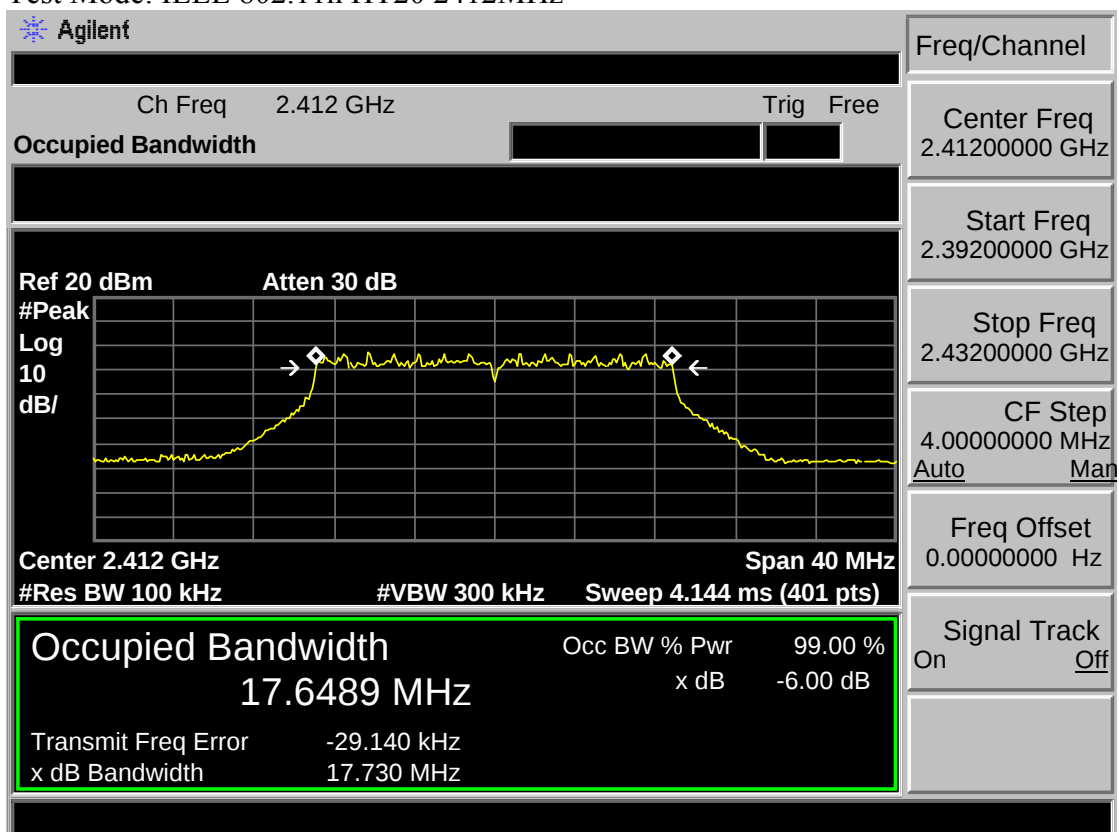
Test Mode: IEEE 802.11g 2437MHz



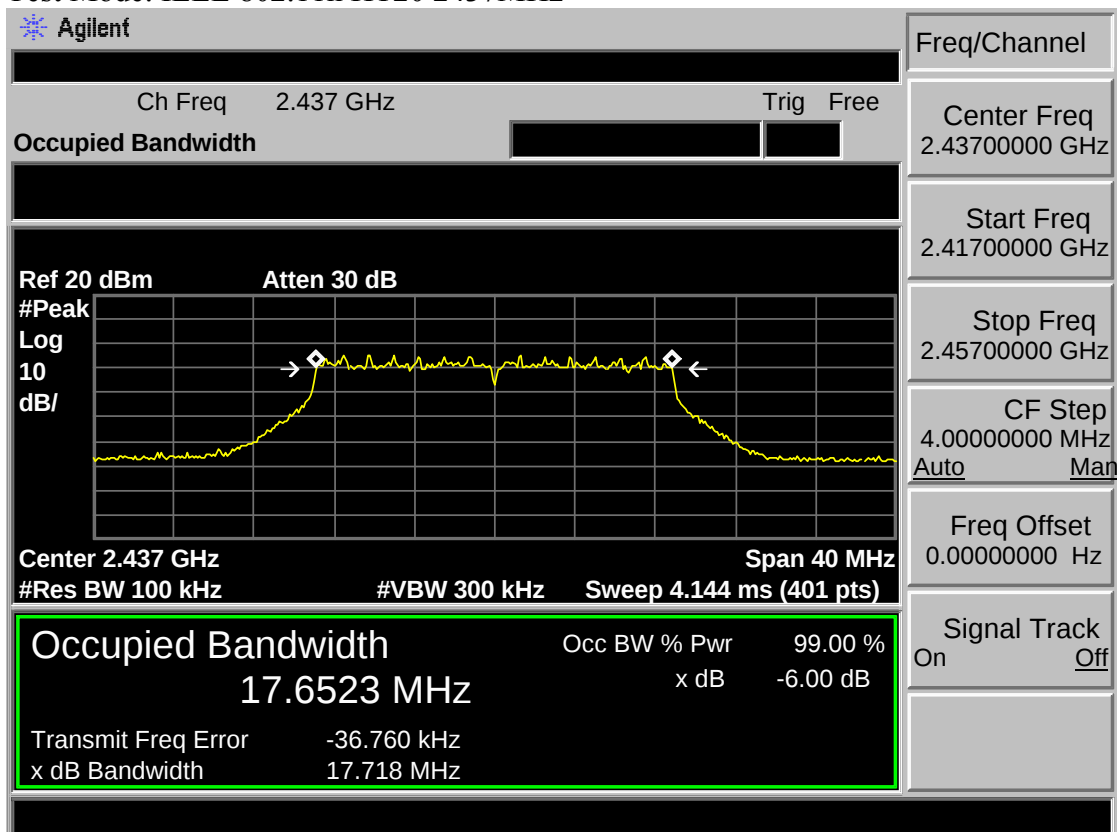
Test Mode: IEEE 802.11g 2462MHz



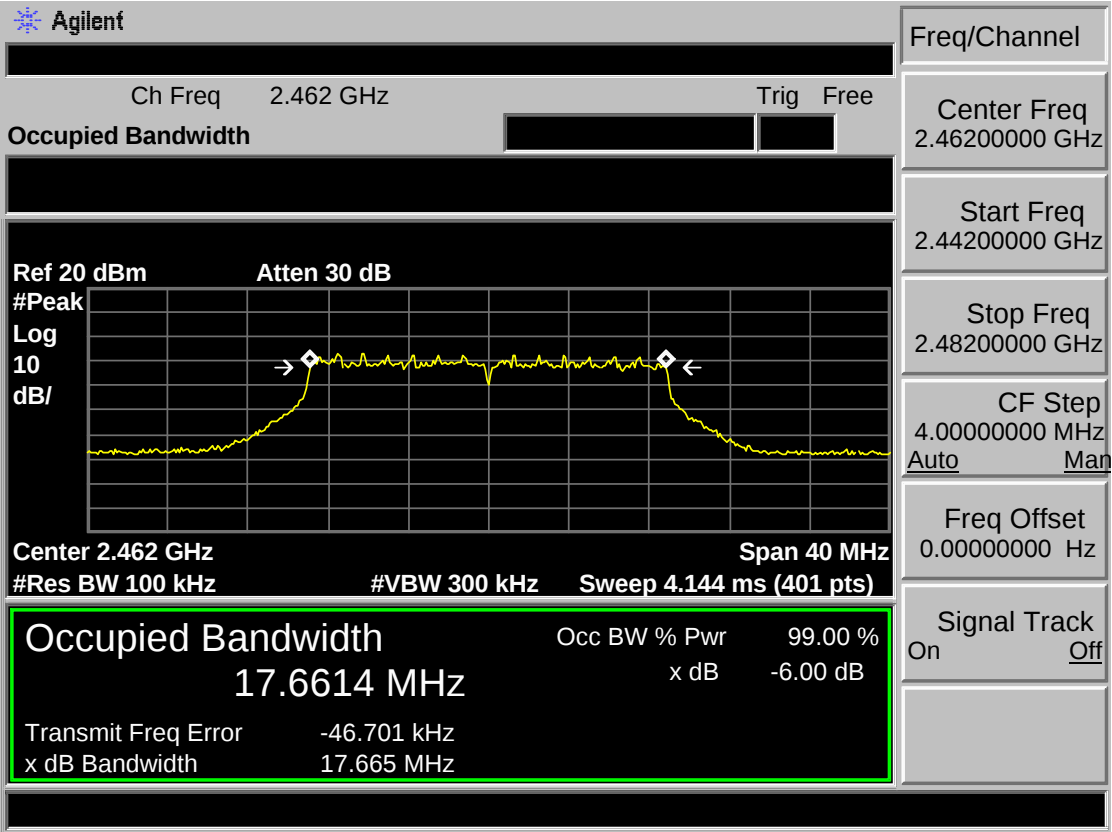
Test Mode: IEEE 802.11n HT20 2412MHz



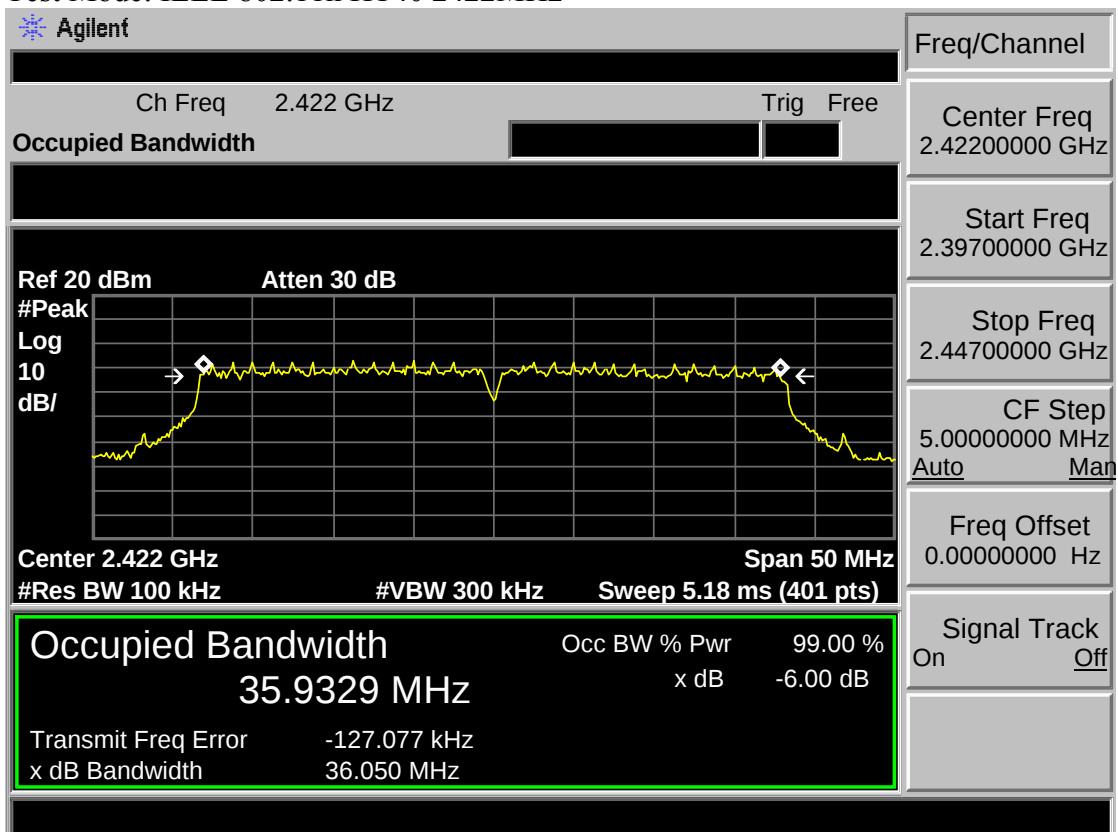
Test Mode: IEEE 802.11n HT20 2437MHz



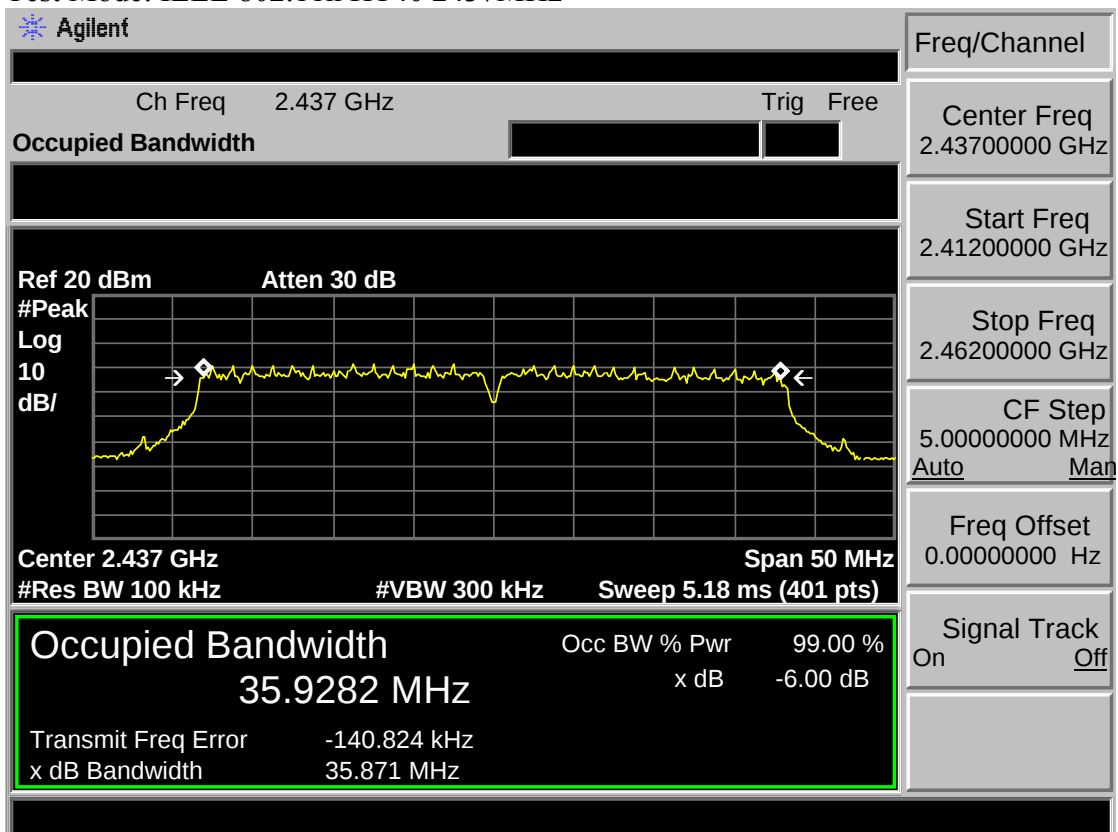
Test Mode: IEEE 802.11n HT20 2462MHz



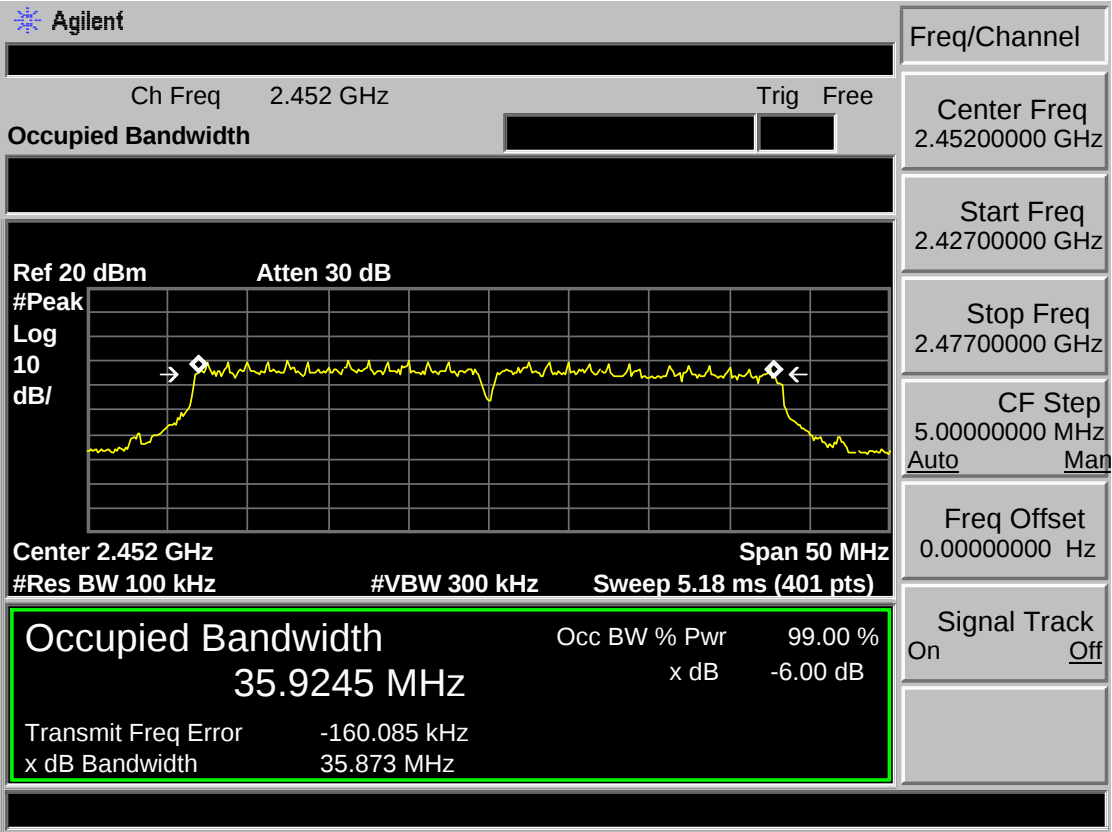
Test Mode: IEEE 802.11n HT40 2422MHz



Test Mode: IEEE 802.11n HT40 2437MHz

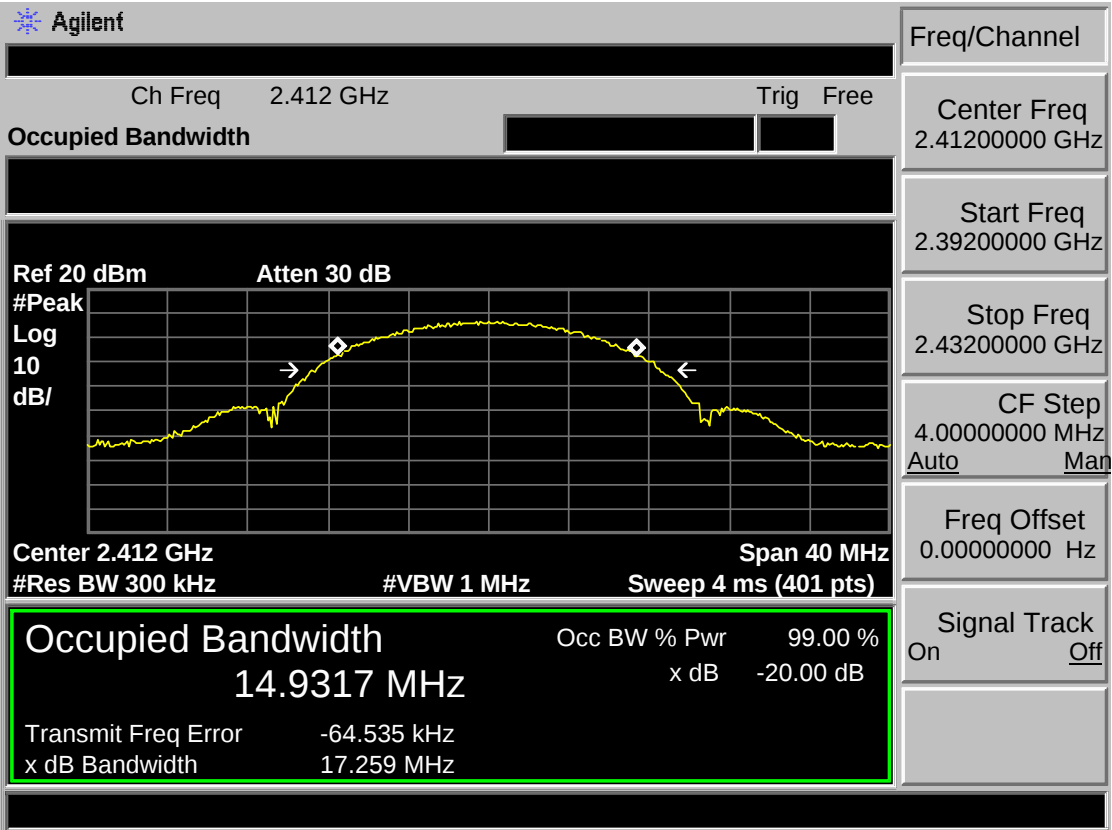


Test Mode: IEEE 802.11n HT40 2452MHz

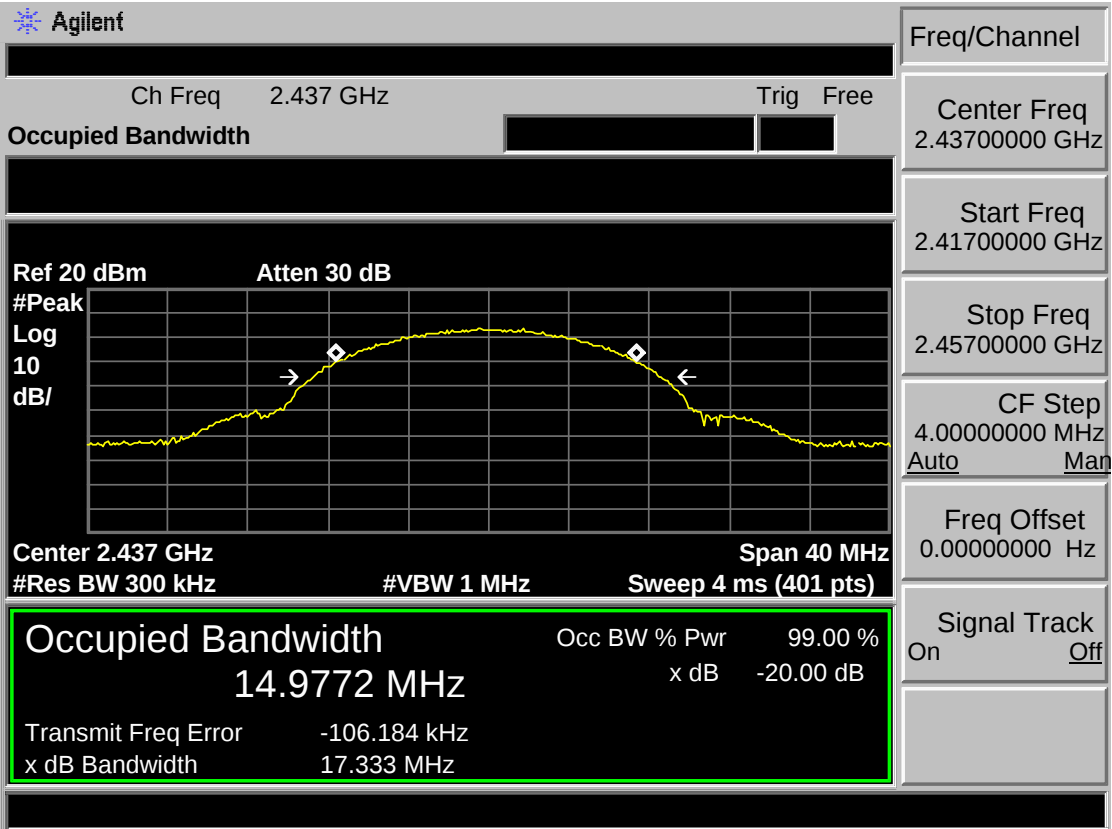


7.6 20dB Test Data

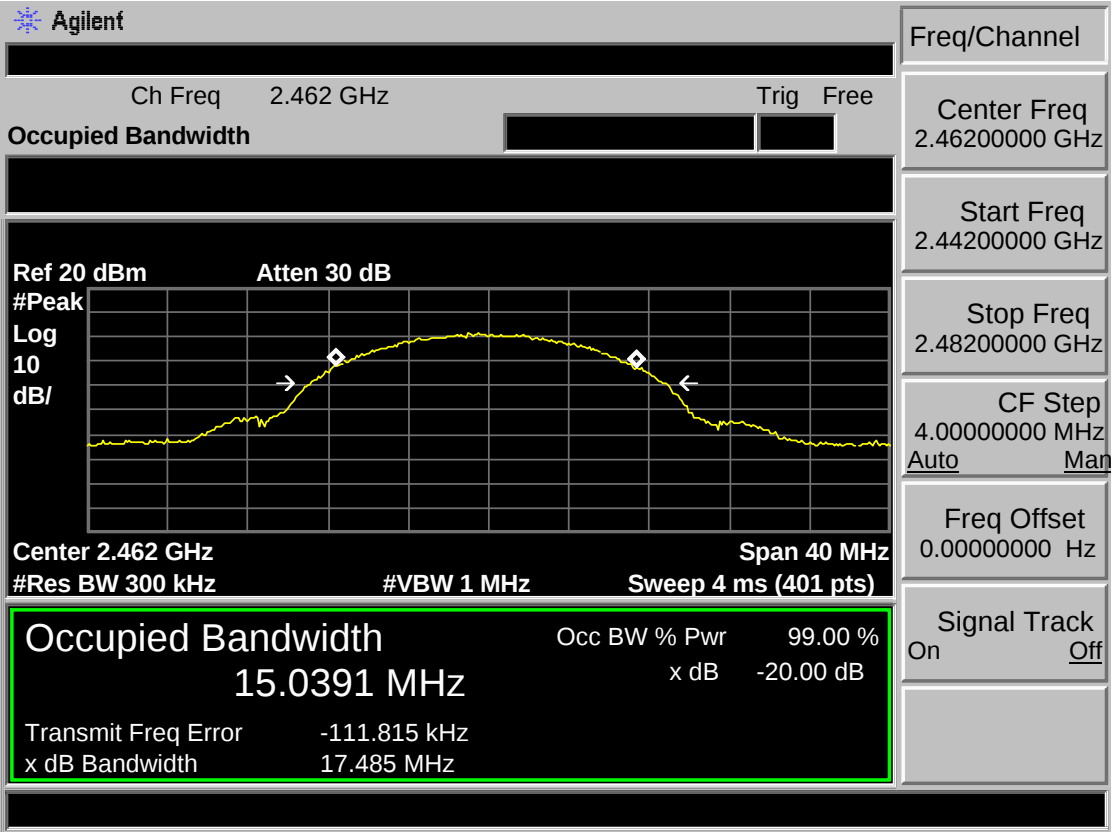
Test Mode: IEEE 802.11b 2412MHz



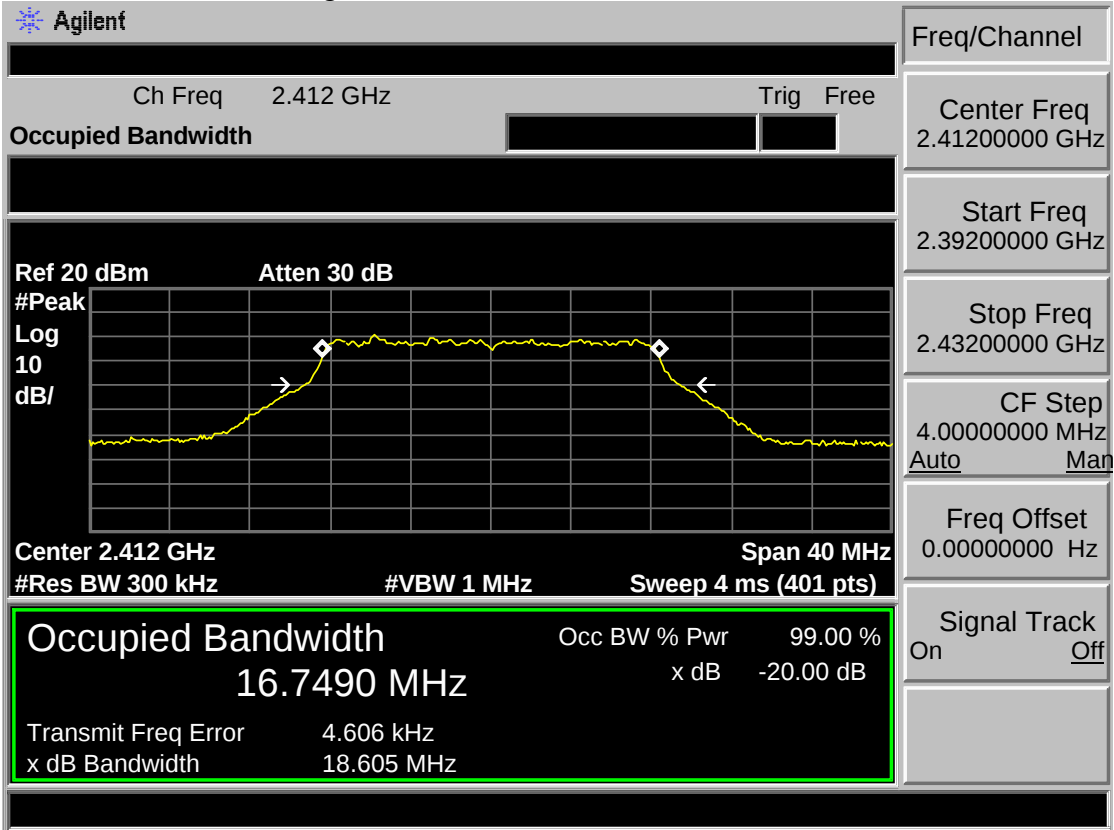
Test Mode: IEEE 802.11b 2437MHz



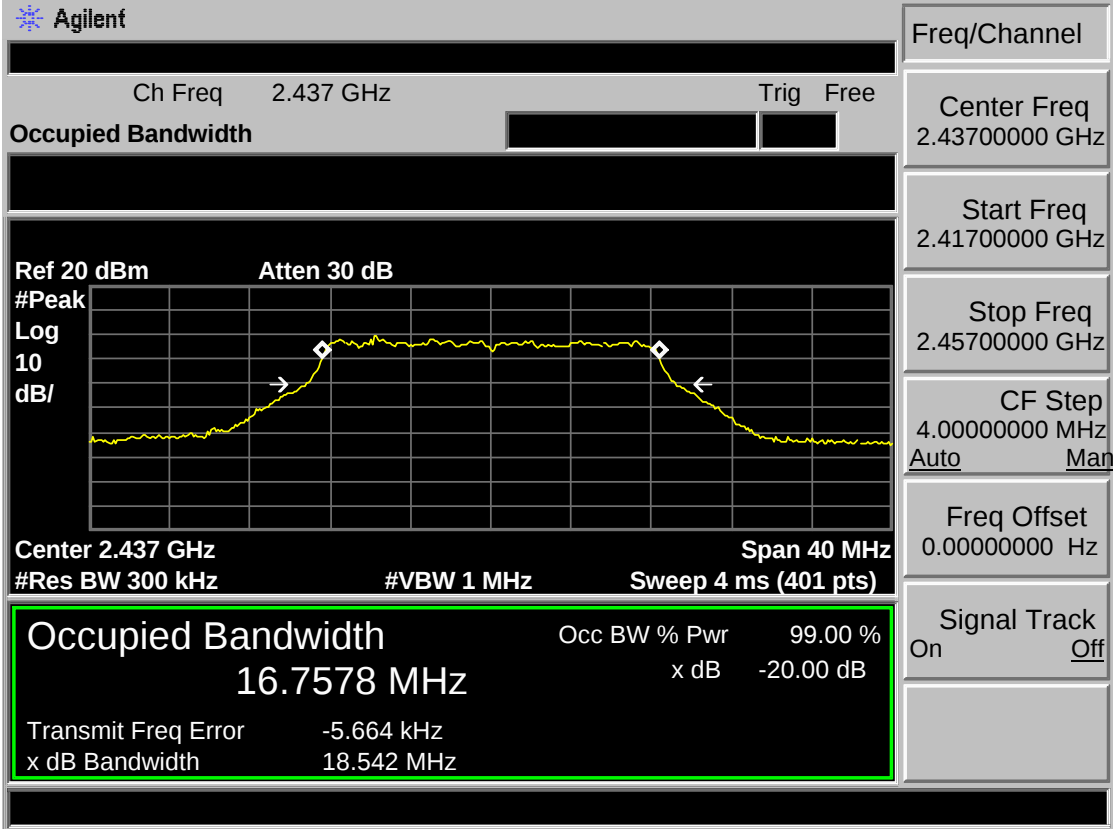
Test Mode: IEEE 802.11b 2462MHz



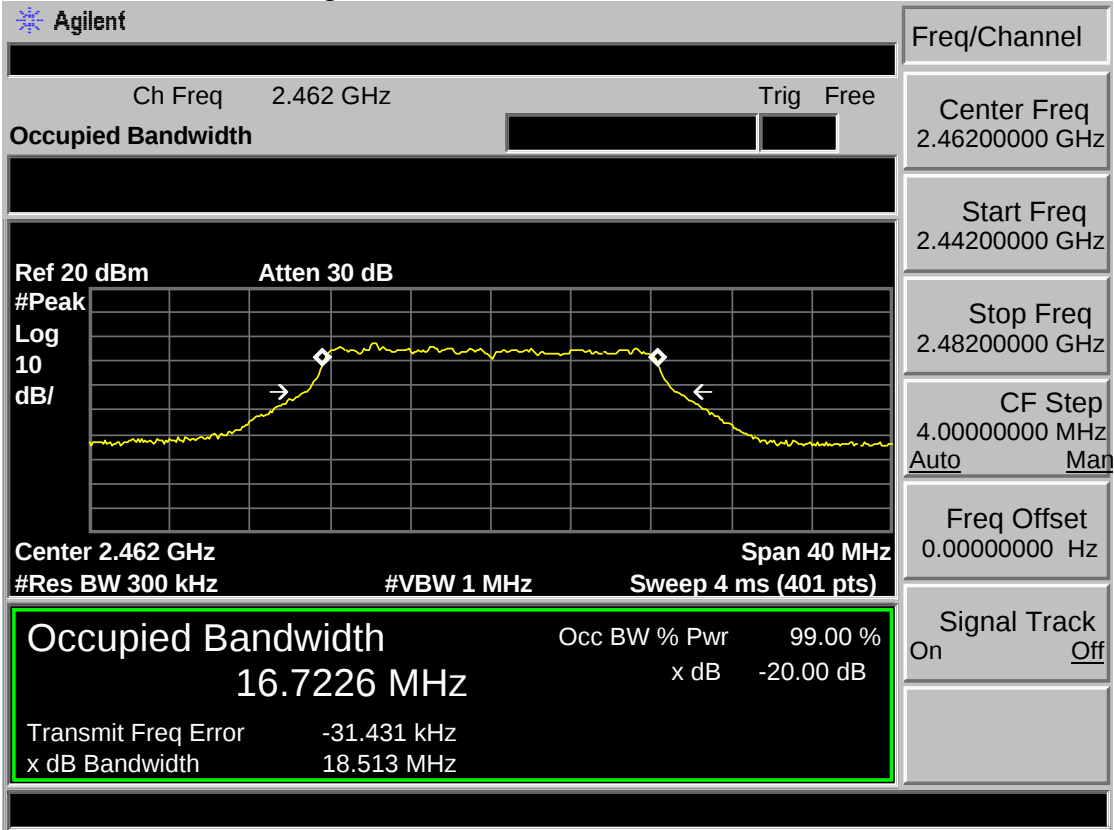
Test Mode: IEEE 802.11g 2412MHz



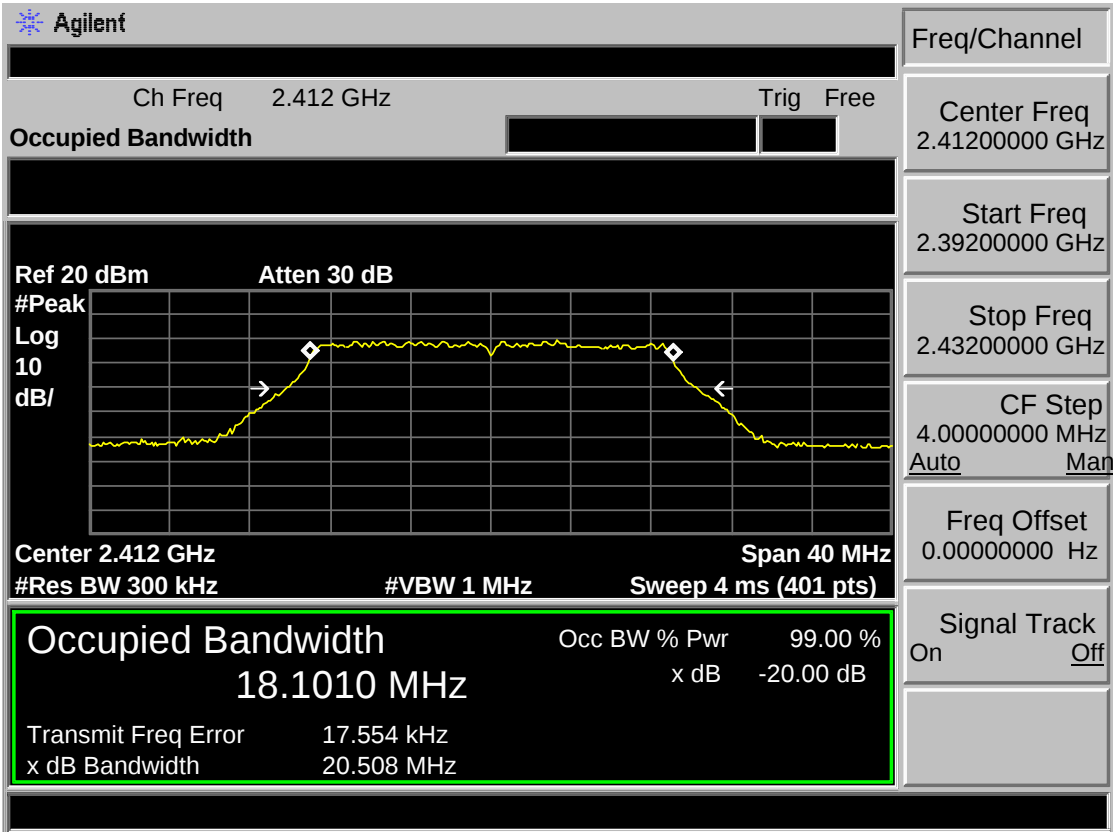
Test Mode: IEEE 802.11g 2437MHz



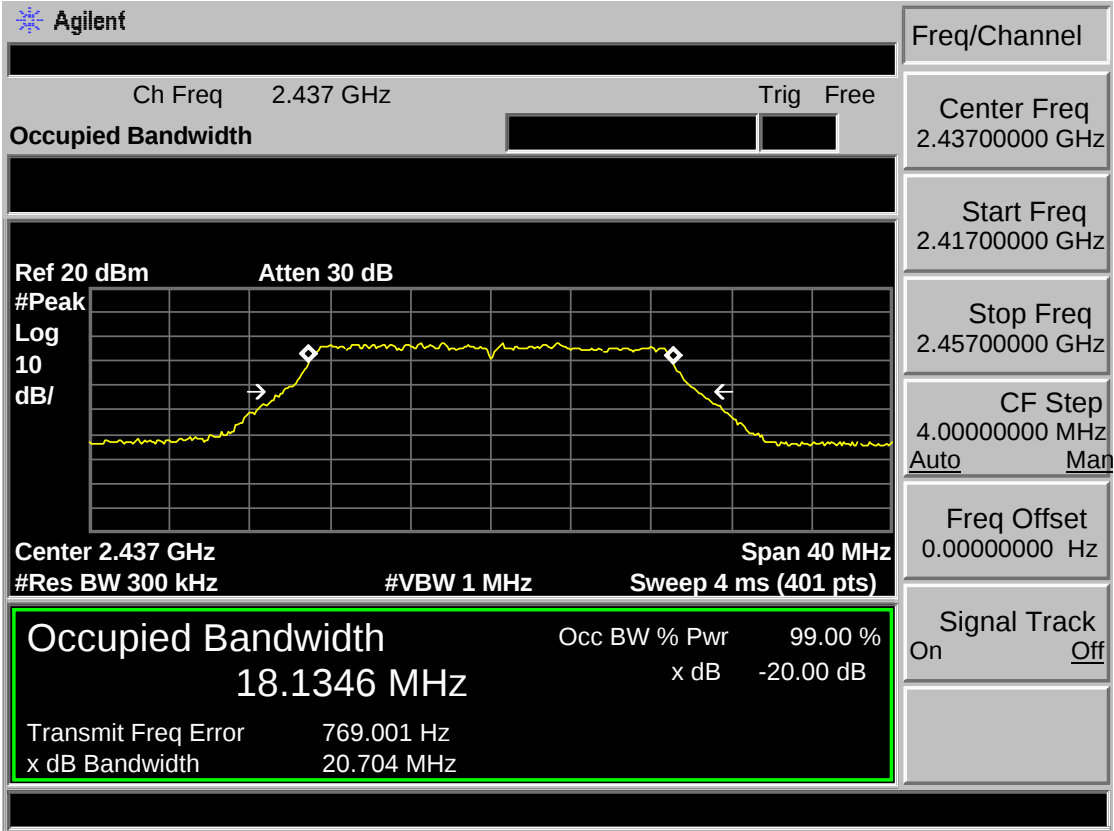
Test Mode: IEEE 802.11g 2462MHz



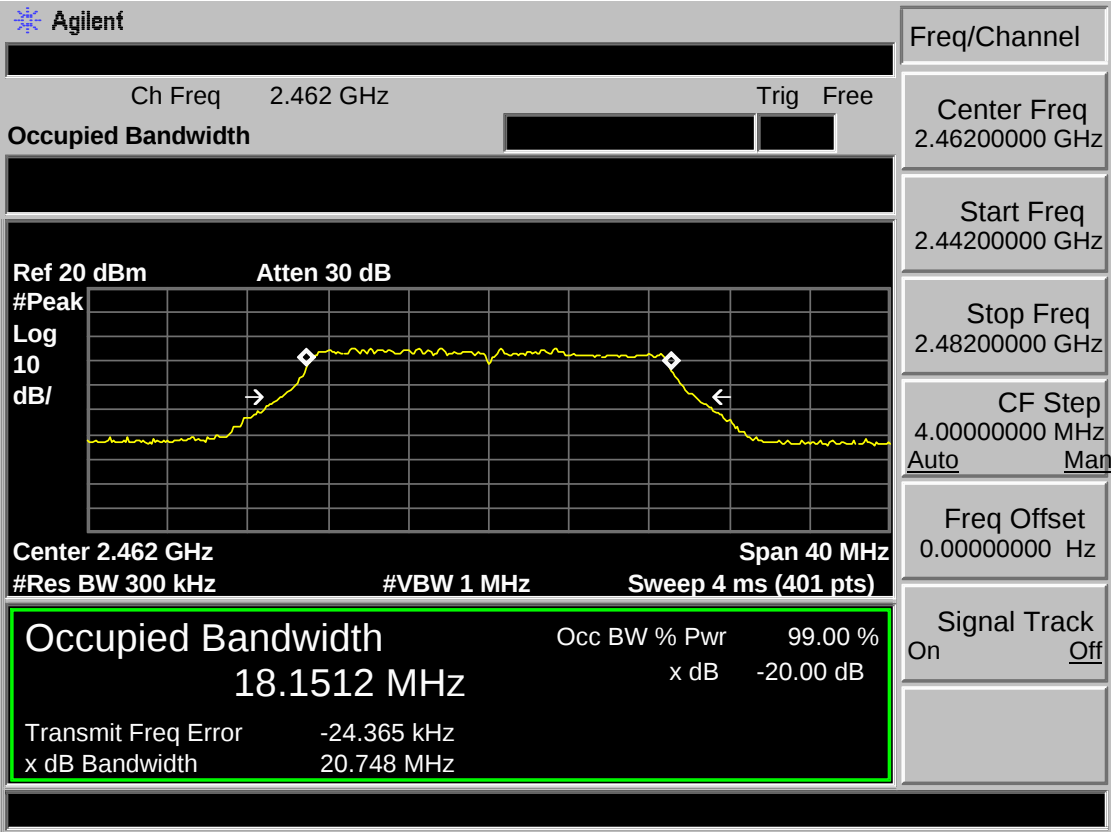
Test Mode: IEEE 802.11n HT20 2412MHz



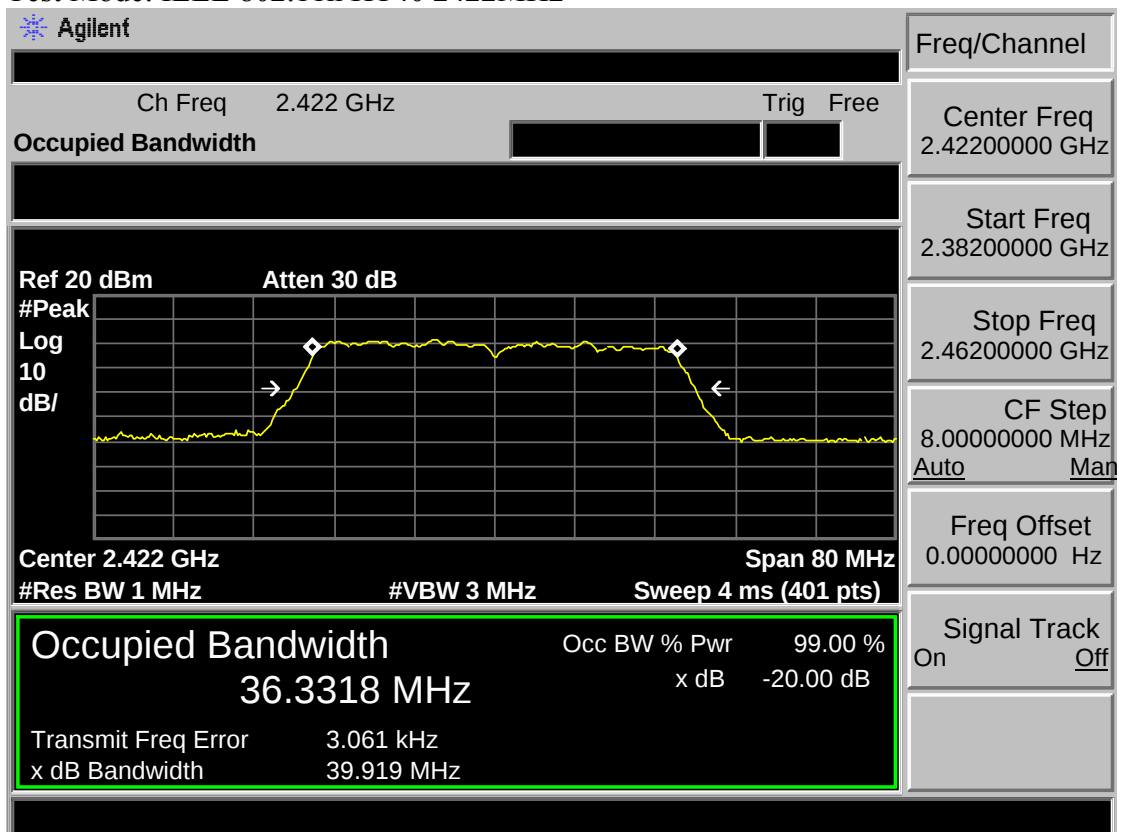
Test Mode: IEEE 802.11n HT20 2437MHz



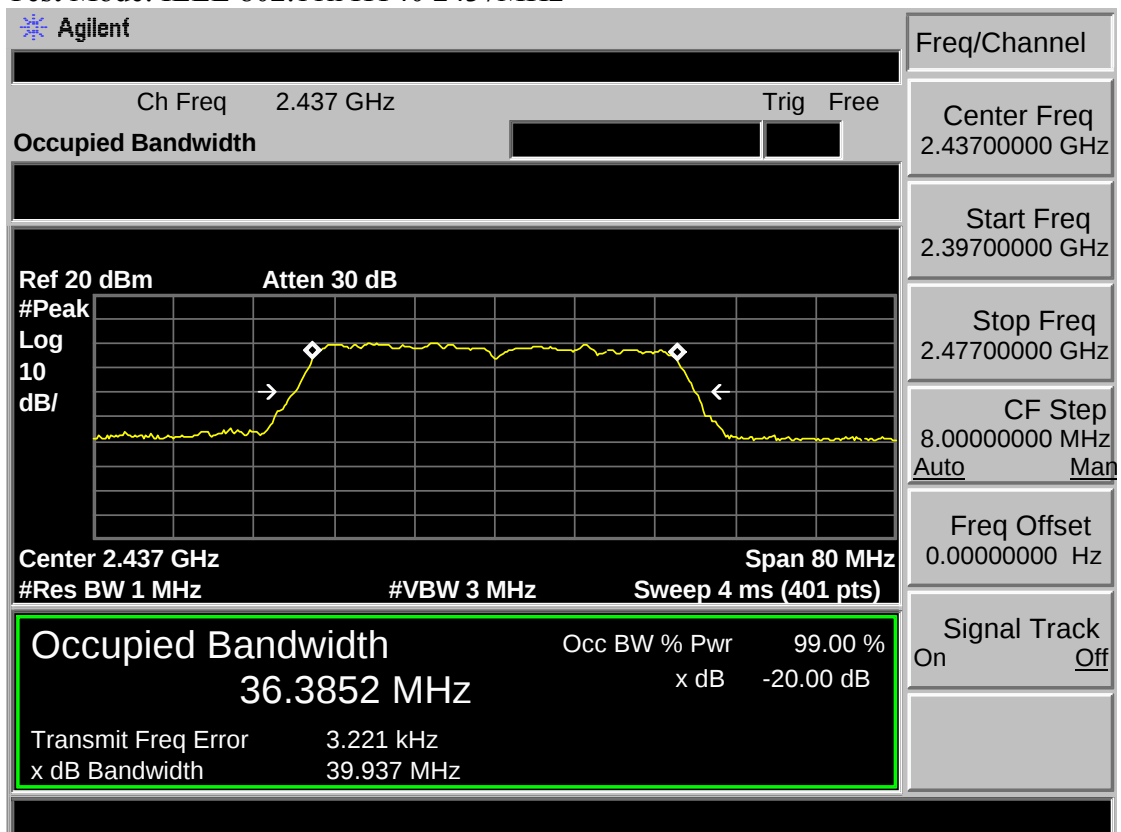
Test Mode: IEEE 802.11n HT20 2462MHz



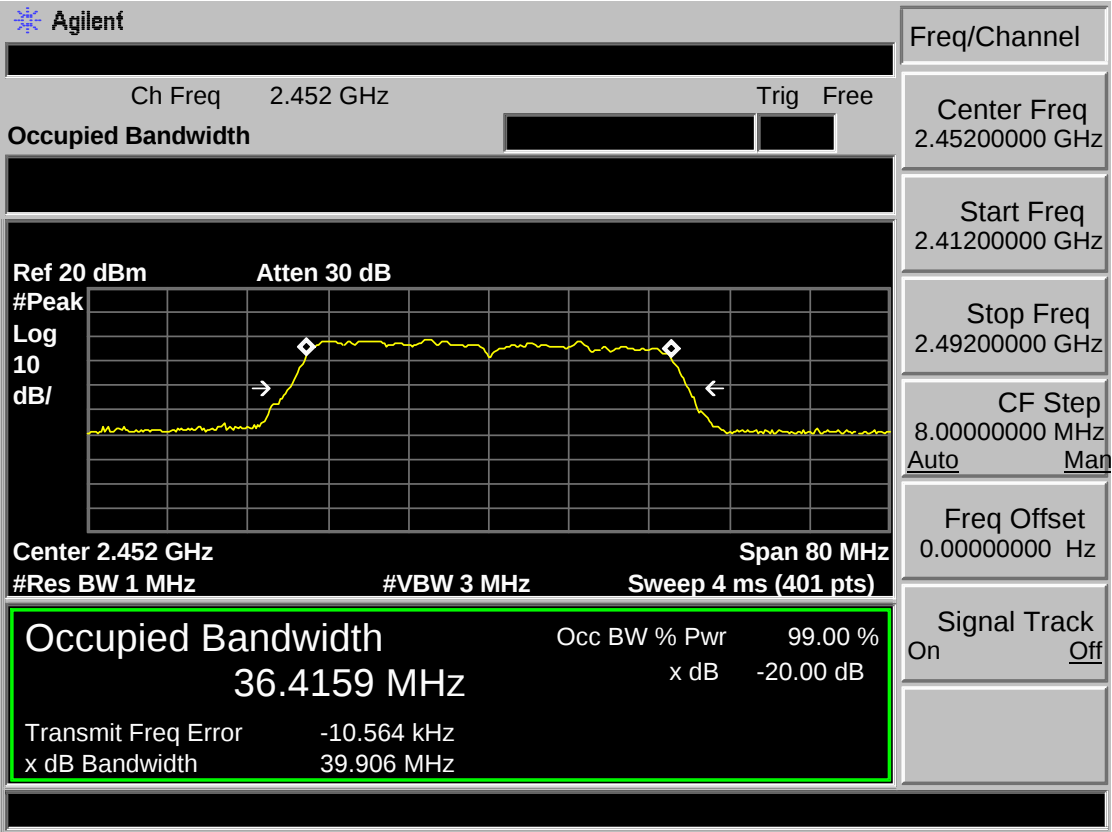
Test Mode: IEEE 802.11n HT40 2422MHz



Test Mode: IEEE 802.11n HT40 2437MHz



Test Mode: IEEE 802.11n HT40 2452MHz



8 OUTPUT POWER TEST

8.1 Limit

For systems using digital modulation in the 2400—2483.5MHz, The Peak out put Power shall not exceed 1W(30dBm)

8.2 Test Procedure

- 1, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.
- 2, Follow the test procedure as described in KDB 558074
 - (1)Set span to at least 1.5 times the OBW.
 - (2)Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
 - (3)Set VBW $\geq 3 \times$ RBW.
 - (4)Number of points in sweep $\geq 2 \times$ span / RBW. (This gives bin-to-bin spacing $\leq$ RBW/2, so that narrowband signals are not lost between frequency bins.)
 - (4)Sweep time = auto.
 - (5)Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
 - (6)If transmit duty cycle $< 98 \%$, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle $\geq 98 \%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
 - (7)Trace average at least 100 traces in power averaging (i.e., RMS) mode.
 - (8)Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

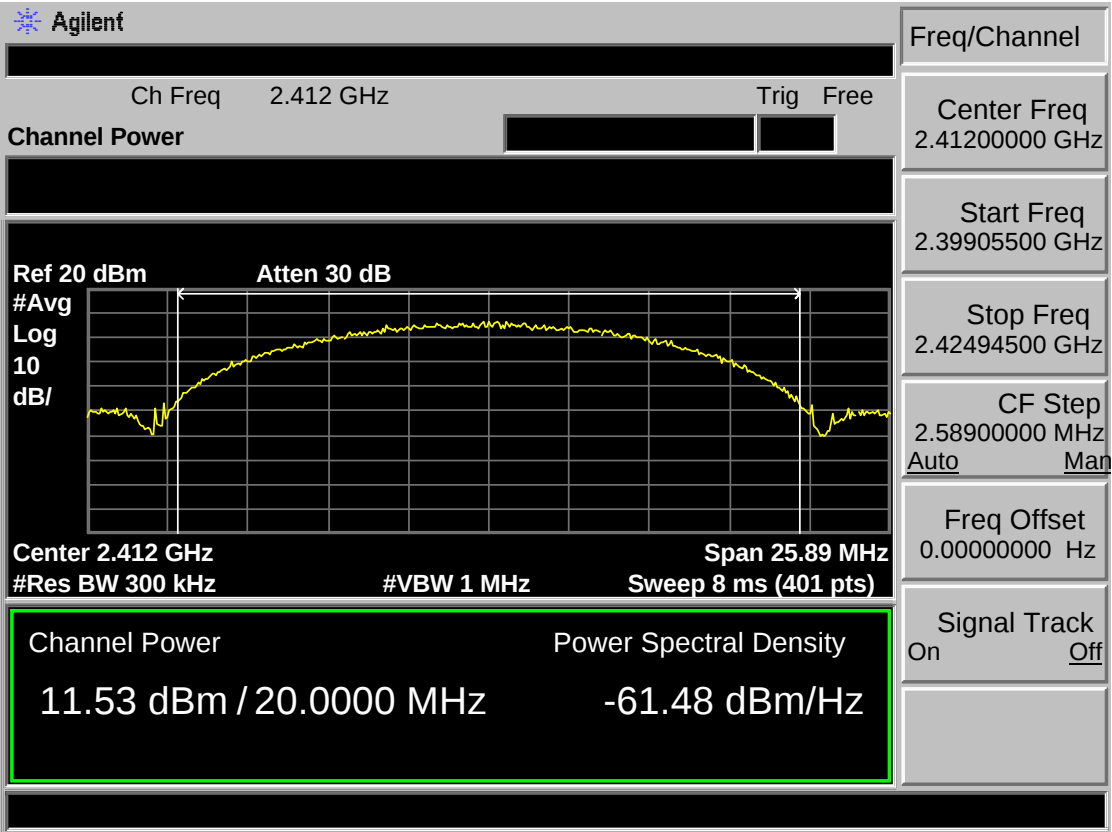
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

8.3 Test Result

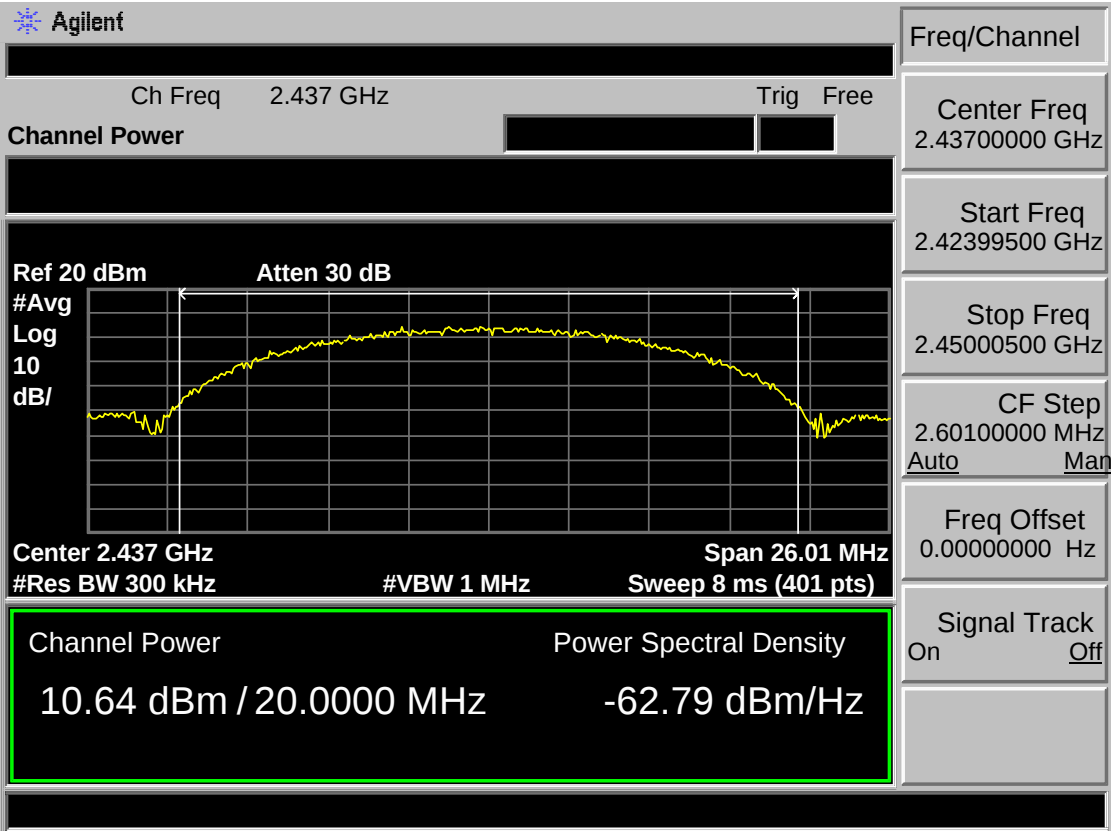
EUT: Robot Vacuum Cleaner			
M/N: LDS M7			
Test date: 2019.03.06		Test site: RF Site	Tested by: Viking
Pass			
Test Mode	CH	Conducted Power (dBm)	Limit (dBm)
IEEE 802.11 b	CH1	11.53	30
	CH6	10.64	30
	CH11	8.85	30
IEEE 802.11 g	CH1	5.88	30
	CH6	4.57	30
	CH11	2.63	30
IEEE 802.11 n HT 20	CH1	6.05	30
	CH6	3.92	30
	CH11	1.92	30
IEEE 802.11 n HT 40	CH3	4.35	30
	CH6	3.43	30
	CH9	2.15	30
Conclusion : PASS			

8.4 Test Data

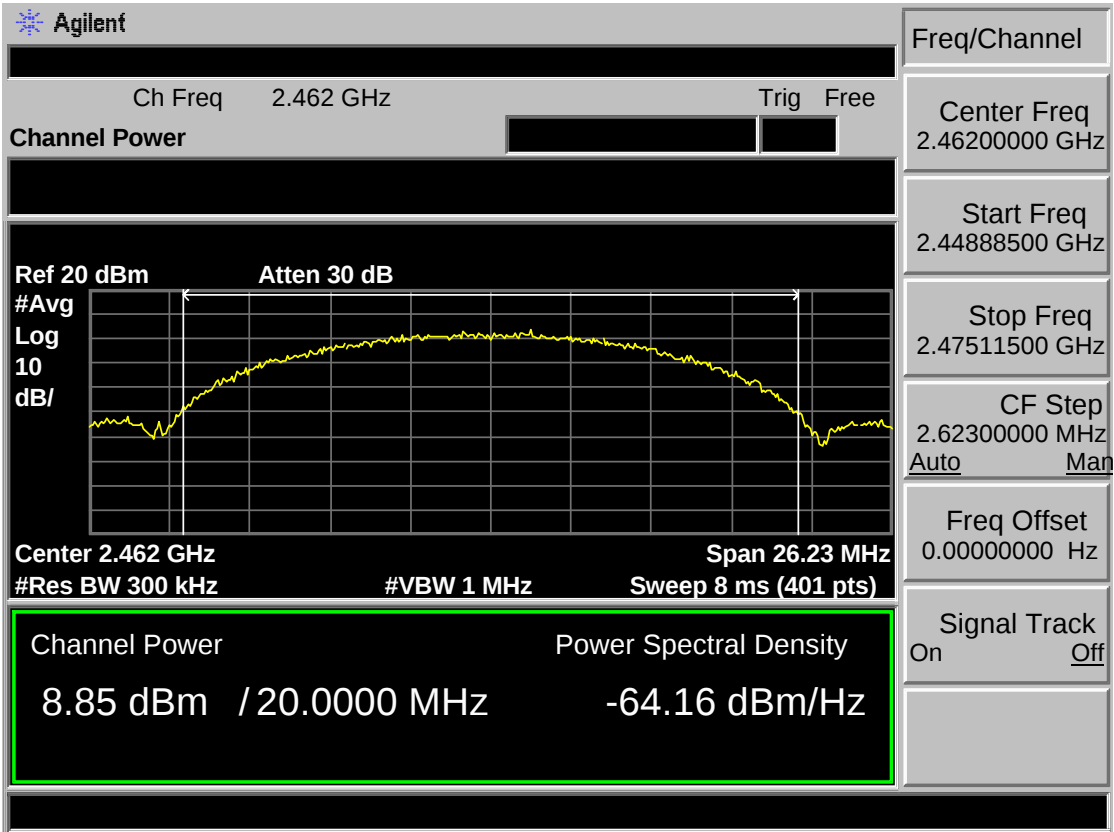
Test Mode: IEEE 802.11b 2412MHz



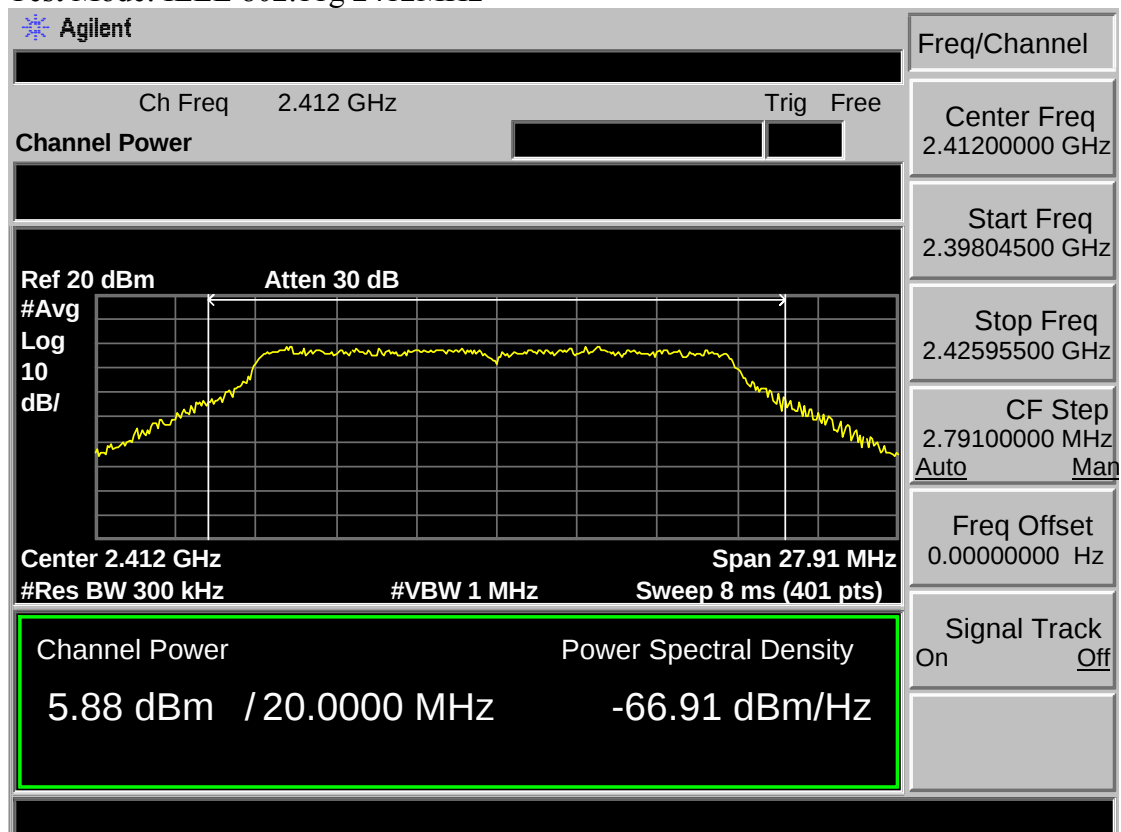
Test Mode: IEEE 802.11b 2437MHz



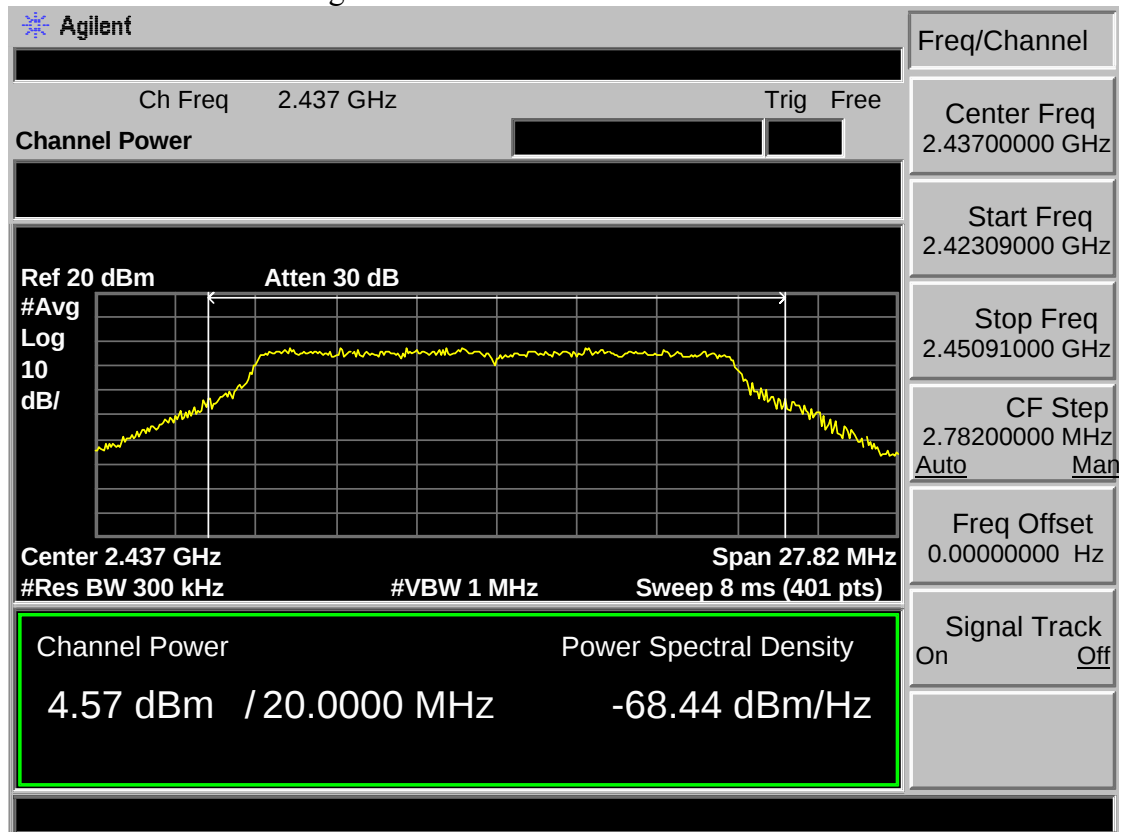
Test Mode: IEEE 802.11b 2462MHz



Test Mode: IEEE 802.11g 2412MHz



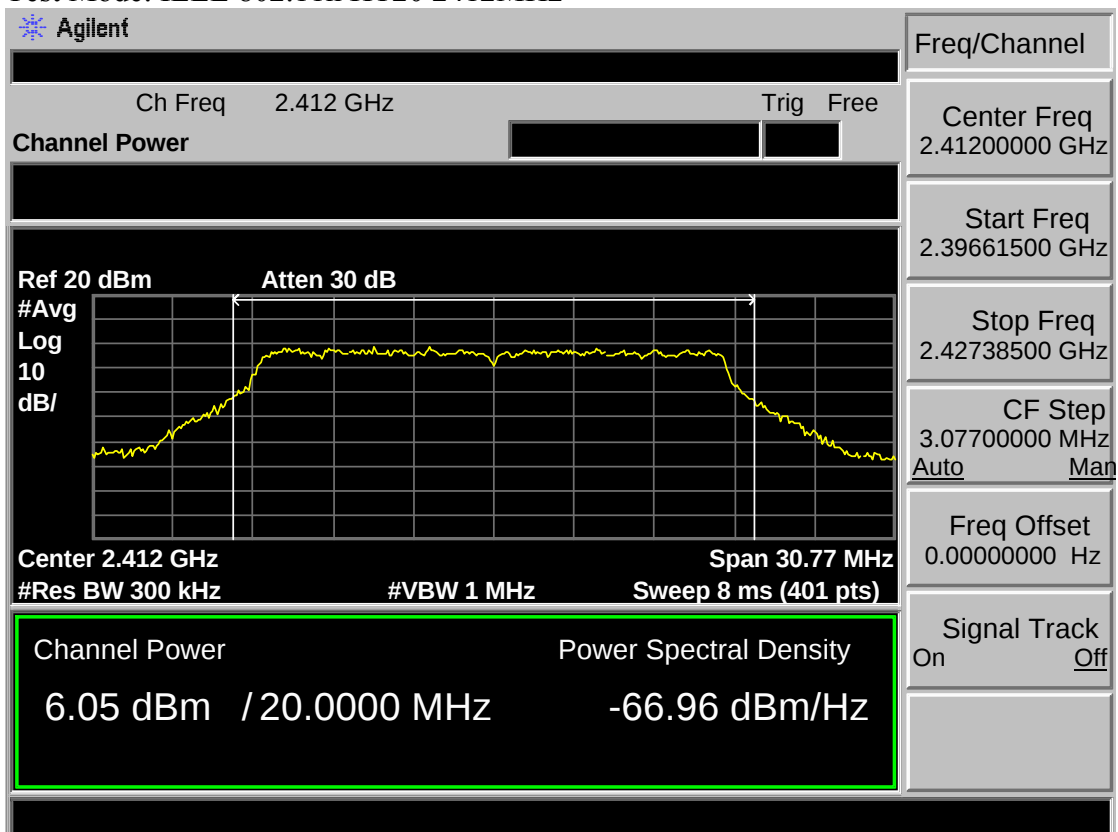
Test Mode: IEEE 802.11g 2437MHz



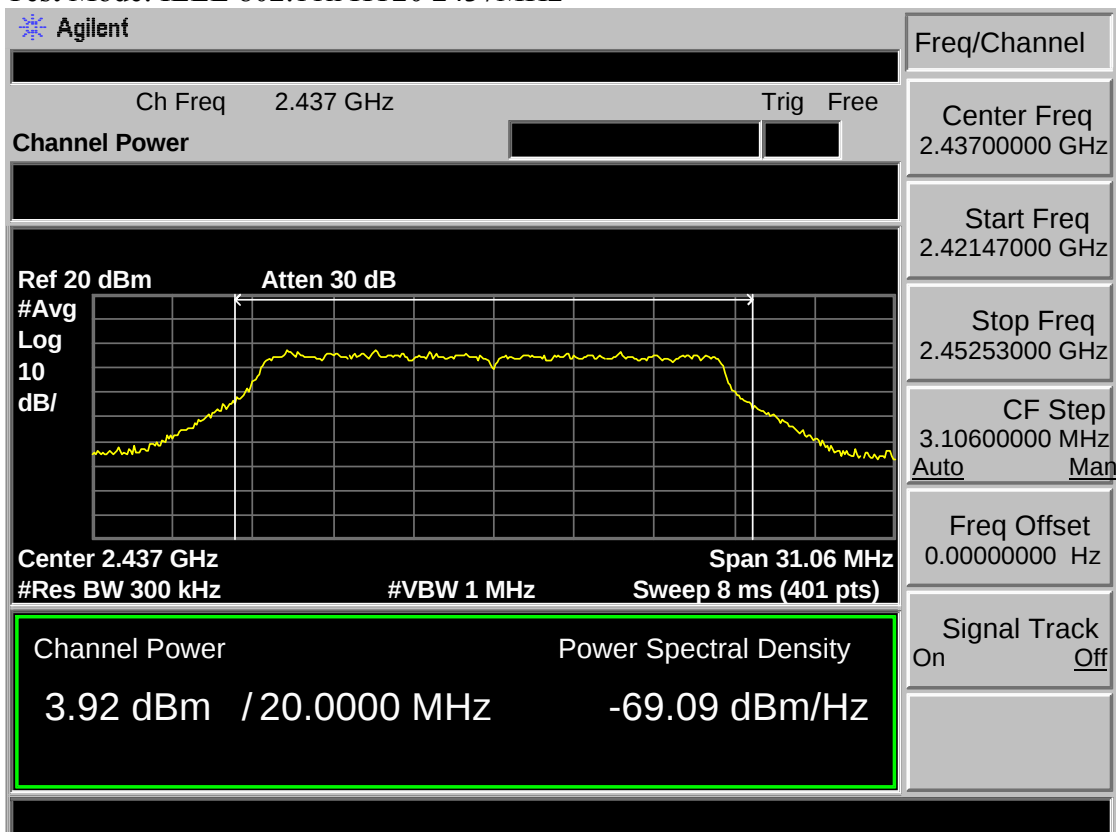
Test Mode: IEEE 802.11g 2462MHz



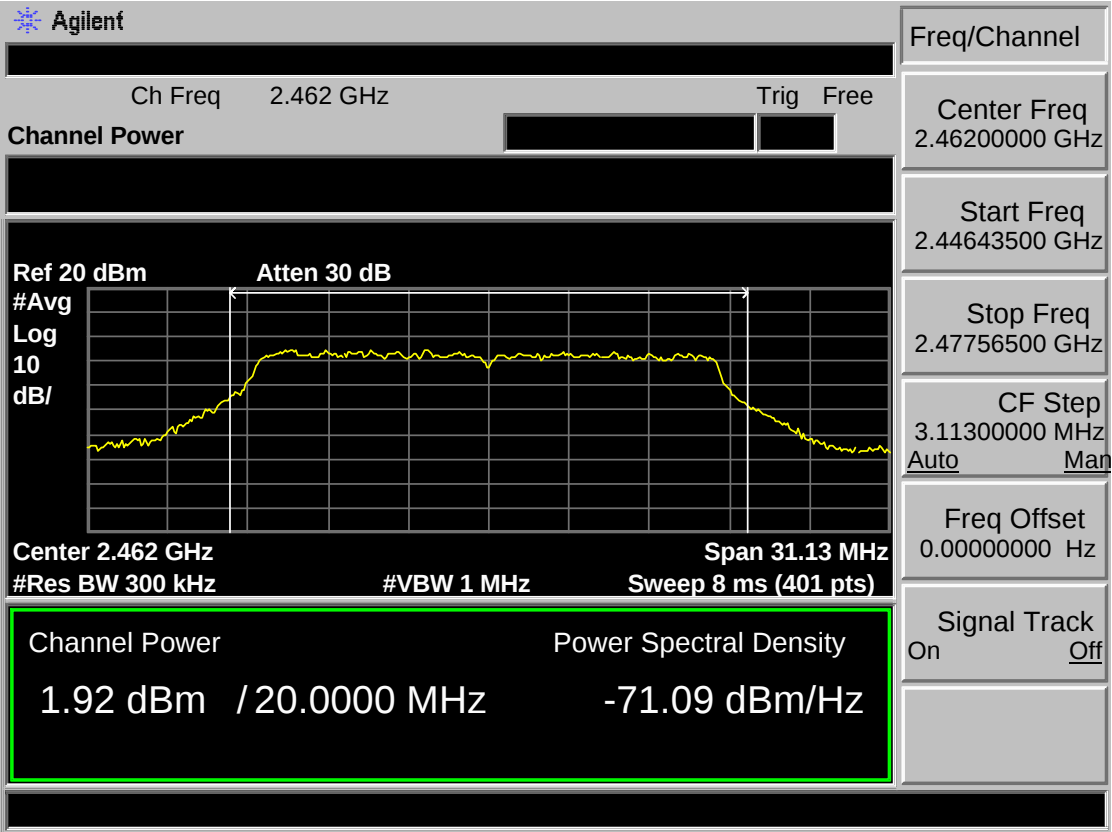
Test Mode: IEEE 802.11n HT20 2412MHz



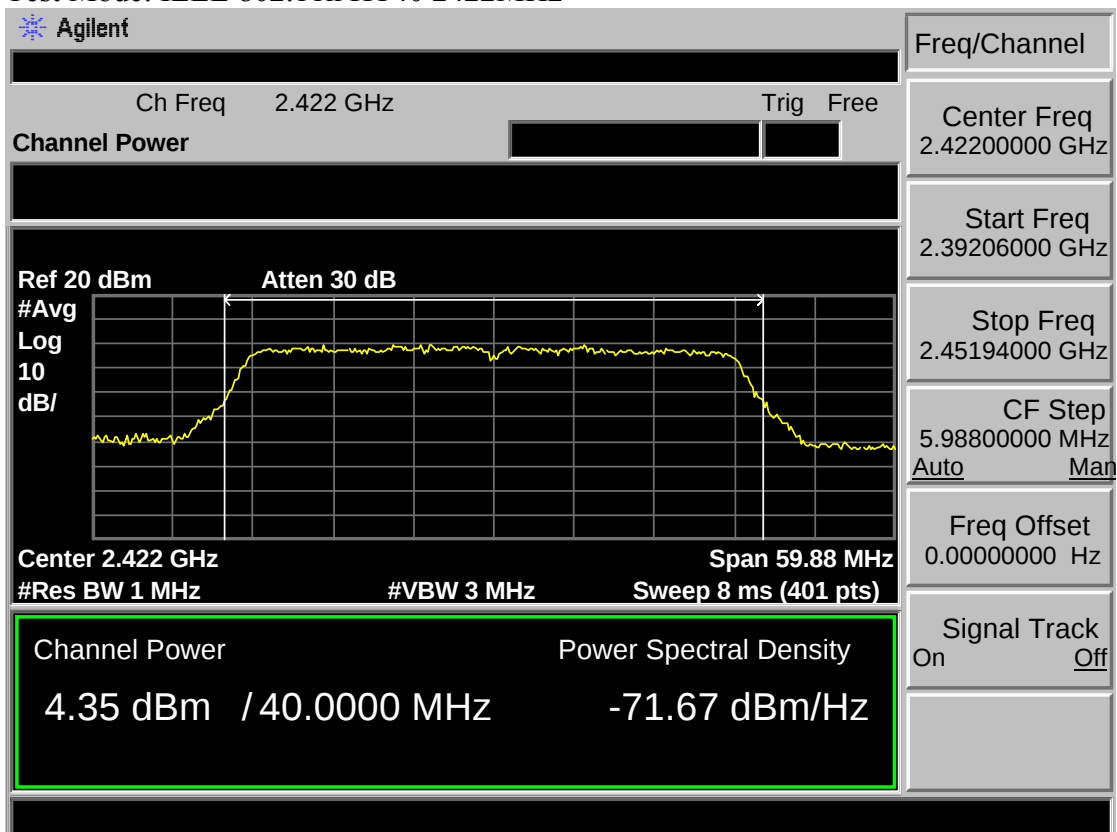
Test Mode: IEEE 802.11n HT20 2437MHz



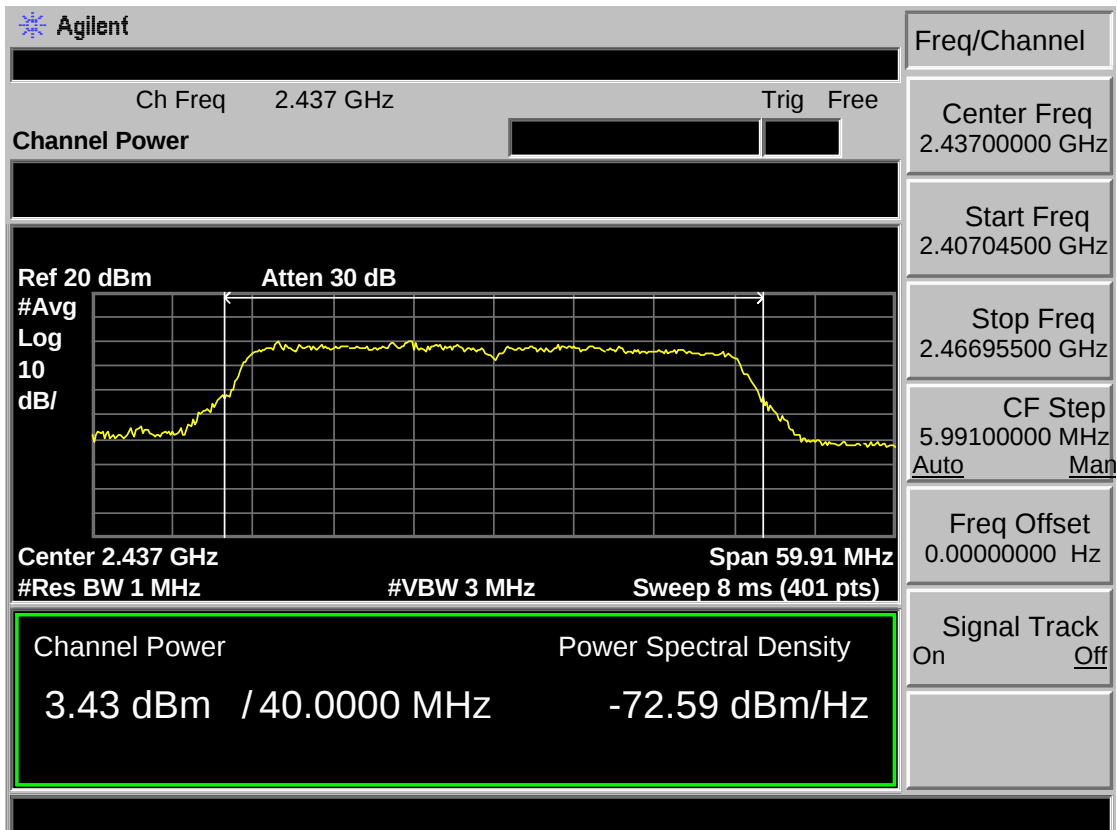
Test Mode: IEEE 802.11n HT20 2462MHz



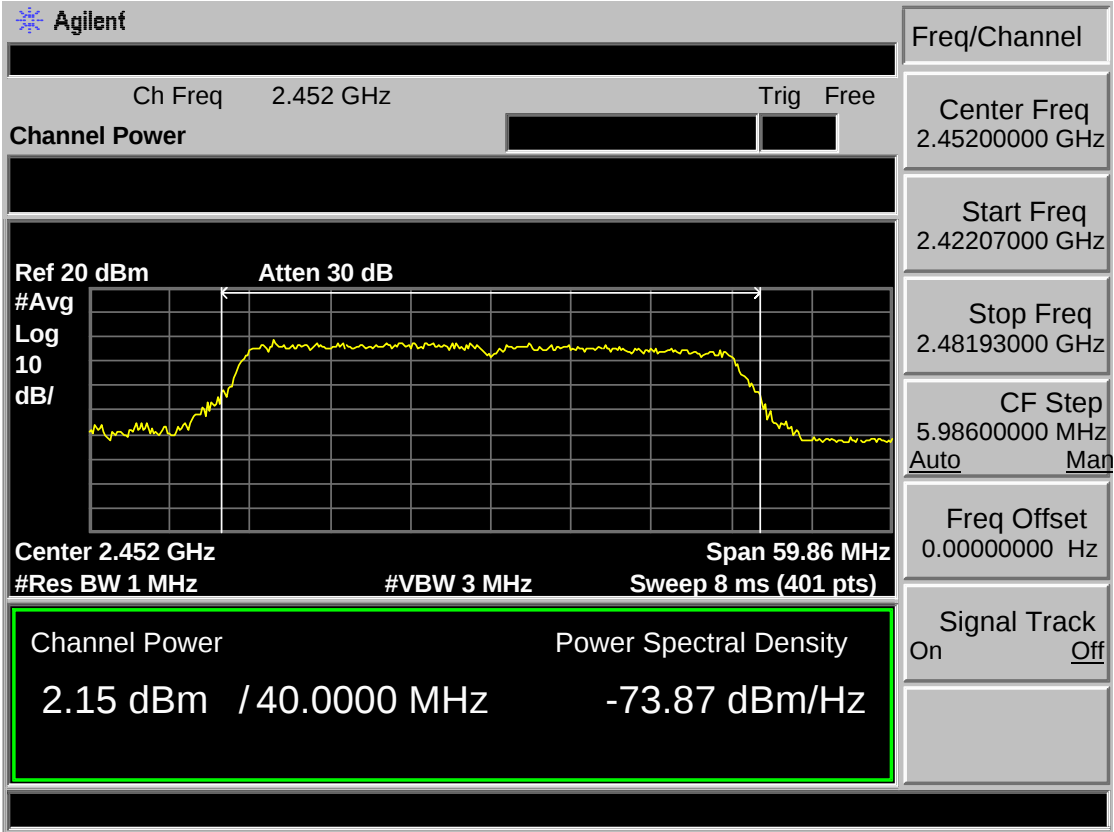
Test Mode: IEEE 802.11n HT40 2422MHz



Test Mode: IEEE 802.11n HT40 2437MHz



Test Mode: IEEE 802.11n HT40 2452MHz



9 POWER SPECTRAL DENSITY TEST

9.1 Limit

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

9.2 Test Procedure

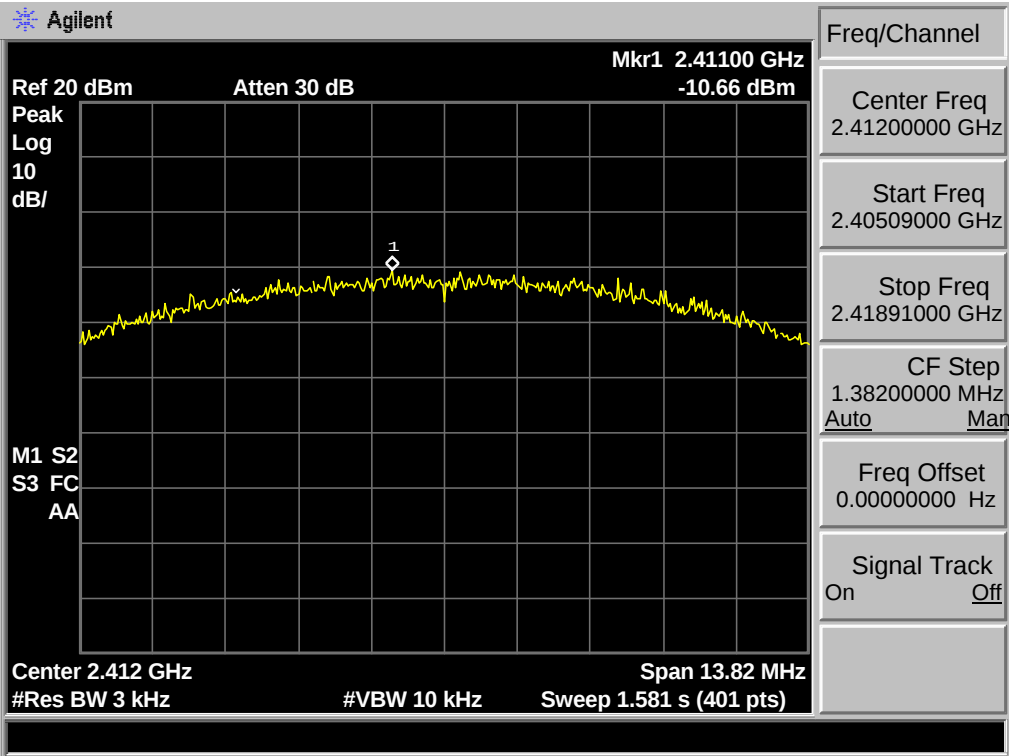
- 1, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.
- 2, Follow the test procedure as described in KDB 558074
 - (1). Set analyzer center frequency to DTS channel center frequency.
 - (2). Set the span to 1.5 times the DTS bandwidth.
 - (3). Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - (4). Set the VBW $\geq 3 \text{ RBW}$.
 - (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.

9.3 Test Result

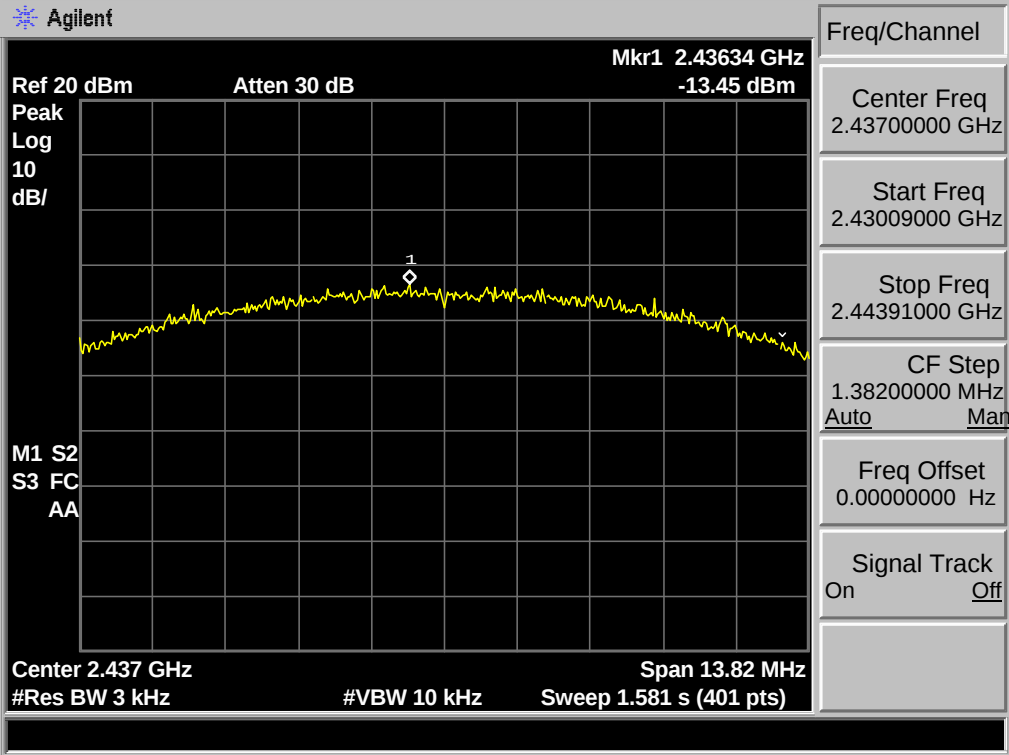
EUT: Robot Vacuum Cleaner			
M/N: LDS M7			
Test date: 2019.03.06		Test site: RF Site	Tested by: Viking
Pass			
Test Mode	CH	Power density (dBm/3kHz)	Limit (dBm/3kHz)
IEEE 802.11 b	CH1	-10.66	8
	CH6	-13.45	8
	CH11	-15.60	8
IEEE 802.11 g	CH1	-17.37	8
	CH6	-18.99	8
	CH11	-20.58	8
IEEE 802.11 n HT 20	CH1	-18.71	8
	CH6	-19.88	8
	CH11	-22.58	8
IEEE 802.11 n HT 40	CH3	-21.56	8
	CH6	-23.35	8
	CH9	-24.44	8
Conclusion : PASS			

9.4 Test Data

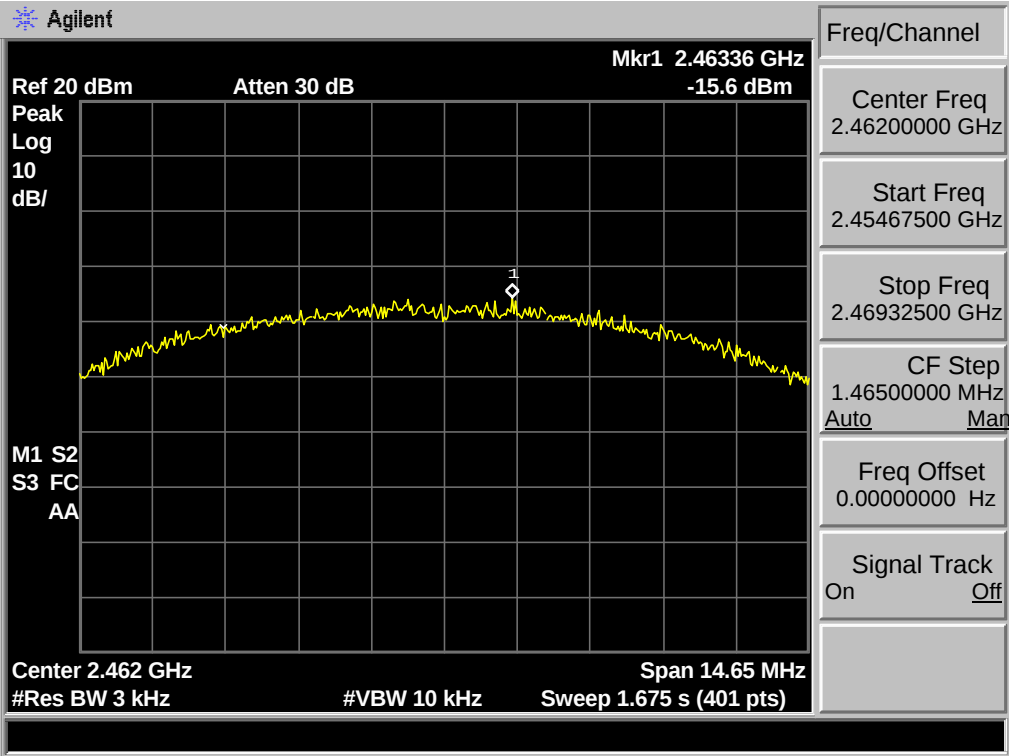
Test Mode: IEEE 802.11b 2412MHz



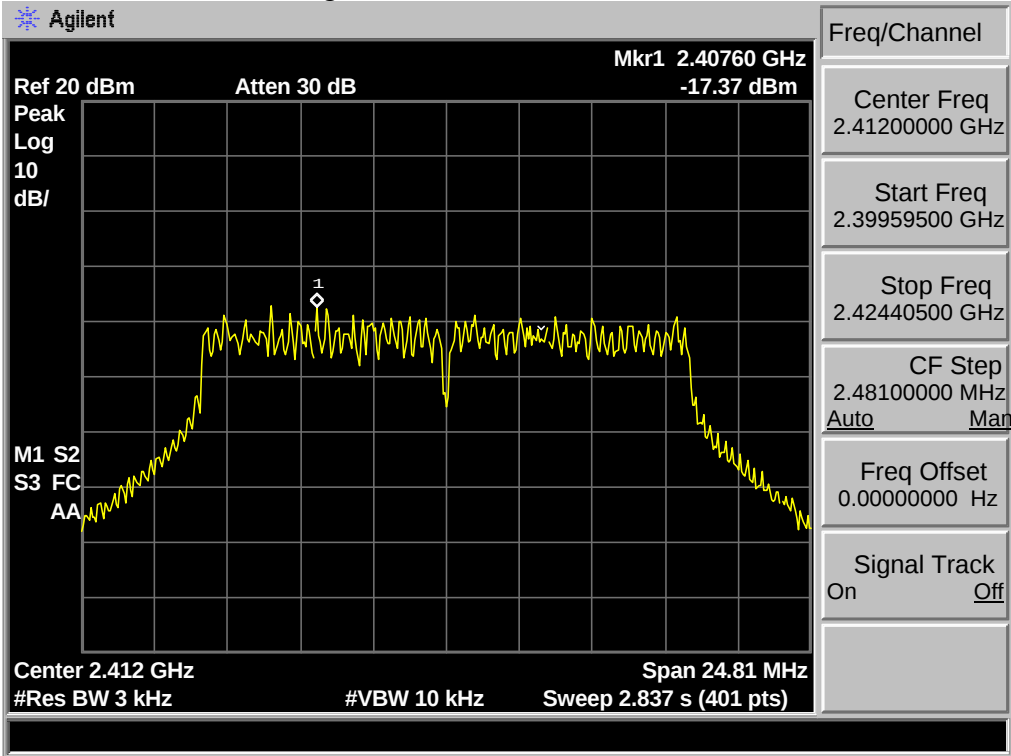
Test Mode: IEEE 802.11b 2437MHz



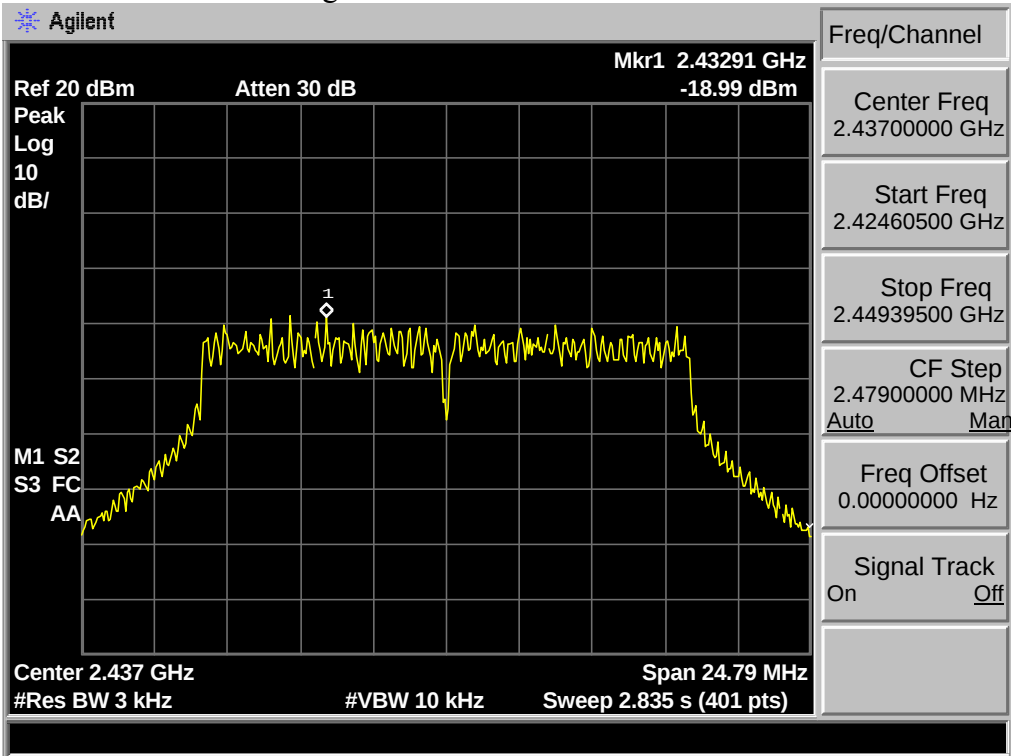
Test Mode: IEEE 802.11b 2462MHz



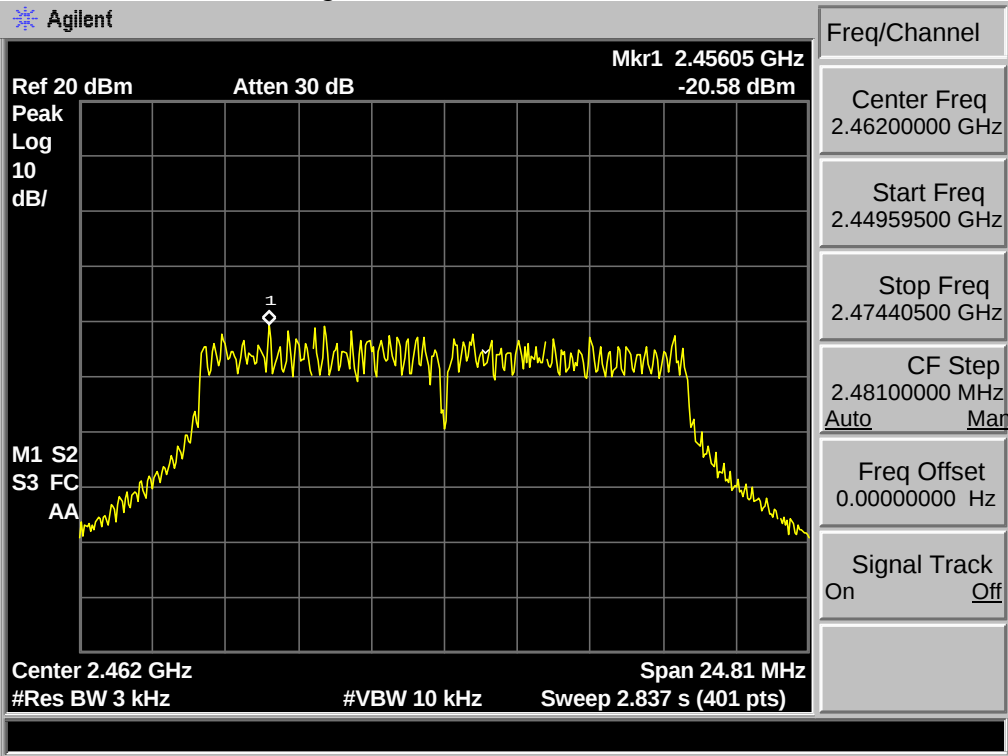
Test Mode: IEEE 802.11g 2412MHz



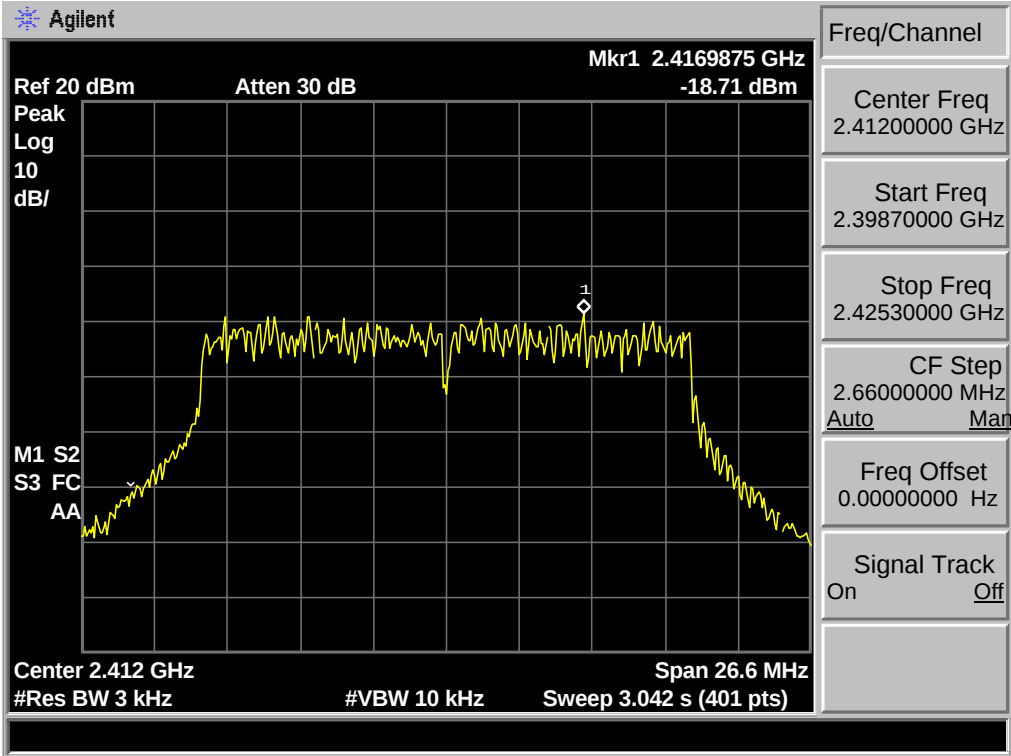
Test Mode: IEEE 802.11g 2437MHz



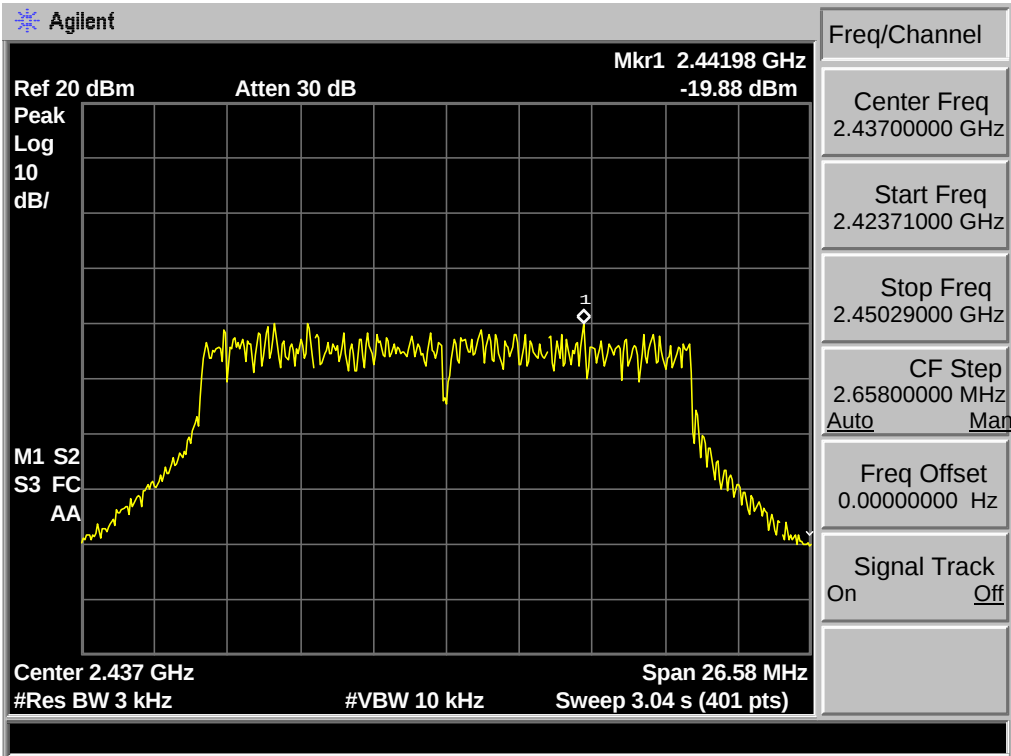
Test Mode: IEEE 802.11g 2462MHz



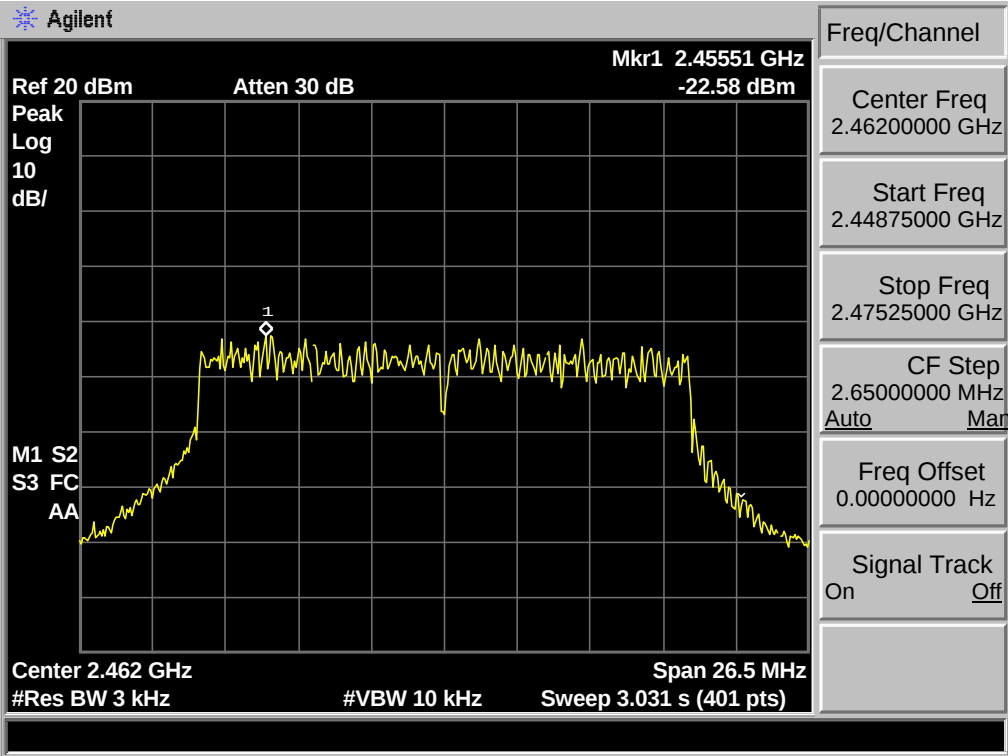
Test Mode: IEEE 802.11n HT20 2412MHz



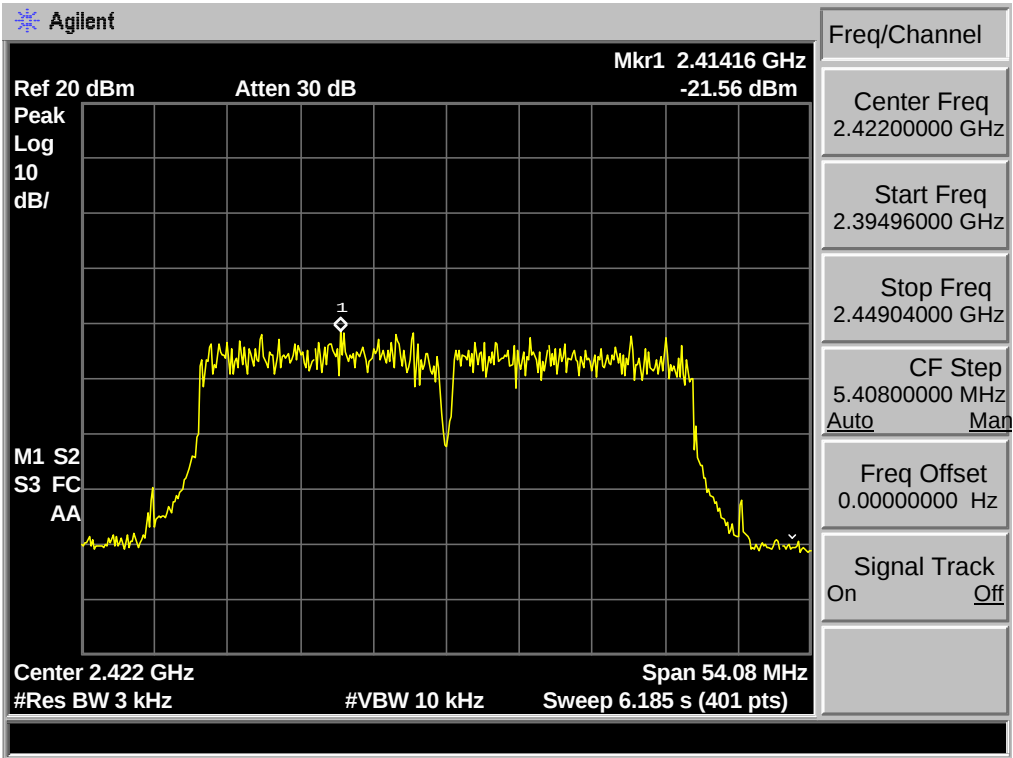
Test Mode: IEEE 802.11n HT20 2437MHz



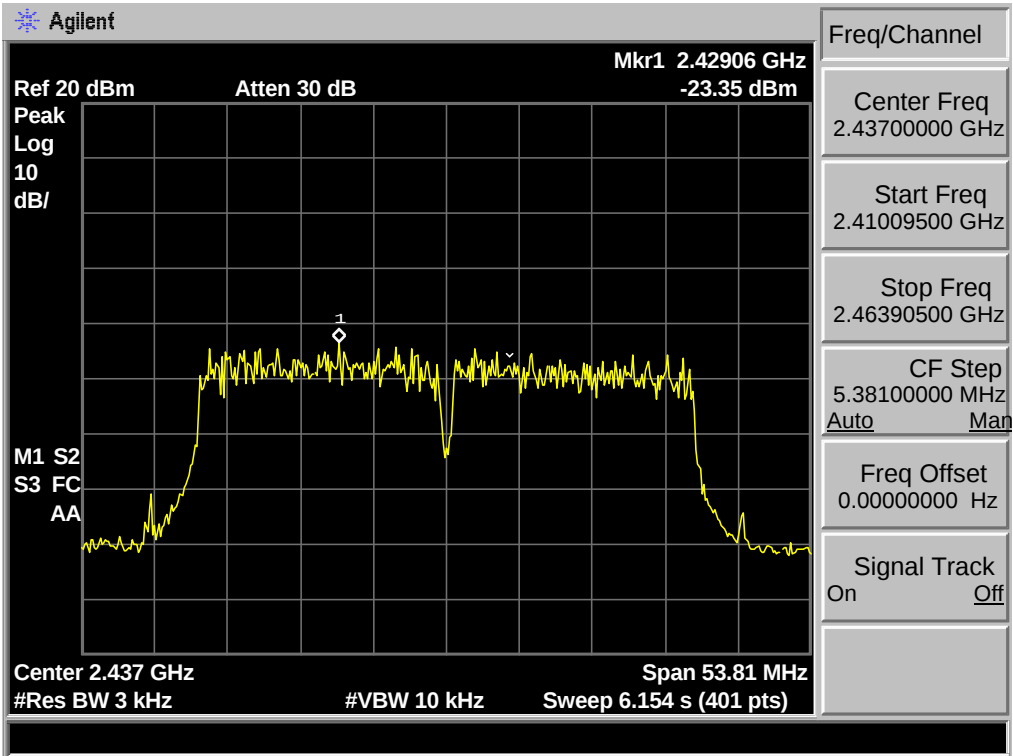
Test Mode: IEEE 802.11n HT20 2462MHz



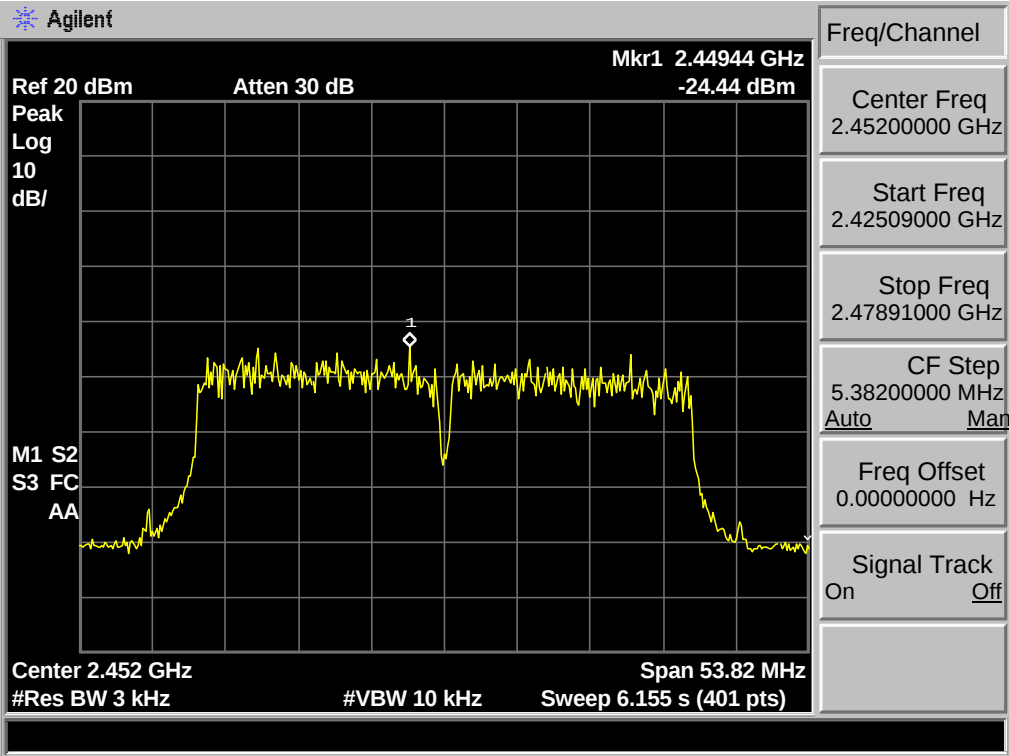
Test Mode: IEEE 802.11n HT40 2422MHz



Test Mode: IEEE 802.11n HT40 2437MHz



Test Mode: IEEE 802.11n HT40 2452MHz



10 ANTENNA REQUIREMENTS

10.1 Limit

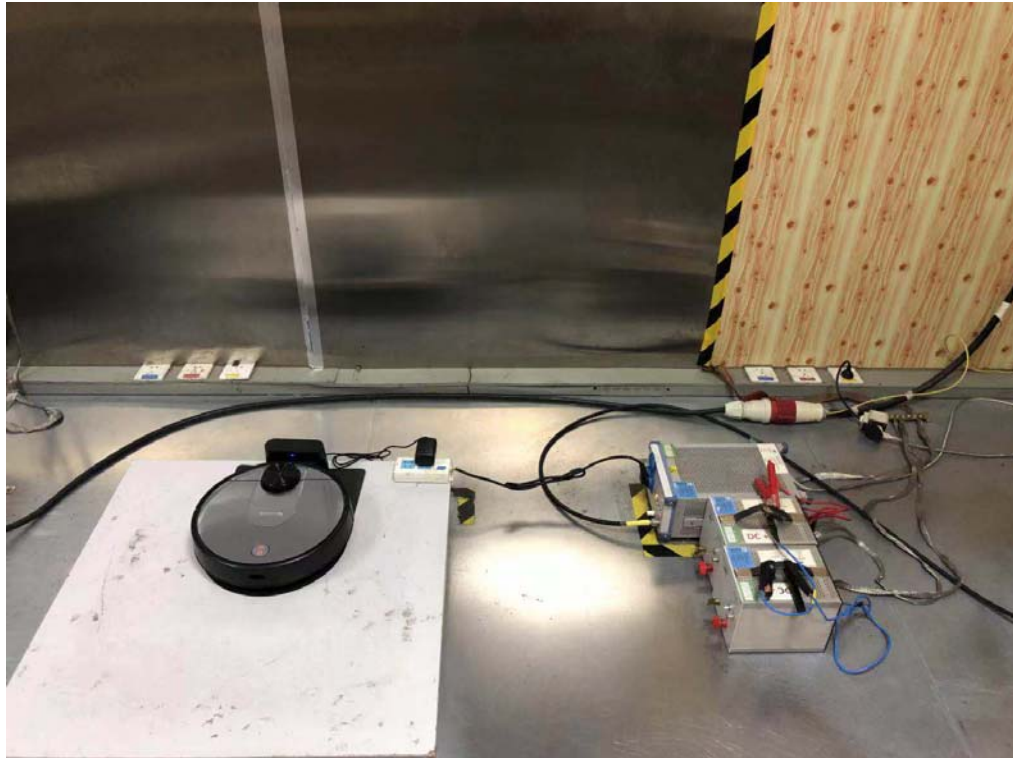
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2 Result

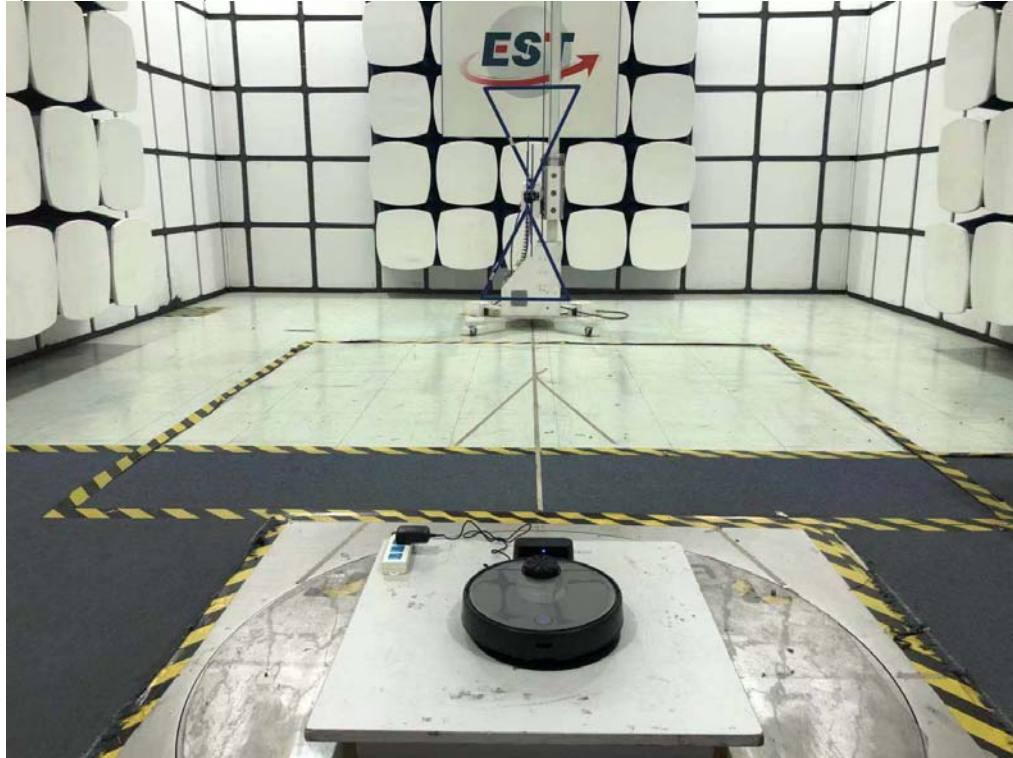
The antennas used for this product are Internal antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1dBi.

11 TEST SETUP PHOTO

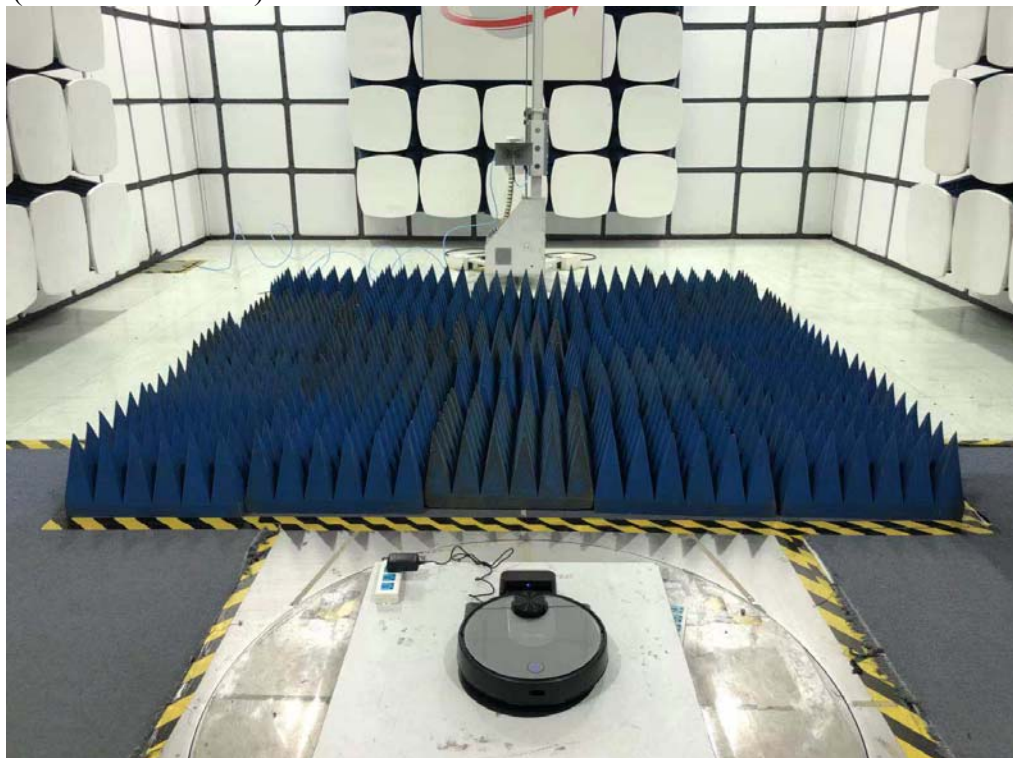
Conducted Test



Radiated Test (30-1000 MHz)

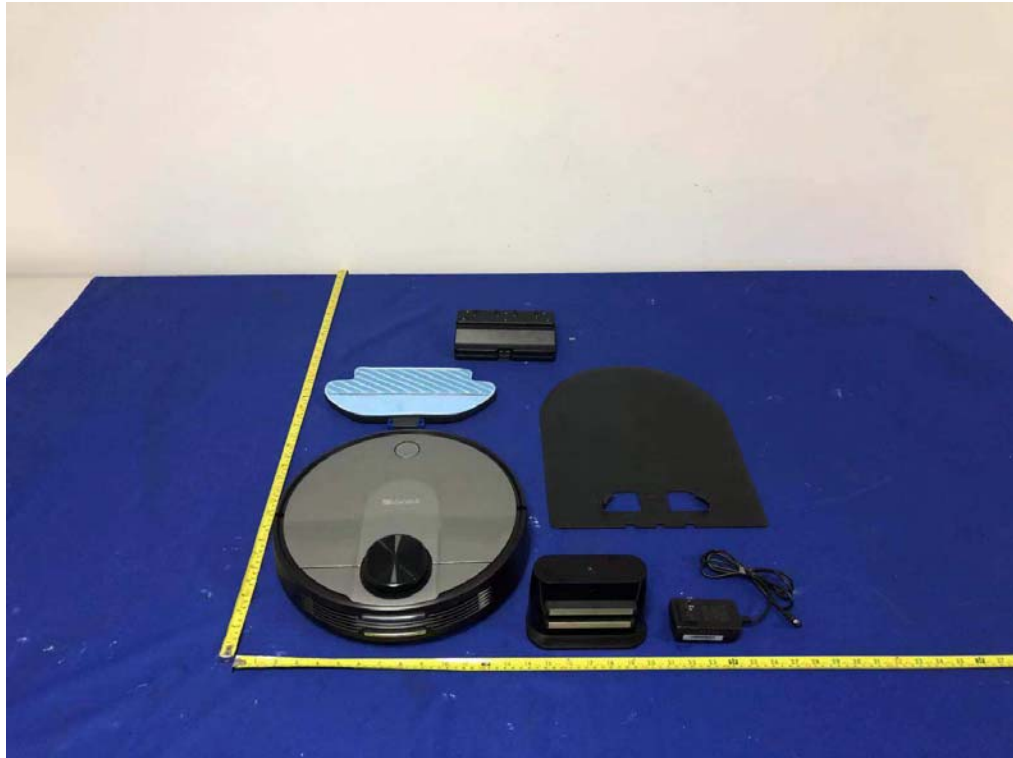


Radiated Test (Above 1000 MHz)

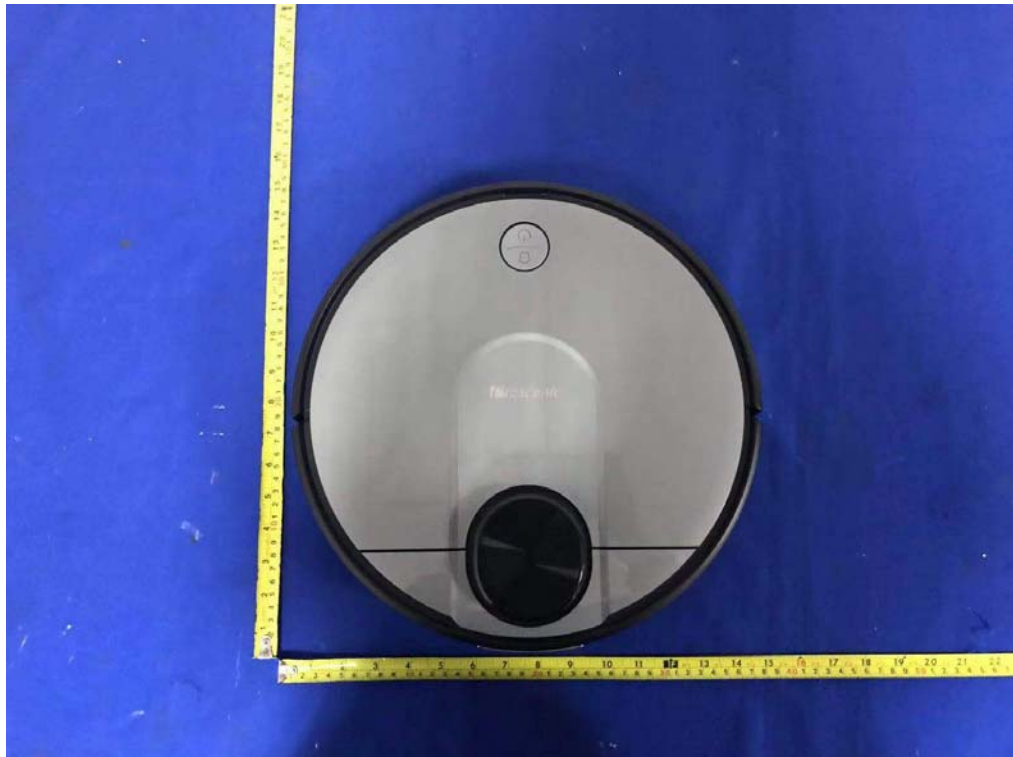


12 PHOTOS OF EUT

External Photos M/N: LDS M7



External Photos
M/N: LDS M7



External Photos
M/N: LDS M7



External Photos
M/N: LDS M7



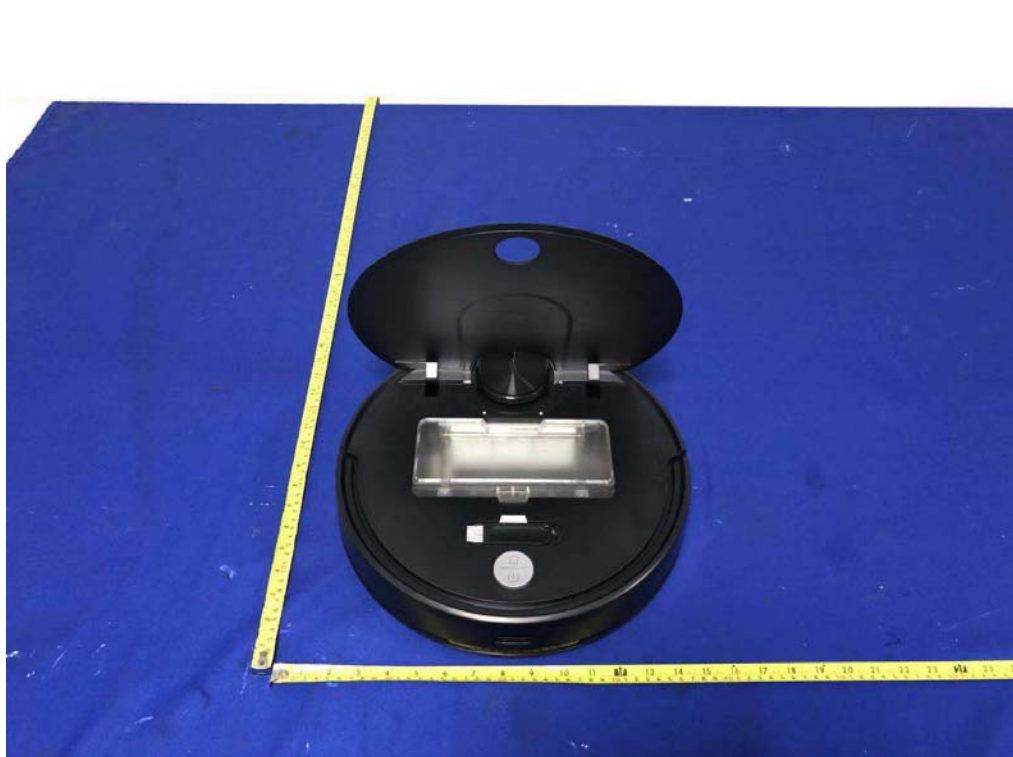
External Photos
M/N: LDS M7



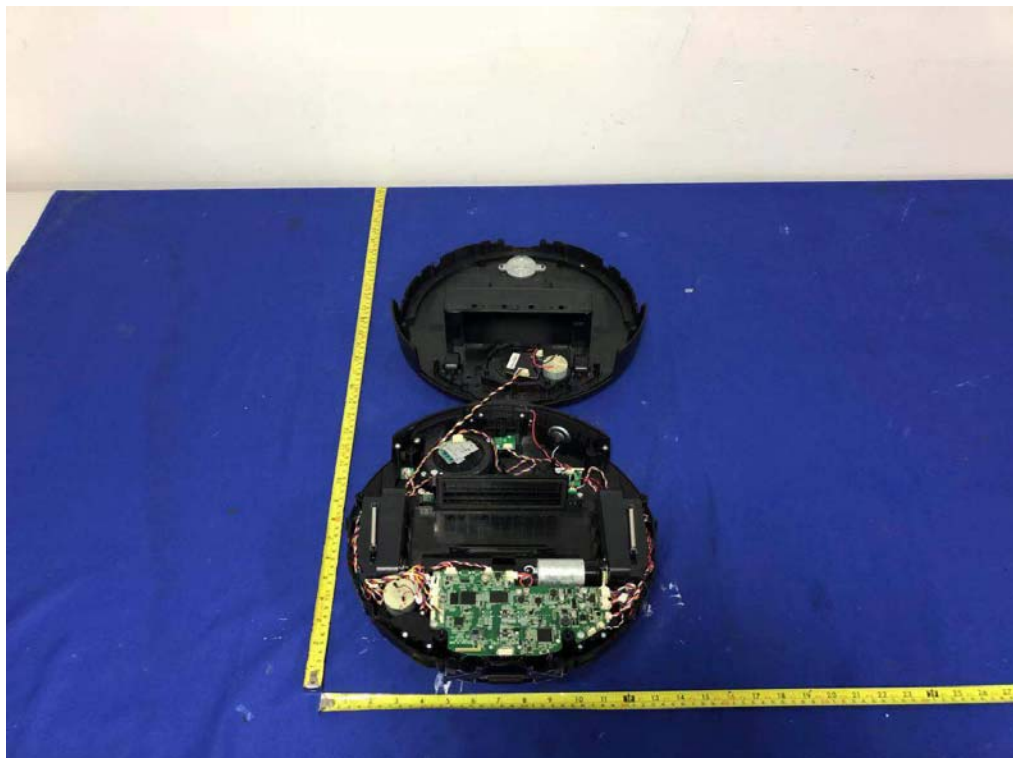
External Photos
M/N: LDS M7



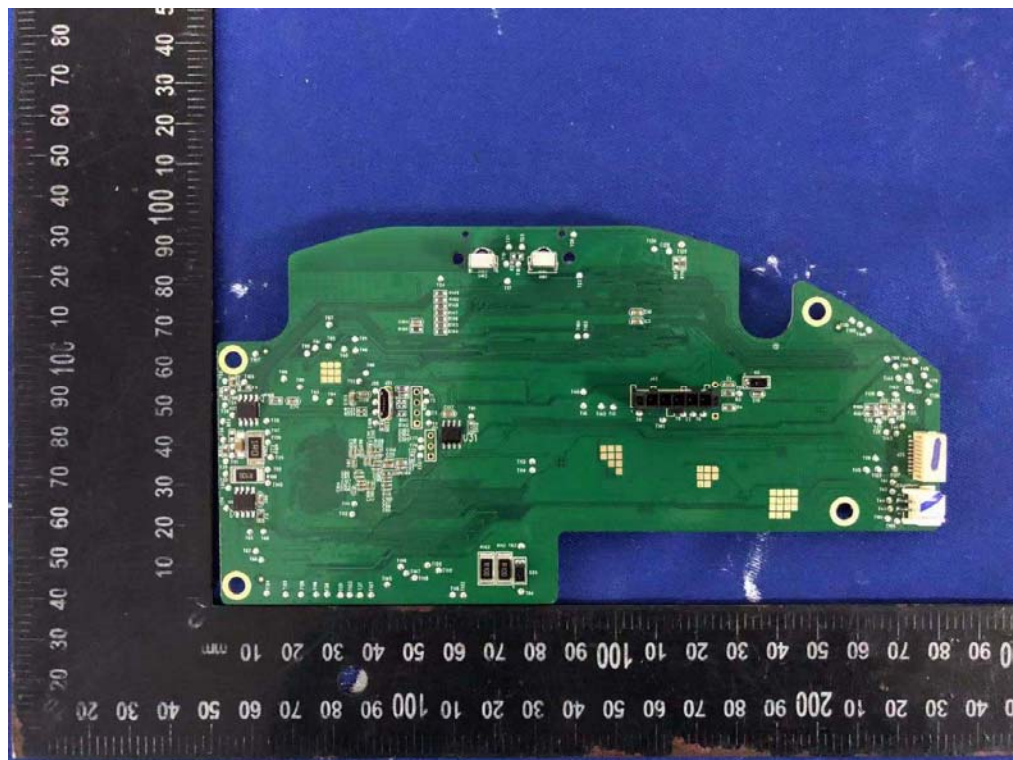
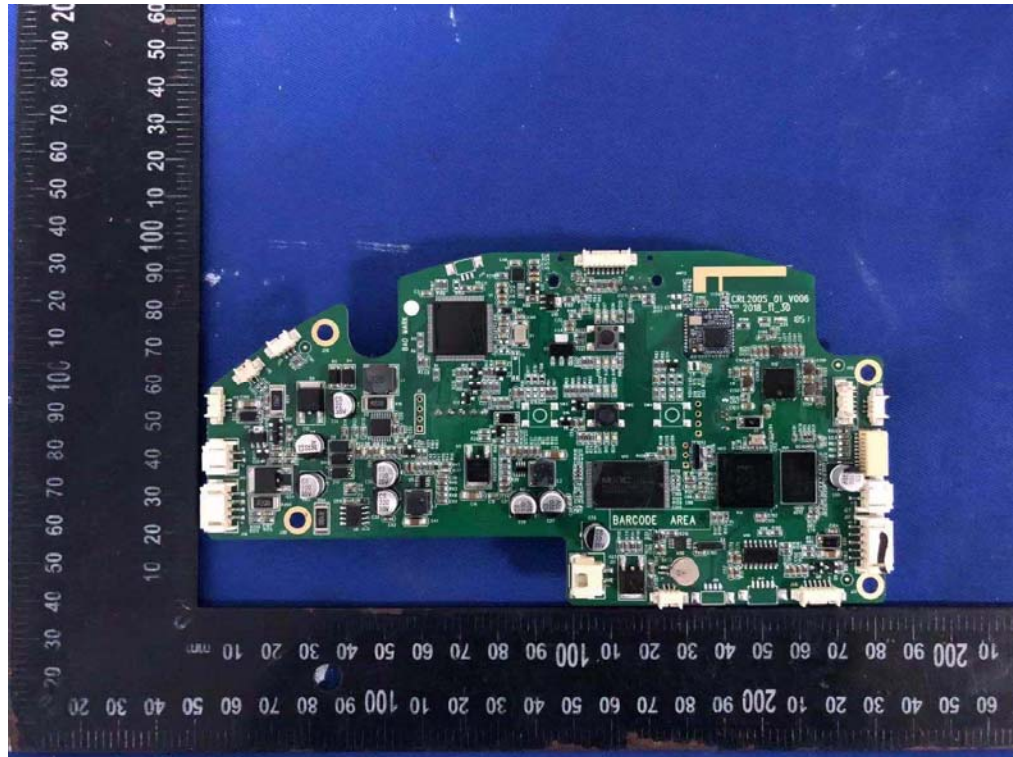
Internal Photos
M/N: LDS M7



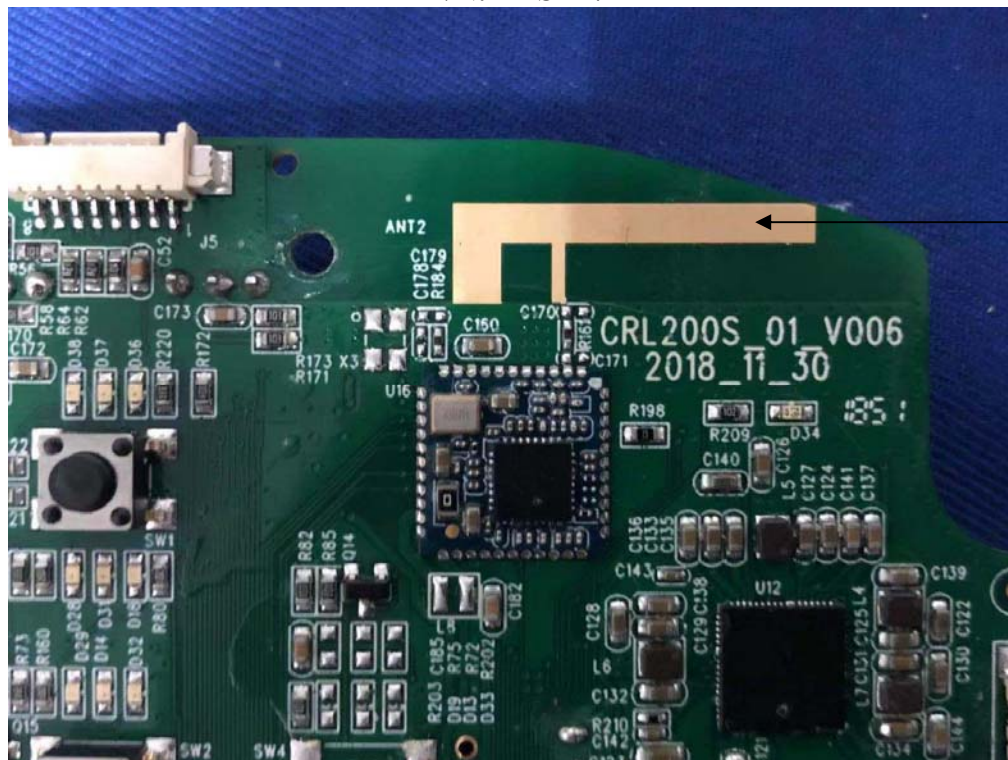
Internal Photos
M/N: LDS M7



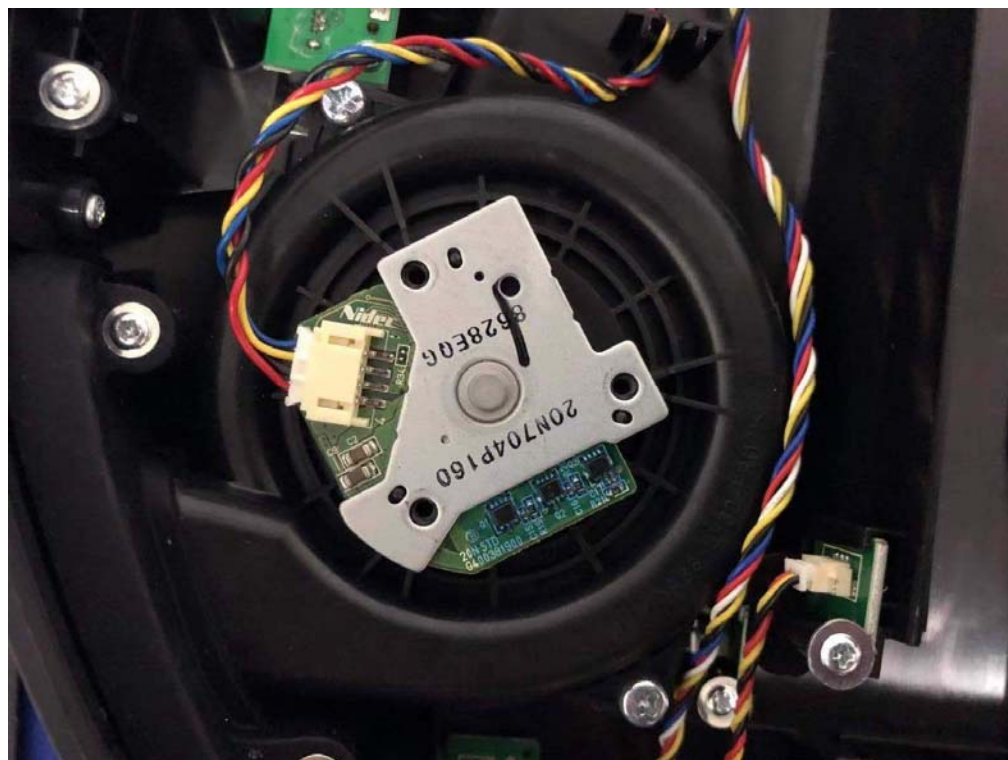
Internal Photos
M/N: LDS M7



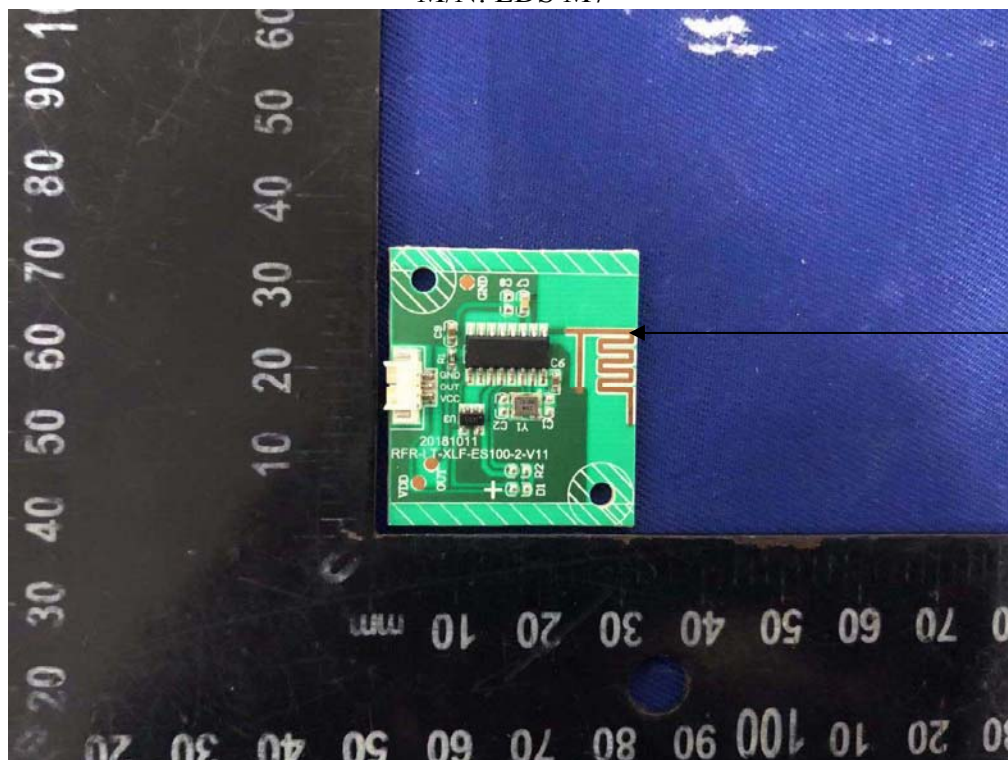
Internal Photos M/N: LDS M7



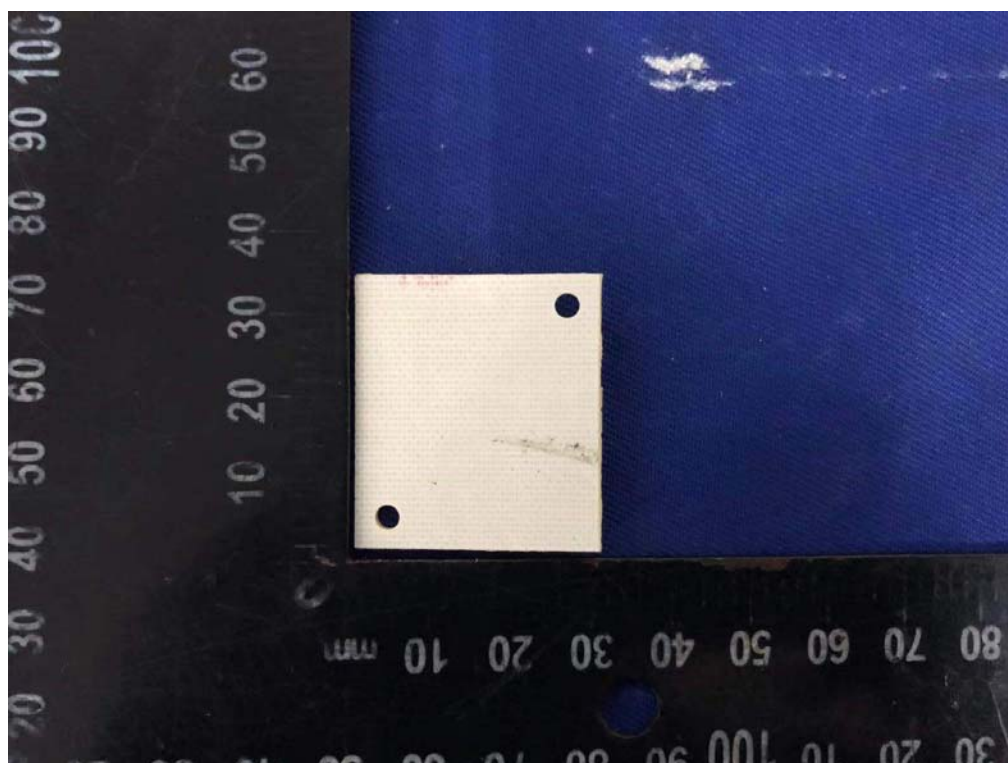
Wi-Fi
Antenna



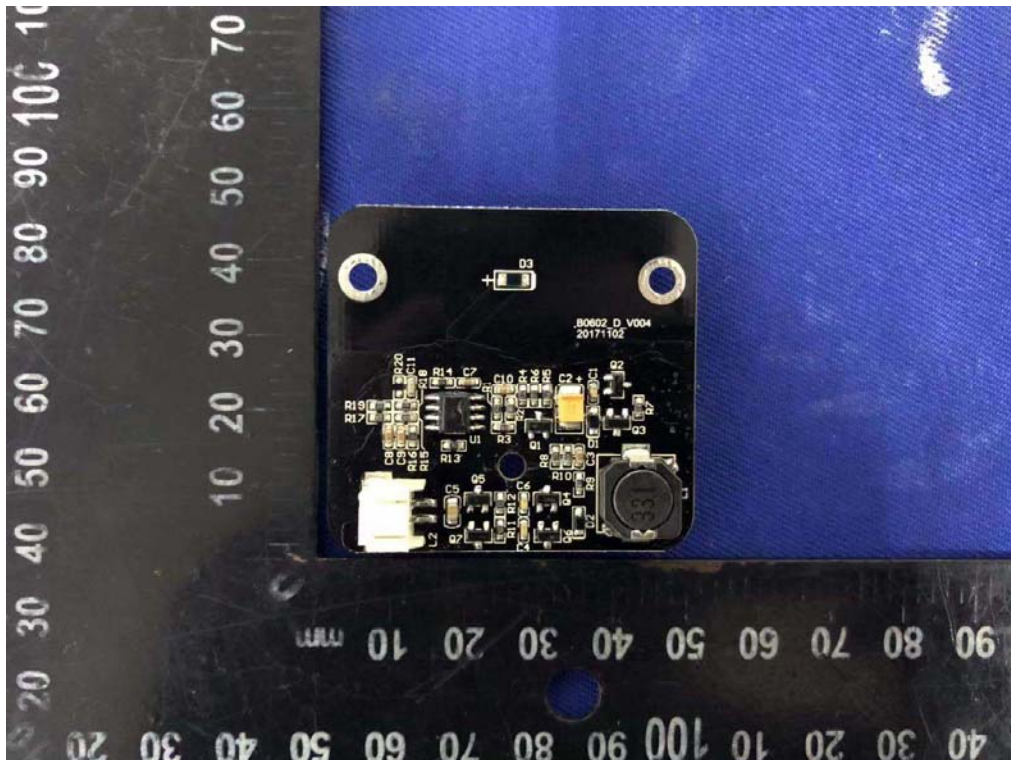
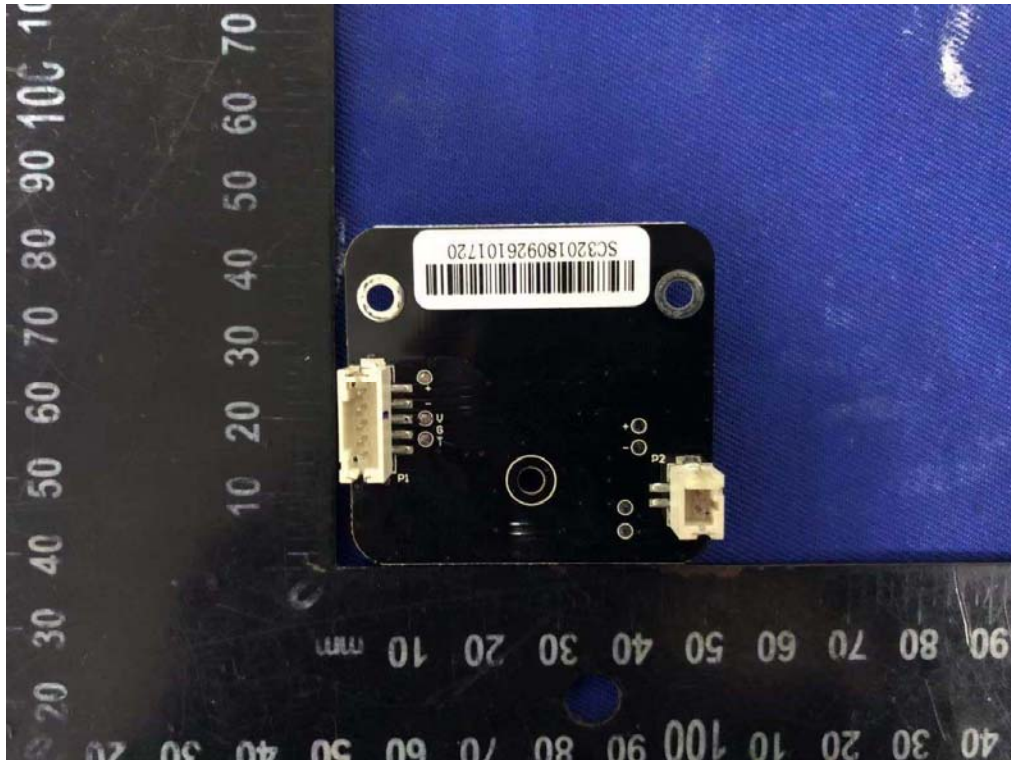
Internal Photos
M/N: LDS M7



2.4G RX
Antenna



Internal Photos
M/N: LDS M7



Internal Photos
M/N: LDS M7

