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Report Template Version: V04
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TEST REPORT

Report No. :	CQASZ20191101244E-01
Applicant:	Shenzhen Yuejiang Technology Co., Ltd
Address of Applicant:	Floor 9-10, Building 2, Chongwen Garden, No. 3370 Nanshan iPark, Liuxian Avenue, Nanshan District, Shenzhen City, China
Equipment Under Test (EUT):	
EUT Name:	DOBOT MOOZ-2 PLUS
Model No.:	DT-MZ-2ZSG-03C
Brand Name:	DOBOT
FCC ID:	2AHI4-MOOZ-2-PLUS
Standards:	47 CFR Part 15, Subpart C
Date of Receipt:	2019-12-02
Date of Test:	2019-12-02 to 2019-12-25
Date of Issue:	2019-12-25
Test Result :	**PASS***

***In the configuration tested, the EUT complied with the standards specified above**

Tested By: Tom Chen.

(Tom Chen)

Reviewed By: Aaron Ma

(Aaron Ma)

Approved By:

(Jack Ai)

SHENZHEN HUAXIA TESTING TECHNOLOGY CO., LTD
CQA 华夏准测
APPROVED

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20191101244E-01	Rev.01	Initial report	2019-12-25

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
Conducted Peak & Average Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10 2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10 2013	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10 2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS

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4 General Information

4.1 Client Information

Applicant:	Shenzhen Yuejiang Technology Co., Ltd
Address of Applicant:	Floor 9-10, Building 2, Chongwen Garden, No. 3370 Nanshan iPark, Liuxian Avenue, Nanshan District, Shenzhen City, China
Manufacturer:	Shenzhen Yuejiang Technology Co., Ltd
Address of Manufacturer:	Floor 9-10, Building 2, Chongwen Garden, No. 3370 Nanshan iPark, Liuxian Avenue, Nanshan District, Shenzhen City, China

4.2 General Description of EUT

Product Name:	DOBOT MOOZ-2 PLUS
Model No.:	DT-MZ-2ZSG-03C
Trade Mark:	DOBOT
Hardware version:	V1.0
Software version:	MOOZ_PlusV0.0.18
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM, QPSK, BPSK)
Transfer Rate:	IEEE for 802.11b: 1Mbps/2Mbps/5.5Mbps/11Mbps IEEE for 802.11g : 6Mbps/9Mbps/12Mbps/18Mbps/24Mbps/36Mbps/48Mbps/54Mbps IEEE for 802.11n(HT20) : 6.5Mbps/13Mbps/19.5Mbps/26Mbps/39Mbps/52Mbps/58.5Mbps/65Mbps
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	ESP Series Modules FCC & CE Test Tool V2.2.3.0 (manufacturer declare)
Antenna Type:	External antenna
Antenna Gain:	2.25dBi
Power Supply:	AC ADAPTER: MODEL: EA11011H-120 AC INPUT: 100-240V~2.0A,50-60Hz DC OUTPUT: 12V⎓10A

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

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

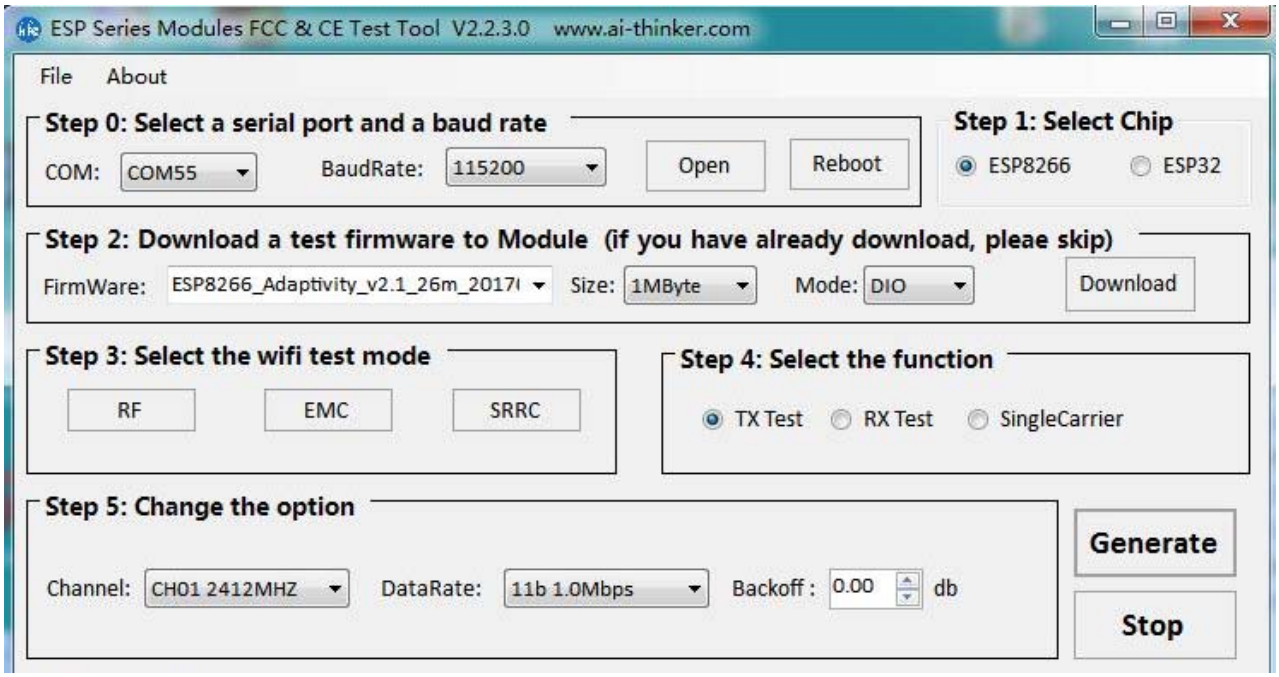
For 802.11b/g/n (HT20):

Channel	Frequency
The Lowest channel	2412MHz
The Middle channel	2437MHz
The Highest channel	2462MHz

Note:
Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.3 Test Environment and Mode

Operating Environment:	
Radiated Emissions:	
Temperature:	25.4 °C
Humidity:	52 % RH
Atmospheric Pressure:	1015 mbar
Conducted Emissions:	
Temperature:	23.8 °C
Humidity:	40 % RH
Atmospheric Pressure:	1015 mbar
Radio conducted item test (RF Conducted test room):	
Temperature:	24.1 °C
Humidity:	41 % RH
Atmospheric Pressure:	1015 mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.
Run Software:	



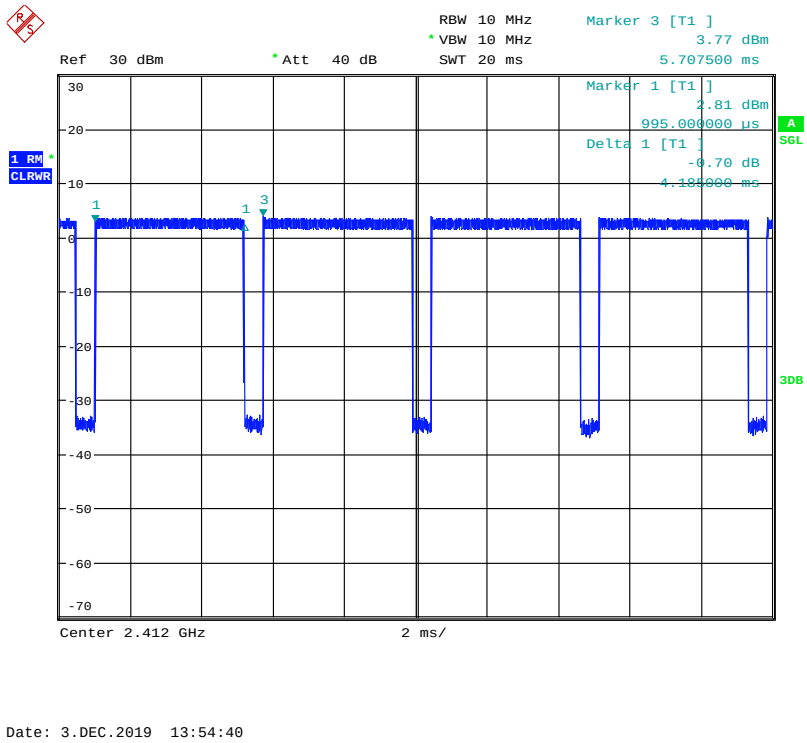
Operated Mode for Worst Duty Cycle:		
Test Mode	Duty Cycle(x)	Average correction factor(dB)
IEEE802.11b	88.81%	0.52
IEEE802.11g	86.48%	0.63
IEEE802.11n (HT20)	85.86%	0.66

Remark:

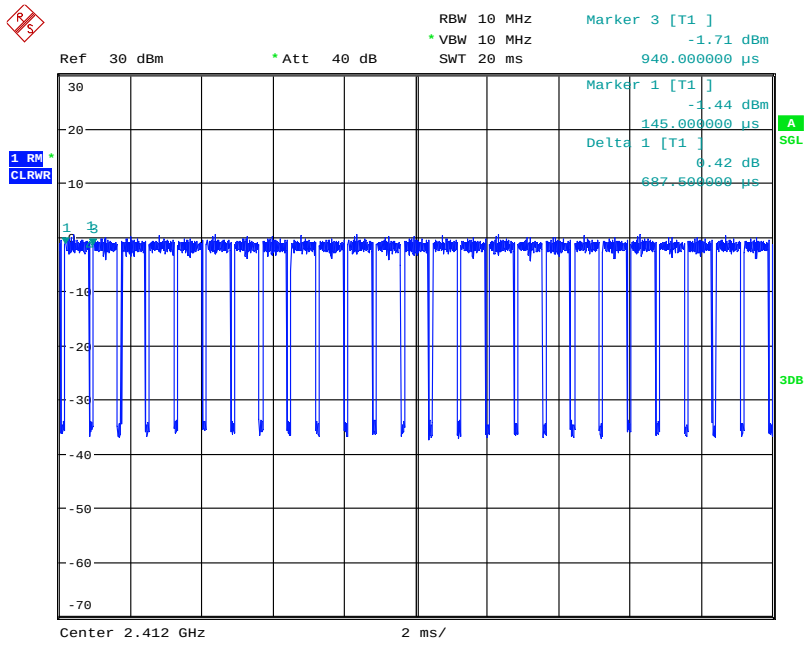
1) Duty cycle= On Time/ Period;

2) Duty Cycle factor = 10 * log(1/ Duty cycle);

Test Graph_IEEE802.11b Duty Cycle:

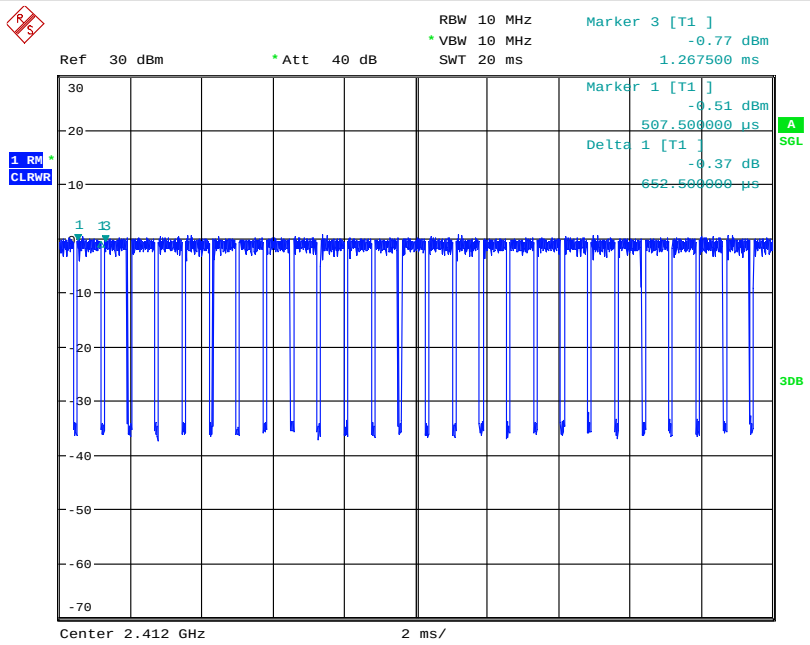


Test Graph_IEEE802.11g Duty Cycle:



Date: 3.DEC.2019 14:17:16

Test Graph_IEEE802.11 n (HT20) Duty Cycle:



Date: 3.DEC.2019 14:41:41

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

1）Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
PC	Lenovo	ThinkPad E450c	FCC ID and DOC	CQA

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.5 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

4.6 Test Facility

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen 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. Registration No.:522263

4.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	time	0.6 %.	(1)
14	Frequency Error	5.5 Hz	(1)

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

4.8 Deviation from Standards

None.

4.9 Abnormalities from Standard Conditions

None.

4.10 Other Information Requested by the Customer

None.

4.11 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSU26	CQA-038	2019/10/25	2020/10/24
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2019/10/25	2020/10/24
Loop antenna	Schwarzbeck	FMZB1516	CQA-060	2019/10/21	2020/10/20
Bilog Antenna	R&S	HL562	CQA-011	2019/9/26	2020/9/25
Horn Antenna	R&S	HF906	CQA-012	2019/9/26	2020/9/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2019/9/25	2020/9/24
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2019/9/26	2020/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2019/9/26	2020/9/25
Antenna Connector	CQA	RFC-01	CQA-080	2019/9/26	2020/9/25
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2019/9/26	2020/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2019/9/26	2020/9/25
EMI Test Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
LISN	R&S	ENV216	CQA-003	2019/10/23	2020/10/22
Coaxial cable	CQA	N/A	CQA-C009	2019/9/26	2020/9/25

Note:

The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: 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. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is External antenna. The best case gain of the antenna is 2.25dBi.	

5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Limit:	

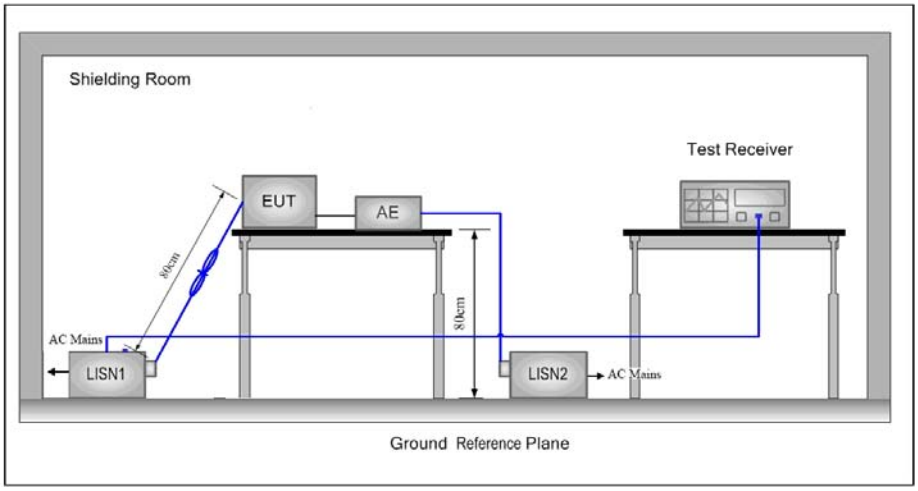
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

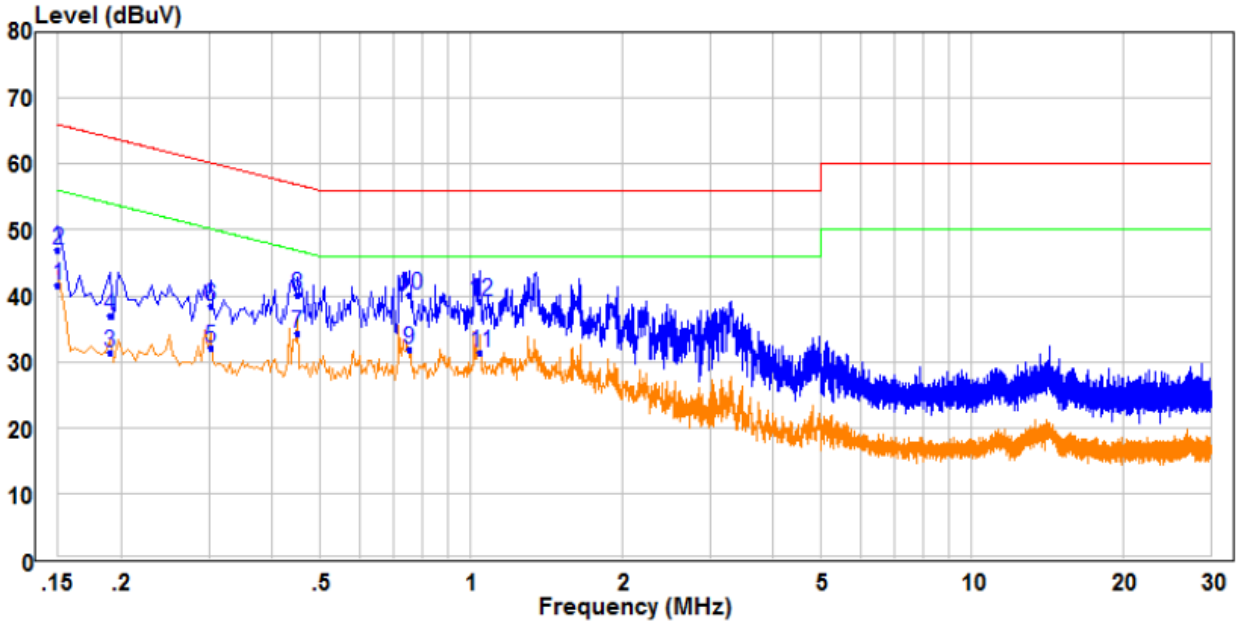
Test Setup:



Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11b at lowest channel is the worst case. Only the worst case is recorded in the report.
Test Voltage:	AC120V/60Hz
Test Results:	Pass

Measurement Data

Live Line:

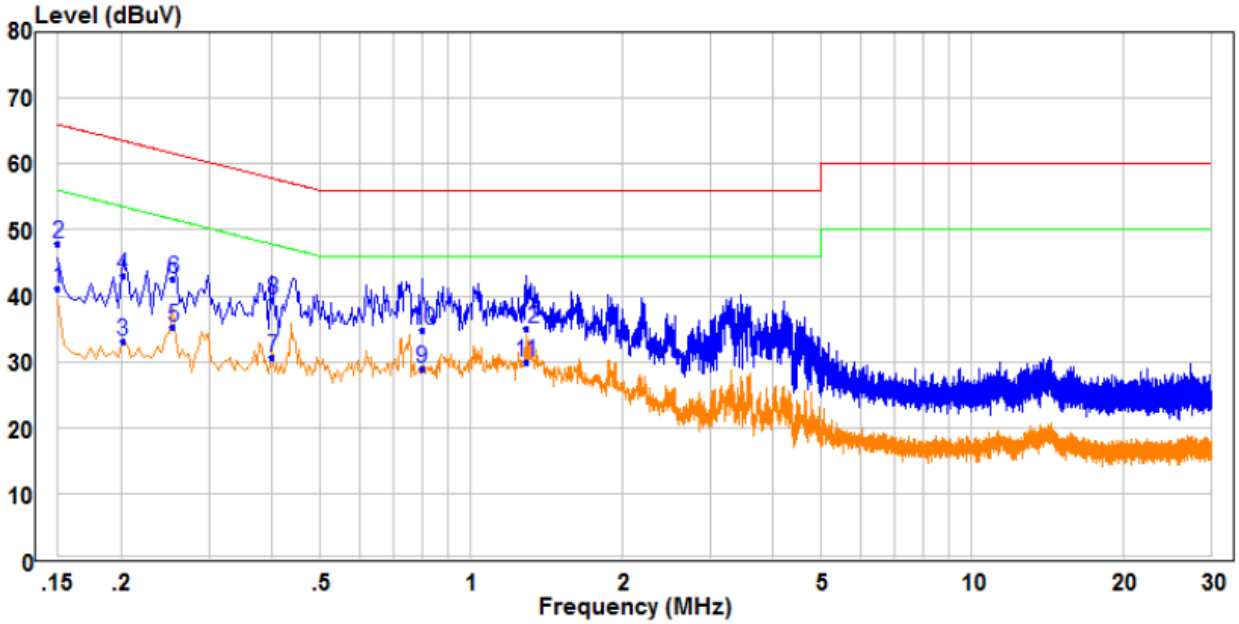


		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.150	32.11	9.49	41.60	56.00	-14.40	Average	Line
2		0.150	37.57	9.49	47.06	66.00	-18.94	QP	Line
3		0.190	21.84	9.49	31.33	54.04	-22.71	Average	Line
4		0.190	27.40	9.49	36.89	64.04	-27.15	QP	Line
5		0.302	22.52	9.49	32.01	50.19	-18.18	Average	Line
6		0.302	29.05	9.49	38.54	60.19	-21.65	QP	Line
7	PP	0.450	24.77	9.51	34.28	46.88	-12.60	Average	Line
8		0.450	30.60	9.51	40.11	56.88	-16.77	QP	Line
9		0.754	22.01	9.80	31.81	46.00	-14.19	Average	Line
10	QP	0.754	30.30	9.80	40.10	56.00	-15.90	QP	Line
11		1.046	21.92	9.53	31.45	46.00	-14.55	Average	Line
12		1.046	29.54	9.53	39.07	56.00	-16.93	QP	Line

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral Line:

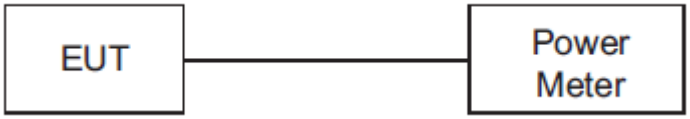


		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	PP	0.150	31.58	9.48	41.06	56.00	-14.94	Average	Neutral
2	QP	0.150	38.40	9.48	47.88	66.00	-18.12	QP	Neutral
3		0.202	23.52	9.48	33.00	53.53	-20.53	Average	Neutral
4		0.202	33.58	9.48	43.06	63.53	-20.47	QP	Neutral
5		0.254	25.88	9.48	35.36	51.63	-16.27	Average	Neutral
6		0.254	33.09	9.48	42.57	61.63	-19.06	QP	Neutral
7		0.402	21.08	9.54	30.62	47.81	-17.19	Average	Neutral
8		0.402	29.89	9.54	39.43	57.81	-18.38	QP	Neutral
9		0.798	19.26	9.79	29.05	46.00	-16.95	Average	Neutral
10		0.798	25.02	9.79	34.81	56.00	-21.19	QP	Neutral
11		1.286	20.17	9.71	29.88	46.00	-16.12	Average	Neutral
12		1.286	25.24	9.71	34.95	56.00	-21.05	QP	Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

5.3 Conducted Peak & Average Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) Only the worst case is recorded in the report.
Limit:	30dBm
Test Results:	Pass

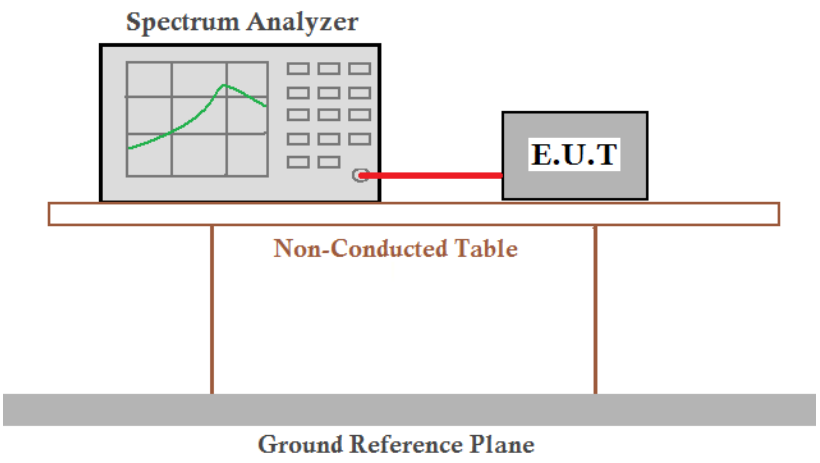
Measurement Data

802.11b mode				
Test channel	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	15.48	12.86	30.00	Pass
Middle	15.35	12.65	30.00	Pass
Highest	14.48	12.23	30.00	Pass
802.11g mode				
Test channel	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	18.58	11.06	30.00	Pass
Middle	19.96	12.45	30.00	Pass
Highest	18.78	11.22	30.00	Pass
802.11n(HT20) mode				
Test channel	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	19.22	11.88	30.00	Pass
Middle	19.76	12.35	30.00	Pass
Highest	19.36	12.00	30.00	Pass

Remark:

1. Average Output Power was for reference only
2. Average Output Power had added duty cycle factor

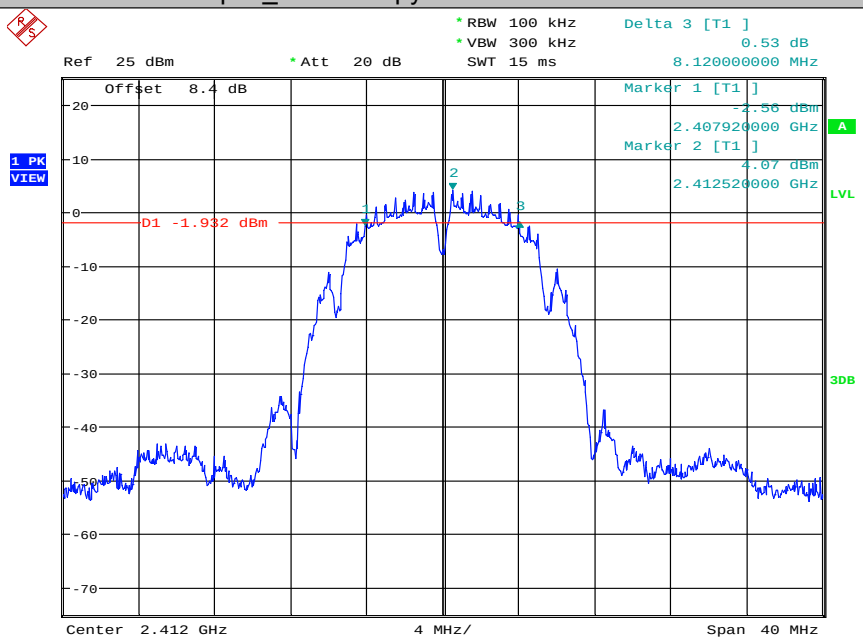
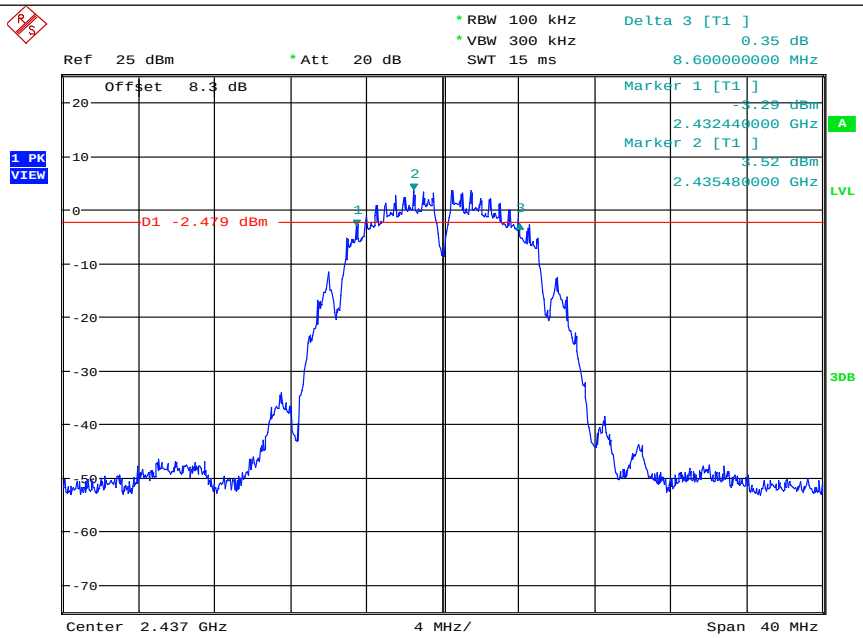
5.4 6dB Occupy Bandwidth

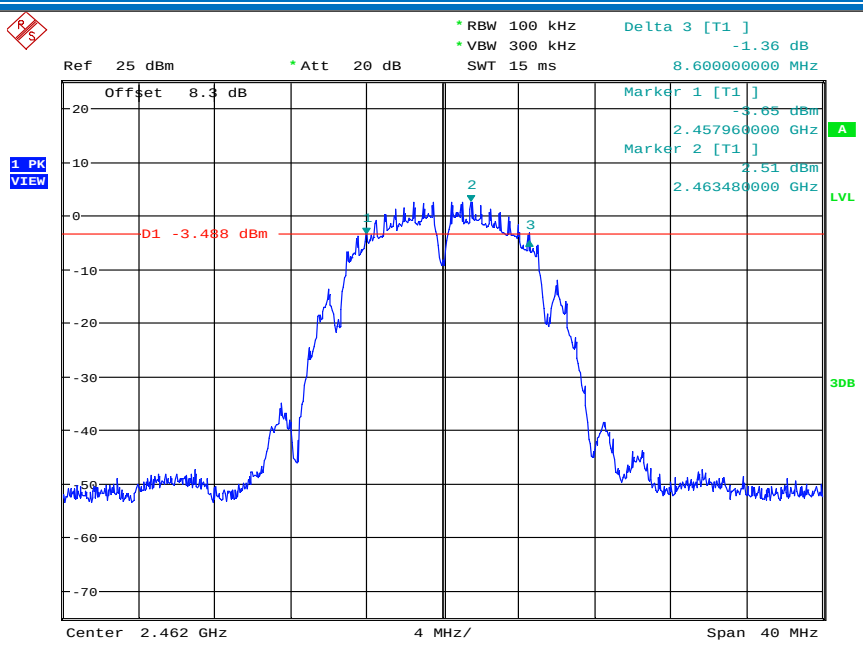
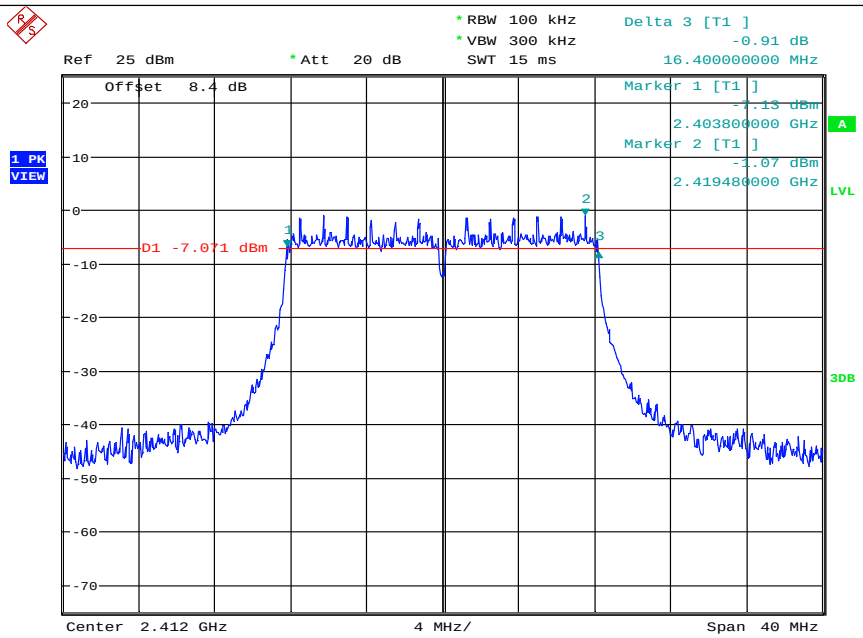
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) Only the worst case is recorded in the report.
Limit:	≥ 500 kHz
Test Results:	Pass

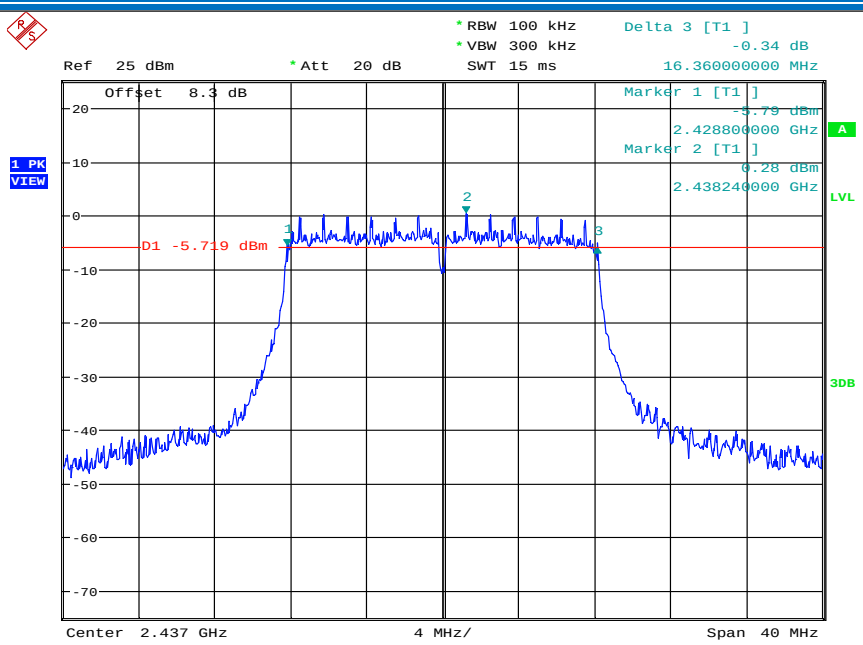
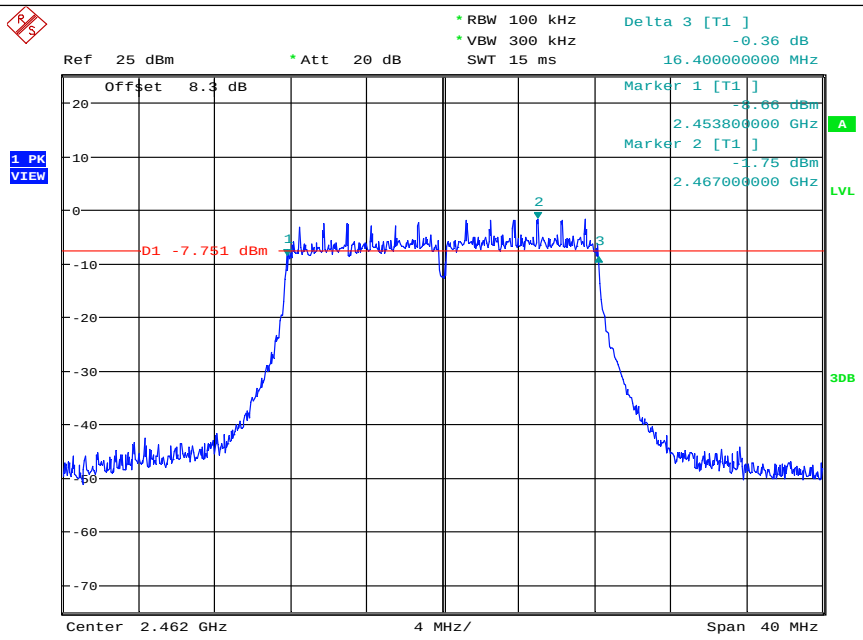
Measurement Data

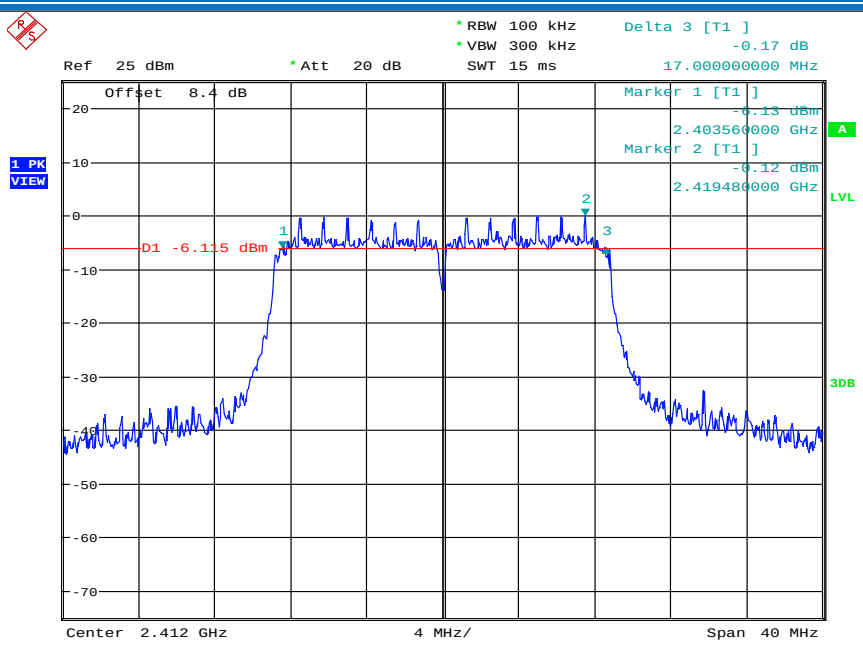
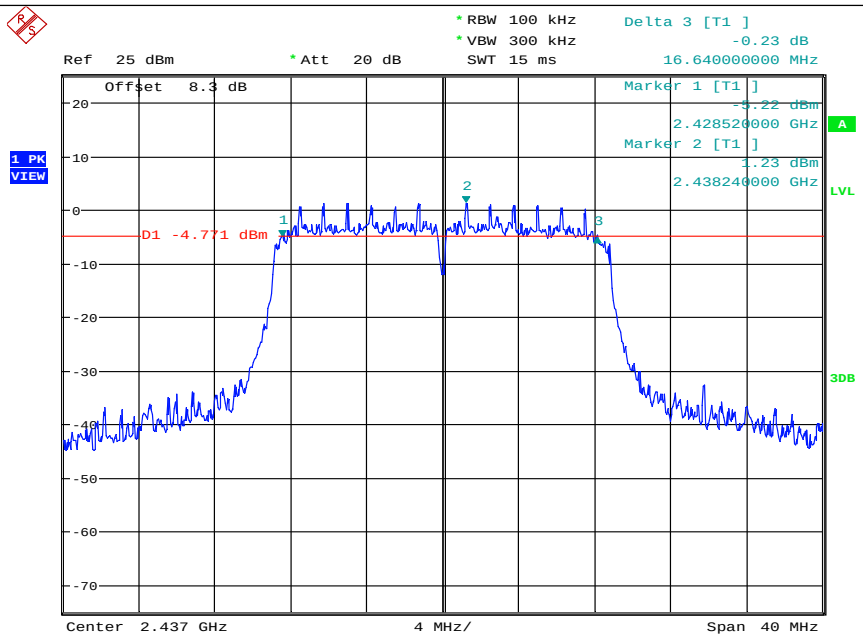
802.11b mode				
Test channel	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	8.120	10.960	≥0.5	Pass
Middle	8.600	10.640	≥0.5	Pass
Highest	8.600	10.760	≥0.5	Pass
802.11g mode				
Test channel	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	16.400	16.600	≥0.5	Pass
Middle	16.360	16.520	≥0.5	Pass
Highest	16.400	16.560	≥0.5	Pass
802.11n(HT20) mode				
Test channel	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	17.000	17.680	≥0.5	Pass
Middle	16.640	17.560	≥0.5	Pass
Highest	17.000	17.680	≥0.5	Pass
Remark: 1. 99% OBW was for reference only				

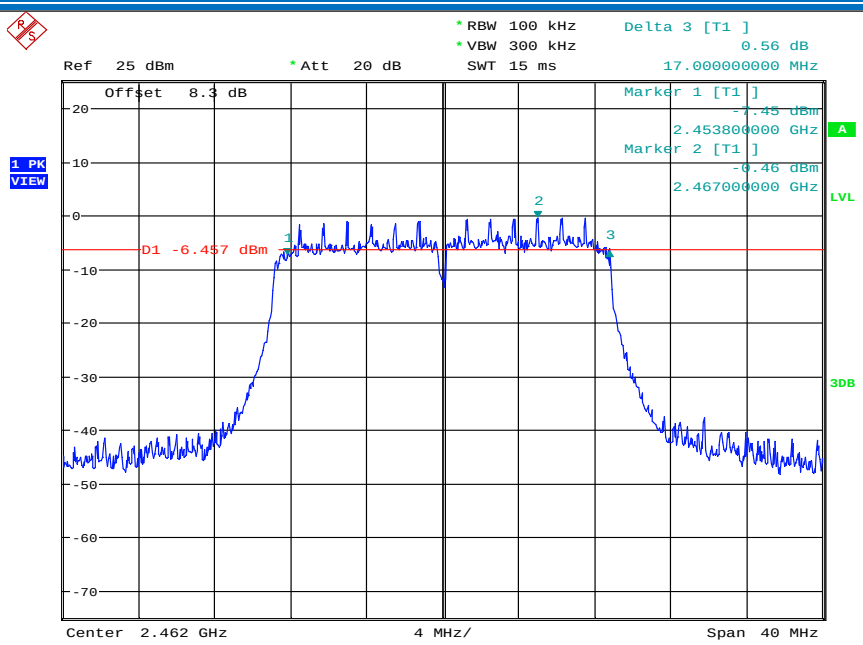
Test plot as follows:

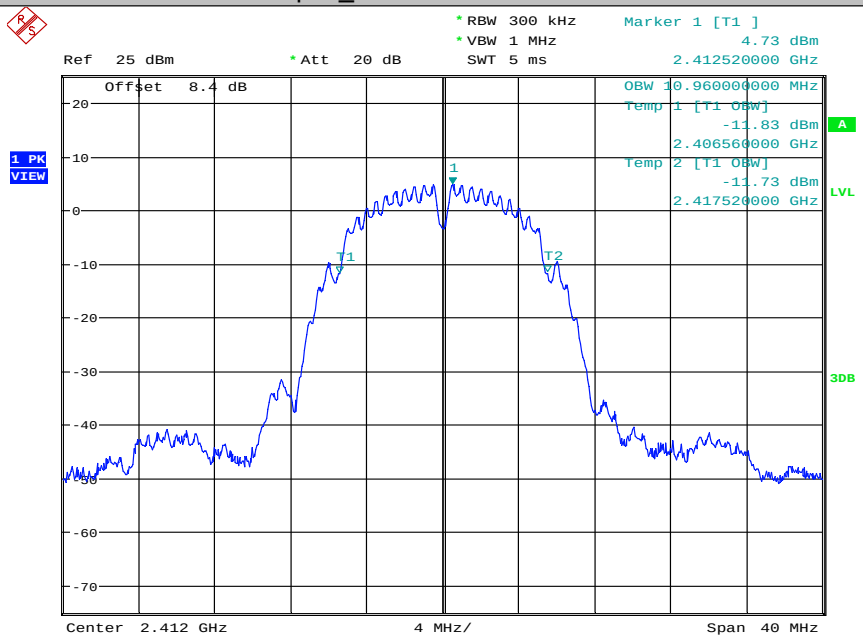
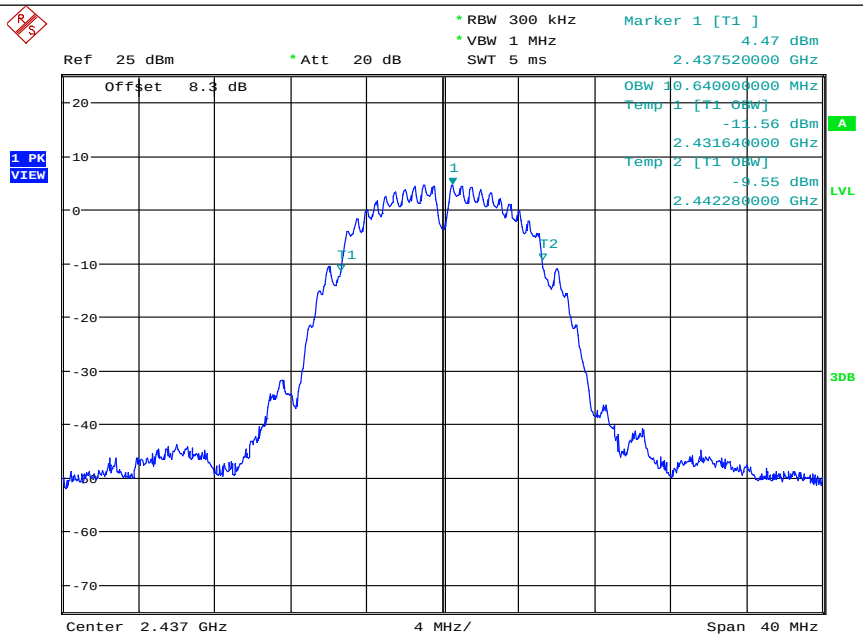
Graphs_6dB Occupy Bandwidth	
11B/LCH	 Date: 3.DEC.2019 13:53:54
11B/MCH	 Date: 3.DEC.2019 14:04:24

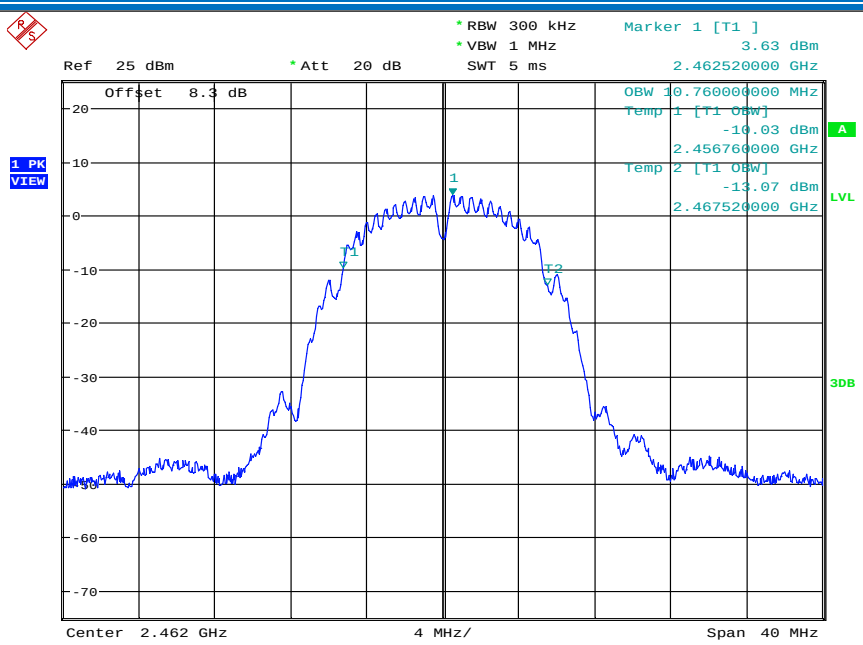
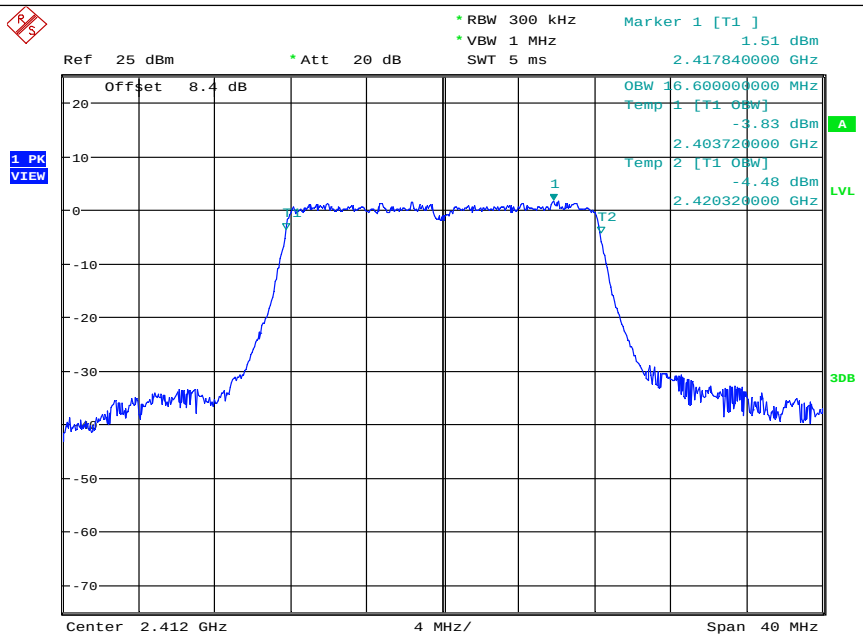
11B/HCH	 Date: 3.DEC.2019 14:09:11
11G/LCH	 Date: 3.DEC.2019 14:16:31

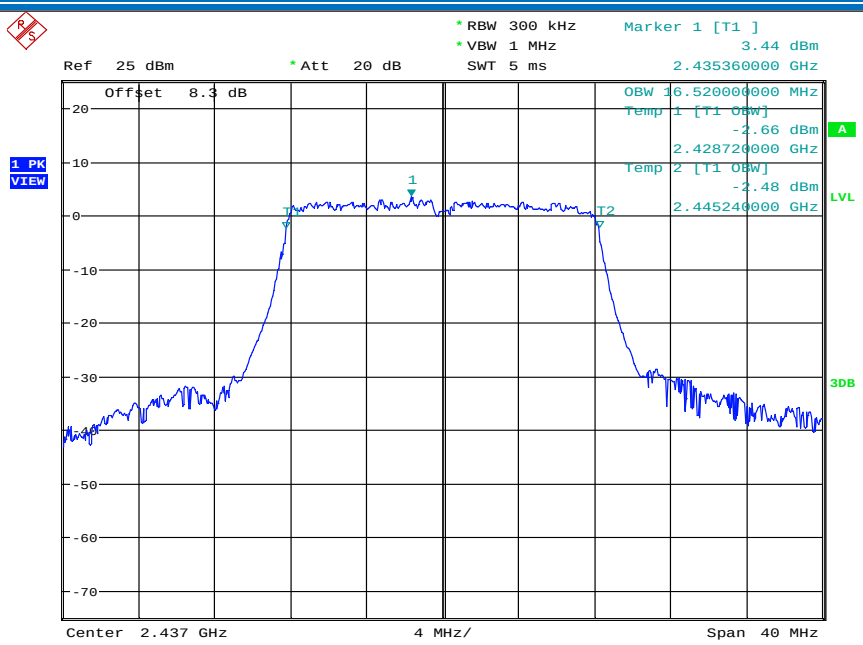
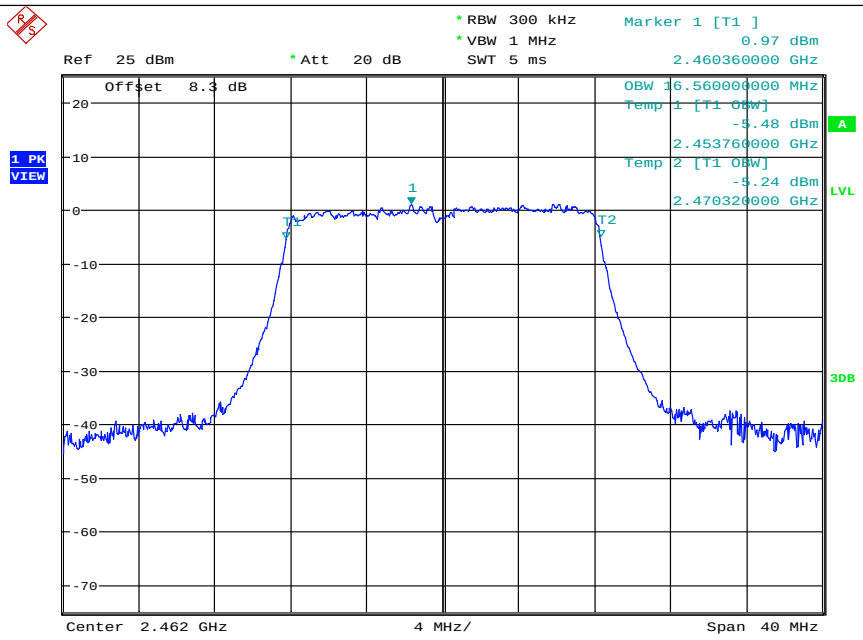
11G/MCH	 Date: 3.DEC.2019 14:21:40
11G/HCH	 Date: 3.DEC.2019 14:26:19

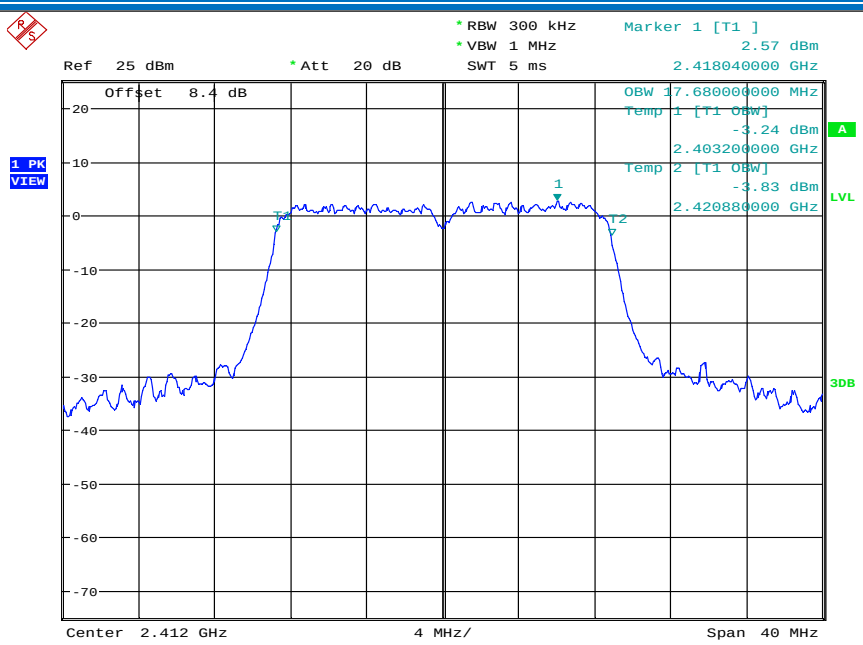
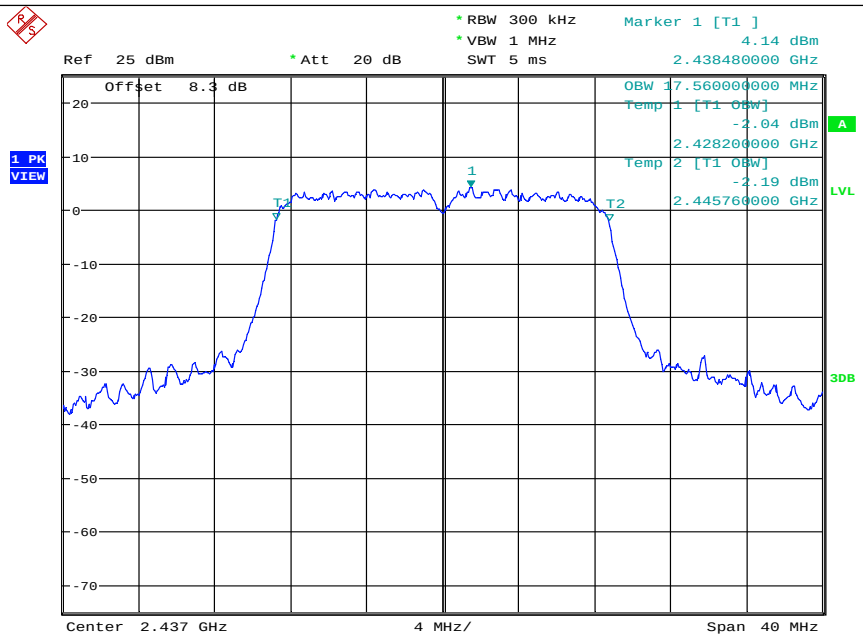
11N20SISO/LCH	 Date: 3.DEC.2019 14:40:36
11N20SISO/MCH	 Date: 3.DEC.2019 14:50:17

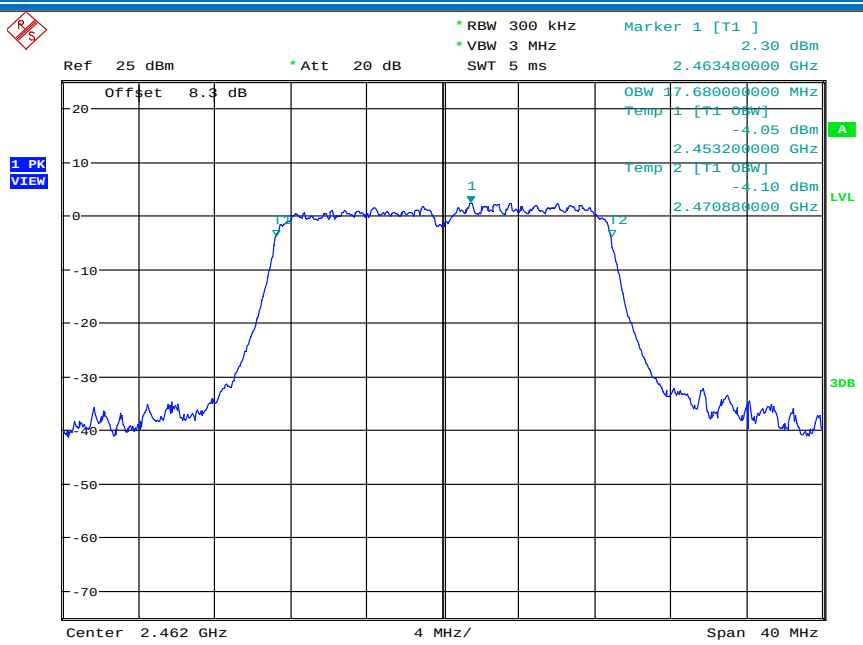
11N20SISO/HCH	

Graphs_99% OBW	
11B/LCH	 Date: 3.DEC.2019 13:54:21
11B/MCH	 Date: 3.DEC.2019 14:04:51

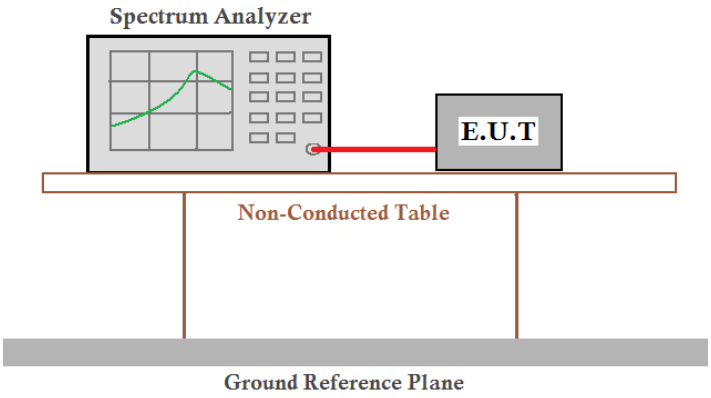
11B/HCH	 Date: 3.DEC.2019 14:09:38
11G/LCH	 Date: 3.DEC.2019 14:16:58

11G/MCH	 Date: 3.DEC.2019 14:22:07
11G/HCH	 Date: 3.DEC.2019 14:26:46

11N20SISO/LCH	 Date: 3.DEC.2019 14:41:23
11N20SISO/MCH	 Date: 3.DEC.2019 14:51:04

11N20SISO/HCH	

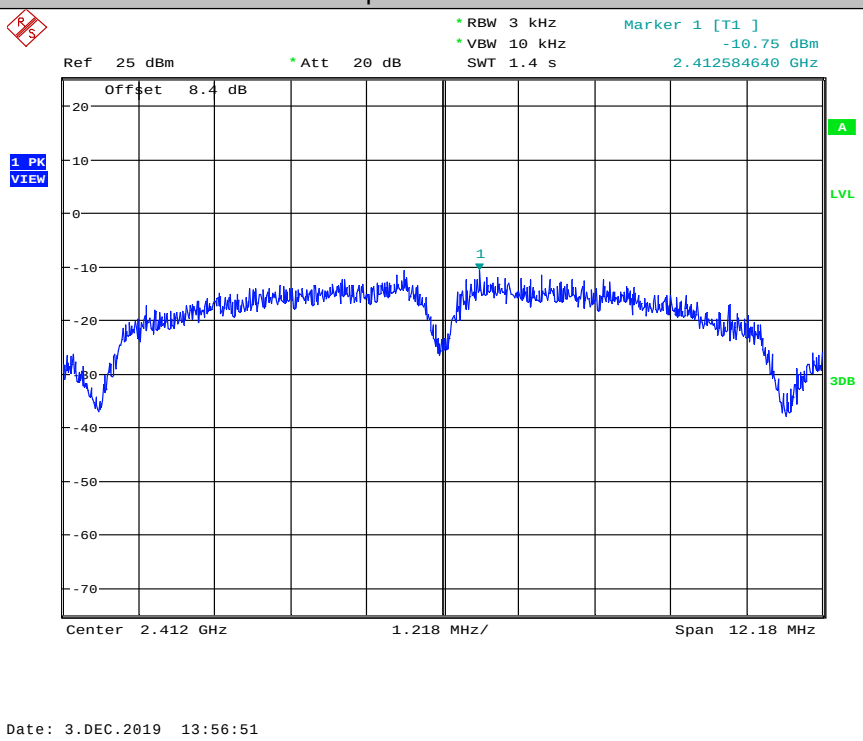
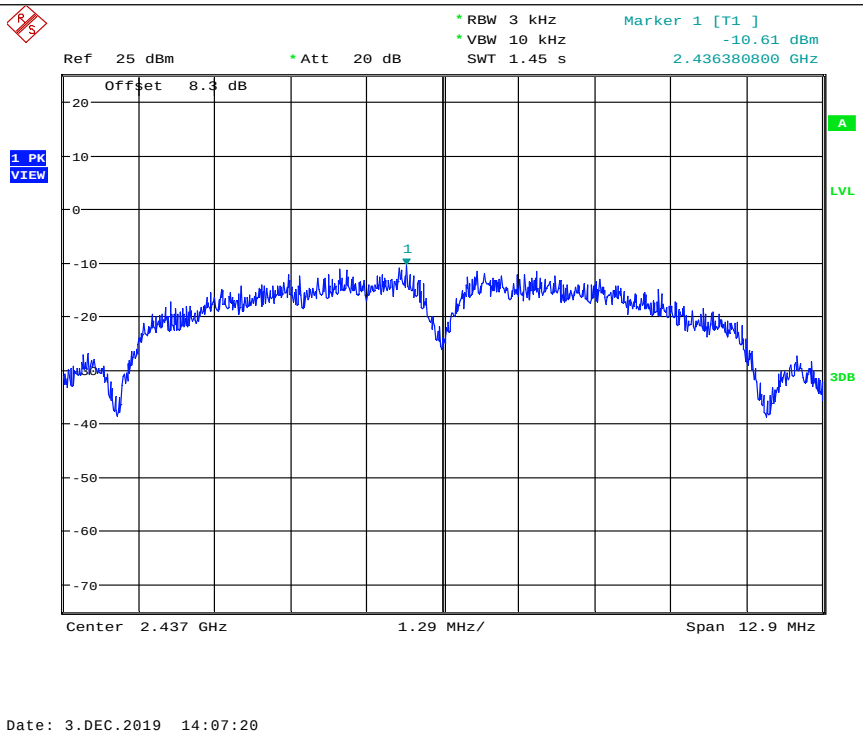
5.5 Power Spectral Density

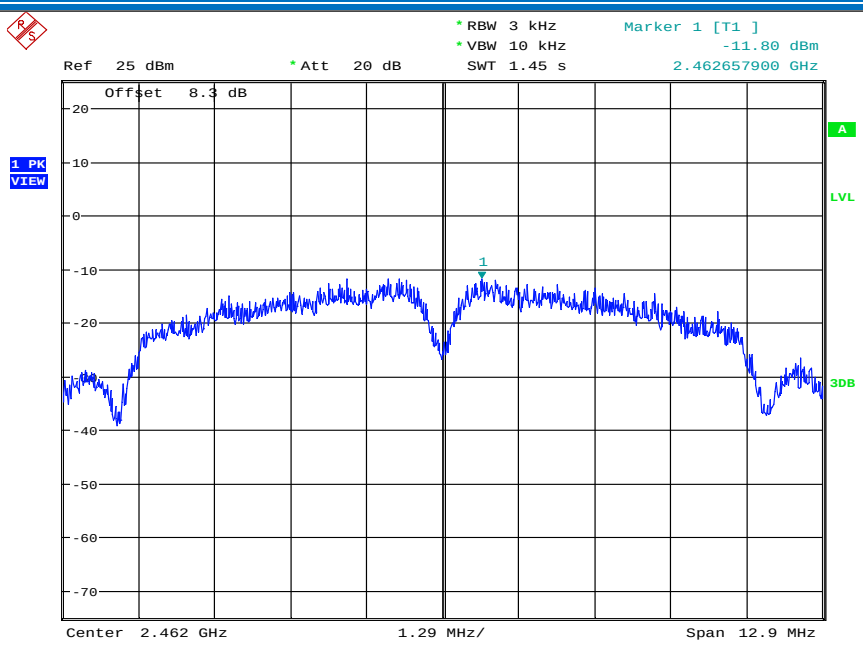
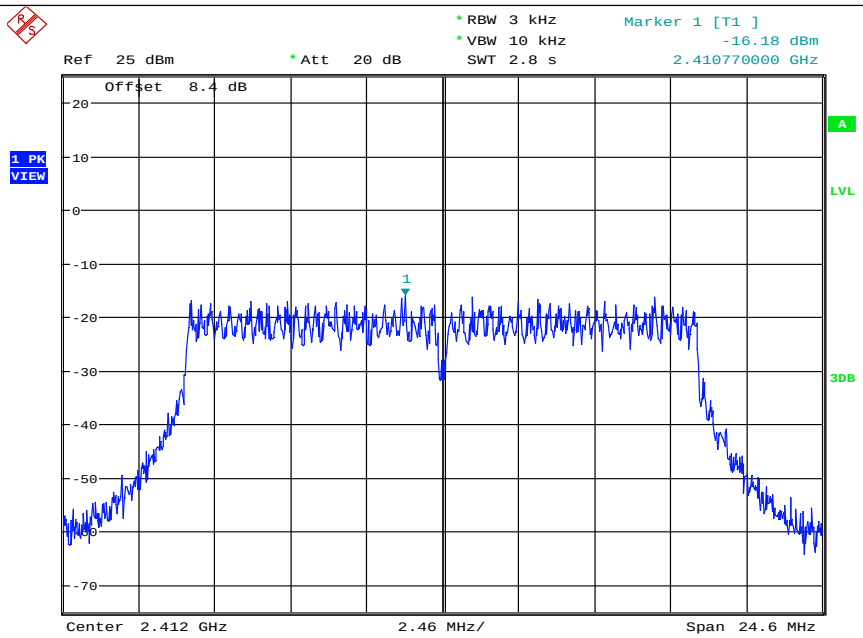
Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) Only the worst case is recorded in the report.
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

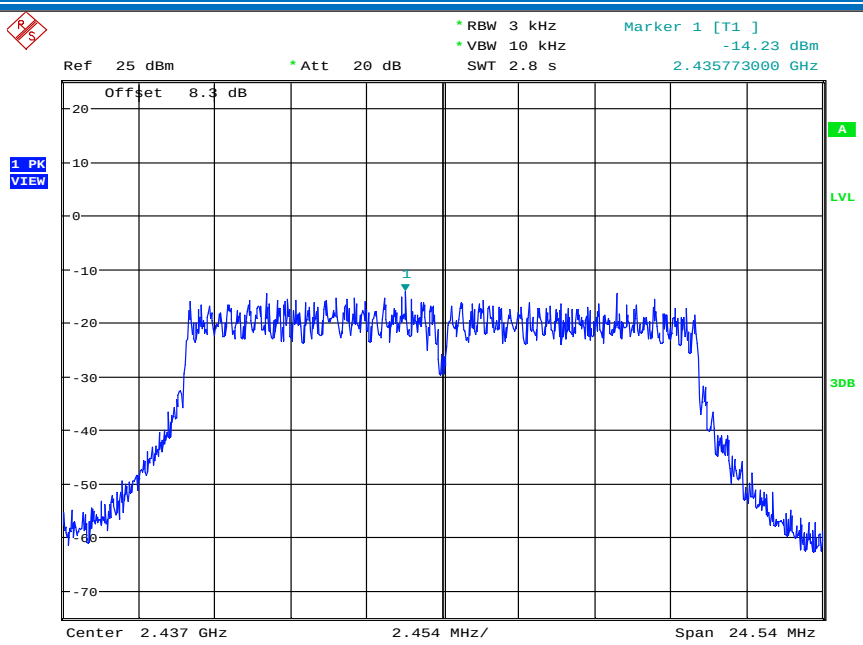
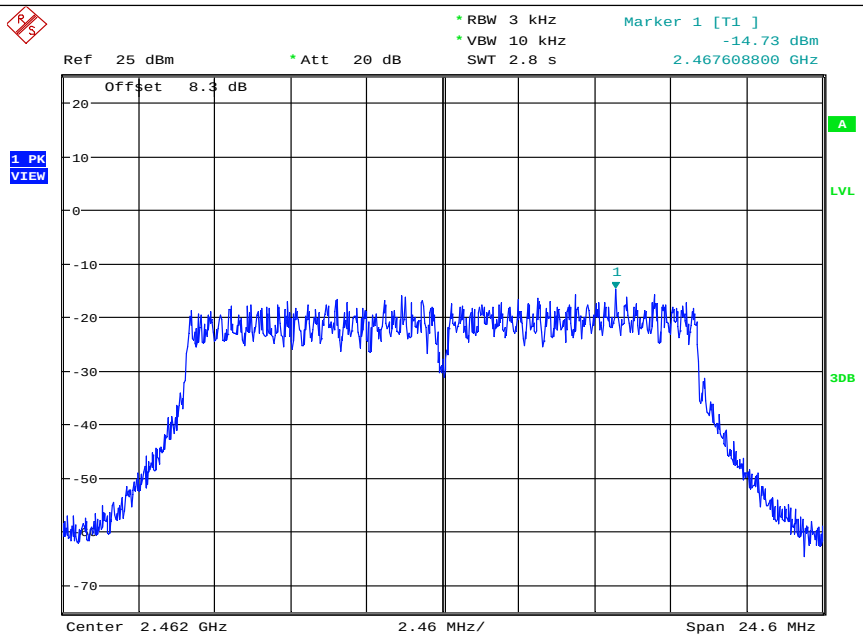
Measurement Data

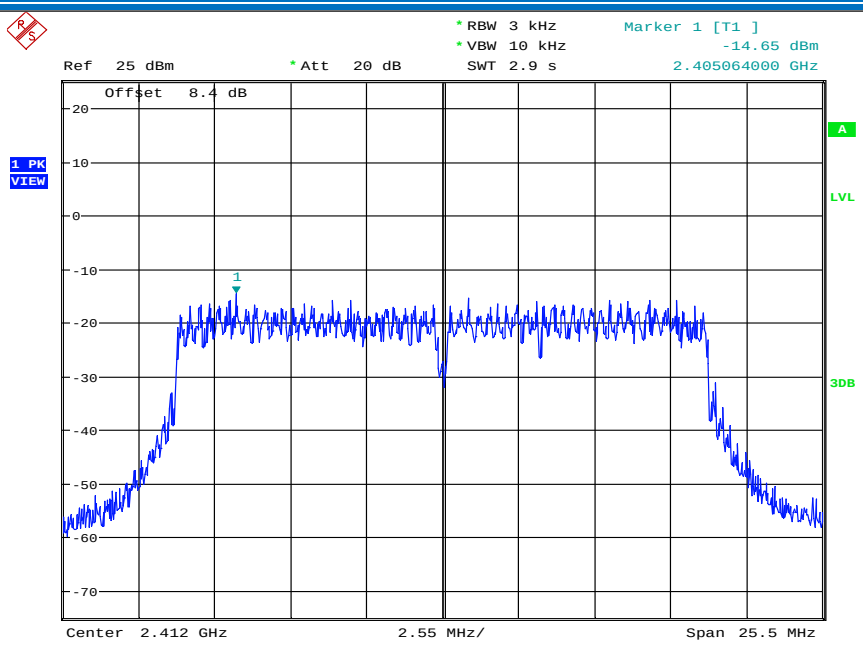
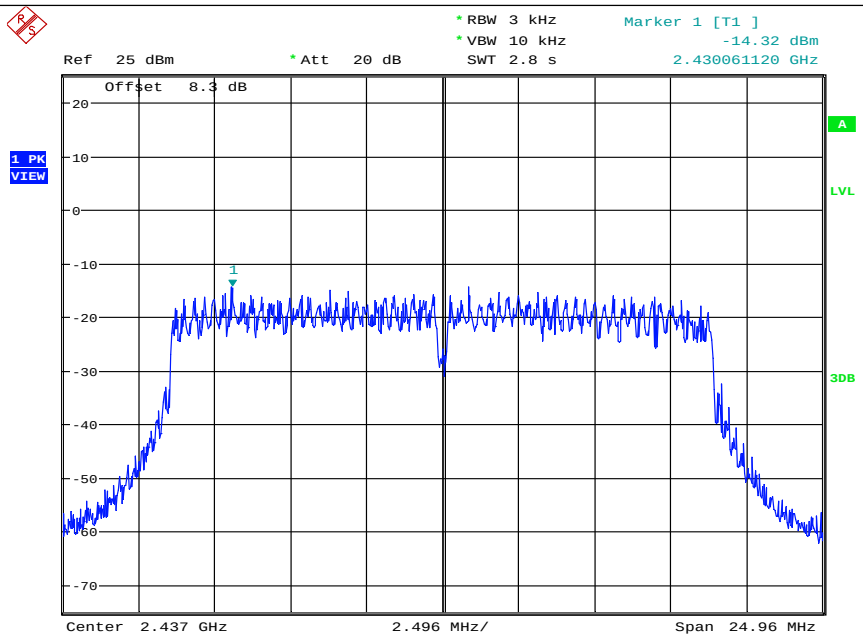
802.11b mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-10.750	≤8.00	Pass
Middle	-10.610	≤8.00	Pass
Highest	-11.800	≤8.00	Pass
802.11g mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-16.180	≤8.00	Pass
Middle	-14.230	≤8.00	Pass
Highest	-14.730	≤8.00	Pass
802.11n(HT20) mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-14.650	≤8.00	Pass
Middle	-14.320	≤8.00	Pass
Highest	-15.690	≤8.00	Pass

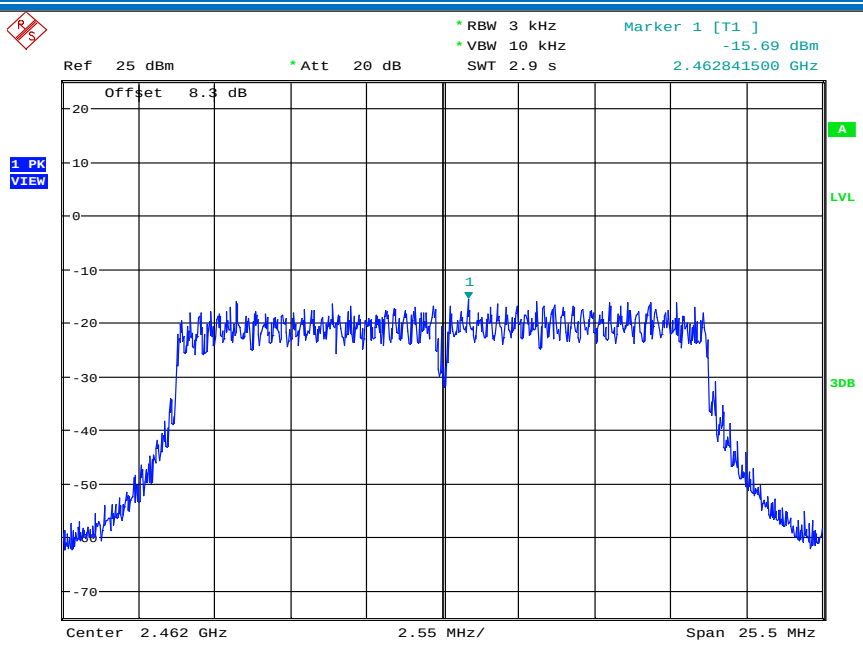
Test plot as follows:

Graphs	
11B/LCH	
11B/MCH	

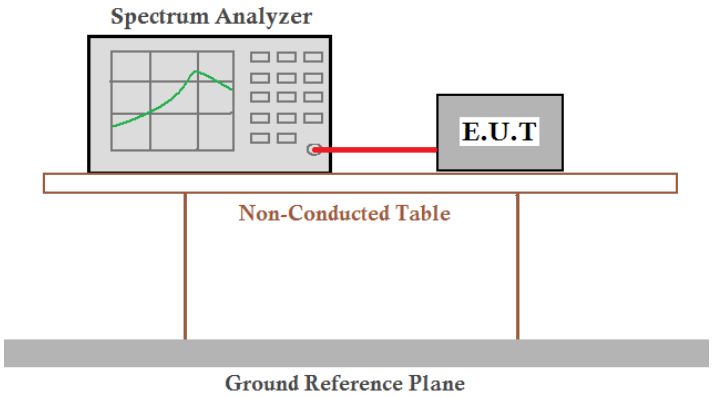
11B/HCH	 Date: 3.DEC.2019 14:14:23
11G/LCH	 Date: 3.DEC.2019 14:19:28

11G/MCH	 Date: 3.DEC.2019 14:24:36
11G/HCH	 Date: 3.DEC.2019 14:37:30

11N20SISO/LCH	 Date: 3.DEC.2019 14:45:34
11N20SISO/MCH	 Date: 3.DEC.2019 14:59:19

11N20SISO/HCH	

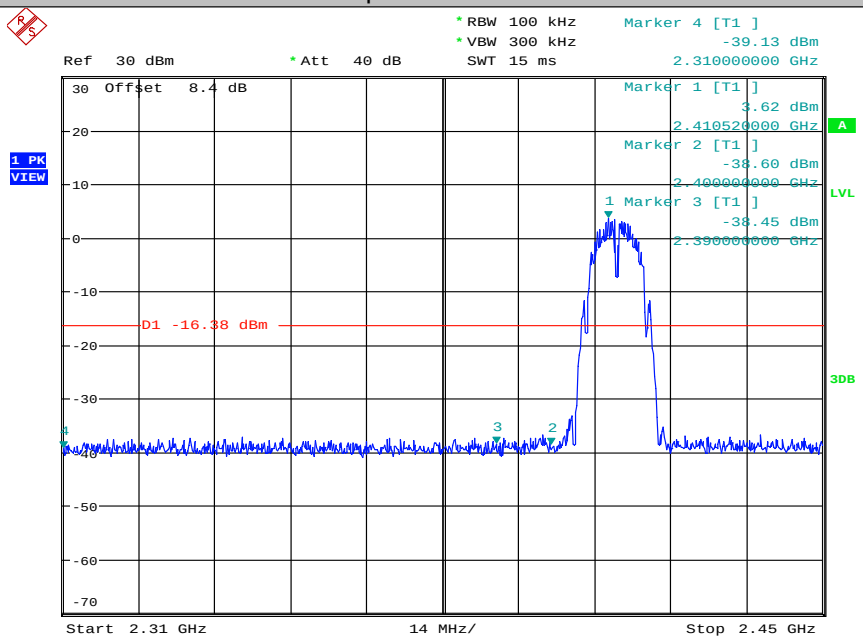
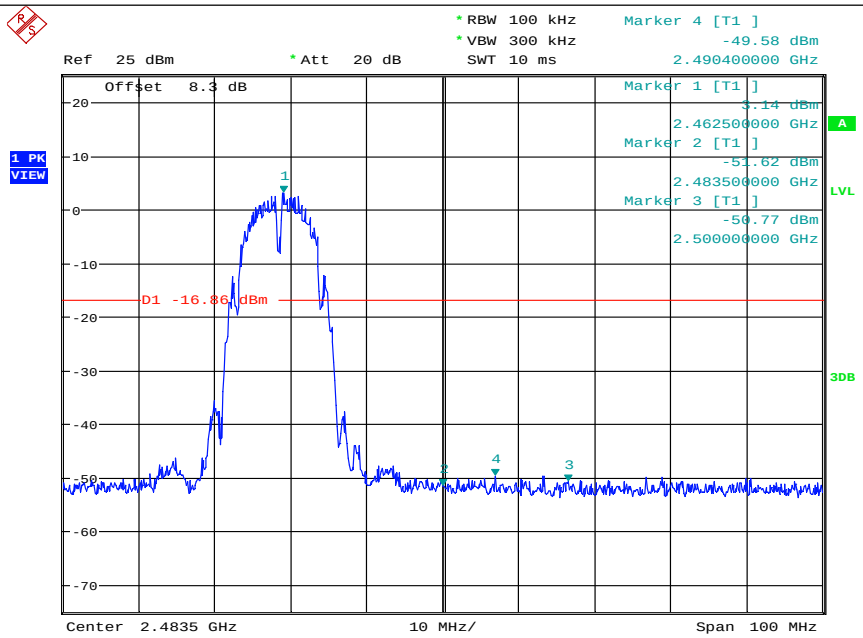
5.6 Band-edge for RF Conducted Emissions

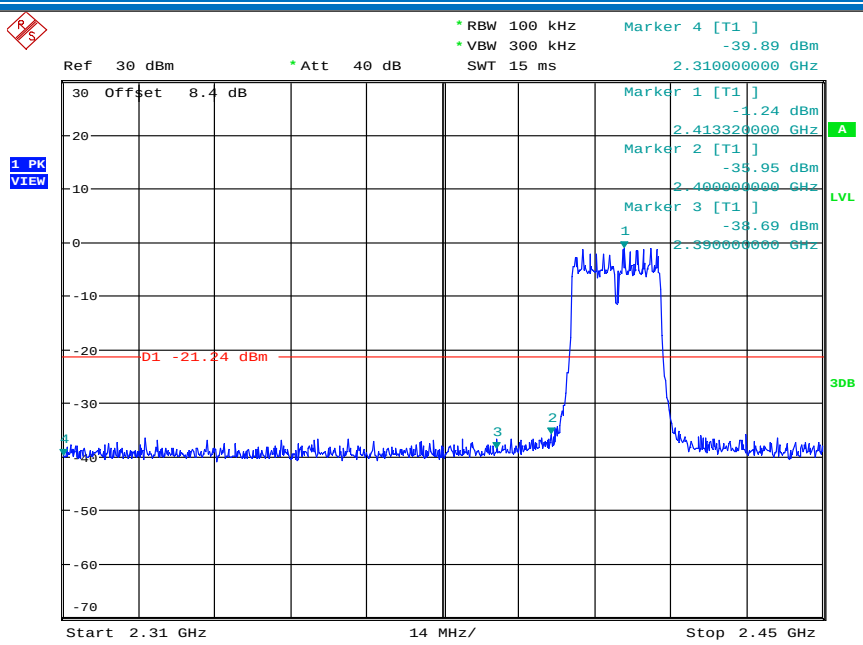
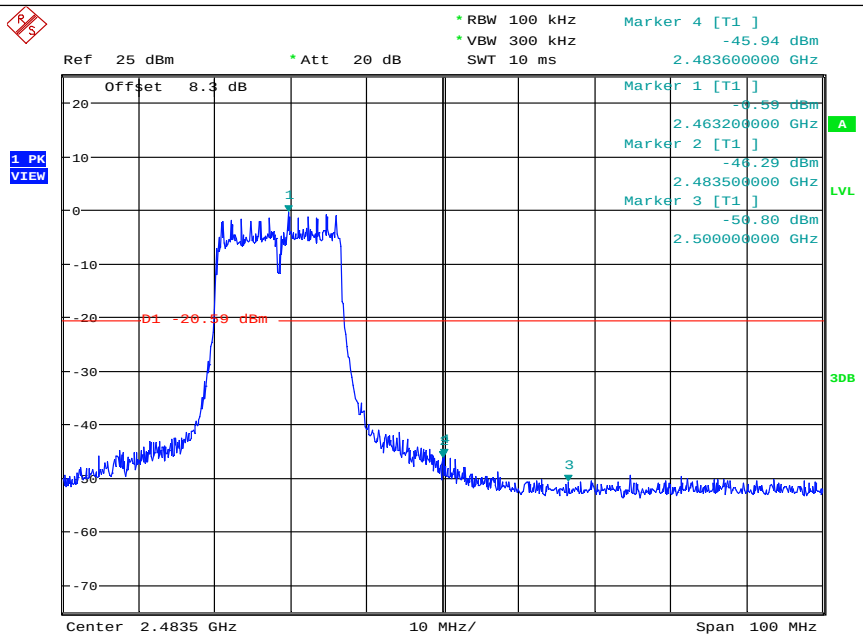
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) Only the worst case is recorded in the report.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

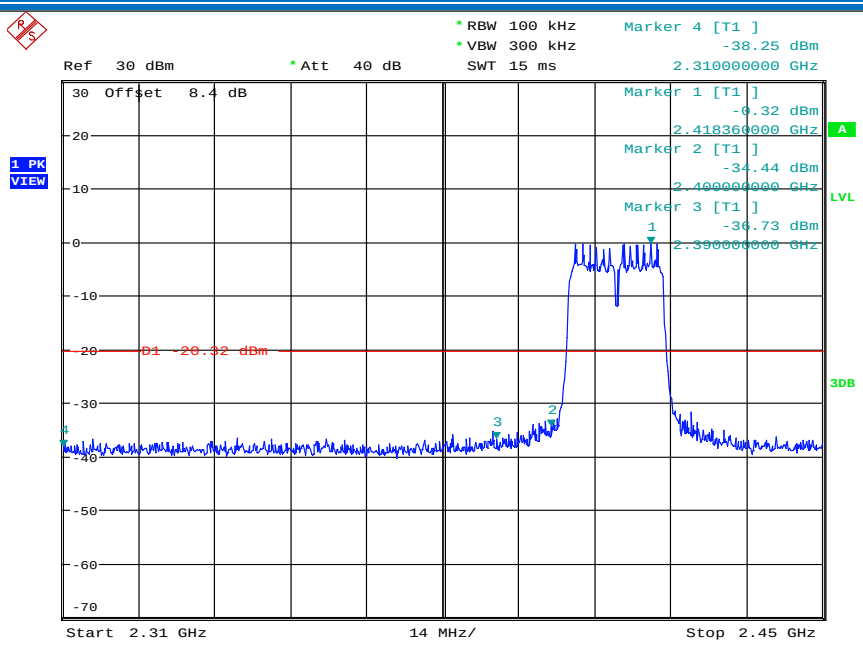
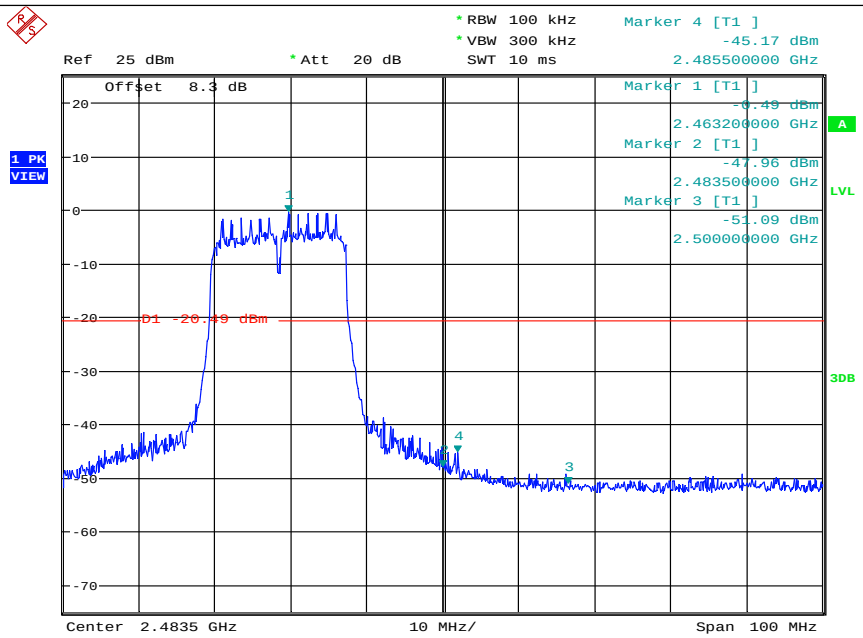
Test Data:

Test mode: 802.11b				
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	2400	-38.600	-16.38	Pass
Highest	2483.5	-51.620	-16.86	Pass
Test mode: 802.11g				
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	2400	-35.950	-21.24	Pass
Highest	2483.5	-46.290	-20.59	Pass
Test mode: 802.11n(HT20)				
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	2400	-34.440	-20.32	Pass
Highest	2483.5	-47.960	-20.49	Pass

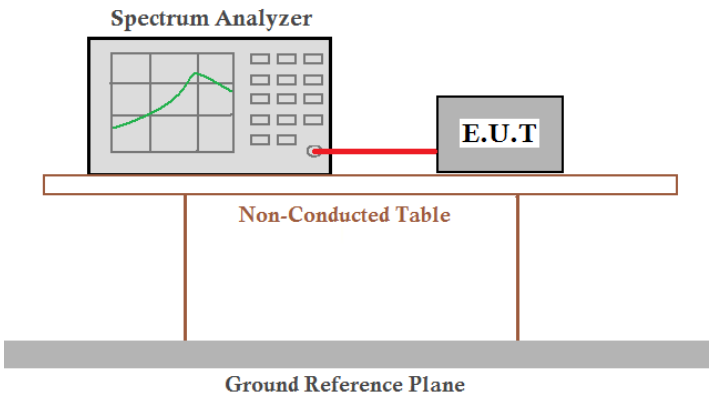
Test plot as follows:

Graphs	
11B/LCH	 Date: 3.DEC.2019 13:57:20
11B/HCH	 Date: 3.DEC.2019 14:14:48

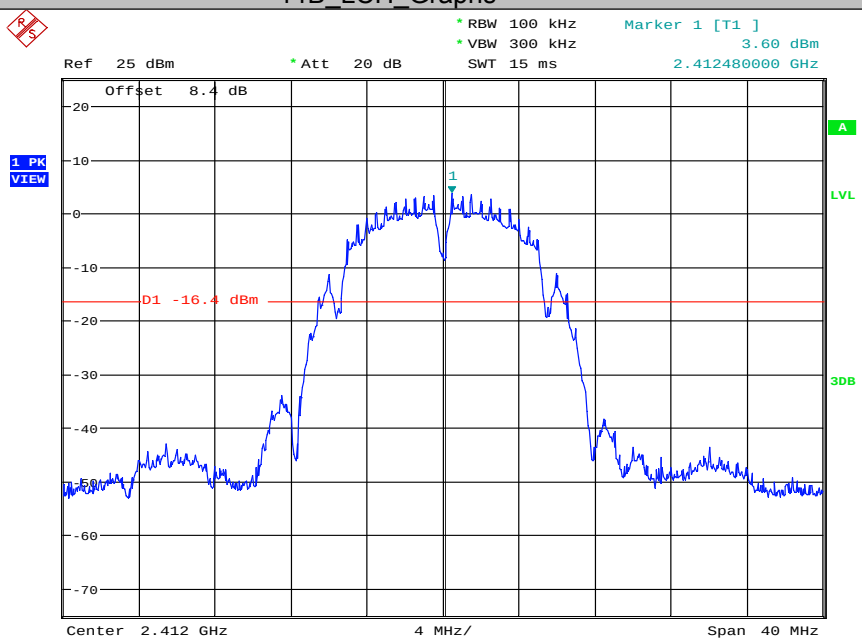
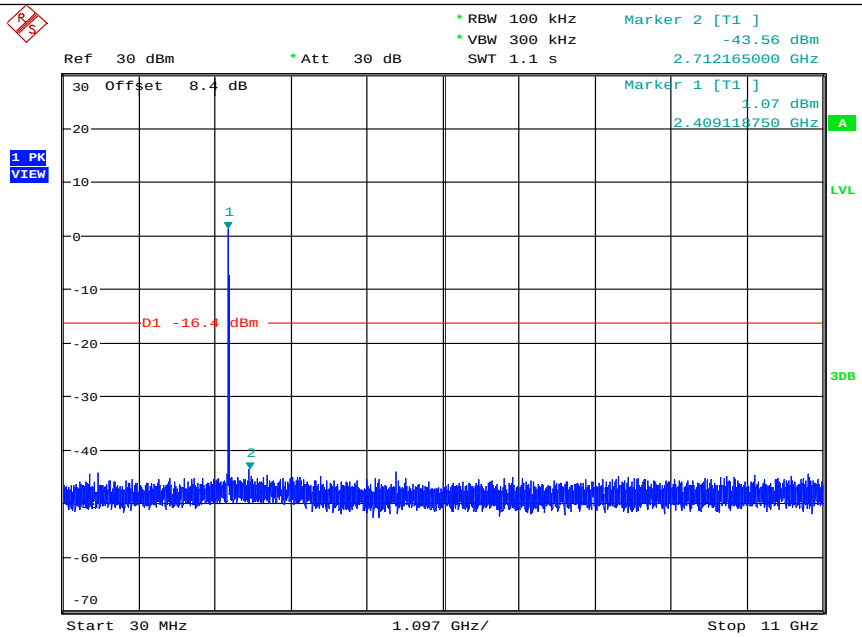
11G/LCH	 Date: 3.DEC.2019 14:19:57
11G/HCH	 Date: 3.DEC.2019 14:37:54

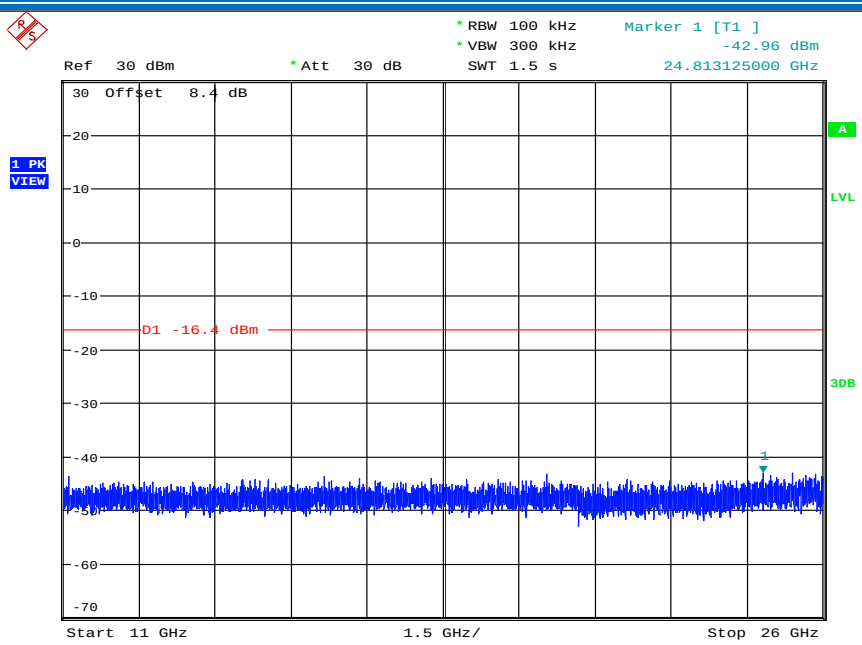
11N20SISO/LCH	 Date: 3.DEC.2019 14:46:22
11N20SISO/HCH	 Date: 3.DEC.2019 17:05:29

5.7 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) Only the worst case is recorded in the report.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

Test plot as follows:

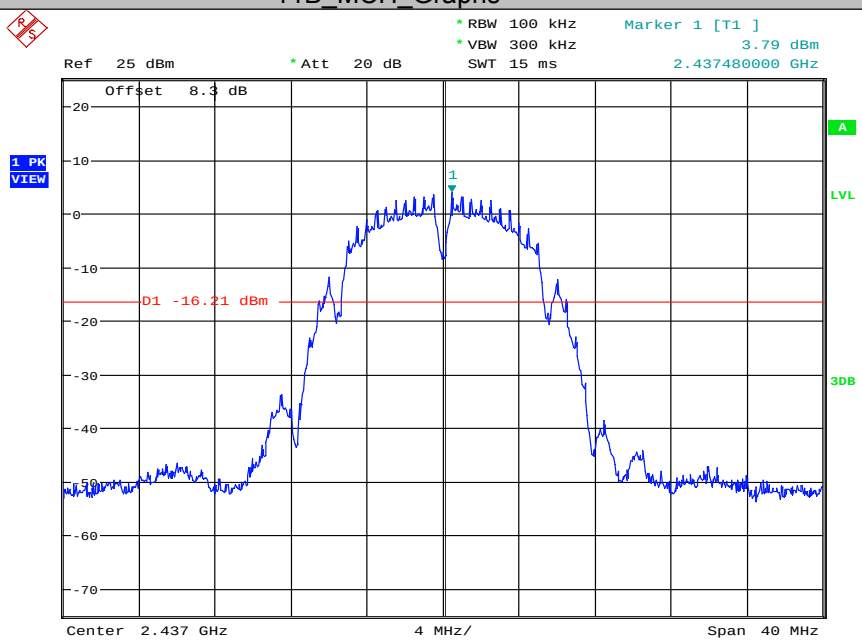
11B_LCH_Graphs	
Pref/11B/LCH	 Date: 3.DEC.2019 13:57:44
Puw/11B/LCH	 Date: 3.DEC.2019 13:57:57



Date: 3.DEC.2019 13:58:08

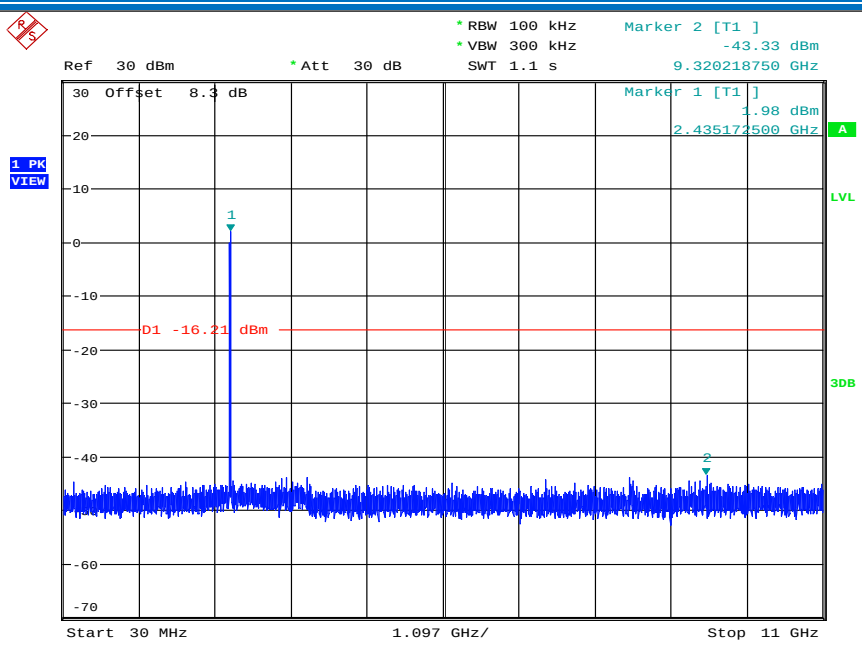
11B_MCH_Graphs

Pref/11B/MCH

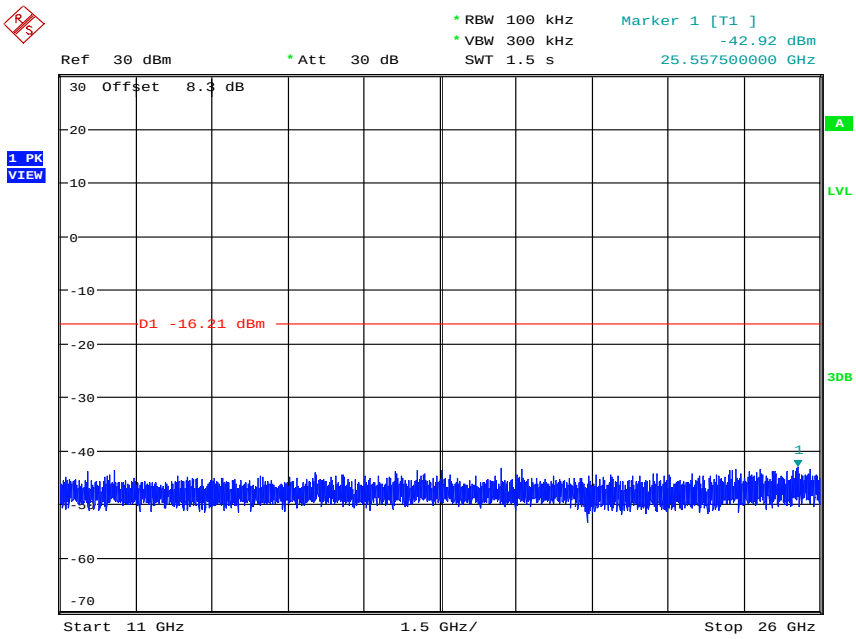


Date: 3.DEC.2019 14:07:44

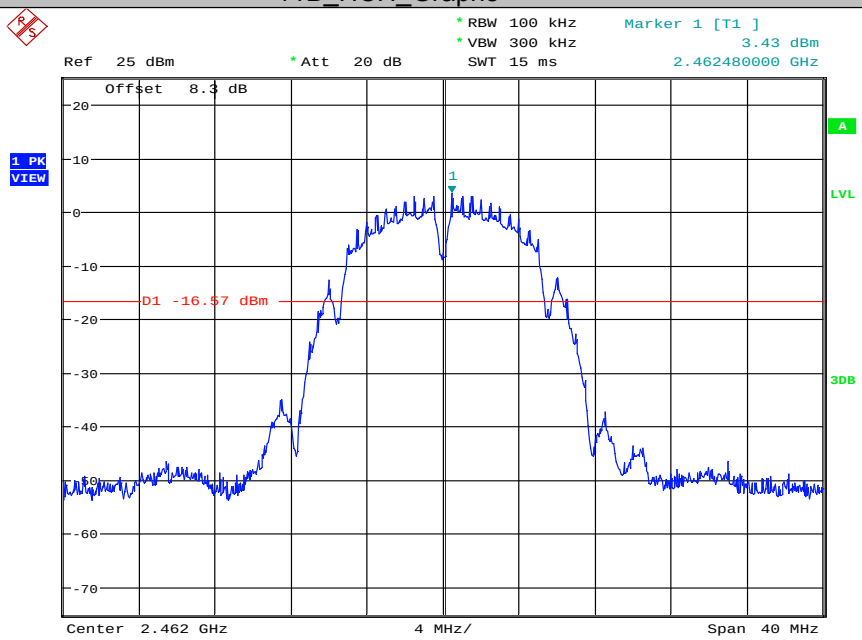
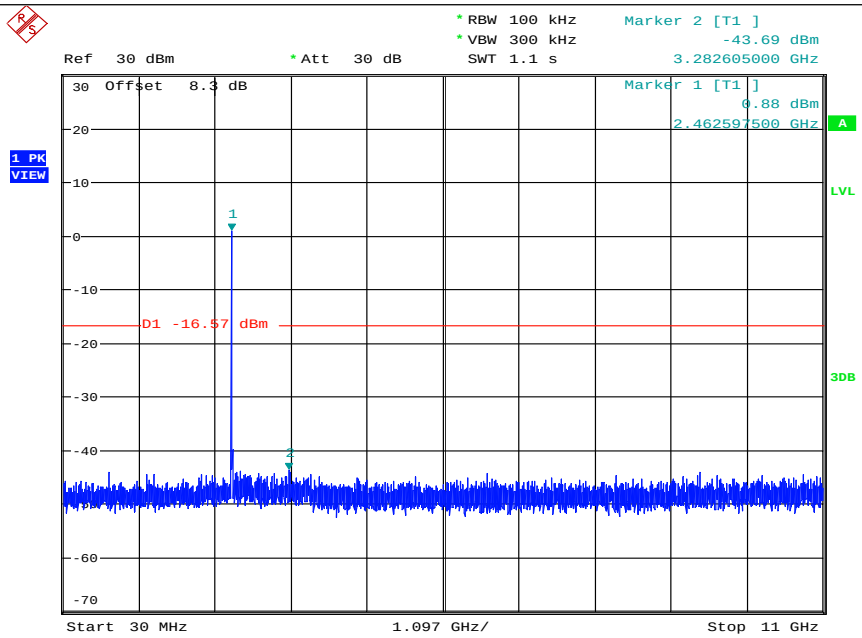
Puw/11B/MCH

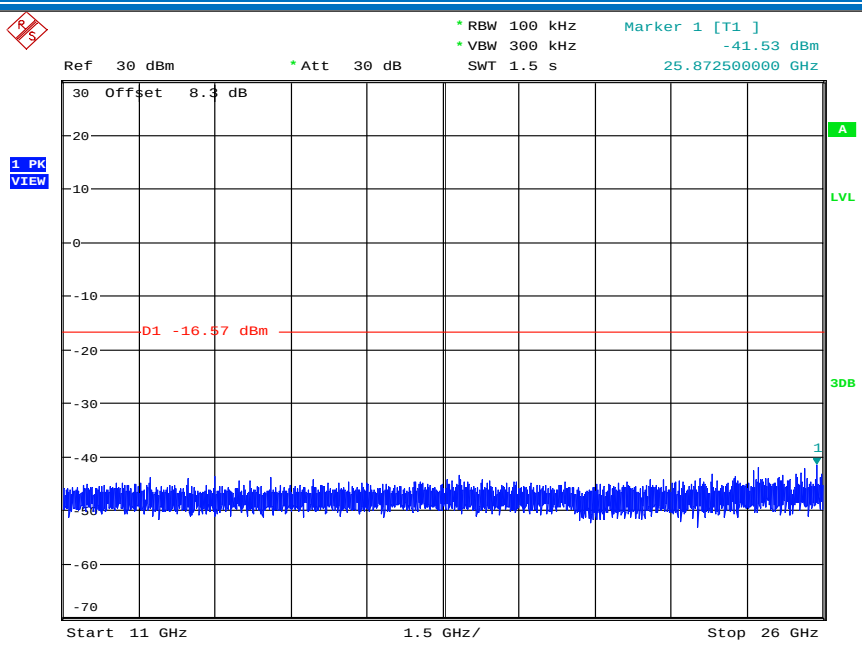


Date: 3.DEC.2019 14:07:57



Date: 3.DEC.2019 14:08:08

11B_HCH_Graphs	
Pref/11B/HCH	
Puw/11B/HCH	



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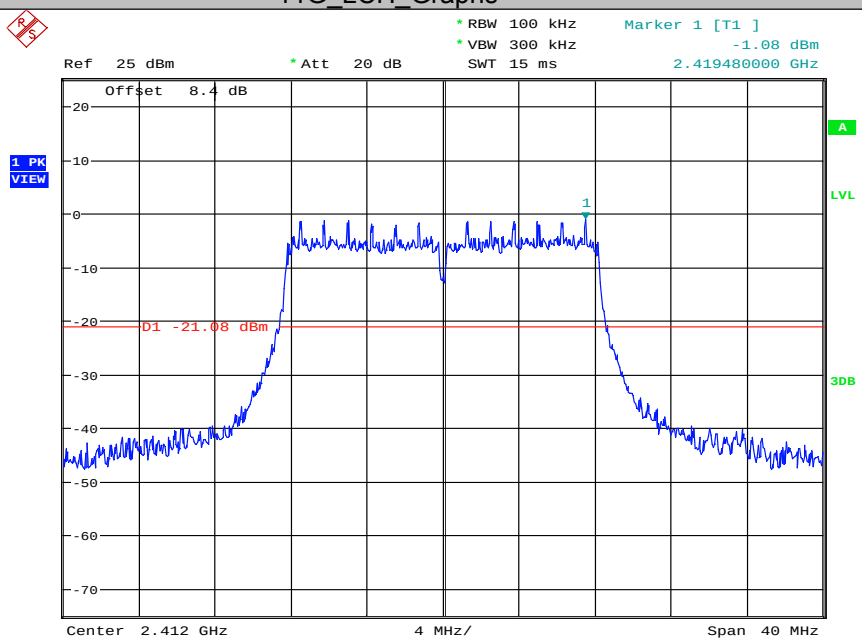
11G_LCH_Graphs

Pref/11G/LCH



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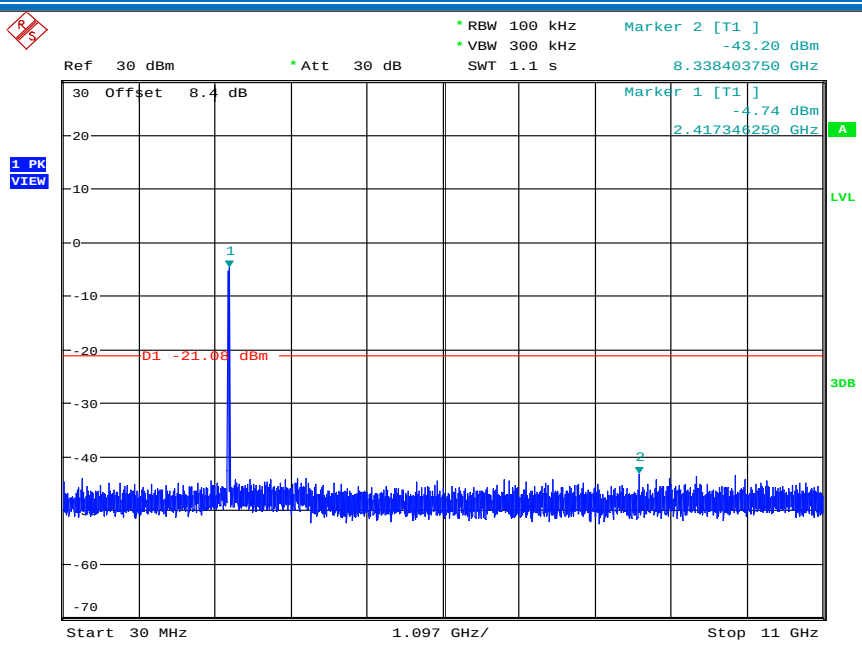
Puw/11G/LCH



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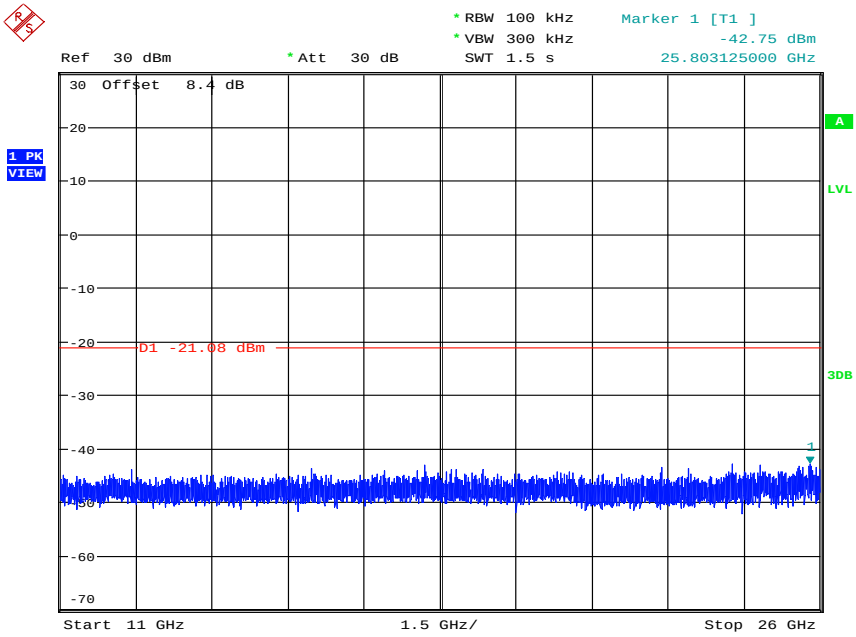

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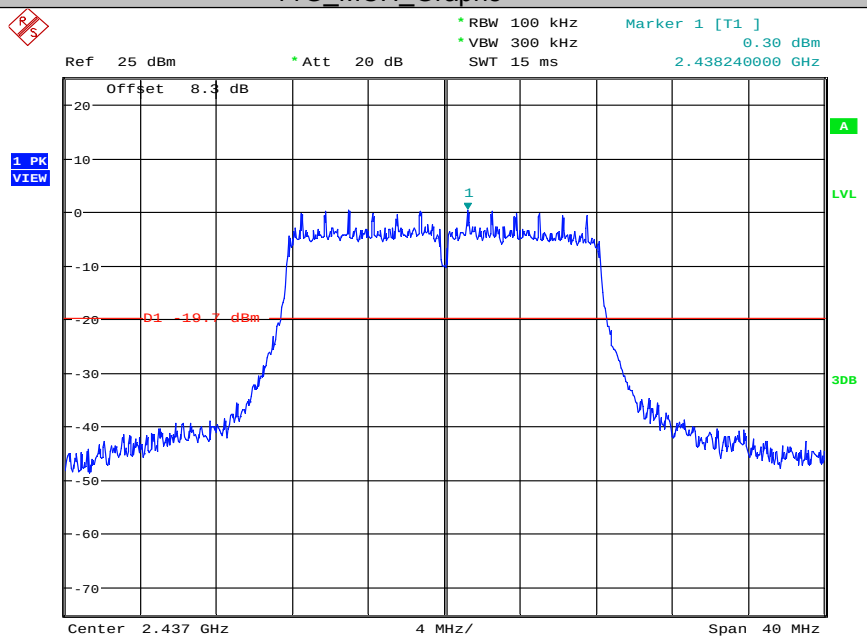
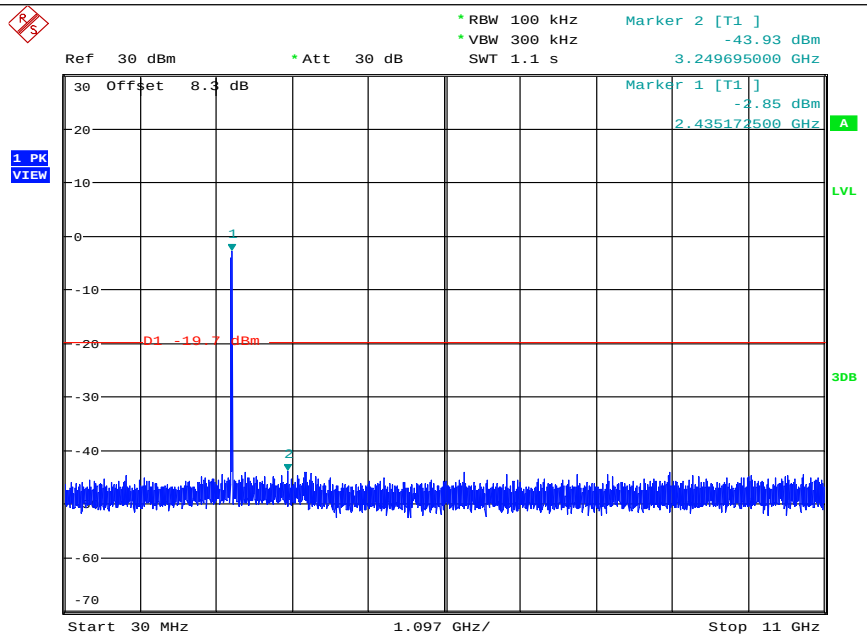
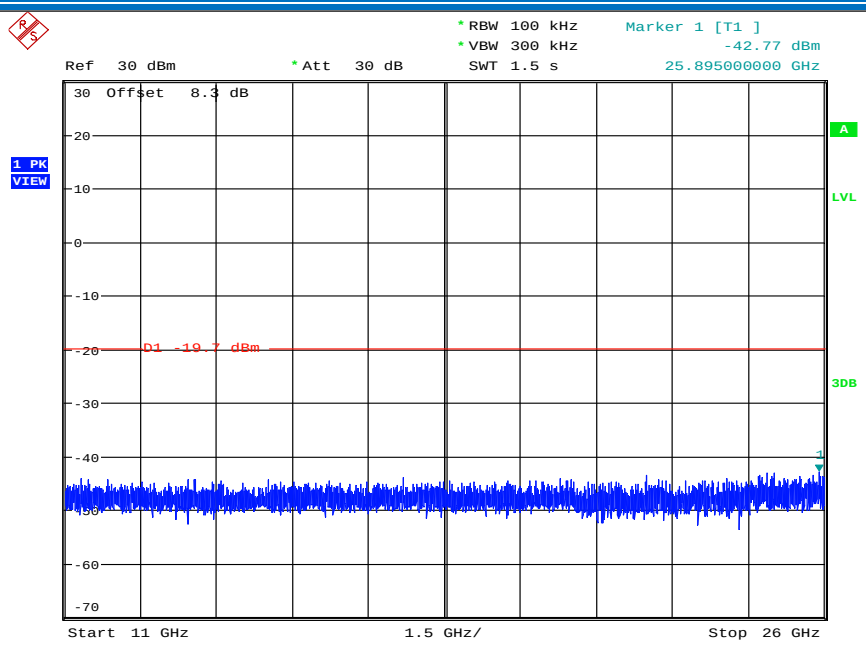
Pref/11G/MCH	 Date: 3.DEC.2019 14:25:01
Puw/11G/MCH	 Date: 3.DEC.2019 14:25:13



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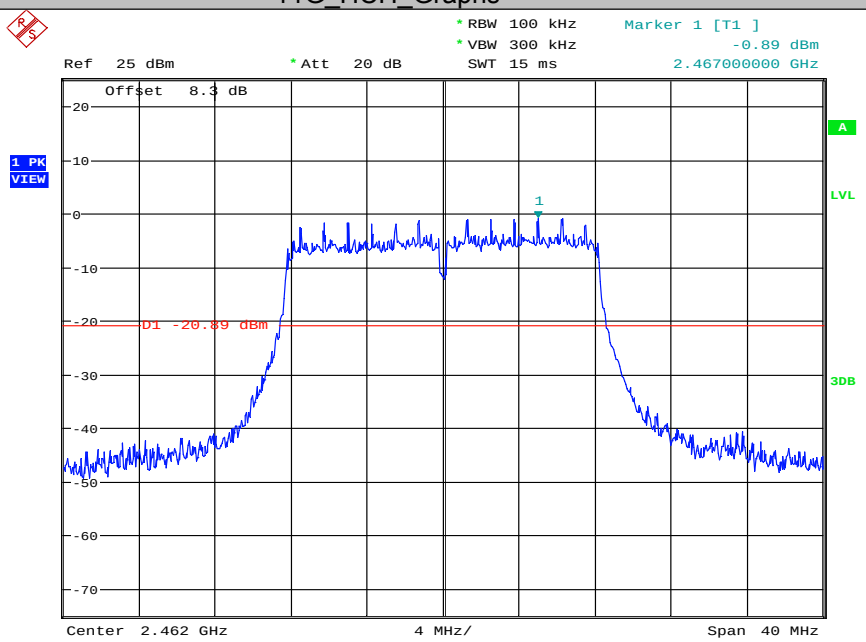

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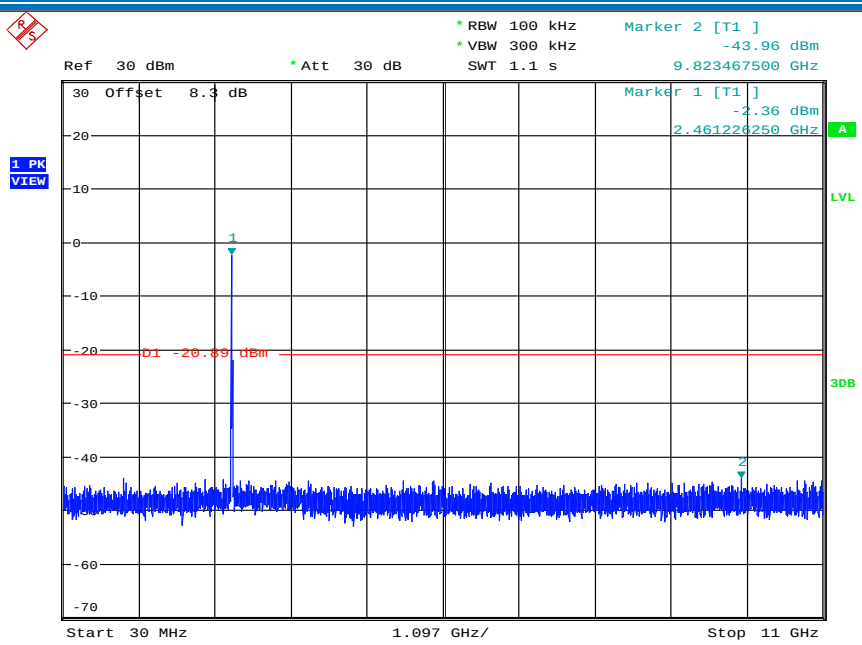

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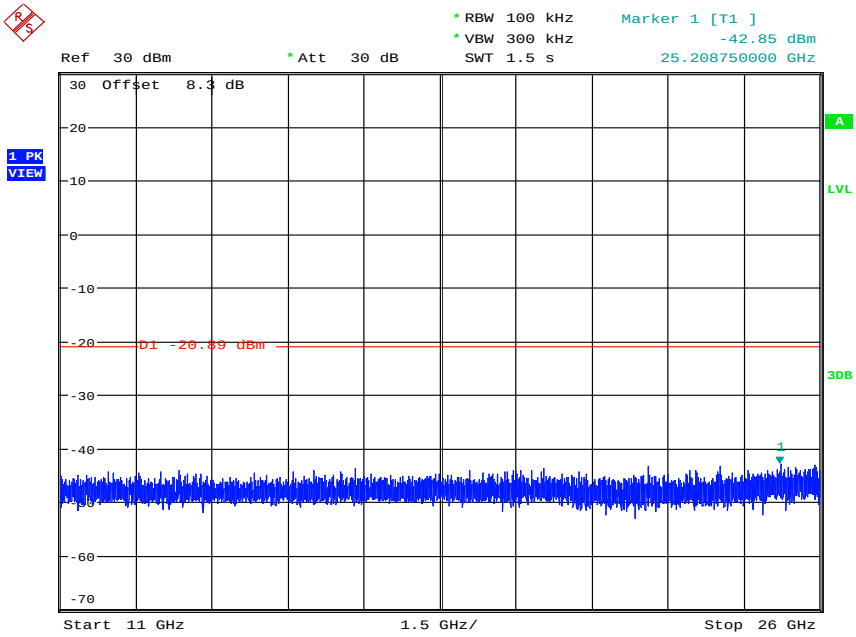

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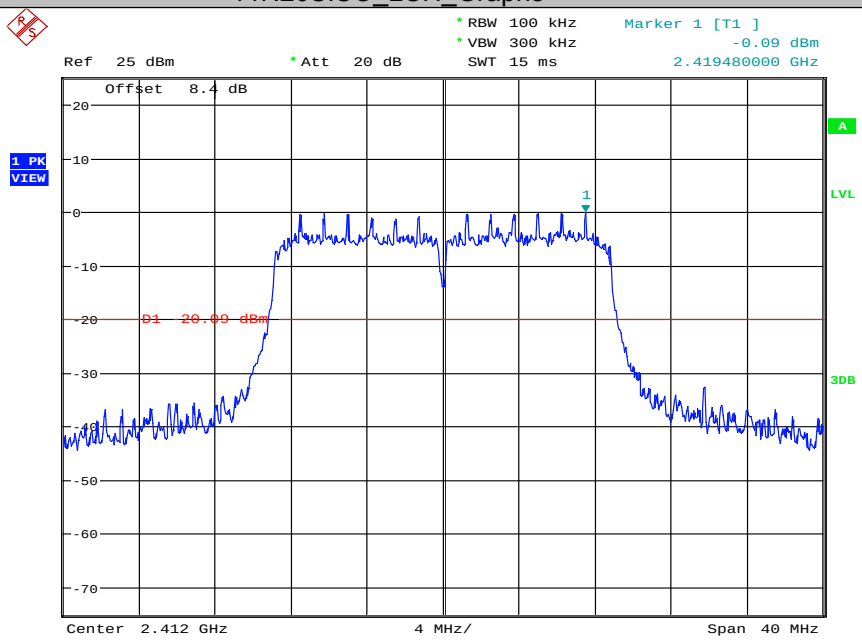
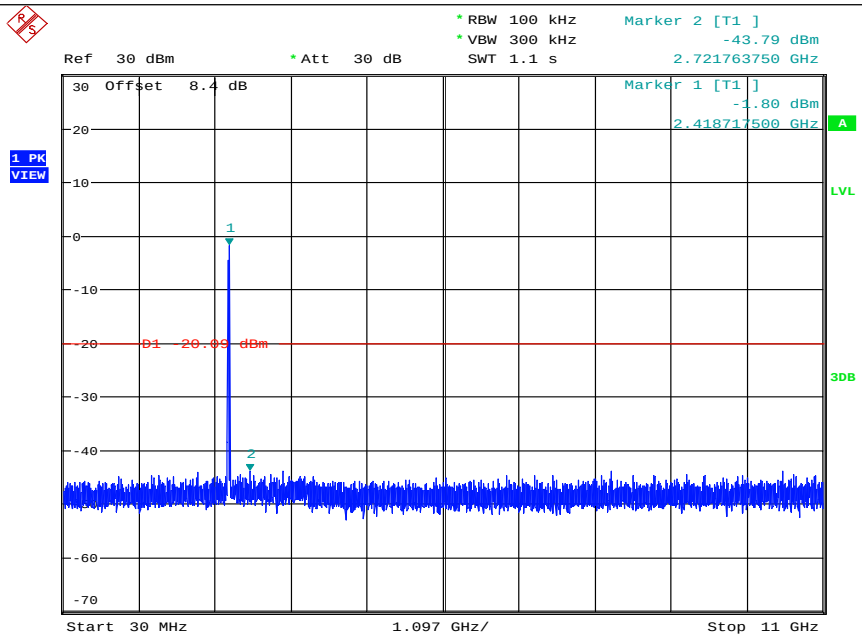
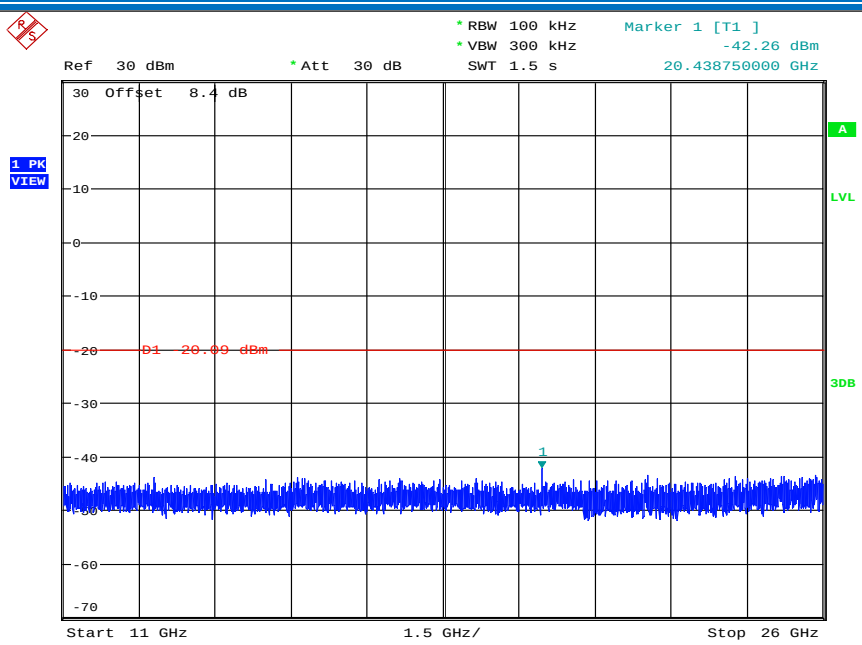
Pref/11N20SISO/LCH	
/11N20SISO/LCH	



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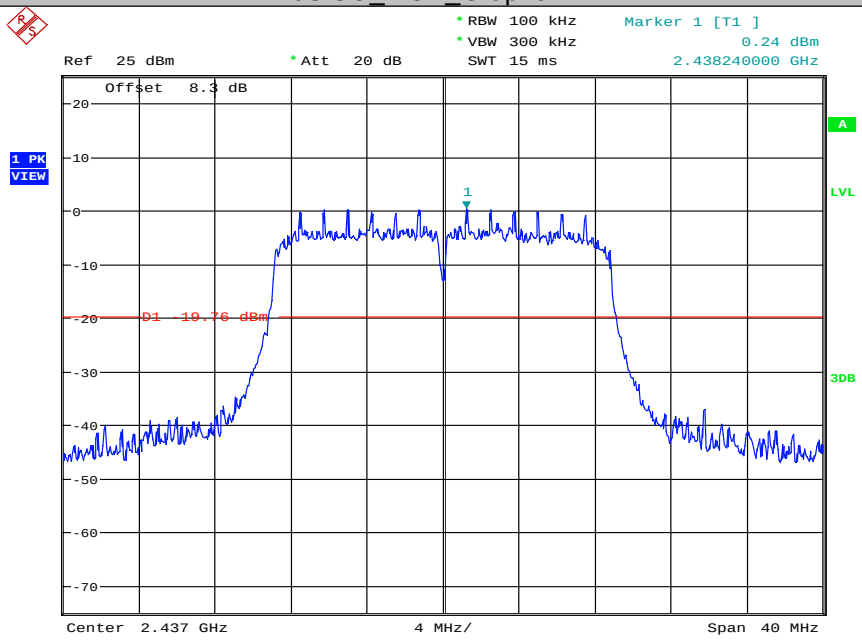
11N20SISO_MCH_Graphs

Pref/11N20SISO/MCH



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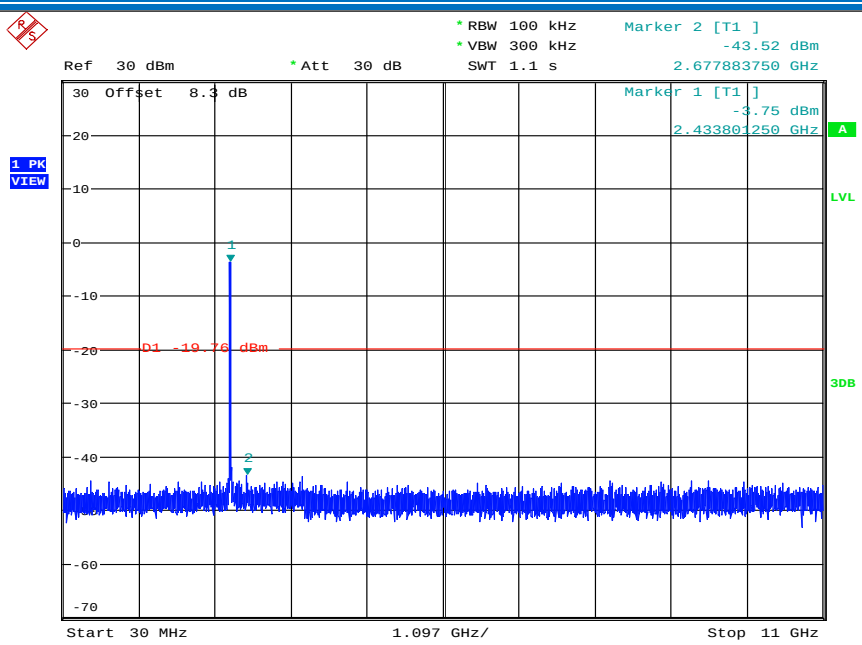
Puw/11N20SISO/MCH



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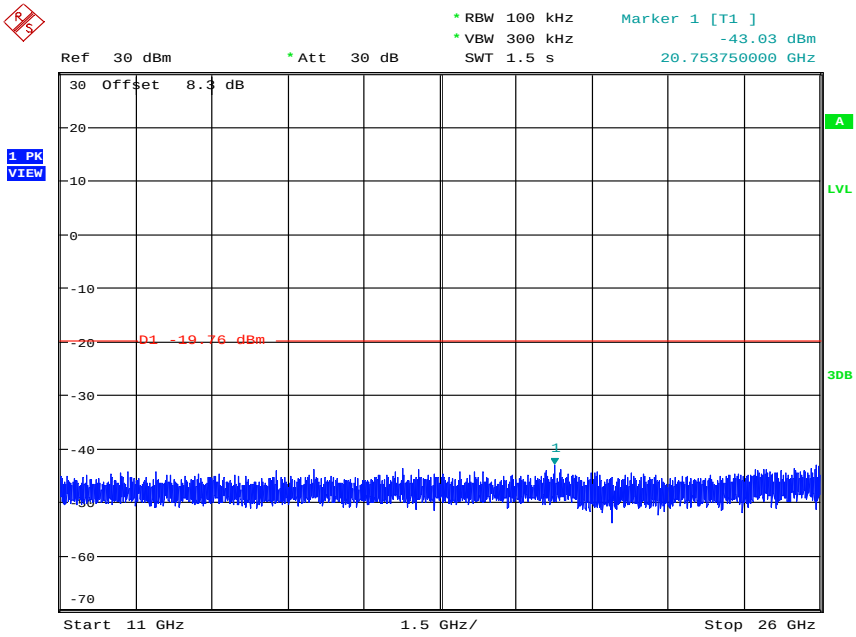

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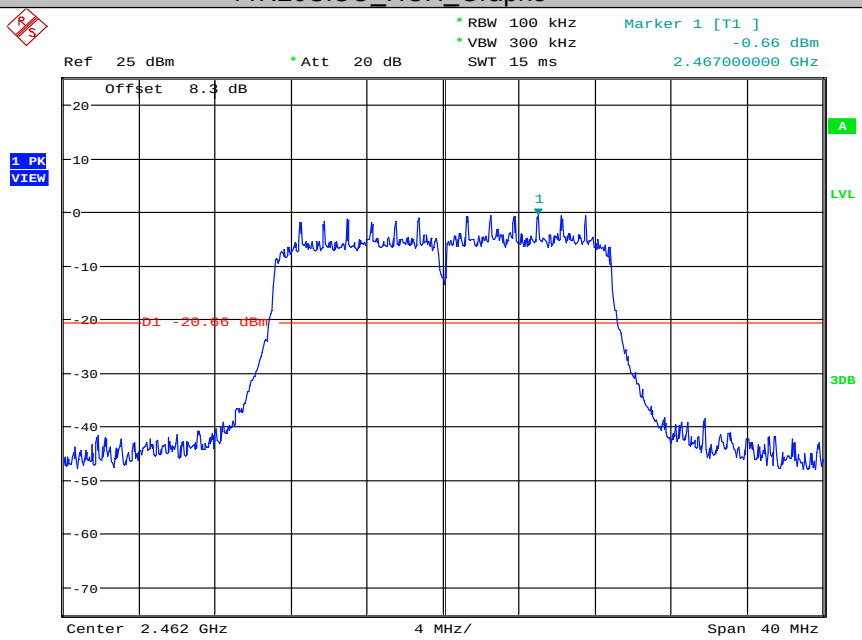
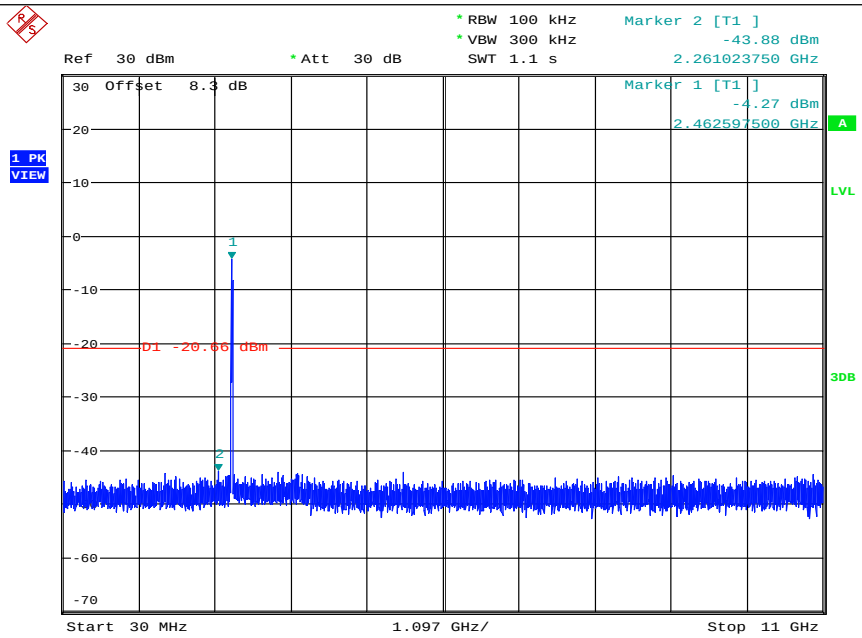
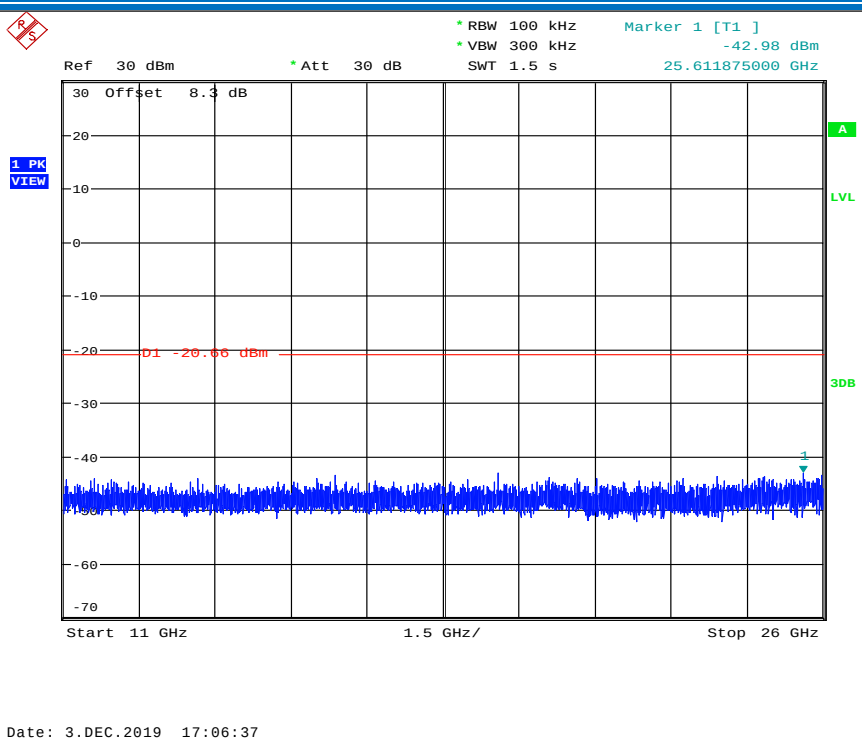
11N20SISO_HCH_Graphs	
Pref/11N20SISO/HCH	
Puw/11N20SISO/HCH	



Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

5.8 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

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

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Setup:	

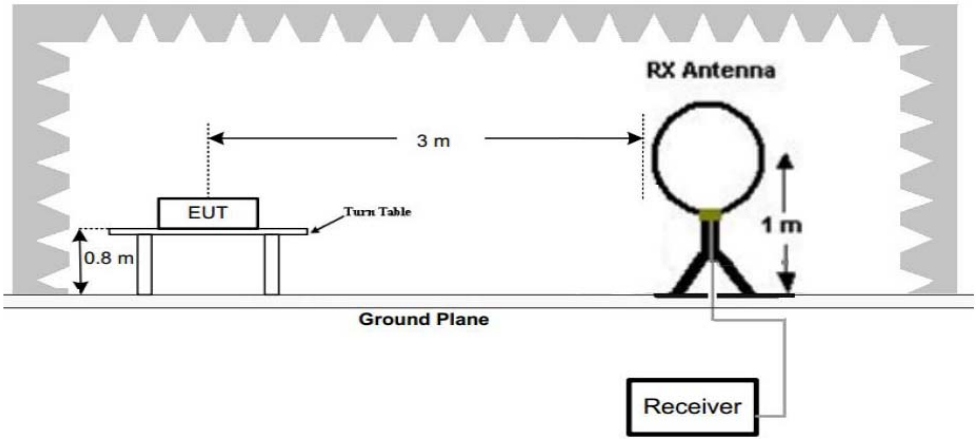


Figure 1. Below 30MHz

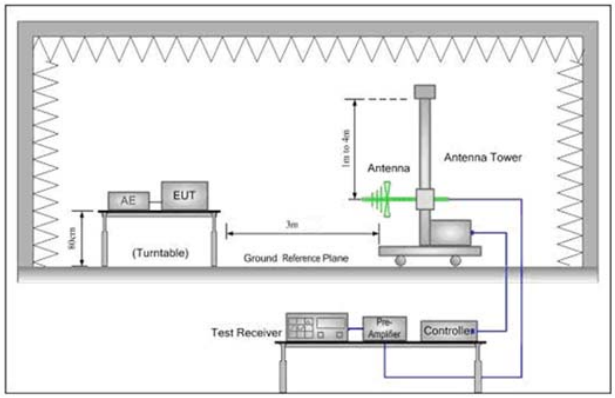


Figure 2. 30MHz to 1GHz

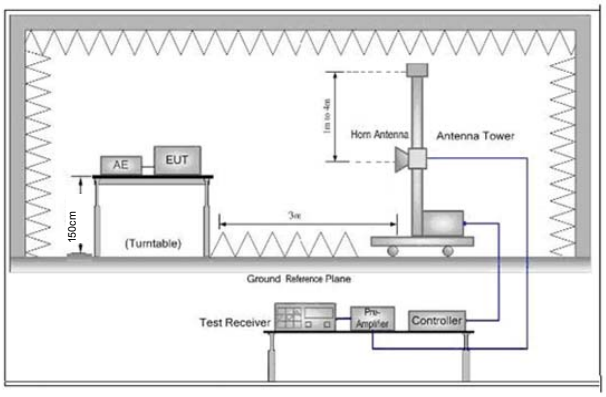


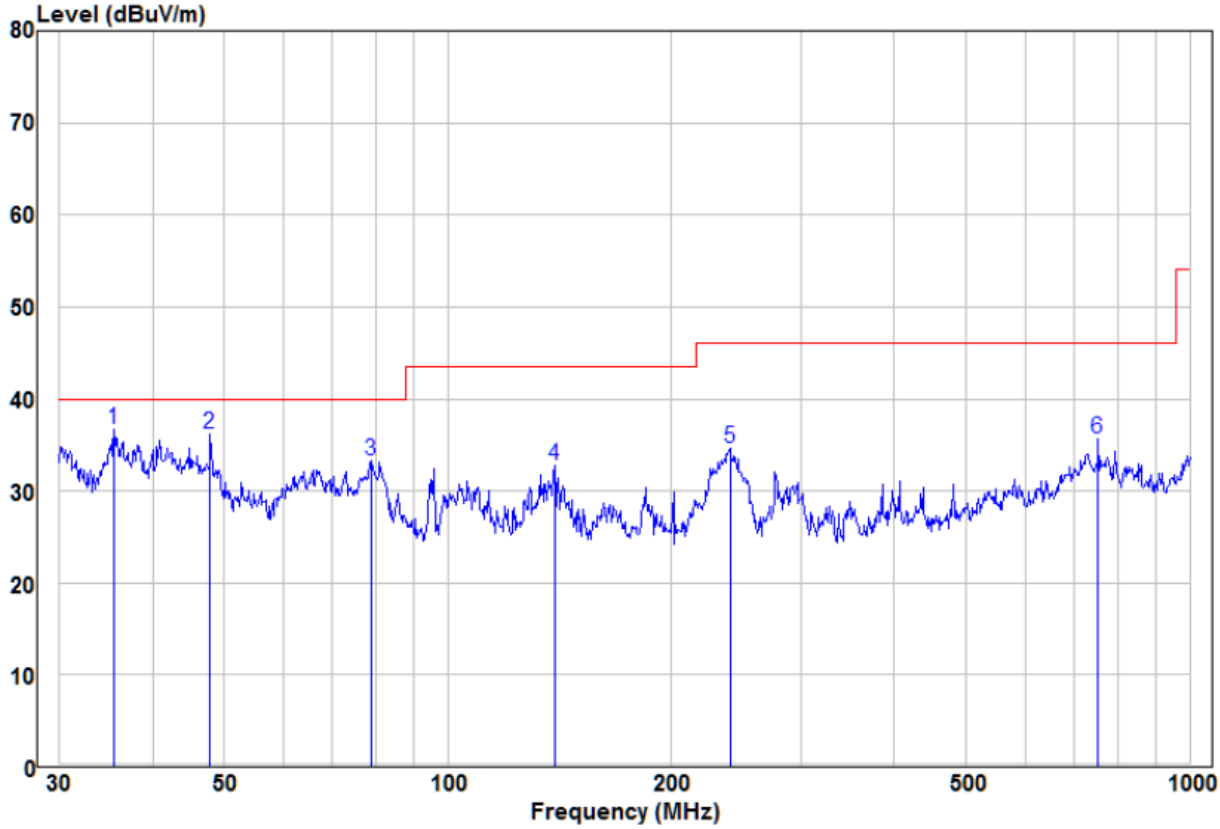
Figure 3. Above 1 GHz

Test Procedure:	a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. Note: For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

	d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel ,the middle channel ,the Highest channel h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11b at lowest channel is the worst case. Only the worst case is recorded in the report.
Test Results:	Pass

5.8.1 Radiated emission below 1GHz

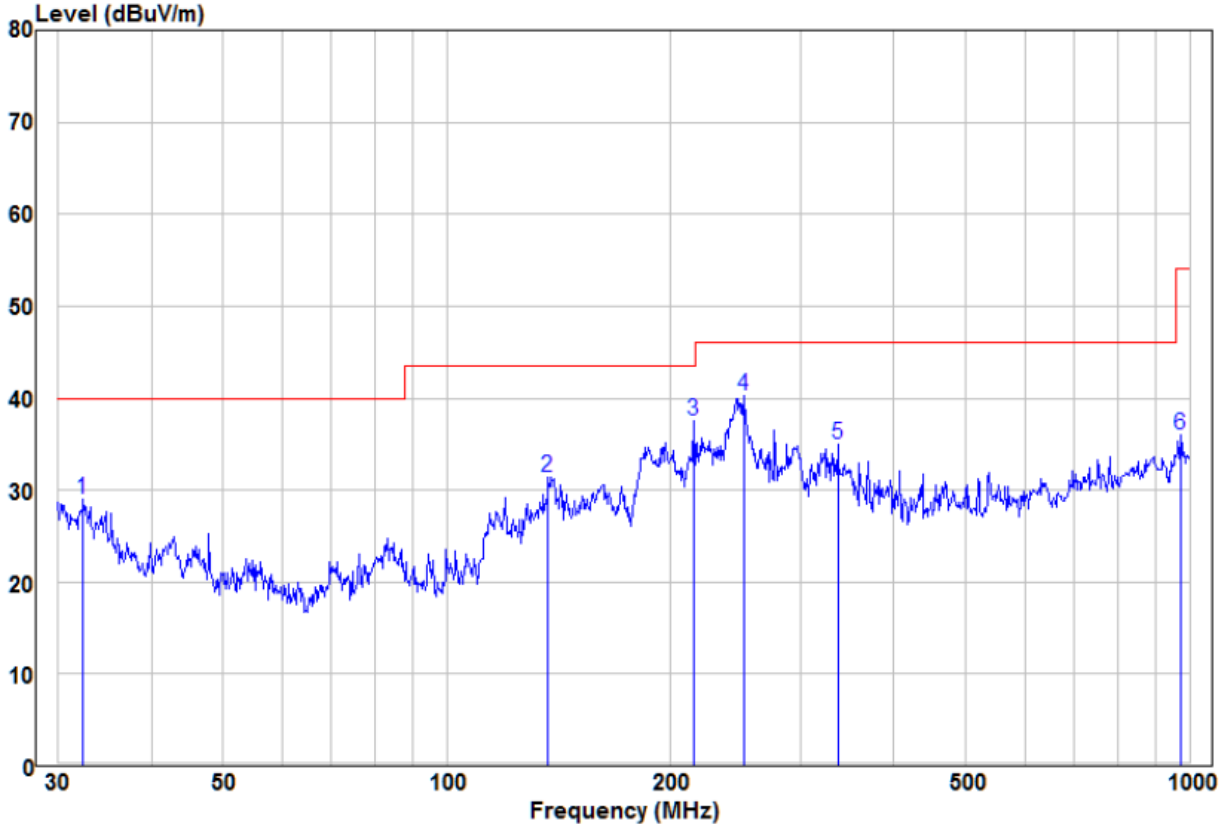
30MHz~1GHz		
Test mode:	Transmitting	Vertical



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	35.50	20.24	16.42	36.66	40.00	-3.34	Peak	VERTICAL
2	47.83	25.90	10.33	36.23	40.00	-3.77	Peak	VERTICAL
3	78.97	23.68	9.61	33.29	40.00	-6.71	Peak	VERTICAL
4	139.36	24.58	8.19	32.77	43.50	-10.73	Peak	VERTICAL
5	239.99	24.88	9.76	34.64	46.00	-11.36	Peak	VERTICAL
6	752.74	15.17	20.45	35.62	46.00	-10.38	Peak	VERTICAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

Test mode:	Transmitting	Horizontal



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	32.41	11.48	17.54	29.02	40.00	-10.98	Peak	HORIZONTAL
2	136.94	22.74	8.74	31.48	43.50	-12.02	Peak	HORIZONTAL
3	215.27	28.55	8.97	37.52	43.50	-5.98	Peak	HORIZONTAL
4 pp	251.18	30.09	10.12	40.21	46.00	-5.79	Peak	HORIZONTAL
5	336.04	22.42	12.61	35.03	46.00	-10.97	Peak	HORIZONTAL
6	972.34	13.72	22.36	36.08	54.00	-17.92	Peak	HORIZONTAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

5.8.2 Transmitter emission above 1GHz

Test mode:		802.11b(1Mbps)		Test channel:		Lowest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4824.000	53.99	-4.26	49.73	74	-24.27	peak	H
4824.000	36.68	-4.26	32.42	54	-21.58	AVG	H
7236.000	50.53	1.18	51.71	74	-22.29	peak	H
7236.000	38.26	1.18	39.44	54	-14.56	AVG	H
4824.000	54.65	-4.26	50.39	74	-23.61	peak	V
4824.000	39.88	-4.26	35.62	54	-18.38	AVG	V
7236.000	51.42	1.18	52.60	74	-21.40	peak	V
7236.000	36.93	1.18	38.11	54	-15.89	AVG	V

Test mode:		802.11b(1Mbps)		Test channel:		Middle	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4874.000	52.03	-4.12	47.91	74	-26.09	peak	H
4874.000	37.12	-4.12	33.00	54	-21.00	AVG	H
7311.000	49.90	1.46	51.36	74	-22.64	peak	H
7311.000	36.65	1.46	38.11	54	-15.89	AVG	H
4874.000	53.70	-4.12	49.58	74	-24.42	peak	V
4874.000	37.83	-4.12	33.71	54	-20.29	AVG	V
7311.000	49.34	1.46	50.80	74	-23.20	peak	V
7311.000	36.75	1.46	38.21	54	-15.79	AVG	V

Test mode:		802.11b(1Mbps)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4924.000	52.83	-4.03	48.80	74	-25.20	peak	H
4924.000	38.06	-4.03	34.03	54	-19.97	AVG	H
7386.000	50.93	1.66	52.59	74	-21.41	peak	H
7386.000	37.31	1.66	38.97	54	-15.03	AVG	H
4924.000	53.25	-4.03	49.22	74	-24.78	peak	V
4924.000	38.53	-4.03	34.50	54	-19.50	AVG	V
7386.000	50.96	1.66	52.62	74	-21.38	peak	V
7386.000	37.35	1.66	39.01	54	-14.99	AVG	V

Remark:

1) The 1Mbps of rate of 802.11b is the worst case.
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
3) Scan from 9kHz to 25GHz,The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

5.9 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

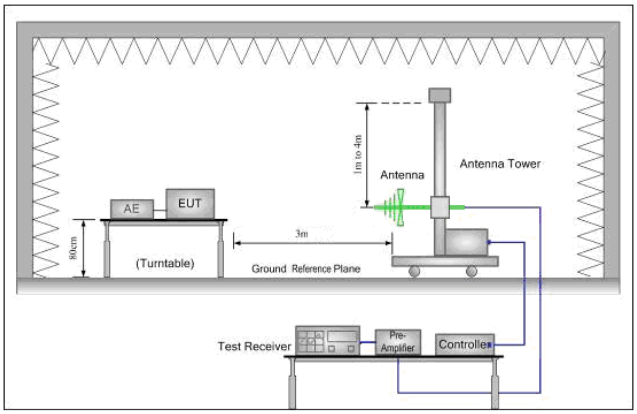


Figure 1. 30MHz to 1GHz

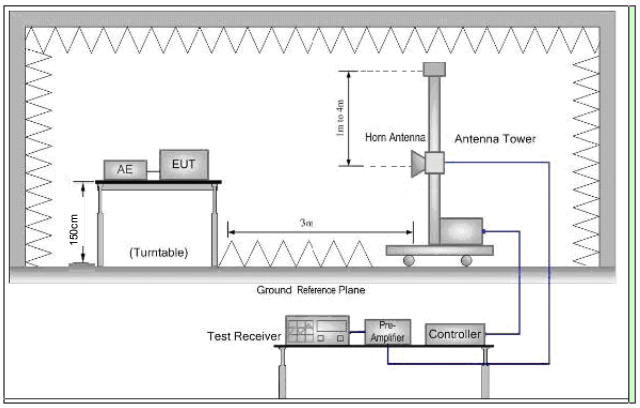


Figure 2. Above 1 GHz

Test Procedure:

a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and

	then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel g. Test the EUT in the lowest channel , the Highest channel h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) Only the worst case is recorded in the report.
Test Results:	Pass

Test data:

Worse case mode:		802.11b(1Mbps)		Test channel:		Lowest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	58.57	-9.2	49.37	74	-24.63	peak	H
2390.000	44.51	-9.2	35.31	54	-18.69	AVG	H
2400.000	60.24	-9.39	50.85	74	-23.15	peak	H
2400.000	46.30	-9.39	36.91	54	-17.09	AVG	H
2390.000	58.29	-9.2	49.09	74	-24.91	peak	V
2390.000	44.32	-9.2	35.12	54	-18.88	AVG	V
2400.000	59.70	-9.39	50.31	74	-23.69	peak	V
2400.000	46.18	-9.39	36.79	54	-17.21	AVG	V

Worse case mode:		802.11b(1Mbps)		Test channel:		Highest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2483.500	58.02	-9.29	48.73	74	-25.27	peak	H
2483.500	43.76	-9.29	34.47	54	-19.53	AVG	H
2483.500	58.01	-9.29	48.72	74	-25.28	peak	V
2483.500	45.77	-9.29	36.48	54	-17.52	AVG	V

Worse case mode:		802.11g(6Mbps)		Test channel:		Lowest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	58.41	-9.2	49.21	74	-24.79	peak	H
2390.000	44.20	-9.2	35.00	54	-19.00	AVG	H
2400.000	59.67	-9.39	50.28	74	-23.72	peak	H
2400.000	46.22	-9.39	36.83	54	-17.17	AVG	H
2390.000	59.21	-9.2	50.01	74	-23.99	peak	V
2390.000	44.39	-9.2	35.19	54	-18.81	AVG	V
2400.000	59.35	-9.39	49.96	74	-24.04	peak	V
2400.000	46.21	-9.39	36.82	54	-17.18	AVG	V

Worse case mode:		802.11g(6Mbps)		Test channel:		Highest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2483.500	57.63	-9.29	48.34	74	-25.66	peak	H
2483.500	44.43	-9.29	35.14	54	-18.86	AVG	H
2483.500	58.32	-9.29	49.03	74	-24.97	peak	V
2483.500	45.65	-9.29	36.36	54	-17.64	AVG	V

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		Lowest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	58.97	-9.2	49.77	74	-24.23	peak	H
2390.000	44.15	-9.2	34.95	54	-19.05	AVG	H
2400.000	59.71	-9.39	50.32	74	-23.68	peak	H
2400.000	46.21	-9.39	36.82	54	-17.18	AVG	H
2390.000	59.18	-9.2	49.98	74	-24.02	peak	V
2390.000	44.55	-9.2	35.35	54	-18.65	AVG	V
2400.000	59.46	-9.39	50.07	74	-23.93	peak	V
2400.000	46.22	-9.39	36.83	54	-17.17	AVG	V

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		Highest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2483.500	58.02	-9.29	48.73	74	-25.27	peak	H
2483.500	44.30	-9.29	35.01	54	-18.99	AVG	H
2483.500	57.85	-9.29	48.56	74	-25.44	peak	V
2483.500	46.38	-9.29	37.09	54	-16.91	AVG	V

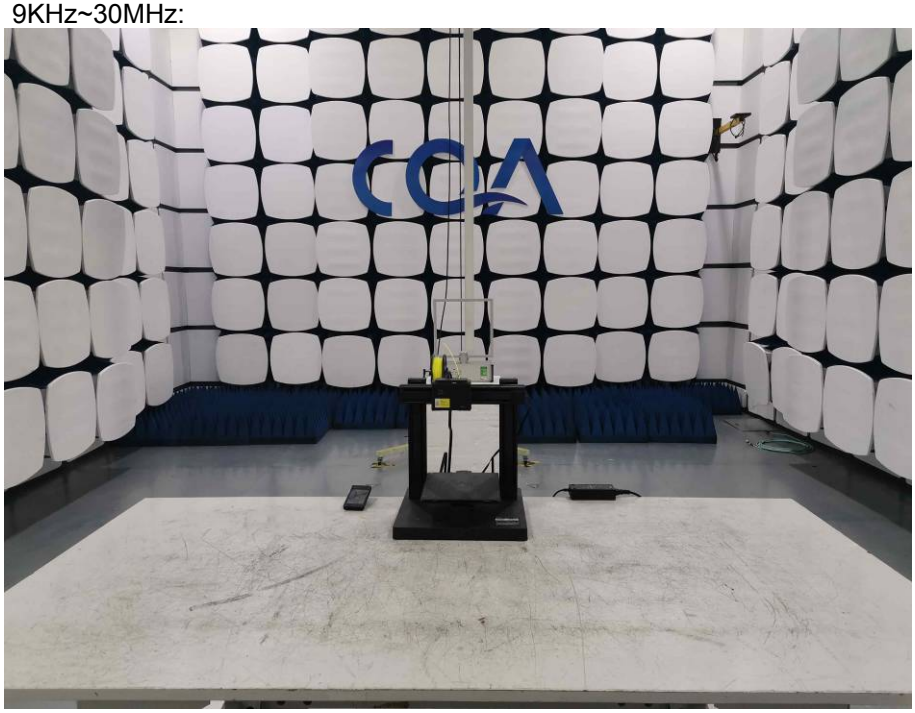
Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

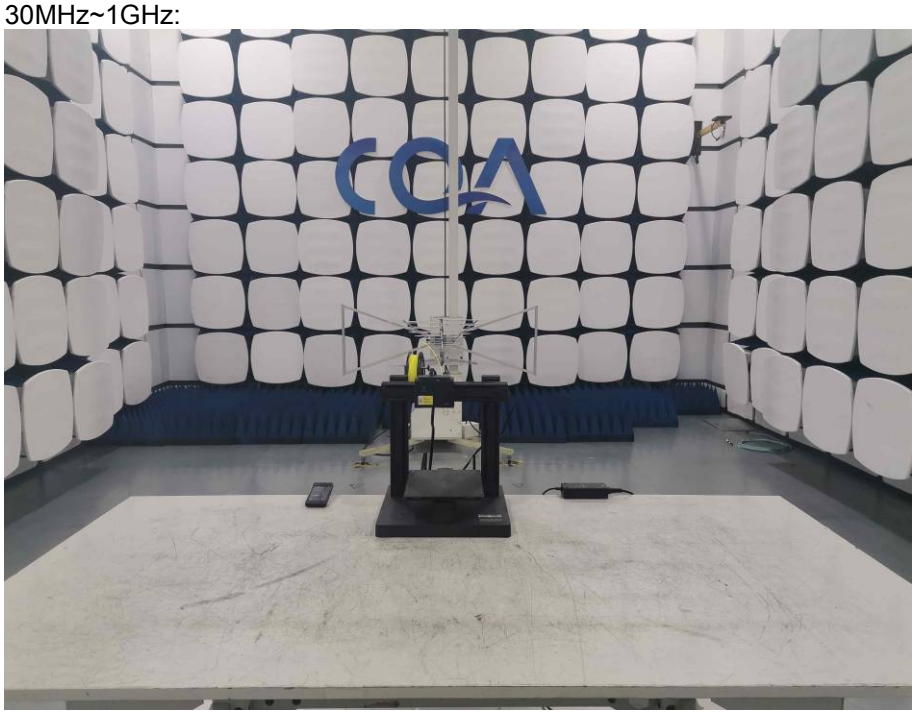
6 Photographs - EUT Test Setup

6.1 Radiated Spurious Emission

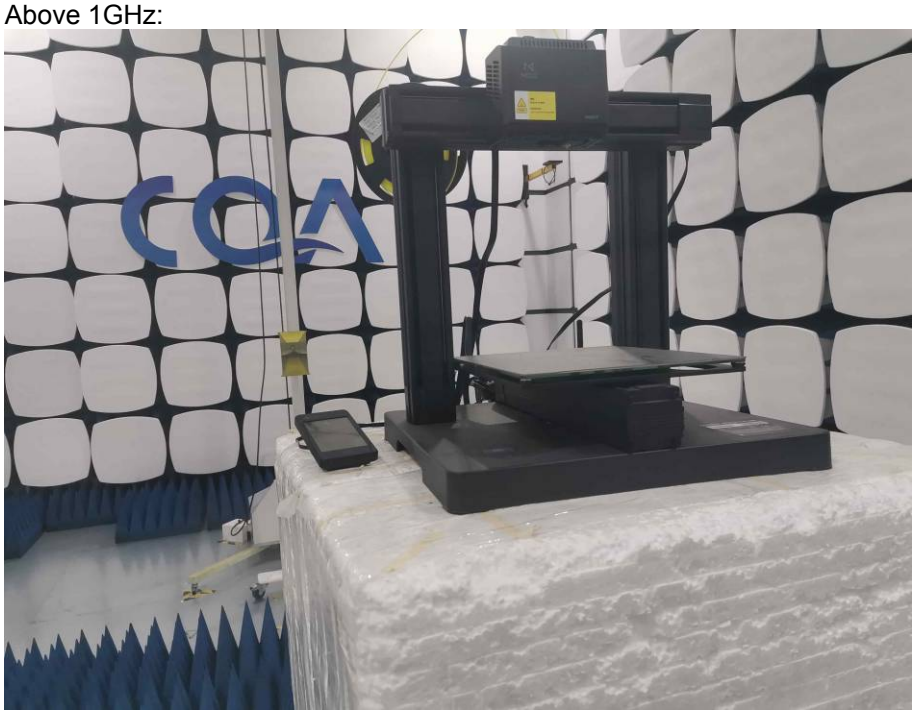
9KHz~30MHz:



30MHz~1GHz:

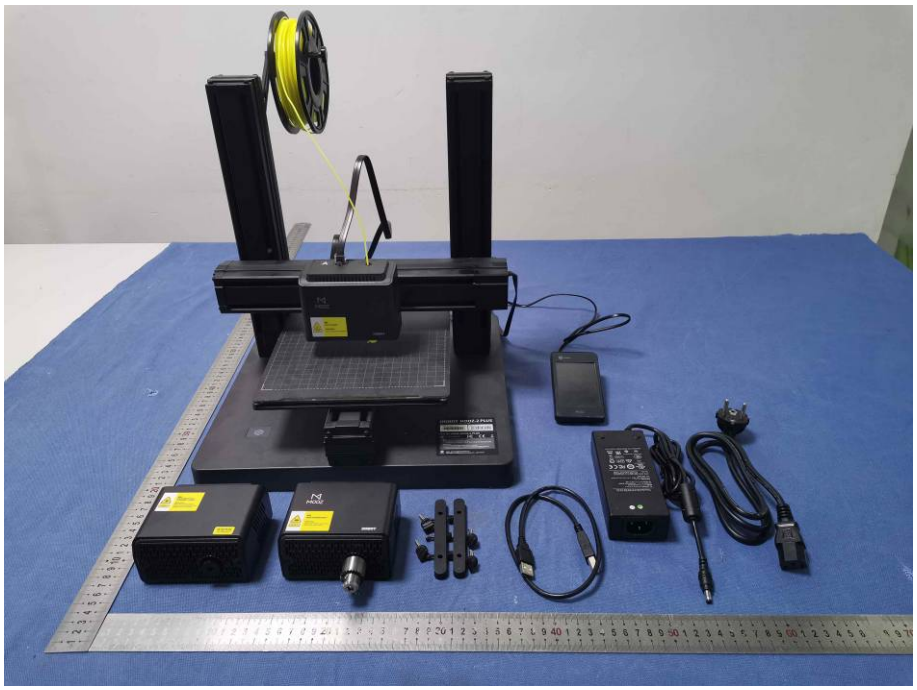


Above 1GHz:



6.2 Conducted Emission

7 Photographs - EUT Constructional Details



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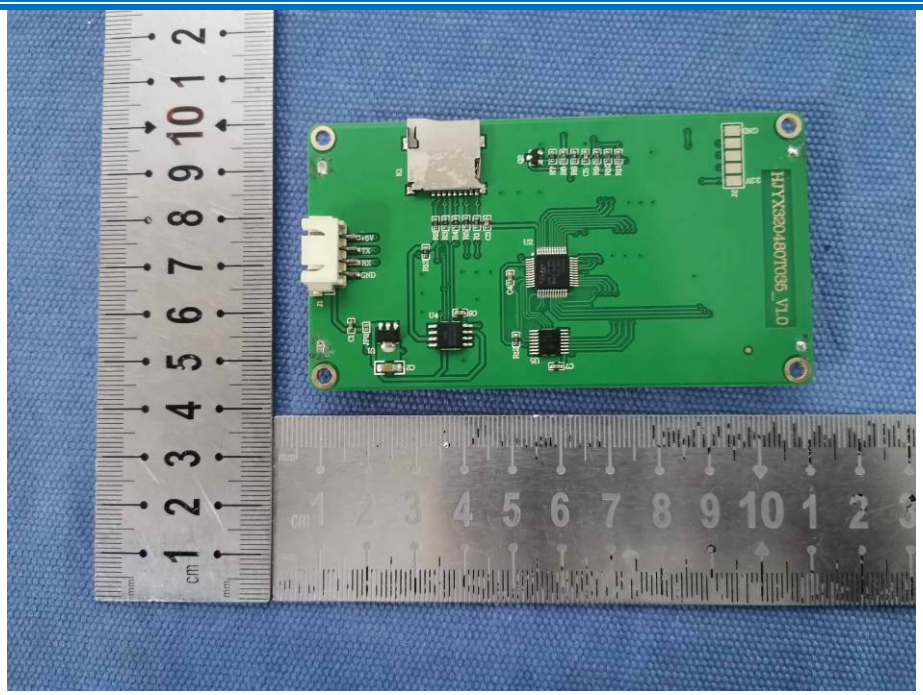
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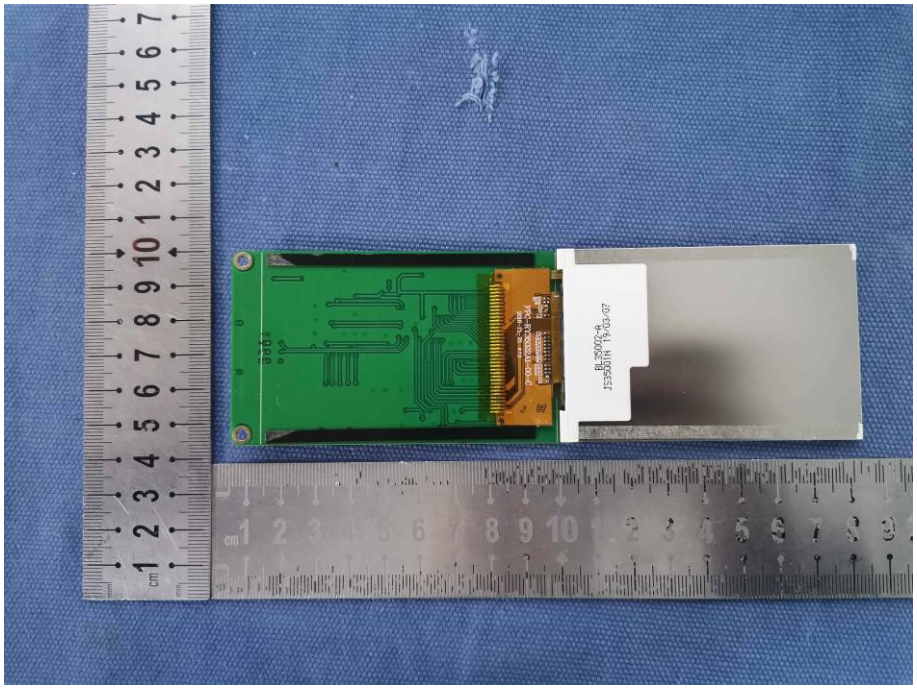

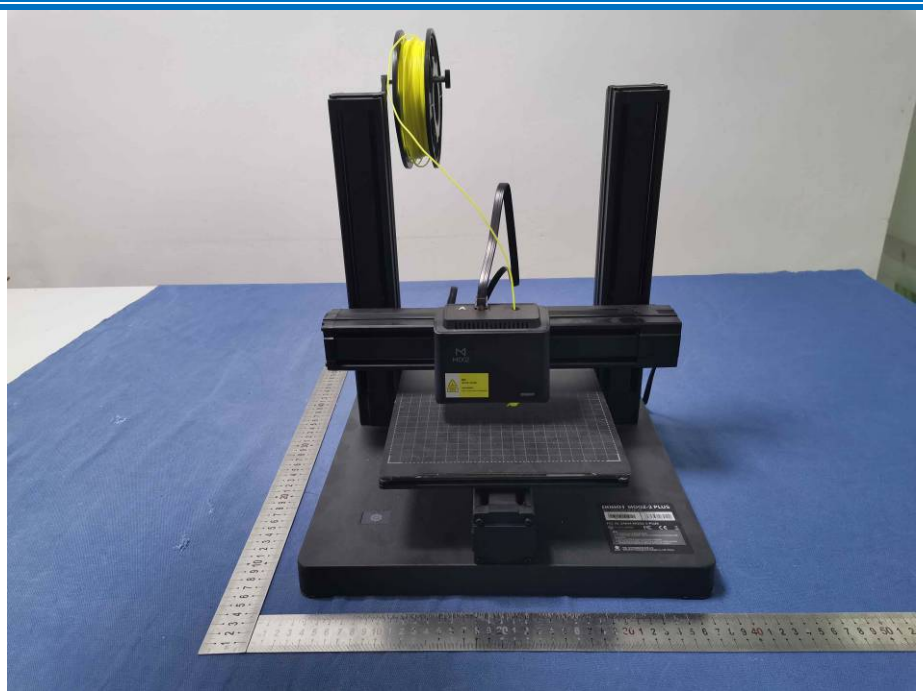

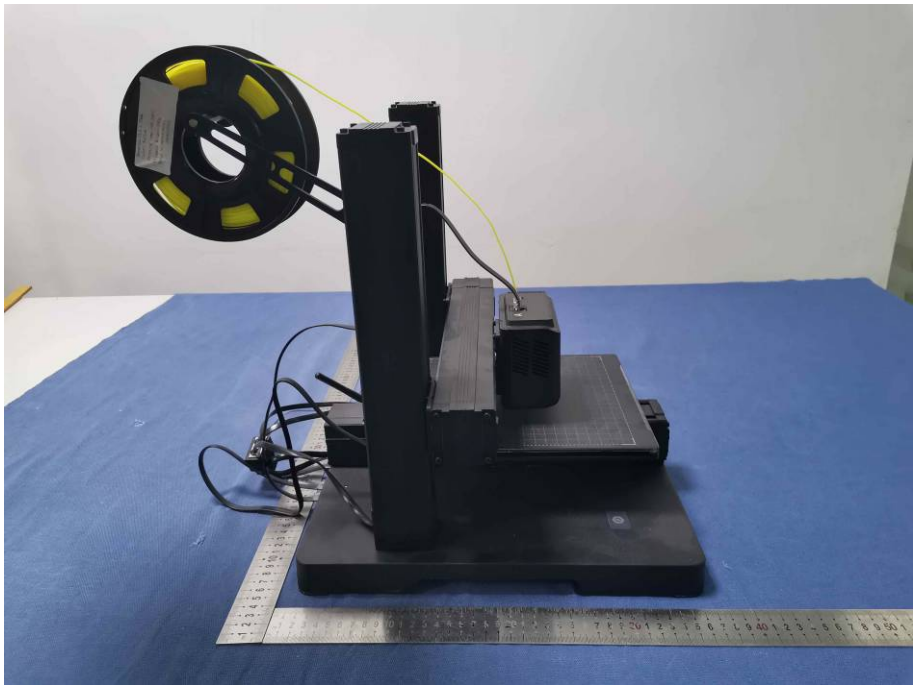

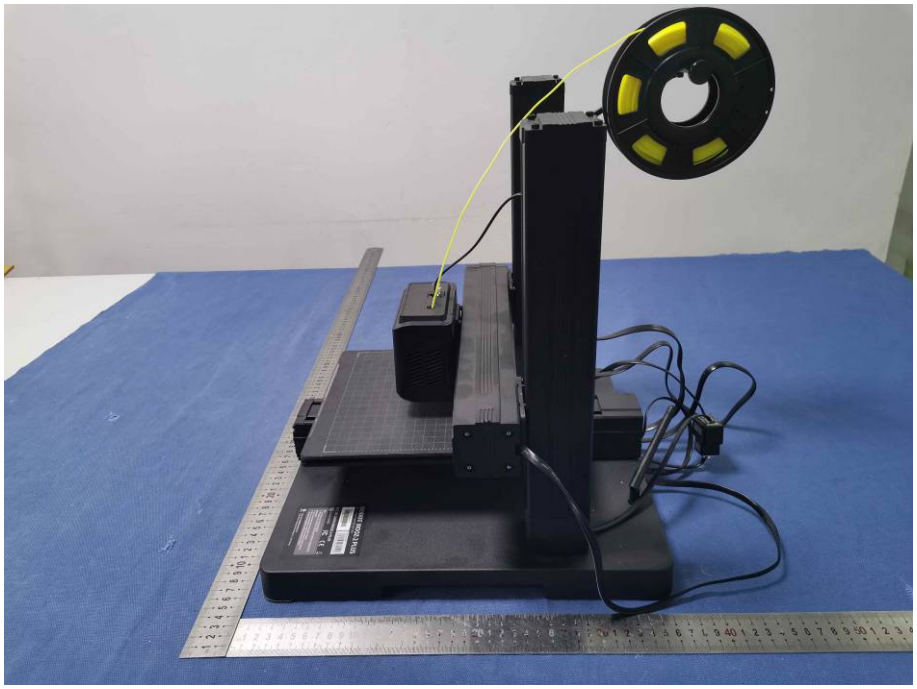

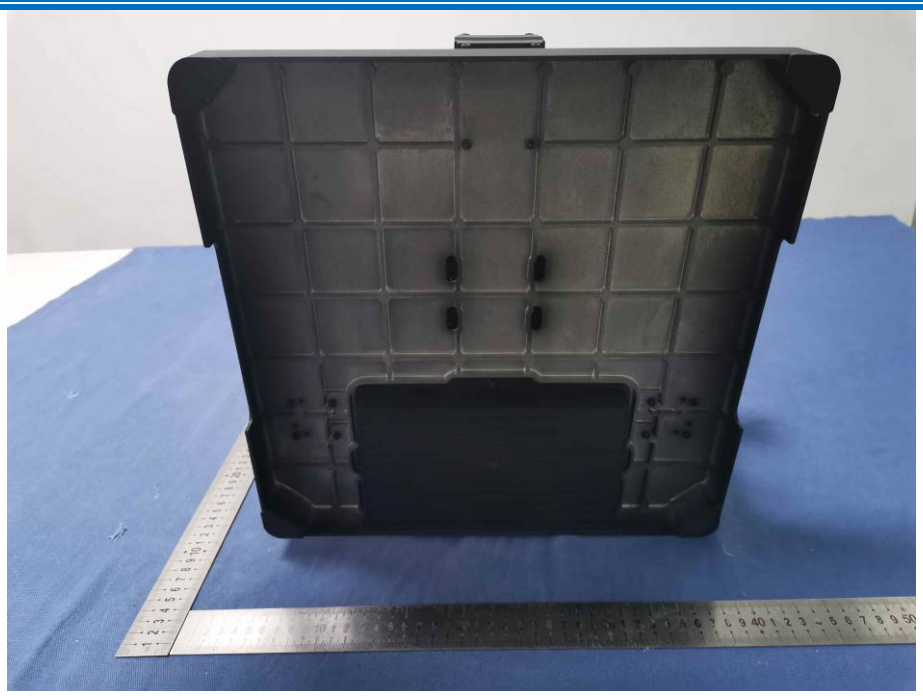

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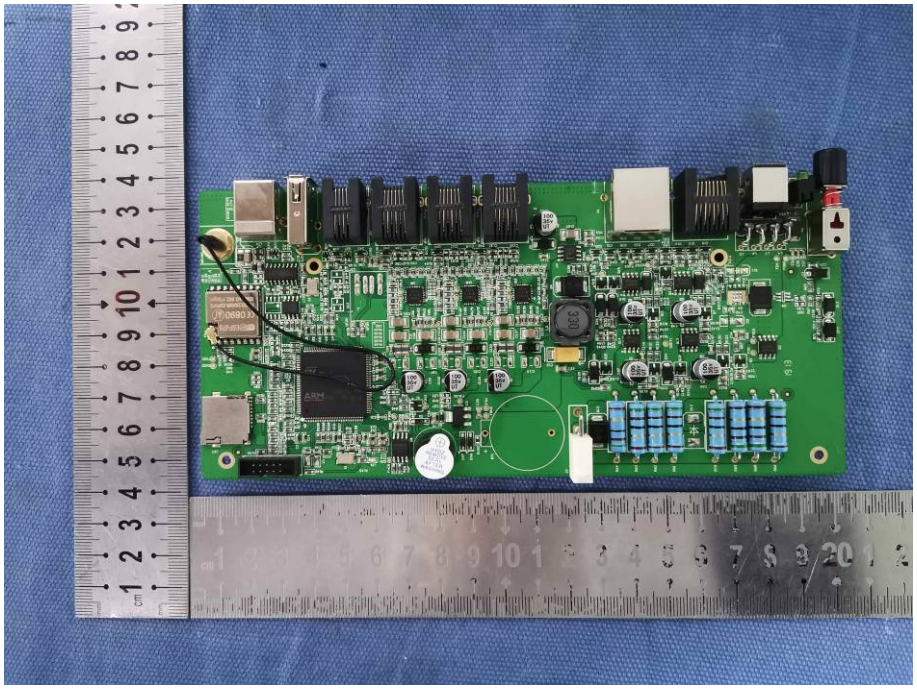

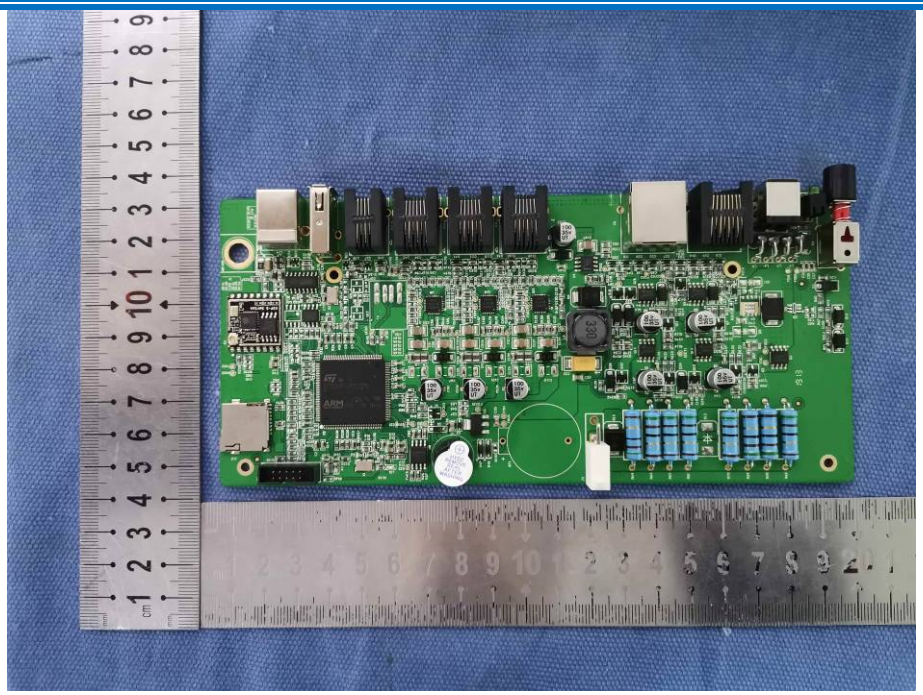

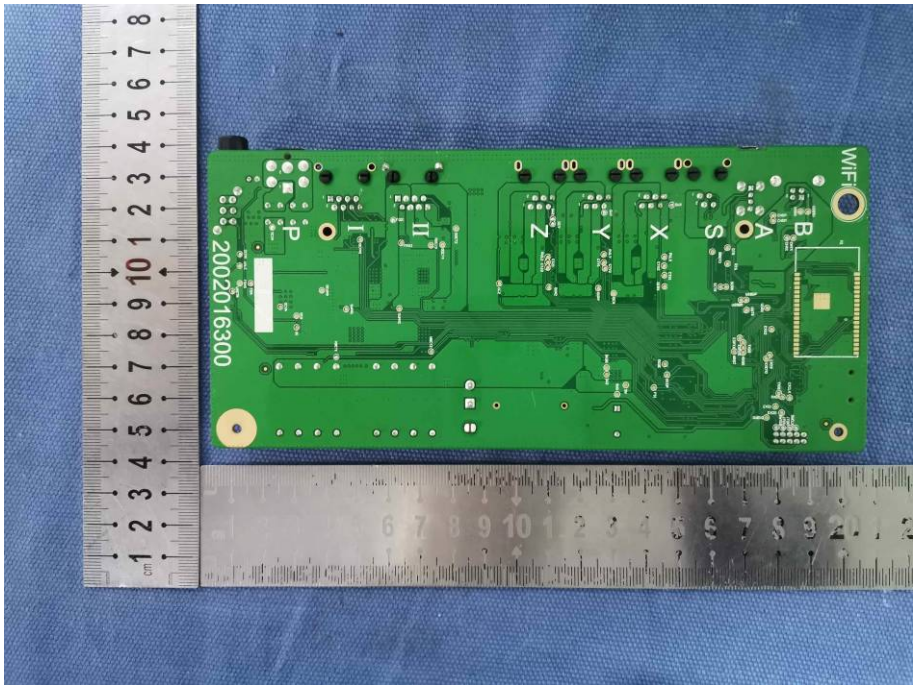
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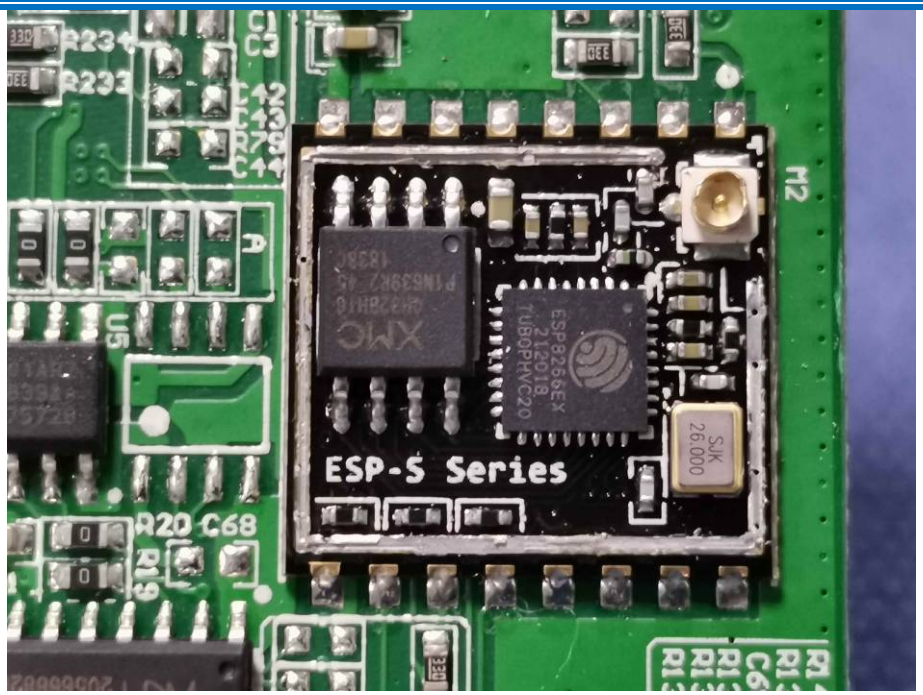

THE END