FCC TEST REPORT

FCC ID: 2BDJ4-UNP100

On Behalf of

Shenzhen Ucalcul Technology Co., Ltd

AEROPAD

Model No.: UNP100, UNP105, UNP121, UNP122, UNP151, UNP180, UNP181, UNP182

Prepared for	:	Shenzhen Ucalcul Technology Co., Ltd
Address	:	401, Building A, Jiewei Industrial City Phase III, Shangmugu, Pinghu Street, Longgang District, Shenzhen

Prepared By	:	Shenzhen PSI Testing Co., Ltd.
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TEST REPORT DECLARATION

Applicant	:	Shenzhen Ucalcul Technology Co., Ltd
Address	:	401, Building A, Jiewei Industrial City Phase III, Shangmugu, Pinghu Street, Longgang District, Shenzhen
Manufacturer	:	Shenzhen Ucalcul Technology Co., Ltd
Address	:	401, Building A, Jiewei Industrial City Phase III, Shangmugu, Pinghu Street, Longgang District, Shenzhen
EUT Description	:	AEROPAD
		(A) Model No. : UNP100, UNP105, UNP121, UNP122, UNP151, UNP180, UNP181, UNP182
		(B) Trademark : N/A

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

ANSI C63.10-2013

The device described above is tested by Shenzhen PSI Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen PSI Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen PSI Testing Co., Ltd.

Tested by (name + signature).....:	Jensen Wang Project Engineer	Jensen Wang
Approved by (name + signature)…....:	Simple Guan Project Manager	
Date of issue…… ……..:	November 27, 2023	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	November 27, 2023	Initial released Issue	Jensen Wang

1. Summary Of Standards And Results

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Radiated Spurious Emission	FCC Part 15: 15.209 FCC Part 15: 15.205	P
Radiated Band Edge Emission	FCC Part 15: 15.247(d)	P
Power Line Conducted Emissions	FCC Part 15: 15.207	P
6dB Bandwidth	FCC PART 15:15.247(a)(2)	P
Output Power	FCC Part 15: 15.247(b)(3)	P
Out-of-band Emissions	FCC Part 15: 15.247(d)	P
Power Spectral Density	FCC PART 15:15.247(e)	P
Antenna Requirement	FCC Part 15: 15.203	P
Note:	1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable. 4. Conclusion determination rules of this report: Unless there are clear provisions on measurement uncertainty in the standard or customer requirements, decision by actual test data without considering measurement uncertainty.	

2. General Information

2.1. Description of Device (EUT)

Product Name	:	AEROPAD
Trademark	:	N/A
Model Number	:	UNP100, UNP105, UNP121, UNP122, UNP151, UNP180, UNP181, UNP182
Diff	:	There is no difference between the except for different names of sales regions. So all the test were performed on the model UNP100.
Trademark	:	N/A
Power supply	:	DC 7.6V from battery or DC12V from Adapter with AC 120V/60Hz
Operation frequency	:	2412MHz-2472MHz for IEEE 802.11 b, g. n/HT20, n/HT40
Modulation type	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)
Operation Frequency	:	IEEE 802.11b: 2412MHz-2462MHz IEEE 802.11g: 2412MHz-2462MHz IEEE 802.11n HT20: 2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
Channel No.	:	IEEE 802.11b,g.n/HT20: 11 Channels IEEE 802.11n HT40: 7Channels
Antenna Type	:	Internal Antenna, max gain 1.96dBi.
Software version	:	V1.0
Hardware version/FVIN	:	V1.0
Intend use environment	:	Residential, commercial and light industrial environment
Note	:	Antenna information is provided by applicant. Testing lab is not responsible for the accuracy of the information.

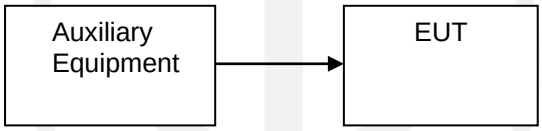
2.2. Accessories of Device (EUT)

Accessories1	:	Adapter
Manufacturer	:	Shenzhen Jihongda Power Co., Ltd.
Model	:	JHD-AD036D-12300BA-A
Ratings	:	Input: AC 100-240V, 50/60Hz, 1.2A Output: DC 12V 3A, 36W

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number
1	/	/	/	/
2	/	/	/	/
3	/	/	/	/
4	/	/	/	/

2.4. Block Diagram of Connection Between EUT and Simulators



Signal Cable Description of the above Support Units

No.	Port Name	Cable	Length	Shielded (Yes or No)	Detachable (Yes or No)
(a)	/	/	/	/	/

2.5. Test Mode Description

Duty cycle :100%Keeping TX			
Mode	**data rate (Mbps)(see Note)**	**Channel**	**Frequency (MHz)**
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40	13.5	Low :CH1	2422
	13.5	Middle:CH4	2437
	13.5	High:CH7	2452
Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.			

Channel list:					
For IEEE 802.11b, g, n/HT20					
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		

For IEEE 802.11 n/HT40					
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
CH1	2422	CH5	2442		
CH2	2427	CH6	2447		
CH3	2432	CH7	2452		
CH4	2437				

Setting output power (Max)			
802.11b	802.11g	802.11n(HT20)	802.11n(HT40)
0±1dBm	0±1dBm	0±1dBm	0±1dBm

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

2.7. Test Facility

Shenzhen PSI Testing Co., Ltd.

1-2F, Building 5, Yudafu Industrial Park, No. 10, Xingye West Road, Shajing Street, Bao'an District, Shenzhen, Guangdong, China 518104

September 13, 2023 File on Federal Communication Commission
Registration Number: 916281

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	**Uncertainty**
Uncertainty for Power point Conducted Emissions Test	2.17dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	2.74dB(Polarize: V)
	2.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 18GHz)	4.29dB(Polarize: V)
	4.82dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (18GHz to 40GHz)	4.31 dB(Polarize: V)
	4.30 dB(Polarize: H)
Uncertainty for radio frequency	48.24KHz
Uncertainty for conducted RF Power	0.41dB
Uncertainty for Power Spectral Density	0.39 dB

2.9. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Firmware Version	Last Cal.	Cal. Interval
1.	9*6*6 anechoic chamber	SKET	9*6*6	N/A	/	2022.12.20	3 Year
2.	Test Receiver	Rohde&Schwarz	ESCI 7	101032/003	4.42 SP3	2022.12.30	1 Year
3.	L.I.S.N.#1	Rohde&Schwarz	ENV216	102282	/	2022.12.30	1 Year
4.	L.I.S.N.#2	RFT	NNB111	13835240	/	2023.05.04	1 Year
5.	Loop Antenna	Schwarz beck	FMZB 1519B	00128	/	2023.04.03	2 Year
6.	Bilog Antenna	Schwarz beck	VULB 9168	01448	/	2022.12.26	2 Year
7.	Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101648	3.70	2022.12.30	1 Year
8.	Horn Antenna	Schwarz beck	BBHA 9120 D	02706	/	2022.12.26	2 Year
9.	Amplifier	SKET	LAPA_01G18G-45dB	SK2022032901	/	2022.12.29	1 Yea
10.	Horn Antenna	Schwarz beck	BBHA 9170	00946	/	2022.12.25	2 Year
11.	Amplifier	SKET	LNPA_0118G-45	SK2020010801	/	2022.12.30	1 Yea
12	RF Power Probe	Rohde&Schwarz	NRP-Z11	1138.3004.02-1111533-Fz	/	2023.03.30	1 Yea

For Test Software Information

Item	Software Name	Manufacturer	Version
RE	EMC-I	SKET	V1.5.0.3
CE	EMC-I	SKET	V1.5.0.3
RF	RTS	TACHOY	V1.0.0

3. Spurious Emission

3.1. Test Limits

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

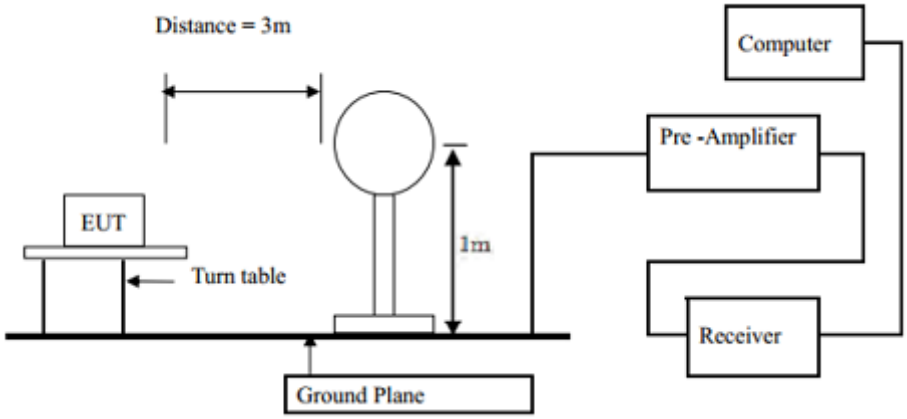
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 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

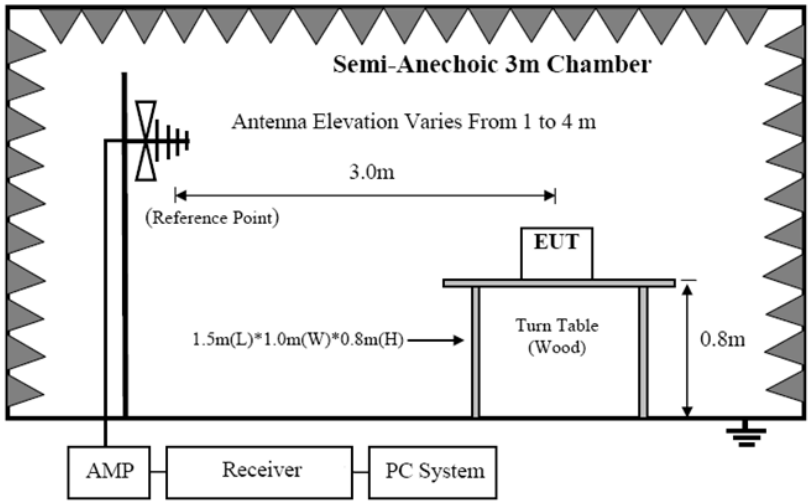
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	
Note 1: The peak limit is 20 dB higher than the average limit			

3.2. Block Diagram of Test setup

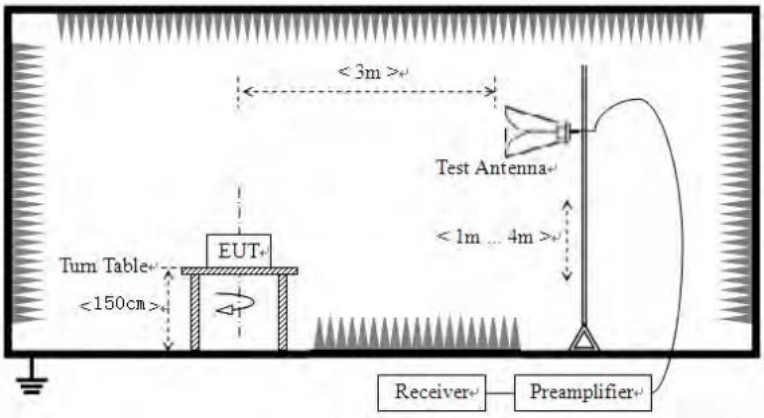
3.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



3.2.2 In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



3.2.3 In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



3.3. Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
(2) Setup EUT and simulator
(3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
(a) Change work frequency or channel of device if practicable.
(b) Change modulation type of device if practicable.
(c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
(4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated
(5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on Radiated Emission test.
(6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.
Test setup information:

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHZ~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

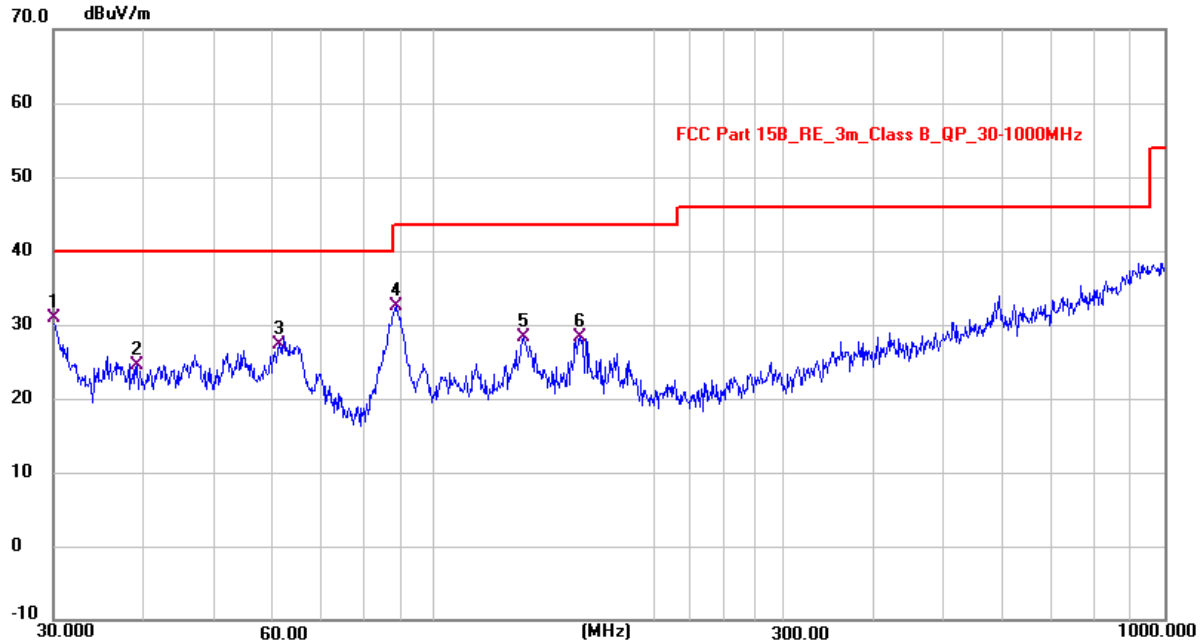
3.4. Test Results

We have scanned from 9kHz to the 10th harmonic of the EUT's highest frequency.
Detailed information please see the following page.

From 9KHz to 30MHz:					
Test Date	:	2023.11.05	Temperature	:	24℃
Test Engineer	:	Jensen Wang	Humidity	:	56%
Test Mode	:	IEEE 802.11b mode			
Test Results	:	**PASS**			
Note:	The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.				

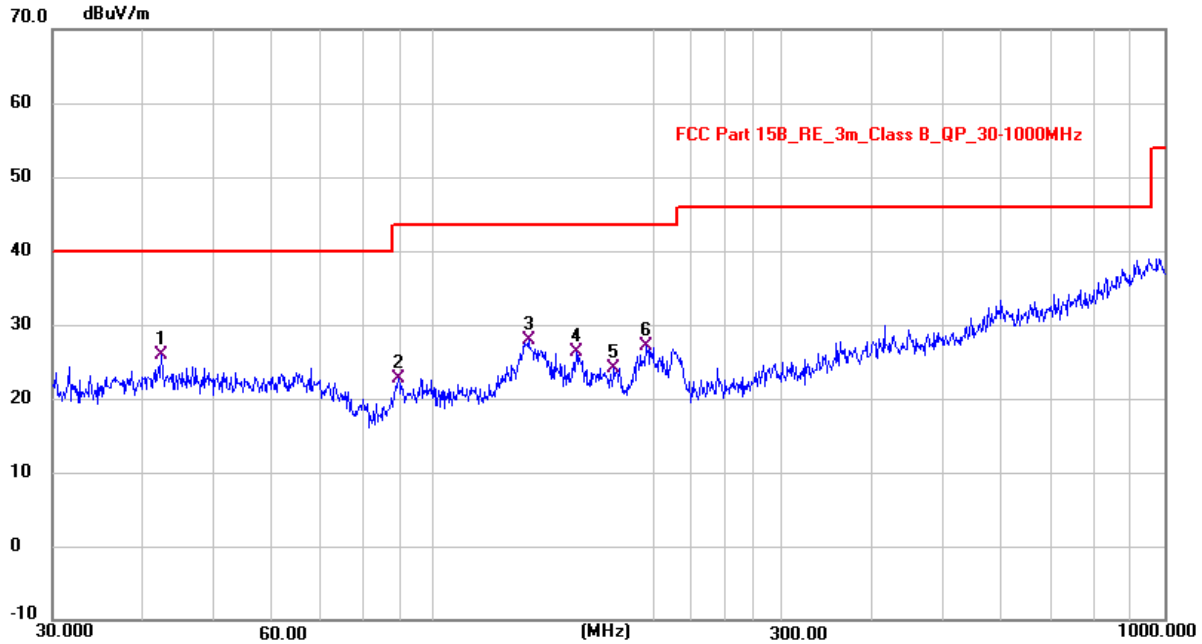
From 30MHz to 1000MHz:					
Test Date	:	2023.11.04	Temperature	:	24℃
Test Engineer	:	Jensen Wang	Humidity	:	56%
Test Mode	:	IEEE 802.11b mode			
Test Results	:	**PASS**			
Note:	1. The test results are listed in next pages. 2. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector and quasi-peak detector need not be carried out. 3. All modes have been tested, and only worst data of IEEE 802.11b mode mode, Channel 2437MHz (AC 120V/ 60Hz) was listed in this report.				

Polarization: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	30.0000	15.79	15.09	30.88	40.00	-9.12	QP
2	39.0416	8.01	16.51	24.52	40.00	-15.48	QP
3	61.1316	12.24	15.03	27.27	40.00	-12.73	QP
4	88.5360	20.77	11.65	32.42	43.50	-11.08	QP
5	132.5687	12.99	15.33	28.32	43.50	-15.18	QP
6	158.1817	12.01	16.21	28.22	43.50	-15.28	QP

Polarization: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	42.4136	9.34	16.54	25.88	40.00	-14.12	QP
2	89.3547	11.04	11.68	22.72	43.50	-20.78	QP
3	134.8544	12.34	15.48	27.82	43.50	-15.68	QP
4	156.5264	10.14	16.18	26.32	43.50	-17.18	QP
5	176.7328	9.56	14.61	24.17	43.50	-19.33	QP
6	195.3076	13.76	13.31	27.07	43.50	-16.43	QP

From 1GHz to 25GHz:					
Test Date	:	2023.11.04	Temperature	:	24℃
Test Engineer	:	Jensen Wang	Humidity	:	56%
Test Mode	:	WIFI mode			
Test Results	:	**PASS**			
Note:	1. The test results are listed in next pages. 2. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector and quasi-peak detector need not be carried out. 3. If the limits for the measurement with the average detector are met when using a receiver with a quasi-peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.				

Test Mode : IEEE 802.11b TX Low								
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	4824	V	84.51	-27.27	57.24	74.00	-16.76	Peak
2	4824	V	66.20	-27.27	38.93	54.00	-15.07	Avg
3	7236	--	--	--	--	--	--	--
4	9648	--	--	--	--	--	--	--
5	4824	H	81.75	-27.27	54.48	74.00	-19.52	Peak
6	4824	H	72.99	-27.27	45.72	54.00	-8.28	Avg
7	7236	--	--	--	--	--	--	--
8	9648	--	--	--	--	--	--	--
Test Mode : IEEE 802.11b TX Mid								
1	4874	V	86.16	-27.79	58.37	74.00	-15.63	Peak
2	4874	V	65.48	-27.79	37.69	54.00	-16.31	Avg
3	7311	--	--	--	--	--	--	--
4	9748	--	--	--	--	--	--	--
5	4874	H	82.97	-27.79	55.18	74.00	-18.82	Peak
6	4874	H	71.79	-27.79	44.00	54.00	-10.00	Avg
7	7311	--	--	--	--	--	--	--
8	9748	--	--	--	--	--	--	--
Test Mode : IEEE 802.11b TX High								
1	4924	V	84.76	-28.30	56.46	74.00	-17.54	Peak
2	4924	V	68.88	-28.30	40.58	54.00	-13.42	Avg
3	7386	--	--	--	--	--	--	--
4	9848	--	--	--	--	--	--	--
5	4924	H	82.04	-28.30	53.74	74.00	-20.26	Peak
6	4924	H	71.57	-28.30	43.27	54.00	-10.73	Avg
7	7386	--	--	--	--	--	--	--
8	9848	--	--	--	--	--	--	--

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.

Test Mode : IEEE 802.11g TX Low								
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	4824	V	80.03	-27.27	52.76	74.00	-21.24	Peak
2	4824	V	65.94	-27.27	38.67	54.00	-15.33	Avg
3	7236	--	--	--	--	--	--	--
4	9648	--	--	--	--	--	--	--
5	4824	H	83.15	-27.27	55.88	74.00	-18.12	Peak
6	4824	H	66.71	-27.27	39.44	54.00	-14.56	Avg
7	7236	--	--	--	--	--	--	--
8	9648	--	--	--	--	--	--	--
Test Mode : IEEE 802.11g TX Mid								
1	4874	V	81.37	-27.79	53.58	74.00	-20.42	Peak
2	4874	V	65.06	-27.79	37.27	54.00	-16.73	Avg
3	7311	--	--	--	--	--	--	--
4	9748	--	--	--	--	--	--	--
5	4874	H	85.42	-27.79	57.63	74.00	-16.37	Peak
6	4874	H	72.11	-27.79	44.32	54.00	-9.68	Avg
7	7311	--	--	--	--	--	--	--
8	9748	--	--	--	--	--	--	--
Test Mode : IEEE 802.11g TX High								
1	4924	V	83.01	-28.30	54.71	74.00	-19.29	Peak
2	4924	V	69.96	-28.30	41.66	54.00	-12.34	Avg
3	7386	--	--	--	--	--	--	--
4	9848	--	--	--	--	--	--	--
5	4924	H	80.75	-28.30	52.45	74.00	-21.55	Peak
6	4924	H	71.46	-28.30	43.16	54.00	-10.84	Avg
7	7386	--	--	--	--	--	--	--
8	9848	--	--	--	--	--	--	--

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.

Test Mode : IEEE 802.11n/HT20 TX Low								
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	4824	V	86.84	-27.27	59.57	74.00	-14.43	Peak
2	4824	V	73.75	-27.27	46.48	54.00	-7.52	Avg
3	7236	--	--	--	--	--	--	--
4	9648	--	--	--	--	--	--	--
5	4824	H	86.55	-27.27	59.28	74.00	-14.72	Peak
6	4824	H	71.09	-27.27	43.82	54.00	-10.18	Avg
7	7236	--	--	--	--	--	--	--
8	9648	--	--	--	--	--	--	--
Test Mode : IEEE 802.11n/HT20 TX Mid								
1	4874	V	82.45	-27.79	54.66	74.00	-19.34	Peak
2	4874	V	68.69	-27.79	40.90	54.00	-13.10	Avg
3	7311	--	--	--	--	--	--	--
4	9748	--	--	--	--	--	--	--
5	4874	H	82.68	-27.79	54.89	74.00	-19.11	Peak
6	4874	H	73.03	-27.79	45.24	54.00	-8.76	Avg
7	7311	--	--	--	--	--	--	--
8	9748	--	--	--	--	--	--	--
Test Mode : IEEE 802.11n/HT20 TX High								
1	4924	V	85.53	-28.30	57.23	74.00	-16.77	Peak
2	4924	V	68.05	-28.30	39.75	54.00	-14.25	Avg
3	7386	--	--	--	--	--	--	--
4	9848	--	--	--	--	--	--	--
5	4924	H	83.63	-28.30	55.33	74.00	-18.67	Peak
6	4924	H	69.04	-28.30	40.74	54.00	-13.26	Avg
7	7386	--	--	--	--	--	--	--
8	9848	--	--	--	--	--	--	--

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.

Test Mode : IEEE 802.11n/HT40 TX Low								
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	4844	V	82.29	-27.27	55.02	74.00	-18.98	Peak
2	4844	V	65.99	-27.27	38.72	54.00	-15.28	Avg
3	7266	--	--	--	--	--	--	--
4	9688	--	--	--	--	--	--	--
5	4844	H	83.75	-27.27	56.48	74.00	-17.52	Peak
6	4844	H	71.75	-27.27	44.48	54.00	-9.52	Avg
7	7266	--	--	--	--	--	--	--
8	9688	--	--	--	--	--	--	--
Test Mode : IEEE 802.11n/HT40 TX Mid								
1	4874	V	85.29	-27.79	57.50	74.00	-16.50	Peak
2	4874	V	71.62	-27.79	43.83	54.00	-10.17	Avg
3	7311	--	--	--	--	--	--	--
4	9748	--	--	--	--	--	--	--
5	4874	H	82.81	-27.79	55.02	74.00	-18.98	Peak
6	4874	H	66.65	-27.79	38.86	54.00	-15.14	Avg
7	7311	--	--	--	--	--	--	--
8	9748	--	--	--	--	--	--	--
Test Mode : IEEE 802.11n/HT40 TX High								
1	4904	V	83.06	-28.30	54.76	74.00	-19.24	Peak
2	4904	V	65.97	-28.30	37.67	54.00	-16.33	Avg
3	7356	--	--	--	--	--	--	--
4	9808	--	--	--	--	--	--	--
5	4904	H	83.00	-28.30	54.70	74.00	-19.30	Peak
6	4904	H	70.28	-28.30	41.98	54.00	-12.02	Avg
7	7356	--	--	--	--	--	--	--
8	9808	--	--	--	--	--	--	--

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.

4. Power Line Conducted Emission

4.1. Test Limits

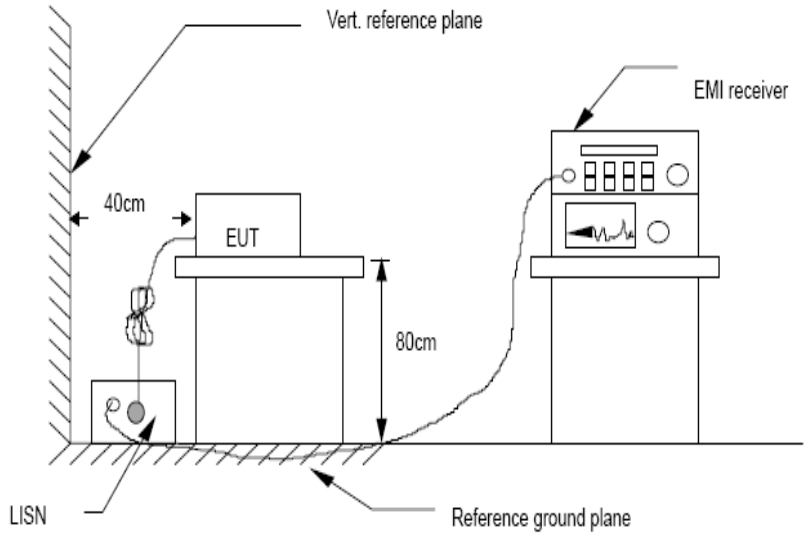
Frequency	Limits dB(μV)	
MHz	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.
3.The limit decreases in line with the logarithm of the frequency in the rang of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs.
Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.
The bandwidth of test receiver is set at 9 kHz.

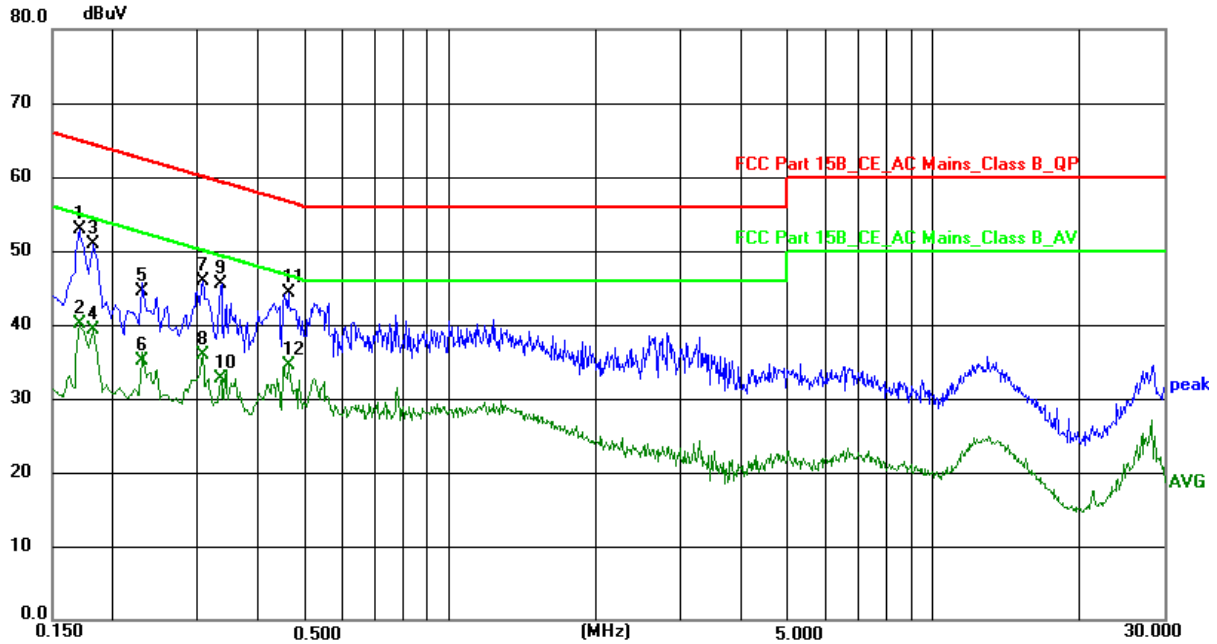
4.3. Test Setup



4.4. Test Results

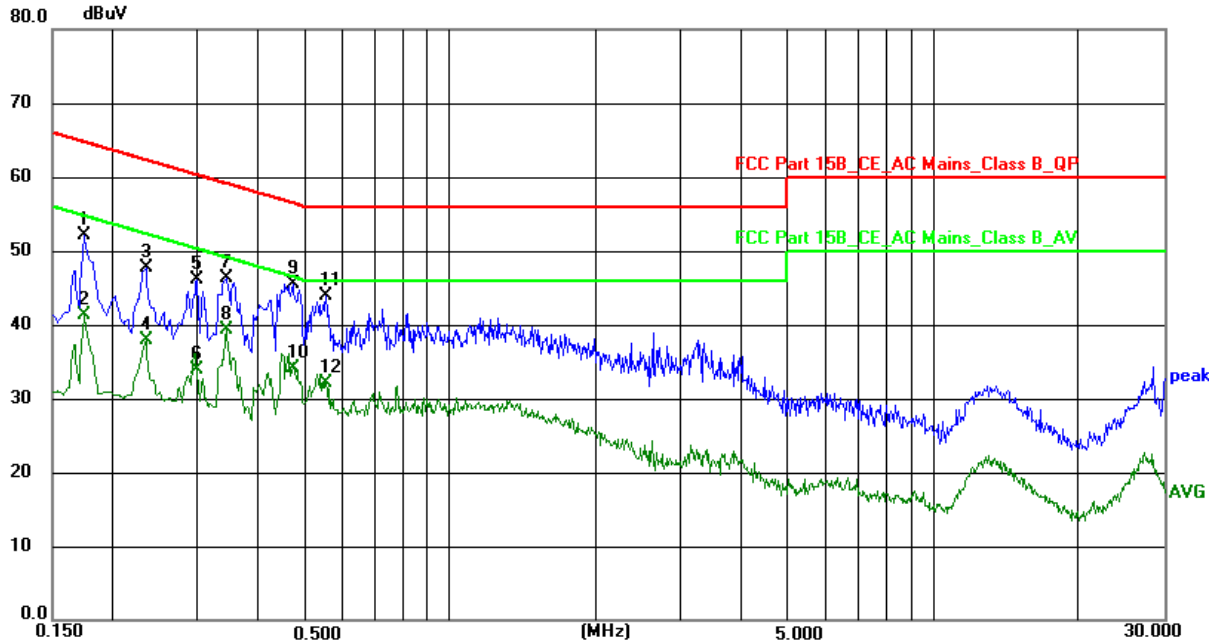
Test Date	:	2023.11.04	Temperature	:	24℃
Test Engineer	:	Jensen Wang	Humidity	:	56%
Test Mode	:	IEEE 802.11b mode			
Test Results	:	**PASS**			
Note:	1. The test results are listed in next pages. 2. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector and quasi-peak detector need not be carried out. 3. If the limits for the measurement with the average detector are met when using a receiver with a quasi-peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out. 4. All modes have been tested, and only worst data of IEEE 802.11b mode mode, Channel 2437MHz (AC 120V/ 60Hz) was listed in this report.				

Polarization: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.1700	42.95	9.94	52.89	64.96	-12.07	peak	P
2	0.1700	30.26	9.94	40.20	54.96	-14.76	AVG	P
3	0.1819	40.88	9.95	50.83	64.40	-13.57	peak	P
4	0.1819	29.29	9.95	39.24	54.40	-15.16	AVG	P
5	0.2292	34.59	9.96	44.55	62.48	-17.93	peak	P
6	0.2292	25.20	9.96	35.16	52.48	-17.32	AVG	P
7	0.3060	35.91	9.97	45.88	60.08	-14.20	peak	P
8	0.3060	25.85	9.97	35.82	50.08	-14.26	AVG	P
9	0.3339	35.64	9.86	45.50	59.35	-13.85	peak	P
10	0.3339	22.78	9.86	32.64	49.35	-16.71	AVG	P
11	0.4620	34.52	9.80	44.32	56.66	-12.34	peak	P
12	0.4620	24.64	9.80	34.44	46.66	-12.22	AVG	P

Polarization: N



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1740	42.15	9.90	52.05	64.77	-12.72	peak	P
2	0.1740	31.43	9.90	41.33	54.77	-13.44	AVG	P
3	0.2340	37.70	9.96	47.66	62.31	-14.65	peak	P
4	0.2340	27.93	9.96	37.89	52.31	-14.42	AVG	P
5	0.2980	36.35	9.79	46.14	60.30	-14.16	peak	P
6	0.2980	24.15	9.79	33.94	50.30	-16.36	AVG	P
7	0.3420	36.65	9.68	46.33	59.15	-12.82	peak	P
8 *	0.3420	29.66	9.68	39.34	49.15	-9.81	AVG	P
9	0.4700	35.73	9.71	45.44	56.51	-11.07	peak	P
10	0.4700	24.34	9.71	34.05	46.51	-12.46	AVG	P
11	0.5540	34.10	9.78	43.88	56.00	-12.12	peak	P
12	0.5540	22.35	9.78	32.13	46.00	-13.87	AVG	P

5. Out-of-band Emissions

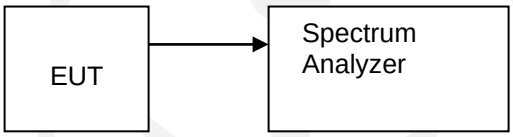
5.1. Test Limits

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 FCC Part15.209(a) is not required.

5.2. Test Procedure

Connect the transmitter ouput to spectrum analvzer using a low loss RF cable, and set the spectrum analvzerto RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these setting aremade of the in-band reference level, bandedge and out-of-band emissions.

5.3. Test Setup

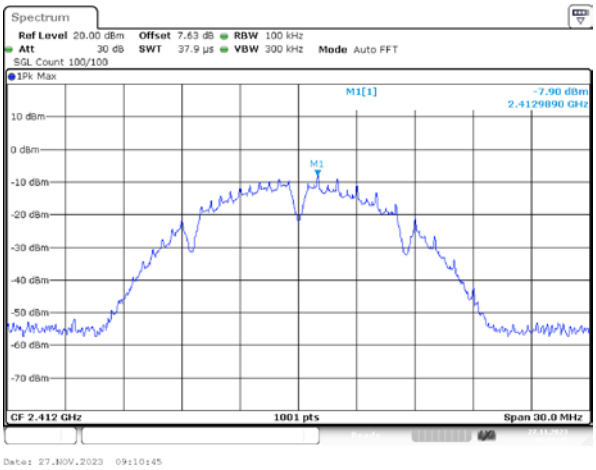


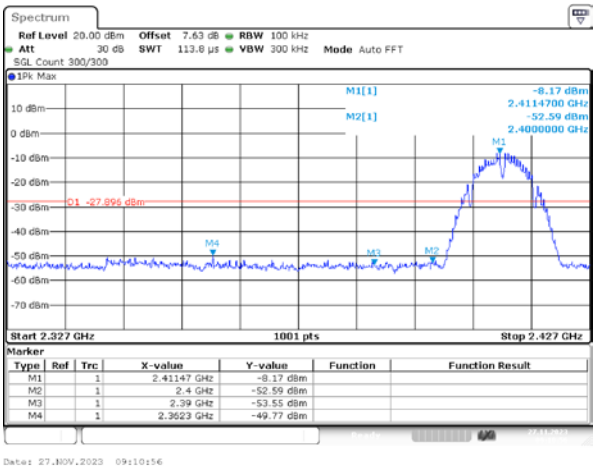
5.4. Test Results

PASS.

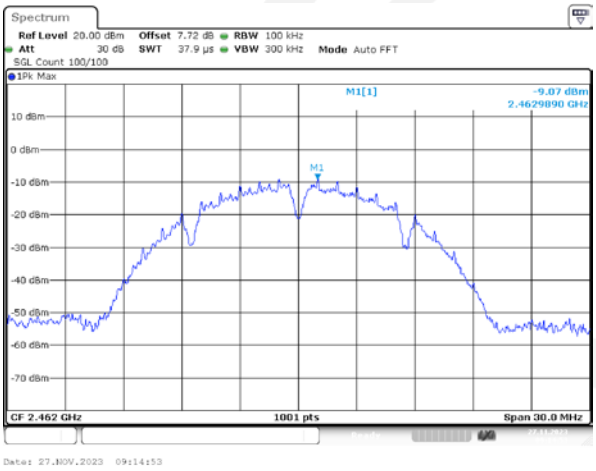
All modes have been tested, and only worst data of IEEE 802.11b mode, IEEE 802.11b was listed in this report.The test results are listed in next pages.

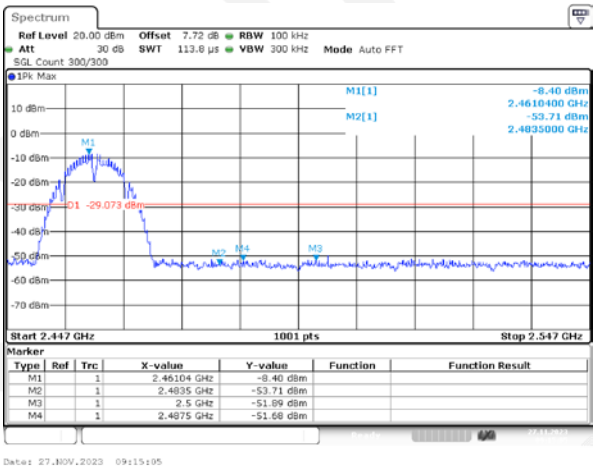
For Band Edge:





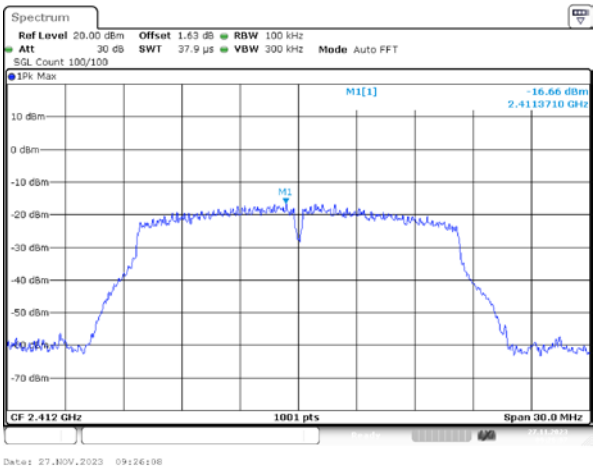
IEEE 802.11 b 2412MHz

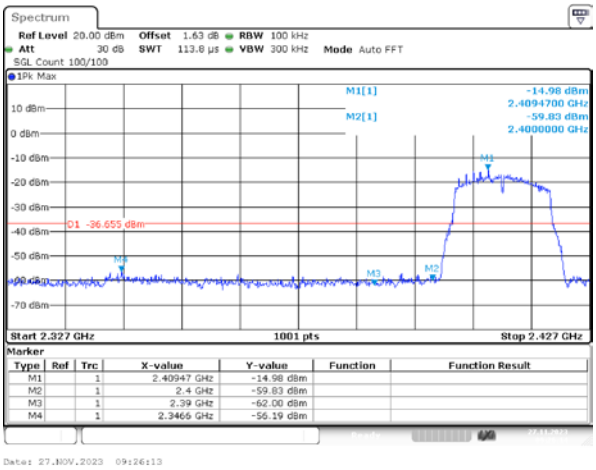




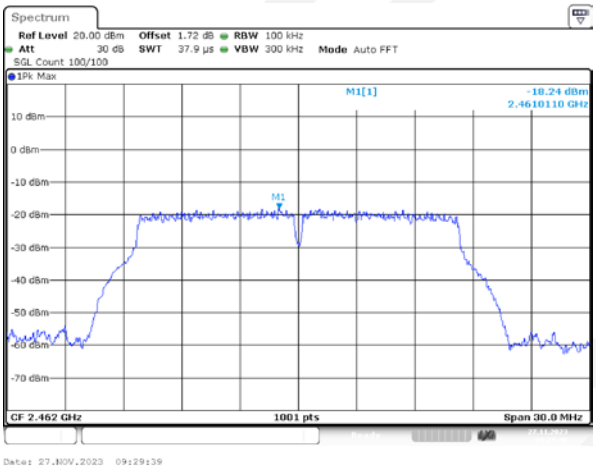
IEEE 802.11 b 2462MHz

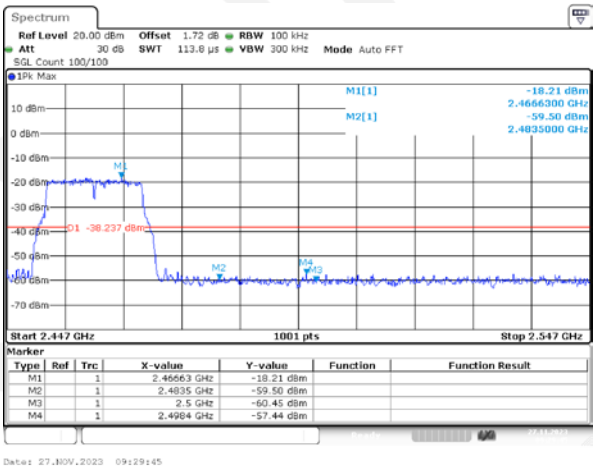
For Band Edge:





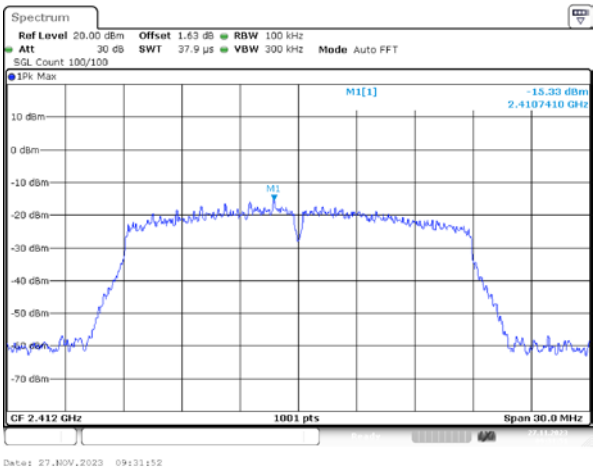
IEEE 802.11 g 2412MHz

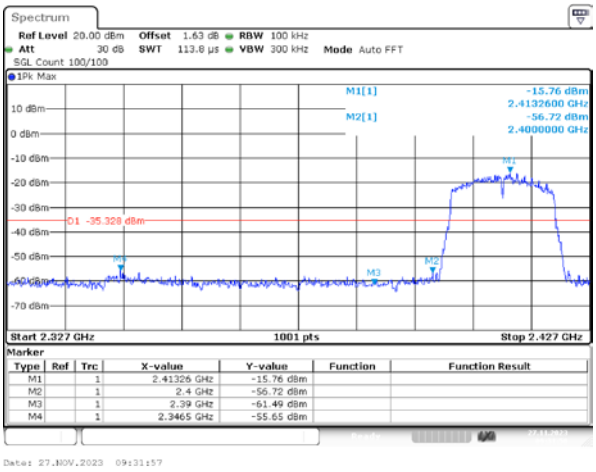




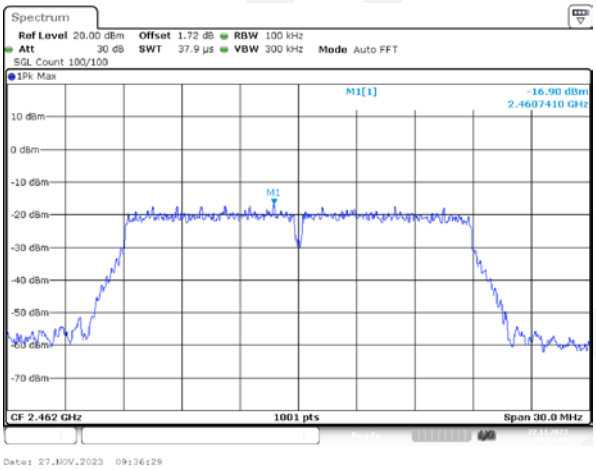
IEEE 802.11 g 2462MHz

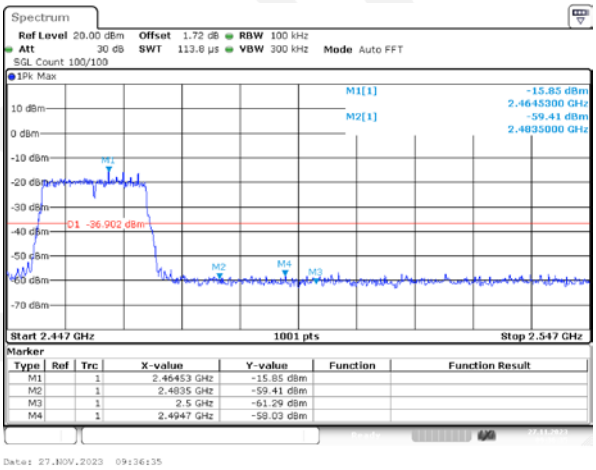
For Band Edge:





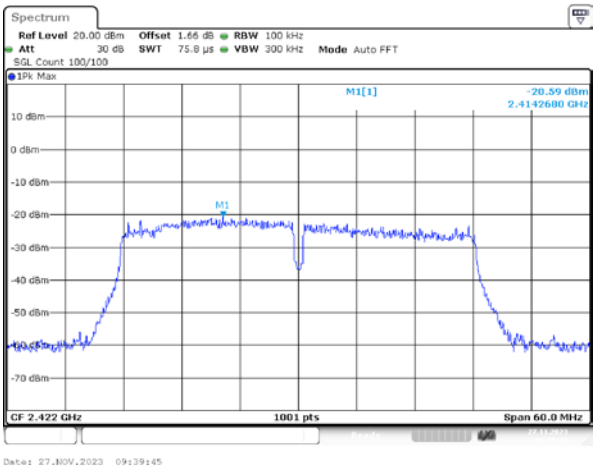
IEEE 802.11 n/HT20 2412MHz

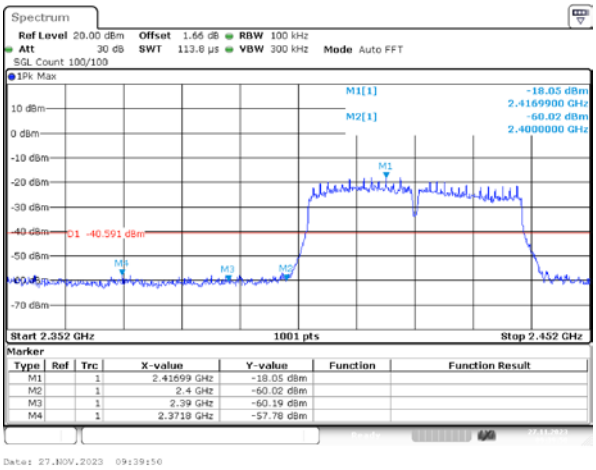




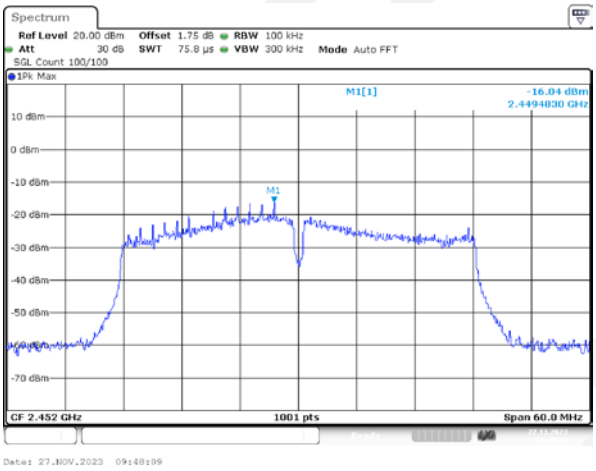
IEEE 802.11 n/HT20 2462MHz

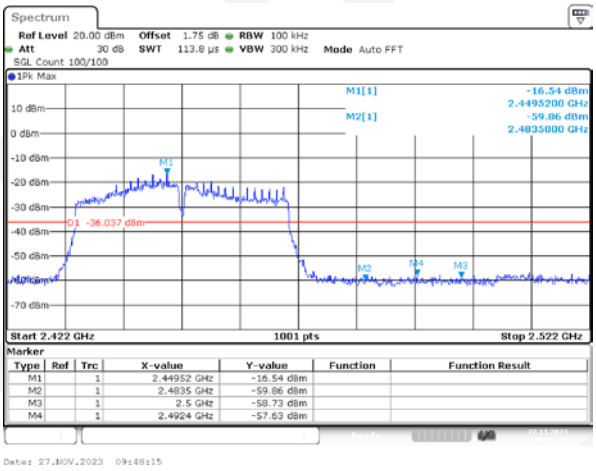
For Band Edge:





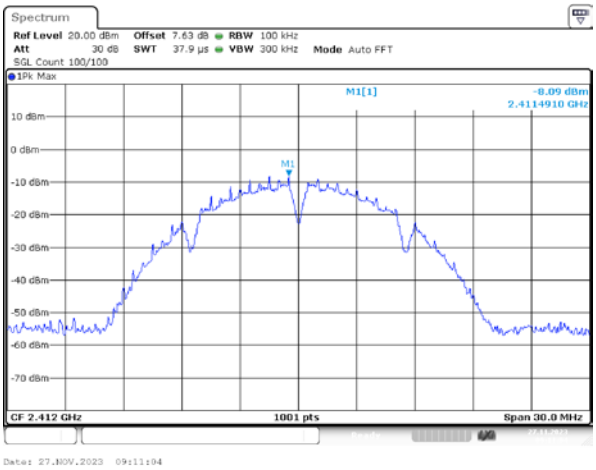
IEEE 802.11 n/HT40 2422MHz

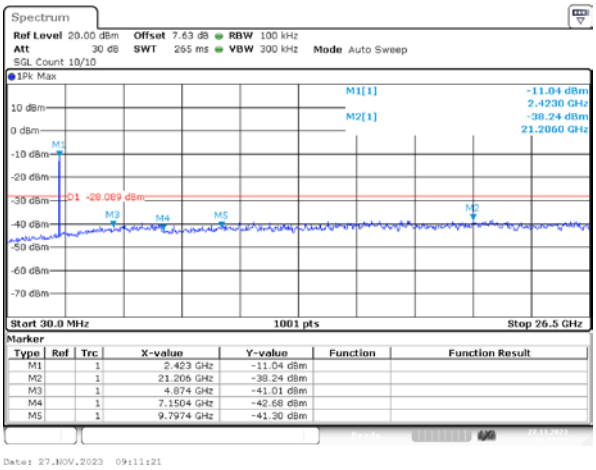




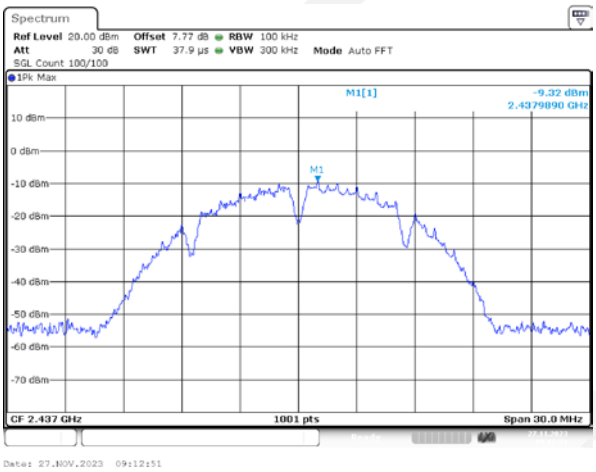
IEEE 802.11 n/HT40 2452MHz

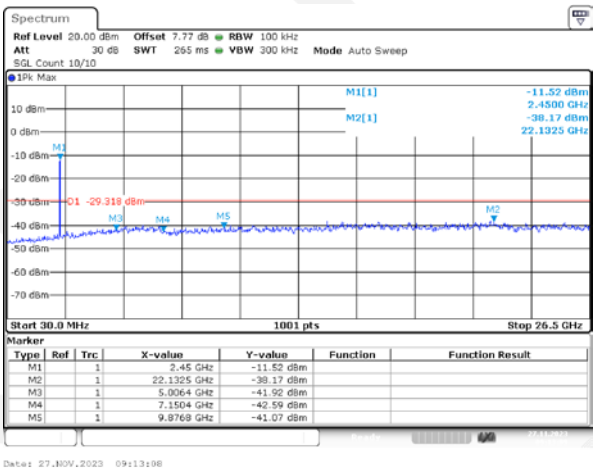
For Connected Spurious Emission:



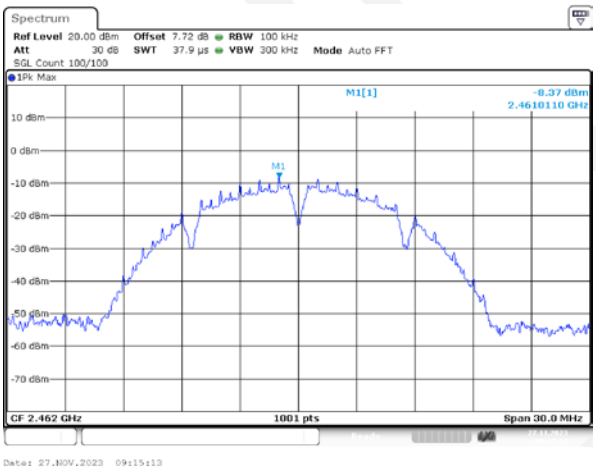


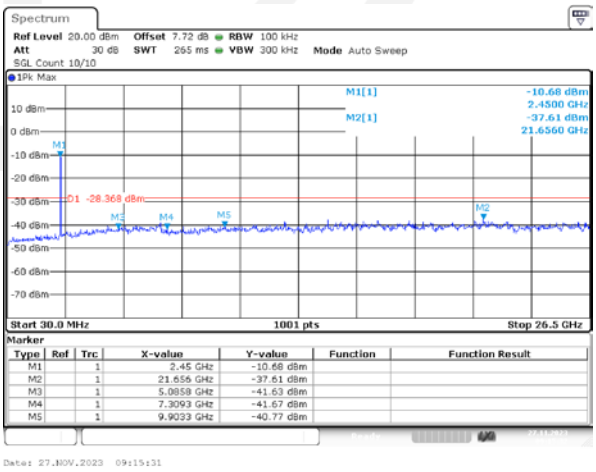
IEEE 802.11 b 2412MHz





IEEE 802.11 b 2437MHz





IEEE 802.11 b 2462MHz

6. Conducted Maximum Output Power

6.1. Test limits

Please refer RSS-247 & FCC PART 15: 15.247.

Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1 W(30dBm)

6.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

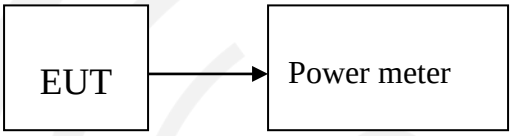
5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Connected the EUT's antenna port to peak power meter by 20dB attenuator.

5.2.3 Measure out each mode and each bands peak output power of EUT.

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

6.3. Test Setup

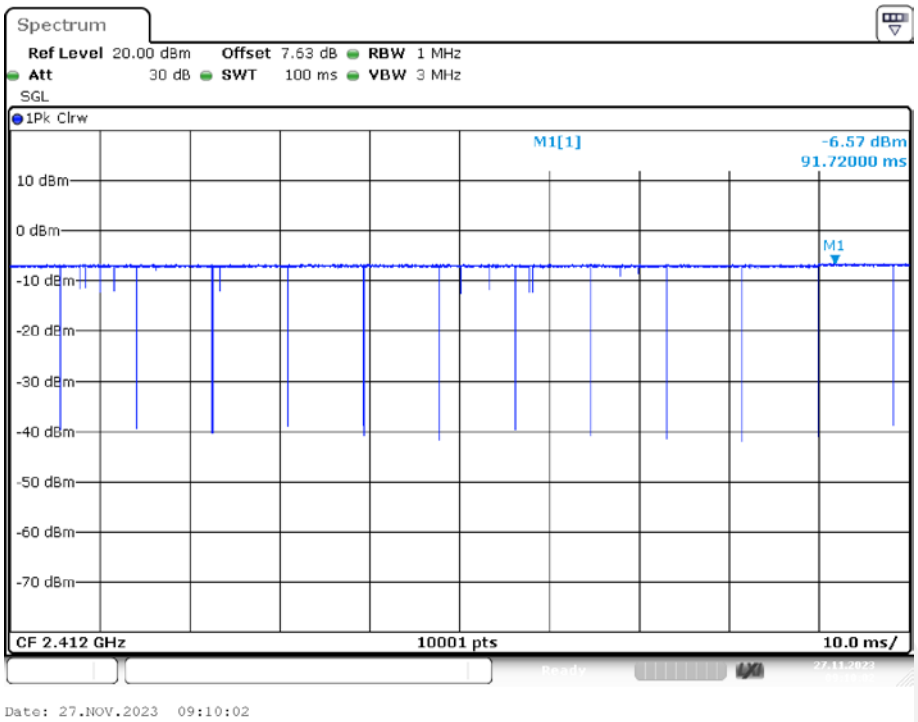


6.4. Test Results

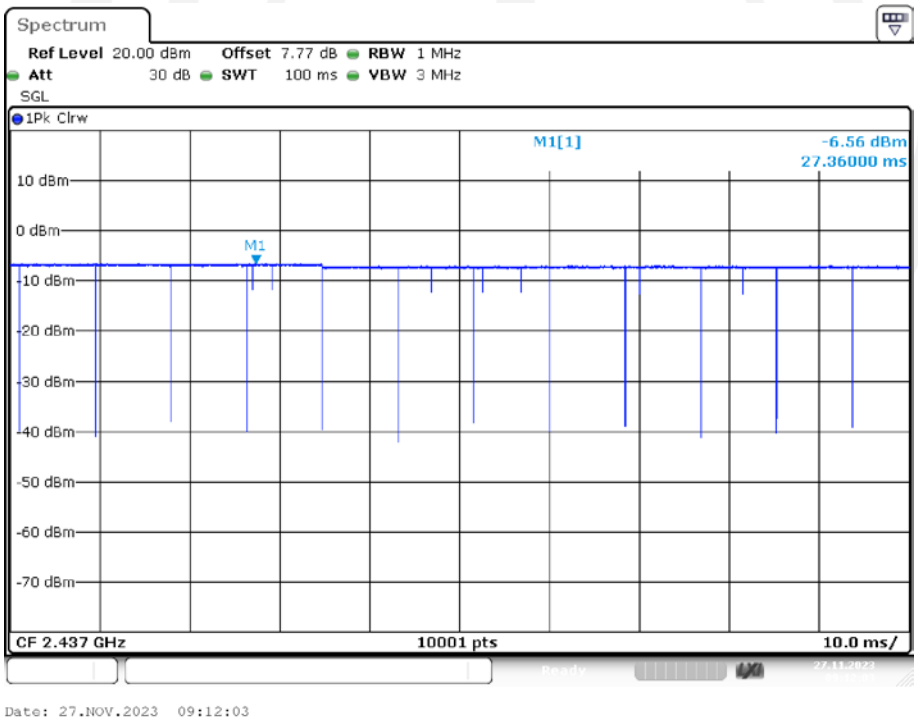
PASS
Detailed information please sees the following page.

Mode	Frequency (MHz)	PK Output power(dBm)	Limit (dBm)	Result
IEEE 802.11 b	CH 1: 2412	3.82	30	PASS
	CH 6: 2437	**4.12**	30	PASS
	CH 11: 2462	3.31	30	PASS
IEEE 802.11 g	CH 1: 2412	2.43	30	PASS
	CH 6: 2437	2.41	30	PASS
	CH 11: 2462	2.24	30	PASS
IEEE 802.11 n/HT20	CH 1: 2412	2.08	30	PASS
	CH 6: 2437	2.11	30	PASS
	CH 11: 2462	2.13	30	PASS
IEEE 802.11 n/HT40	CH 1: 2422	2.24	30	PASS
	CH 4: 2437	2.07	30	PASS
	CH 7: 2452	2.12	30	PASS

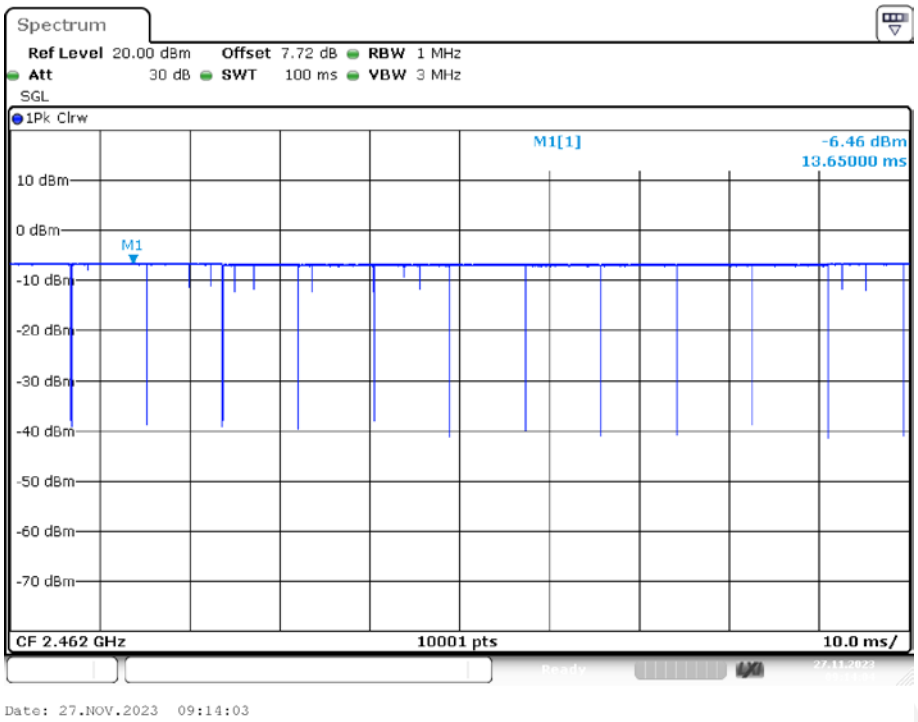
Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)
IEEE 802.11 b	CH 1: 2412	99.89	0
	CH 6: 2437	99.94	0
	CH 11: 2462	99.95	0
IEEE 802.11 g	CH 1: 2412	97.64	0.1
	CH 6: 2437	97.67	0.1
	CH 11: 2462	97.63	0.1
IEEE 802.11 n/HT20	CH 1: 2412	97.47	0.11
	CH 6: 2437	97.5	0.11
	CH 11: 2462	97.49	0.11
IEEE 802.11 n/HT40	CH 1: 2422	95.13	0.22
	CH 4: 2437	95.14	0.22
	CH 7: 2452	95.15	0.22



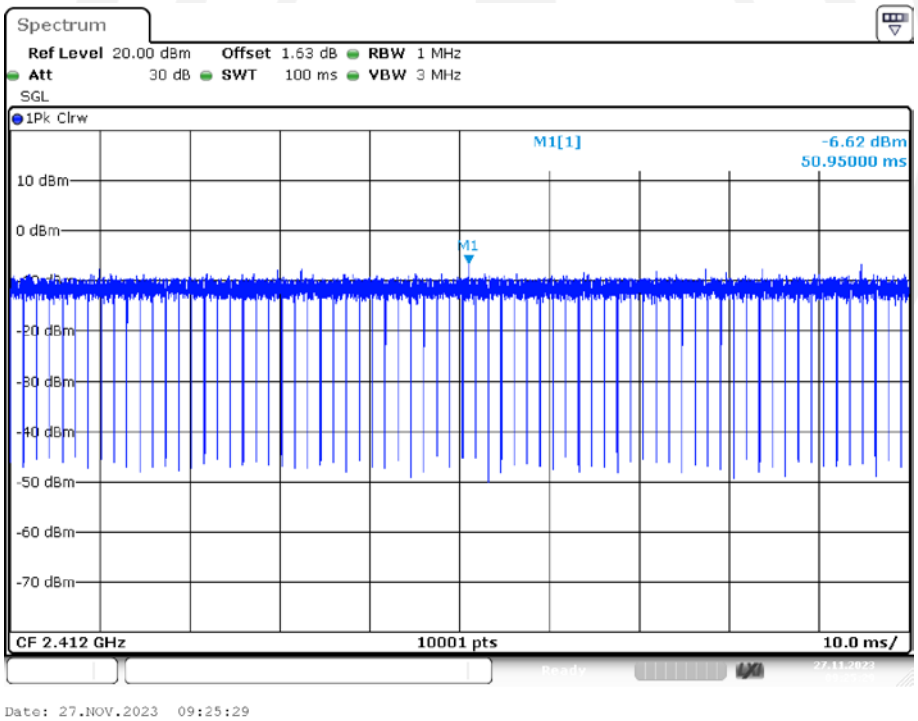
IEEE 802.11 b 2412MHz



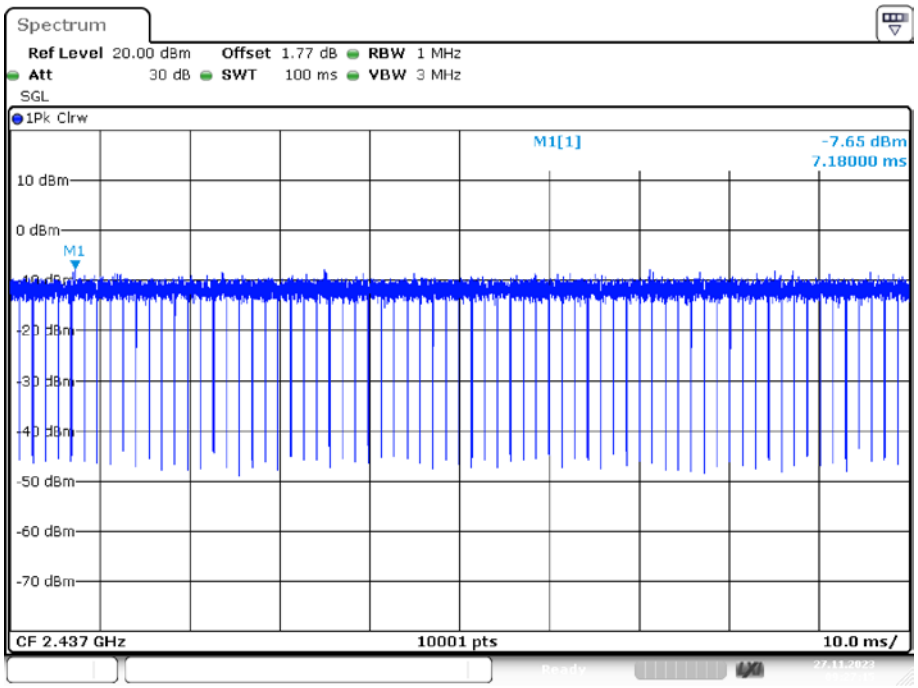
IEEE 802.11 b 2437MHz



IEEE 802.11 b 2462MHz



IEEE 802.11 g 2412MHz



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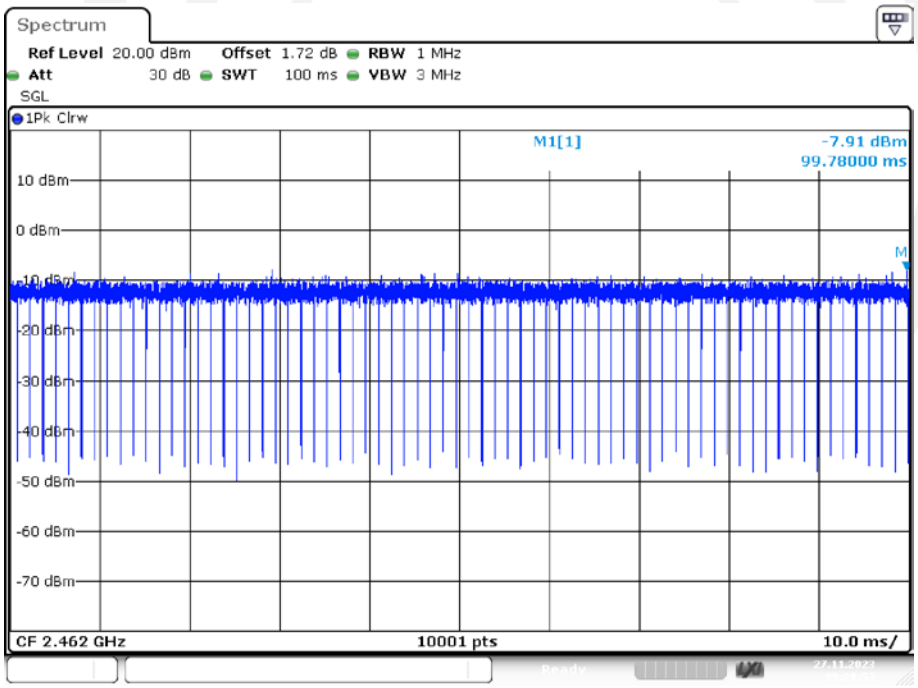
IEEE 802.11 g 2437MHz



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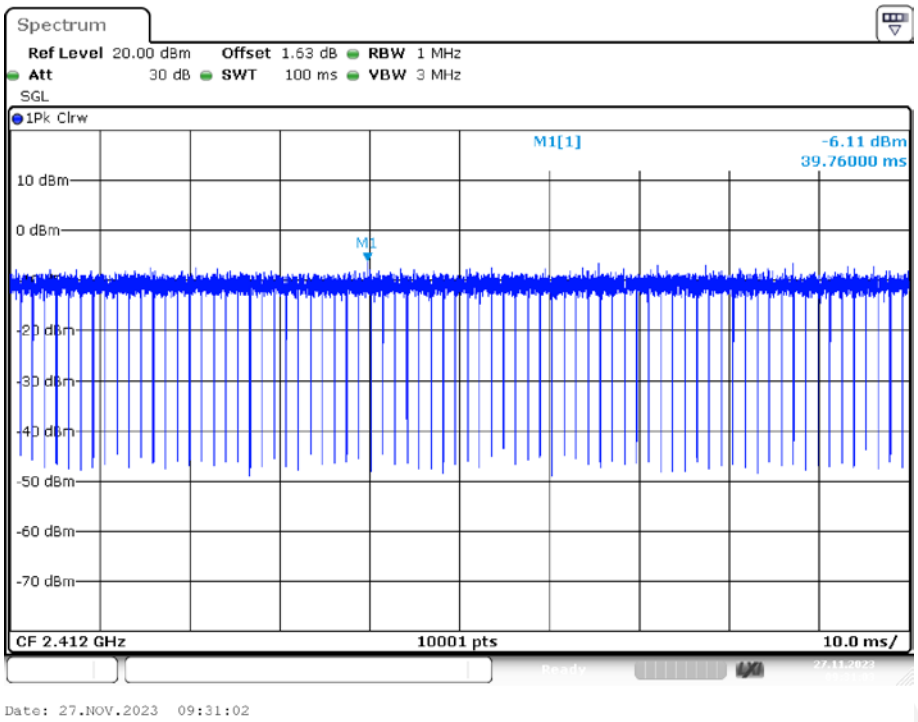
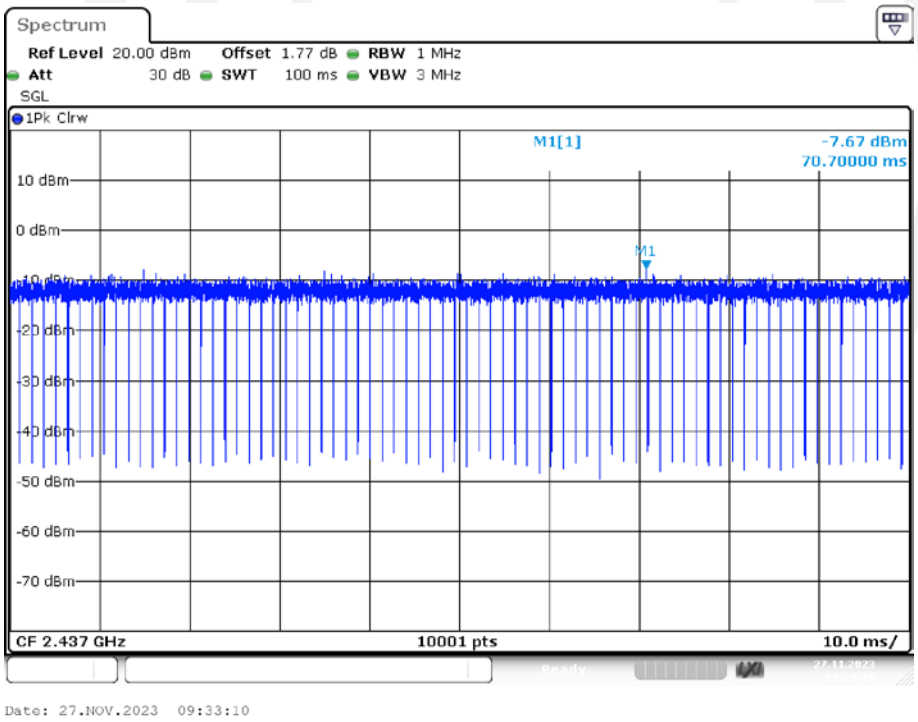
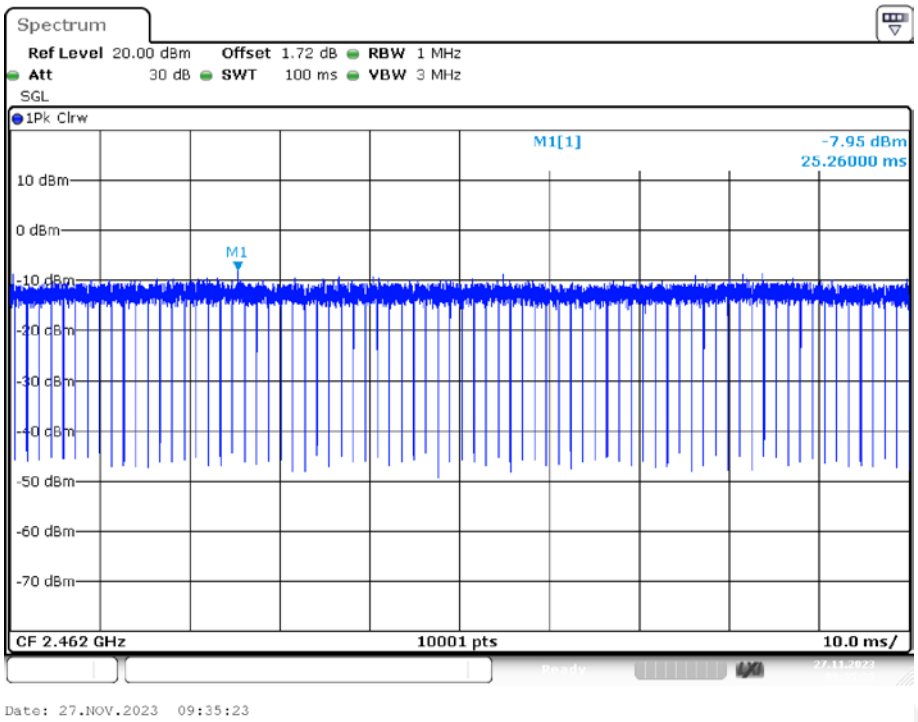
IEEE 802.11 g 2462MHz



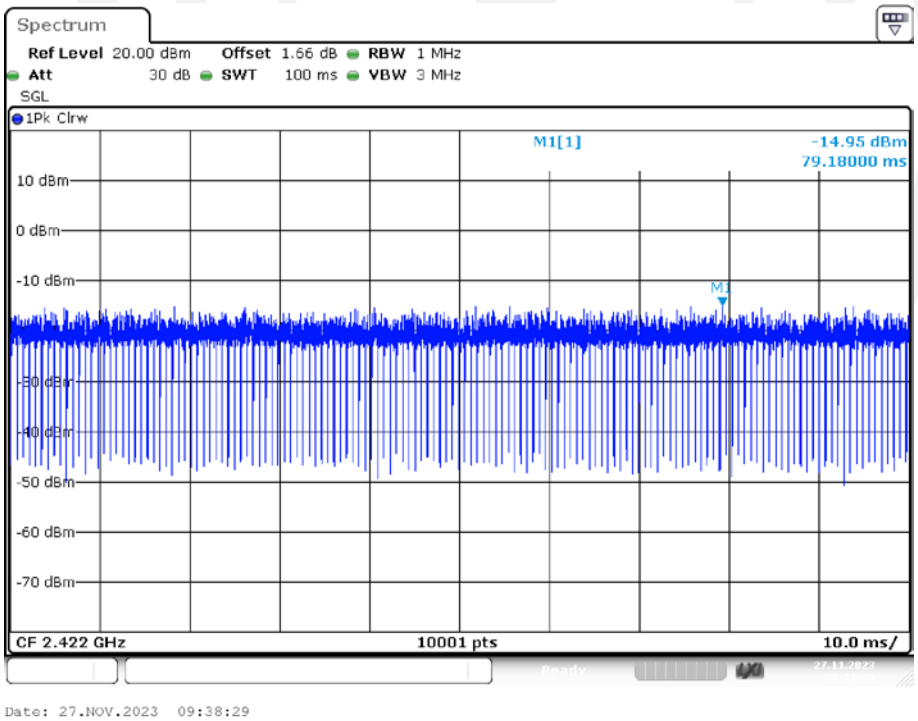
IEEE 802.11 n/HT20 2412MHz



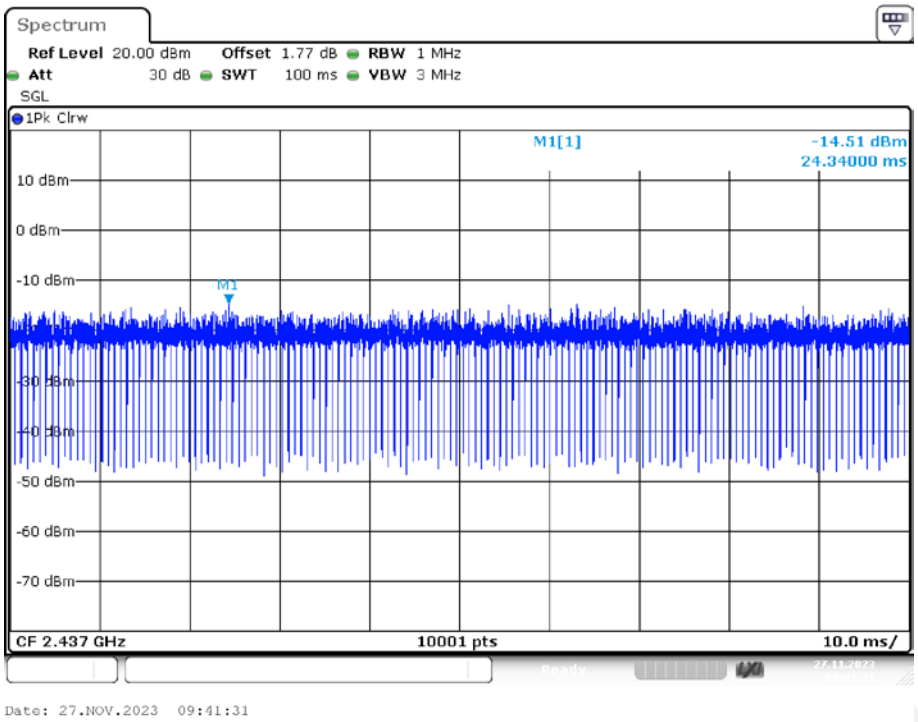
IEEE 802.11 n/HT20 2437MHz



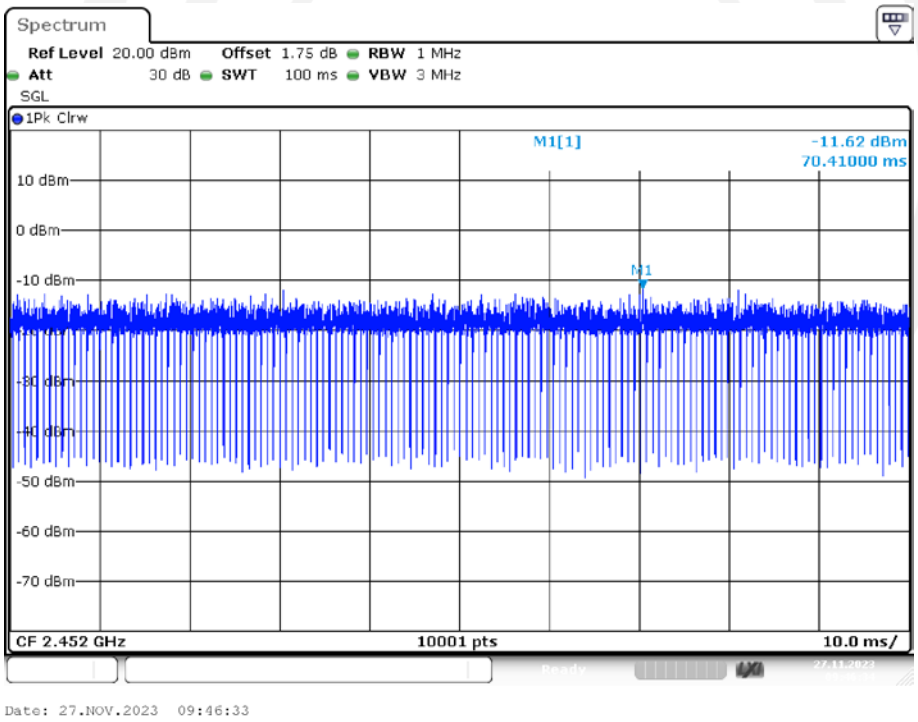
IEEE 802.11 n/HT20 2462MHz



IEEE 802.11 n/HT40 2422MHz



IEEE 802.11 n/HT40 2437MHz



IEEE 802.11 n/HT40 2452MHz

7. Peak Power Spectral Density

7.1. Test limits

6.1.1 Please refer RSS-247 & FCC PART 15: 15.247.

6.1.2 For direct sequence systems, the peak 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.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

6.2.1 Place the EUT on the table and set it in transmitting mode.

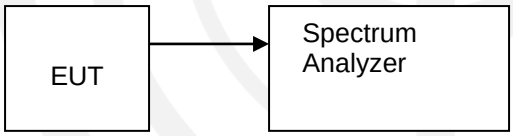
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 100kHz(Set the RBW to: 3 kHz≤RBW≤100 kHz.), VBW = 300kHz(Set the VBW≥3×RBW), span≥1.5×DTS bandwidth., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

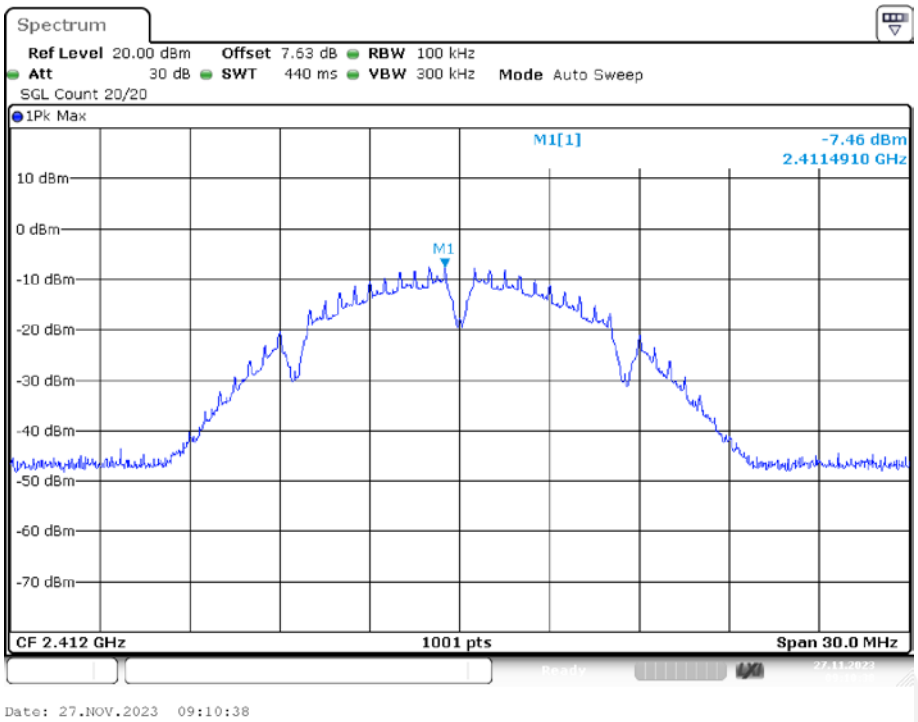
7.3. Test Setup



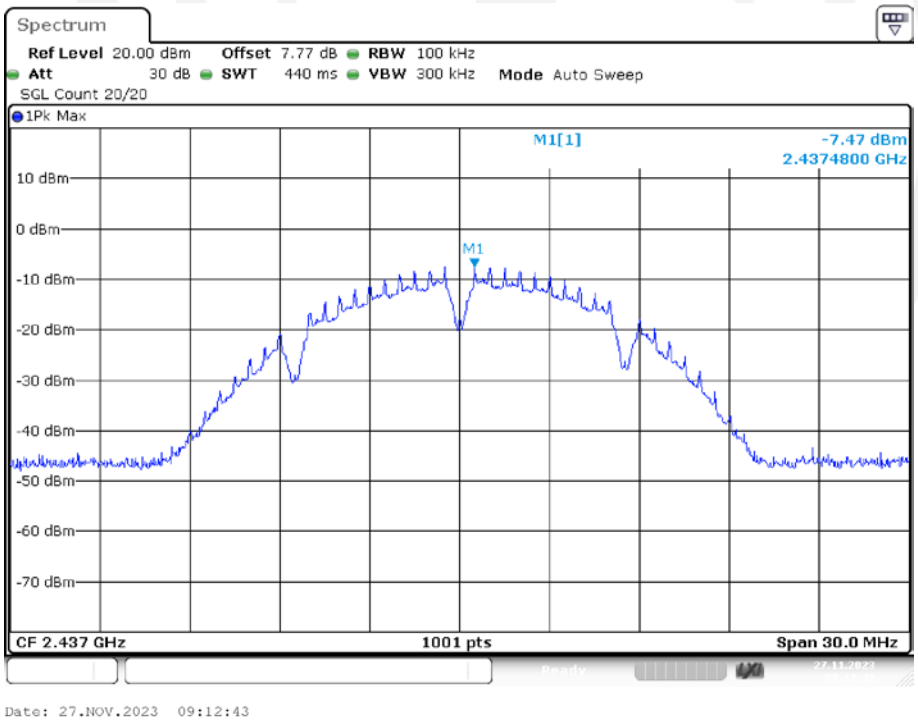
7.4. Test Results

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm/100K)	Max PSD (dBm/3K)	Limit (dBm/3K)	Verdict
NVNT	b	2412	Ant1	-7.462	-22.691	8	Pass
NVNT	b	2437	Ant1	-7.475	-22.704	8	Pass
NVNT	b	2462	Ant1	-7.667	-22.896	8	Pass
NVNT	g	2412	Ant1	-13.261	-28.49	8	Pass
NVNT	g	2437	Ant1	-13.787	-29.016	8	Pass
NVNT	g	2462	Ant1	-14.581	-29.81	8	Pass
NVNT	n/HT20	2412	Ant1	-12.938	-28.167	8	Pass
NVNT	n/HT20	2437	Ant1	-13.559	-28.788	8	Pass
NVNT	n/HT20	2462	Ant1	-14.523	-29.752	8	Pass
NVNT	n/HT40	2412	Ant1	-18.477	-33.706	8	Pass
NVNT	n/HT40	2437	Ant1	-18.127	-33.356	8	Pass
NVNT	n/HT40	2462	Ant1	-16.832	-32.061	8	Pass

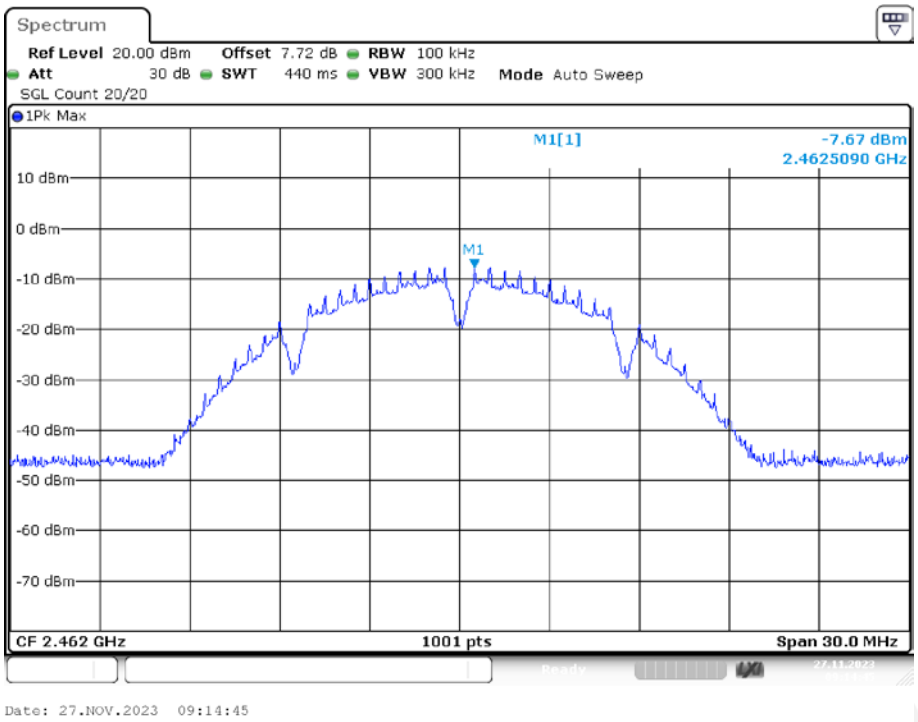
Note: Max PSD (dBm/3K)= Max PSD (dBm/100K)-Log(100/3)*10



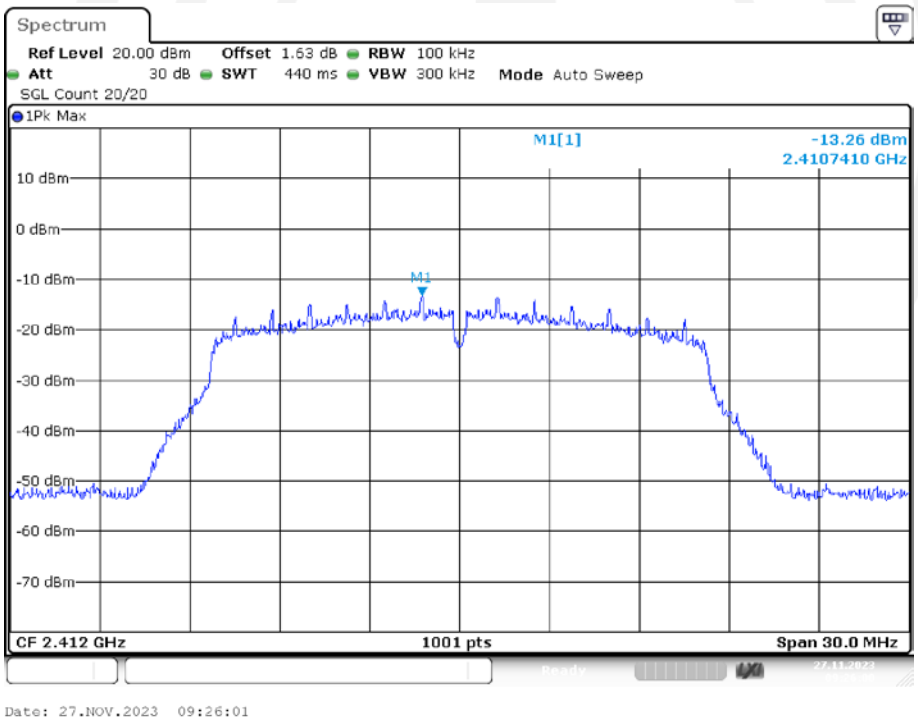
IEEE 802.11 b 2412MHz



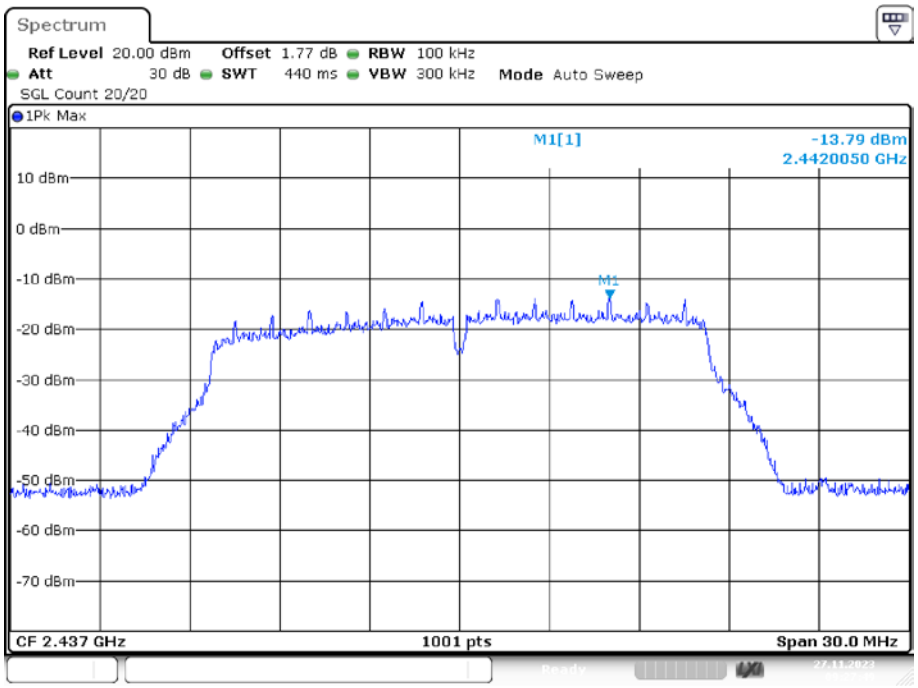
IEEE 802.11 b 2437MHz



IEEE 802.11 b 2462MHz



IEEE 802.11 g 2412MHz



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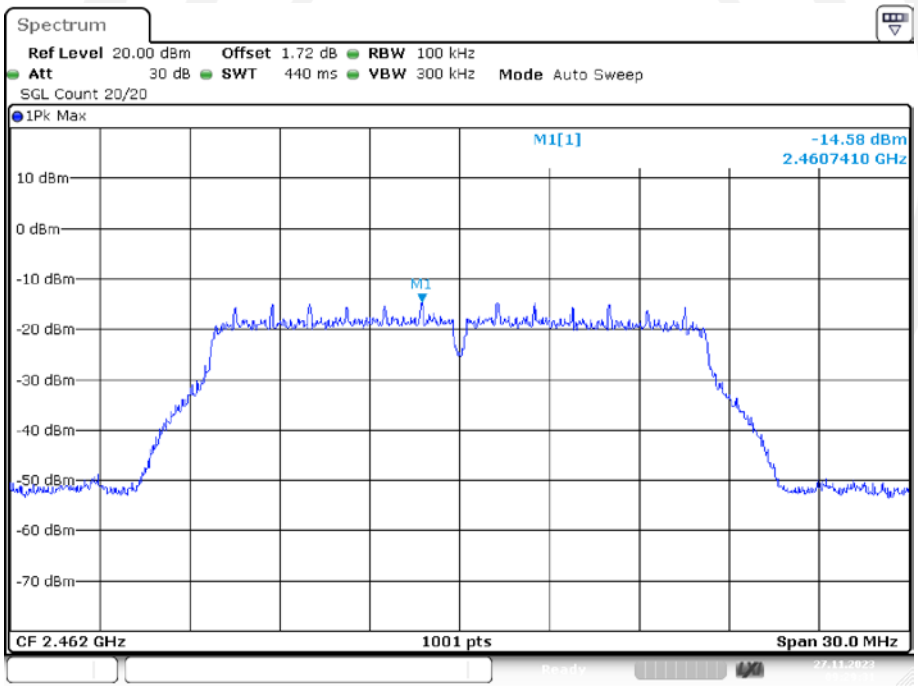
IEEE 802.11 g 2437MHz



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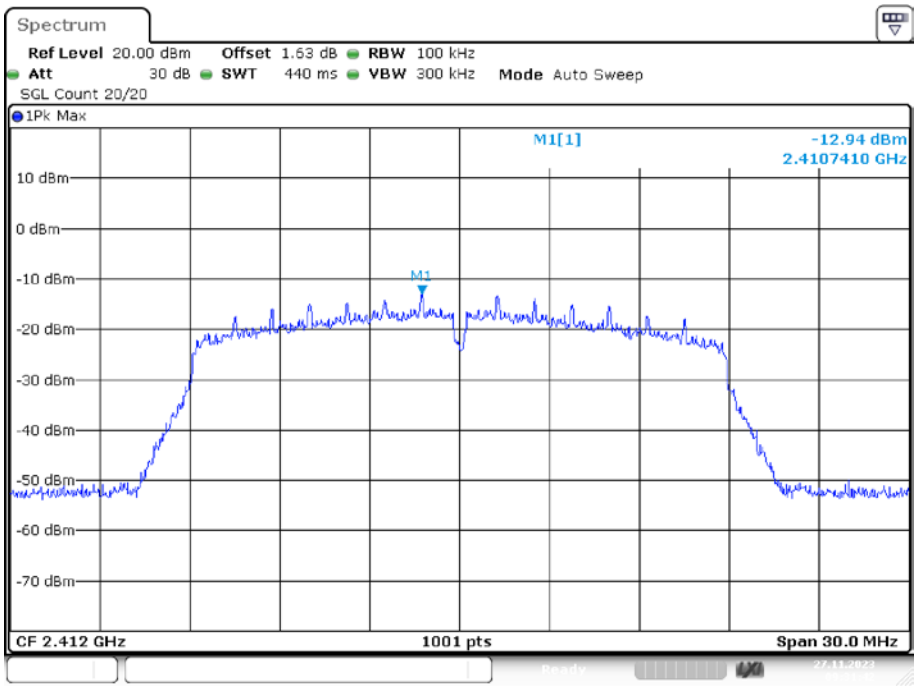
IEEE 802.11 g 2462MHz



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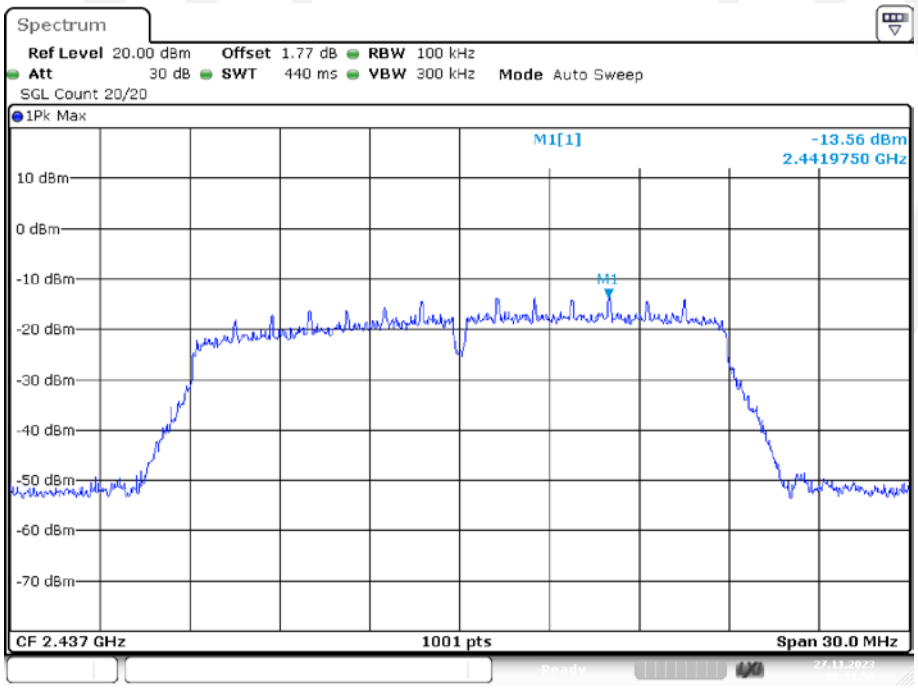
IEEE 802.11 n/HT20 2412MHz



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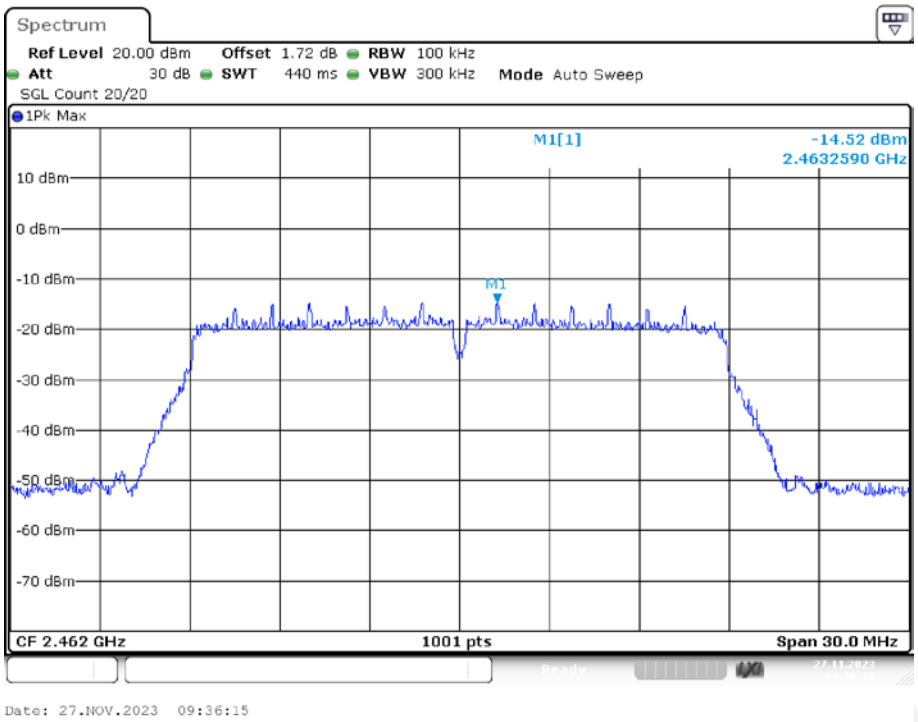
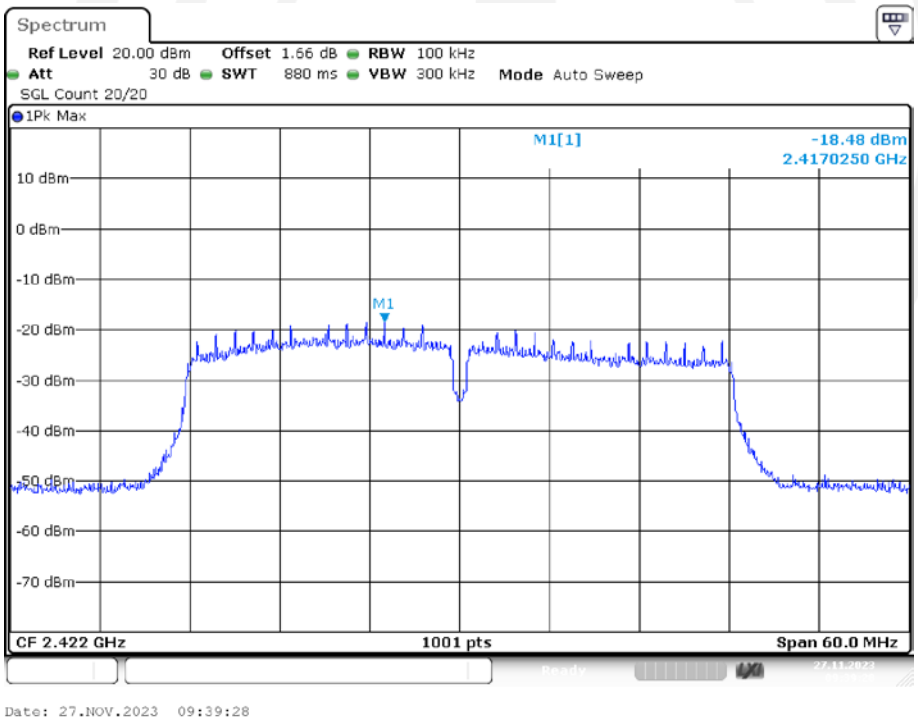
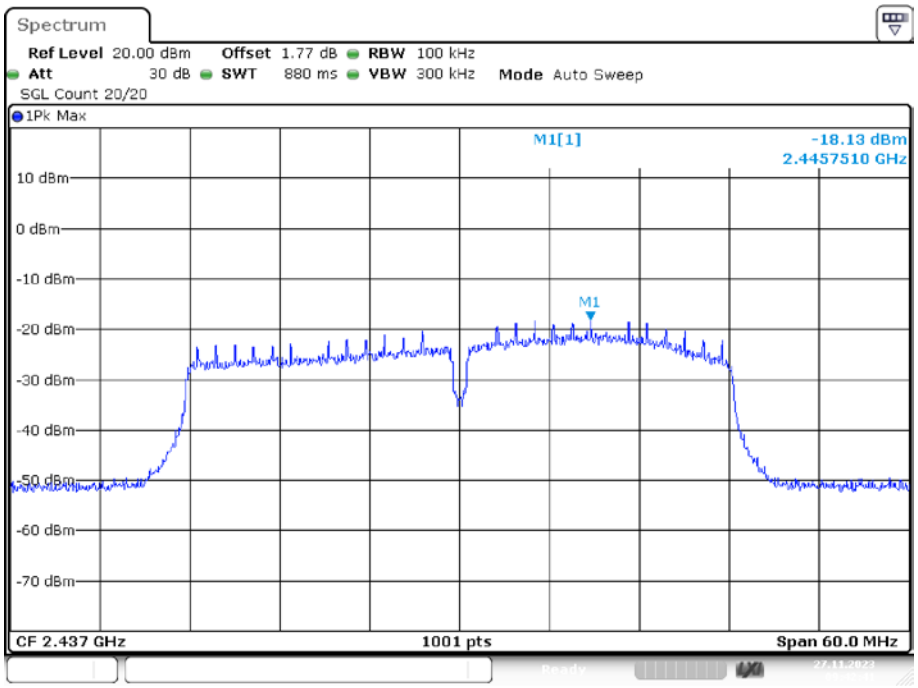
IEEE 802.11 n/HT20 2437MHz



IEEE 802.11 n/HT20 2462MHz



IEEE 802.11 n/HT40 2422MHz



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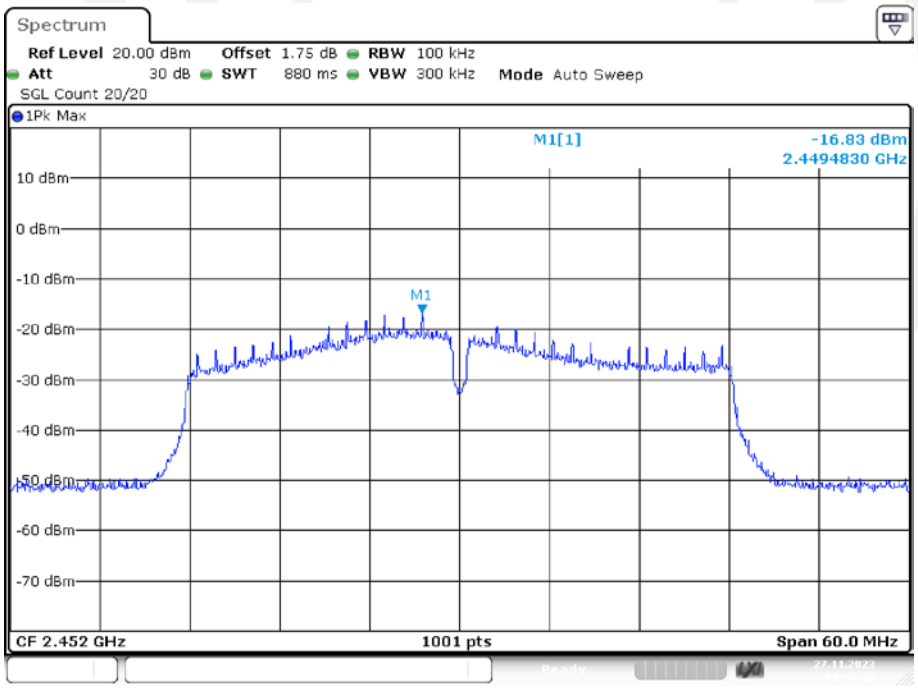
IEEE 802.11 n/HT40 2437MHz



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IEEE 802.11 n/HT40 2452MHz

8. Bandwidth

8.1. Test limits

Please refer RSS-247 & FCC PART 15: 15.247
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

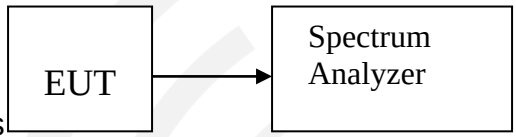
8.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

a) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

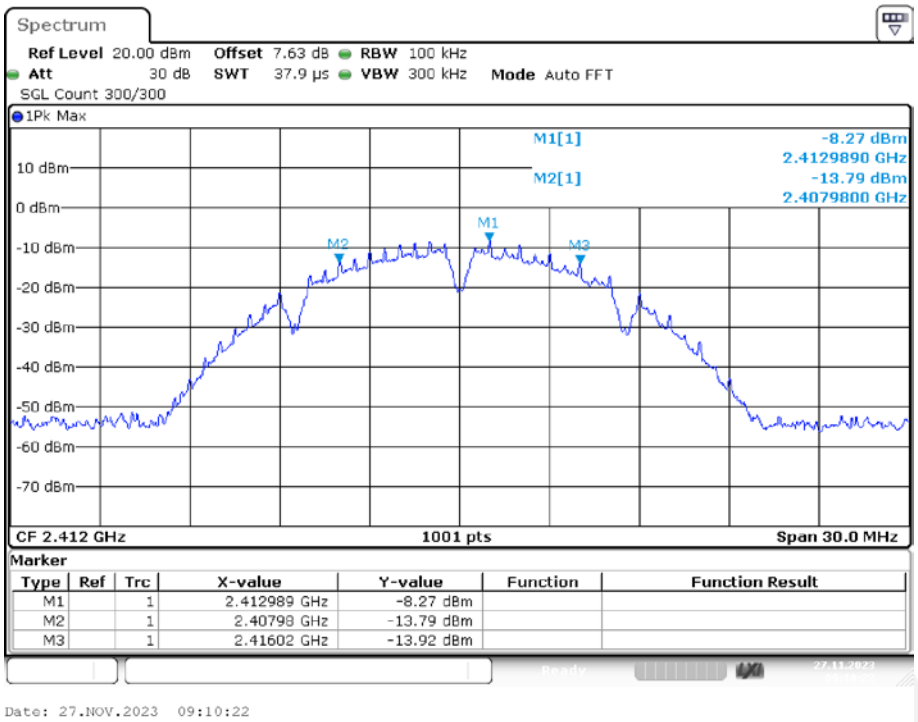
b) The test receiver set RBW = 100kHz, VBW≥3*RBW =300kHz,, Peak Detector, Sweep time set auto, detail see the test plot.

8.3. Test Setup



8.4. Test Results

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	802.11b	2412	Ant 1	8.04	0.5	Pass
NVNT	802.11b	2437	Ant 1	8.07	0.5	Pass
NVNT	802.11b	2462	Ant 1	8.07	0.5	Pass
NVNT	802.11g	2412	Ant 1	13.2	0.5	Pass
NVNT	802.11g	2437	Ant 1	16.44	0.5	Pass
NVNT	802.11g	2462	Ant 1	16.35	0.5	Pass
NVNT	802.11n(HT20)	2412	Ant 1	13.8	0.5	Pass
NVNT	802.11n(HT20)	2437	Ant 1	17.7	0.5	Pass
NVNT	802.11n(HT20)	2462	Ant 1	17.82	0.5	Pass
NVNT	802.11n(HT40)	2422	Ant 1	34.5	0.5	Pass
NVNT	802.11n(HT40)	2437	Ant 1	28.8	0.5	Pass
NVNT	802.11n(HT40)	2452	Ant 1	35.04	0.5	Pass



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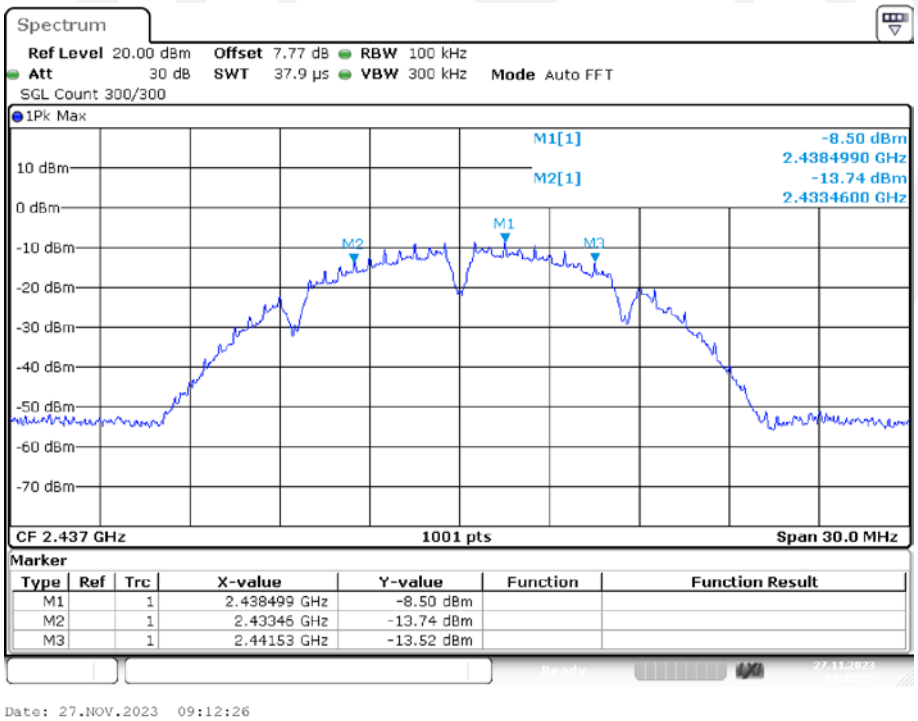
IEEE 802.11 b 2412MHz



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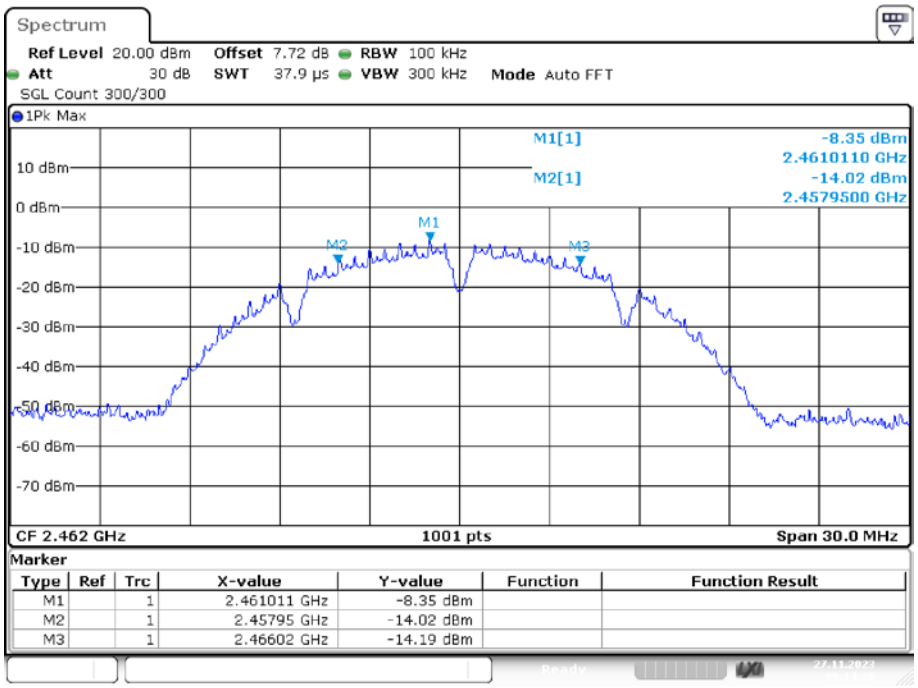
IEEE 802.11 b 2437MHz



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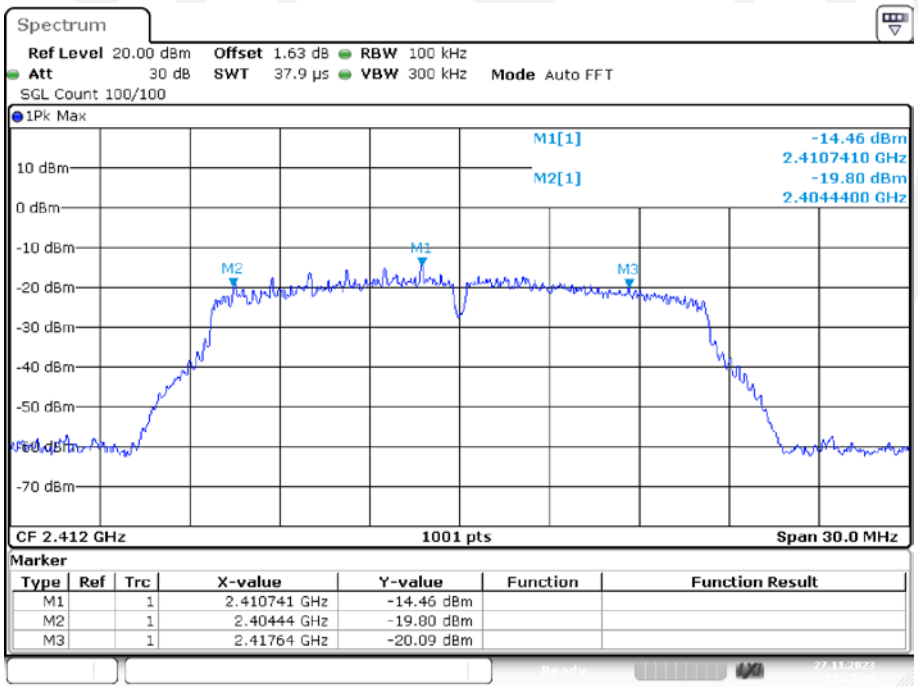
IEEE 802.11 b 2462MHz



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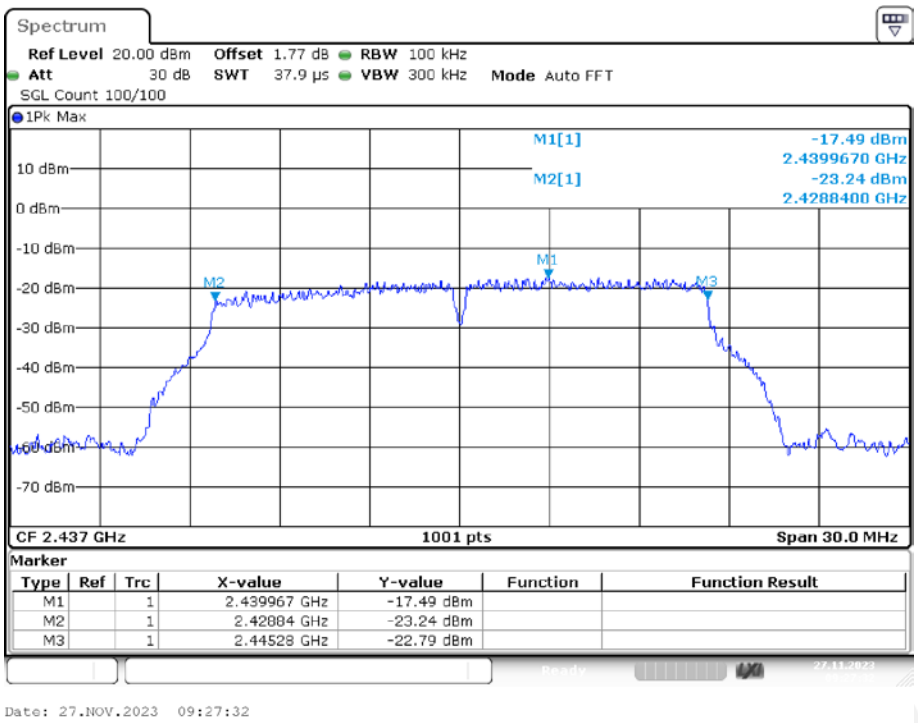
IEEE 802.11 g 2412MHz



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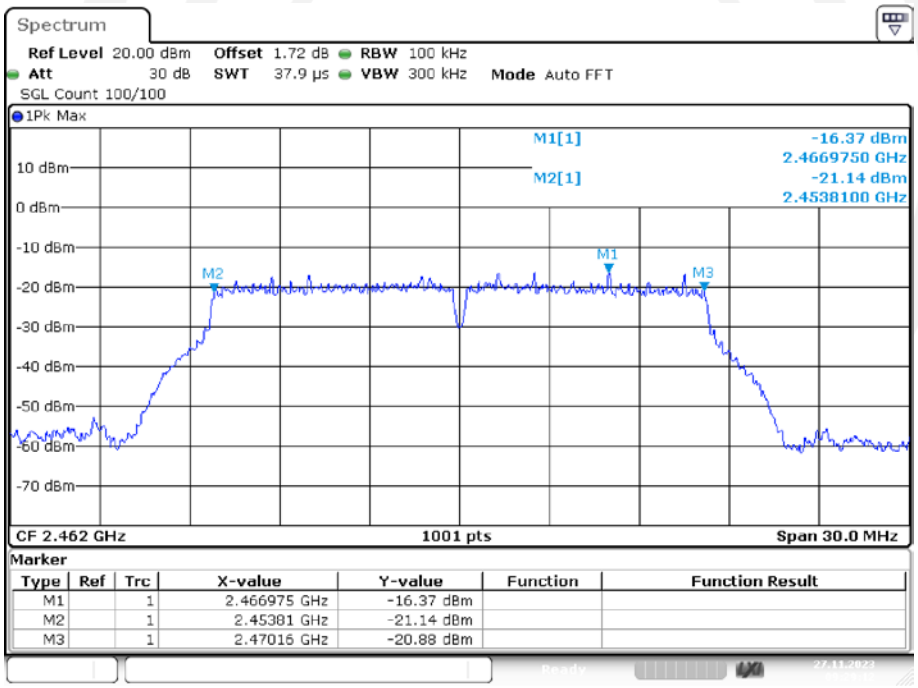
IEEE 802.11 g 2437MHz



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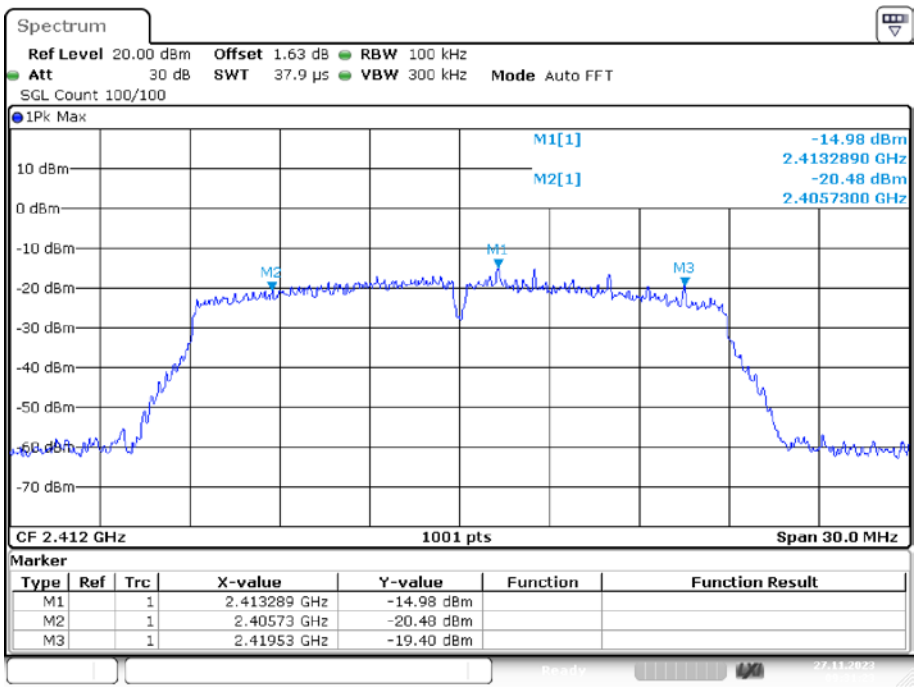

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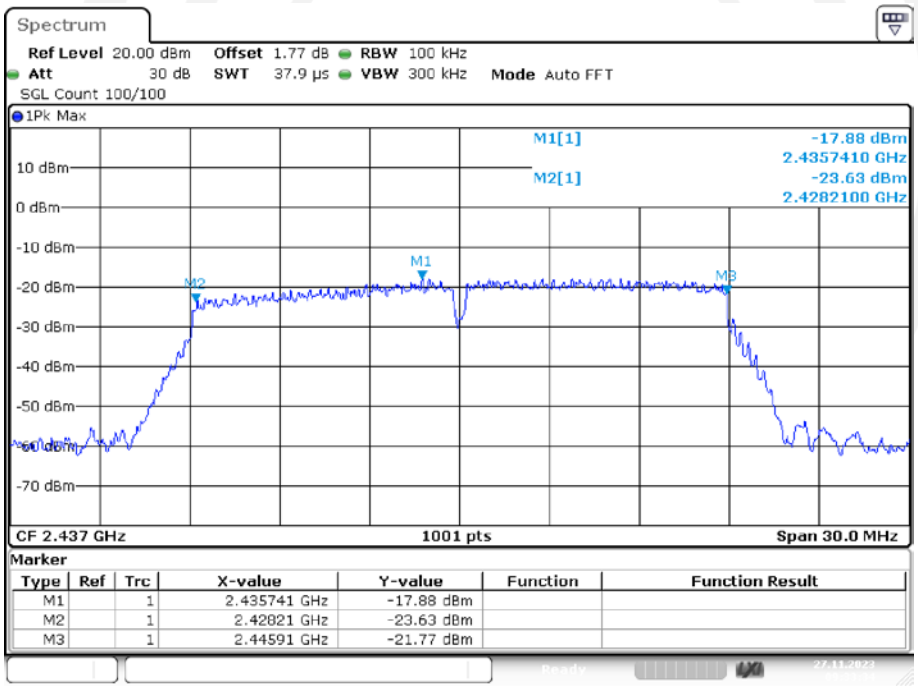
IEEE 802.11 n/HT20 2412MHz



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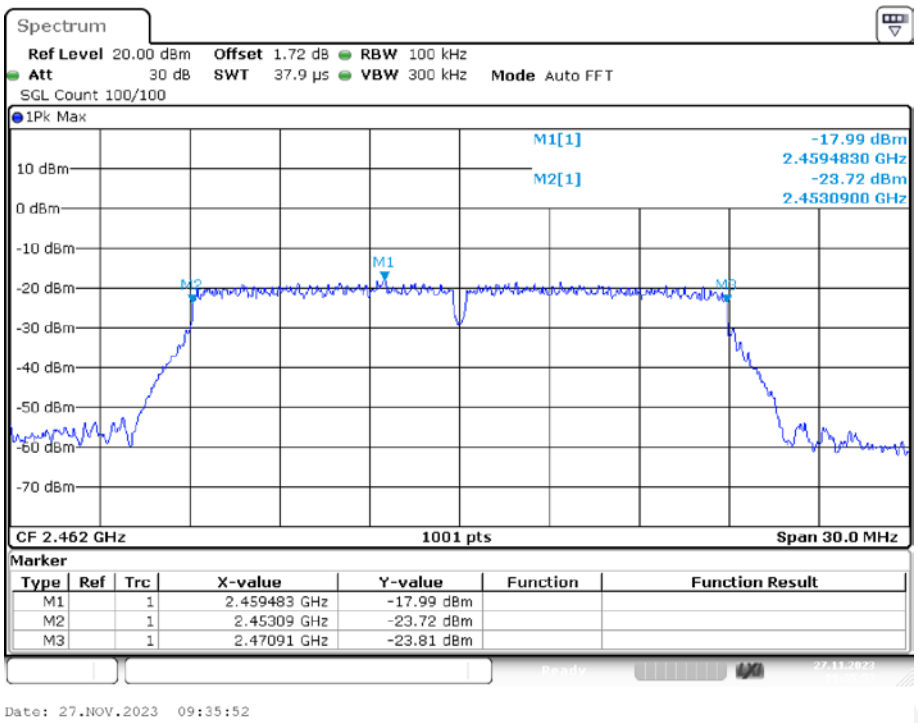
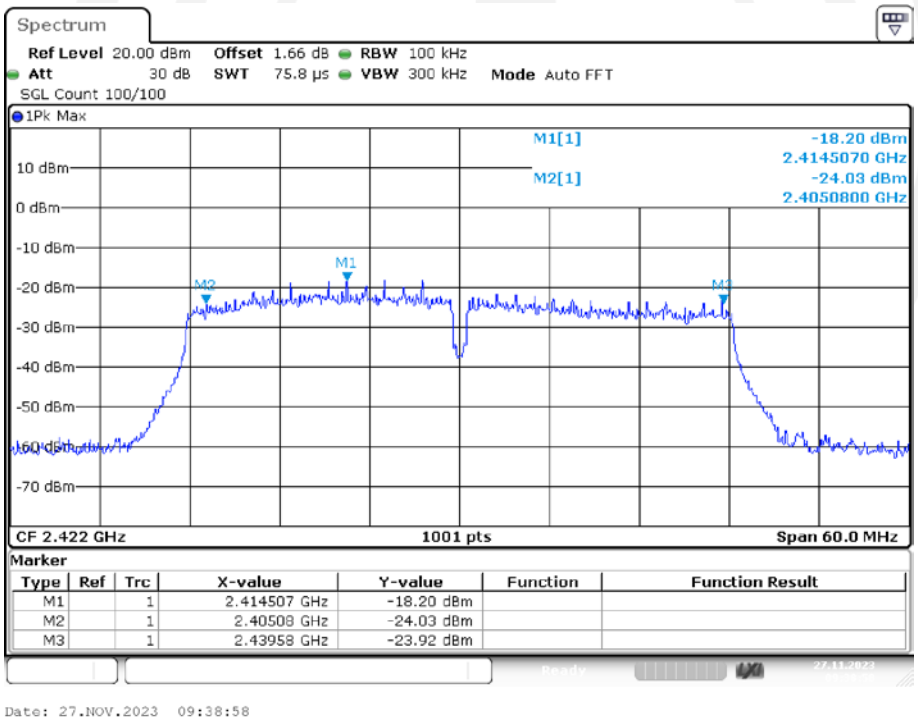
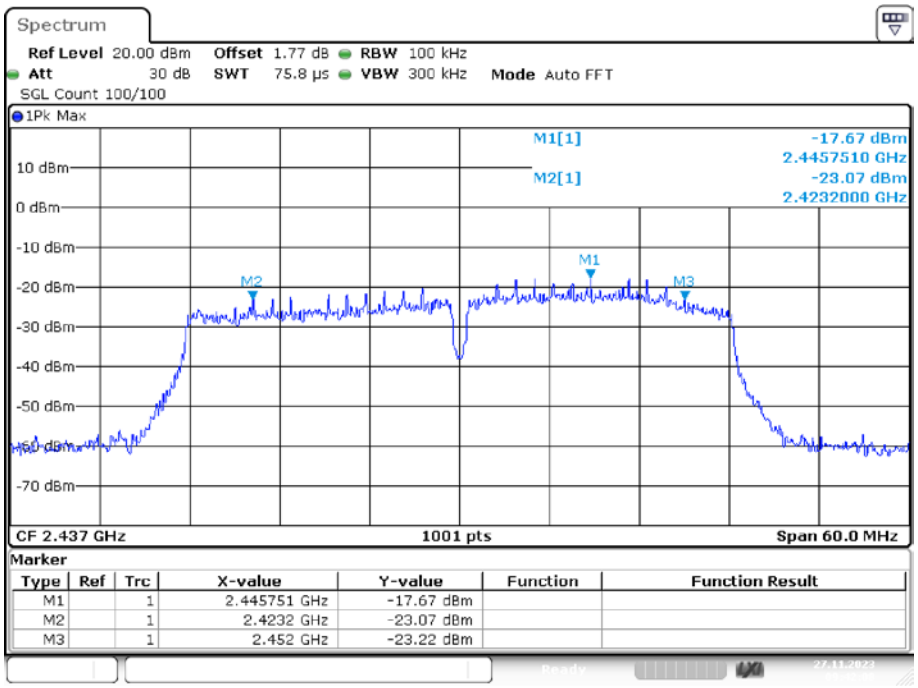
IEEE 802.11 n/HT20 2437MHz



IEEE 802.11 n/HT20 2462MHz



IEEE 802.11 n/HT40 2422MHz



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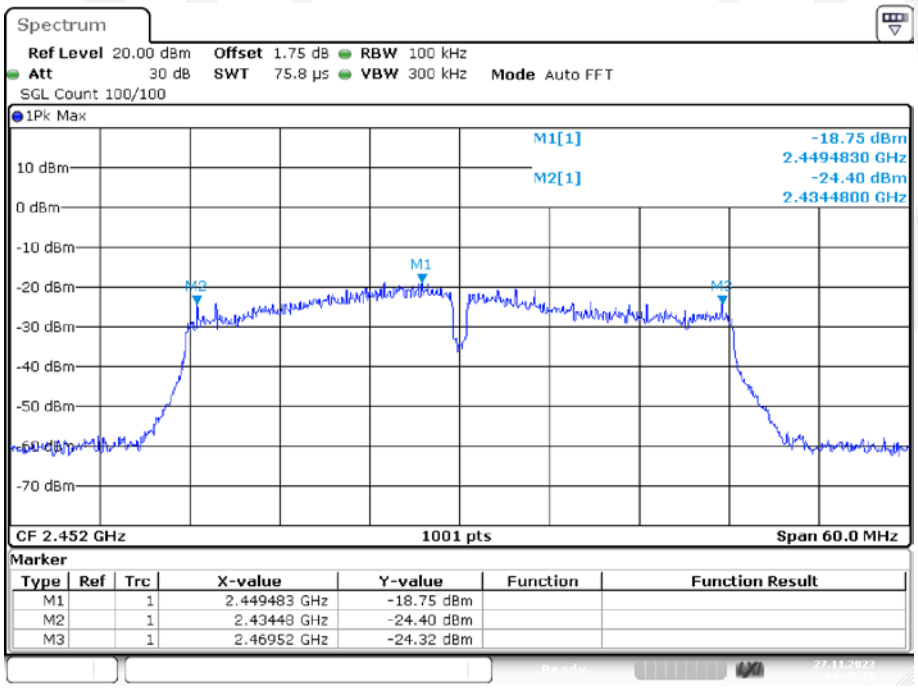
IEEE 802.11 n/HT40 2437MHz



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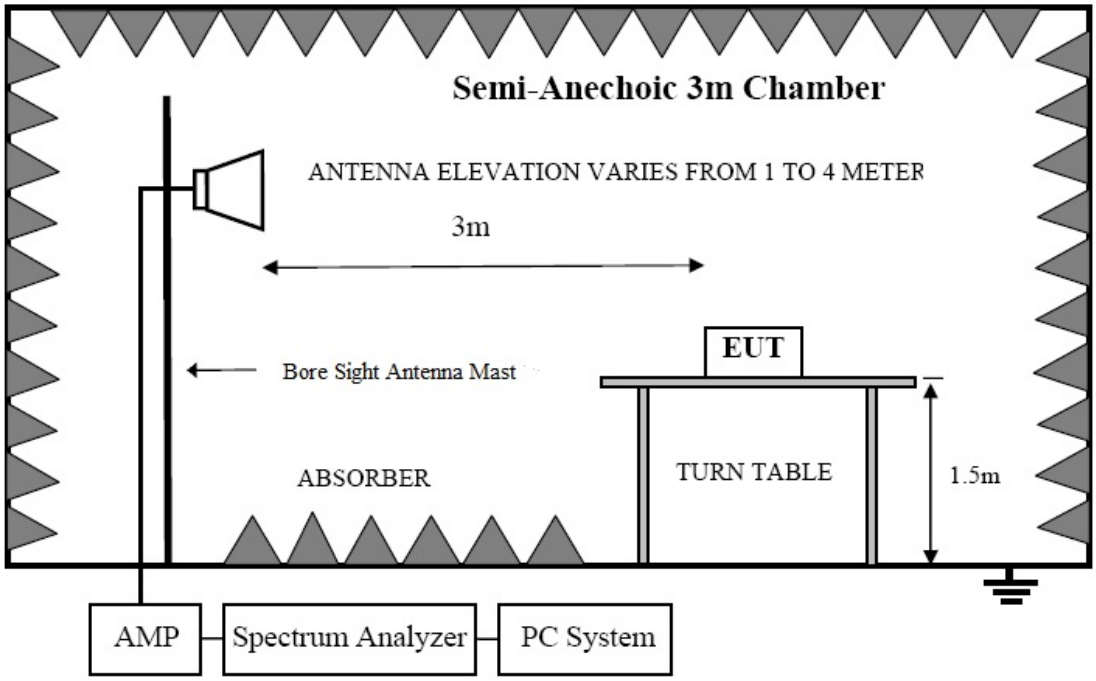
IEEE 802.11 n/HT40 2452MHz

9. Band Edge Test

9.1. Block Diagram of Test Setup



9.2. Test Limit

Please refer section15.247 and section 15.209.
All the lower and upper band-edges emissions appearing within restricted frequency bands shall not exceed the limits shown in FCC part 15.209 and RSS-GEN, all the other emissions outside operation shall be at least 20dB below the fundamental emissions, or comply with FCC part 15.209 and RSS-GEN limits.
All the lower and upper band-edges emissions appearing within 2310MHz to 24100MHz 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 and 5725MHz to 5850MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

9.3. Test Procedure

Refer to ANSI C 63.10, Clause 6.10.
All restriction band and non- restriction band have been tested, only worse case is reported.
Details see the KDB558074 D01 Meas Guidance v05r02

8.2.1 Put the EUT on a 1.5m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission
8.2.2 Check the spurious emissions out of band.
8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value , RBW 1MHz ,VBW 10Hz , RMS detector for AV value.

9.4. Test Results

Test Date	:	2023.11.04			Temperature	:	24℃	
Test Engineer	:	Jensen Wang			Humidity	:	56%	
Test Results	:	**PASS**						
Frequency Range	:	**2310MHz~2410MHz**						
Test Mode	:	IEEE 802.11b TX 2412MHz						
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	2390	H	71.90	-21.62	50.28	74.00	-23.72	Peak
2	2390	H	--	-21.62	--	54.00	--	Avg
3	2400	H	77.15	-26.08	51.07	74.00	-22.93	Peak
4	2400	H	--	-26.08	--	54.00	--	Avg
1	2390	V	68.75	-21.62	47.13	74.00	-26.87	Peak
2	2390	V	--	-21.62	--	54.00	--	Avg
3	2400	V	77.71	-26.08	51.63	74.00	-22.37	Peak
4	2400	V	--	-26.08	--	54.00	--	Avg
Frequency Range	:	**2450MHz~2550MHz**						
Test Mode	:	IEEE 802.11b TX 2462MHz						
1	2483.5	H	75.29	-25.84	49.45	74.00	-24.55	Peak
2	2483.5	H	--	-25.84	--	54.00	--	Avg
1	2483.5	V	73.55	-25.84	47.71	74.00	-26.29	Peak
2	2483.5	V	--	-25.84	--	54.00	--	Avg
Note:	1. Means other frequency and mode comply with standard requirements and at least have 20dB margin. 2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain. Result=Reading + Correct Factor. Margin= Result-Limit. 5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.							

Test Date	:	2023.11.04			Temperature	:	24℃	
Test Engineer	:	Jensen Wang			Humidity	:	56%	
Test Results	:	**PASS**						
Frequency Range	:	**2310MHz~2410MHz**						
Test Mode	:	IEEE 802.11g TX 2412MHz						
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	2390	H	68.04	-21.62	46.42	74.00	-27.58	Peak
2	2390	H	--	-21.62	--	54.00	--	Avg
3	2400	H	74.06	-26.08	47.98	74.00	-26.02	Peak
4	2400	H	--	-26.08	--	54.00	--	Avg
1	2390	V	69.95	-21.62	48.33	74.00	-25.67	Peak
2	2390	V	--	-21.62	--	54.00	--	Avg
3	2400	V	75.63	-26.08	49.55	74.00	-24.45	Peak
4	2400	V	--	-26.08	--	54.00	--	Avg
Frequency Range	:	**2450MHz~2550MHz**						
Test Mode	:	IEEE 802.11g TX 2462MHz						
1	2483.5	H	75.52	-25.84	49.68	74.00	-24.32	Peak
2	2483.5	H	--	-25.84	--	54.00	--	Avg
1	2483.5	V	76.86	-25.84	51.02	74.00	-22.98	Peak
2	2483.5	V	--	-25.84	--	54.00	--	Avg

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.
3. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

Test Date	:	2023.11.04			Temperature	:	24℃	
Test Engineer	:	Jensen Wang			Humidity	:	56%	
Test Results	:	**PASS**						
Frequency Range	:	**2310MHz~2410MHz**						
Test Mode	:	IEEE 802.11n/HT20 TX 2412MHz						
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	2390	H	68.93	-21.62	47.31	74.00	-26.69	Peak
2	2390	H	--	-21.62	--	54.00	--	Avg
3	2400	H	75.05	-26.08	48.97	74.00	-25.03	Peak
4	2400	H	--	-26.08	--	54.00	--	Avg
1	2390	V	73.15	-21.62	51.53	74.00	-22.47	Peak
2	2390	V	--	-21.62	--	54.00	--	Avg
3	2400	V	79.27	-26.08	53.19	74.00	-20.81	Peak
4	2400	V	--	-26.08	--	54.00	--	Avg
Frequency Range	:	**2450MHz~2550MHz**						
Test Mode	:	IEEE 802.11n/HT20 TX 2462MHz						
1	2483.5	H	77.77	-25.84	51.93	74.00	-22.07	Peak
2	2483.5	H	--	-25.84	--	54.00	--	Avg
1	2483.5	V	77.93	-25.84	52.09	74.00	-21.91	Peak
2	2483.5	V	--	-25.84	--	54.00	--	Avg

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.
3. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

Test Date	:	2023.11.04			Temperature	:	24℃	
Test Engineer	:	Jensen Wang			Humidity	:	56%	
Test Results	:	**PASS**						
Frequency Range	:	**2310MHz~2410MHz**						
Test Mode	:	IEEE 802.11n/HT40 TX 2422MHz						
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	2390	H	70.71	-21.62	49.09	74.00	-24.91	Peak
2	2390	H	--	-21.62	--	54.00	--	Avg
3	2400	H	79.09	-26.08	53.01	74.00	-20.99	Peak
4	2400	H	--	-26.08	--	54.00	--	Avg
1	2390	V	68.29	-21.62	46.67	74.00	-27.33	Peak
2	2390	V	--	-21.62	--	54.00	--	Avg
3	2400	V	73.60	-26.08	47.52	74.00	-26.48	Peak
4	2400	V	--	-26.08	--	54.00	--	Avg
Frequency Range	:	**2450MHz~2550MHz**						
Test Mode	:	IEEE 802.11n/HT20 TX 2452MHz						
1	2483.5	H	77.99	-25.84	52.15	74.00	-21.85	Peak
2	2483.5	H	--	-25.84	--	54.00	--	Avg
1	2483.5	V	75.30	-25.84	49.46	74.00	-24.54	Peak
2	2483.5	V	--	-25.84	--	54.00	--	Avg

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.
3. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

10. Antenna Requirement

10.1.Standard 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 shall be considered sufficient to comply with the provisions of this Section. 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.

10.2.Antenna Connected Construction

The antenna connector is unique antenna and no consideration of replacement. Please see EUT photo for details.

10.3.Results

The EUT antenna is internal Antenna. It complies with the standard requirement.

11. Photos of test setup

Reference to the **appendix I Test Setup Photo** for details.

12. Photos of EUT

Reference to the **appendix II external photos** and **appendix III internal photos** for details.

------ END OF REPORT------