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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

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

1.2. Report version

Revised No.	Date of issue	Description
01	Jun. 03, 2020	Original

1.3. Test Description

FCC Part 15 Subpart C(15.247)			
Test Item	Standard Section	Result	Test Engineer
	FCC		
Antenna Requirement	15.203	Pass	Emiya Lin
Conducted Emission	15.207	Pass	Emiya Lin
6dB&99% Bandwidth	15.247(a)(2)	Pass	Emiya Lin
Peak Output Power	15.247(b)	Pass	Emiya Lin
Power Spectral Density	15.247(e)	Pass	Emiya Lin
Restricted Band	15.247(d)/15.205	Pass	Emiya Lin
Band Edge and Spurious Emission(Conducted)	15.247(d)	Pass	Emiya Lin
Spurious Emission(Radiated)	15.247(d)&15.209	Pass	Emiya Lin

Note: The measurement uncertainty is not included in the test result.

1.4. Test Facility

Address of the report laboratory

KSIGN(Guangdong) Testing Co., Ltd.

West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu,Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Laboratory accreditation

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

CNAS-Lab Code: L13261
KSIGN(Guangdong) Testing Co., Ltd. has been assessed and proved to be in Compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 5457.01
KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: CN0096
The 3m alternate test site of KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: CN0096

FCC-Registration No.: CN1272
KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the KSIGN(Guangdong) Testing Co., Ltd. system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Below is the best measurement capability for KSIGN(Guangdong) Testing Co., Ltd.

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth	2.80 dB	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

1.6. Environmental conditions

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

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Dongguan Fuzhaotong Electronic Co.,Ltd.
Address:	No.58, Yangkeng Road, Qiaoli, ChangpingTown, Dongguan City, Guangdong Province, P.R.China
Manufacturer:	Dongguan Fuzhaotong Electronic Co.,Ltd.
Address:	No.58, Yangkeng Road, Qiaoli, ChangpingTown, Dongguan City, Guangdong Province, P.R.China

2.2. General Description of EUT

Product Name:	Smart vacuum cleaner
Model/Type reference:	F6S
Marketing Name:	N/A
Listed Model(s):	F6, F8S, E3, E3S, E300, E320, E330, E6, E6S, E600, E660, E670, E680
Model Difference:	The difference between product models only depends on the model naming, appearance color, with or without WiFi and voice are different for the marketing requirement. Other power supply methods, interior structure, electrical circuits and key components are the same, which do not affect the safety and electromagnetic compatibility performance.
Power supply(Adapter 1):	MODEL: YNQX12G120100UL INPUT: 100-240V~ 50/60Hz 0.3A OUTPUT: 12.0V⎓1.0A 12.0W
Power supply(Adapter 2):	MODEL: KA1201A-1201000US INPUT: 100-240V~ 50/60Hz 0.4A Max OUTPUT: 12V⎓1000mA
Power supply(Battery):	DC 7.4V 2600mAh
Hardware version:	REV_V1.2
Software version:	F6S_V0.19
WIFI	
Modulation:	802.11b: DSSS(CCK, DQPSK, DBPSK) 802.11g/n: OFDM(BPSK,QPSK,16QAM,64QAM)
Operation frequency:	802.11b/g/n(HT20): 2412MHz~2462MHz 80211n(HT40): 2422MHz~2452MHz
Max Peak Output Power:	802.11b: 13.21dBm 802.11g: 11.87dBm 802.11n (HT20): 9.80dBm 802.11n (HT40): 10.17dBm
Channel number:	802.11b/g/n(HT20):11 channels 80211n(HT40): 7 channels
Test frequency:	CH01/03: 2412M/2422MHz; CH06: 2437MHz; CH09/11: 2452M/2462MHz
Channel separation:	5MHz
Antenna type:	PCB Antenna
Antenna gain:	2.5dBi

2.3. Operation state

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

Operation Frequency List:

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

Note: 1.CH 01~CH 11 for 802.11b/g/n(HT20/HT40), CH03~CH09 for 802.11n(HT40).
2.The display in grey were the channel selected for testing.

Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).
For AC power line conducted emissions:
The EUT was set to connect with the WLAN AP under large package sizes transmission.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit(duty cycle>98%). The EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

2.4. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2021
2	Vector Signal Generator	Agilent	N5182A	MY50142520	04/07/2021
3	Analog Signal Generator	HP	83752A	3344A00337	04/07/2021
4	Power Sensor	Agilent	E9304A	MY50390009	04/07/2021
5	Power Sensor	Agilent	E9300A	MY41498315	04/07/2021
6	Wideband Radio Communication Tester	R&S	CMW500	157282	04/07/2021
7	Climate Chamber	Angul	AGNH80L	1903042120	04/07/2021
8	Dual Output DC Power Supply	Agilent	E3646A	MY40009992	04/07/2021
9	RF Control Unit	Tonscend	JS0806-2	/	04/07/2021

Transmitter spurious emissions & Receiver spurious emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	EMI Test Receiver	R&S	ESR	102525	04/07/2021
2	High Pass Filter	Chengdu E-Microwave	OHF-3-18-S	0E01901038	03/27/2021
3	High Pass Filter	Chengdu E-Microwave	OHF-6.5-18-S	0E01901039	03/27/2021
4	Spectrum Analyzer	HP	8593E	3831U02087	04/07/2021
5	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	03/29/2023
6	Loop Antenna	Beijin ZHINAN	ZN30900C	18050	03/25/2021
7	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2021
8	Horn Antenna	Schwarzbeck	BBHA 9120 D	2023	03/29/2023
9	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	04/07/2021
10	Pre-Amplifier	EMCI	EMC051835SE	980662	04/07/2021

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV432	1326.6105.02	03/27/2021
2	EMI Test Receiver	R&S	ESR	102524	04/07/2021
3	Manual RF Switch	JS TOYO	/	MSW-01/002	04/07/2021

Note:
1)The Cal. Interval was one year.
2)The cable loss has calculated in test result which connection between each test instruments.

2.5. Test Software

Software name	Model	Version
Conducted emission Measurement Software	EZ-EMC	EMC-Con 3A1.1
Radiated emission Measurement Software	EZ-EMC	FA-03A.2.RE
Bluetooth and WIFI Test System	JS1120-3	2.5.77.0418

3. TEST ITEM AND RESULTS

3.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.

3.2. Conducted Emission

Limit

Conducted Emission Test Limit

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

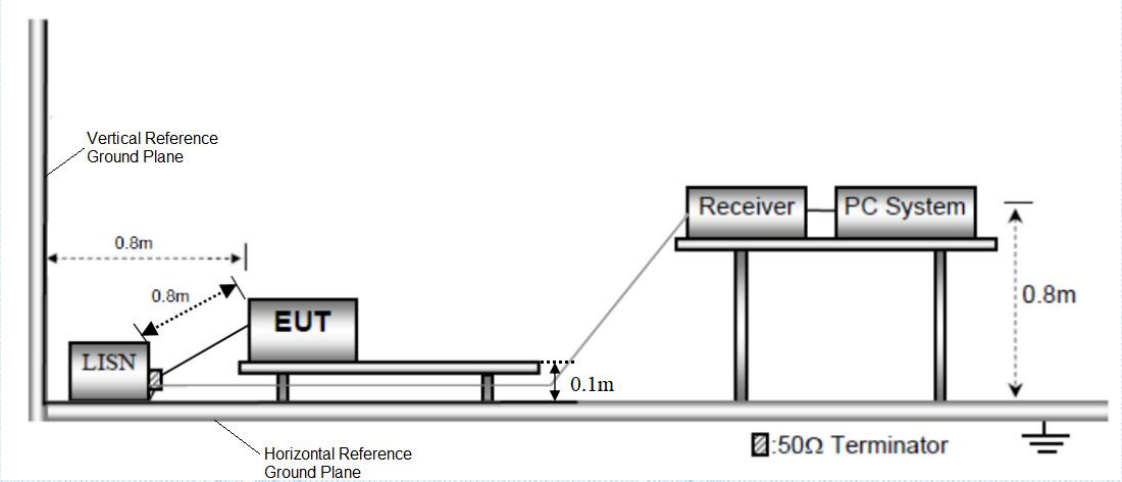
Notes:

(1) *Decreasing linearly with logarithm of the frequency.

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

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Configuration



Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 0.1m above the conducting ground plane. The vertical conducting plane was located 80 cm to the rear of the EUT. All other surfaces of EUT were at least 0.8m from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment.
   The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

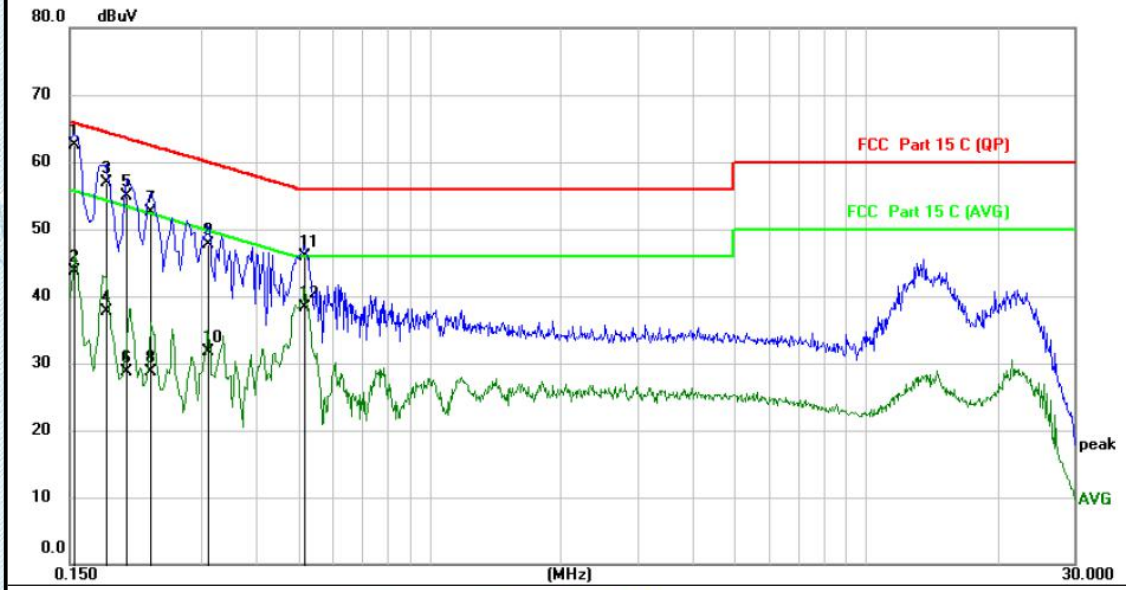
Test Mode:

Please refer to the clause 2.3.

Test Results

Pre-scan 802.11b/g/n(HT20/HT40) modulation, and found the 802.11b modulation 2412MHz which it is worse case, so only show the test data for worse case.

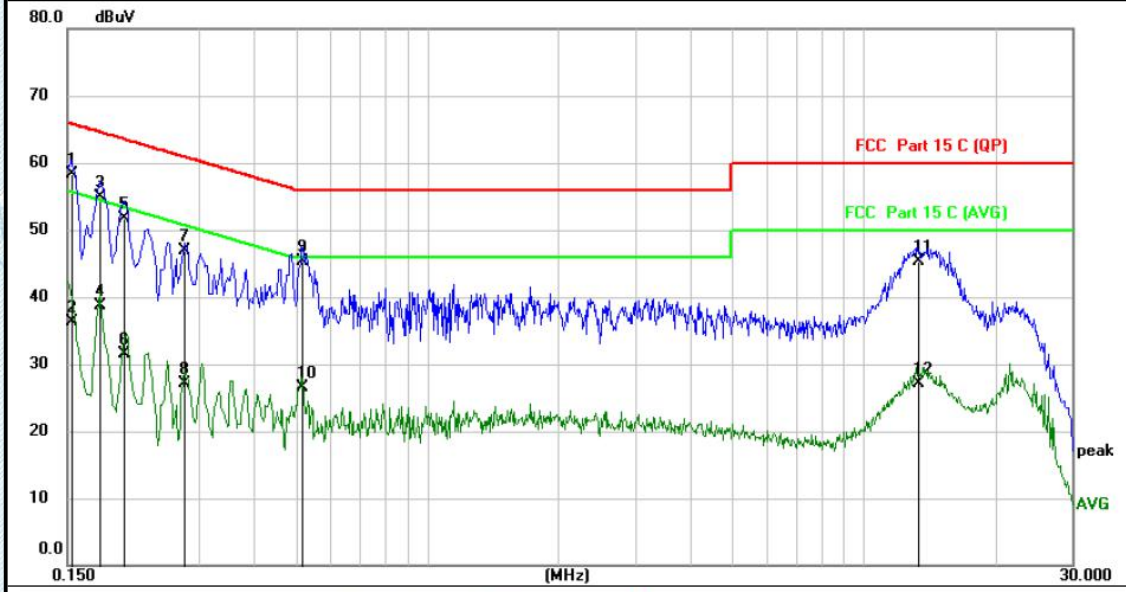
Test Voltage:	AC 120V/60 Hz
Terminal:	Line
Test Mode:	Charging+WIFI (Adapter 1)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	51.69	10.82	62.51	65.79	-3.28	QP
2		0.1539	32.87	10.82	43.69	55.79	-12.10	AVG
3		0.1819	45.98	10.86	56.84	64.40	-7.56	QP
4		0.1819	26.75	10.86	37.61	54.40	-16.79	AVG
5		0.2020	44.08	10.88	54.96	63.53	-8.57	QP
6		0.2020	17.74	10.88	28.62	53.53	-24.91	AVG
7		0.2300	41.57	10.88	52.45	62.45	-10.00	QP
8		0.2300	17.74	10.88	28.62	52.45	-23.83	AVG
9		0.3116	36.72	10.89	47.61	59.93	-12.32	QP
10		0.3116	20.73	10.89	31.62	49.93	-18.31	AVG
11		0.5180	35.04	10.91	45.95	56.00	-10.05	QP
12		0.5180	27.49	10.91	38.40	46.00	-7.60	AVG

Remarks:
1.Measurement = Reading Level+ Correct Factor
2.Over = Measurement -Limit

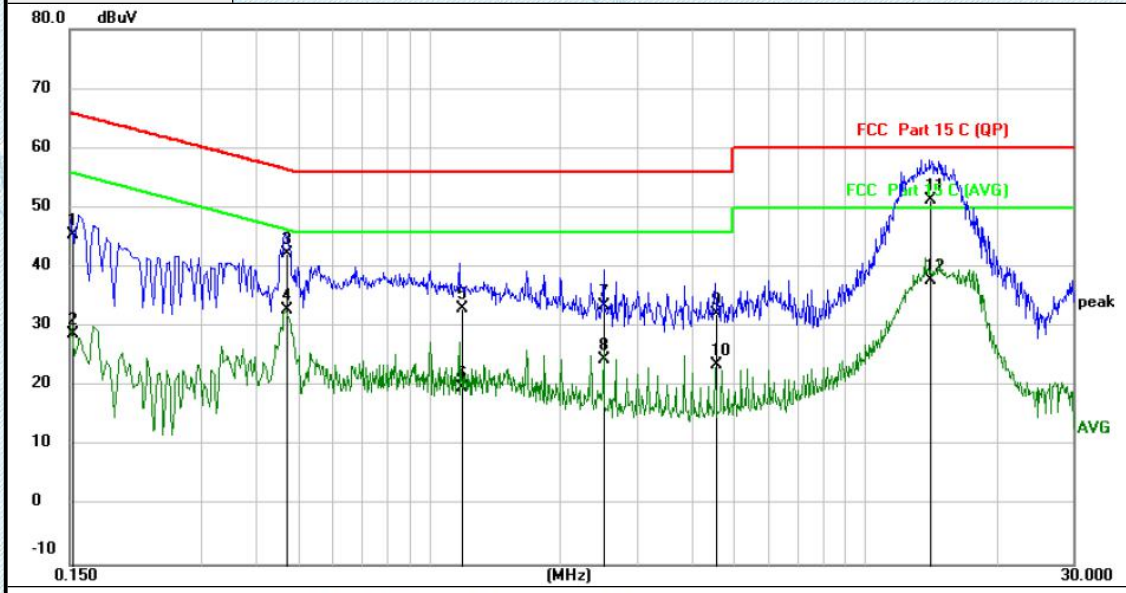
Test Voltage:	AC 120V/60 Hz
Terminal:	Neutral
Test Mode:	Charging+WIFI (Adapter 1)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	47.53	10.83	58.36	65.79	-7.43	QP
2		0.1539	25.52	10.83	36.35	55.79	-19.44	AVG
3		0.1780	43.99	10.86	54.85	64.58	-9.73	QP
4		0.1780	27.76	10.86	38.62	54.58	-15.96	AVG
5		0.2020	40.87	10.88	51.75	63.53	-11.78	QP
6		0.2020	20.64	10.88	31.52	53.53	-22.01	AVG
7		0.2779	35.99	10.85	46.84	60.88	-14.04	QP
8		0.2779	16.29	10.85	27.14	50.88	-23.74	AVG
9		0.5180	34.44	10.88	45.32	56.00	-10.68	QP
10		0.5180	15.64	10.88	26.52	46.00	-19.48	AVG
11		13.3060	34.45	10.91	45.36	60.00	-14.64	QP
12		13.3060	16.24	10.91	27.15	50.00	-22.85	AVG

Remarks:
1.Measurement = Reading Level+ Correct Factor
2.Over = Measurement -Limit

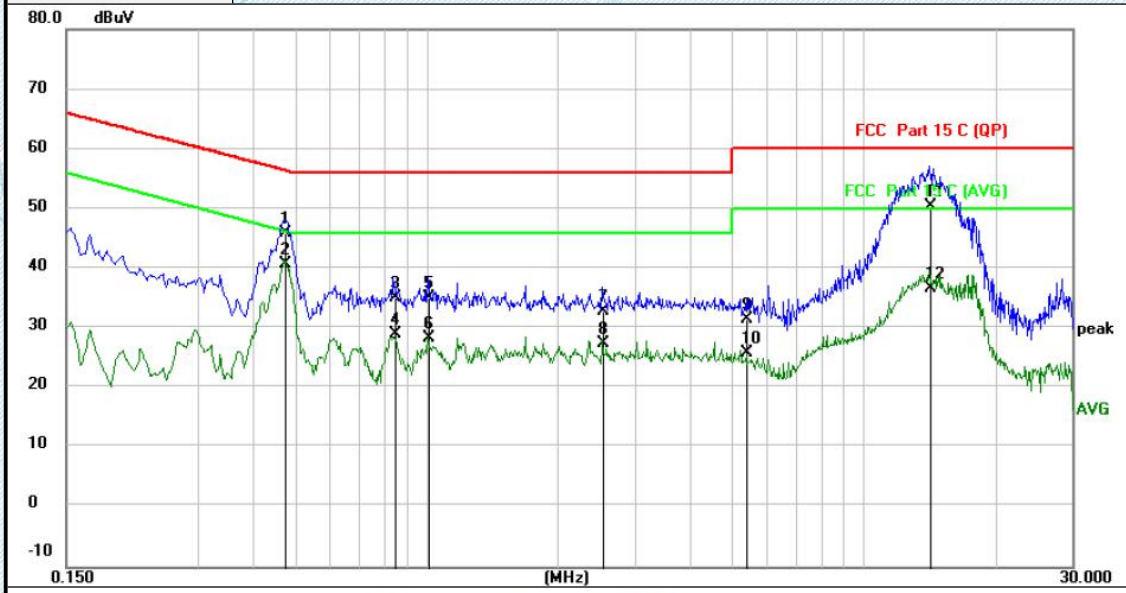
Test Voltage:	AC 120V/60 Hz
Terminal:	Line
Test Mode:	Charging+WIFI (Adapter 2)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1516	34.73	10.82	45.55	65.91	-20.36	QP
2		0.1516	17.95	10.82	28.77	55.91	-27.14	AVG
3		0.4711	31.43	10.91	42.34	56.49	-14.15	QP
4		0.4711	21.86	10.91	32.77	46.49	-13.72	AVG
5		1.1859	22.32	10.87	33.19	56.00	-22.81	QP
6		1.1859	8.84	10.87	19.71	46.00	-26.29	AVG
7		2.5183	22.68	10.91	33.59	56.00	-22.41	QP
8		2.5183	13.61	10.91	24.52	46.00	-21.48	AVG
9		4.5371	21.24	10.98	32.22	56.00	-23.78	QP
10		4.5371	12.56	10.98	23.54	46.00	-22.46	AVG
11	*	14.1068	40.35	10.99	51.34	60.00	-8.66	QP
12		14.1068	26.74	10.99	37.73	50.00	-12.27	AVG

Remarks:
1.Measurement = Reading Level+ Correct Factor
2.Over = Measurement -Limit

Test Voltage:	AC 120V/60 Hz
Terminal:	Neutral
Test Mode:	Charging+WIFI (Adapter 2)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.4749	35.14	10.88	46.02	56.43	-10.41	QP
2	*	0.4749	29.86	10.88	40.74	46.43	-5.69	AVG
3		0.8440	24.32	10.88	35.20	56.00	-20.80	QP
4		0.8440	18.11	10.88	28.99	46.00	-17.01	AVG
5		1.0122	24.23	10.87	35.10	56.00	-20.90	QP
6		1.0122	17.41	10.87	28.28	46.00	-17.72	AVG
7		2.5326	21.93	10.91	32.84	56.00	-23.16	QP
8		2.5326	16.57	10.91	27.48	46.00	-18.52	AVG
9		5.3993	20.55	10.97	31.52	60.00	-28.48	QP
10		5.3993	14.96	10.97	25.93	50.00	-24.07	AVG
11		14.1684	39.55	10.91	50.46	60.00	-9.54	QP
12		14.1684	25.74	10.91	36.65	50.00	-13.35	AVG

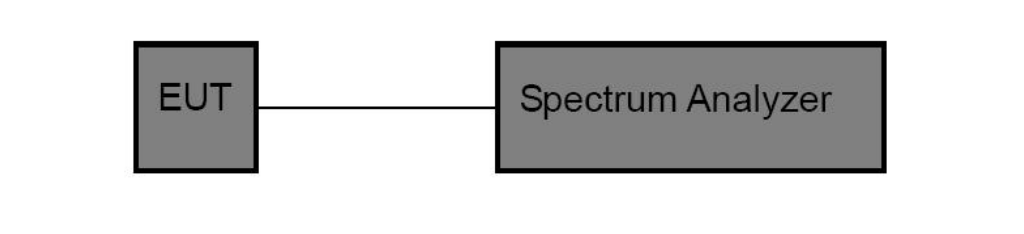
Remarks:
1.Measurement = Reading Level+ Correct Factor
2.Over = Measurement -Limit

3.3. Bandwidth

Limit

Test Item	Limit	Frequency Range(MHz)
Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. Spectrum Setting:

6db Bandwidth

(1) Set RBW = 100 kHz.
(2) Set the video bandwidth (VBW) ≥ 3 RBW.
(3) Detector = Peak.
(4) Trace mode = Max hold.
(5) Sweep = Auto couple.

99% Bandwidth

(1) Set RBW = 500 kHz.
(2) Set the video bandwidth (VBW) =2MHz.
(3) Detector = Peak.
(4) Trace mode = Max hold.
(5) Sweep = Auto couple.

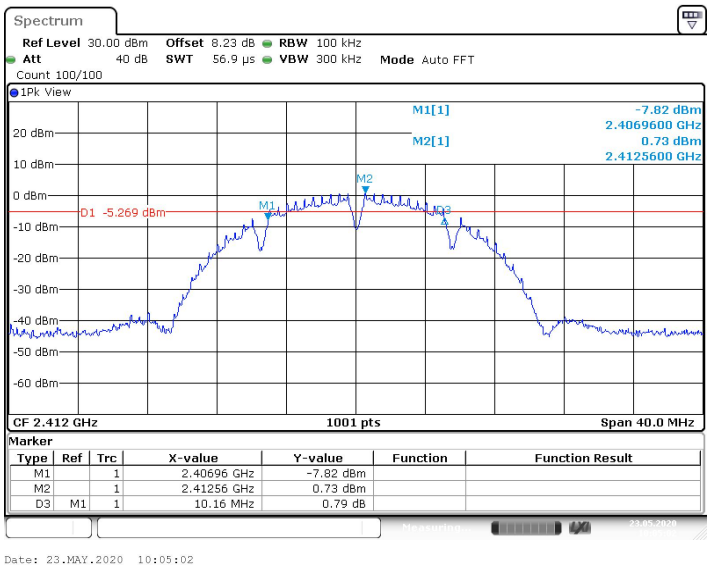
NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

Test Mode

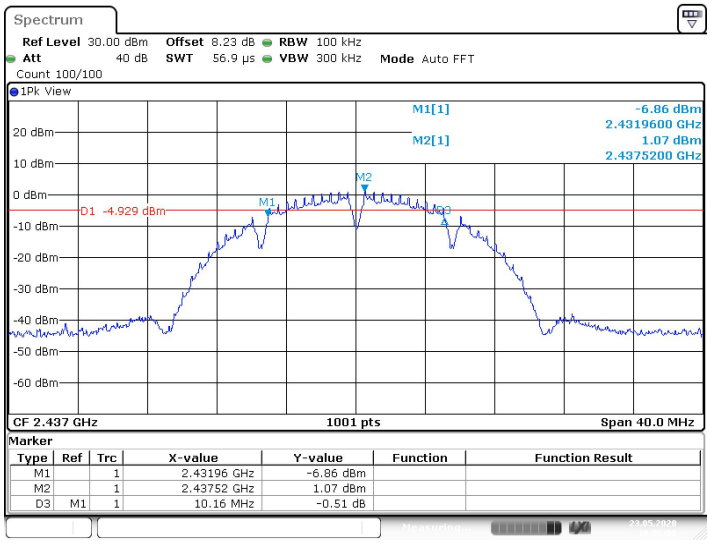
Please refer to the clause 2.3.

Test Results

Test Mode:	802.11b Mode	
Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
2412	10.160	>=0.5
2437	10.160	
2462	10.160	
2412 MHz		



2437 MHz



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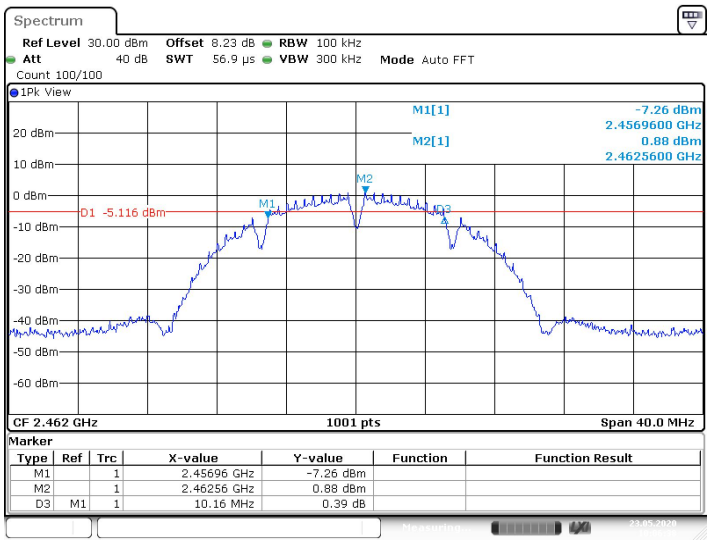
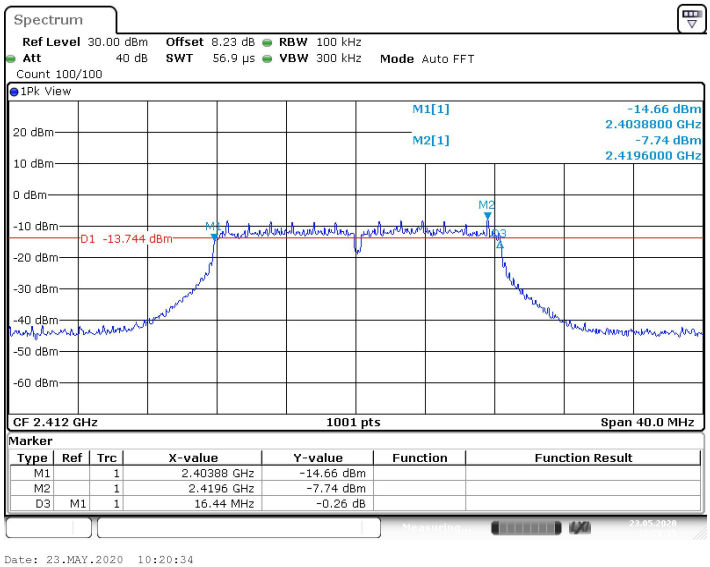
2462 MHz

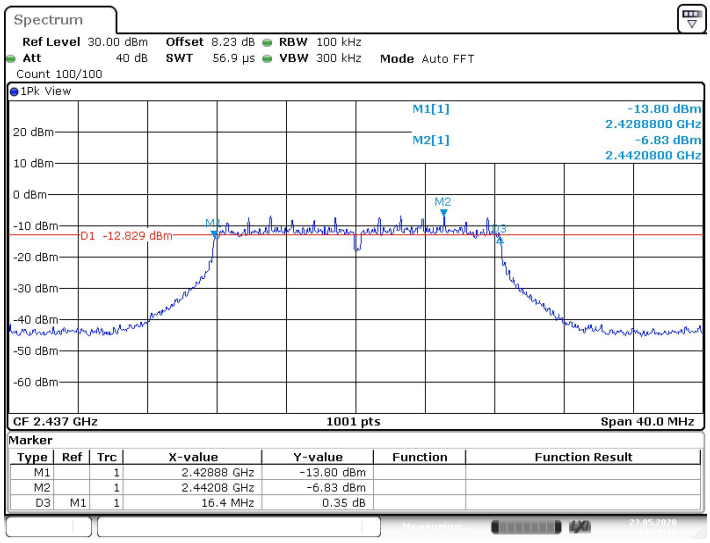


Date: 23.MAY.2020 10:06:38

Test Mode:	802.11g Mode	
Channel frequency (MHz)	**6dB Bandwidth (MHz)**	**Limit (MHz)**
2412	16.440	>=0.5
2437	16.400	
2462	16.400	
2412 MHz		

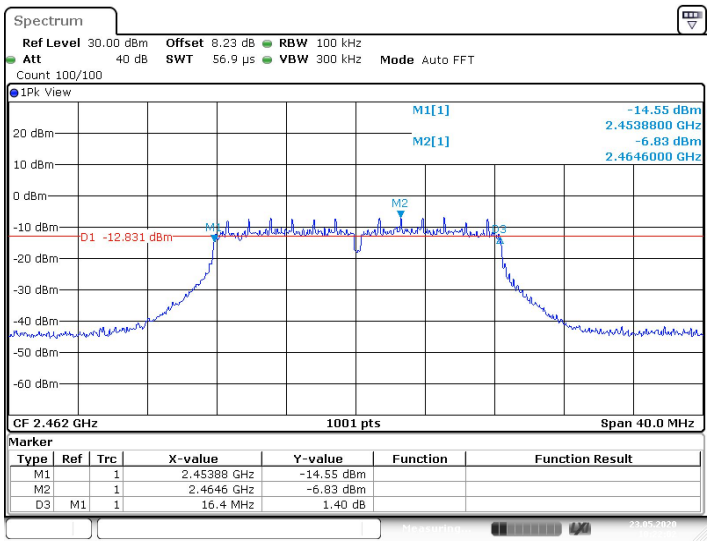


2437 MHz



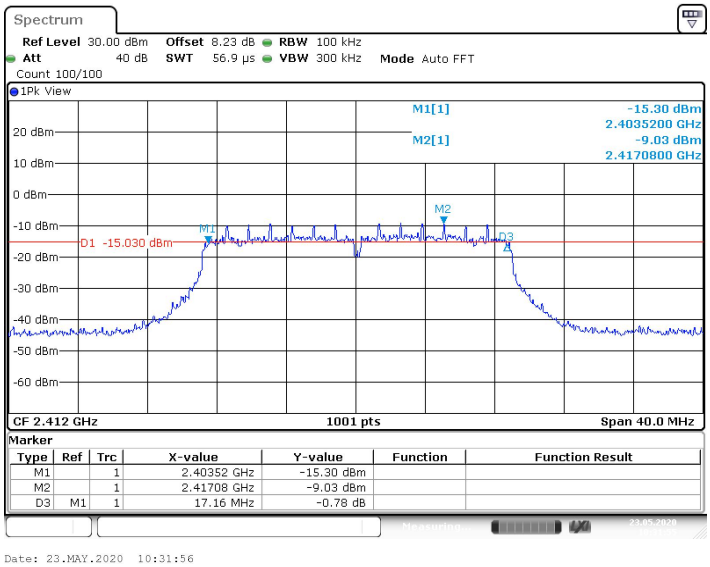
Date: 23.MAY.2020 10:21:15

2462 MHz

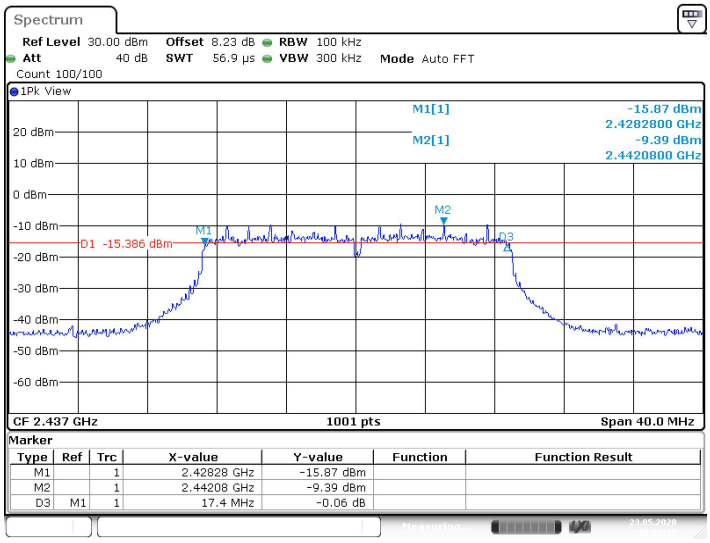


Date: 23.MAY.2020 10:22:01

Test Mode:	802.11n(HT20) Mode	
Channel frequency (MHz)	**6dB Bandwidth (MHz)**	**Limit (MHz)**
2412	17.160	>=0.5
2437	17.400	
2462	17.400	
2412 MHz		

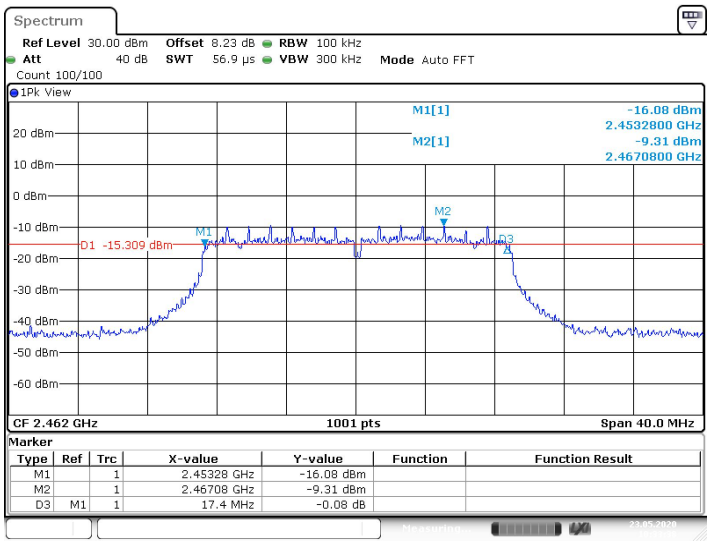


2437 MHz



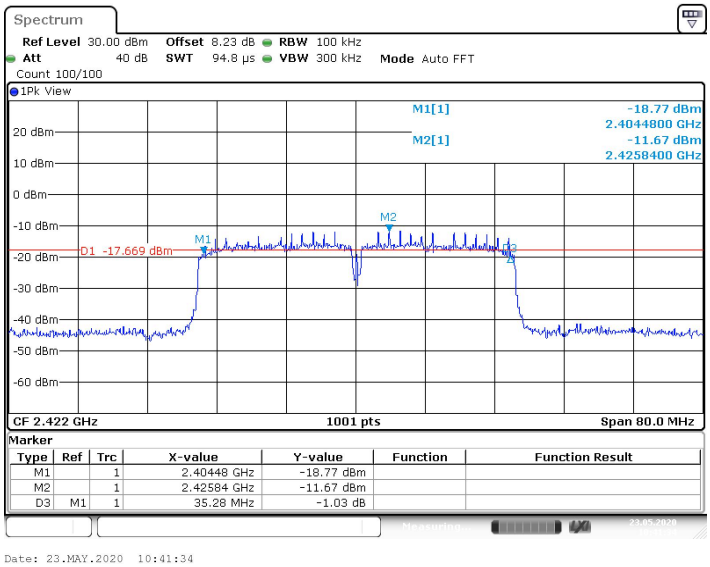
Date: 23.MAY.2020 10:32:35

2462 MHz

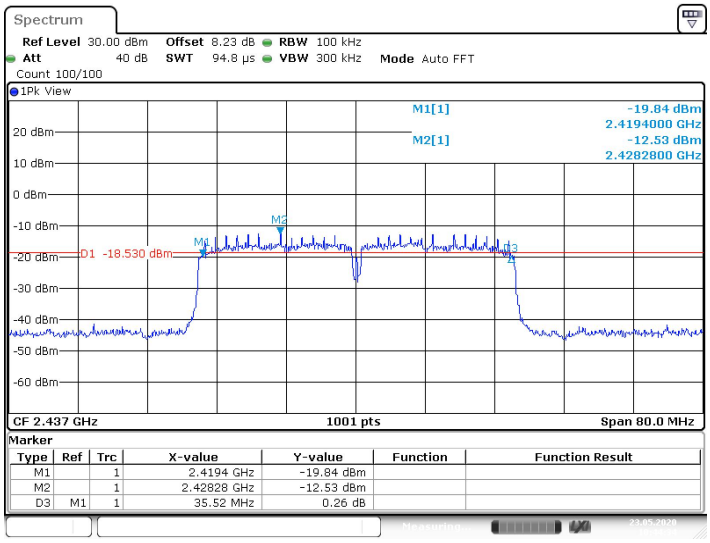


Date: 23.MAY.2020 10:33:39

Test Mode:	802.11n(HT40) Mode	
Channel frequency (MHz)	**6dB Bandwidth (MHz)**	**Limit (MHz)**
2422	35.280	>=0.5
2437	35.520	
2452	35.360	
2422 MHz		

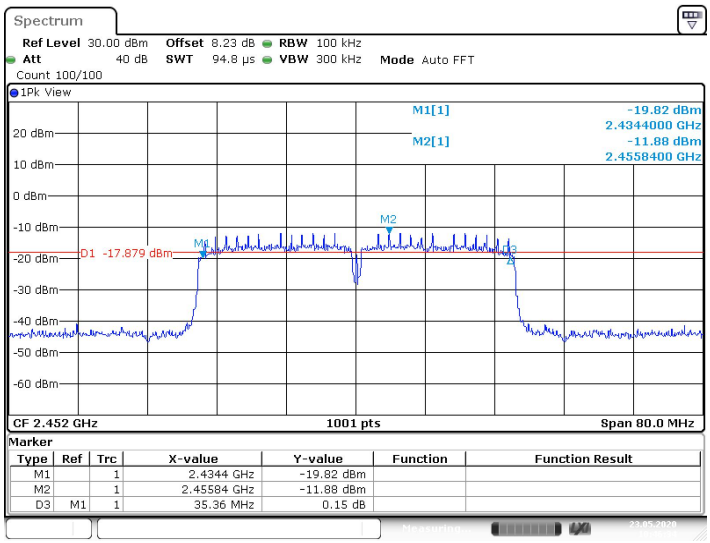


2437 MHz



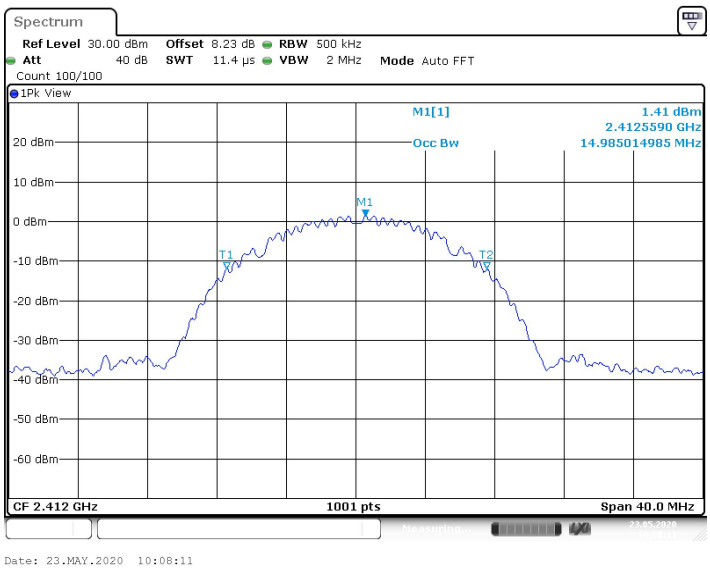
Date: 23.MAY.2020 10:44:34

2452 MHz

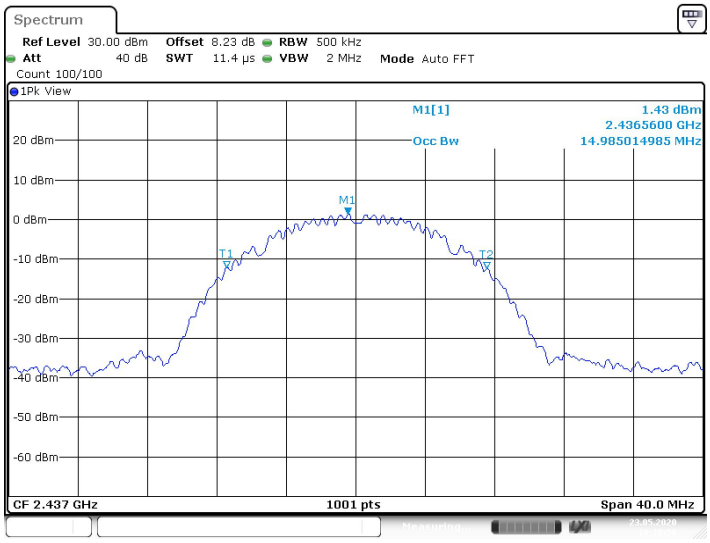


Date: 23.MAY.2020 10:46:33

Test Mode:	802.11b Mode	
Channel frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)
2412	14.985	>=0.5
2437	14.985	
2462	15.025	
2412 MHz		

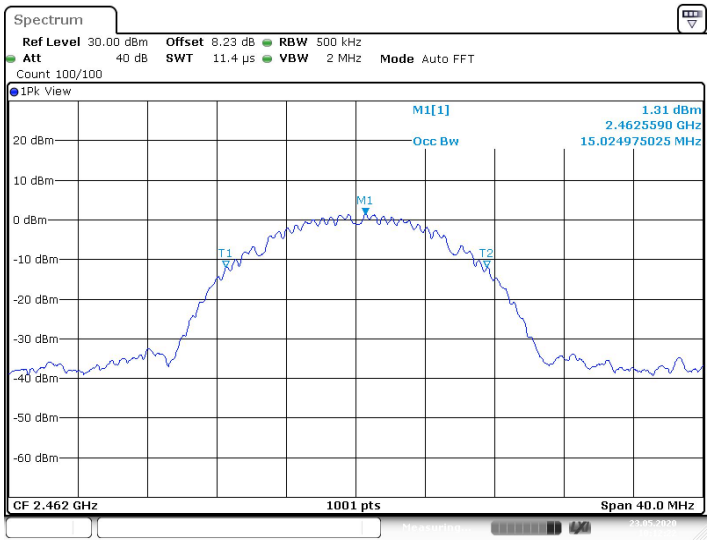


2437 MHz



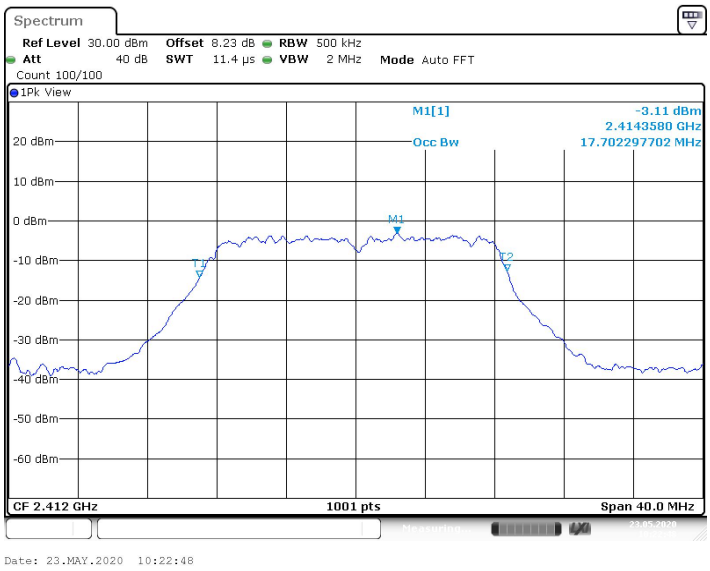
Date: 23.MAY.2020 10:10:50

2462 MHz

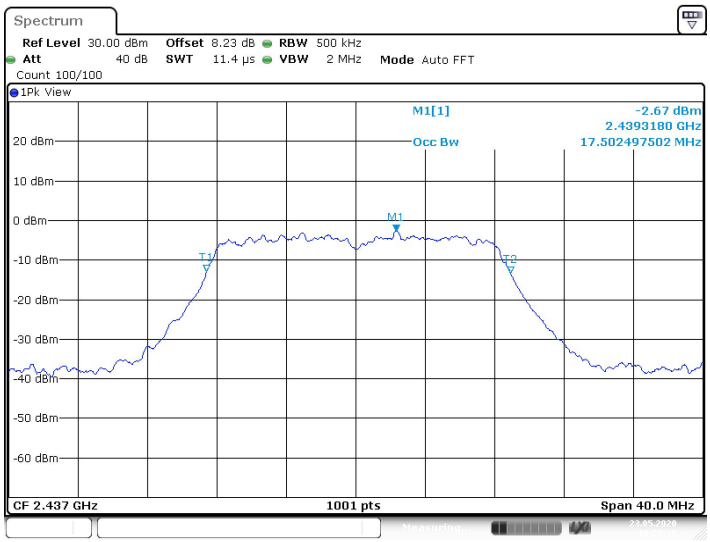


Date: 23.MAY.2020 10:12:23

Test Mode:	802.11g Mode	
Channel frequency (MHz)	**99% Bandwidth (MHz)**	**Limit (MHz)**
2412	17.702	>=0.5
2437	17.502	
2462	17.383	
2412 MHz		

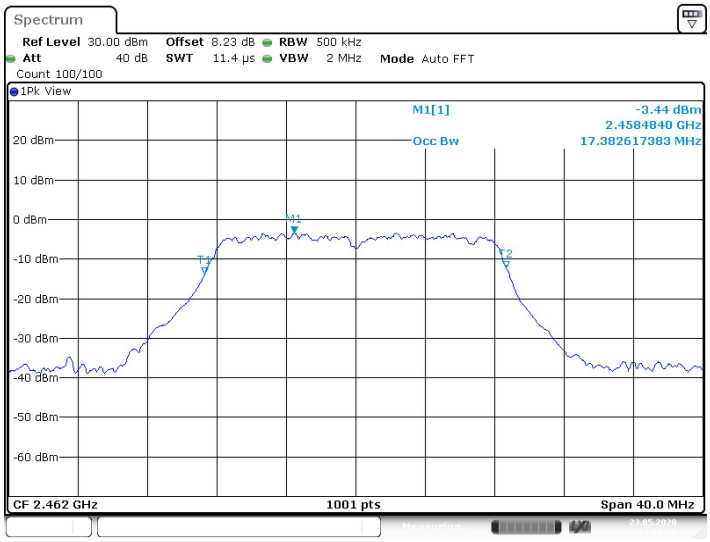


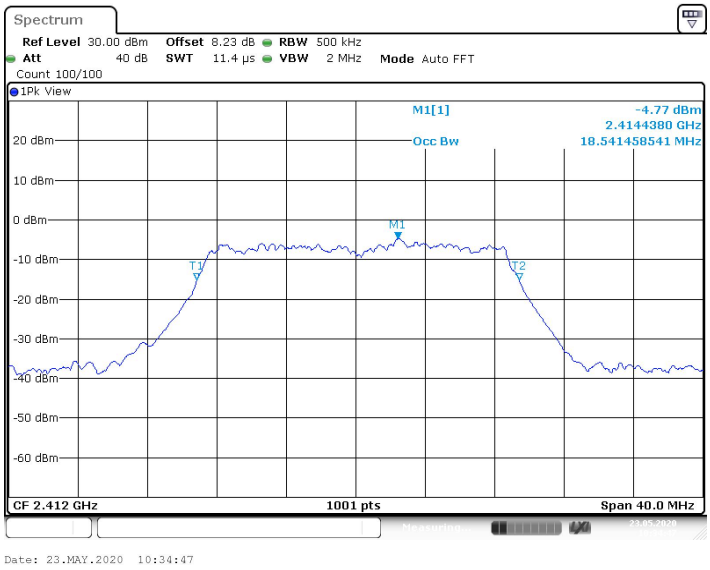
2437 MHz



Date: 23.MAY.2020 10:25:18

2462 MHz



Date: 23.MAY.2020 10:26:43

Test Mode:	802.11n(HT20) Mode	
Channel frequency (MHz)	**99% Bandwidth (MHz)**	**Limit (MHz)**
2412	18.541	>=0.5
2437	18.302	
2462	18.501	
2412 MHz