

FCC- TEST REPORTReport Number : **708881974877-00** Date of Issue: December 26, 2019

Model : WBR3

Product Type : WiFi and Bluetooth module

FCC ID : 2ANDL-WBR3

Applicant : Hangzhou Tuya Information Technology Co.,Ltd

Address of Applicant : Room701,Building3,More Center,No.87 GuDun

: Road, Hangzhou, Zhejiang China

Manufacturer : Hangzhou Tuya Information Technology Co.,Ltd

Address of Manufacturer : Room701,Building3,More Center,No.87 GuDun

: Road, Hangzhou, Zhejiang China

Factory : Newtronics Hangzhou Co.,Ltd

Address of Factory : No.15,Jiu zhou Road,Jiang Gan Science&Technology
Economic Park HangzhouTest Result : ☒ Positive ☐ NegativeTotal pages including
Appendices : 48

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China

2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road,
Shanghai 201108,
P.R. China

Test Firm Registration Number: 820234
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3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	WiFi and Bluetooth module
Model no.:	WBR3
FCC ID:	2ANDL-WBR3
IC:	NA
Options and accessories:	NA
Rating:	DC 3.0-3.6V
RF Transmission Frequency:	For 802.11b/g/n-HT20: 2412~2462 MHz For 802.15.1:2402~2480 MHz
No. of Operated Channel:	2.4GHz WiFi: 11 2.4GHz BLE: 40
Modulation:	For 2.4GHz WIFI: Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11g/n For 2.4GHz BLE: GFSK
Antenna Type:	PCB antenna
Antenna Gain:	2.5dBi
Description of the EUT:	The Equipment Under Test (EUT) is a low-power embedded Wi-Fi and Bluetooth module (4.2). We tested it and listed the worst data in this report.



4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements							
FCC Part 15 Subpart C							
Test Condition			Pages	Test Site	Test Result		
					Pass	Fail	N/A
§15.207		Conducted emission AC power port	12-14	Site 1	☒	☐	☐
§15.247 (b) (1)		Conducted peak output power	15	Site 1	☒	☐	☐
§15.247(a)(1)		20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)		Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)		Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)		Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)		6dB bandwidth	16-19	Site 1	☒	☐	☐
§15.247(e)		Power spectral density	20-23	Site 1	☒	☐	☐
§15.247(d)		Spurious RF conducted emissions	24-33	Site 1	☒	☐	☐
§15.247(d)		Band edge	34-37	Site 1	☒	☐	☐
§15.247(d) & §15.209		Spurious radiated emissions for transmitter	38-44	Site 1	☒	☐	☐
§15.203		Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a patch antenna, which gain is 2.5dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.



6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ANDL-WBR3 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

This report is only for the 2.4GHz WiFi test report, for the 2.4GHz BLE test report please refer to 708881974888-00.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: November 25, 2019

Testing Start Date: November 28, 2019

Testing End Date: December 30, 2019

-TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:

Prepared by:

Tested by:

Hui TONG

EMC Section Manager
Date: 2019-12-26

Jiayi XU

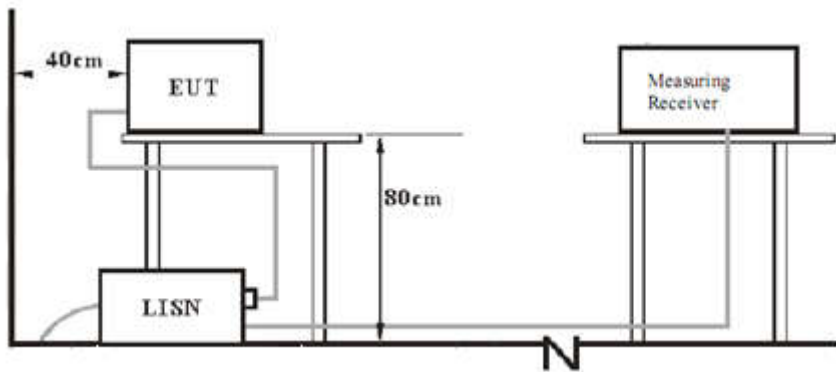
EMC Project Engineer
Date: 2019-12-26

Wenqiang LU

EMC Test Engineer
Date: 2019-12-26

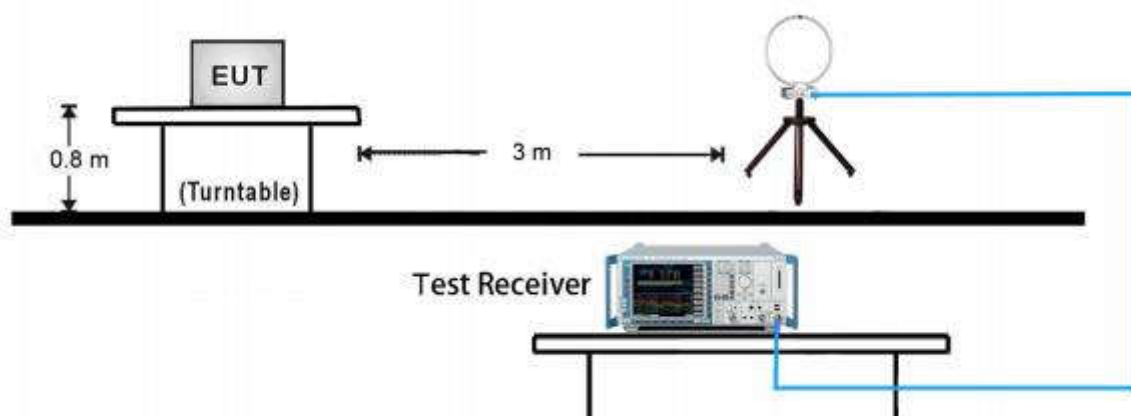
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

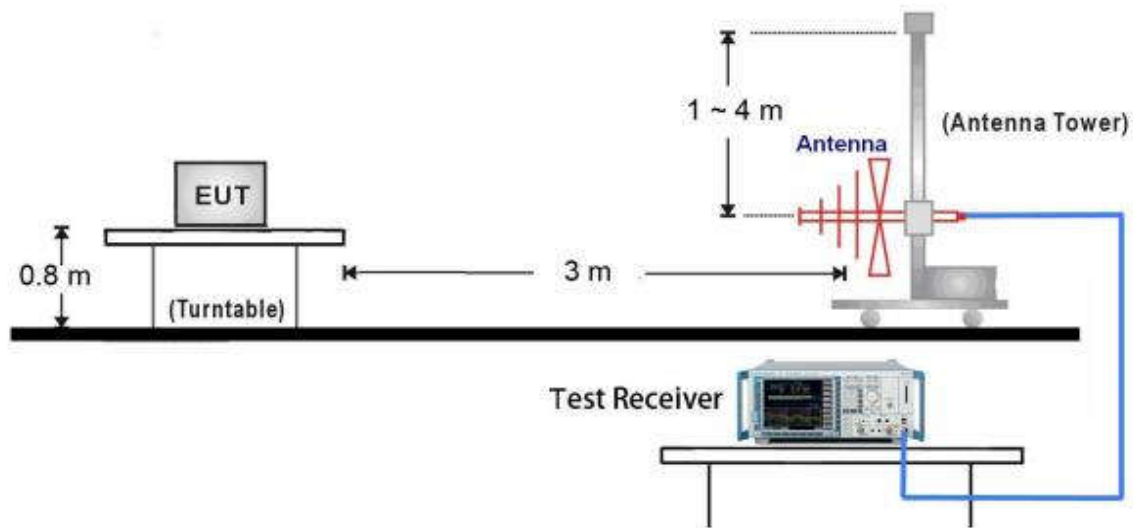


7.2 Radiated test setups

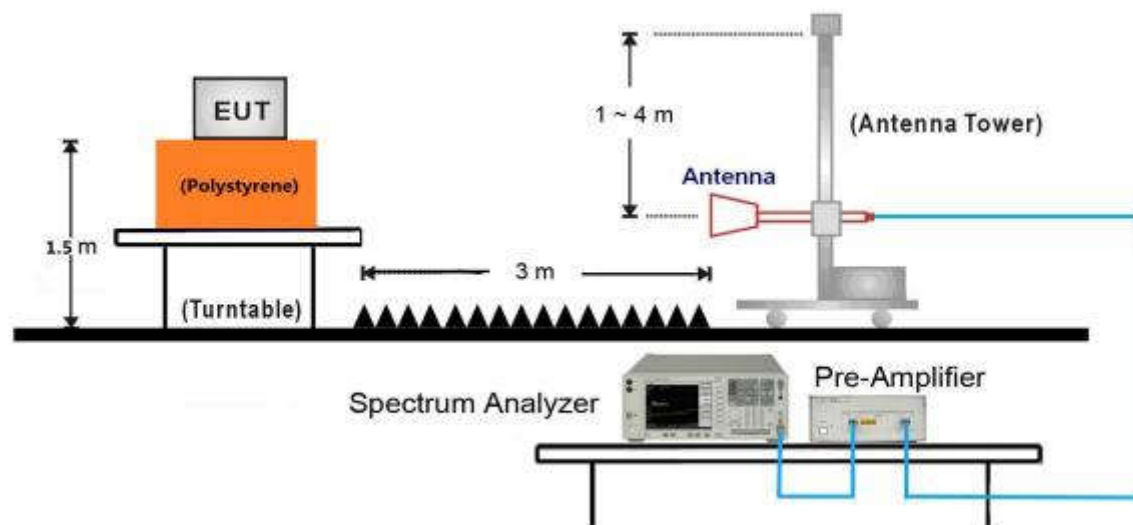
9kHz ~ 30MHz Test Setup:



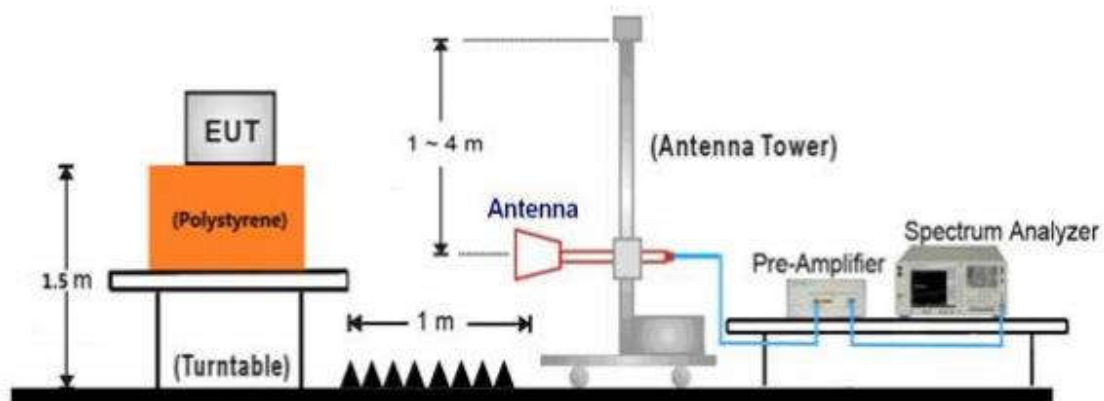
30MHz ~ 1GHz Test Setup:



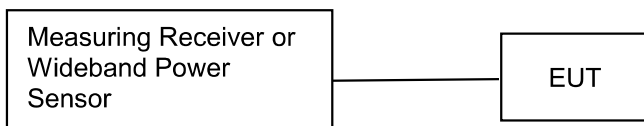
1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
PC	Lenovo	X240	---

Test software: UI_mptool

The system was configured to channel 1(2412MHz), 6(2437MHz), and 11(2462MHz) for the test.

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

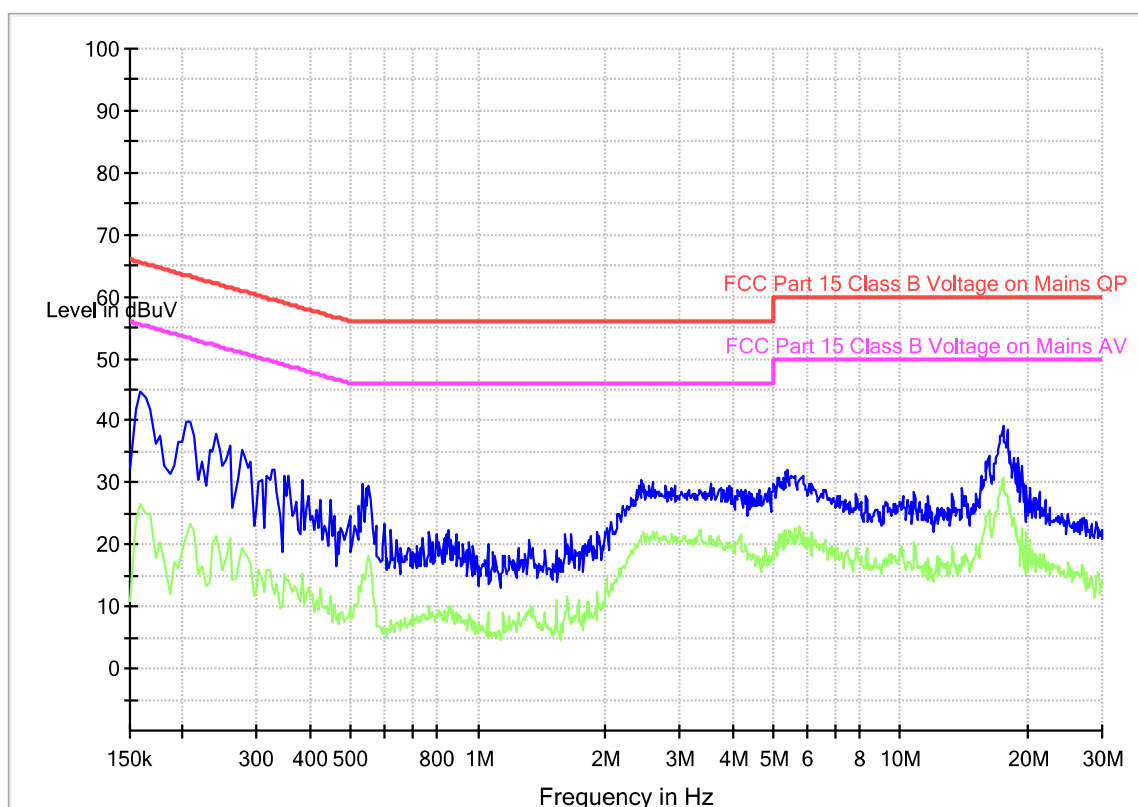
Limit

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

Conducted Emission

Product Type : WiFi and BLE Module
M/N : WBR3
Operating Condition : Mode 1: Tx_2437MHz for 802.11g
Test Specification : L-line
Comment : AC 120V/60Hz (powered by notebook)

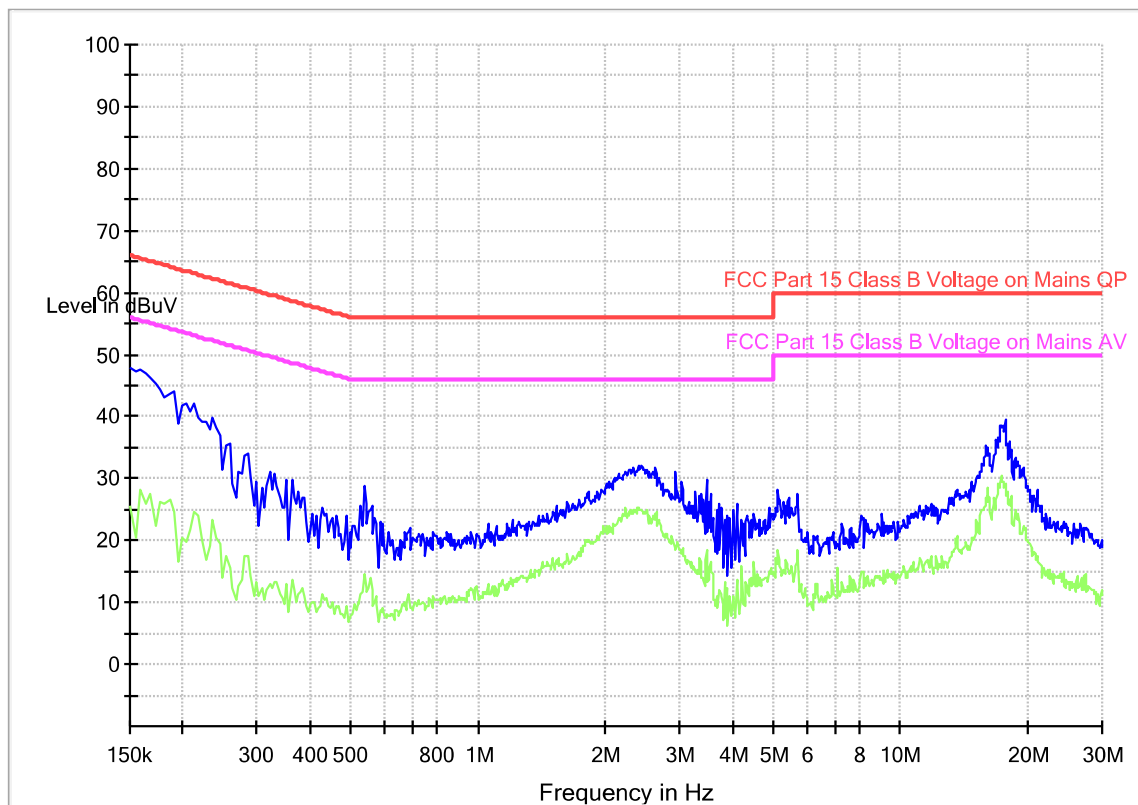


Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator



China

Product Type : WiFi and BLE Module
M/N : WBR3
Operating Condition : Mode 1: Tx_2437MHz for 802.11g
Test Specification : N-line
Comment : AC 120V/60Hz (powered by notebook)



9.2 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
RBW > the 6 dB bandwidth of the emission being measured, VBW $\geq$ 3RBW, Span $\geq$ 3RBW
Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Use a power meter to measure the conducted peak output power.

Limits

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤ 1	≤ 30

Test result as below table

802.11B

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	17.86	Pass
Middle channel 2437MHz	18.31	Pass
High channel 2462MHz	18.47	Pass

802.11G

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	24.05	Pass
Middle channel 2437MHz	24.33	Pass
High channel 2462MHz	24.02	Pass

802.11N20

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	24.16	Pass
Middle channel 2437MHz	21.01	Pass
High channel 2462MHz	21.25	Pass

9.3 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be $\geq$ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

≥ 500

Test result
802.11B

Frequency MHz	6dB bandwidth MHz	Result
Low channel 2412MHz	9.0527	Pass
Middle channel 2437MHz	9.0627	Pass
High channel 2462MHz	9.9857	Pass

802.11G

Frequency MHz	6dB bandwidth MHz	Result
Low channel 2412MHz	16.3245	Pass
Middle channel 2437MHz	16.3255	Pass
High channel 2462MHz	16.3165	Pass

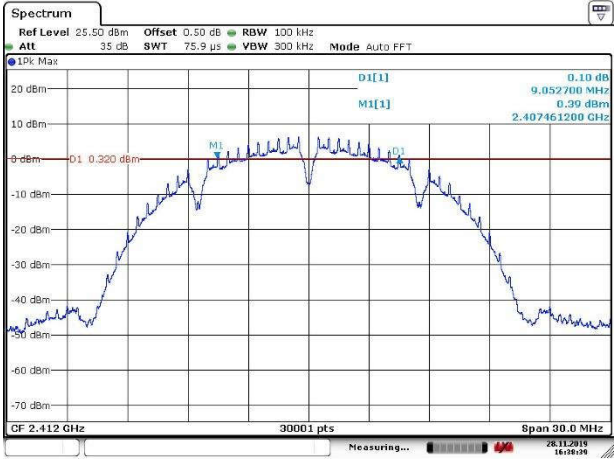
802.11N20

Frequency MHz	6dB bandwidth MHz	Result
Low channel 2412MHz	17.3154	Pass
Middle channel 2437MHz	17.5524	Pass
High channel 2462MHz	17.5504	Pass

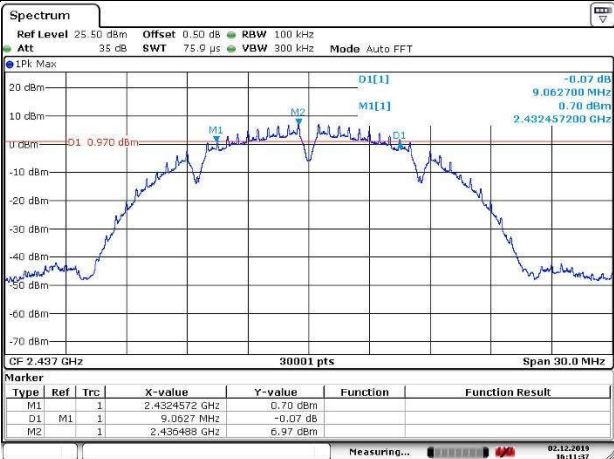
6 dB Bandwidth

802.11B

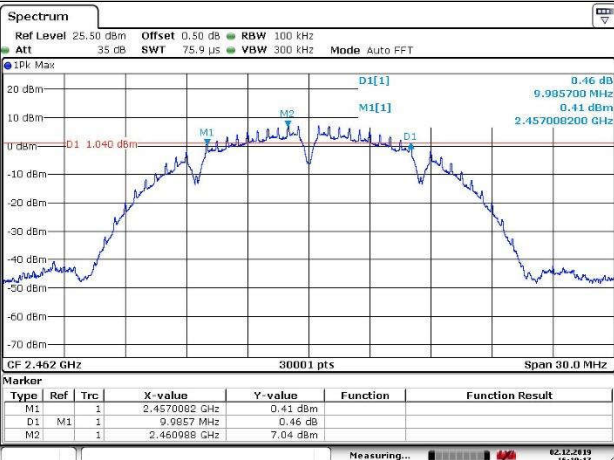
2412



2437

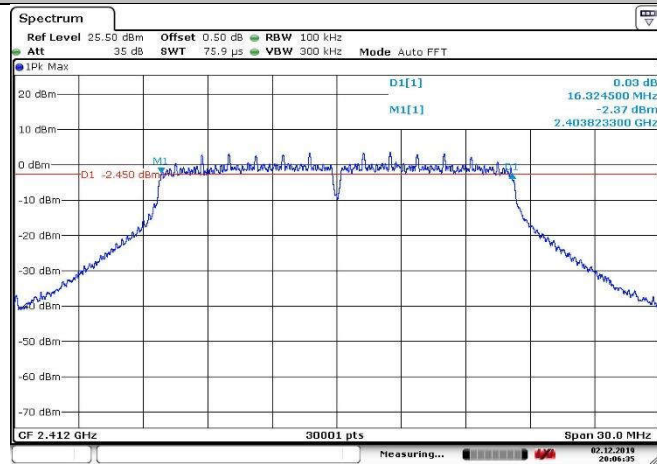


2462



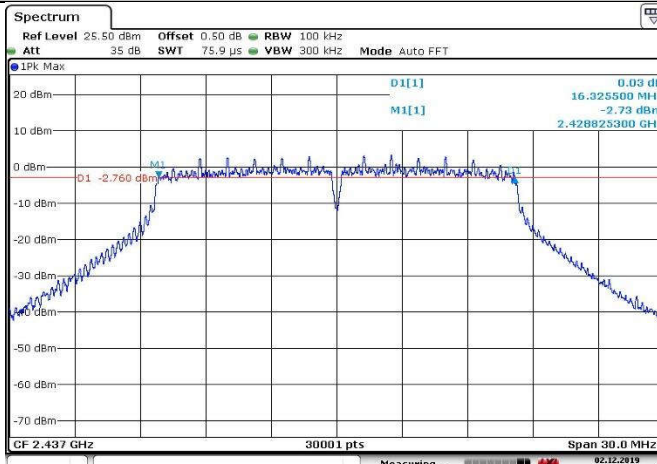
802.11G

2412



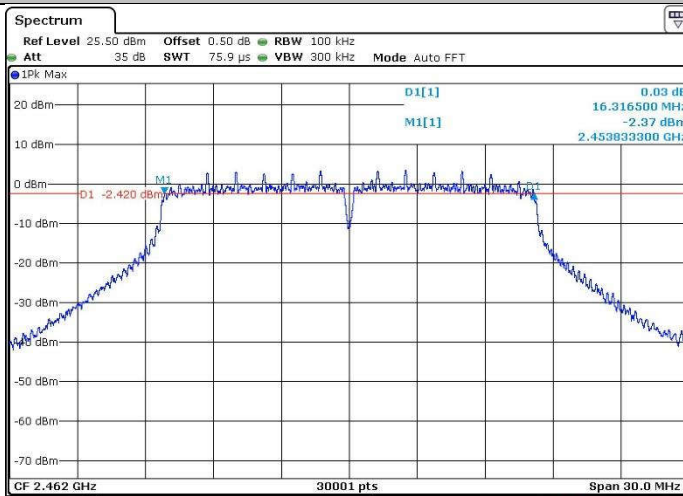
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2437



Date: 2 DEC. 2019 20:12:24

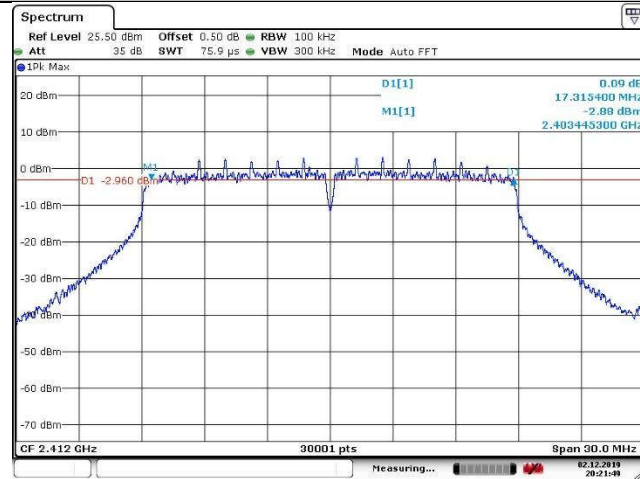
2462



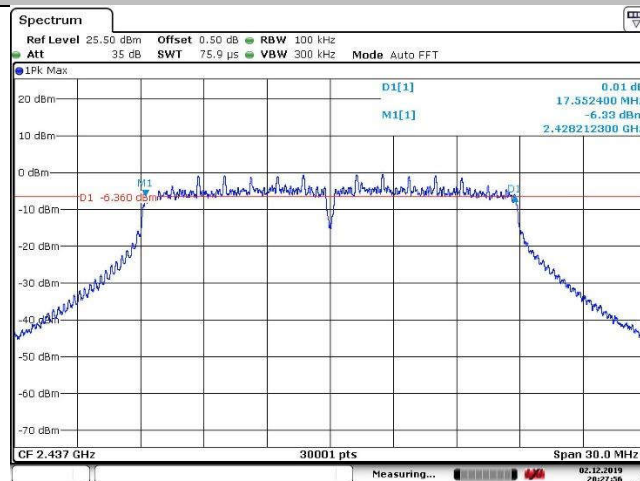
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802.11N20

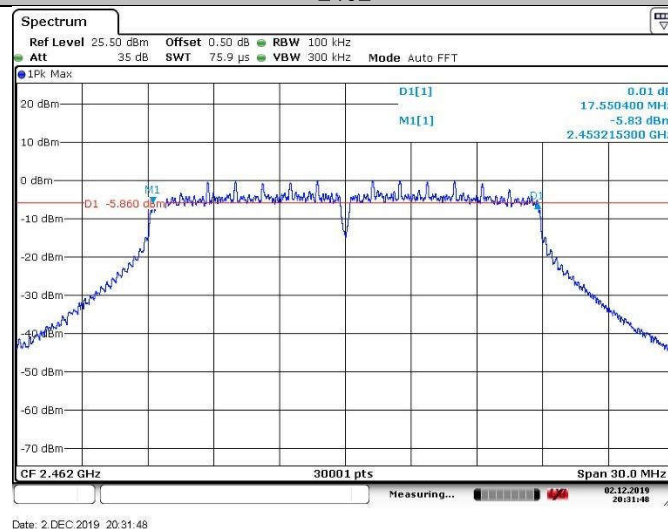
2412



2437



2462



9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.
RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]

≤8

Test result

802.11 B

Frequency MHz	Power spectral density dBm	Result
Low channel 2412MHz	-6.88	Pass
Middle channel 2437MHz	-5.83	Pass
High channel 2462MHz	-6.35	Pass

802.11 G

Frequency MHz	Power spectral density dBm	Result
Low channel 2412MHz	-10.49	Pass
Middle channel 2437MHz	-10.54	Pass
High channel 2462MHz	-10.52	Pass

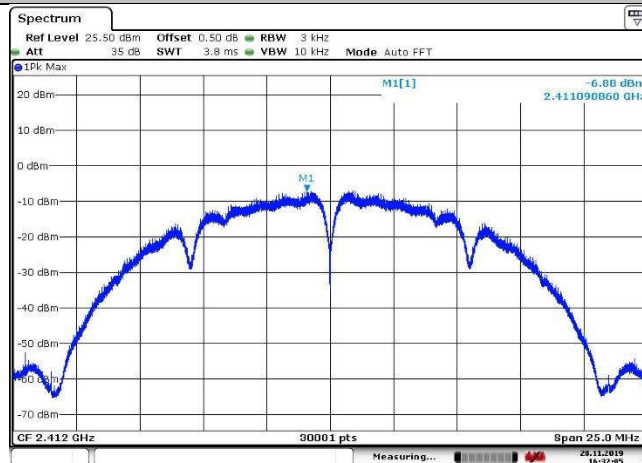
802.11 N20

Frequency MHz	Power spectral density dBm	Result
Low channel 2412MHz	-9.80	Pass
Middle channel 2437MHz	-12.22	Pass
High channel 2462MHz	-13.79	Pass

Power spectral density

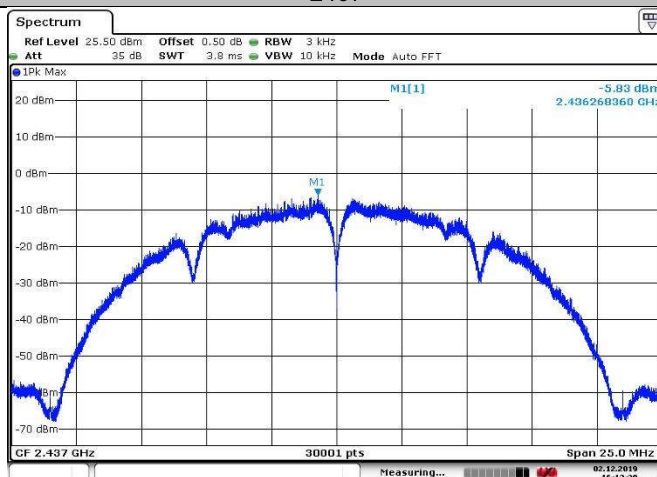
802.11B

2412



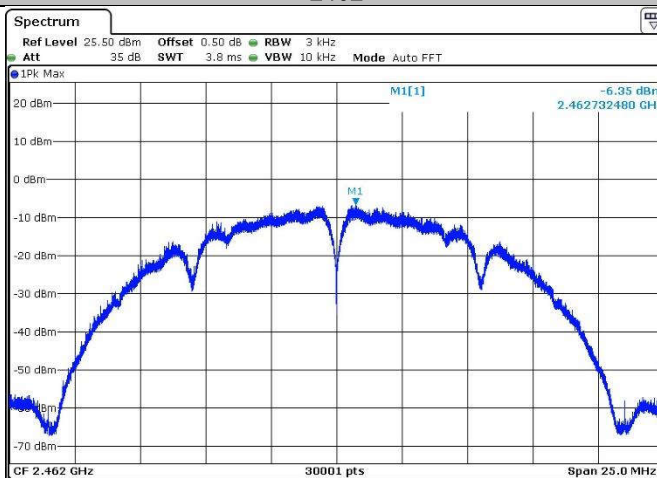
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2437



Date: 2 DEC.2019 16:12:20

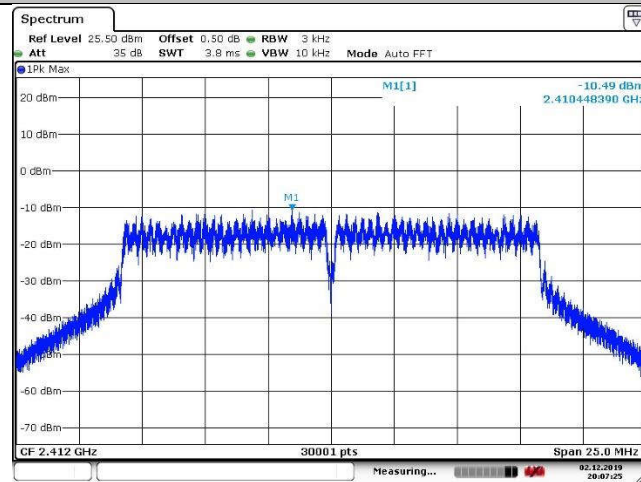
2462



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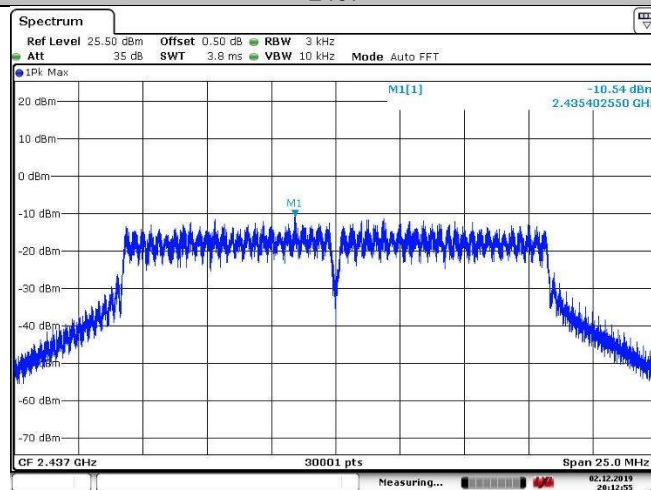
802.11G

2412



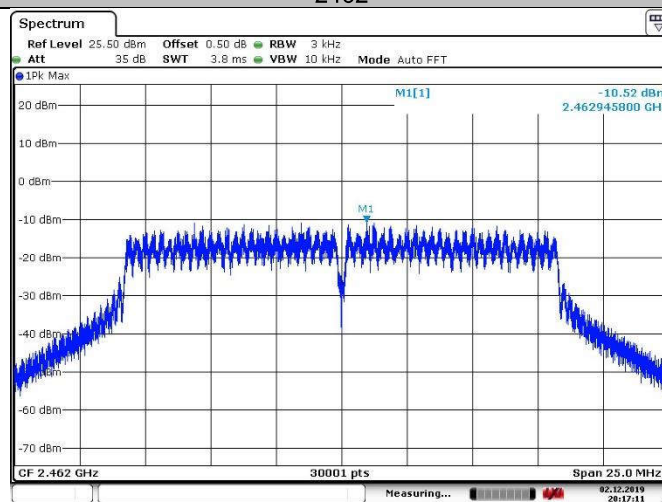
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2437



Date: 2 DEC 2019 20:12:55

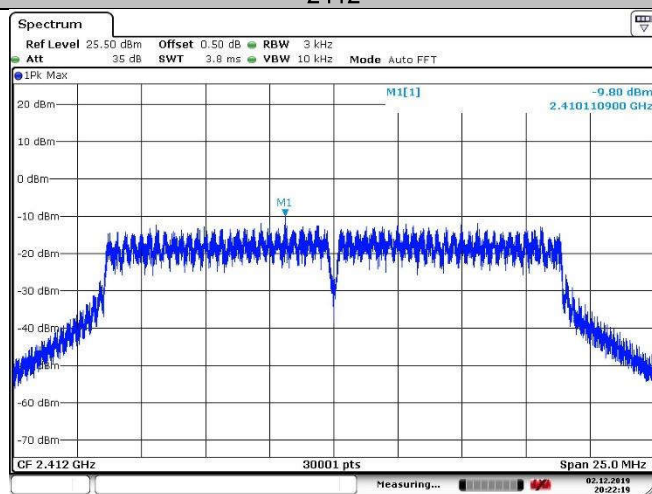
2462



Date: 2 DEC 2019 20:17:11

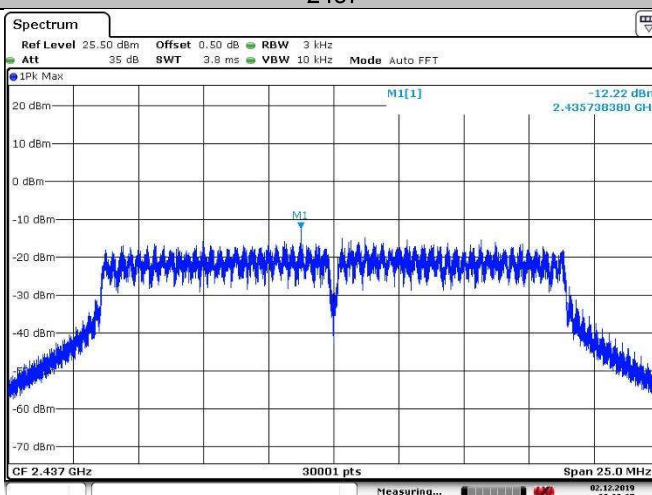
802.11N20

2412



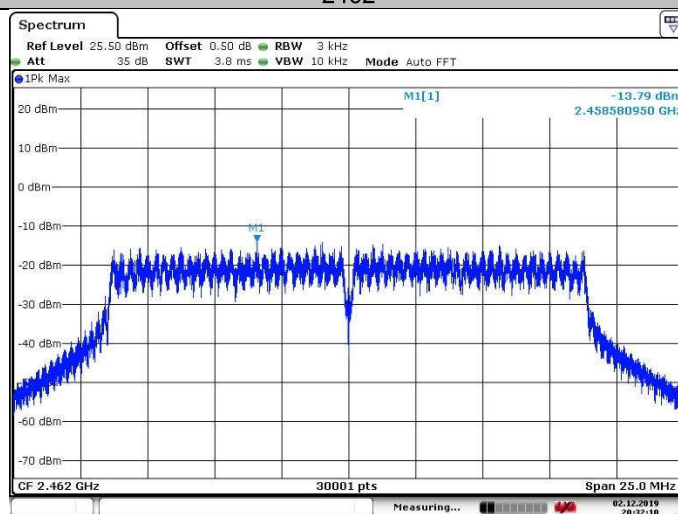
Date: 2 DEC 2019 20:22:19

2437



Date: 2 DEC 2019 20:28:26

2462



Date: 2 DEC 2019 20:32:09

9.5 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW $\geq$ 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

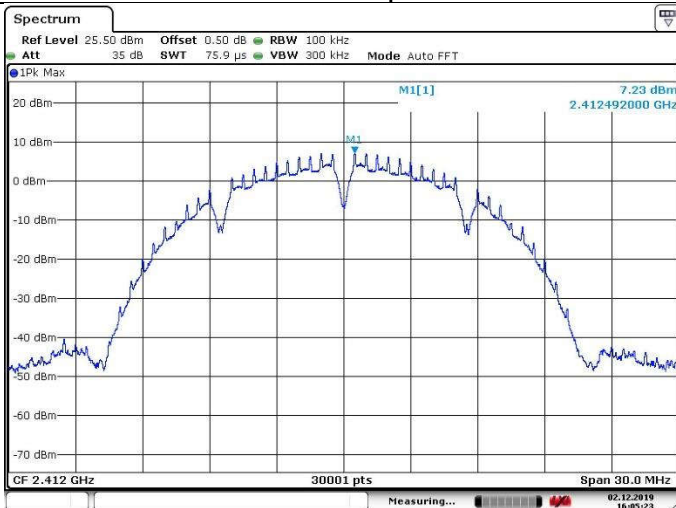
802.11 B

Out-of-Band Emissions

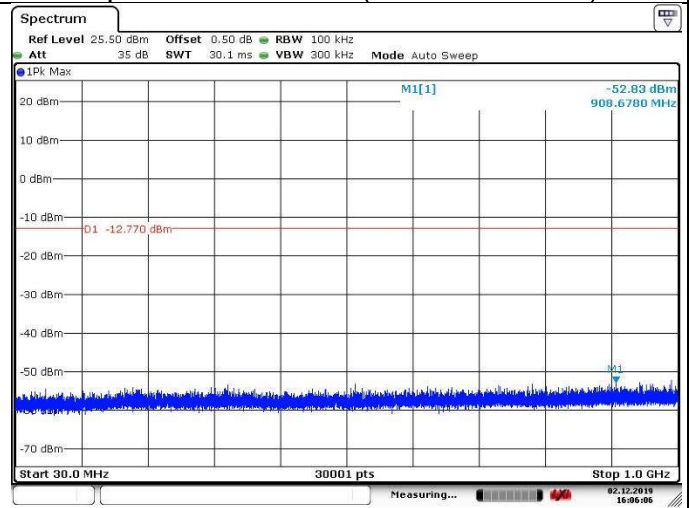
Channel 1 (2412MHz)

Reference point

Spurious Emission (30MHz – 1GHz)



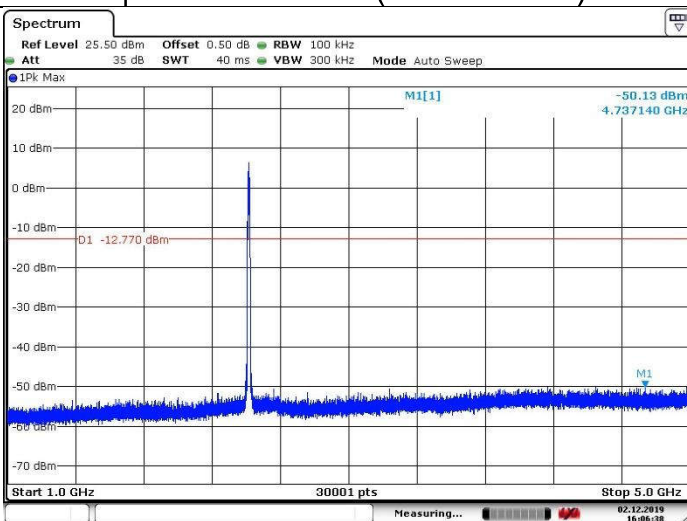
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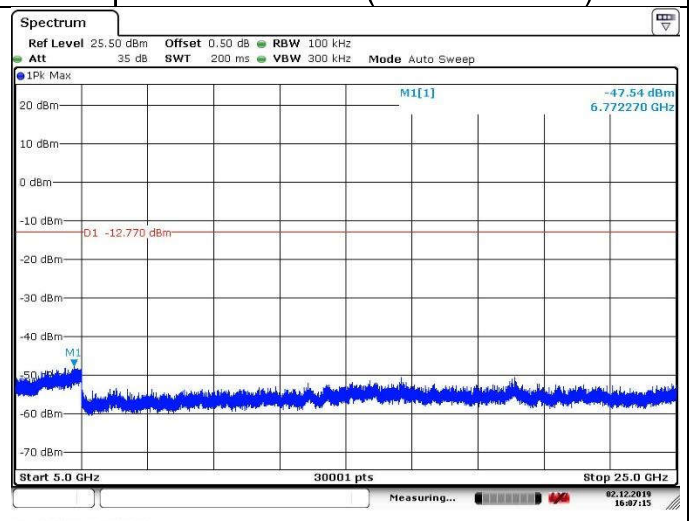
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Spurious Emission (1GHz – 5GHz)

Spurious Emission (5GHz – 25GHz)



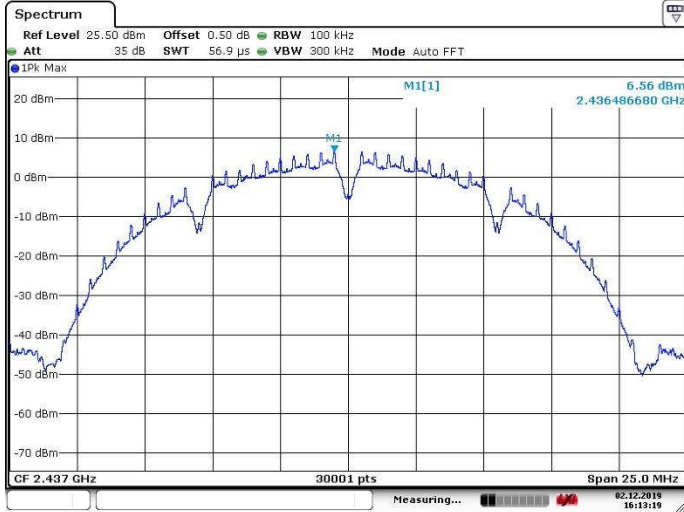
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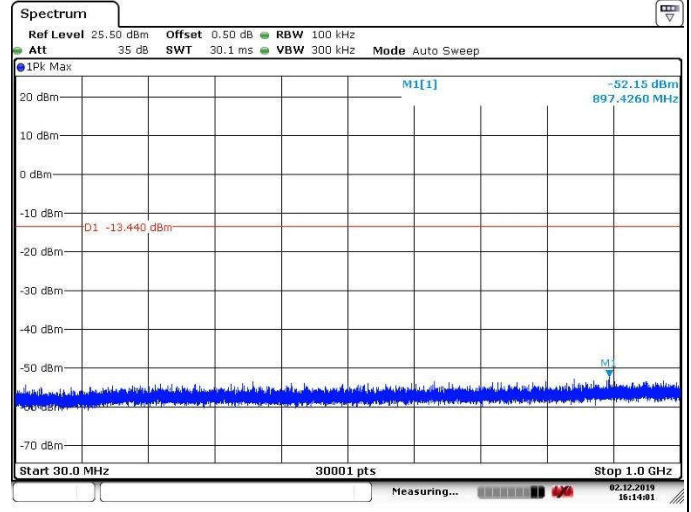
Date: 2 DEC.2019 16:07:16

Out-of-Band Emissions Channel 6 (2437MHz)

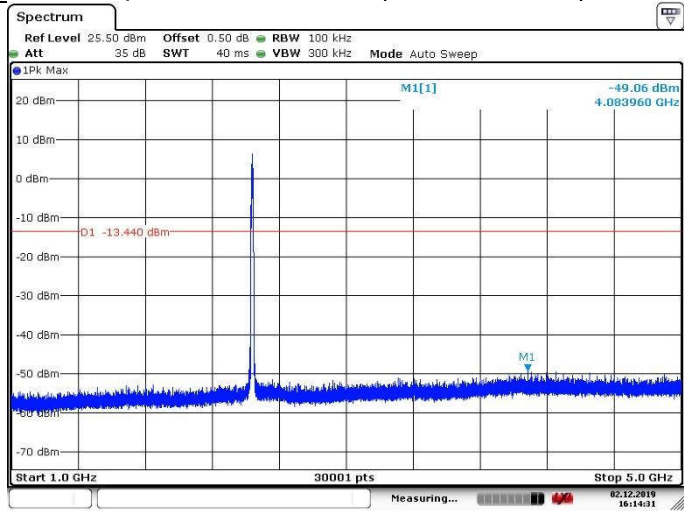
Reference point



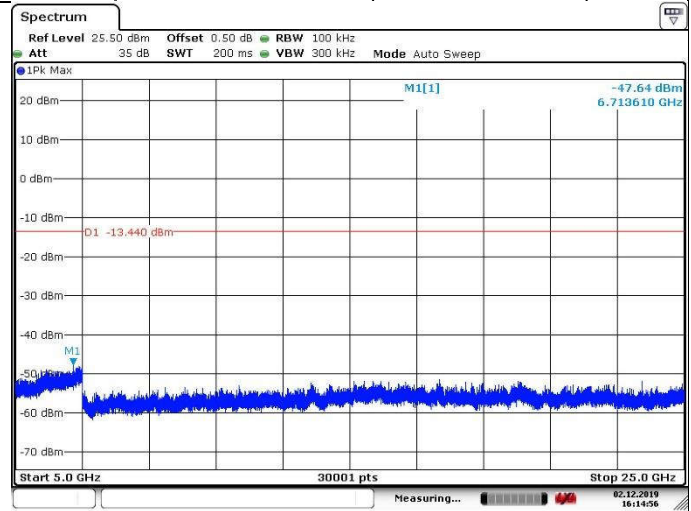
Spurious Emission (30MHz – 1GHz)



Spurious Emission (1GHz –5GHz)

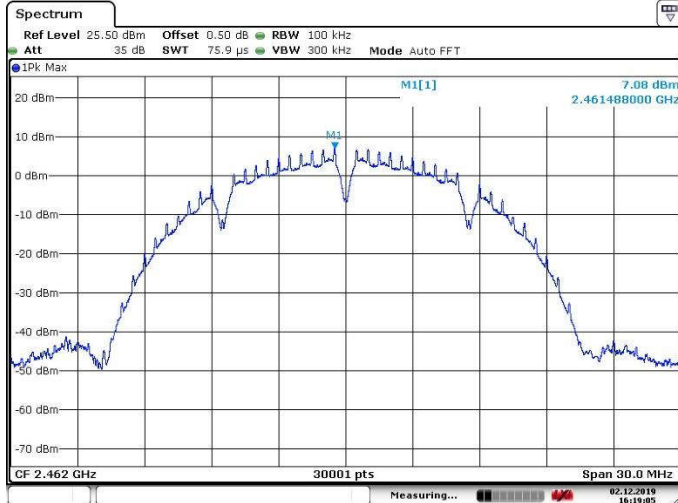


Spurious Emission (5GHz –25GHz)



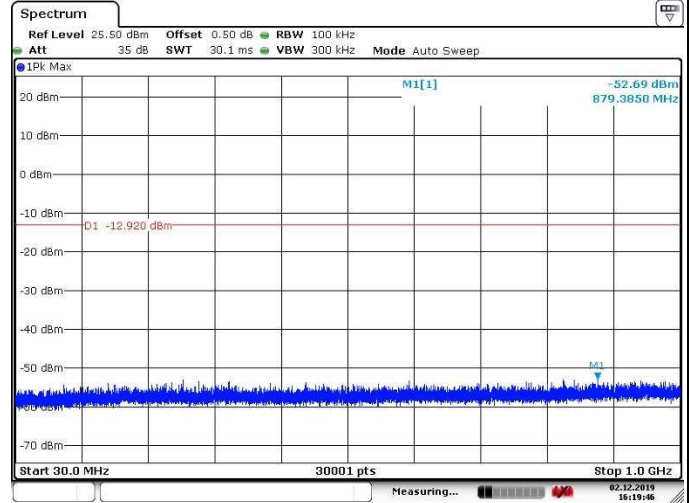
Out-of-Band Emissions Channel 11 (2462MHz)

Reference point



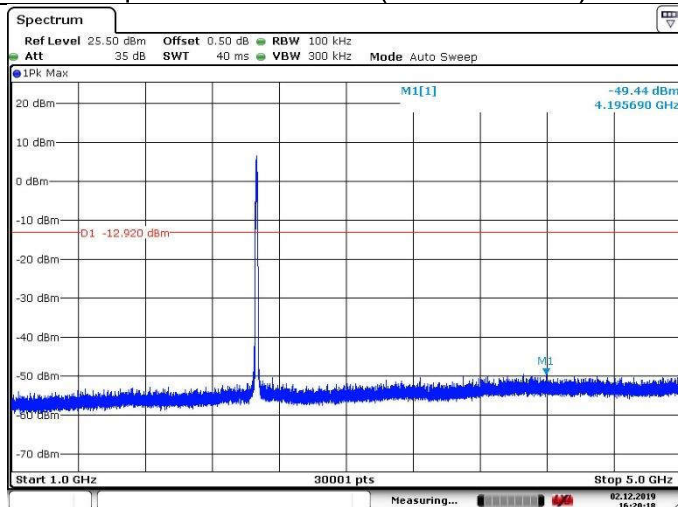
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Spurious Emission (30MHz – 1GHz)



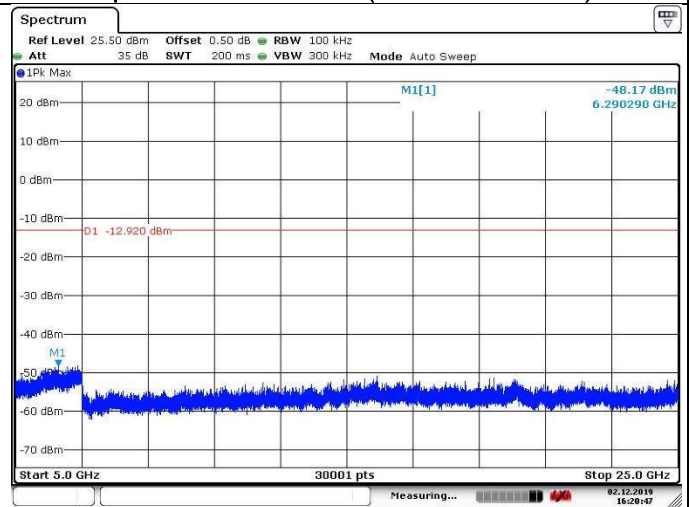
Date: 2 DEC.2019 16:19:45

Spurious Emission (1GHz – 5GHz)



Date: 2 DEC.2019 16:20:18

Spurious Emission (5GHz – 25GHz)



Date: 2 DEC.2019 16:20:47

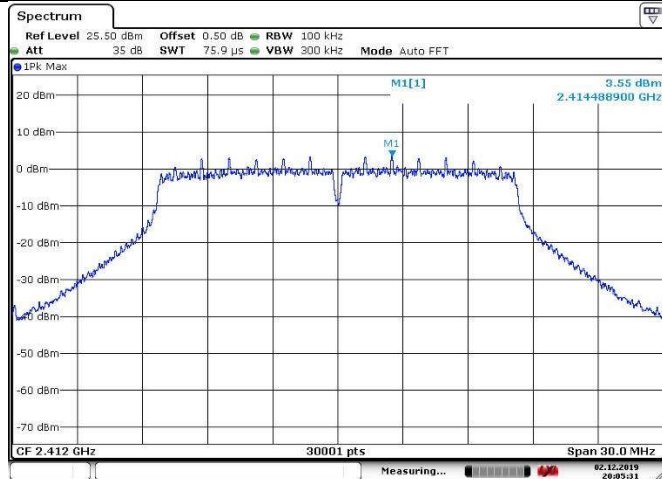
802.11 G

Out-of-Band Emissions

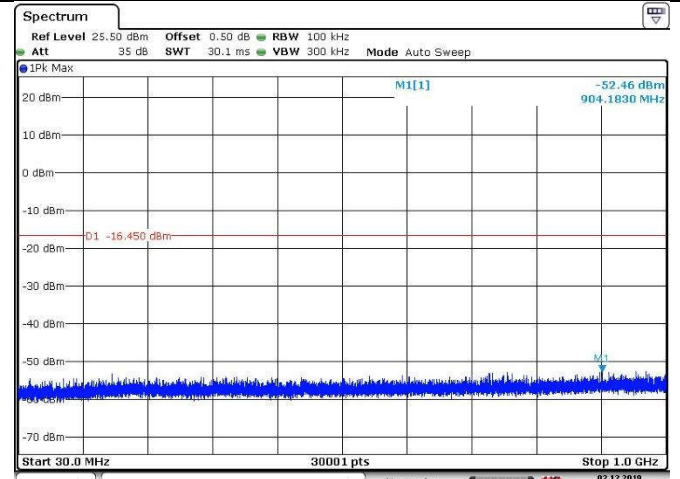
Channel 1 (2412MHz)

Reference point

Spurious Emission (30MHz – 1GHz)



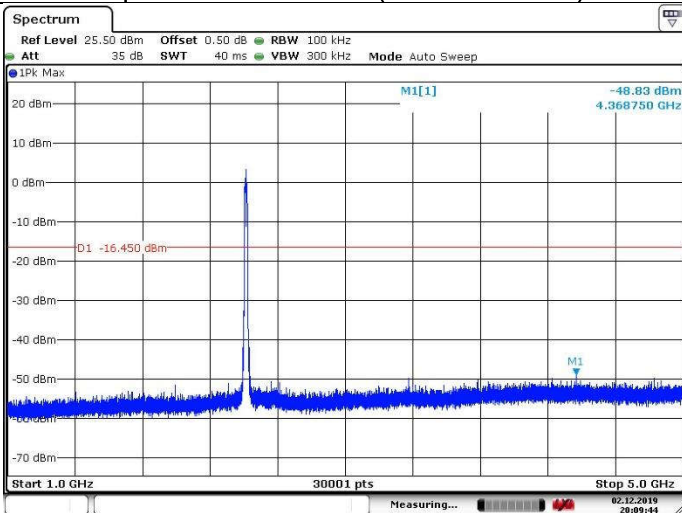
Date: 2 DEC 2019 20:05:31



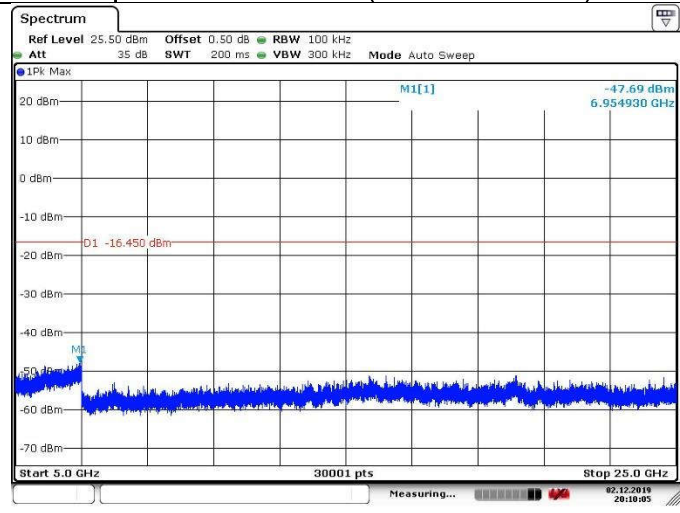
Date: 2 DEC 2019 20:09:23

Spurious Emission (1GHz – 5GHz)

Spurious Emission (5GHz – 25GHz)



Date: 2 DEC 2019 20:09:44



Date: 2 DEC 2019 20:10:05