



FCC - TEST REPORT

Report Number : **708882003249-00** Date of Issue: July 6, 2020

Model : SC012-WK2

Product Type : Smart Camera

Applicant : Hangzhou Tuya Information Technology Co.,Ltd

Address : Room701,Building3,More Center,No.87 GuDun
Road,Hangzhou,Zhejiang China

Production Facility : Hangzhou Tuya Information Technology Co.,Ltd

Address : Room701,Building3,More Center,No.87 GuDun
Road,Hangzhou,Zhejiang China

Test Result : Positive Negative

Total pages including Appendices : 52



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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
Telephone: +86 21 6141 0123
Fax: +86 21 6140 8600



3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	Smart Camera
Model no.:	SC012-WK2
FCC ID:	2ANDLTY-R8818
Options and accessories:	Adapter model: KA06E-050100US and A18A-050100U-US2
Rating:	5V DC 1000mA (Adapter model:KA06E-050100US and A18A-050100U-US2 Input:100-240V~, 50/60Hz; Output: 5V DC, 1000mA)
RF Transmission Frequency:	For 802.11b/g/n-HT20: 2412~2462 MHz
No. of Operated Channel:	For 802.11b/g/n-HT20: 11
Modulation:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11g/n
Antenna Type:	Ceramic antenna
Antenna Gain:	3.88 dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Smart Camera supports 2.4GHz WIFI functions. We tested it and listed the worst data in this report.

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment, antenna gain or any information supplied.



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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	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			Page s	Test Site	Test Result		
					Pass	Fail	N/A
§15.207		Conducted emission AC power port	12-16	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (b) (3)		Conducted peak output power	17	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(1)		20dB bandwidth	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)		Carrier frequency separation	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)		Number of hopping frequencies	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)		Dwell Time	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(2)		6dB bandwidth	18-21	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(e)		Power spectral density	22-25	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)		Spurious RF conducted emissions	26-35	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)		Band edge	36-39	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209		Spurious radiated emissions for transmitter	40-48	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203		Antenna requirement	See note 1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a Ceramic antenna, which gain is 3.88dBi. 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: 2ANDLTY-R8818 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment under Test

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

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

Sample Received Date: June 1, 2020

Testing Start Date: June 1, 2020

Testing End Date: June 10, 2020

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

Reviewed by:

Prepared by:

Tested by:



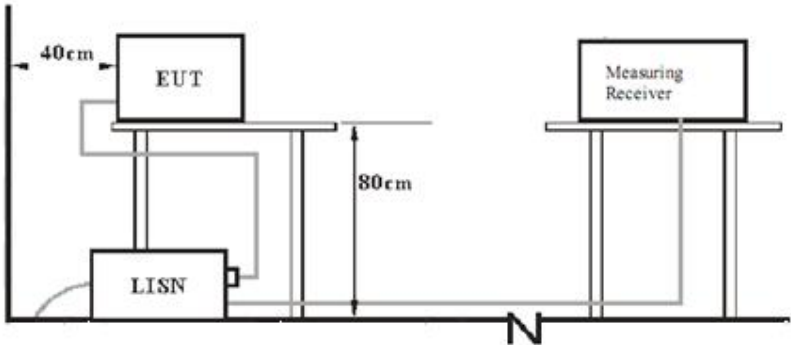
Hui TONG
Review Engineer

Jiaxi XU
Project Engineer

Wenqiang LU
Test Engineer

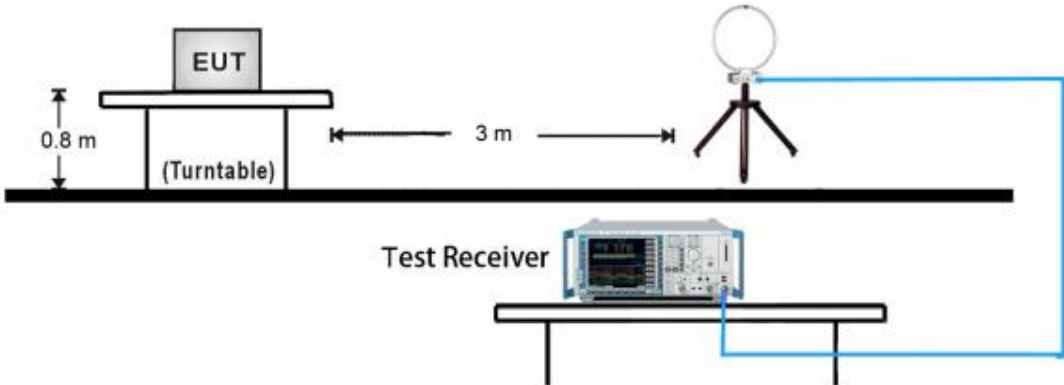
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

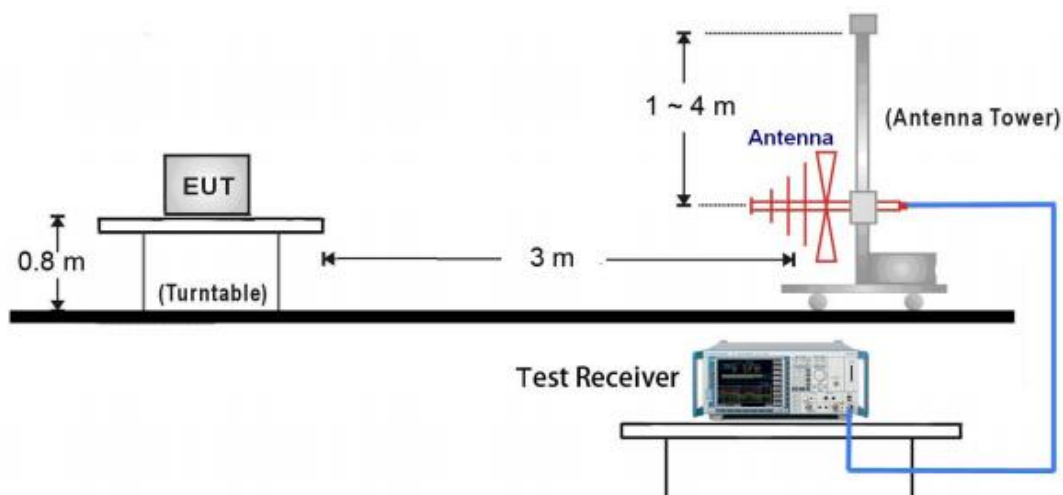


7.2 Radiated test setups

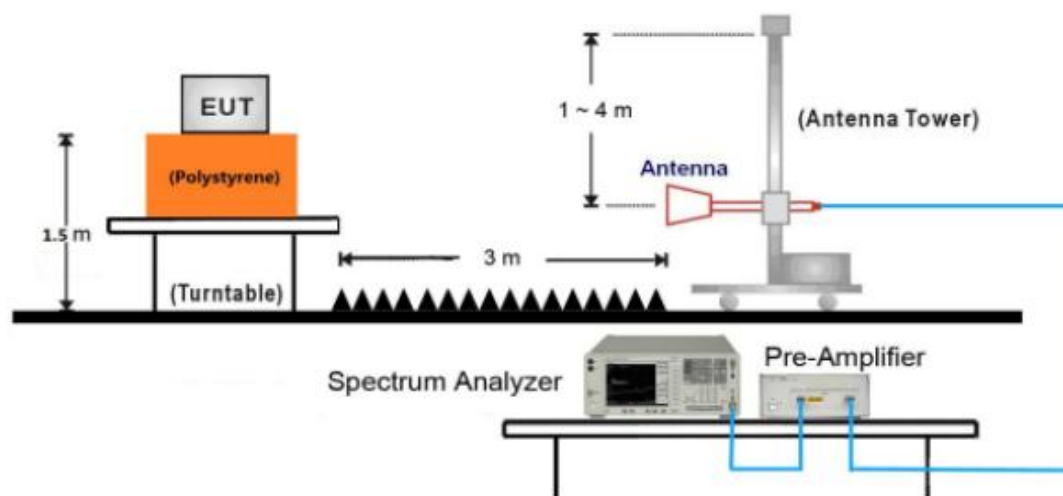
9kHz ~ 30MHz Test Setup:



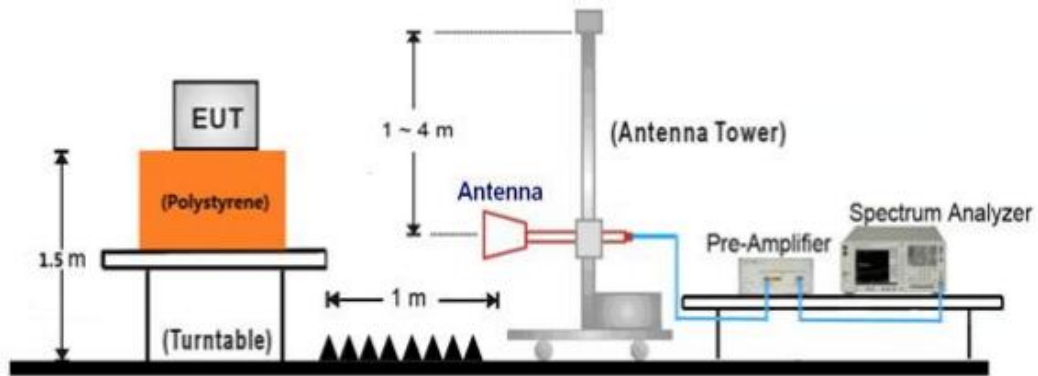
30MHz ~ 1GHz Test Setup:



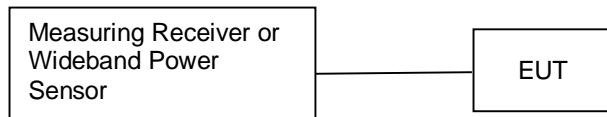
1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups





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8 Systems test configuration

Auxiliary Equipment Used during Test:

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

Test software: XCOM V2.0

The system was configured to channel 802.11b/g/n-HT20: 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

According to §15.207, conducted emissions limit as below:

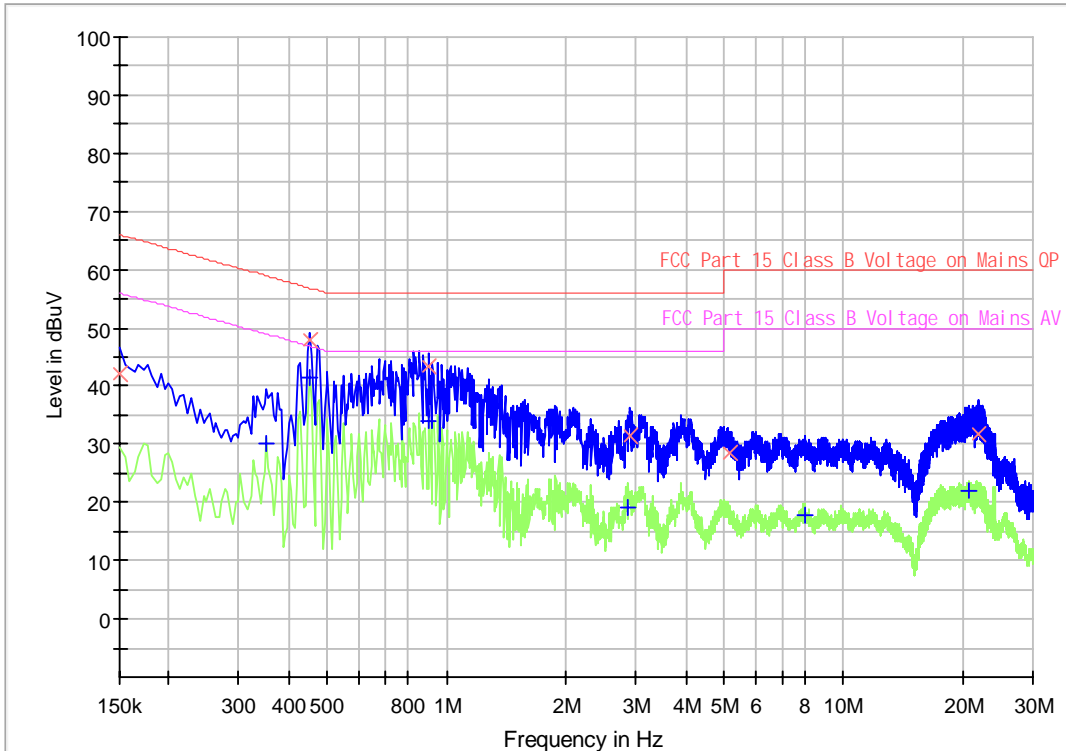
Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency



Conducted Emission

Product Type : Smart Camera
 M/N : SC012-WK2
 Operating Condition : Mode 1: Tx_2412MHz for 802.11N20
 Test Specification : L-line
 Comment : AC 120V/60Hz, powered by adapter: KA06E-0501000US



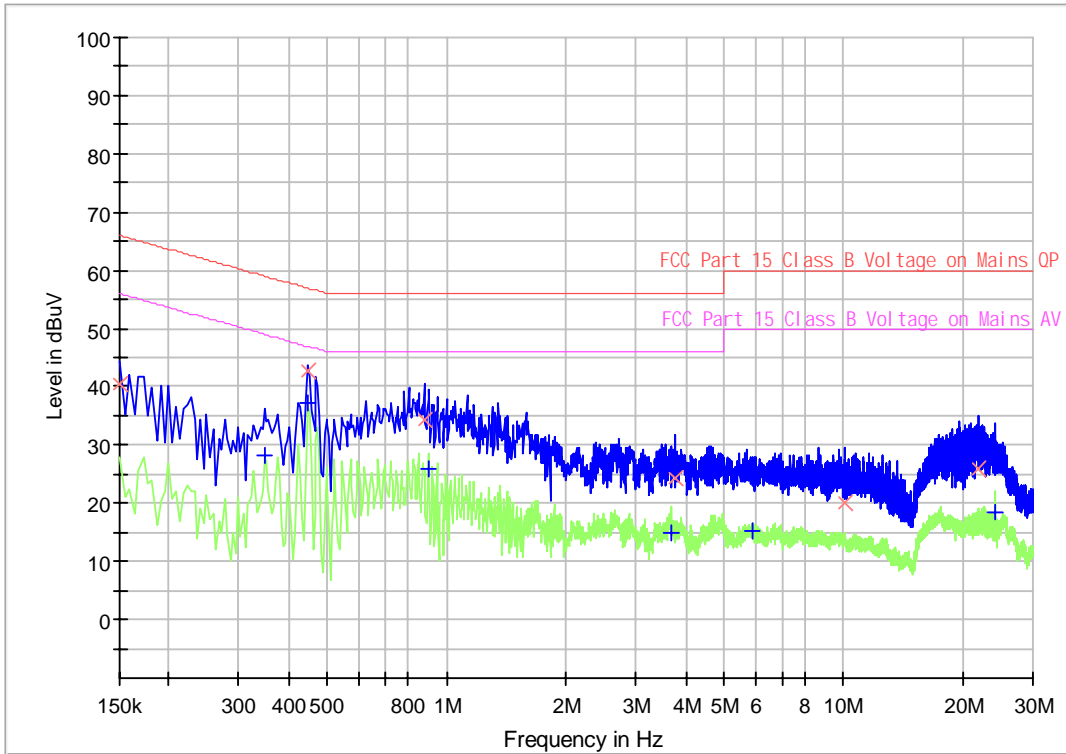
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	42.10	---	66.00	23.90	1000.0	9.000	L1	19.5
0.352500	---	30.01	48.90	18.89	1000.0	9.000	L1	19.4
0.451500	---	41.45	46.85	5.40	1000.0	9.000	L1	19.4
0.451500	47.94	---	56.85	8.91	1000.0	9.000	L1	19.4
0.901500	---	34.03	46.00	11.97	1000.0	9.000	L1	19.4
0.901500	43.51	---	56.00	12.49	1000.0	9.000	L1	19.4
2.872500	---	19.19	46.00	26.81	1000.0	9.000	L1	19.5
2.908500	31.42	---	56.00	24.58	1000.0	9.000	L1	19.5
5.154000	28.65	---	60.00	31.35	1000.0	9.000	L1	19.6
7.962000	---	17.83	50.00	32.17	1000.0	9.000	L1	19.7
20.697000	---	22.13	50.00	27.87	1000.0	9.000	L1	19.8
21.921000	31.83	---	60.00	28.17	1000.0	9.000	L1	19.9

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



China

Product Type : Smart Camera
 M/N : SC012-WK2
 Operating Condition : Mode 1: Tx_2412MHz for 802.11N20
 Test Specification : N-line
 Comment : AC 120V/60Hz, powered by adapter: KA06E-0501000US



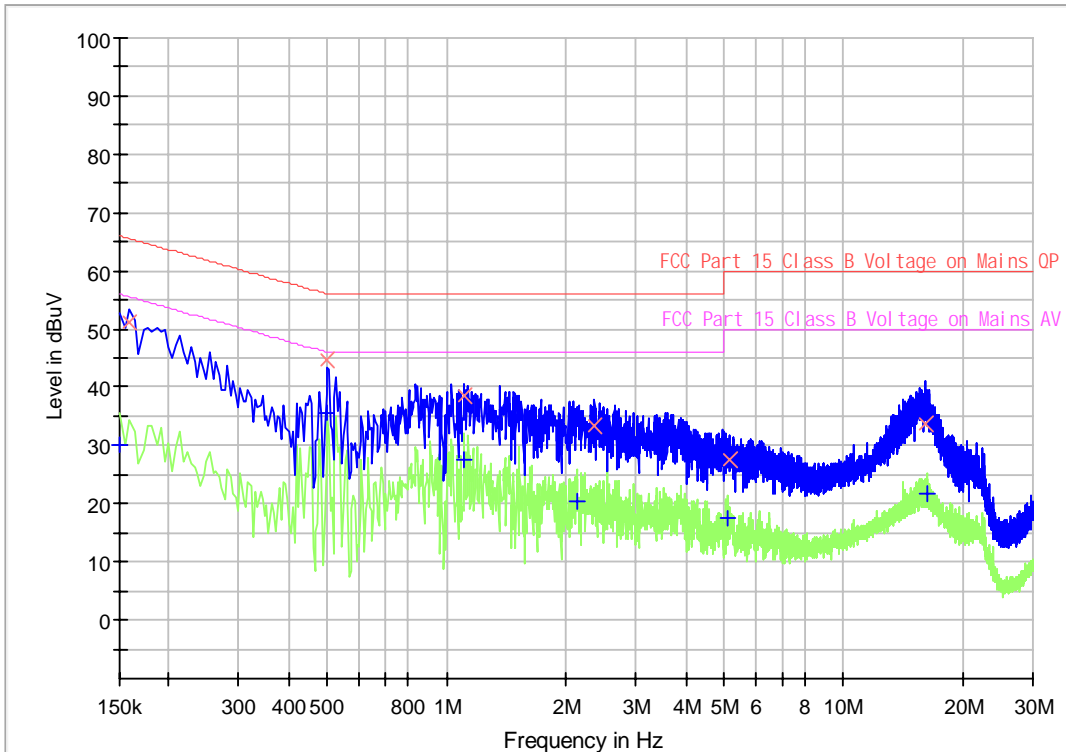
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	40.34	---	66.00	25.66	1000.0	9.000	N	19.6
0.348000	---	28.16	49.01	20.85	1000.0	9.000	N	19.6
0.447000	---	37.16	46.93	9.77	1000.0	9.000	N	19.5
0.447000	42.88	---	56.93	14.05	1000.0	9.000	N	19.5
0.879000	34.25	---	56.00	21.75	1000.0	9.000	N	19.5
0.897000	---	26.04	46.00	19.96	1000.0	9.000	N	19.5
3.682500	---	14.83	46.00	31.17	1000.0	9.000	N	19.6
3.750000	24.45	---	56.00	31.55	1000.0	9.000	N	19.6
5.892000	---	15.15	50.00	34.85	1000.0	9.000	N	19.7
10.104000	20.23	---	60.00	39.77	1000.0	9.000	N	19.7
21.745500	25.97	---	60.00	34.03	1000.0	9.000	N	19.9
23.991000	---	18.55	50.00	31.45	1000.0	9.000	N	20.0

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



Conducted Emission

Product Type : Smart Camera
 M/N : SC012-WK2
 Operating Condition : Mode 1: Tx_2412MHz for 802.11N20
 Test Specification : L-line
 Comment : AC 120V/60Hz, powered by adapter: A18A-050100U-US2



Final Result

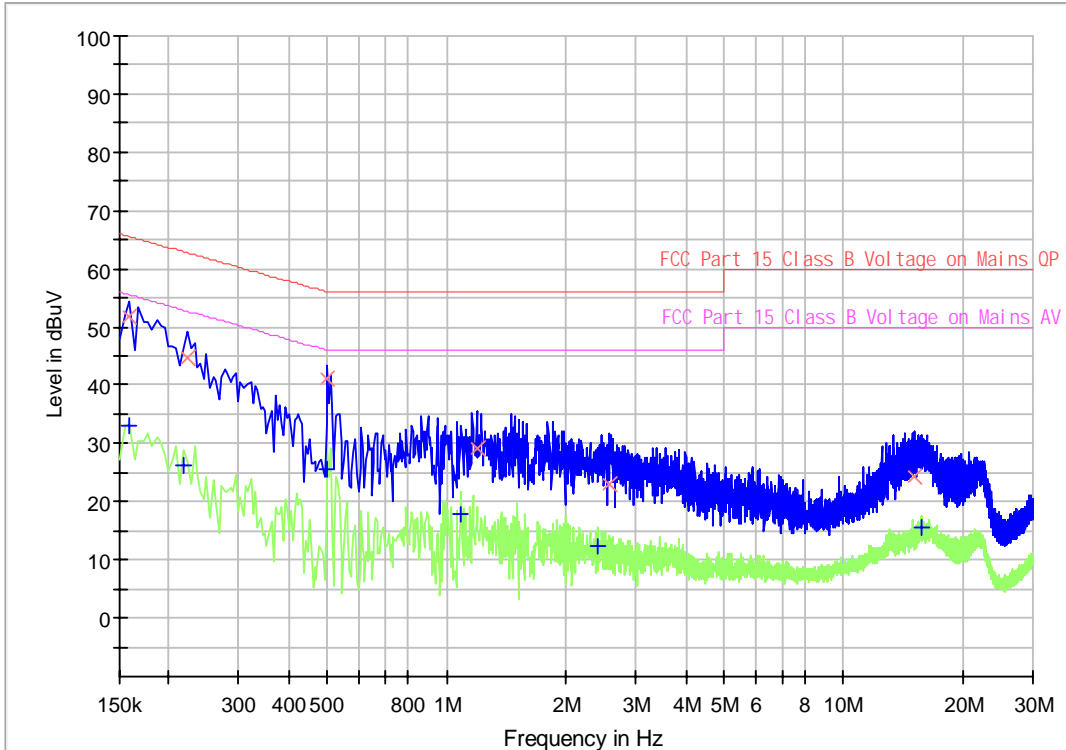
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	---	29.99	56.00	26.01	1000.0	9.000	L1	19.5
0.159000	51.02	---	65.52	14.50	1000.0	9.000	L1	19.5
0.501000	---	35.53	46.00	10.47	1000.0	9.000	L1	19.4
0.501000	44.55	---	56.00	11.45	1000.0	9.000	L1	19.4
1.108500	38.41	---	56.00	17.59	1000.0	9.000	L1	19.5
1.108500	---	27.68	46.00	18.32	1000.0	9.000	L1	19.5
2.125500	---	20.54	46.00	25.46	1000.0	9.000	L1	19.5
2.364000	33.25	---	56.00	22.75	1000.0	9.000	L1	19.5
5.131500	---	17.43	50.00	32.57	1000.0	9.000	L1	19.6
5.163000	27.58	---	60.00	32.42	1000.0	9.000	L1	19.6
16.066500	33.82	---	60.00	26.18	1000.0	9.000	L1	19.7
16.183500	---	21.68	50.00	28.32	1000.0	9.000	L1	19.7

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



Conducted Emission

Product Type : Smart Camera
 M/N : SC012-WK2
 Operating Condition : Mode 1: Tx_2412MHz for 802.11N20
 Test Specification : N-line
 Comment : AC 120V/60Hz, , powered by adapter: A18A-050100U-US2



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.159000	---	33.16	55.52	22.36	1000.0	9.000	N	19.6
0.159000	51.79	---	65.52	13.73	1000.0	9.000	N	19.6
0.217500	---	26.31	52.91	26.60	1000.0	9.000	N	19.6
0.222000	44.62	---	62.74	18.12	1000.0	9.000	N	19.6
0.501000	41.13	---	56.00	14.87	1000.0	9.000	N	19.5
0.501000	---	25.72	46.00	20.28	1000.0	9.000	N	19.5
1.086000	---	17.68	46.00	28.32	1000.0	9.000	N	19.6
1.189500	29.10	---	56.00	26.90	1000.0	9.000	N	19.6
2.400000	---	12.20	46.00	33.80	1000.0	9.000	N	19.6
2.580000	22.99	---	56.00	33.01	1000.0	9.000	N	19.6
15.018000	24.37	---	60.00	35.63	1000.0	9.000	N	19.7
15.715500	---	15.62	50.00	34.38	1000.0	9.000	N	19.7

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



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

According to §15.247 (b) (1), conducted peak output power limit as below:

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	18.94	Pass
Middle channel 2437MHz	18.69	Pass
High channel 2462MHz	17.42	Pass

802.11G

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	19.46	Pass
Middle channel 2437MHz	18.96	Pass
High channel 2462MHz	18.67	Pass

802.11N20

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	19.81	Pass
Middle channel 2437MHz	18.98	Pass
High channel 2462MHz	17.47	Pass



9.3 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW≥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 ≥ 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	7.695	Pass
Middle channel 2437MHz	8.275	Pass
High channel 2462MHz	8.079	Pass

802.11G

Frequency MHz	6dB bandwidth MHz	Result
Low channel 2412MHz	16.405	Pass
Middle channel 2437MHz	16.459	Pass
High channel 2462MHz	16.432	Pass

802.11N20

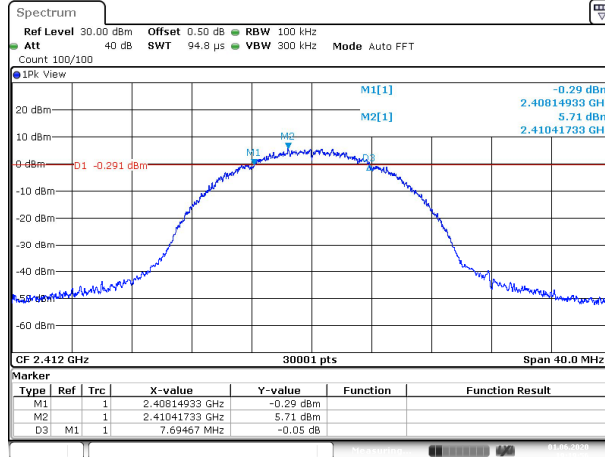
Frequency MHz	6dB bandwidth MHz	Result
Low channel 2412MHz	17.577	Pass
Middle channel 2437MHz	17.565	Pass
High channel 2462MHz	17.588	Pass



6 dB Bandwidth

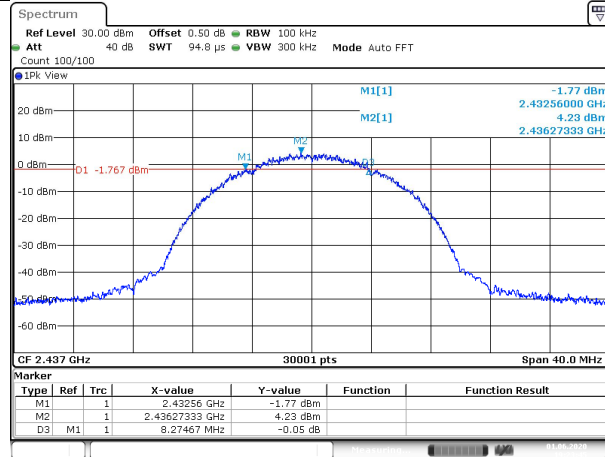
802.11B

2412



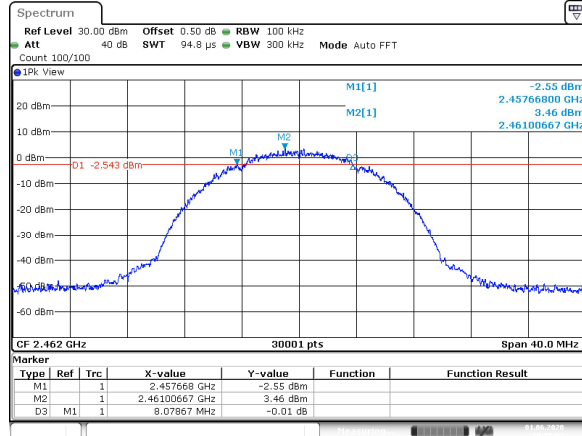
Date: 1.JUN.2020 19:19:57

2437



Date: 1.JUN.2020 19:23:45

2462

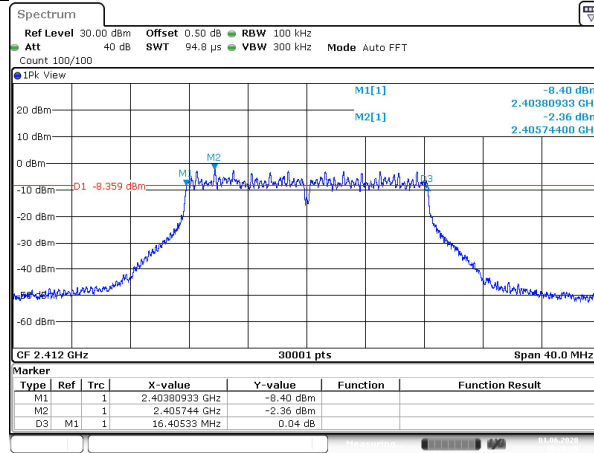


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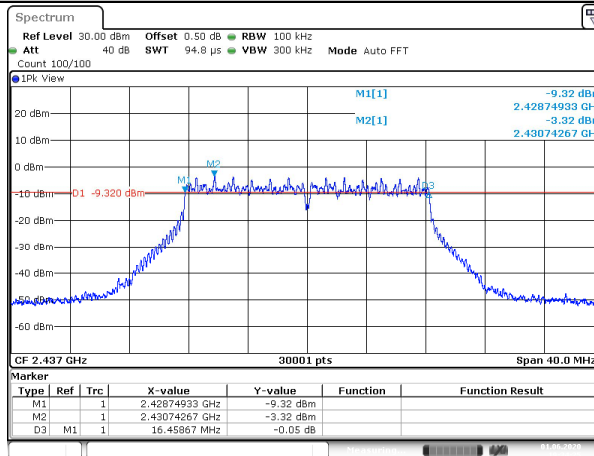
802.11G

2412



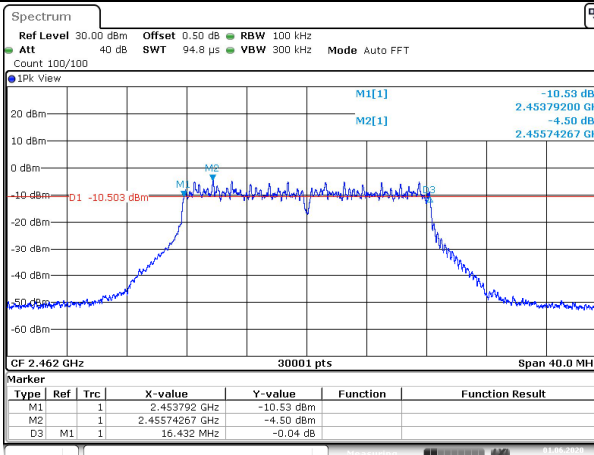
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2437



Date: 1 JUN 2020 19:34:25

2462

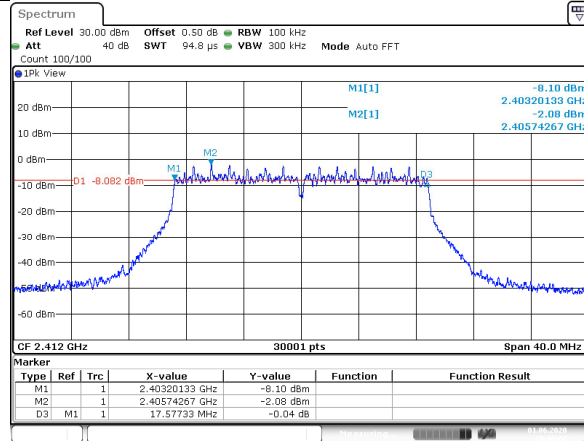


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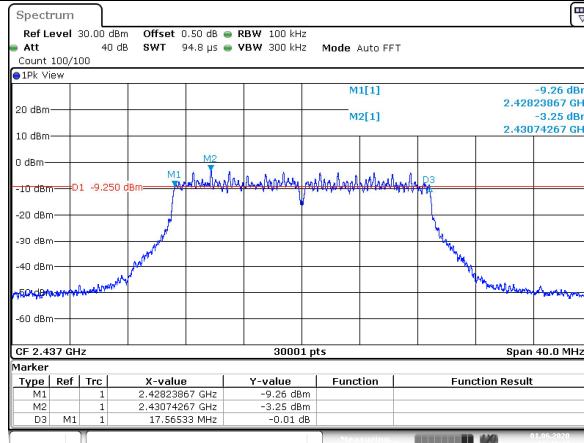


802.11N20

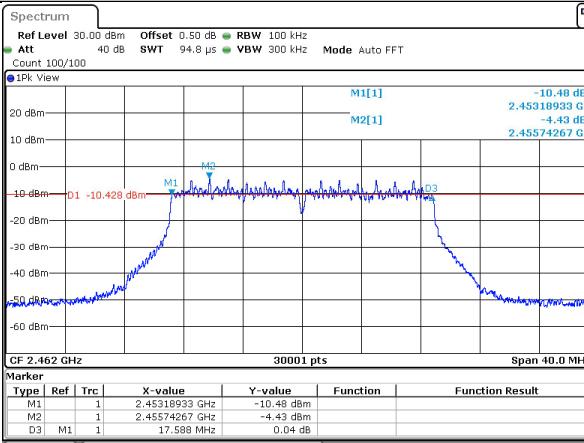
2412



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/3kHz]

≤8

Test result

802.11 B

Frequency MHz	Power spectral density dBm/3kHz	Result
Low channel 2412MHz	-7.54	Pass
Middle channel 2437MHz	-8.63	Pass
High channel 2462MHz	-10.84	Pass

802.11 G

Frequency MHz	Power spectral density dBm/3kHz	Result
Low channel 2412MHz	-17.32	Pass
Middle channel 2437MHz	-17.4	Pass
High channel 2462MHz	-19.67	Pass

802.11 N20

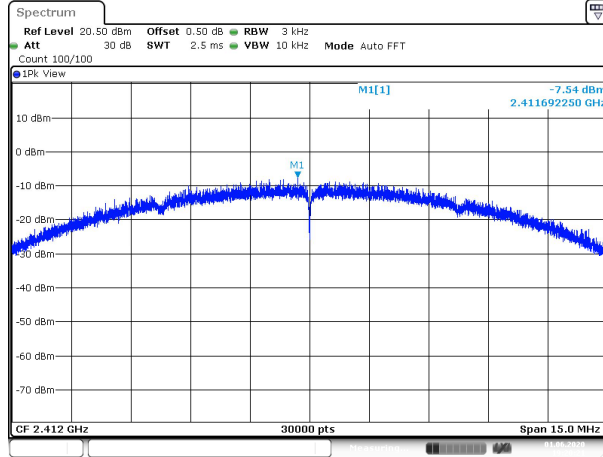
Frequency MHz	Power spectral density dBm/3kHz	Result
Low channel 2412MHz	-16.28	Pass
Middle channel 2437MHz	-18.25	Pass
High channel 2462MHz	-19.71	Pass



Power spectral density

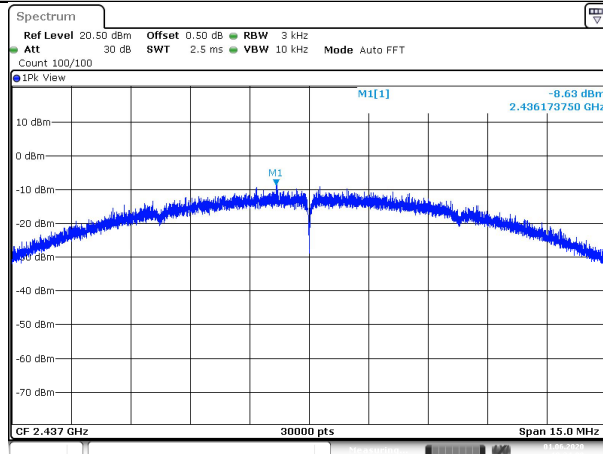
802.11B

2412



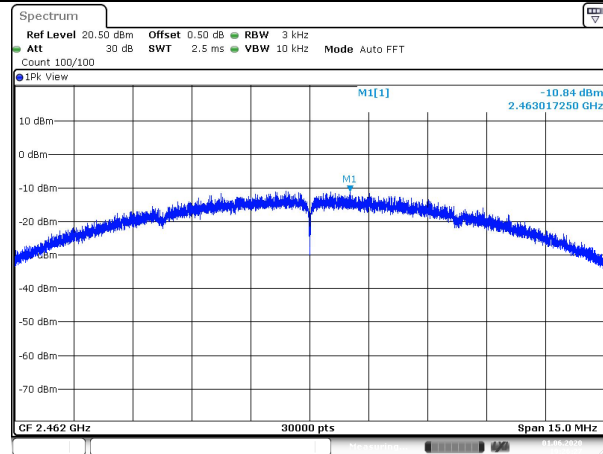
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2437



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2462

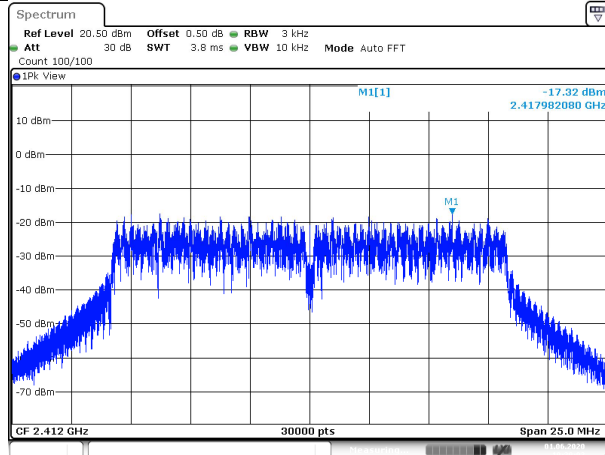


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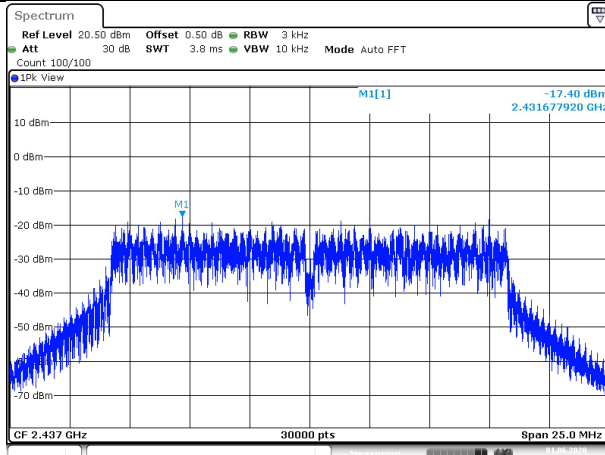
802.11G

2412



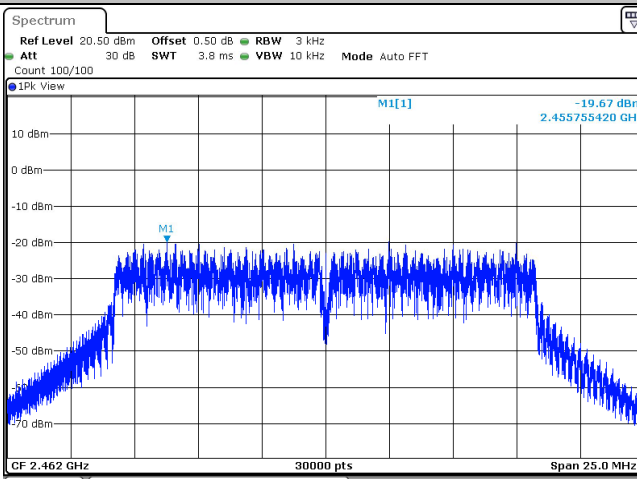
Date: 1 JUN 2020 19:30:03

2437



Date: 1 JUN 2020 19:34:49

2462

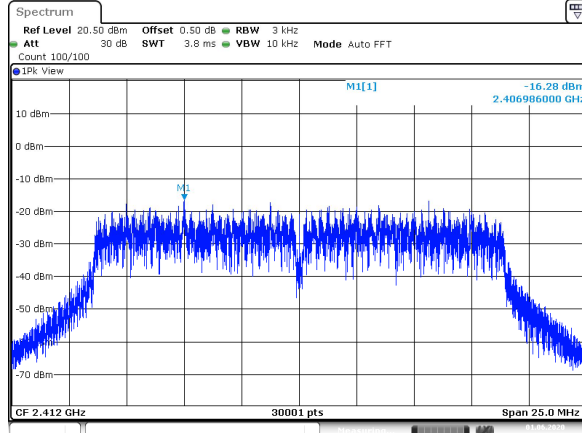


Date: 1 JUN 2020 19:37:08



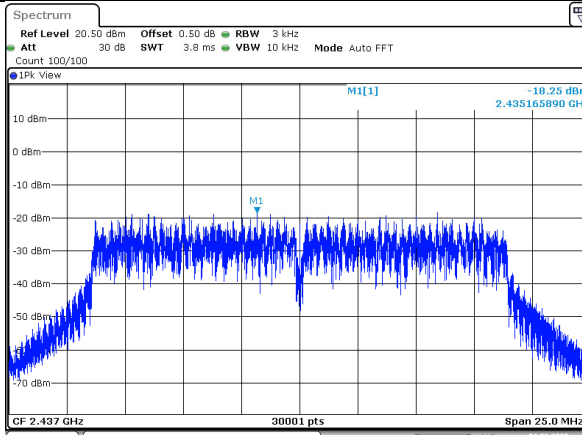
802.11N20

2412



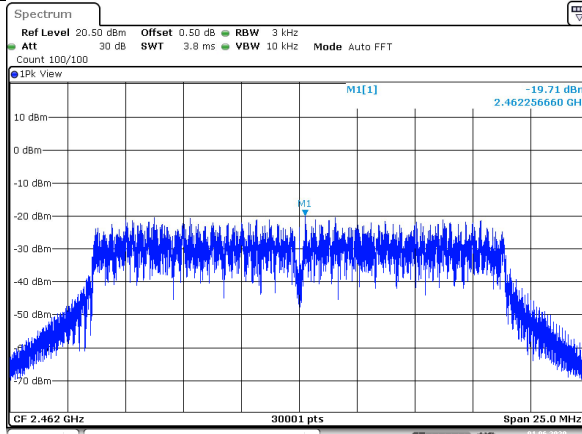
Date: 1 JUN 2020 19:40:28

2437



Date: 1 JUN 2020 19:44:06

2462



Date: 1 JUN 2020 19:46:40



9.5 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW≥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



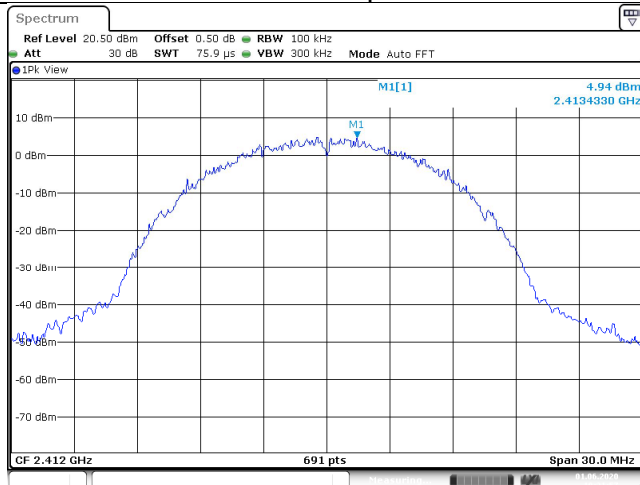
Spurious RF conducted emissions

802.11 B

Out-of-Band Emissions

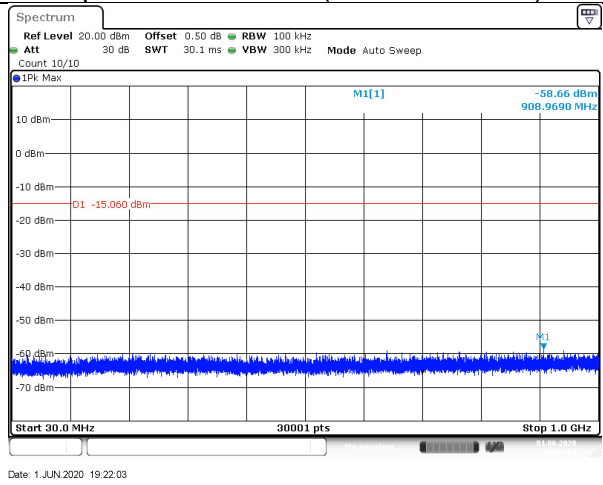
Channel 1 (2412MHz)

Reference point



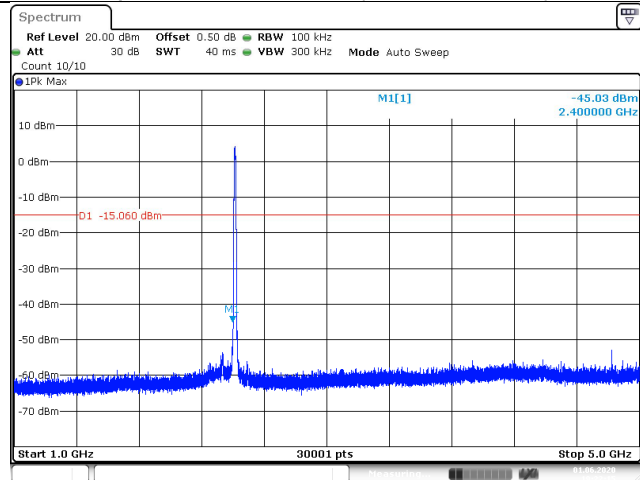
Date: 1.JUN.2020 19:21:57

Spurious Emission (30MHz – 1GHz)



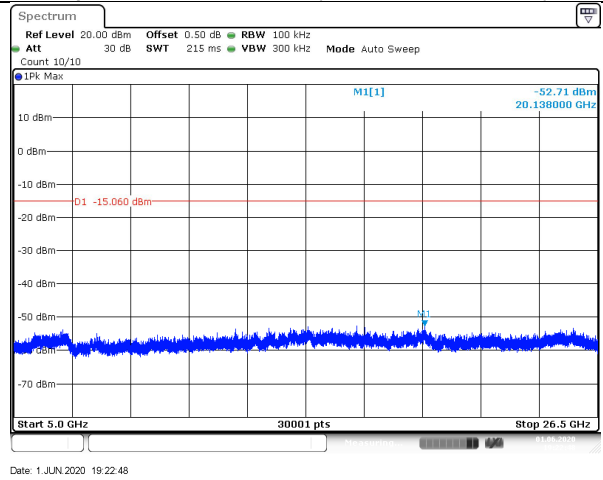
Date: 1.JUN.2020 19:22:03

Spurious Emission (1GHz –5GHz)



Date: 1.JUN.2020 19:22:16

Spurious Emission (5GHz –26.5GHz)

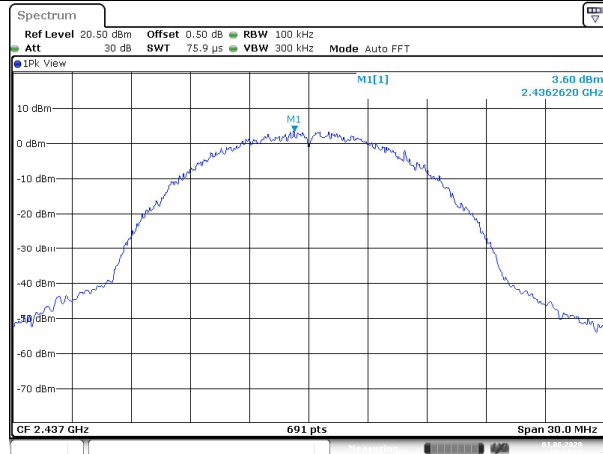


Date: 1.JUN.2020 19:22:48



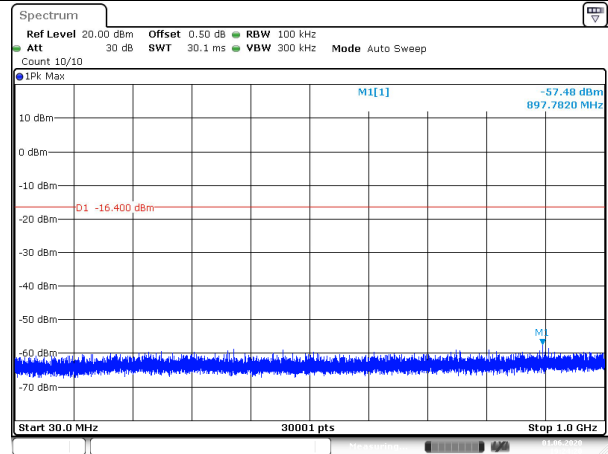
Out-of-Band Emissions Channel 6 (2437MHz)

Reference point



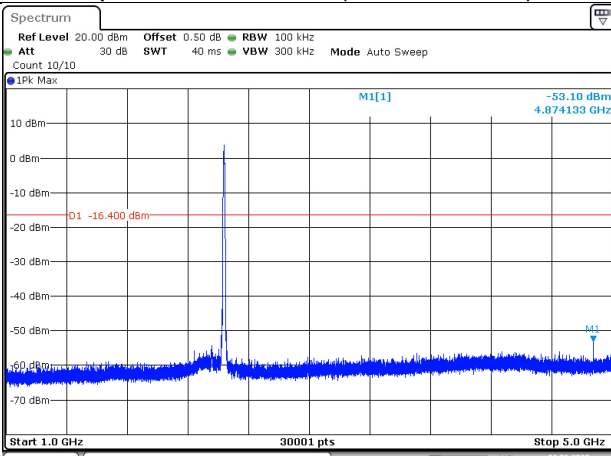
Date: 1.JUN.2020 19:24:15

Spurious Emission (30MHz – 1GHz)



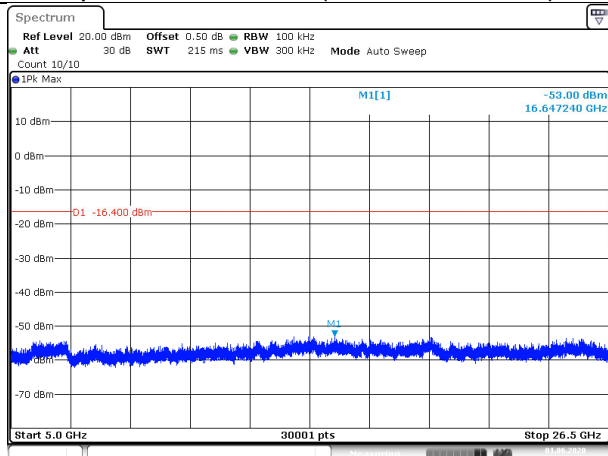
Date: 1.JUN.2020 19:24:20

Spurious Emission (1GHz –5GHz)



Date: 1.JUN.2020 19:24:33

Spurious Emission (5GHz –26.5GHz)

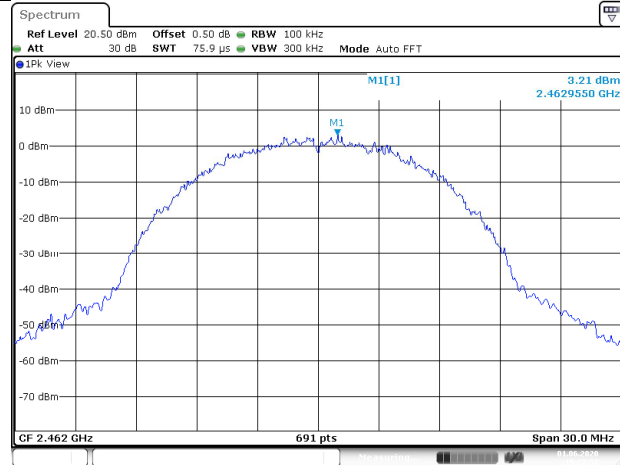


Date: 1.JUN.2020 19:25:05



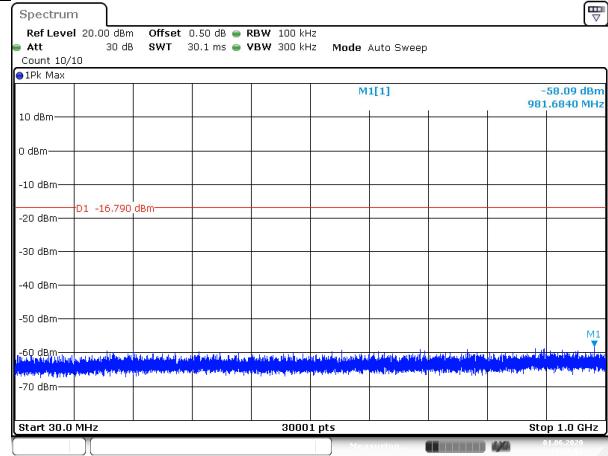
Out-of-Band Emissions Channel 11 (2462MHz)

Reference point



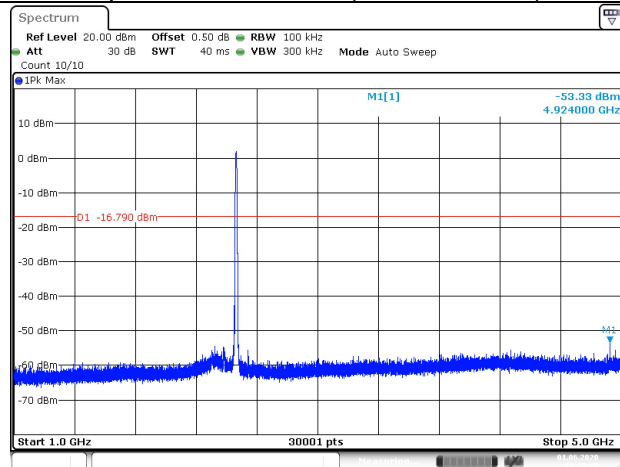
Date: 1 JUN 2020 19:27:57

Spurious Emission (30MHz – 1GHz)



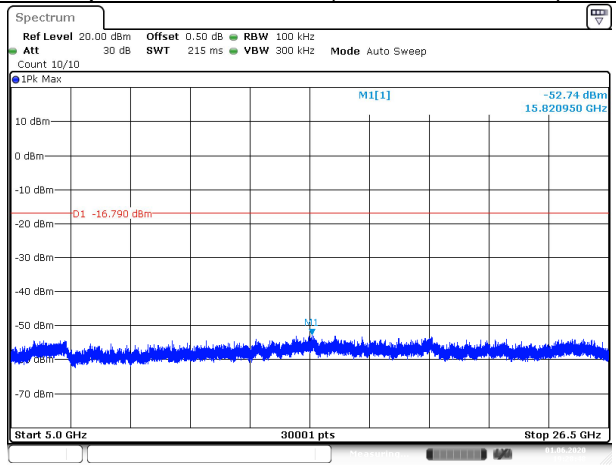
Date: 1 JUN 2020 19:28:02

Spurious Emission (1GHz –5GHz)



Date: 1 JUN 2020 19:28:15

Spurious Emission (5GHz –26.5GHz)



Date: 1 JUN 2020 19:28:47

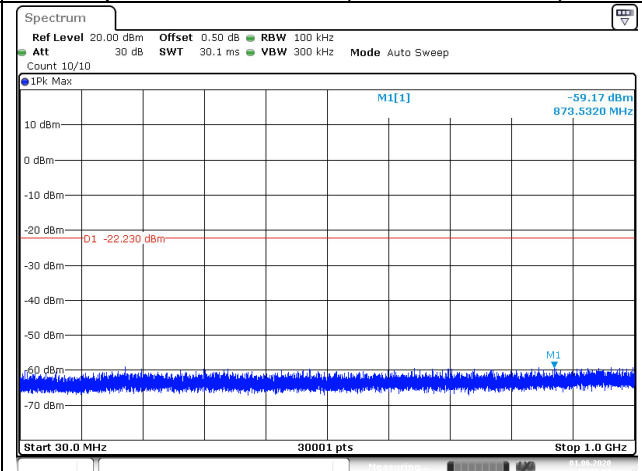
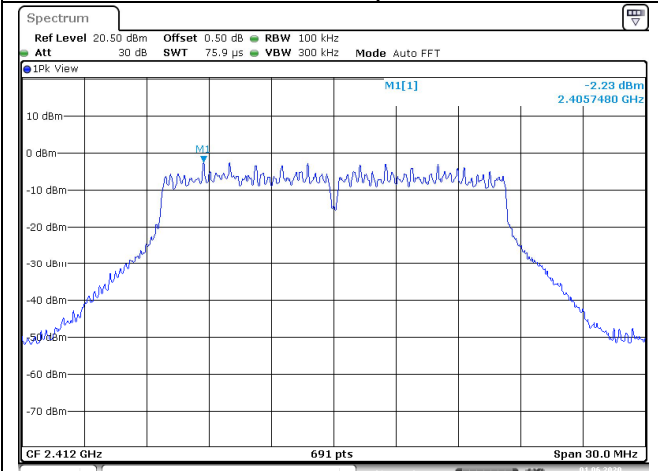
802.11 G

China

Out-of-Band Emissions
Channel 1 (2412MHz)

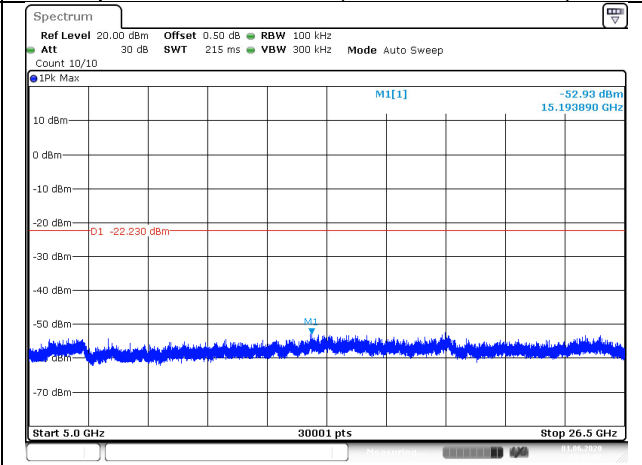
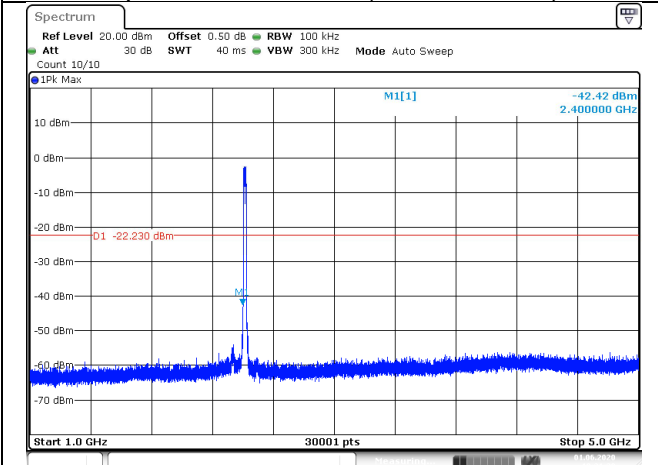
Reference point

Spurious Emission (30MHz – 1GHz)



Spurious Emission (1GHz –5GHz)

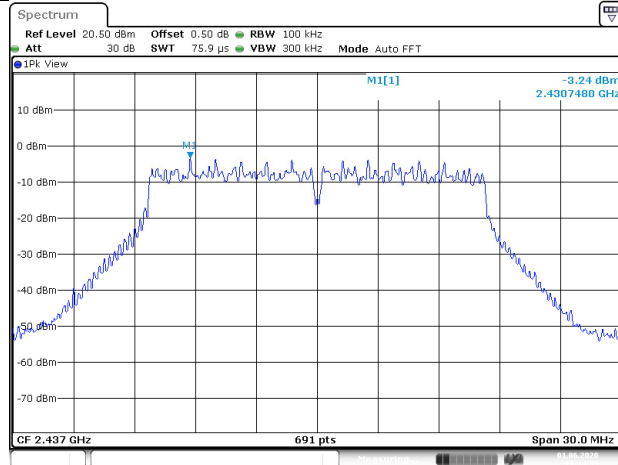
Spurious Emission (5GHz –26.5GHz)





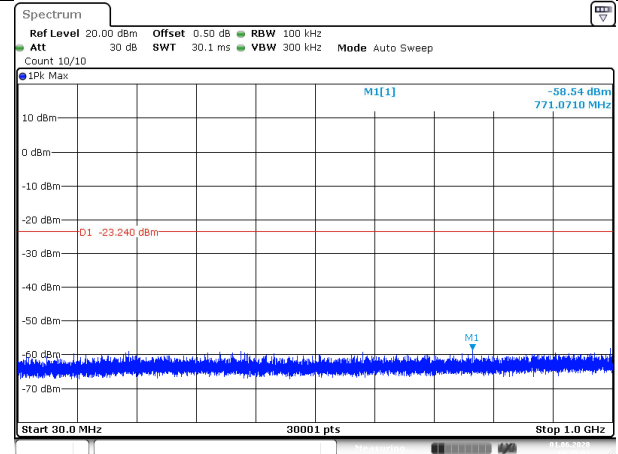
Out-of-Band Emissions Channel 6 (2437MHz)

Reference point



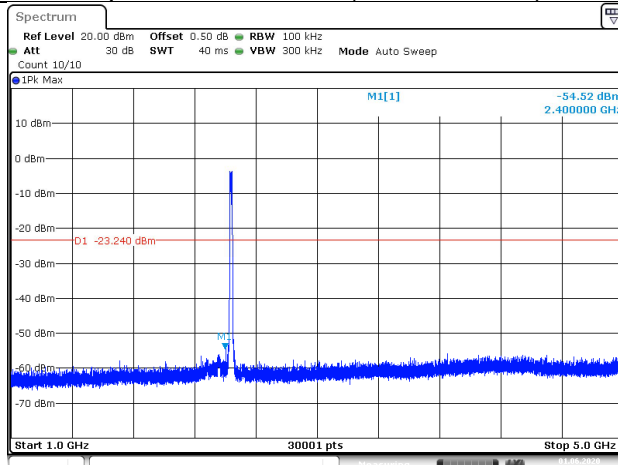
Date: 1 JUN 2020 19:34:55

Spurious Emission (30MHz – 1GHz)



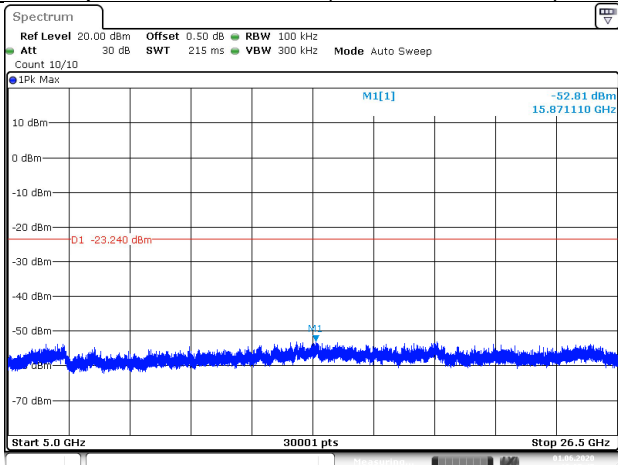
Date: 1 JUN 2020 19:35:00

Spurious Emission (1GHz –5GHz)



Date: 1 JUN 2020 19:35:13

Spurious Emission (5GHz –26.5GHz)

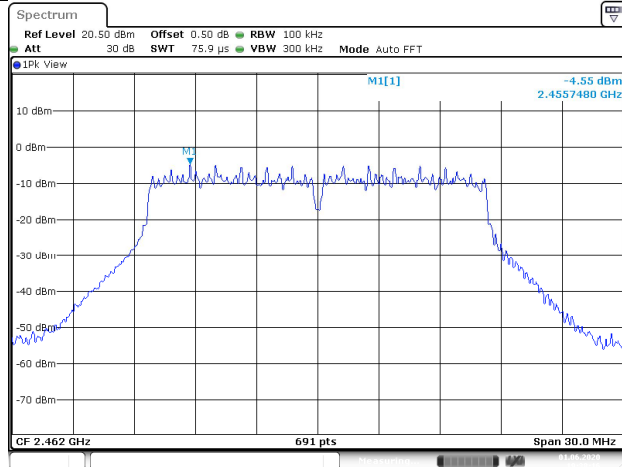


Date: 1 JUN 2020 19:35:46



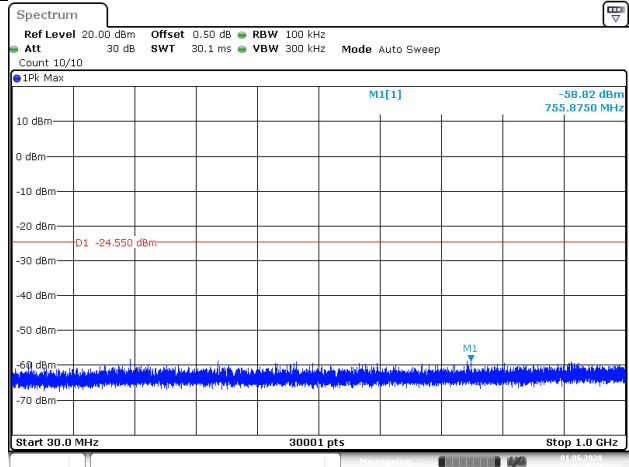
Out-of-Band Emissions Channel 11 (2462MHz)

Reference point



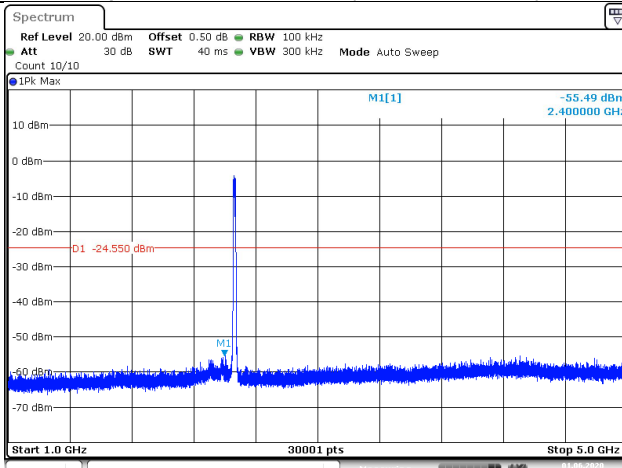
Date: 1 JUN 2020 19:38:16

Spurious Emission (30MHz – 1GHz)



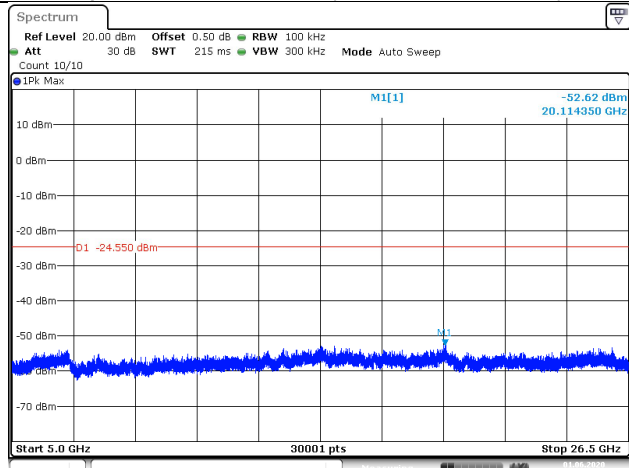
Date: 1 JUN 2020 19:38:22

Spurious Emission (1GHz –5GHz)



Date: 1 JUN 2020 19:38:34

Spurious Emission (5GHz –26.5GHz)



Date: 1 JUN 2020 19:39:07

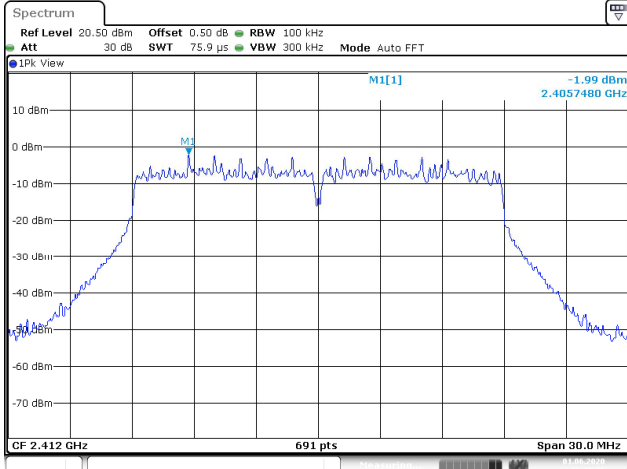


802.11 N20

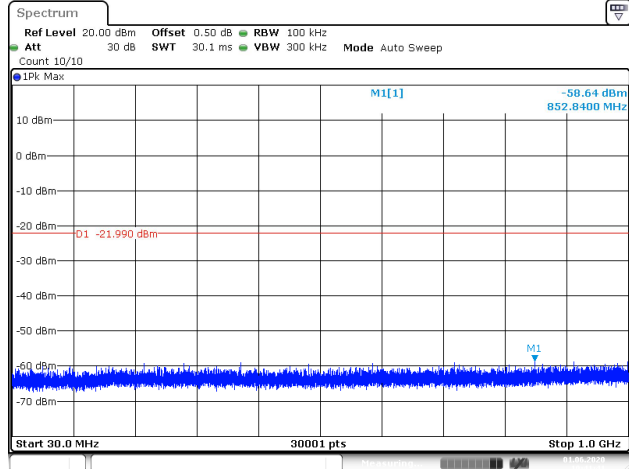
Out-of-Band Emissions
Channel 1 (2412MHz)

Reference point

Spurious Emission (30MHz – 1GHz)



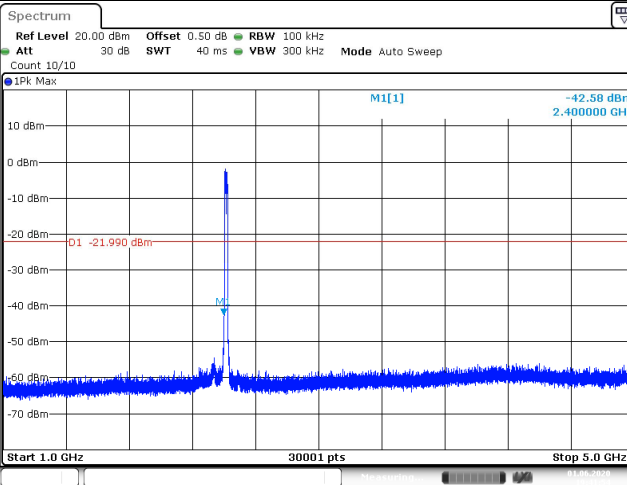
Date: 1 JUN 2020 19:41:36



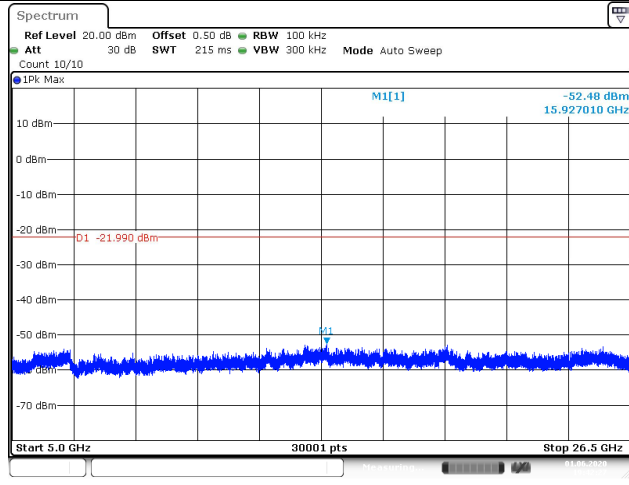
Date: 1 JUN 2020 19:41:42

Spurious Emission (1GHz – 5GHz)

Spurious Emission (5GHz – 26.5GHz)



Date: 1 JUN 2020 19:41:54

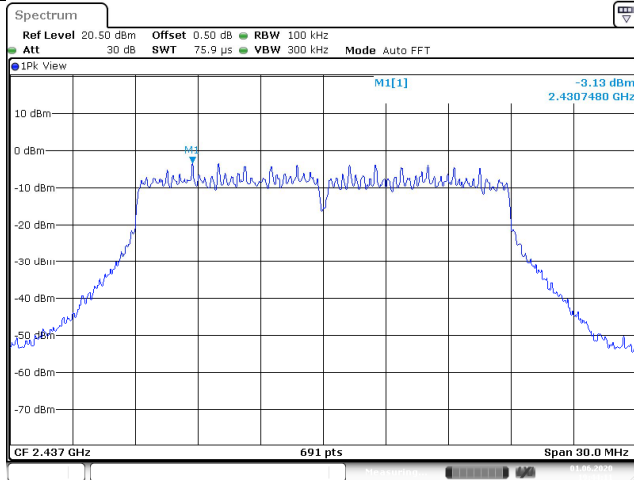


Date: 1 JUN 2020 19:42:27



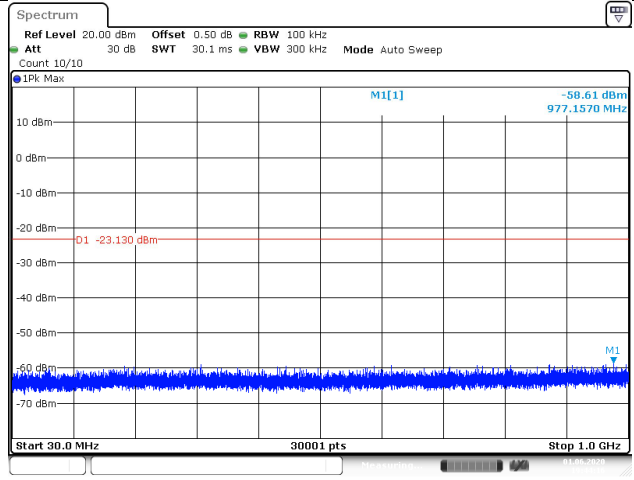
Out-of-Band Emissions Channel 6 (2437MHz)

Reference point



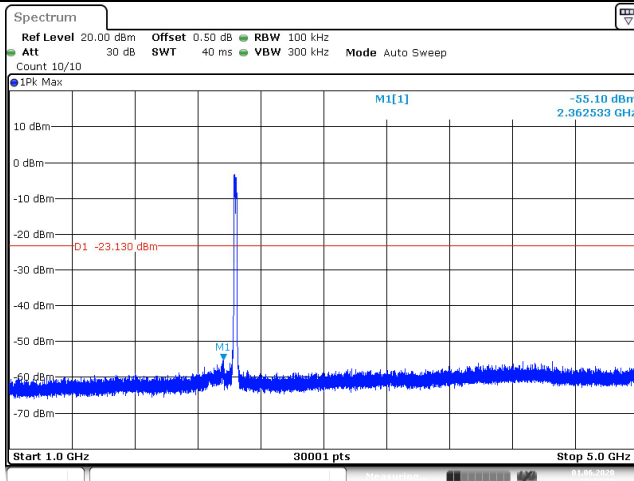
Date: 1 JUN 2020 19:44:12

Spurious Emission (30MHz – 1GHz)



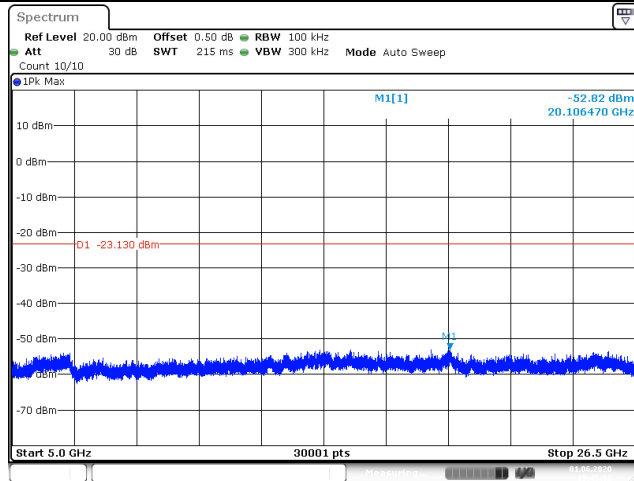
Date: 1 JUN 2020 19:44:17

Spurious Emission (1GHz –5GHz)



Date: 1 JUN 2020 19:44:30

Spurious Emission (5GHz –26.5GHz)

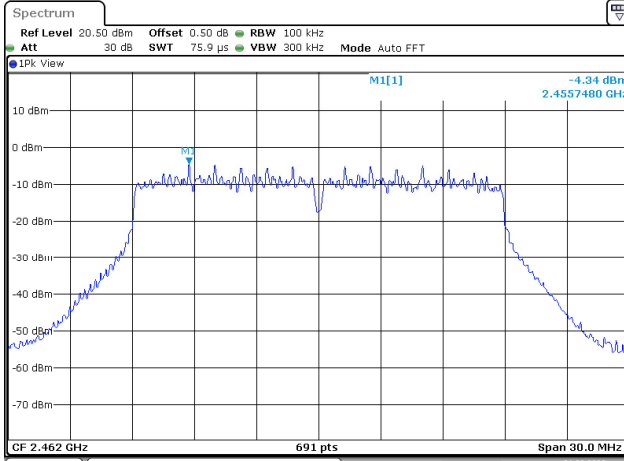


Date: 1 JUN 2020 19:45:02



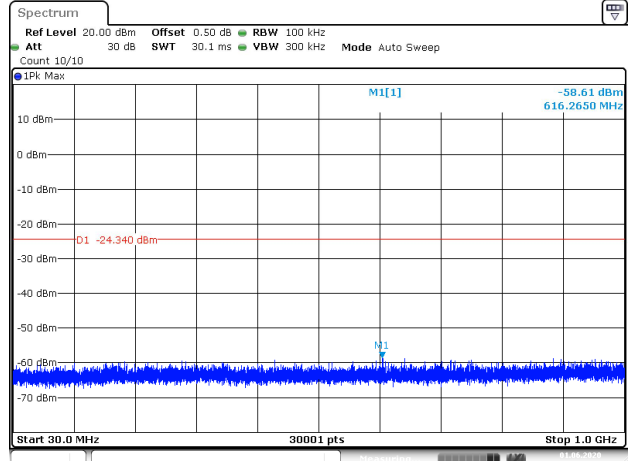
Out-of-Band Emissions Channel 11 (2462MHz)

Reference point



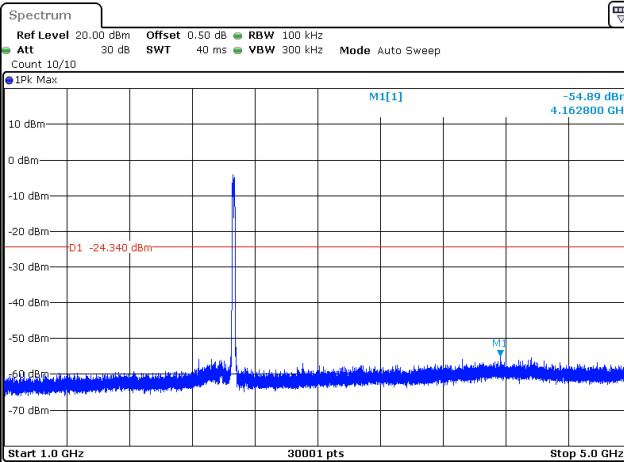
Date: 1 JUN 2020 19:47:48

Spurious Emission (30MHz – 1GHz)



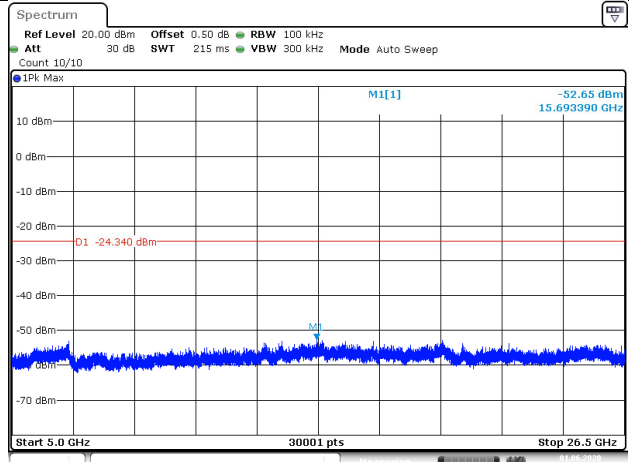
Date: 1 JUN 2020 19:47:53

Spurious Emission (1GHz –5GHz)



Date: 1 JUN 2020 19:48:06

Spurious Emission (5GHz –26.5GHz)



Date: 1 JUN 2020 19:48:38



9.6 Band edge

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

Limit

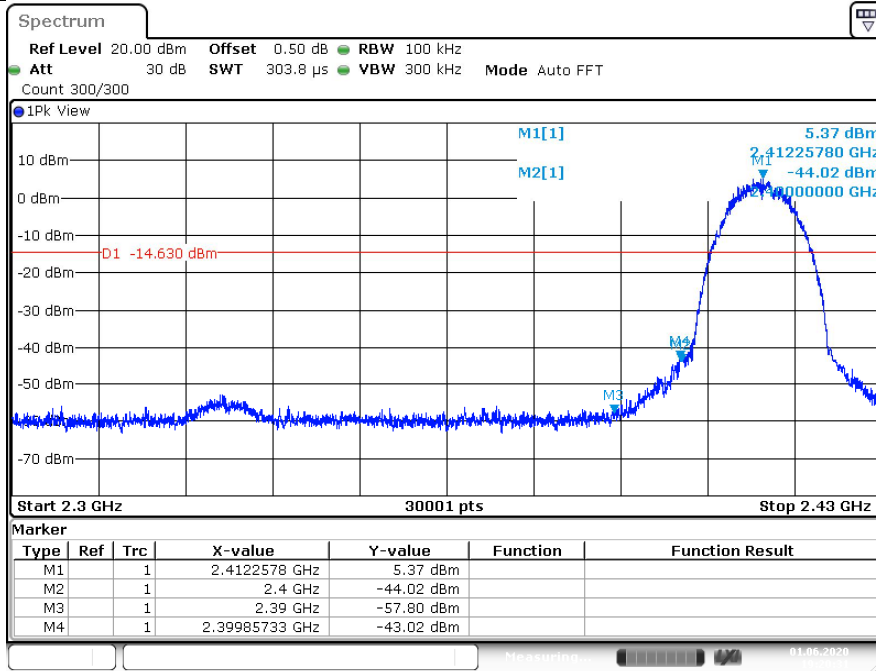
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).



Test result

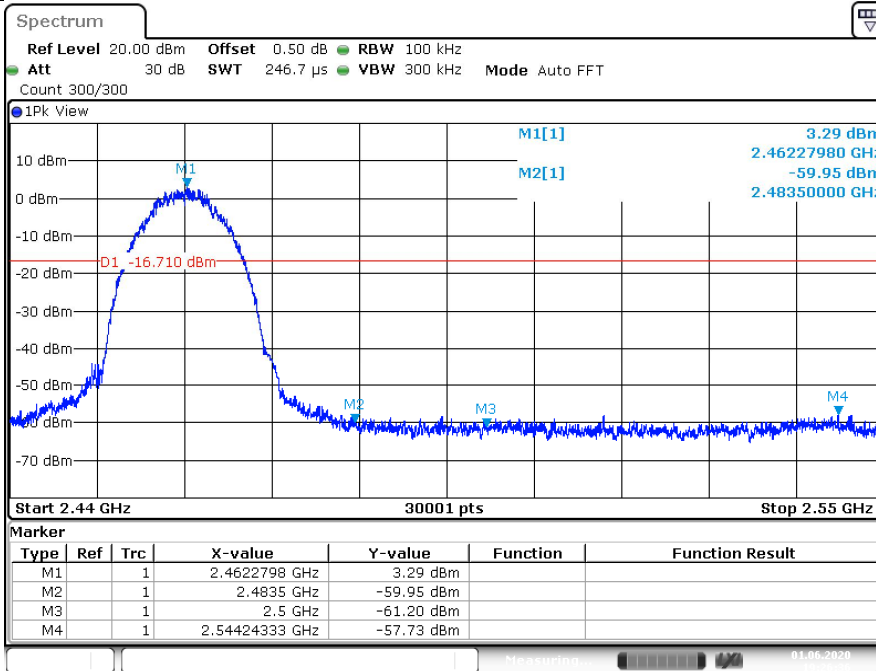
802.11 B

Low_2412



Date: 1 JUN 2020 19:20:31

High_2462

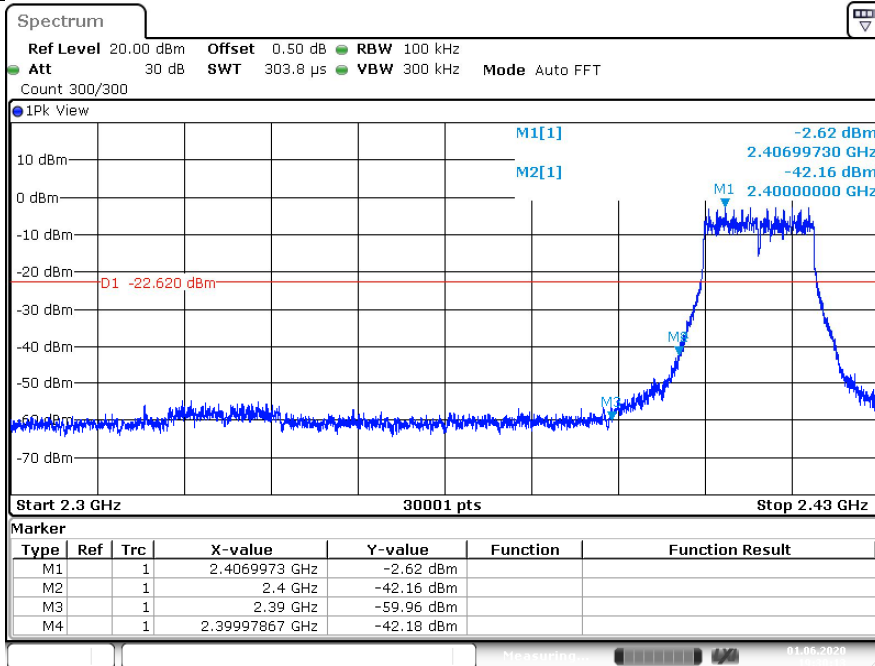


Date: 1 JUN 2020 19:26:36



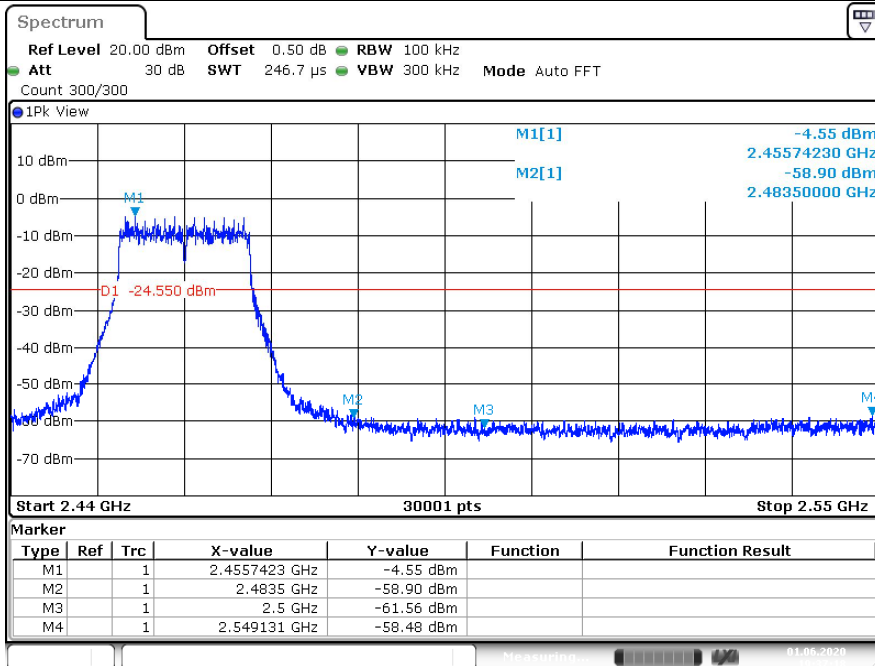
802.11 G

Low_2412



Date: 1.JUN.2020 19:30:13

High_2462

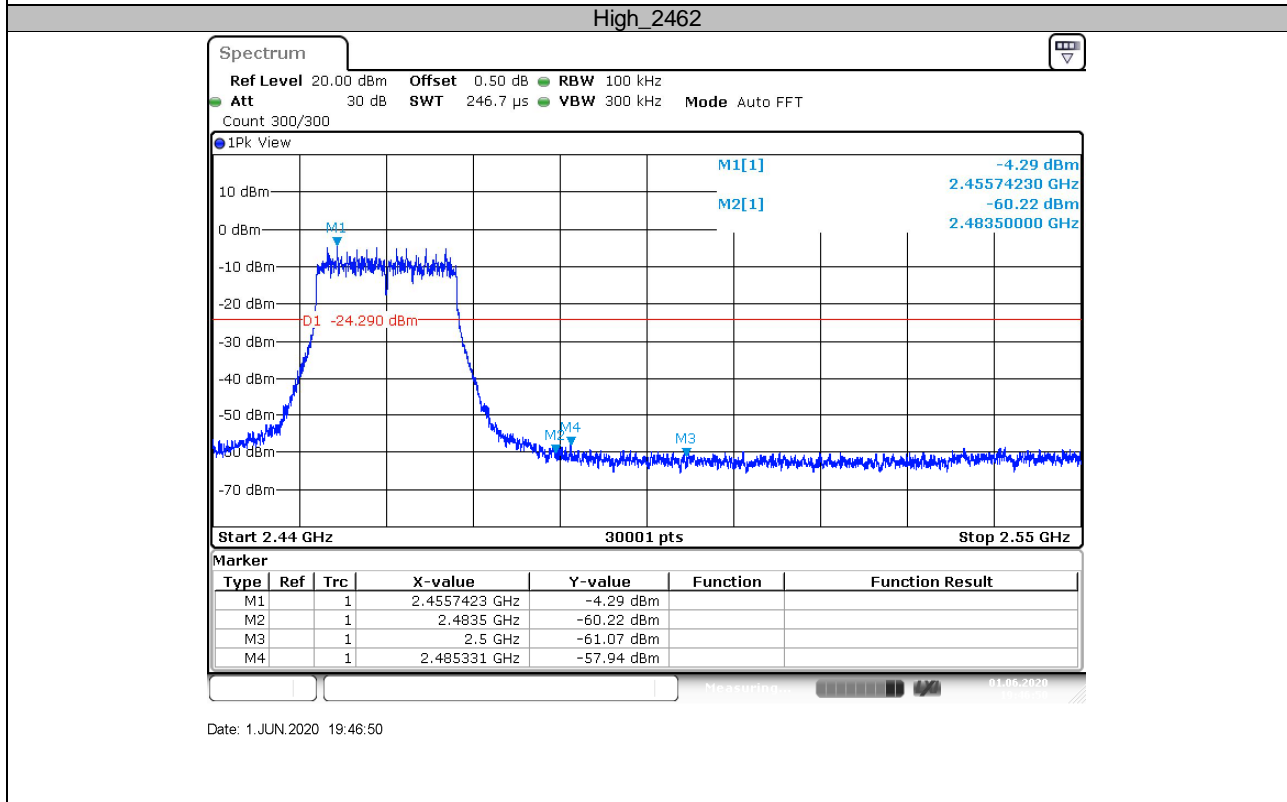
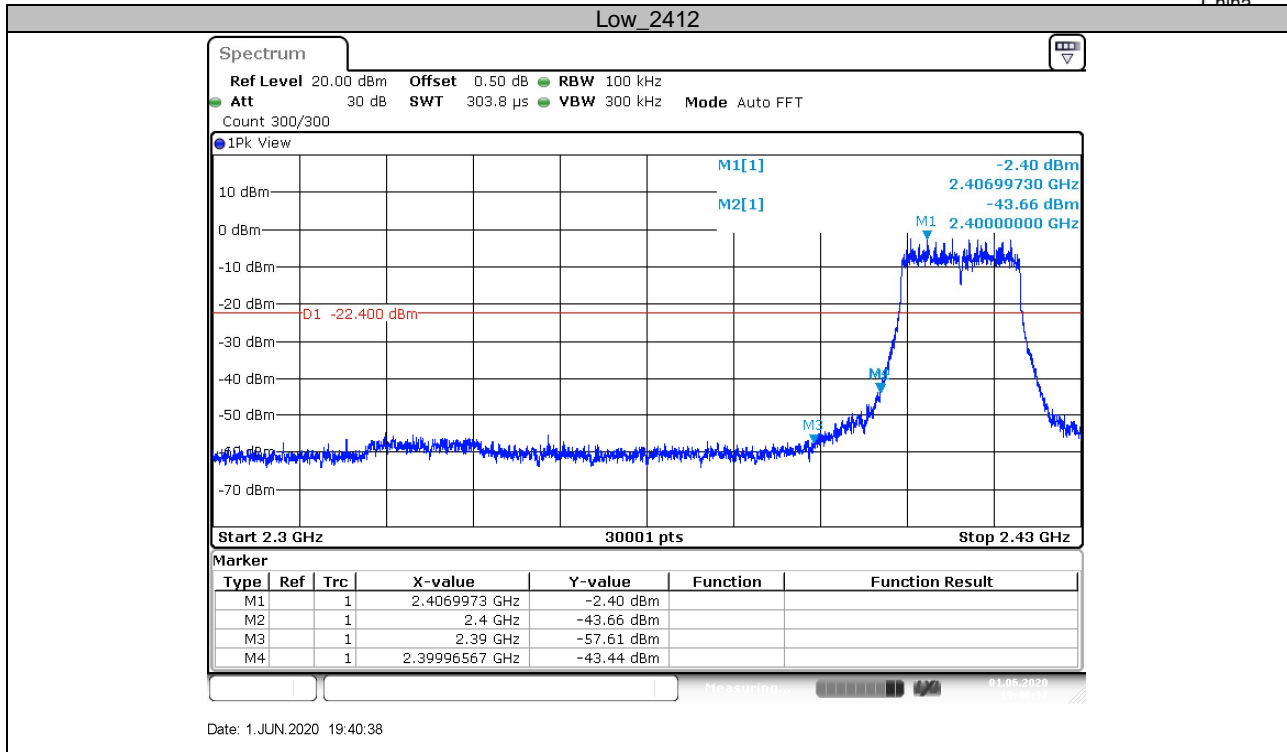


Date: 1.JUN.2020 19:37:18



802.11 N20

China





9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna 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.
4. 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.
5. Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 100 kHz to 120 kHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 1MHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

- a) RBW = 1MHz.
- b) VBW ≥ [3 × RBW].
- c) Detector = RMS (power averaging), if $[\text{span} / (\# \text{ of points in sweep})] \leq \text{RBW} / 2$.
 Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
- d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
- e) Sweep time = auto.
- f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of $1 / D$, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
- g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:



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- 1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is $[10 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
- 2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is $[20 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
- 3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Measured Distance Meters
0.009~0.490	2400/F (kHz)	300
0.490~1.705	24000/F (kHz)	30
1.705~30	30	30

Frequency MHz	Field Strength uV/m	Field Strength dBuV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK



Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (which is subject to the maximum EIRP, B mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Test mode: 802.11B					
Channel 1 (2412MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
2385.8	44.47	74.0	29.53	Peak	Horizontal
4823.8	45.91	74.0	28.09	Peak	Horizontal
2388.0	44.00	74.0	30.00	Peak	Vertical
4823.8	50.02	74.0	23.98	Peak	Vertical

Test mode: 802.11B					
Channel 6 (2437MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
4870.9	43.13	74.0	30.87	Peak	Horizontal
4873.7	46.64	74.0	27.36	Peak	Vertical

Test mode: 802.11B					
Channel 11 (2462MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
2484.4	46.16	74.0	27.84	Peak	Horizontal
4923.6	47.76	74.0	26.24	Peak	Horizontal
2484.6	49.50	74.0	24.50	Peak	Vertical
4924.5	45.24	74.0	28.76	Peak	Vertical

Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading



Test mode: 802.11G					
Channel 1 (2412MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
2383.5	43.61	74.0	30.39	Peak	Horizontal
4826.1	40.04	74.0	33.96	Peak	Horizontal
2382.7	43.58	74.0	30.42	Peak	Vertical
4821.6	40.41	74.0	33.59	Peak	Vertical

Test mode: 802.11G					
Channel 6 (2437MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
4876.0	39.82	74.0	34.18	Peak	Horizontal
4877.7	39.98	74.0	34.02	Peak	Vertical

Test mode: 802.11G					
Channel 11 (2462MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
2483.7	47.02	74.0	26.98	Peak	Horizontal
4920.2	40.36	74.0	33.64	Peak	Horizontal
2483.5	50.42	74.0	23.58	Peak	Vertical
4925.6	41.36	74.0	32.64	Peak	Vertical

Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading



Test mode: 802.11N20					
Channel 1 (2412MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
2385.8	42.81	74.0	31.19	Peak	Horizontal
4821.0	39.82	74.0	34.18	Peak	Horizontal
2383.8	44.01	74.0	29.99	Peak	Vertical
4826.7	39.26	74.0	34.74	Peak	Vertical

Test mode: 802.11N20					
Channel 6 (2437MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
4869.2	39.92	74.0	34.08	Peak	Horizontal
4869.2	40.05	74.0	33.95	Peak	Vertical

Test mode: 802.11N20					
Channel 11 (2462MHz)					
Frequency (MHz)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
2483.7	48.72	74.0	25.28	Peak	Horizontal
4922.4	40.30	74.0	33.70	Peak	Horizontal
2484.4	52.16	74.0	21.84	Peak	Vertical
4927.0	40.31	74.0	33.69	Peak	Vertical

Remark:

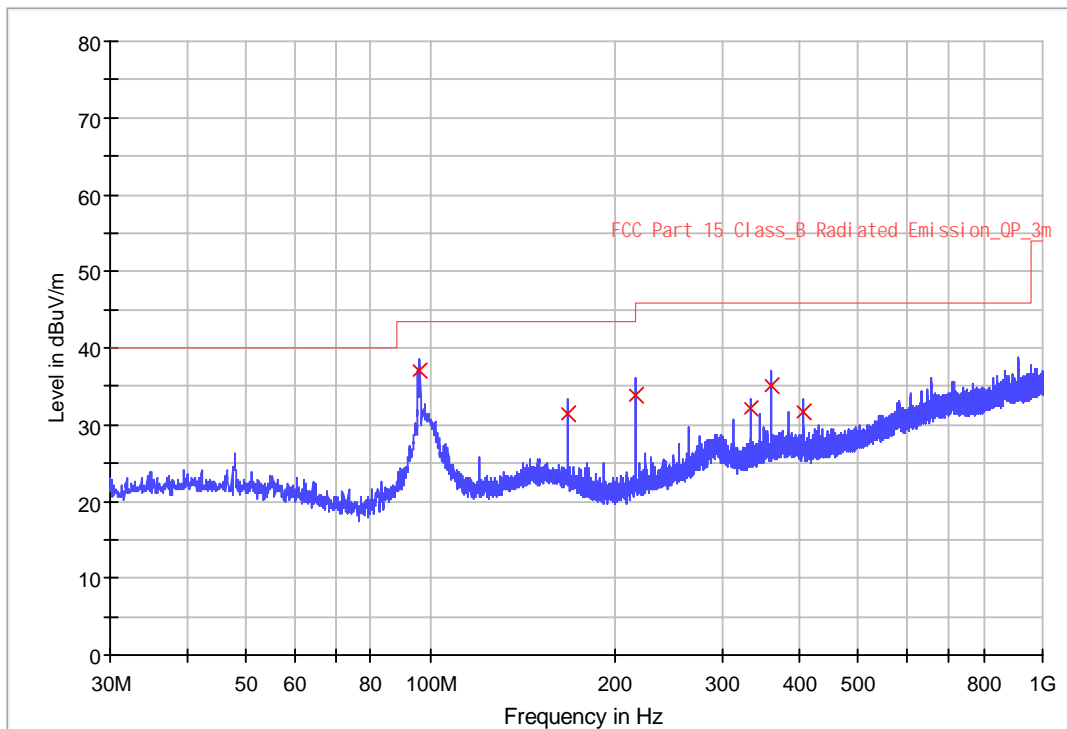
- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading



The worst case of Radiated Emission below 1GHz:

Site: 3-meter chamber	Time: 2020/06/01 - 13:46
Limit: FCC_Part15.109_RE(3m) ClassB	Engineer: Wenqiang LU
Probe: VULB9168	Polarity: Horizontal
EUT: Smart Camera, Model no: SC012-WK2	Power: 120VAC, 60Hz (powered by adapter: KA06E-0501000US)
Note: Transmit by 802.11N20 at channel 2412MHz.	
Note: There is the worst case within frequency range 30MHz~1GHz.	

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
96.000000	37.1	1000.0	120.000	100.2	H	165.0	11.0	6.4	43.5
168.000000	31.5	1000.0	120.000	100.2	H	8.0	14.9	12.0	43.5
215.960000	33.9	1000.0	120.000	100.2	H	79.0	12.3	9.6	43.5
333.360000	32.3	1000.0	120.000	100.2	H	91.0	15.9	13.8	46.0
360.000000	35.1	1000.0	120.000	100.2	H	216.0	16.5	10.9	46.0
407.960000	31.5	1000.0	120.000	100.2	H	341.0	17.5	14.5	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

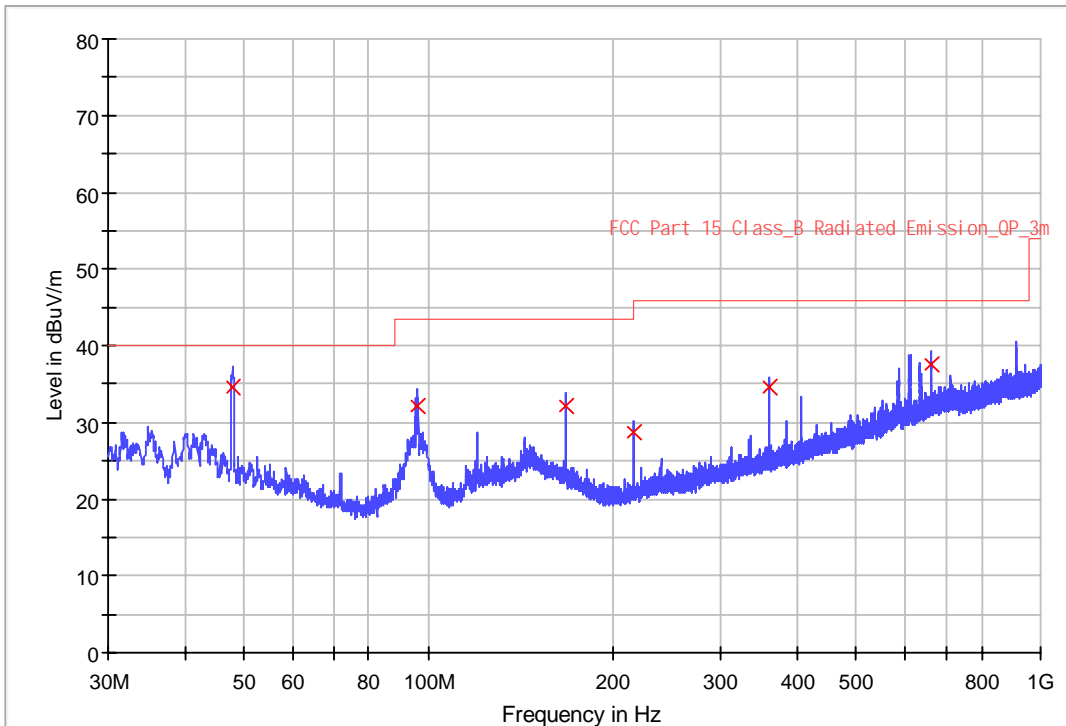
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



Site: 3-meter chamber	Time: 2020/06/01 - 13:48	China
Limit: FCC Part15.109_RE(3m)_ClassB	Engineer: Wenqiang LU	
Probe: VULB9168	Polarity: Vertical	
EUT: Smart Camera, Model no: SC012-WK2	Power: 120VAC, 60Hz (powered by adapter: KA06E-0501000US)	
Note: Transmit by 802.11N20 at channel 2412MHz.		
Note: There is the worst case within frequency range 30MHz~1GHz.		

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
47.760000	34.6	1000.0	120.000	100.2	V	162.0	14.4	5.4	40.0
96.000000	32.0	1000.0	120.000	100.2	V	78.0	11.0	11.5	43.5
168.000000	32.0	1000.0	120.000	100.2	V	213.0	14.9	11.5	43.5
216.000000	28.8	1000.0	120.000	100.2	V	56.0	12.3	17.2	46.0
360.000000	34.5	1000.0	120.000	100.2	V	61.0	16.5	11.5	46.0
661.960000	37.5	1000.0	120.000	100.2	V	194.0	22.7	8.5	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

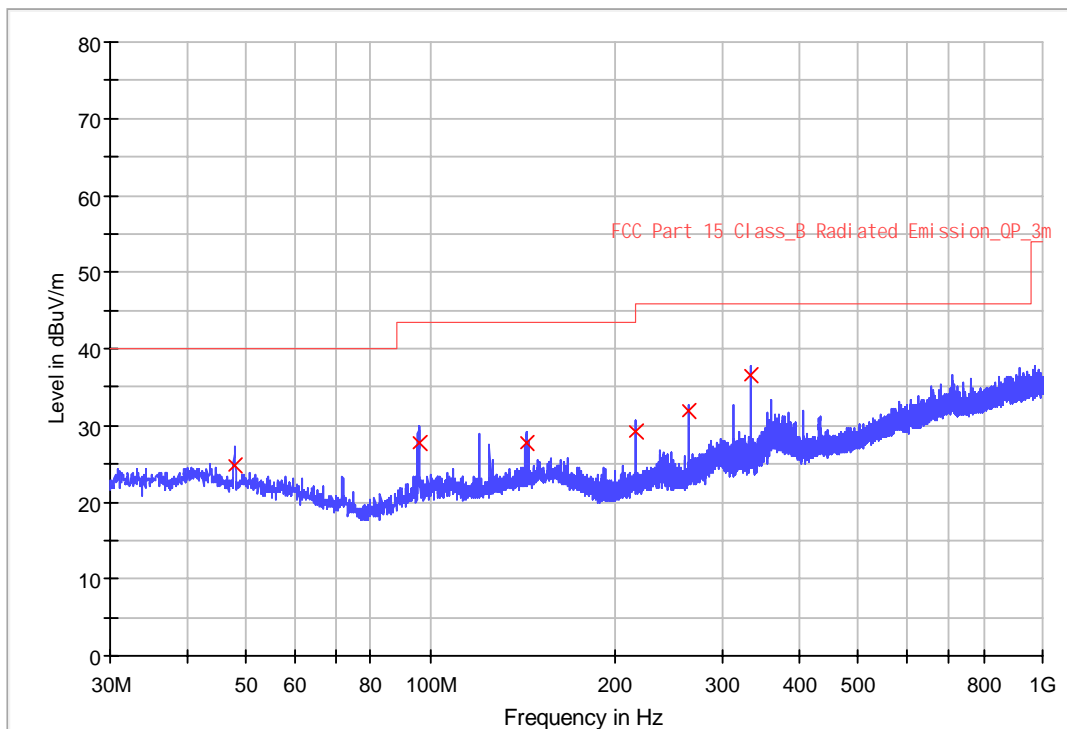
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



The worst case of Radiated Emission below 1GHz:

Site: 3-meter chamber	Time: 2020/06/10 - 10:07
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Wenqiang LU
Probe: VULB9168	Polarity: Horizontal
EUT: Smart Camera, Model no: SC012-WK2	Power: 120VAC, 60Hz (powered by adapter: A18A-050100U-US2)
Note: Transmit by 802.11N20 at channel 2412MHz.	
Note: There is the worst case within frequency range 30MHz~1GHz.	

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
48.000000	24.8	1000.0	120.000	100.7	H	84.0	14.4	15.2	40.0
95.560000	27.7	1000.0	120.000	100.7	H	51.0	11.0	15.8	43.5
143.280000	27.7	1000.0	120.000	100.7	H	266.0	15.2	15.8	43.5
215.960000	29.3	1000.0	120.000	100.7	H	194.0	12.3	14.2	43.5
263.960000	32.0	1000.0	120.000	100.7	H	263.0	13.9	14.0	46.0
333.360000	36.5	1000.0	120.000	100.7	H	36.0	15.9	9.5	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

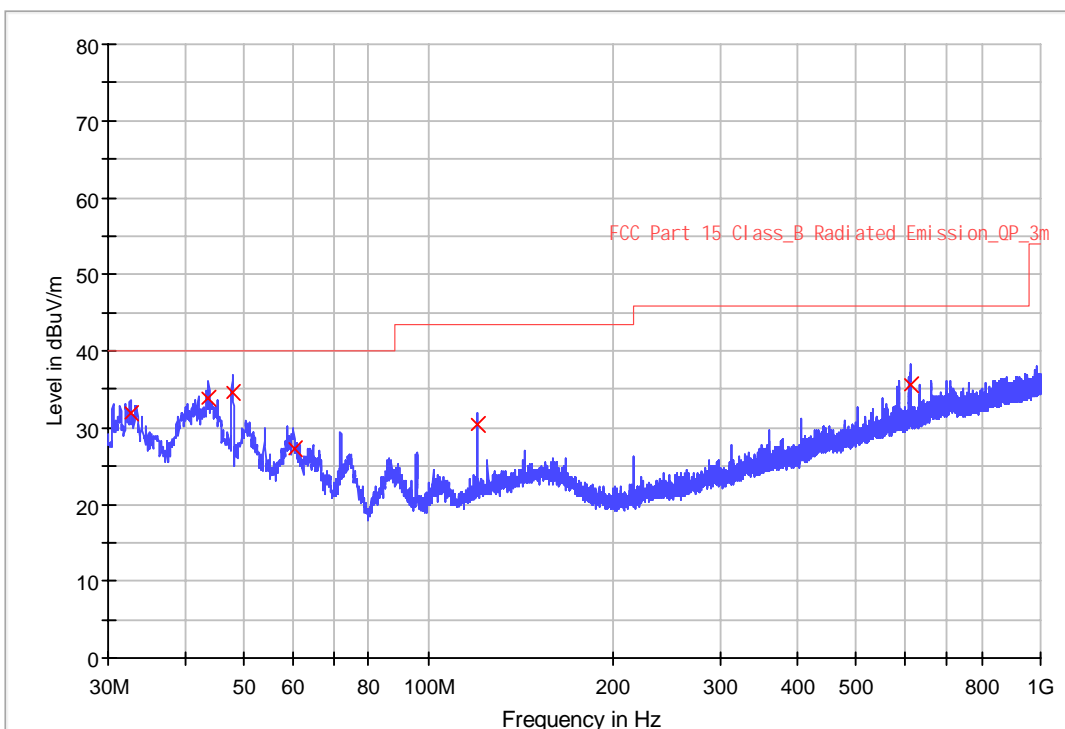
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



China

Site: 3-meter chamber	Time: 2020/06/10 - 10:13
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Wenqiang LU
Probe: VULB9168	Polarity: Vertical
EUT: Smart Camera, Model no: SC012-WK2	Power: 120VAC, 60Hz (powered by adapter: A18A-050100U-US2)
Note: Transmit by 802.11N20 at channel 2412MHz.	
Note: There is the worst case within frequency range 30MHz~1GHz.	

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
32.600000	31.8	1000.0	120.000	100.0	V	115.0	13.9	8.2	40.0
43.760000	33.8	1000.0	120.000	100.0	V	51.0	14.5	6.2	40.0
47.760000	34.6	1000.0	120.000	100.0	V	94.0	14.4	5.4	40.0
60.280000	27.3	1000.0	120.000	100.0	V	32.0	13.6	12.8	40.0
120.000000	30.5	1000.0	120.000	100.0	V	60.0	13.5	13.0	43.5
611.520000	35.6	1000.0	120.000	100.0	V	194.0	21.8	10.4	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



10 Test Equipment List

List of Test Instruments
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2019-8-5	2020-8-4
	Wideband power sensor	Rohde & Schwarz	NRP-Z81	104782	2019-12-23	2020-12-22
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2019-8-5	2020-8-4
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2019-8-5	2020-8-4
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2019-3-16	2022-3-15
	Horn Antenna	Rohde & Schwarz	HF907	102393	2018-6-11	2021-4-1
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2019-8-5	2020-8-4
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2019-6-28	2020-6-27
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	002222727	2018-1-29	2021-1-28
	3m Semi-anechoic chamber	TDK	9X6X6	----	2018-5-11	2021-5-10
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2019-8-5	2020-8-4
	LISN	Rohde & Schwarz	ENV216	101924	2019-8-5	2020-8-4
Measurement Software Information						
Test Item	Software	Manufacturer	Version			
C	Power Viewer	Rohde & Schwarz	V 11.0			
C	Bluetooth and WiFi Test System	Shenzhen JS tonscond co.,ltd	2.6.77.0518			
RE	EMC 32	Rohde & Schwarz	V9.15.00			
CE	EMC 32	Rohde & Schwarz	V9.15.03			

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge



11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, $\pm 3.16\text{dB}$
Radiated Disturbance	30MHz to 1GHz, $\pm 5.03\text{dB}$ (Horizontal) $\pm 5.12\text{dB}$ (Vertical) 1GHz to 18GHz, $\pm 5.49\text{dB}$ 18GHz to 40GHz, $\pm 5.63\text{dB}$
Carrier power conducted measurement	50MHz~18GHz, $\pm 1.238\text{dB}$
Spurious Emission Conducted Measurement	9kHz ~40GHz, $\pm 1.224\text{dB}$



12 Photographs of Test Set-ups

Refer to the < Test Setup photos >.



13 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

THE END