

Hisense (Guangdong) Air Conditioning Co., Ltd.

TEST REPORT

SCOPE OF WORK

EMC TESTING-AEH-W4F1

REPORT NUMBER

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TEST REPORT

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Applicant Name & Address : Hisense (Guangdong) Air Conditioning Co., Ltd.
No.8 Hisense Road, Advanced Manufacturing Jiangsha
Demonstration Park, Jiangmen City, Guangdong Province, P. R. China

Manufacturing Site : Same as applicant

Intertek Report No: 180905028GZU-001

FCC ID: 2AGCCA EH-W4F1

Test standards

47 CFR PART 15 Subpart C: 2016 section 15.247

Sample Description

Product : WIFI Module

Model No. : AEH-W4F1

Electrical Rating : 5Vdc, 0.4A

Serial No. : Not Labeled

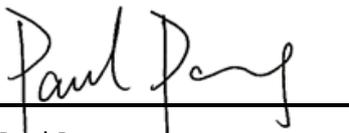
Date Received : 05 September 2018

Date Test : 05 September 2018 to 12 December 2018

Conducted

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1.0 TEST RESULT SUMMARY

Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC PART 15 C section 15.247 (c) and Section 15.203	FCC PART 15 C section 15.247 (c) and Section 15.203	PASS
6 dB Bandwidth (DTS bandwidth)	FCC PART 15 C section 15.247 (a)(2)	ANSI C63.10: Clause 11.8	PASS
Maximum Peak Conducted Output Power	FCC PART 15 C section 15.247(b)(3)	ANSI C63.10: Clause 11.9.1.2	PASS
Peak Power Spectral Density	FCC PART 15 C section 15.247(e)	ANSI C63.10: Clause 11.10.2	PASS
Out of Band Conducted Emissions	FCC PART 15 C section 15.209 &15.247(d)	ANSI C63.10: Clause 11.11	PASS
Out of Band Radiated Emission	FCC PART 15 C section 15.209 &15.247(d)	ANSI C63.10: Clause 11.11, 6.4, 6.5 and 6.6	N/A
Radiated Emissions in Restricted Bands	FCC PART 15 C section 15.209 &15.247(d)	ANSI C63.10: Clause 11.12.1, 6.4, 6.5 and 6.6	PASS
Band Edges Measurement	FCC PART 15 C section 15.247 (d) &15.205	ANSI C63.10: Clause 11.11 and 11.13	PASS
Conducted Emissions at Mains Terminals	FCC PART 15 C section 15.207	ANSI C63.10: Clause 6.2	PASS
<p>Remark: N/A: not applicable. Refer to the relative section for the details. EUT: In this whole report EUT means Equipment Under Test. Tx: In this whole report Tx (or tx) means Transmitter. Rx: In this whole report Rx (or rx) means Receiver. RF: In this whole report RF means Radio Frequency. ANSI C63.10: the detail version is ANSI C63.10:2013 in the whole report</p>			

TEST REPORT

2.0 General Description

2.1 Product Description

Operating Frequency:	2412 MHz to 2462 MHz for 802.11b/g/n(HT20)
Type of Modulation:	802.11b: DSSS(CCK/QPSK/BPSK) 802.11g: OFDM(BPSK/QPSK/16QAM/64QAM) 802.11n: OFDM (BPSK/QPSK/16QAM/64QAM)
Transmit Data Rate:	802.11b :1/2/5.5/11 Mbps 802.11g :6/9/12/18/24/36/48/54 Mbps 802.11n(HT20): 6.5/13/19.5/26/39/52/58.5/65 Mbps
Number of Channels	11 Channels for 802.11b/g/n(HT20)
Channel Separation:	5 MHz
Antenna Type	Internal Printed ANT
Function:	WIFI Module
EUT Power Supply:	DC 5.0V
Power cord:	N/A

EUT channels and frequencies list:

For 802.11b/g/n(HT20): test frequencies are lowest channel 1: 2412 MHz, middle channel 6: 2437 MHz and highest channel 11: 2462 MHz.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	

2.2 Related Submittal(s) Grants

This is an application for certification of:
DTS- Part 15 Digital Transmission Systems (WIFI transmitter portion)

Remaining portions are subject to the following procedures:

1. Receiver portion of WIFI: exempt from technical requirement of this Part.

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2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans and final tests were performed in the semi-anechoic chamber to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise.

2.4 Test Facility

All tests were performed at:

Room102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China

Except Conducted Emissions was performed at:

Block E, No.7-2 Guang Dong Software Science Park, Caipin Road, Guangzhou Science City, GETDD Guangzhou, China

A2LA Certificate Number 0078.10

Intertek Testing Services Shenzhen Ltd. Guangzhou Branch is accredited by A2LA and Listed in FCC website. FCC accredited test labs may perform both Certification testing under Parts 15 and 18 and Declaration of Conformity testing.

3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, AC power line was manipulated to produce worst case emissions. It was powered by DC 5.0V supply.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. The spurious emissions more than 20 dB below the permissible value are not reported.

For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

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Frequency range of radiated emission measurements

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

3.2 EUT Exercising Software

Description	Manufacturer	Model No.	SN/Version	Supplied by
For fixing frequency	Realtek	UI_mptool_1V1 6	1.16	Hisense

3.3 Special Accessories

No special accessories used.

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3.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	20 dB Bandwidth	2.3%
	6dB Bandwidth	
	99% Bandwidth	
2	Carrier Frequencies Separated	2.3%
3	Dwell Time	1.2%
4	Maximum Peak Conducted Output Power	1.5dB
5	Peak Power Spectral Density	1.5dB
6	Out of Band Conducted Emissions	1.5dB
7	Band edges measurement	1.5dB
8	Radiated Emissions	4.7 dB (25 MHz-1 GHz)
		4.8 dB (1 GHz-18 GHz)
		5.21dB (18GZH-26GHz)
9	Conducted Emissions at Mains Terminals	2.58dB
10	Temperature	0.5 °C
11	Humidity	0.4 %
12	Time	1.2%

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty is calculated in accordance with ETSI TR 100 028-2001.

The measurement uncertainty is given with a confidence of 95%, k=2.

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance – Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value

3.5 Equipment Modification

Any modifications installed previous to testing by Hisense (Guangdong) Air Conditioning Co., Ltd. will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.

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3.6 Support Equipment List and Description

This product was tested with corresponding support equipment as below:

Support Equipment

Description	Manufacturer	Model No.	SN/Version	Supplied by
NoteBook	LENOVO	T430	--	Intertek
Adapter	KWONG MING ELECTRICAL MFY.	KMUD-060- 00600-41GS	--	Intertek

Cable

Description	Model No.	Connector type	Cable length/type	Supplied by
Antenna cable	RF-01	SMA	0.2 m(shielded)	Intertek
USB extension cord	USB-01	USB	1.0 m(shielded)	Hisense

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4.0 Measurement Results

4.1 Antenna Requirement

Standard requirement:

15.203 requirement:

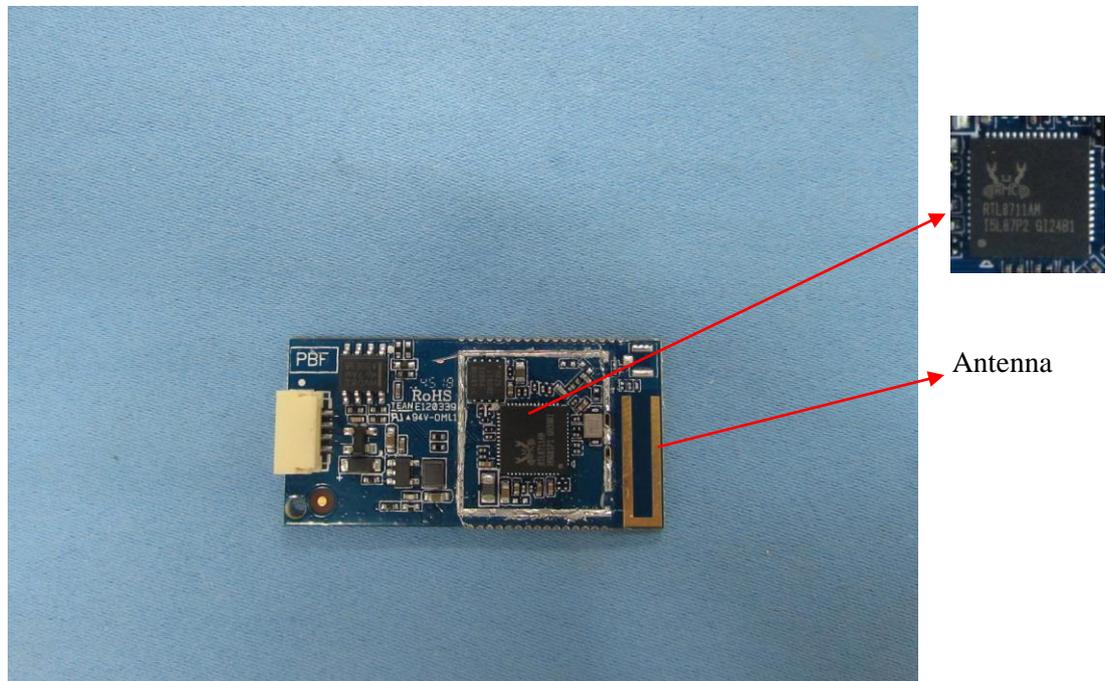
For intentional device. According to 15.203 an intentional radiator shall be designed to Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement:

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

EUT Antenna

The antenna is an integral antenna and no consideration of replacement. The best case gain of the antenna is 1.0 dBi.

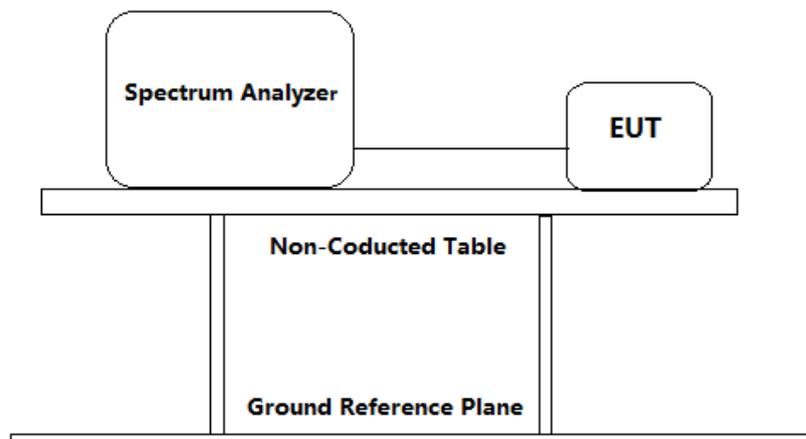


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4.2 6 dB Bandwidth (DTS bandwidth)

Test Requirement:	FCC Part 15 C section 15.247 (a)(2)Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	ANSI C63.10: Clause 11.8
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (cable loss =1.0 dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer:
 - a) Set RBW = 100 kHz
 - b) Set the VBW $\geq [3 \times \text{RBW}]$
 - c) Detector = peak.
 - d) Trace mode = max hold.
 - e) Sweep = auto couple
 - f) Allow the trace to stabilize.
 - g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
 - h) Span=2*BW~5*BW
3. Repeat until all the test status is investigated.
4. Report the worst case.

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Used Test Equipment List

Spectrum Analyzer. Refer to Clause 5 Test Equipment List for details.

Channel No.	Frequency (MHz)	Mode	Data Rate	Measured 6dB bandwidth (MHz)	Limit	Result
1	2412	802.11b	11 Mbps	10.015	≥500KHz	Pass
6	2437		11 Mbps	10.007		Pass
11	2462		11 Mbps	10.031		Pass
1	2412	802.11g	54 Mbps	16.511		Pass
6	2437		54 Mbps	16.512		Pass
11	2462		54 Mbps	16.510		Pass
1	2412	802.11n (HT20)	65 Mbps	17.675		Pass
6	2437		65 Mbps	17.746		Pass
11	2462		65 Mbps	17.745		Pass

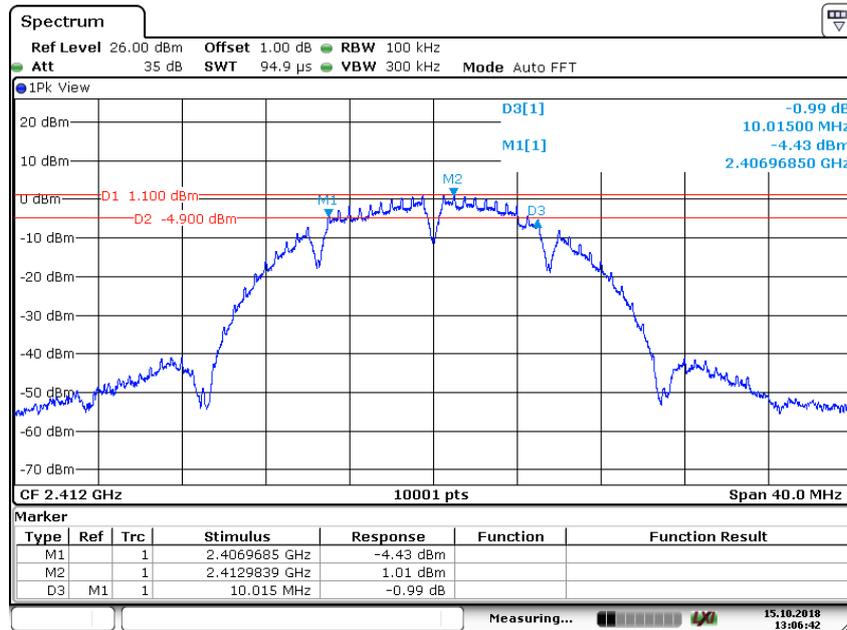
Test result: The unit does meet the FCC requirements.

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Result plot as follows:

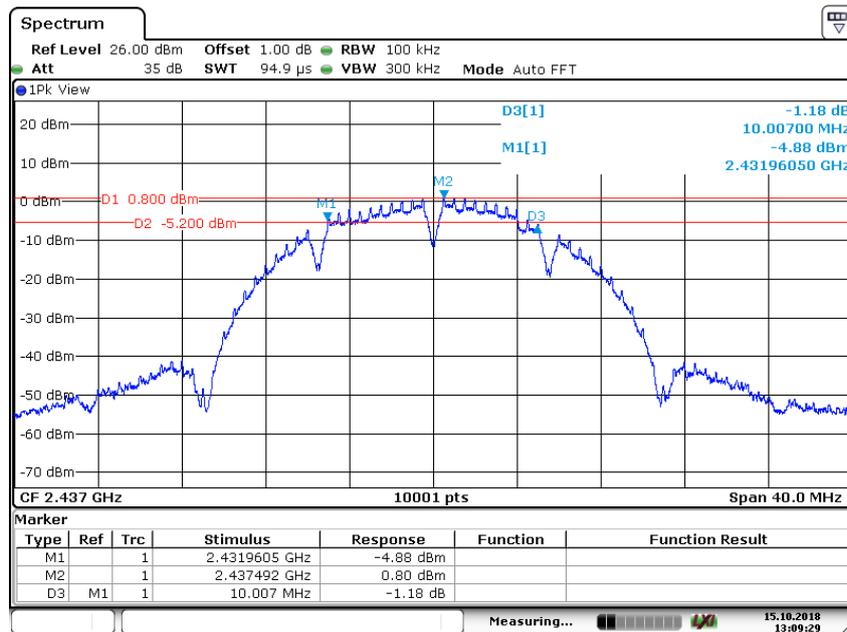
802.11b mode with 11Mbps data rate

Channel 1: 2.412GHz



Date: 15.OCT.2018 13:06:41

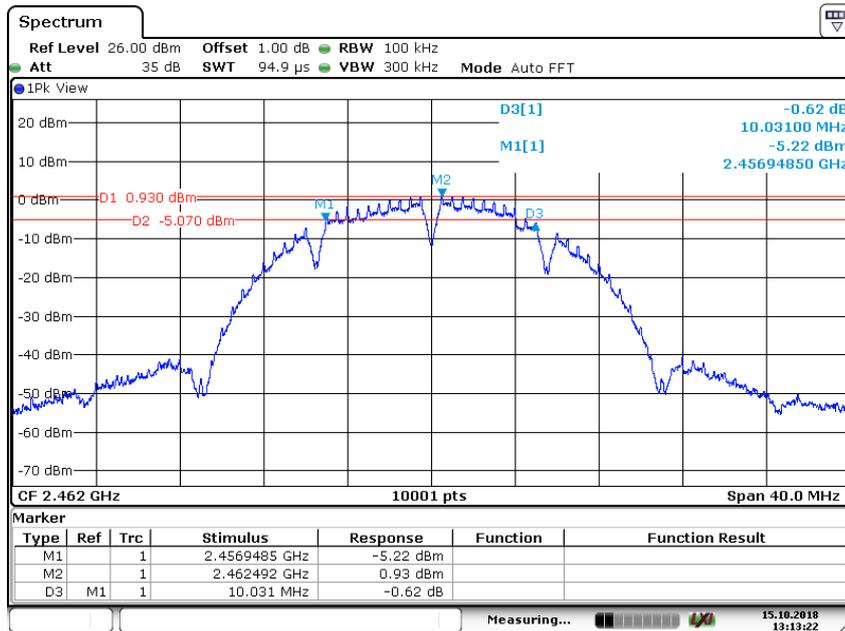
Channel 6: 2.437GHz:



Date: 15.OCT.2018 13:09:29

TEST REPORT

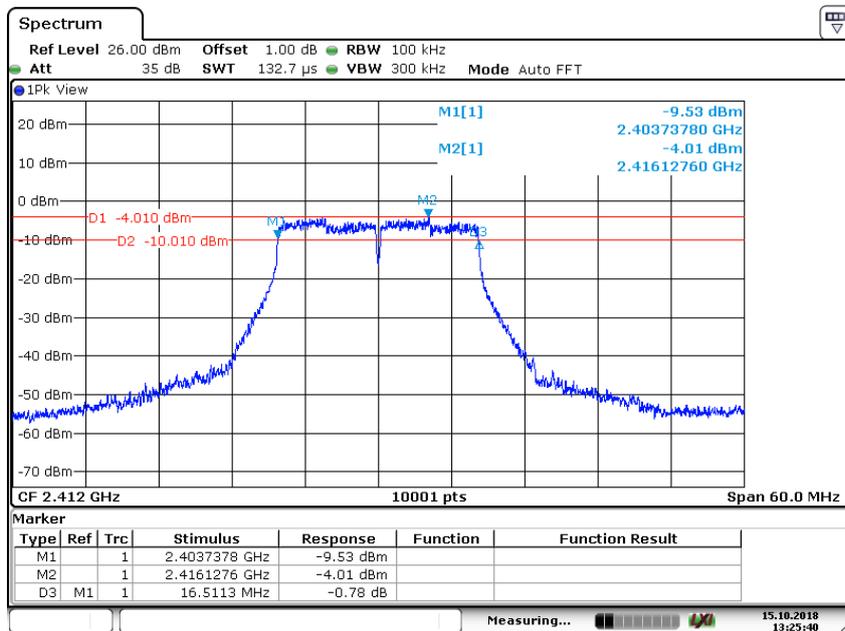
Channel 11: 2.462GHz:



Date: 15.OCT.2018 13:13:21

802.11g mode with 54Mbps data rate

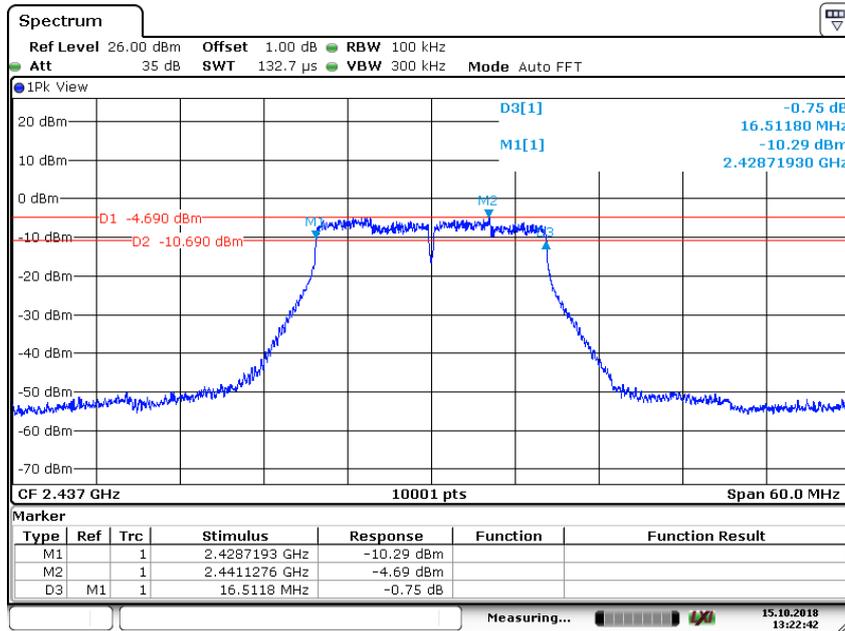
Channel 1: 2.412GHz:



Date: 15.OCT.2018 13:25:40

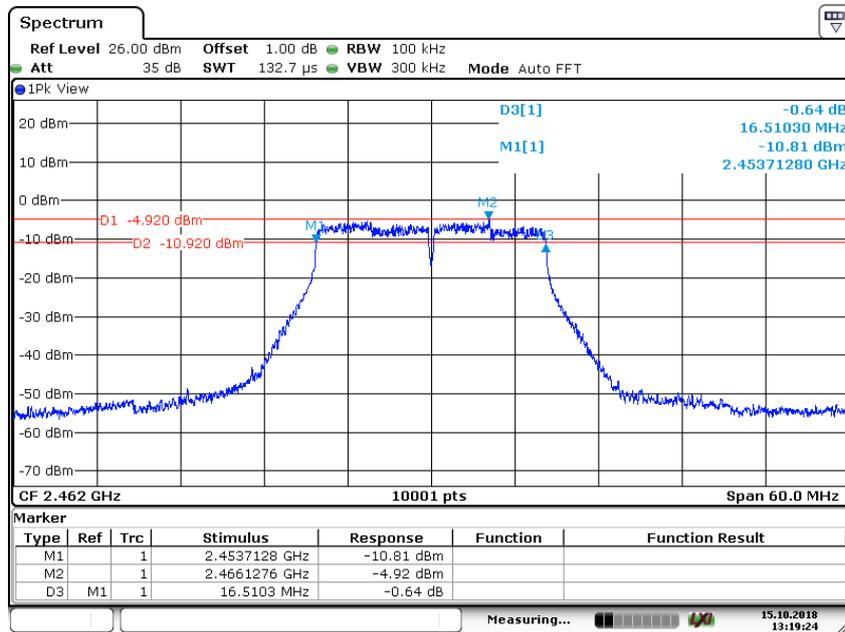
TEST REPORT

Channel 6: 2.437GHz:



Date: 15.OCT.2018 13:22:42

Channel 11: 2.462GHz:

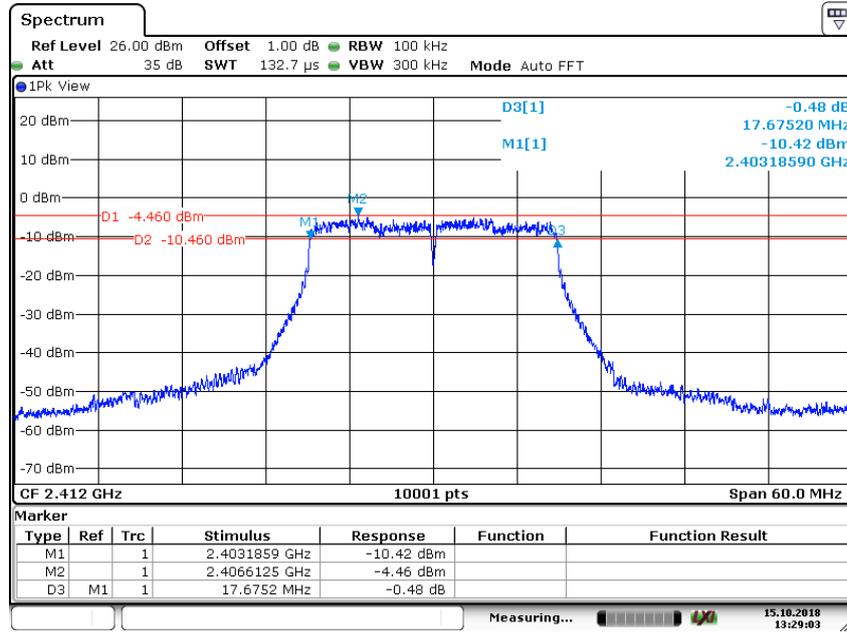


Date: 15.OCT.2018 13:19:23

TEST REPORT

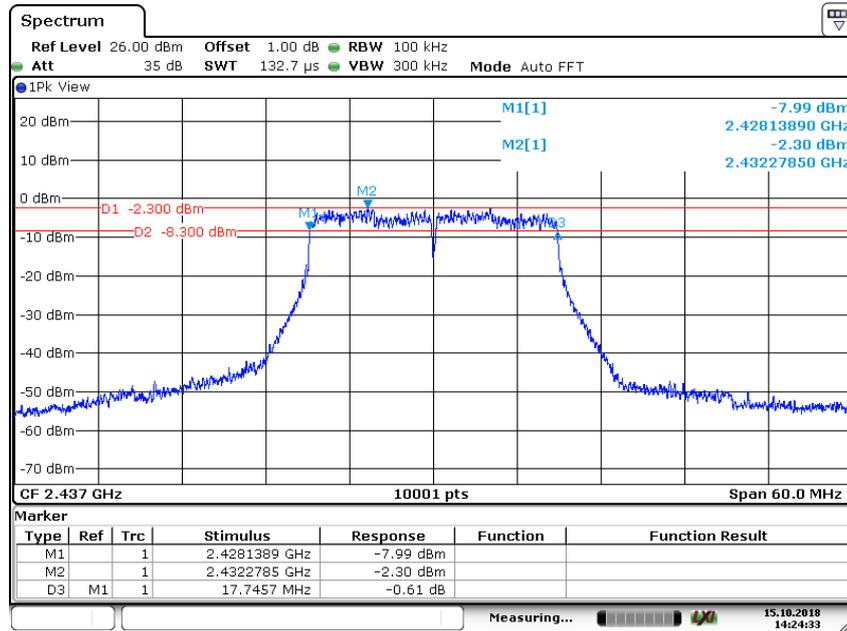
802.11n(HT20) mode with 65Mbps data rate

Channel 1: 2.412GHz:



Date: 15.OCT.2018 13:29:03

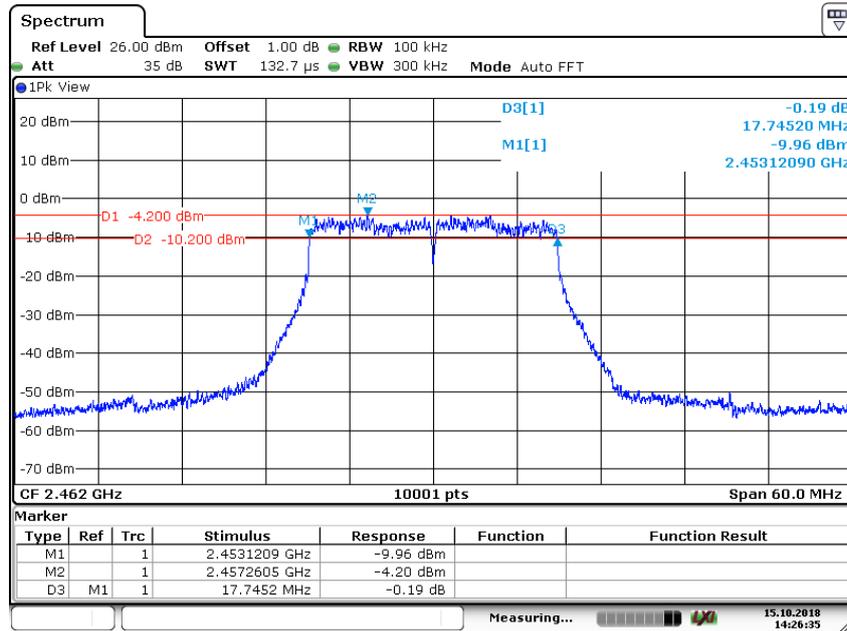
Channel 6: 2.437GHz:



Date: 15.OCT.2018 14:24:33

TEST REPORT

Channel 11: 2.462GHz:



Date: 15.OCT.2018 14:26:35

4.3 Maximum Peak Conducted Output Power

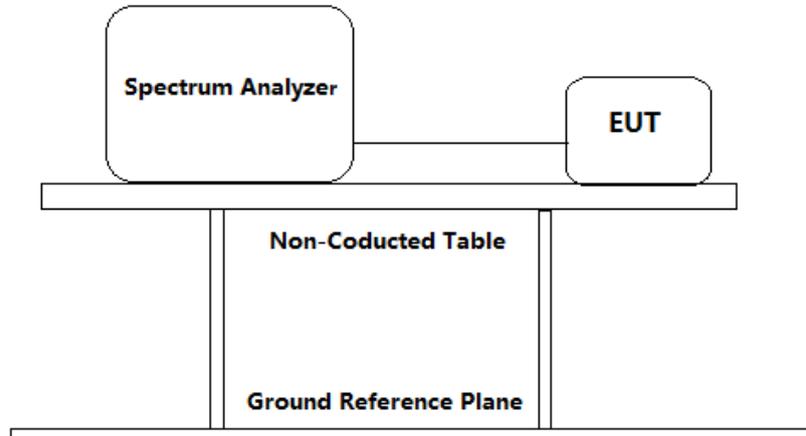
Test Requirement: FCC Part 15 C section 15.247
(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.
Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1), (b) (2), and (b) (3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Method: ANSI C63.10: Clause 11.9.1.2(Integrated band power method)

Test Status: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:

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Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (cable loss =1.0 dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer:
 - a) Set the RBW = 1 MHz.
 - b) Set the VBW \geq [3 \times RBW].
 - c) Set the span \geq [1.5 \times DTS bandwidth].
 - d) Detector = peak.
 - e) Sweep time = auto couple.
 - f) Trace mode = max hold.
 - g) Allow trace to fully stabilize.
 - h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges.
3. Repeat until all the test status is investigated.
4. Report the worst case.

Used Test Equipment List

Spectrum Analyzer. Refer to Clause 5 Test Equipment List for details.

Test result:

Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Channel Power (dBm)	Limit	Result
1	2412	802.11b	11 Mbps	16.65	1W	Pass
6	2437		11 Mbps	16.60		Pass
11	2462		11 Mbps	16.66		Pass
1	2412	802.11g	54 Mbps	14.99		Pass
6	2437		54 Mbps	16.63		Pass
11	2462		54 Mbps	15.24		Pass

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1	2412	802.11n (HT20)	65 Mbps	13.51	(30dBm)	Pass
6	2437		65 Mbps	16.43		Pass
11	2462		65 Mbps	14.63		Pass

Remark: Level = Read Level + Cable Loss

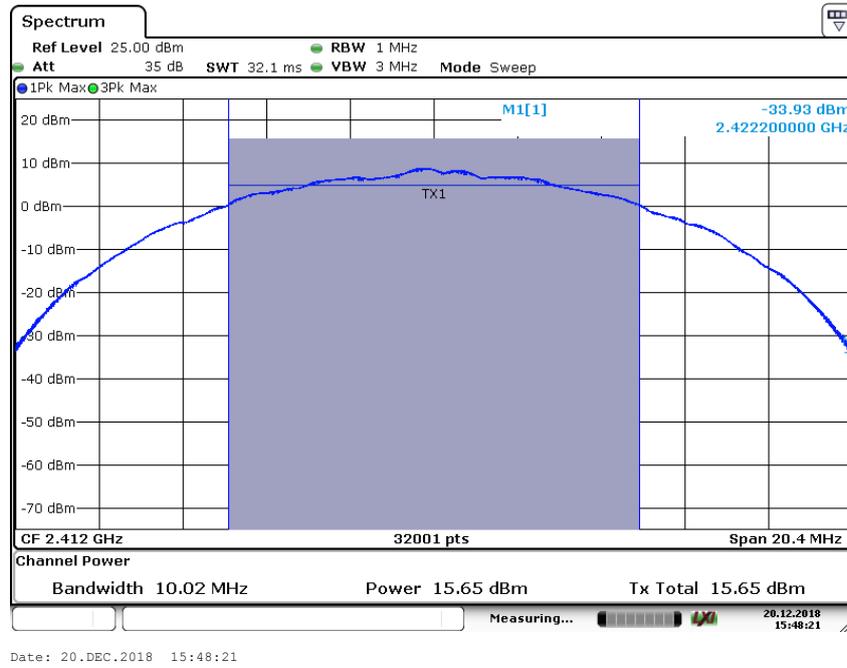
The unit does meet the FCC requirements.

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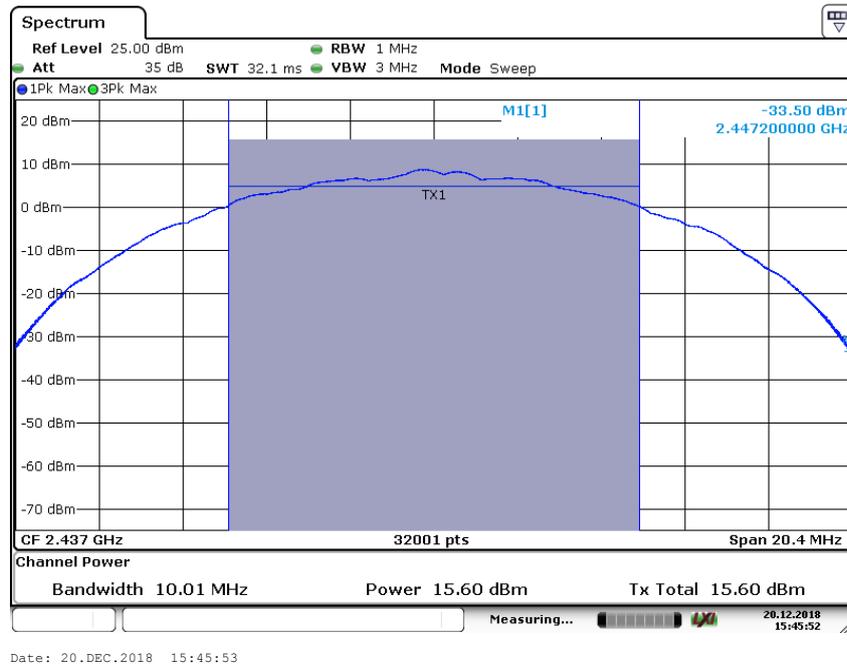
Result plot as follows:

802.11b mode with 11Mbps data rate

Channel 1: 2.412GHz:

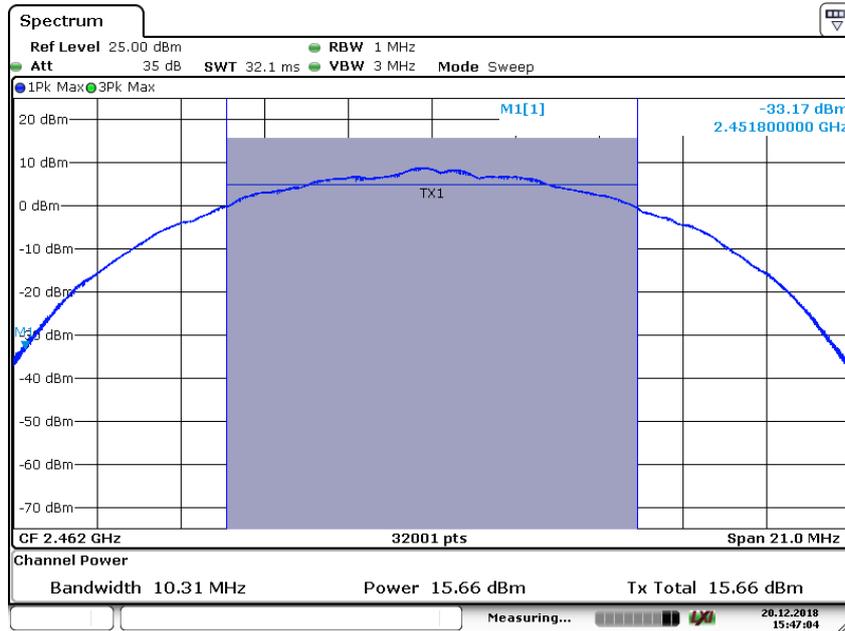


Channel 6: 2.437GHz:



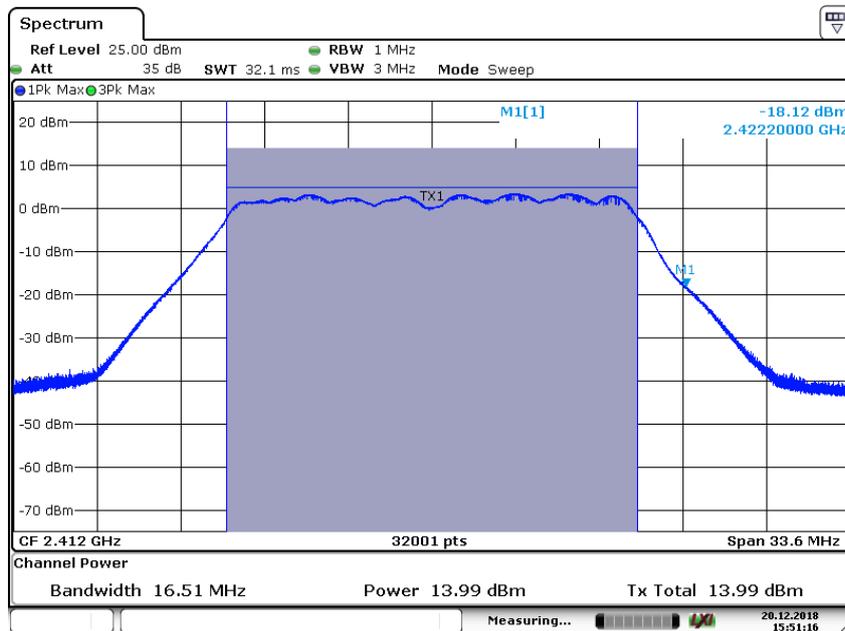
TEST REPORT

Channel 11: 2.462GHz:



Date: 20.DEC.2018 15:47:05

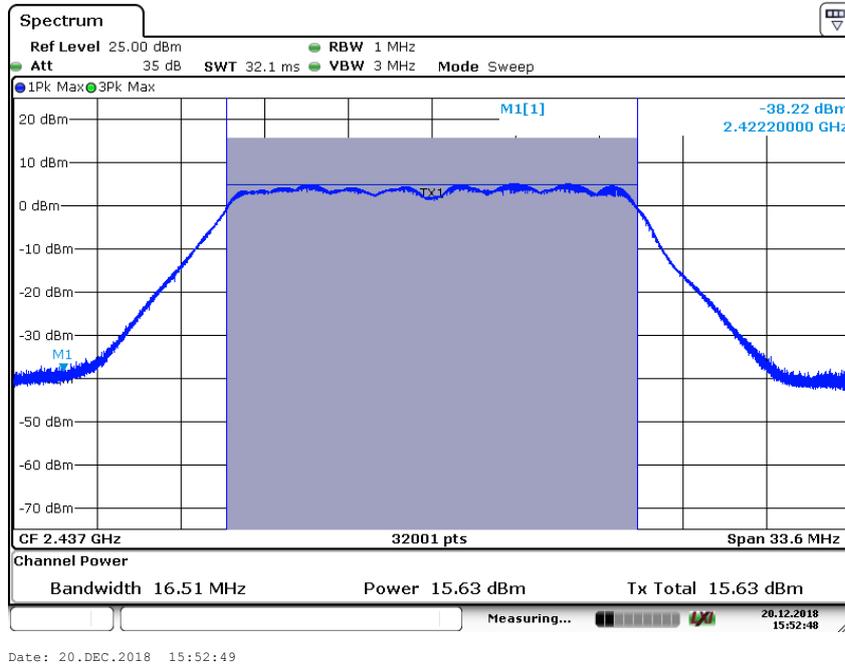
802.11g mode with 54Mbps data rate
Channel 1: 2.412GHz:



Date: 20.DEC.2018 15:51:16

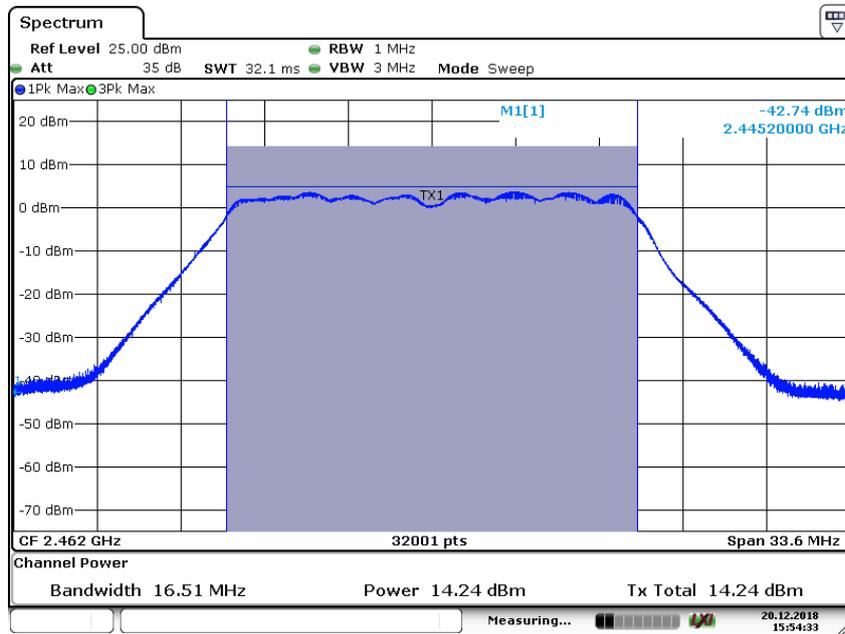
TEST REPORT

Channel 6: 2.437GHz:



Date: 20.DEC.2018 15:52:49

Channel 11: 2.462GHz:

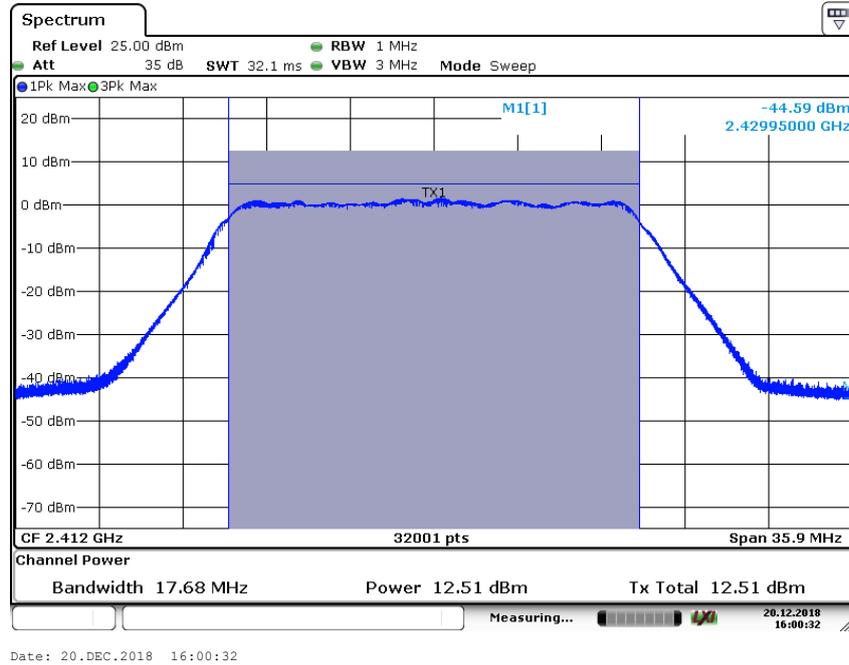


Date: 20.DEC.2018 15:54:34

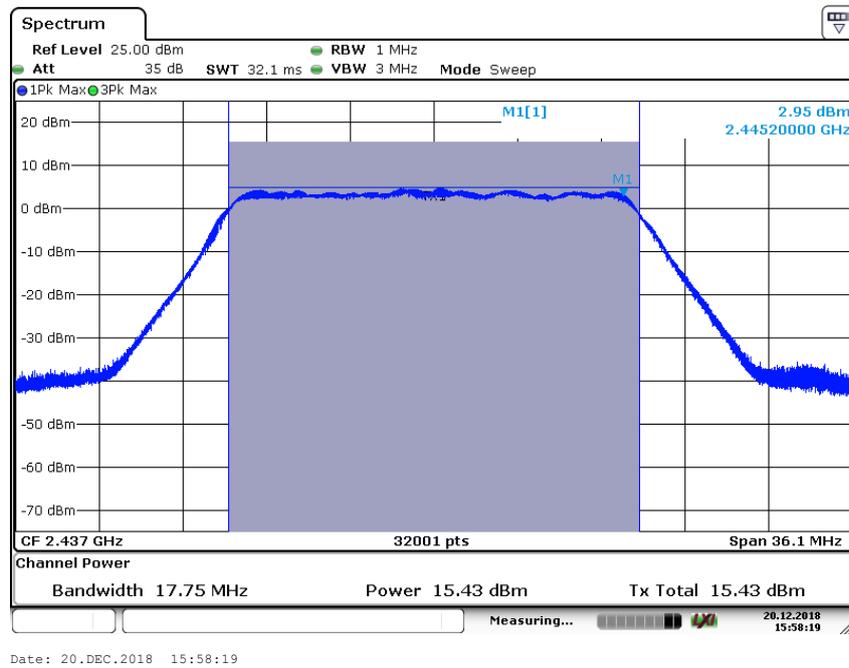
TEST REPORT

802.11n(HT20) mode with 65Mbps data rate

Channel 1: 2.412GHz:

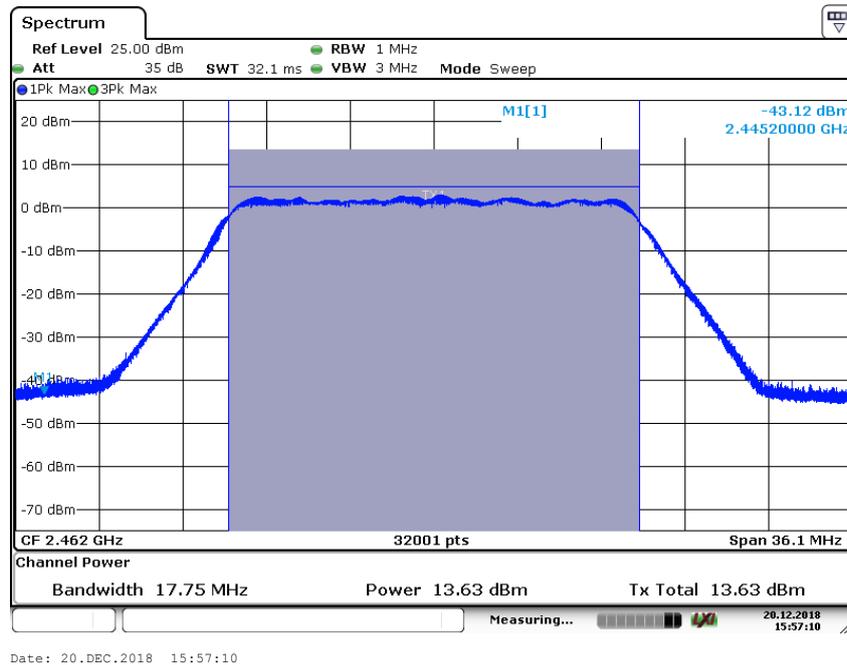


Channel 6: 2.437GHz:



TEST REPORT

Channel 11: 2.462GHz:



Test result: The unit does meet the FCC requirements.

4.4 Peak Power Spectral Density

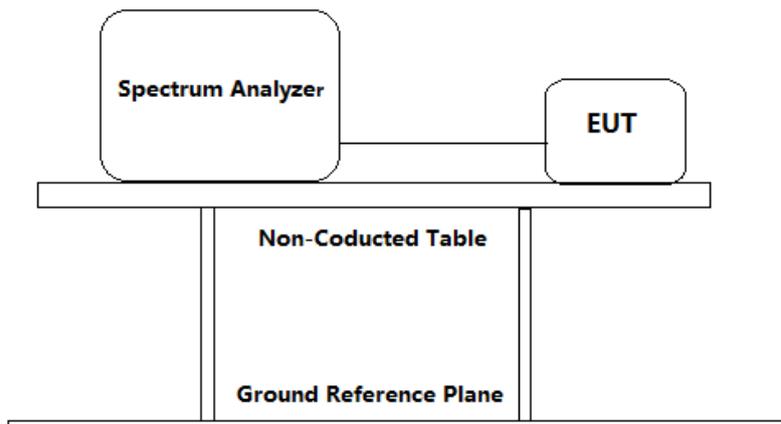
Test Requirement: FCC Part 15 C section 15.247
(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Method: ANSI C63.10: Clause 11.10.2

Test Status: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:

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Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable(cable loss =1.0 dB) from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer:
 - a) Set analyzer center frequency to DTS channel center frequency.
 - b) Set the span= $1.5 \times$ DTS bandwidth.
 - c) Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - d) Set the VBW $\geq [3 \times \text{RBW}]$.
 - e) Detector = peak.
 - f) Sweep time = auto couple.
 - g) Trace mode = max hold.
 - h) Allow trace to fully stabilize.
 - i) Use the peak marker function to determine the maximum amplitude level within the RBW.
 - j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
3. Measure the Power Spectral Density of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worst case.

Used Test Equipment List

Spectrum Analyzer. Refer to Clause 5 Test Equipment List for details.

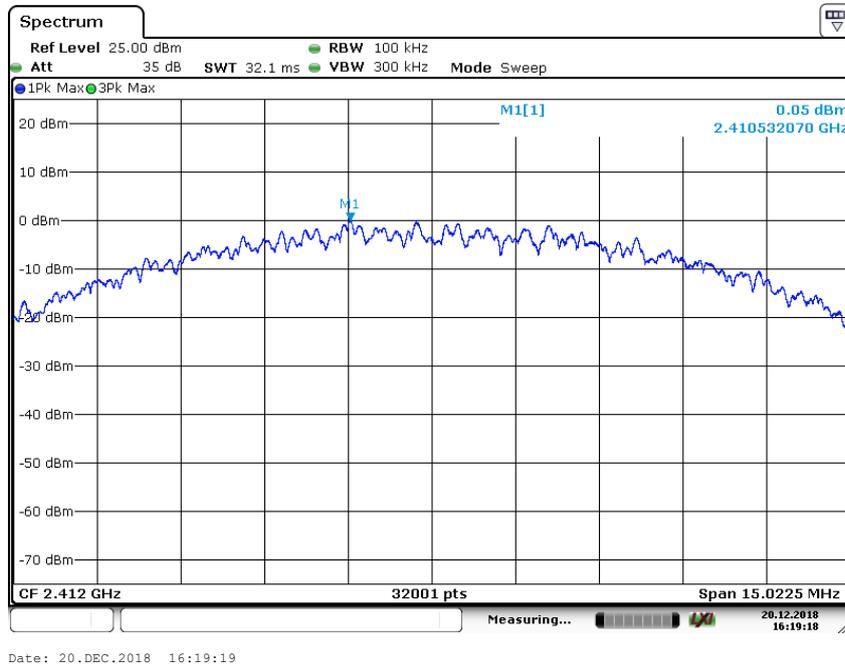
TEST REPORT

Test result:

Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Peak Power Spectral Density (dBm/100kHz)	Limit	Result
1	2412	802.11b	11 Mbps	1.05	8dBm/ 3 KHz	Pass
6	2437		11 Mbps	1.36		Pass
11	2462		11 Mbps	1.23		Pass
1	2412	802.11g	54 Mbps	-7.39		Pass
6	2437		54 Mbps	-5.58		Pass
11	2462		54 Mbps	-6.92		Pass
1	2412	802.11n (HT20)	65 Mbps	-8.19		Pass
6	2437		65 Mbps	-5.35		Pass
11	2462		65 Mbps	-7.07		Pass

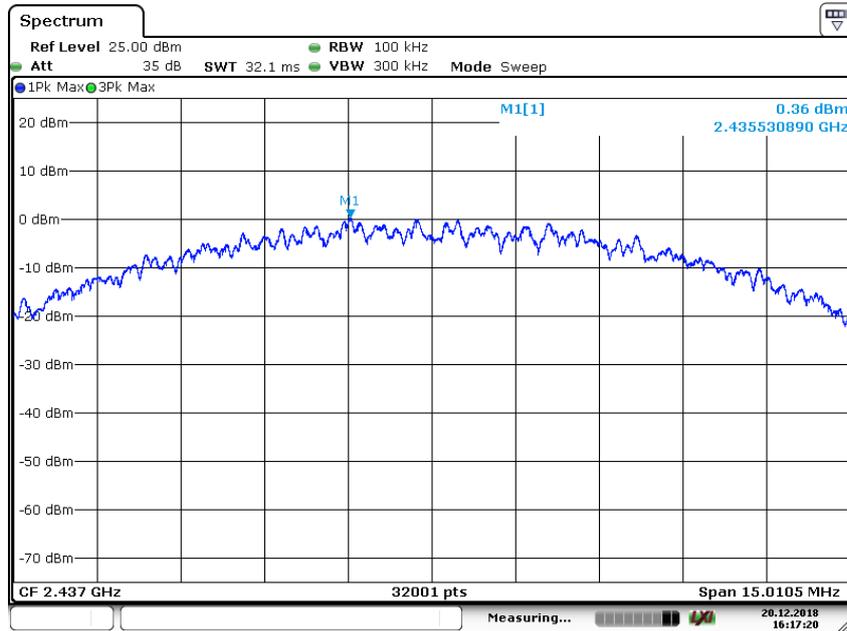
Result plot as follows:

802.11b mode with 11Mbps data rate
Channel 1: 2.412GHz:



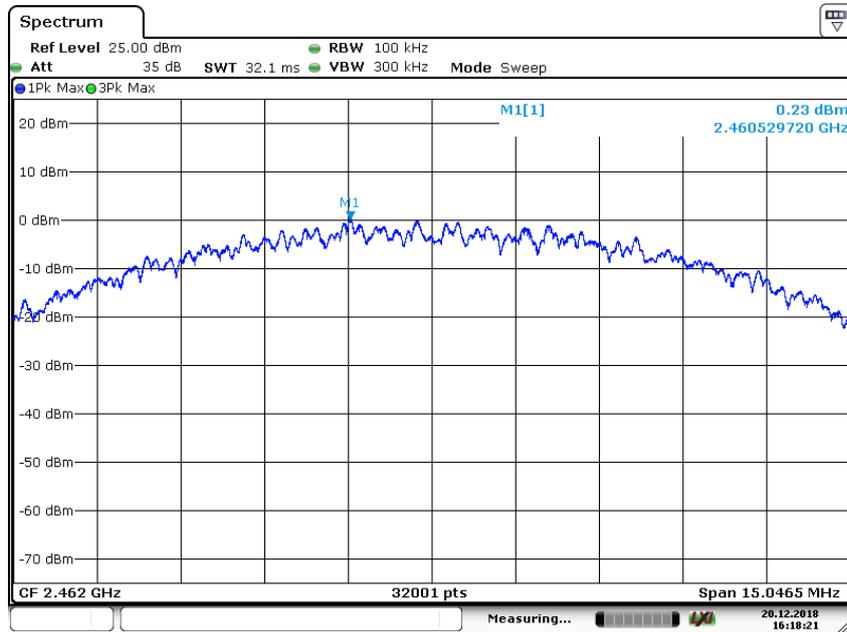
TEST REPORT

Channel 6: 2.437GHz:



Date: 20..DEC.2018 16:17:20

Channel 11: 2.462GHz:

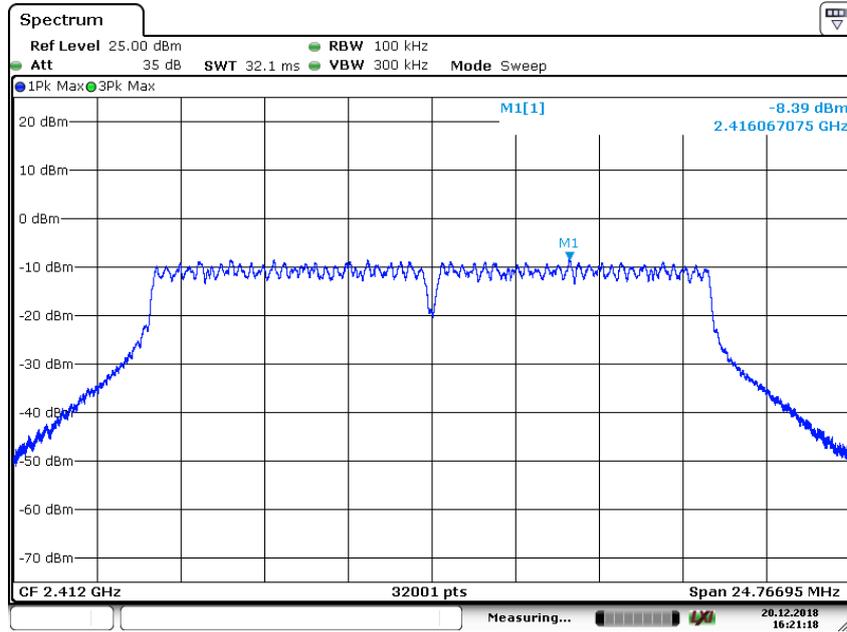


Date: 20..DEC.2018 16:18:21

TEST REPORT

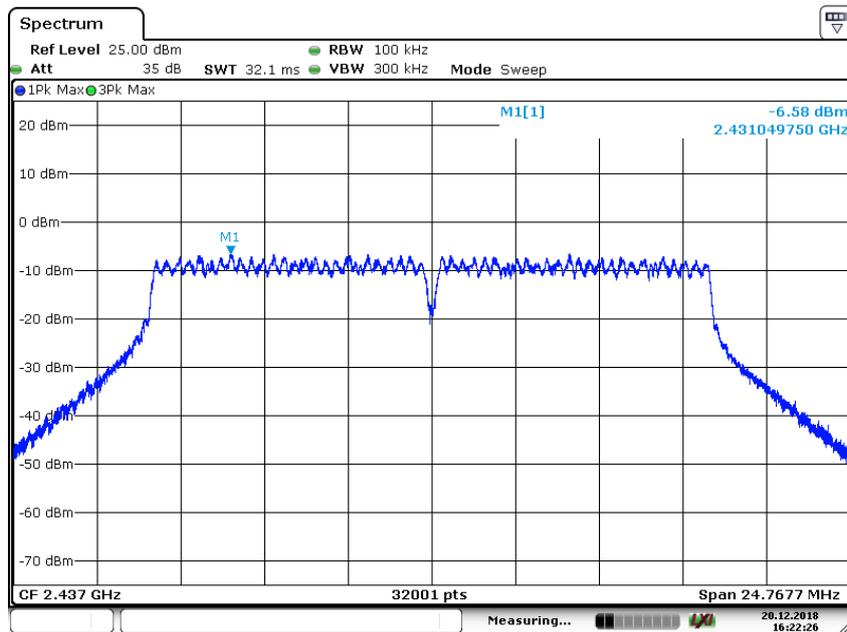
802.11g mode with 54Mbps data rate

Channel 1: 2.412GHz:



Date: 20.DEC.2018 16:21:19

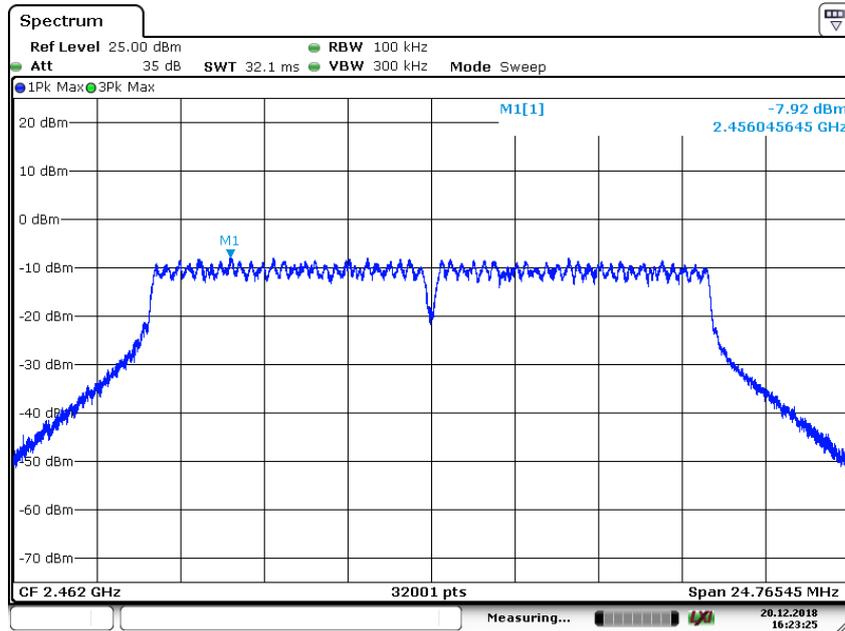
Channel 6: 2.437GHz:



Date: 20.DEC.2018 16:22:27

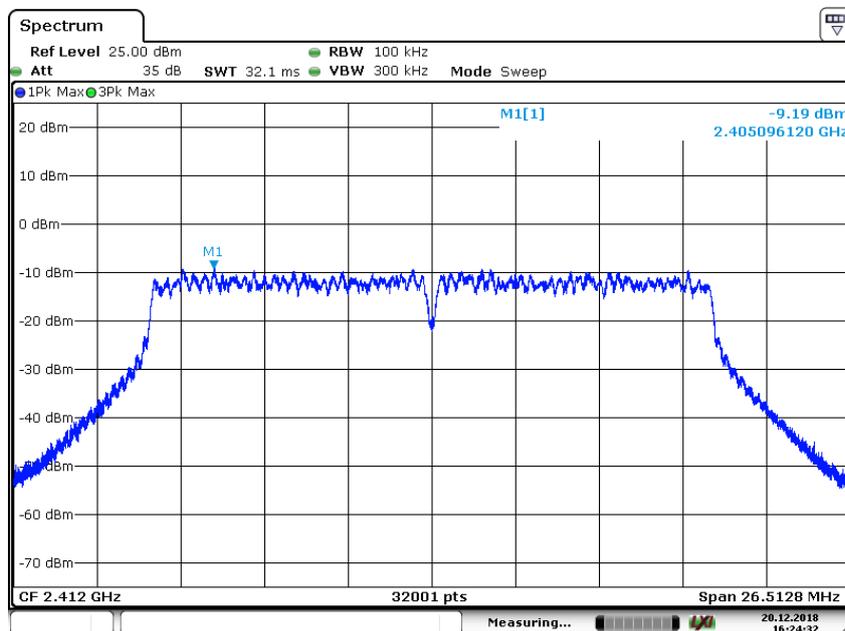
TEST REPORT

Channel 11: 2.462GHz:



Date: 20.DEC.2018 16:23:25

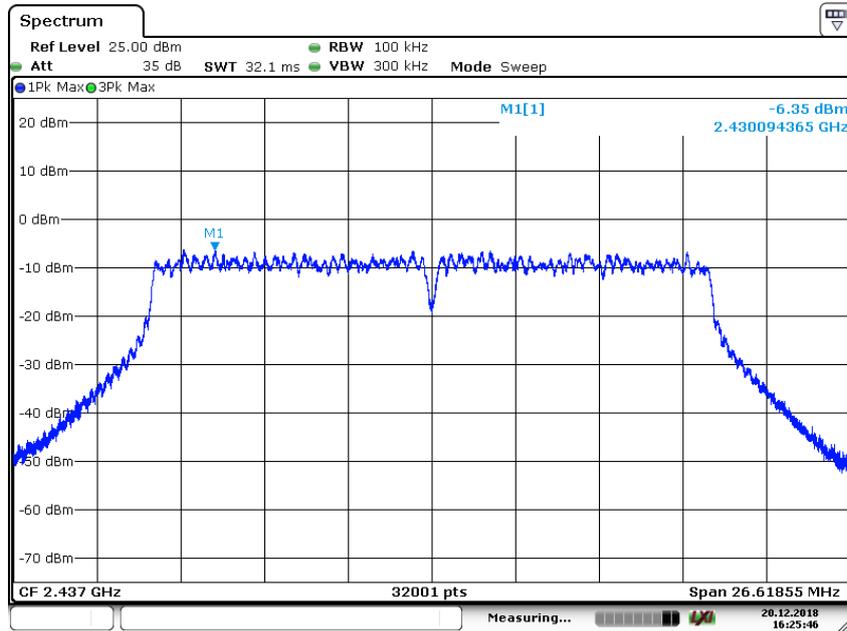
802.11n(HT20) mode with 65Mbps data rate
Channel 1: 2.412GHz:



Date: 20.DEC.2018 16:24:32

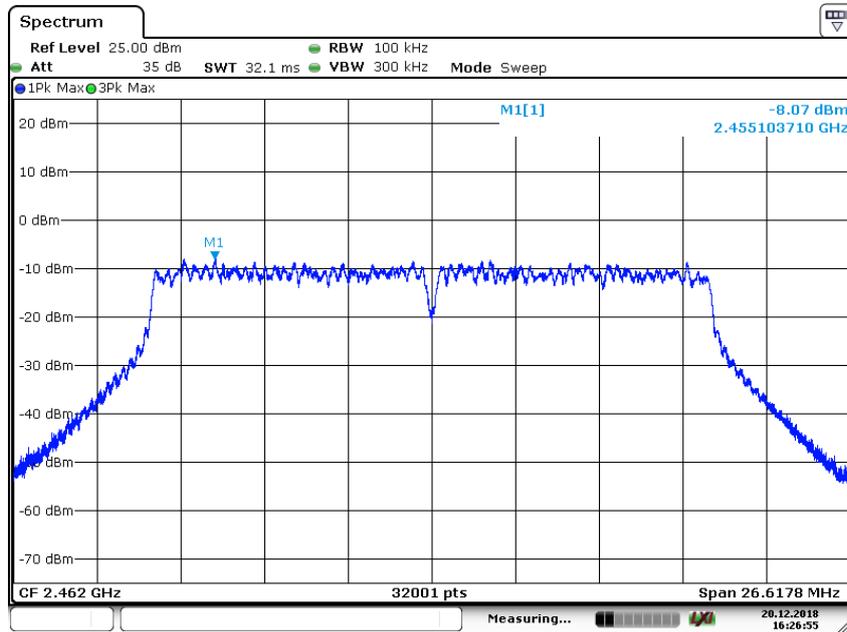
TEST REPORT

Channel 6: 2.437GHz:



Date: 20..DEC.2018 16:25:47

Channel 11: 2.462GHz:



Date: 20..DEC.2018 16:26:54

TEST REPORT

4.5 Out of Band Conducted Emissions

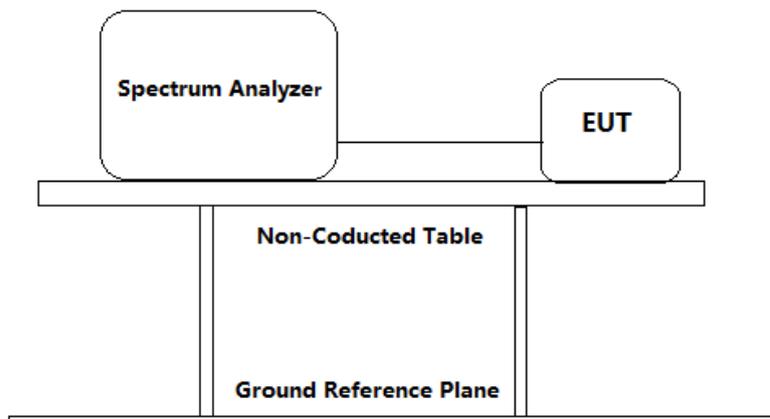
Test Requirement: FCC Part 15 C section 15.247

(d) 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.

Test Method: ANSI C63.10: Clause 11.11

Test Status: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable (cable loss =1.0dB) from the antenna port to the spectrum analyzer or power meter.
2. Establish a reference level by using the following procedure:
 - a) Set instrument center frequency to DTS channel center frequency.
 - b) Set the span to $\geq 1.5 \times$ DTS bandwidth.
 - c) Set the RBW = 100 kHz.
 - d) Set the VBW $\geq [3 \times$ RBW].
 - e) Detector = peak.
 - f) Sweep time = auto couple.
 - g) Trace mode = max hold.
 - h) Allow trace to fully stabilize.
 - i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to

TEST REPORT

- establish the reference level
3. Emission level measurement
 - a) Set the center frequency and span to encompass frequency range to be measured.
 - b) Set the RBW = 100 kHz.
 - c) Set the VBW $\geq [3 \times \text{RBW}]$.
 - d) Detector = peak.
 - e) Sweep time = auto couple.
 - f) Trace mode = max hold.
 - g) Allow trace to fully stabilize.
 - h) Use the peak marker function to determine the maximum amplitude level.
 4. Measure the Conducted unwanted Emissions of the test frequency with special test status.
 5. Repeat until all the test status is investigated.
 6. Report the worst case.

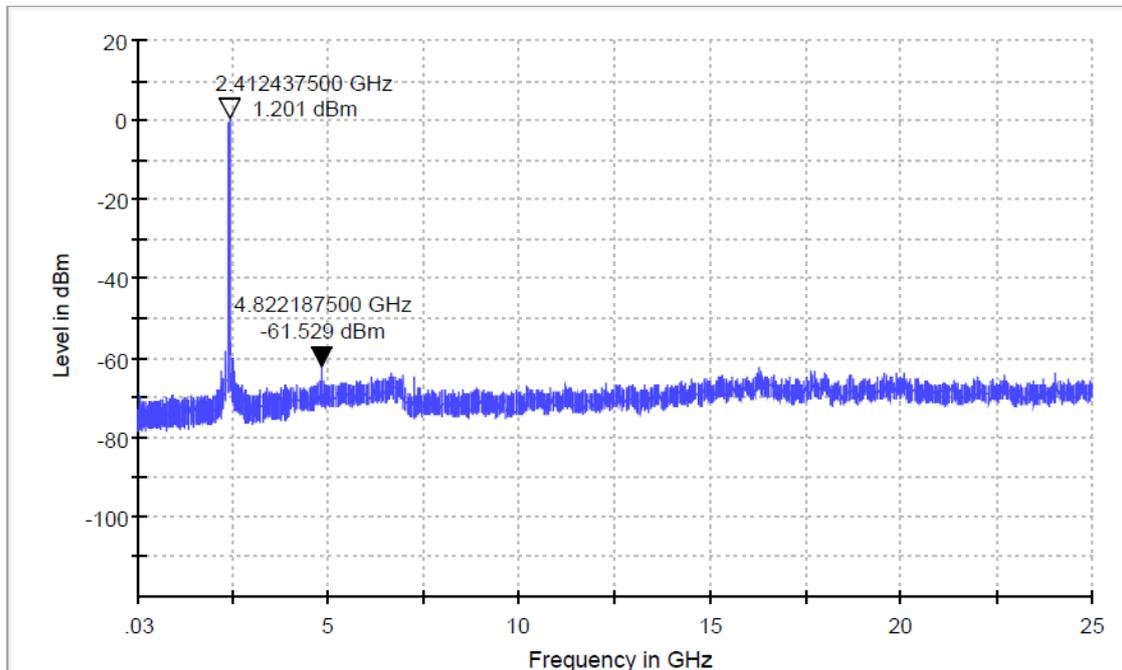
Used Test Equipment List

Spectrum Analyzer. Refer to Clause 5 Test Equipment List for details.

Result plot as follows:

802.11b mode with 11Mbps data rate

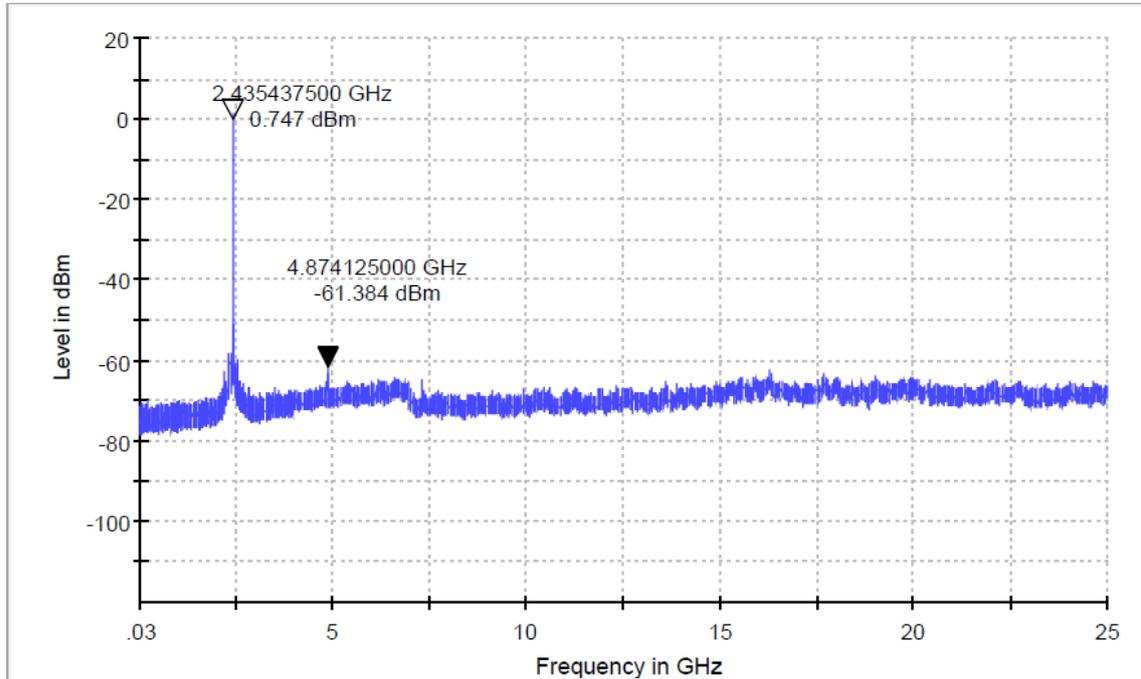
Channel 1: 2.412GHz:



In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

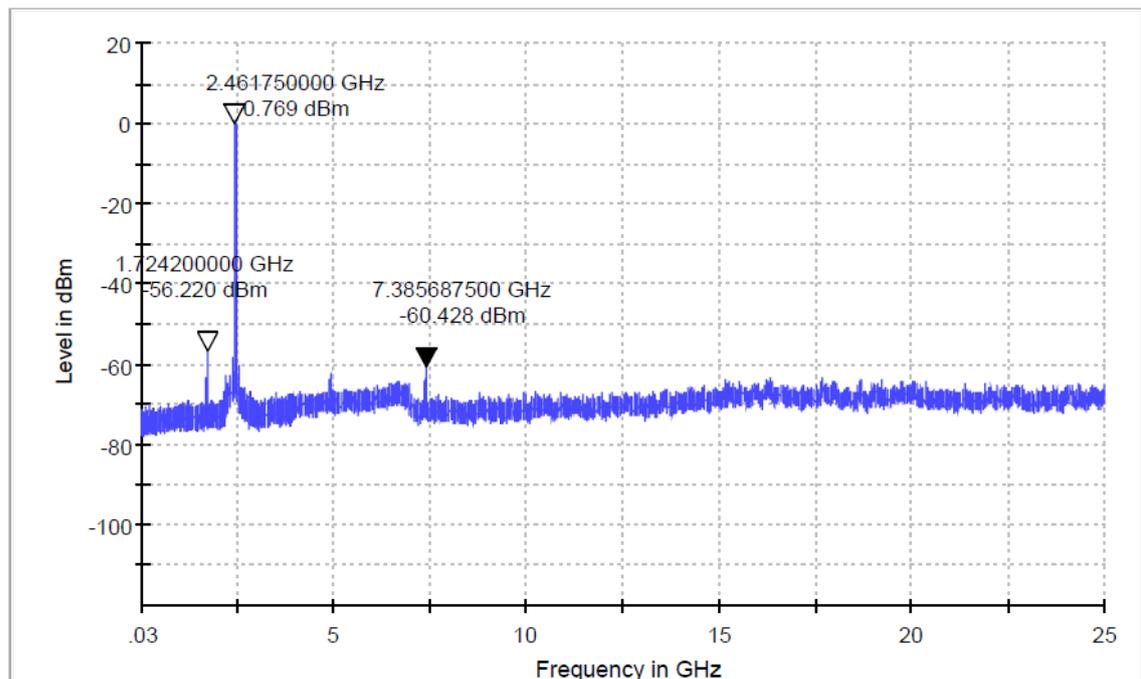
TEST REPORT

Channel 6: 2.437GHz:



In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

Channel 11: 2.462 GHz:



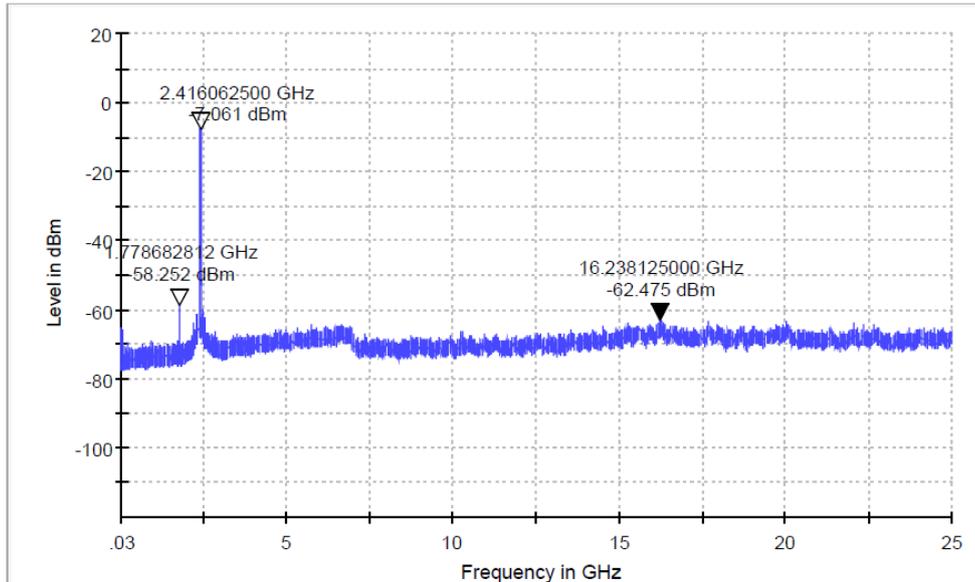
In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of

TEST REPORT

the desired power.

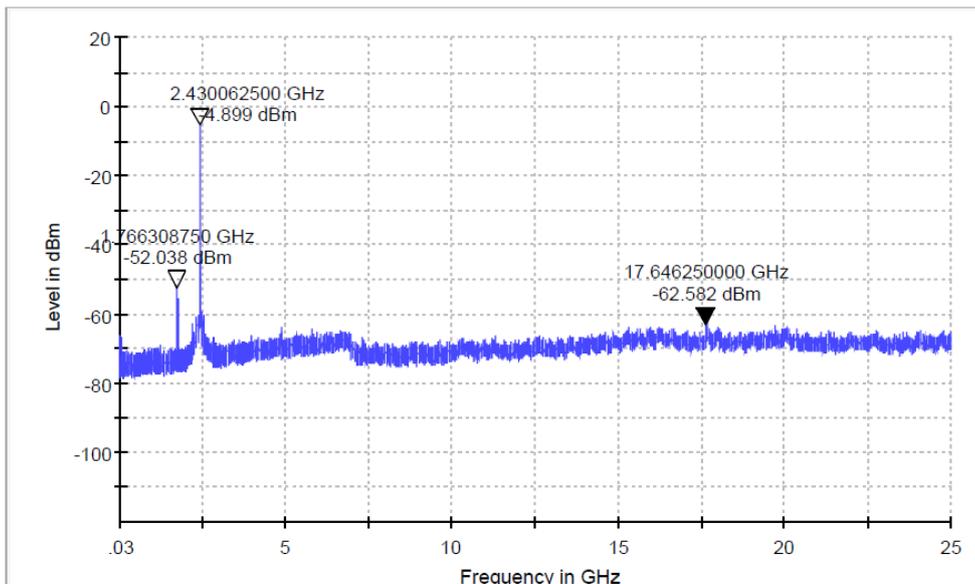
802.11g mode with 54Mbps data rate

Channel 1: 2.412GHz:



In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

Channel 6: 2.437GHz:

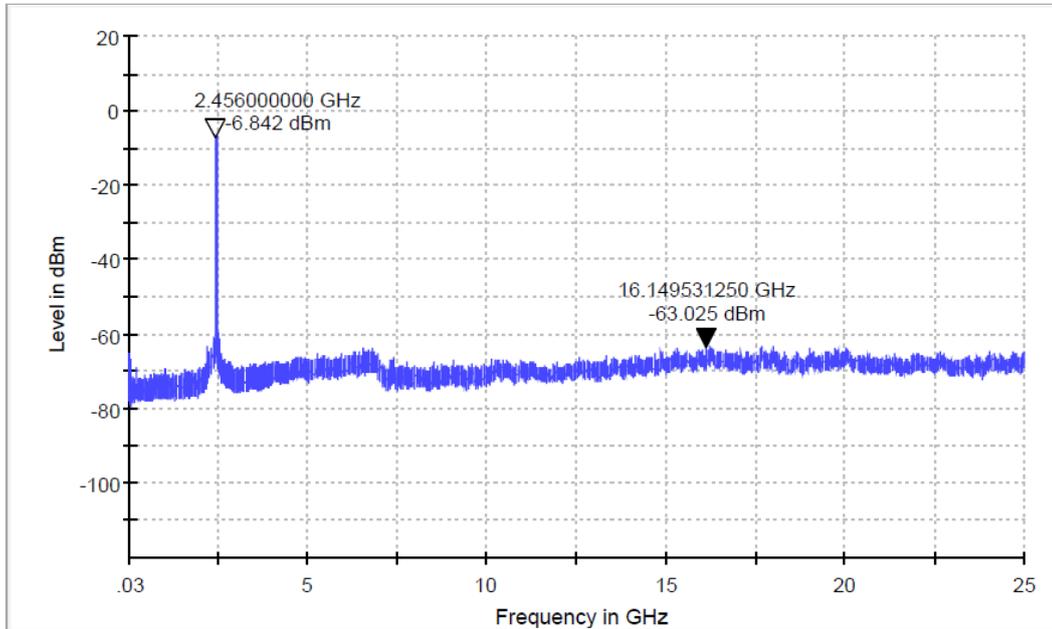


In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of

TEST REPORT

the desired power.

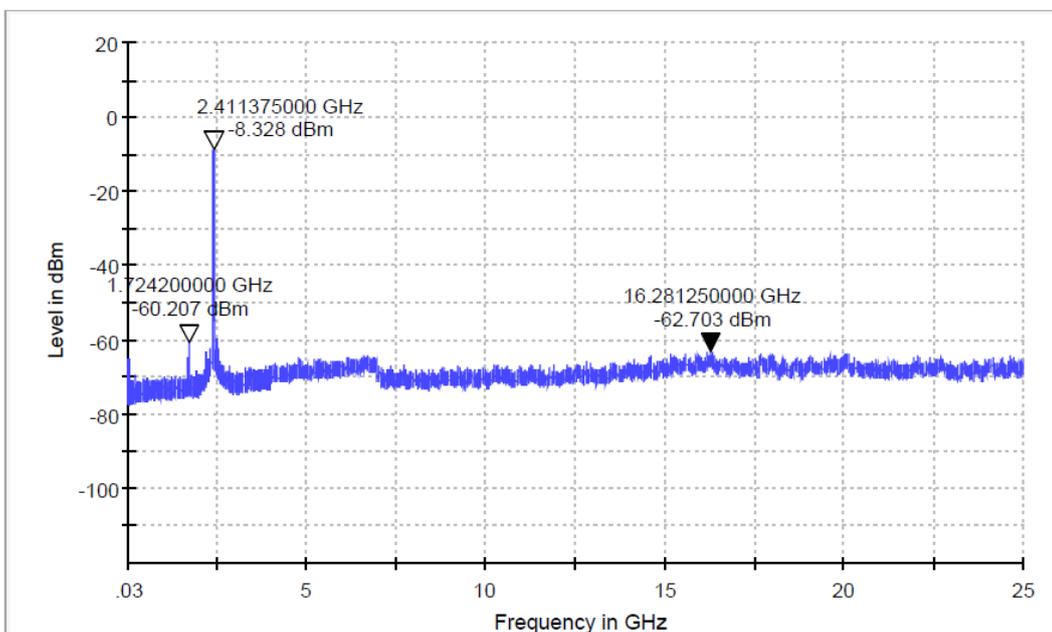
Channel 11: 2.462 GHz:



In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

802.11n(HT20) mode with 65Mbps data rate

Channel 1: 2.412GHz:

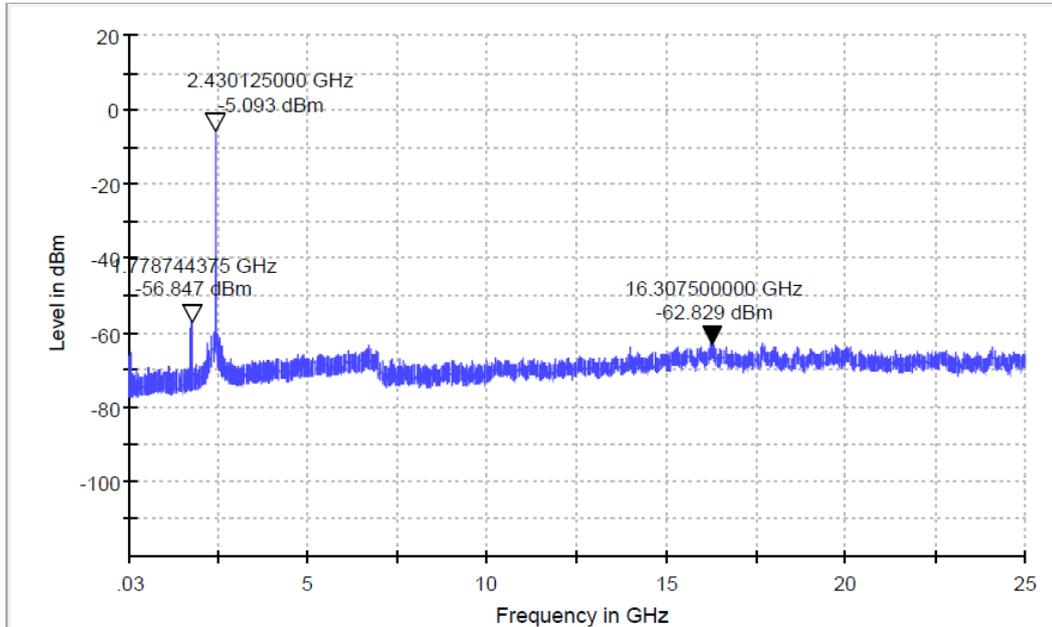


In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were

TEST REPORT

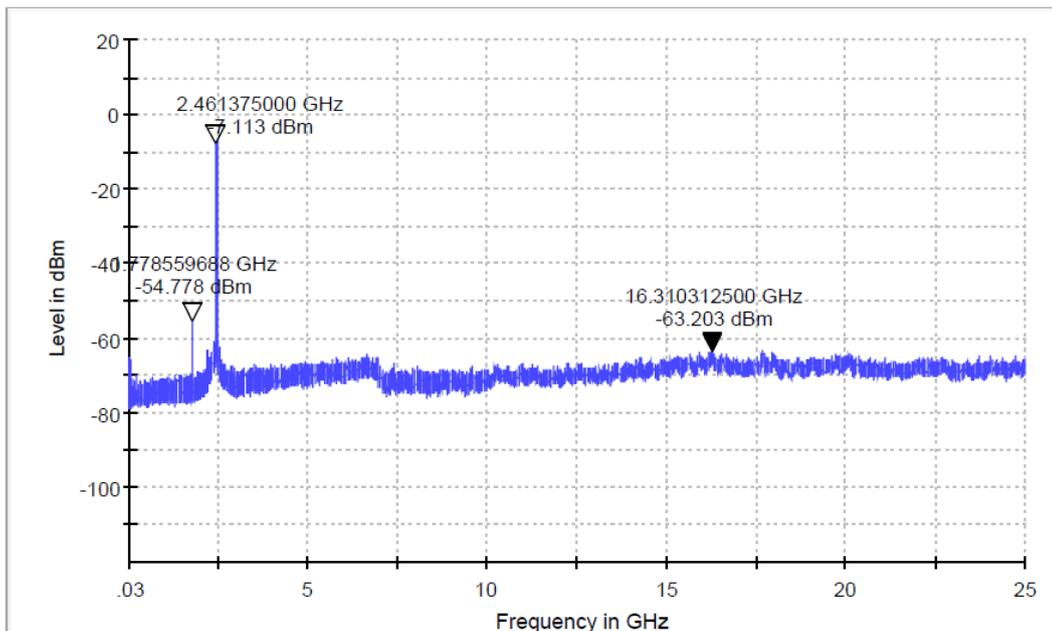
greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

Channel 6: 2.437GHz:



In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

Channel 11: 2.462 GHz:



In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were

TEST REPORT

greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

4.6 Out of Band Radiated Emissions

For out of band radiated emissions into Non-Restricted Frequency Bands were performed at a 3m separation distance to determine whether these emissions complied with the 20dB attenuation requirement.

- Not required, since all emissions are more than 20dB below fundamental
 See attached data sheet

4.7 Radiated Emissions in Restricted Bands

Test Requirement:	FCC Part 15 C section 15.247 (d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10: Clause 11.12.1, 6.4, 6.5 and 6.6
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	40.0 dB μ V/m between 30MHz & 88MHz; 43.5 dB μ V/m between 88MHz & 216MHz; 46.0 dB μ V/m between 216MHz & 960MHz; 54.0 dB μ V/m above 960MHz.
Detector:	For Peak and Quasi-Peak value: RBW = 1 MHz for $f \geq 1$ GHz, 200 Hz for 9 kHz to 150 kHz 9 kHz for 150 kHz to 30 MHz 120 kHz for 30 MHz to 1GHz VBW \geq RBW Sweep = auto Detector function = peak for $f \geq 1$ GHz, QP for $f < 1$ GHz Trace = max hold For AV value:

TEST REPORT

Field Strength Calculation:

RBW = 1 MHz for $f \geq 1$ GHz
VBW=10 Hz
Sweep = auto
Trace = max hold

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below:

Where:

$FS = RA + AF + CF - AG + PD + AV$
FS = Field Strength in dB μ V/m
RA = Receiver Amplitude (including preamplifier) in dB μ V
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB
Correct Factor = AF + CF - AG + PD

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$FS = RA + AF + CF - AG + PD + AV$
Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m.

RA = 62.0 dB μ V
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
AV = -10 dB
Correct Factor = 7.4 + 1.6 - 29.0 + 0 = -20 dB
FS = 62 + (-20) + (-10) = 32 dB μ V/m

Section 15.205 Restricted bands of operation.

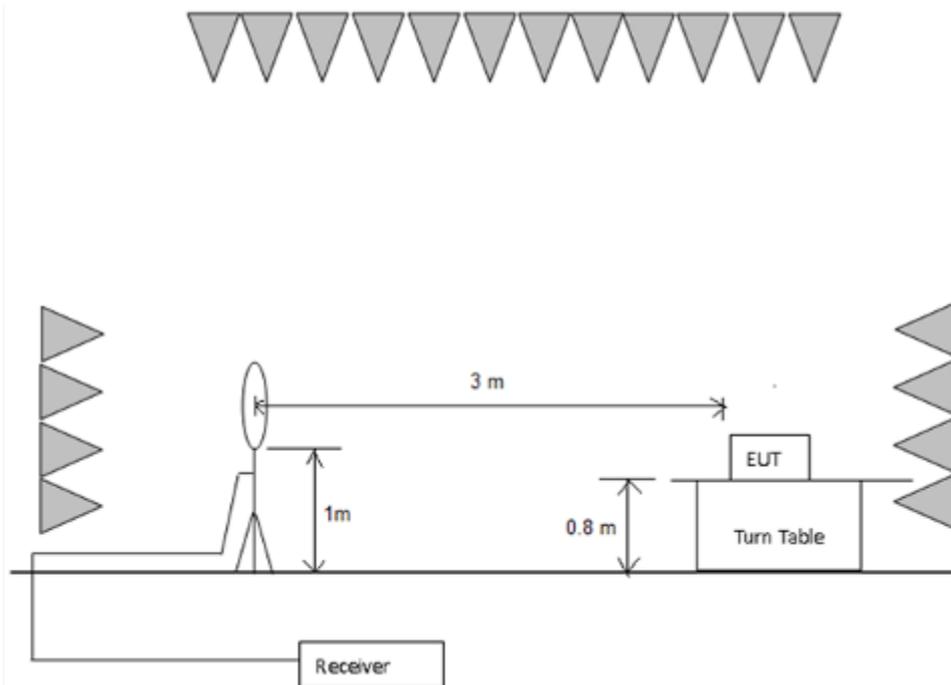
(a) Except as shown in paragraph (d) of this section. Only spurious emissions are permitted in any of the frequency bands listed below:

TEST REPORT

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
10.495 - 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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

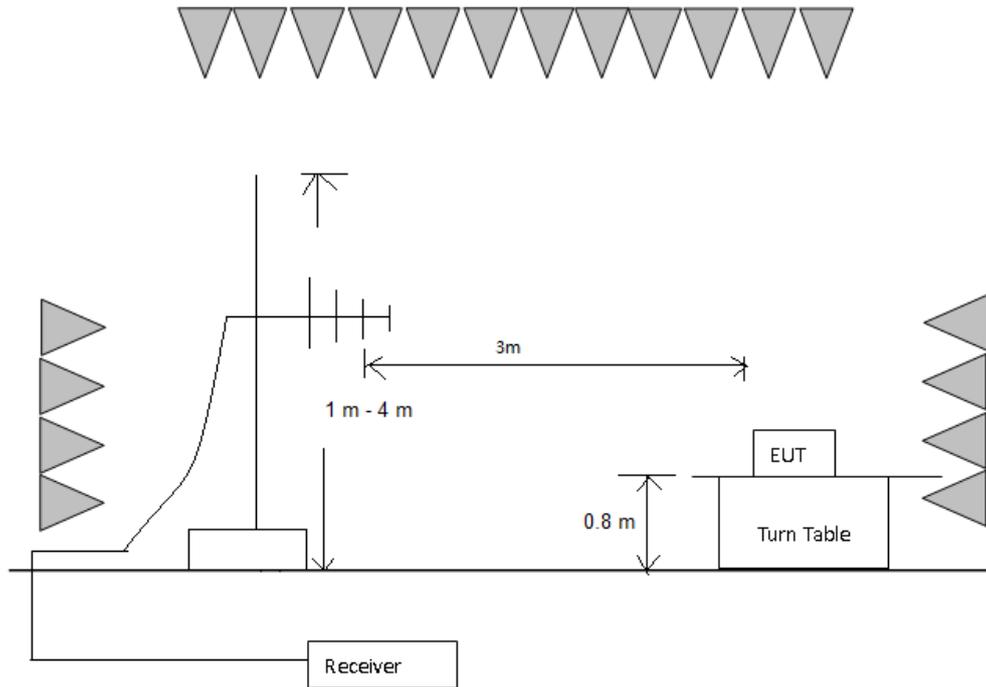
Test Configuration:

- 1) 9 kHz to 30 MHz emissions:

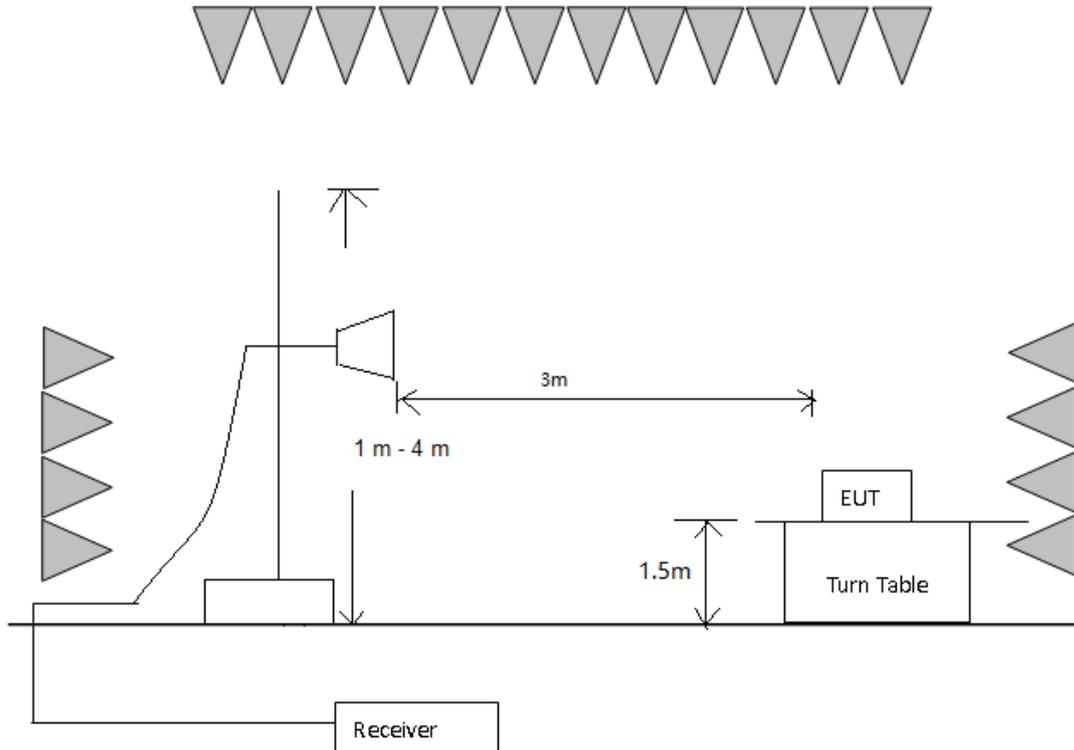


- 2) 30 MHz to 1 GHz emissions:

TEST REPORT



3) 1 GHz to 40 GHz emissions:



Test Procedure:

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

The receiver was scanned from 9 kHz to 25 GHz. When an emission was found, the table was

TEST REPORT

rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

Used Test Equipment List:

3m Semi-Anechoic Chamber, EMI Test Receiver (9 kHz~7 GHz), Signal and Spectrum Analyzer (10 Hz~40 GHz), Loop antenna (9 kHz-30 MHz). TRILOG Super Broadband test Antenna(30 MHz-3 GHz) (RX), Bouble-Ridged Waveguide Horn Antenna (800 MHz-18 GHz)(RX) and High Frequency Antenna & preamplifier(18 GHz~26.5 GHz) (RX). Refer to Clause 5 Test Equipment List for details.

802.11b mode with 11Mbps data rate

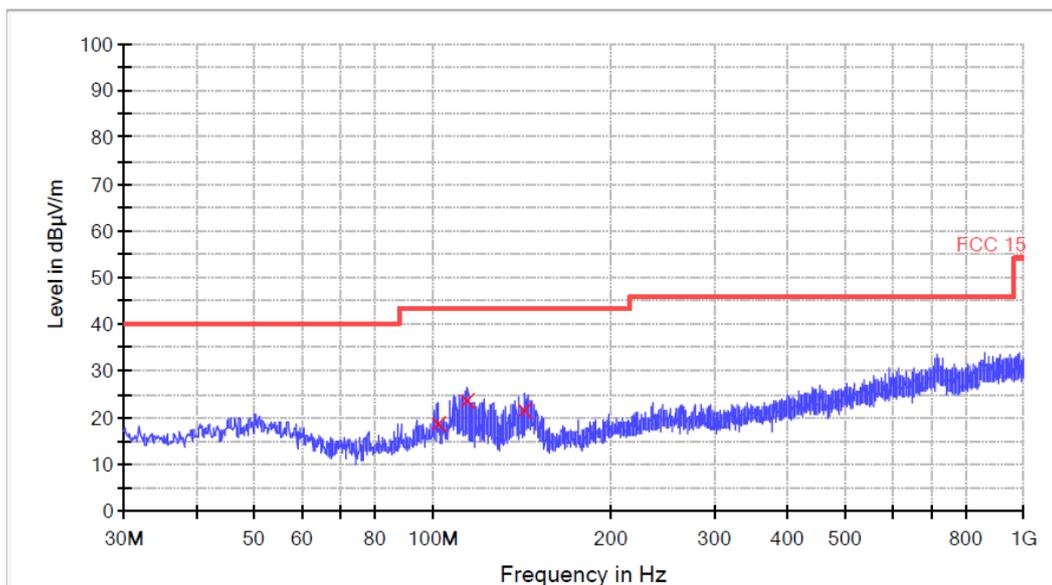
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 1 (2.412 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:



TEST REPORT

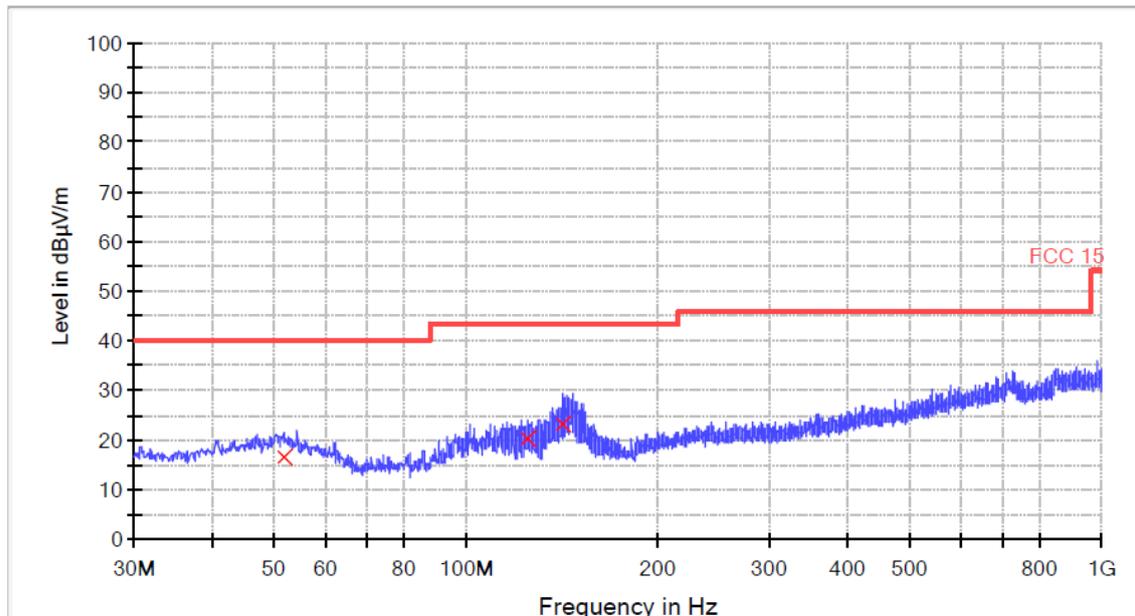
QP

Frequency (MHz)	Quasi Peak (dBμV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
101.920000	18.5	120.000	V	12.6	25.0	43.5
114.760000	23.5	120.000	V	12.1	20.0	43.5
143.360000	21.6	120.000	V	9.7	21.9	43.5

Remark:

1. Corr. (dB) = Antenna Factor (dB) + Cable Loss (dB)
2. Quasi Peak (dBμV/m) = Corr. (dB) + Read Level (dBμV)
3. Margin (dB) = Limit QPK (dBμV/m) – Quasi Peak (dBμV/m)

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBμV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
51.720000	16.4	120.000	H	14.9	23.7	40.0
125.040000	20.4	120.000	H	10.0	23.1	43.5
142.280000	23.3	120.000	H	9.7	20.2	43.5

Remark:

1. Corr. (dB) = Antenna Factor (dB) + Cable Loss (dB)
2. Quasi Peak (dBμV/m) = Corr. (dB) + Read Level (dBμV)
3. Margin (dB) = Limit QPK (dBμV/m) – Quasi Peak (dBμV/m)

TEST REPORT

1~25 GHz Radiated Emissions.

PK Measurement:

Frequency (MHz)	PK Reading Level (dB μ V)	Correction factors (dB/m)	PK Emission Level (dB μ V/m)	PK Limit (dB μ V/m)	Antenna polarization
1535.500	56.237	-12.7	43.537	74	V
1971.125	50.156	-11.1	39.056	74	V
3163.250	45.435	-5.9	39.535	74	V
1535.500	62.182	-12.7	49.482	74	H
2413.125	46.879	-9.0	37.879	74	H
3071.875	47.356	-6.1	41.256	74	H

AV Measurement:

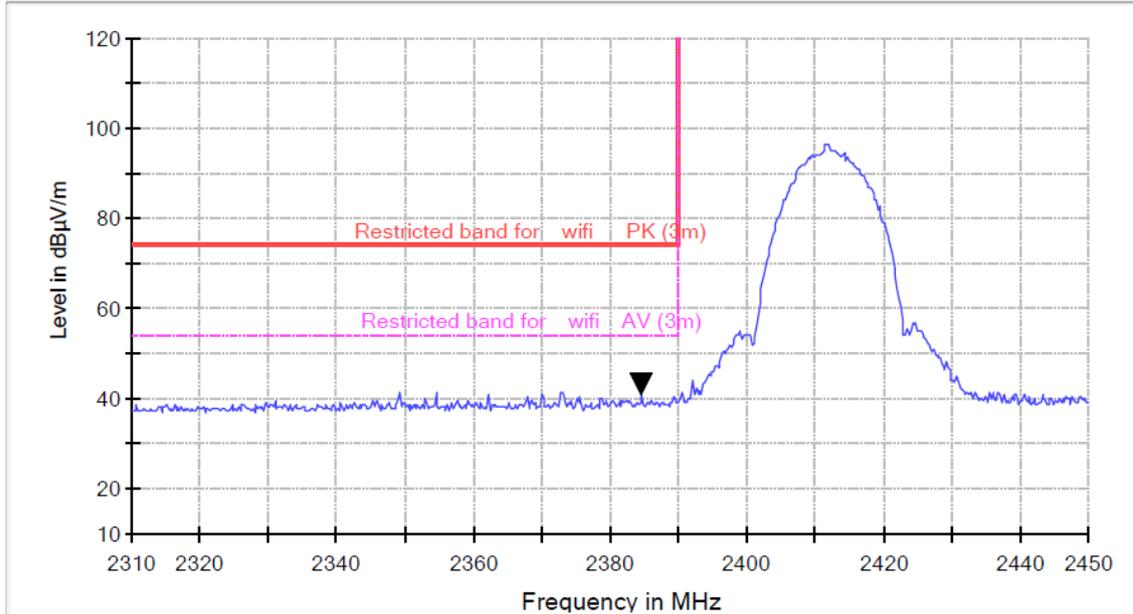
Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
1971.125	-	-11.1	-	54	V
3163.250	-	-5.9	-	54	V
1535.500	-	-12.7	-	54	H
2413.125	-	-9.0	-	54	H
3071.875	-	-6.1	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

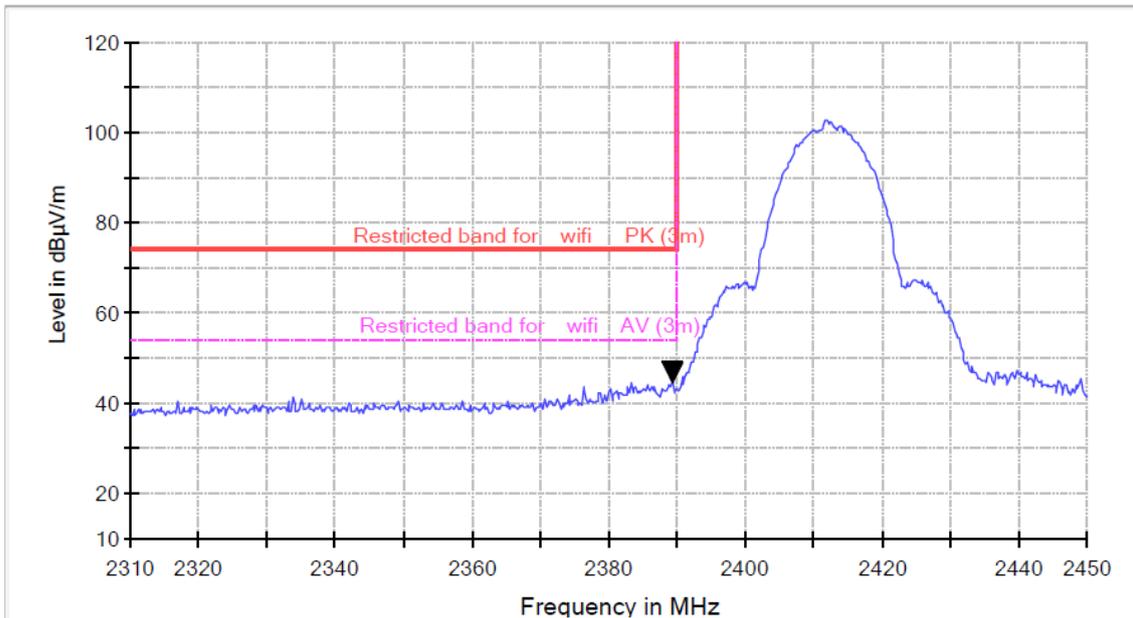
TEST REPORT

Restricted Bands Measurement

Vertical



Horizontal



TEST REPORT

PK Measurement:

Frequency (MHz)	PK Reading Level (dB μ V)	Correction factors (dB/m)	PK Emission Level (dB μ V/m)	PK Limit (dB μ V/m)	Antenna polarization
2386.575	57.623	-9.1	48.523	74	V
2389.333	53.963	-9.1	44.863	74	H

AV Measurement:

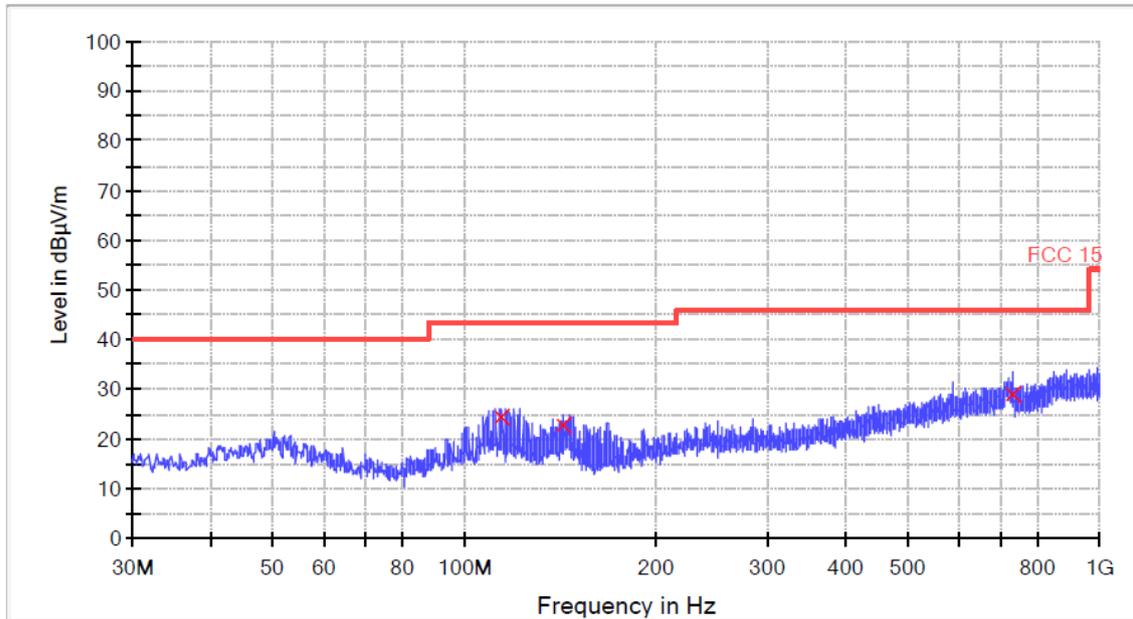
Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
2386.575	-	-9.1	-	54	V
2389.333	-	-9.1	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

TEST REPORT

Test at Channel 6 (2.437 GHz) in transmitting status
30 MHz~1 GHz Radiated Emissions .Quasi-Peak Measurement

Vertical:

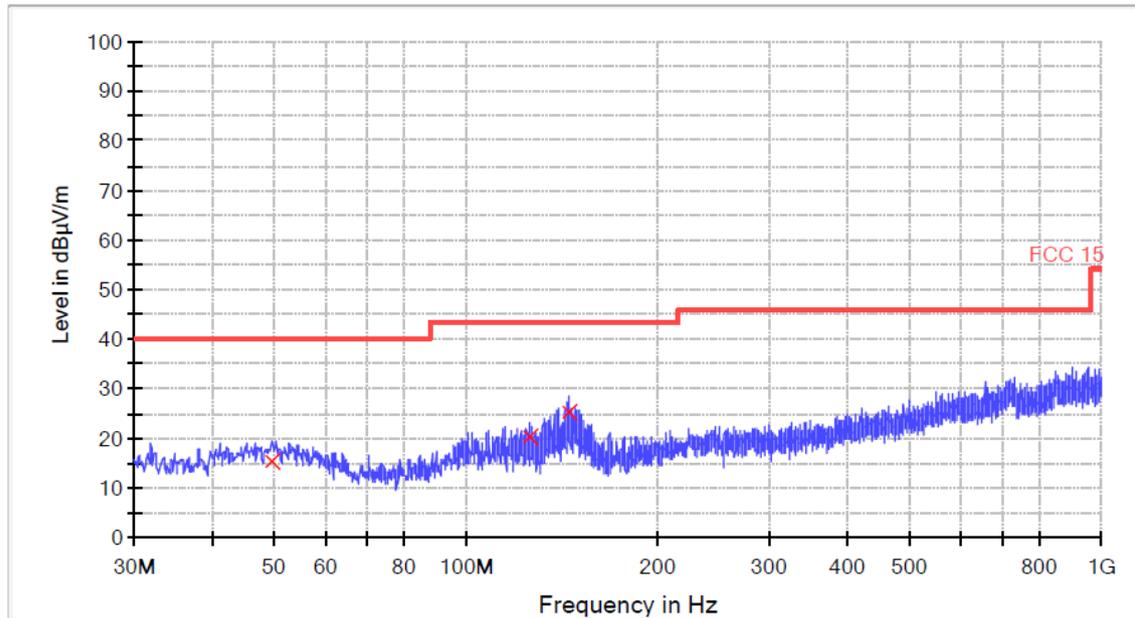


QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
114.760000	24.3	120.000	V	12.1	19.2	43.5
143.360000	22.9	120.000	V	9.7	20.6	43.5
729.000000	28.9	120.000	V	23.2	17.1	46.0

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
49.520000	15.1	120.000	H	15.2	24.9	40.0
125.800000	20.1	120.000	H	9.8	23.4	43.5
145.440000	25.3	120.000	H	9.8	18.2	43.5

1~25 GHz Radiated Emissions.

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	56.442	-12.7	43.742	74	V
3171.750	48.908	-5.9	43.008	74	V
7309.125	41.096	6.6	47.696	74	V
1535.500	61.616	-12.7	48.916	74	H
2436.500	48.711	-8.9	39.811	74	H
3071.875	47.952	-6.1	41.852	74	H

TEST REPORT

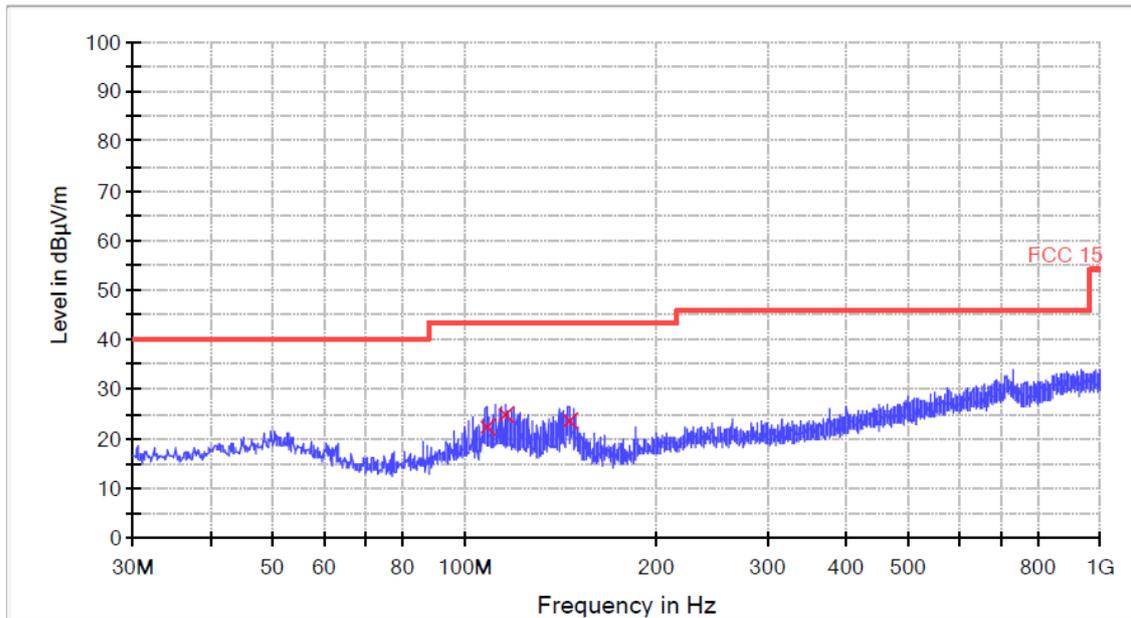
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
3171.750	-	-5.9	-	54	V
7309.125	-	6.6	-	54	V
1535.500	-	-12.7	-	54	H
2436.500	-	-8.9	-	54	H
3071.875	-	-6.1	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded

Test at Channel 11 (2.462 GHz) in transmitting status
30 MHz~1 GHz Radiated Emissions .Quasi-Peak Measurement

Vertical:

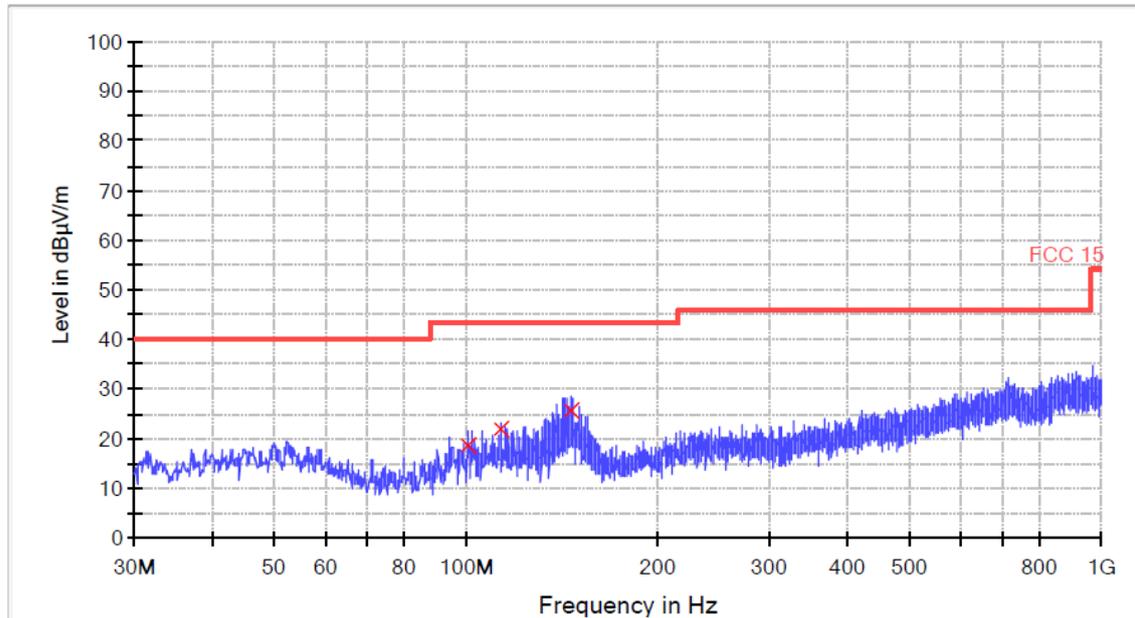


QP

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
108.200000	22.3	120.000	V	13.0	21.2	43.5
115.960000	24.6	120.000	V	11.8	18.9	43.5
145.920000	23.6	120.000	V	9.8	19.9	43.5

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
100.680000	18.4	120.000	H	12.6	25.1	43.5
113.800000	21.7	120.000	H	12.3	21.8	43.5
146.400000	25.8	120.000	H	9.8	17.7	43.5

1~25 GHz Radiated Emissions. Peak & Average Measurement

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	54.266	-12.7	41.566	74	V
1954.125	53.921	-11.2	42.721	74	V
4162.000	45.873	-3.8	42.073	74	V
1535.500	58.911	-12.7	46.211	74	H
3071.875	46.525	-6.1	40.425	74	H
4922.750	43.949	-2.5	41.449	74	H

TEST REPORT

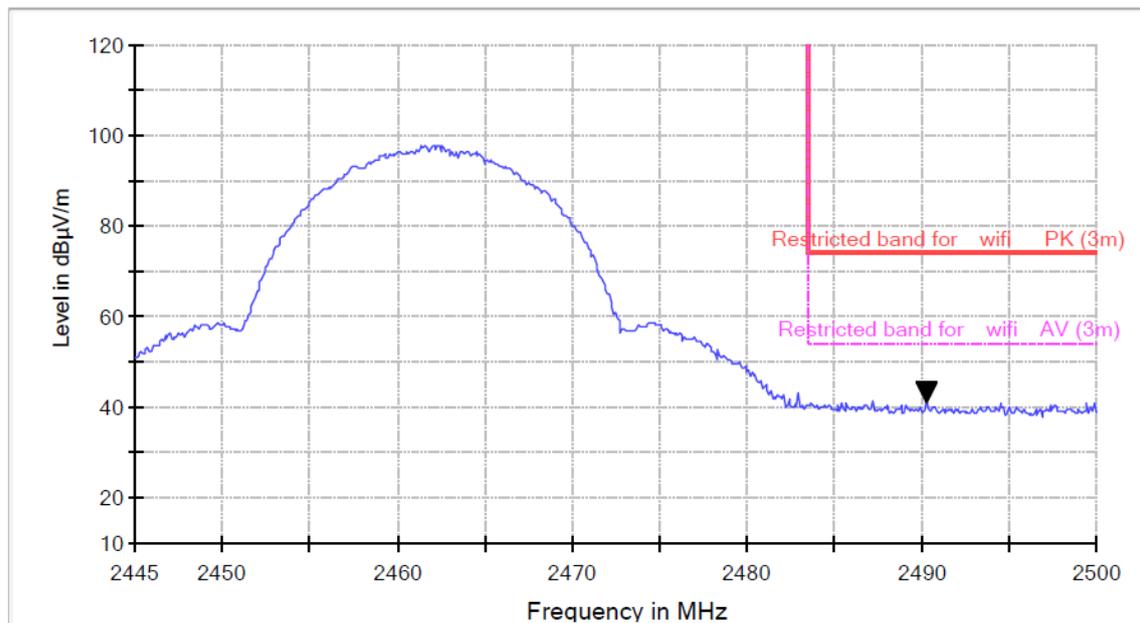
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
1954.125	-	-11.2	-	54	V
4162.000	-	-3.8	-	54	V
1535.500	-	-12.7	-	54	H
3071.875	-	-6.1	-	54	H
4922.750	-	-2.5	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

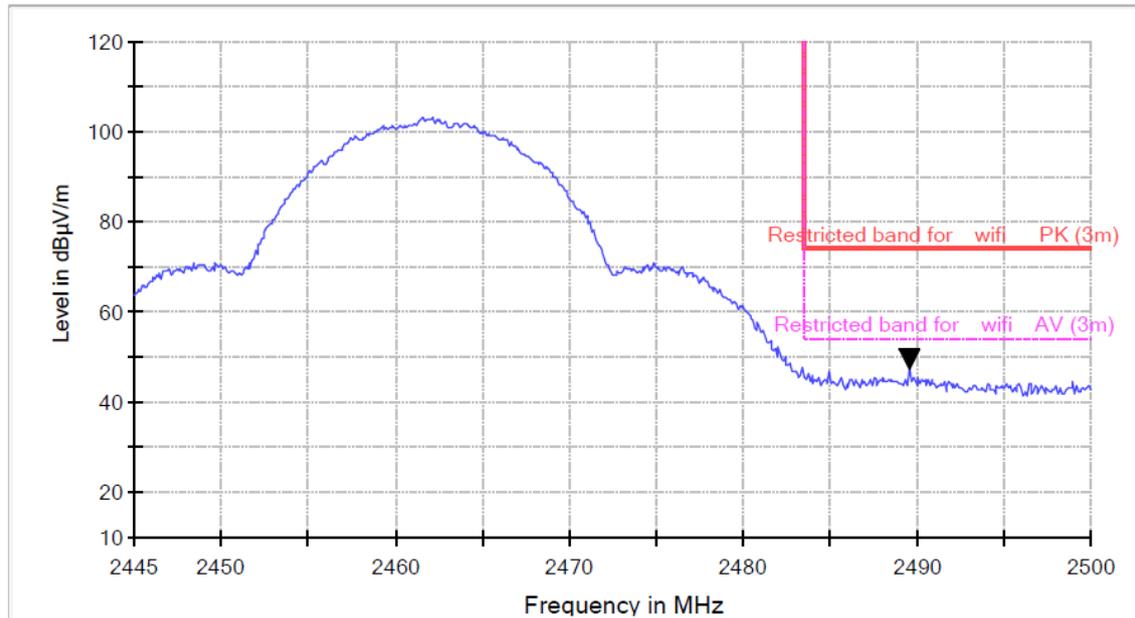
Restricted Bands Measurement

Vertical



TEST REPORT

Horizontal



PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
2490.283	49.838	-8.7	41.138	74	V
2489.550	56.42	-8.7	47.720	74	H

AV Measurement:

Frequency (MHz)	AV Reading Level (dBµV)	Correction factors (dB/m)	AV Emission Level (dBµV/m)	AV Limit (dBµV/m)	Antenna polarization
2490.283	-	-8.7	-	54	V
2489.550	-	-8.7	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

802.11g mode with 54Mbps data rate

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

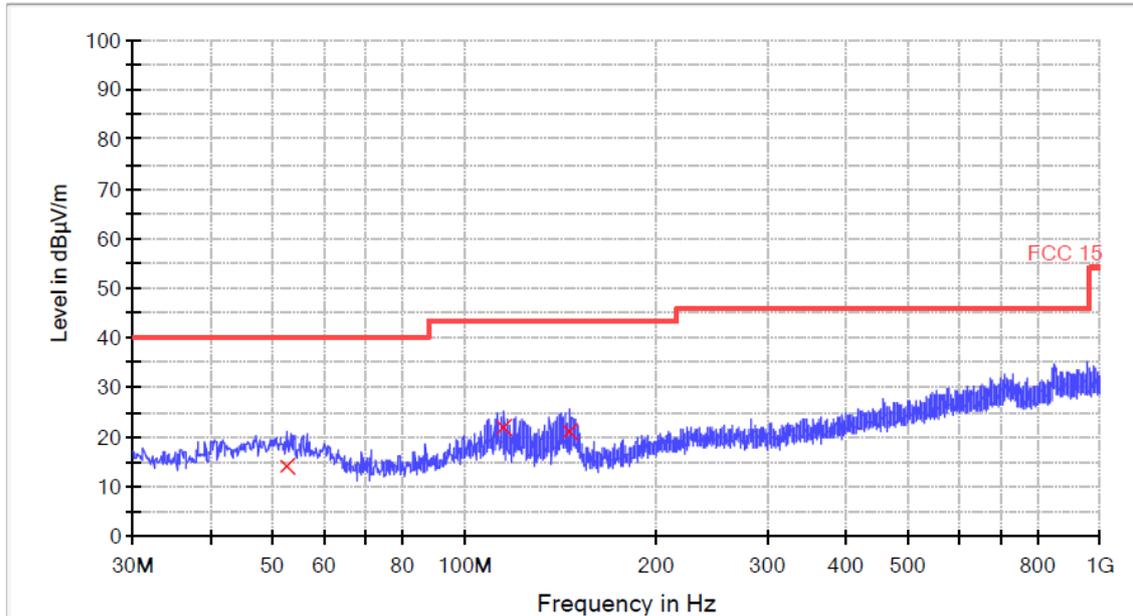
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 1 (2.412 GHz) in transmitting status

30 MHz~1 Radiated Emissions .Quasi-Peak Measurement

TEST REPORT

Vertical:

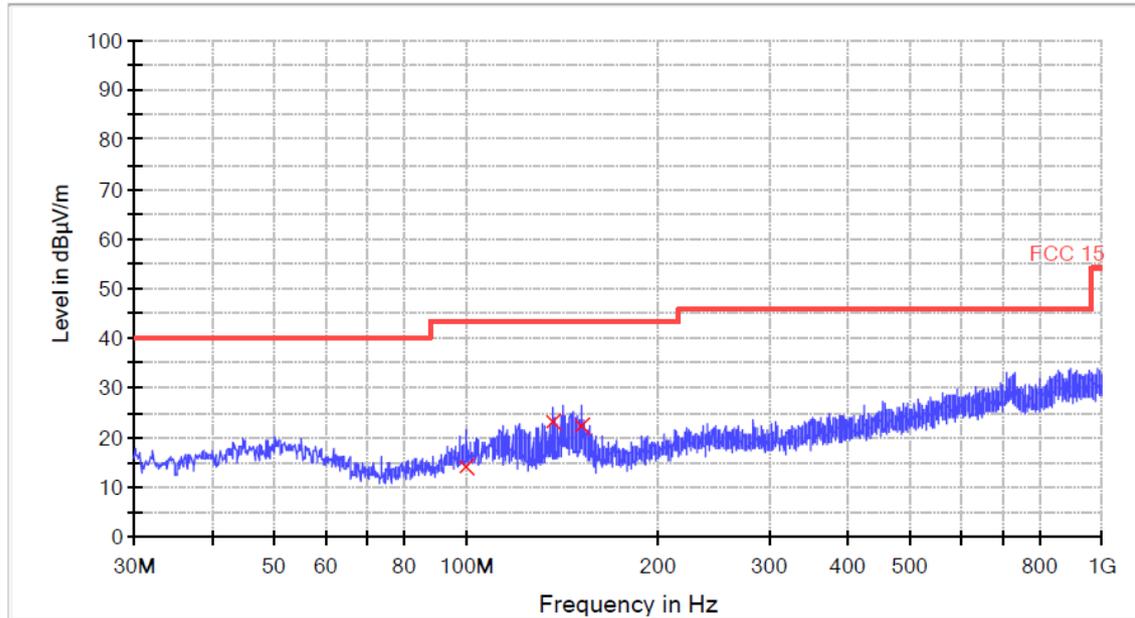


QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
52.560000	14.1	120.000	V	14.8	25.9	40.0
115.600000	22.1	120.000	V	11.9	21.5	43.5
146.640000	21.2	120.000	V	9.8	22.3	43.5

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
100.200000	13.9	120.000	H	12.5	29.6	43.5
136.840000	23.1	120.000	H	9.4	20.4	43.5
152.360000	22.1	120.000	H	10.0	21.4	43.5

1~25 GHz Radiated Emissions. Peak & Average Measurement

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	54.235	-12.7	41.535	74	V
1799.000	49.983	-11.7	38.283	74	V
3071.875	45.413	-6.1	39.313	74	V
7236.875	41.968	6.3	48.268	74	V
1535.500	59.215	-12.7	46.515	74	H
3071.875	48.644	-6.1	42.544	74	H
3892.125	42.633	-4.6	38.033	74	H

TEST REPORT

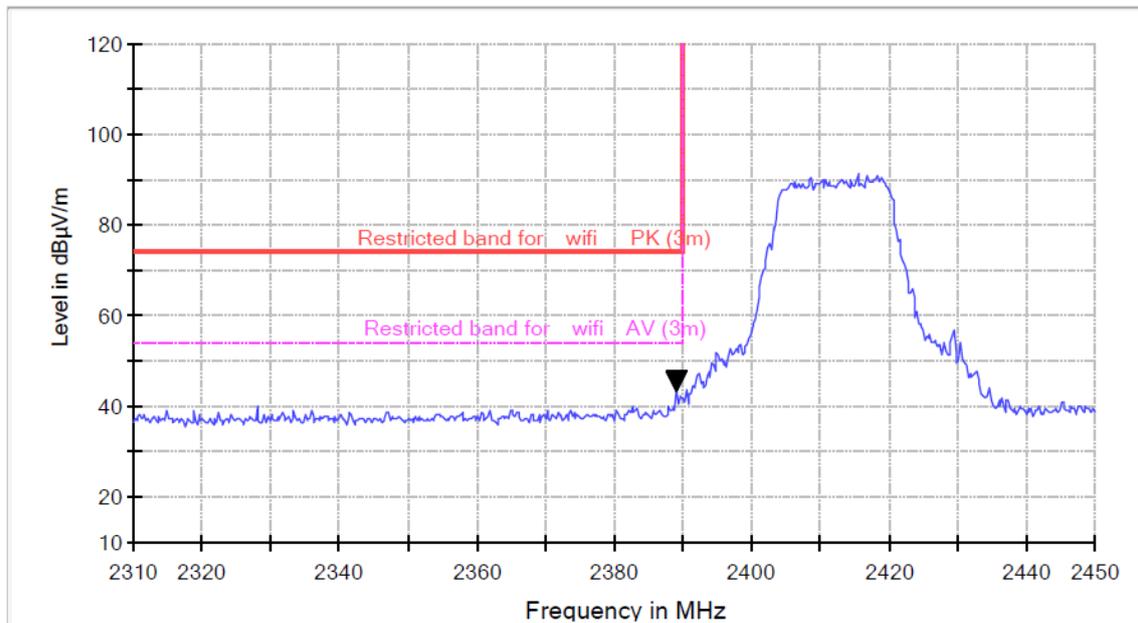
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
1799.000	-	-11.7	-	54	V
3071.875	-	-6.1	-	54	V
7236.875	-	6.3	-	54	V
1535.500	-	-12.7	-	54	H
3071.875	-	-6.1	-	54	H
3892.125	-	-4.6	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

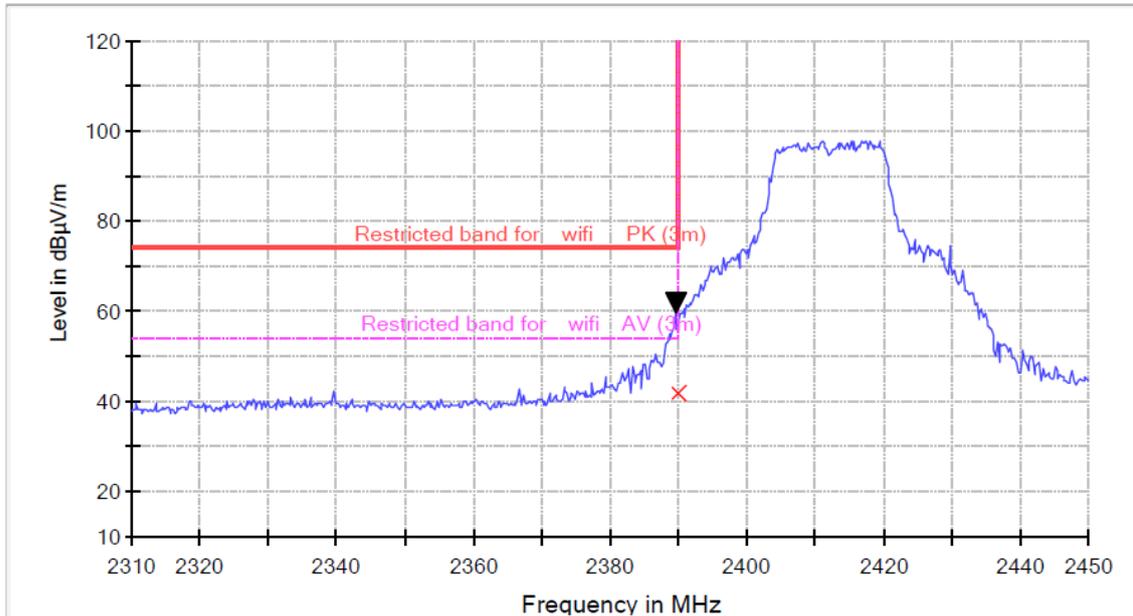
Restricted Bands Measurement

Vertical



TEST REPORT

Horizontal



PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
2389.100	52.539	-9.1	43.439	74	V
2389.566	69.156	-9.1	60.056	74	H

AV Measurement:

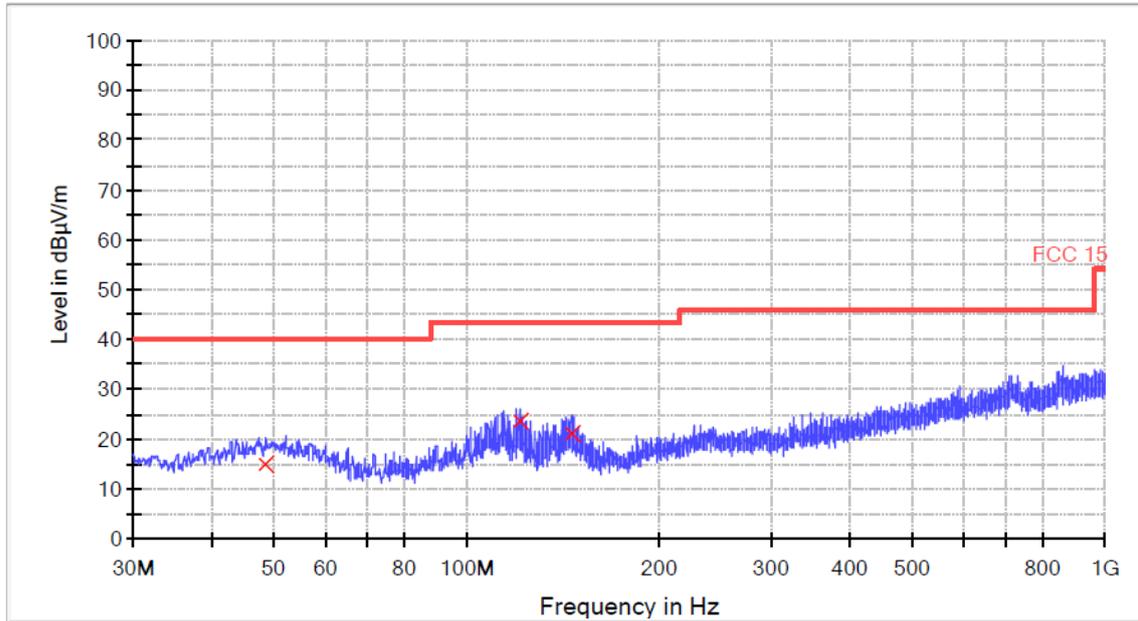
Frequency (MHz)	AV Reading Level (dBµV)	Correction factors (dB/m)	AV Emission Level (dBµV/m)	AV Limit (dBµV/m)	Antenna polarization
2389.100	-	-9.1	-	54	V
2389.566	50.9	-9.1	41.8	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

Test at Channel 6 (2.437GHz) in transmitting status
30 MHz~1 GHz Radiated Emissions .Quasi-Peak Measurement

TEST REPORT

Vertical:

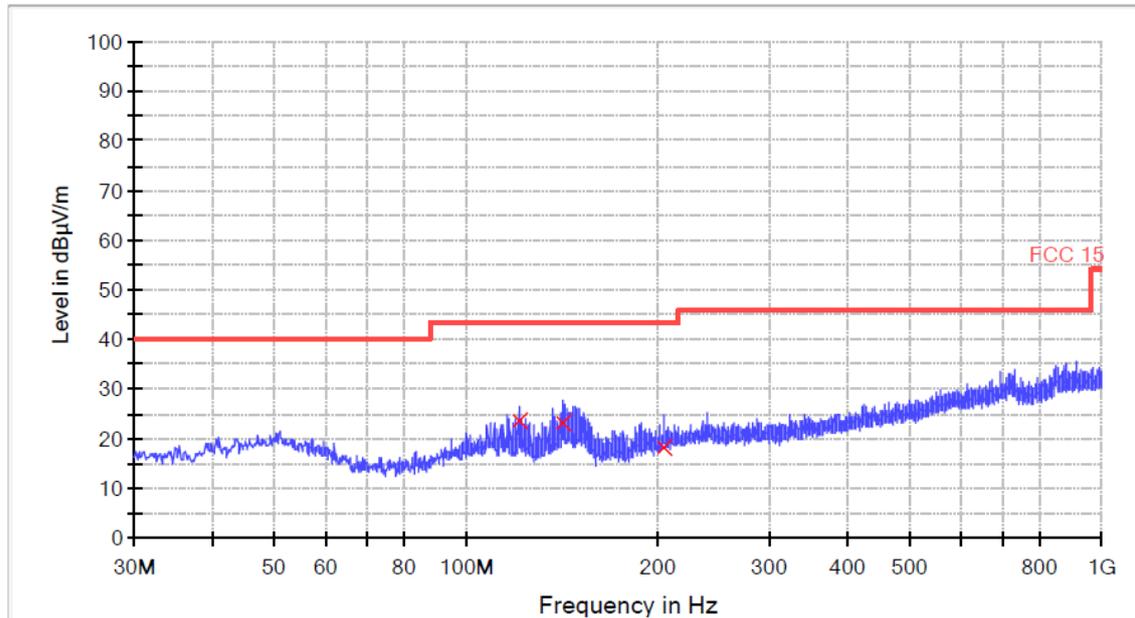


QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
48.560000	14.9	120.000	V	15.1	25.1	40.0
121.040000	23.5	120.000	V	10.7	20.0	43.5
145.920000	21.2	120.000	V	9.8	22.3	43.5

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
121.040000	23.7	120.000	H	10.7	19.8	43.5
142.040000	23.3	120.000	H	9.7	20.3	43.5
205.320000	18.1	120.000	H	13.1	25.4	43.5

1~25 GHz Radiated Emissions. Peak & Average Measurement

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	54.206	-12.7	41.506	74	V
1956.250	52.936	-11.2	41.736	74	V
6000.125	41.89	1.8	43.690	74	V
1116.875	48.667	-14.4	34.267	74	H
1535.500	58.975	-12.7	46.275	74	H
3071.875	46.605	-6.1	40.505	74	H

TEST REPORT

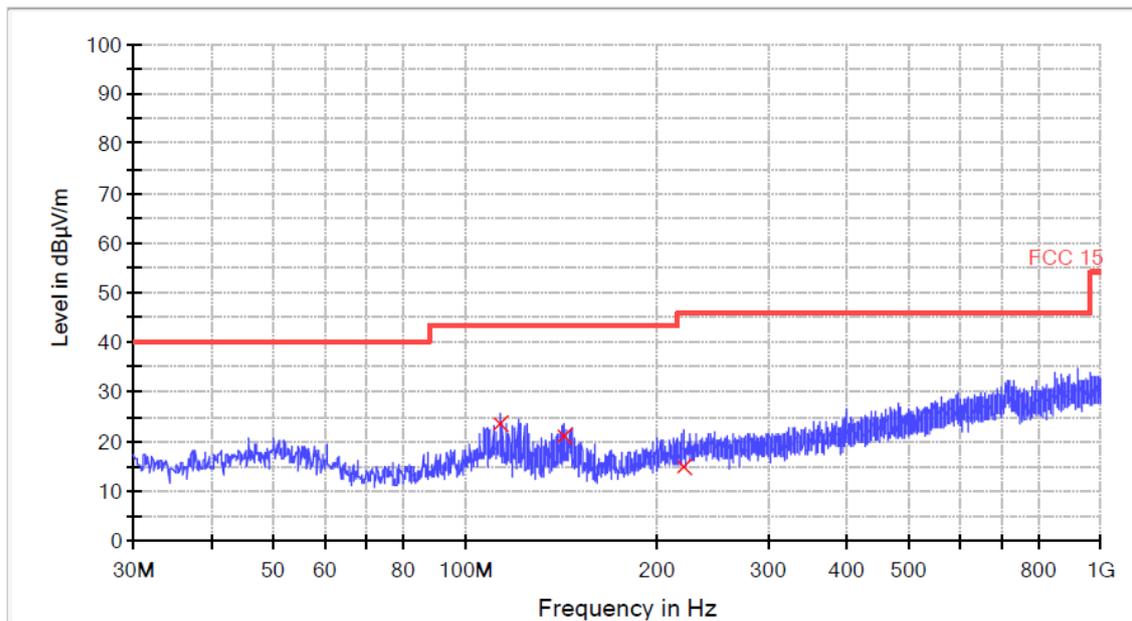
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
1956.250	-	-11.2	-	54	V
6000.125	-	1.8	-	54	V
1116.875	-	-14.4	-	54	H
1535.500	-	-12.7	-	54	H
3071.875	-	-6.1	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

Test at Channel 11 (2.462 GHz) in transmitting status
30 MHz~1 GHz Radiated Emissions .Quasi-Peak Measurement

Vertical:

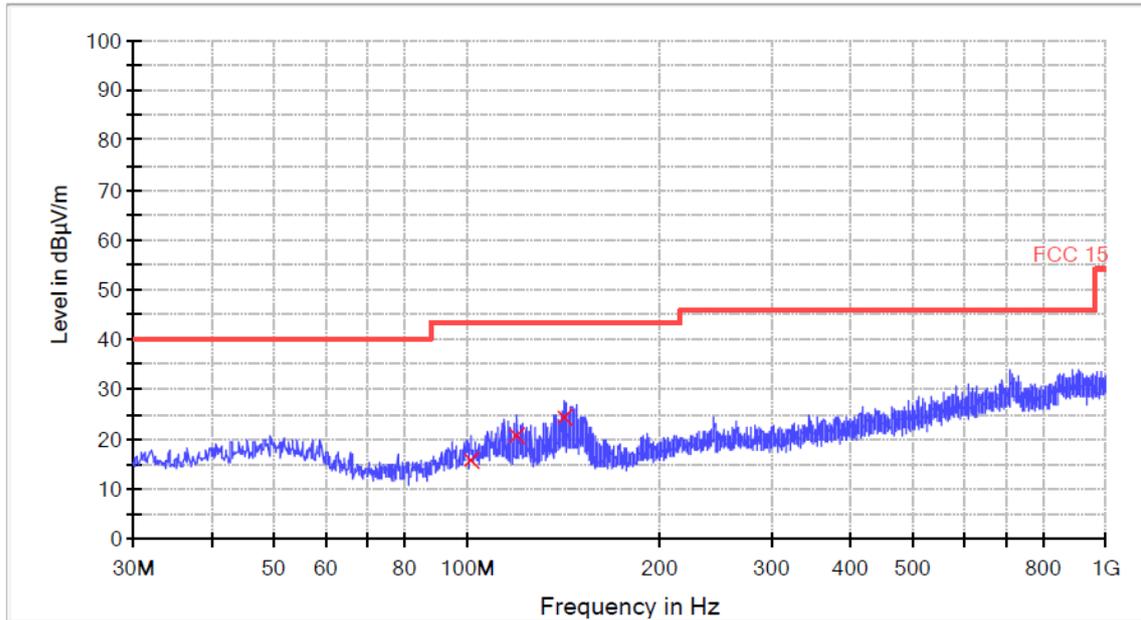


QP

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
113.400000	23.7	120.000	V	12.4	19.8	43.5
143.240000	20.9	120.000	V	9.7	22.6	43.5
220.960000	14.8	120.000	V	13.8	31.2	46.0

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
101.640000	15.9	120.000	H	12.6	27.6	43.5
119.960000	20.7	120.000	H	10.9	22.8	43.5
141.920000	24.3	120.000	H	9.7	19.2	43.5

1~25 GHz Radiated Emissions. Peak & Average Measurement

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	54.012	-12.7	41.312	74	V
1954.125	52.255	-11.2	41.055	74	V
2991.125	47.505	-6.3	41.205	74	V
1112.625	50.202	-14.4	35.802	74	H
1535.500	58.893	-12.7	46.193	74	H
3071.875	47.784	-6.1	41.684	74	H

TEST REPORT

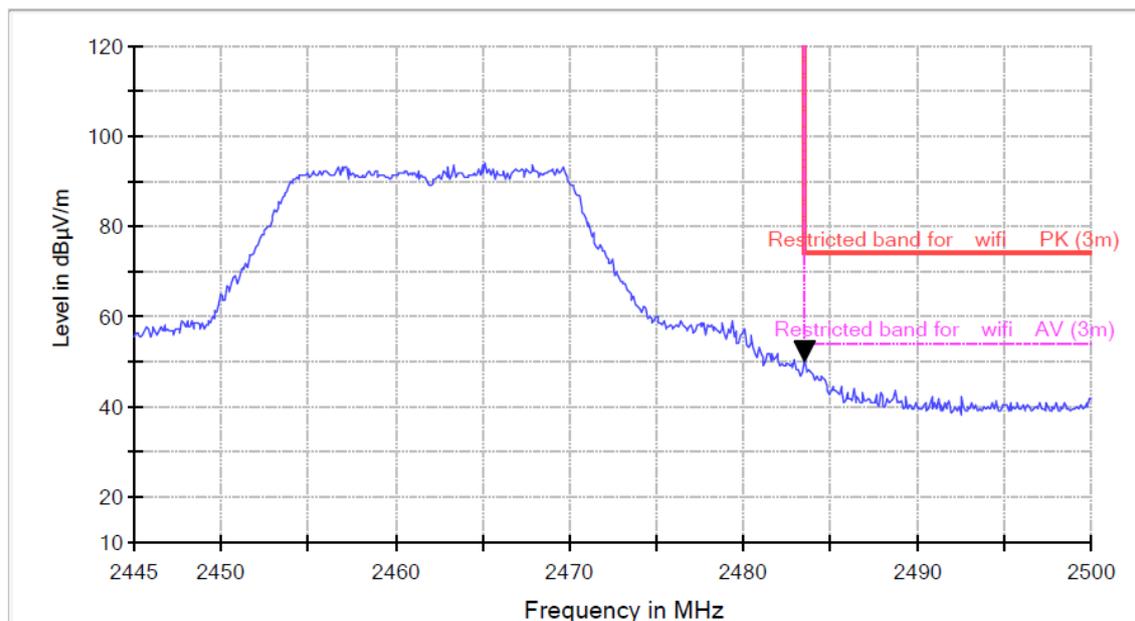
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
1954.125	-	-11.2	-	54	V
2991.125	-	-6.3	-	54	V
1112.625	-	-14.4	-	54	H
1535.500	-	-12.7	-	54	H
3071.875	-	-6.1	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

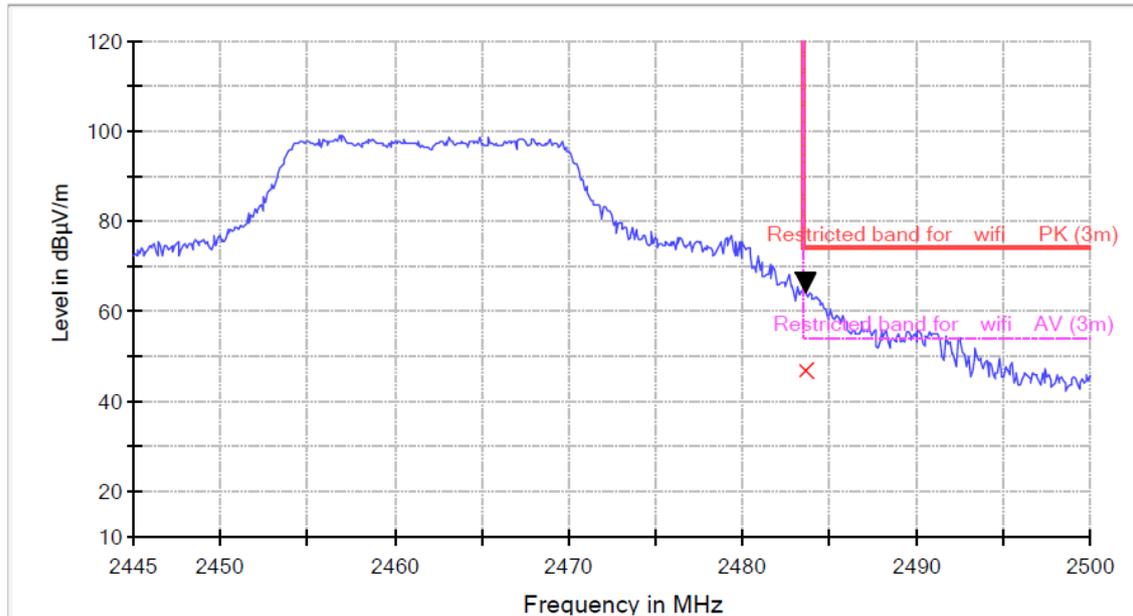
Restricted Bands Measurement

Vertical



TEST REPORT

Horizontal



PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
2483.500	59.07	-8.7	50.370	74	V
2483.591	73.149	-8.7	64.449	74	H

AV Measurement:

Frequency (MHz)	AV Reading Level (dBµV)	Correction factors (dB/m)	AV Emission Level (dBµV/m)	AV Limit (dBµV/m)	Antenna polarization
2483.500	-	-8.7	-	54	V
2483.591	55.4	-8.7	46.7	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

802.11n (HT20) mode with 65Mbps data rate
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

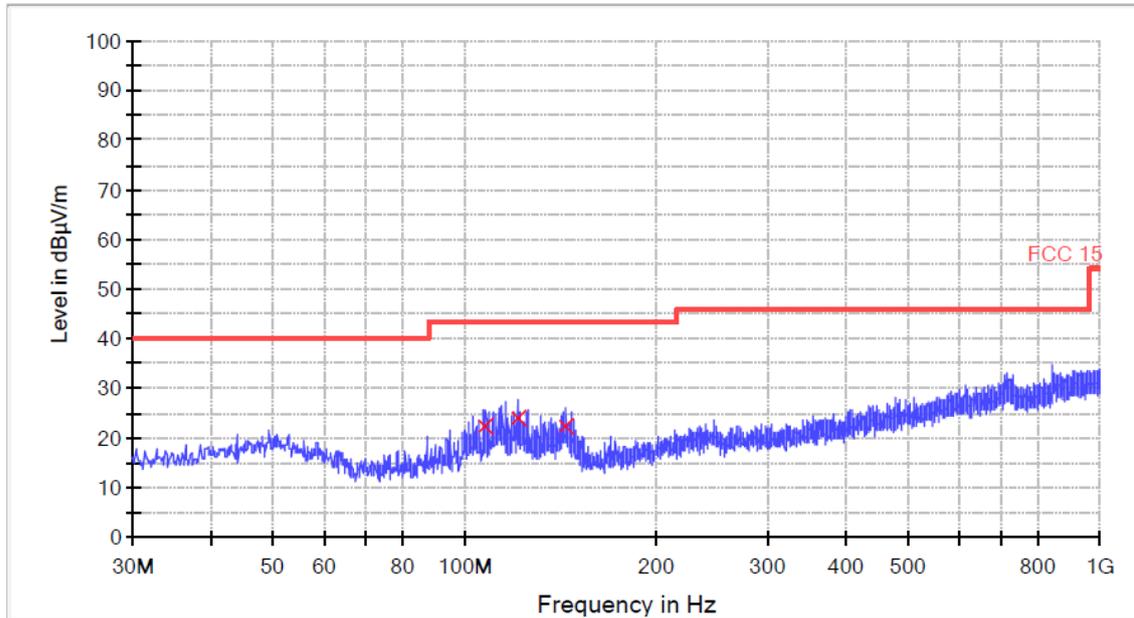
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 1 (2.412 GHz) in transmitting status

30 MHz~1 GHz Radiated Emissions .Quasi-Peak Measurement

TEST REPORT

Vertical:

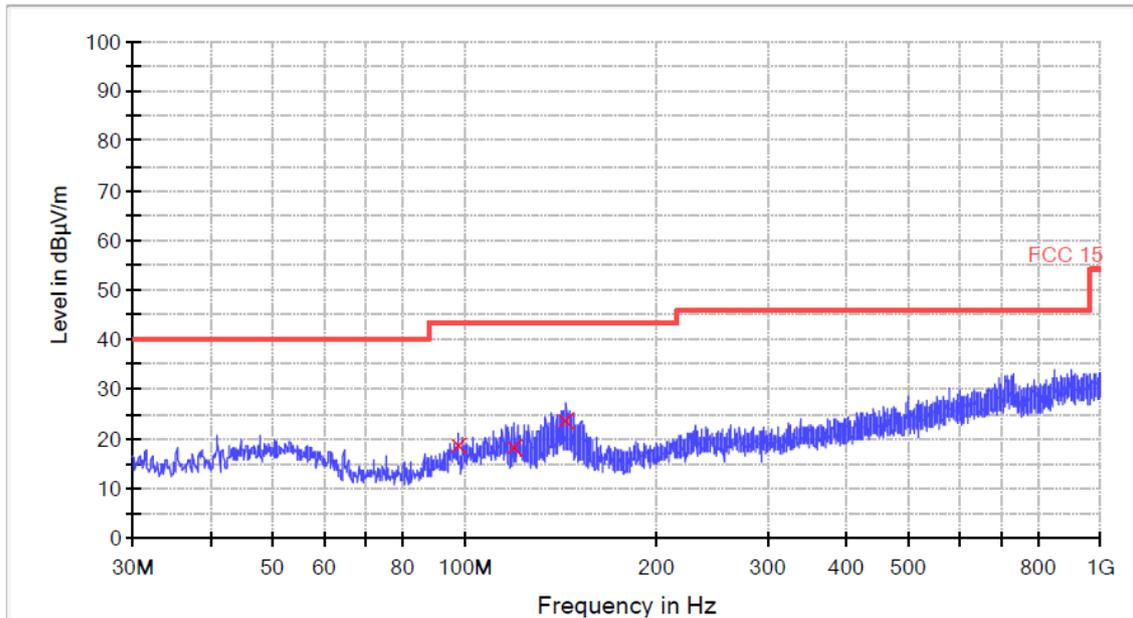


QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
108.080000	22.2	120.000	V	13.0	21.4	43.5
121.160000	24.2	120.000	V	10.7	19.4	43.5
144.600000	22.5	120.000	V	9.8	21.0	43.5

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
97.640000	18.7	120.000	H	12.1	24.8	43.5
119.840000	18.2	120.000	H	11.0	25.3	43.5
144.720000	23.5	120.000	H	9.8	20.0	43.5

1~25 GHz Radiated Emissions. Peak & Average Measurement

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	54.266	-12.7	41.566	74	V
3071.875	45.518	-6.1	39.418	74	V
4200.250	53.368	-3.7	49.668	74	V
1535.500	58.335	-12.7	45.635	74	H
3071.875	48.053	-6.1	41.953	74	H
4221.500	44.004	-3.6	40.404	74	H

TEST REPORT

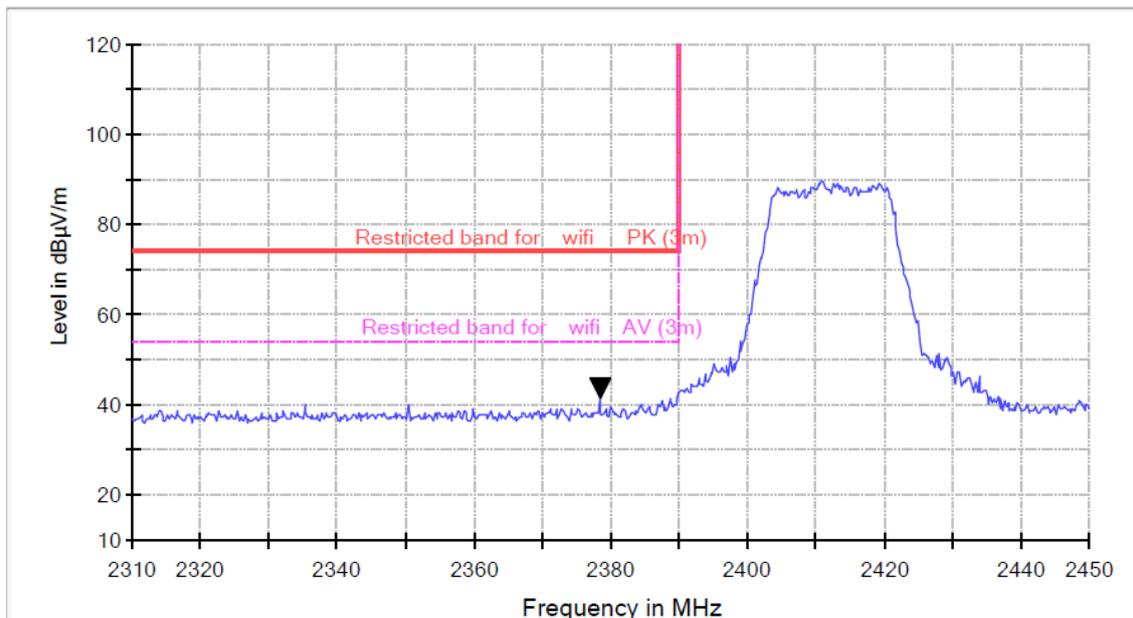
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
3071.875	-	-6.1	-	54	V
4200.250	-	-3.7	-	54	V
1535.500	-	-12.7	-	54	H
3071.875	-	-6.1	-	54	H
4221.500	-	-3.6	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

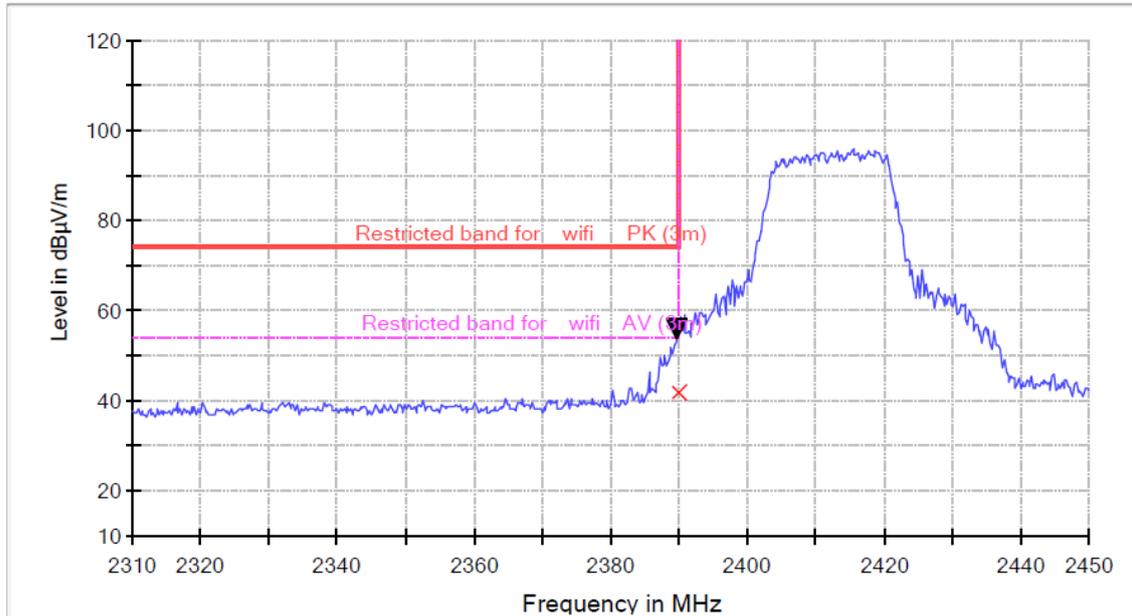
Restricted Bands Measurement

Vertical



TEST REPORT

Horizontal



PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
2378.367	50.965	-9.1	41.865	74	V
2389.800	63.322	-9.1	54.222	74	H

AV Measurement:

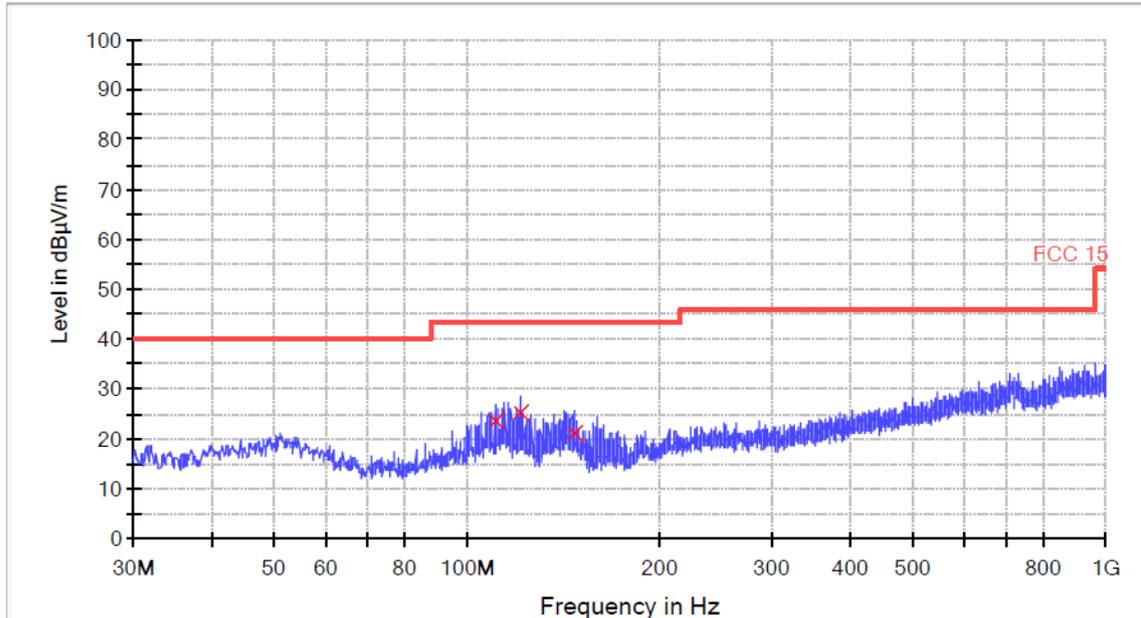
Frequency (MHz)	AV Reading Level (dBµV)	Correction factors (dB/m)	AV Emission Level (dBµV/m)	AV Limit (dBµV/m)	Antenna polarization
2378.367	-	-9.1	-	54	V
2389.800	50.9	-9.1	41.8	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

Test at Channel 6 (2.437 GHz) in transmitting status
30 MHz~1 GHz Radiated Emissions .Quasi-Peak Measurement

TEST REPORT

Vertical:

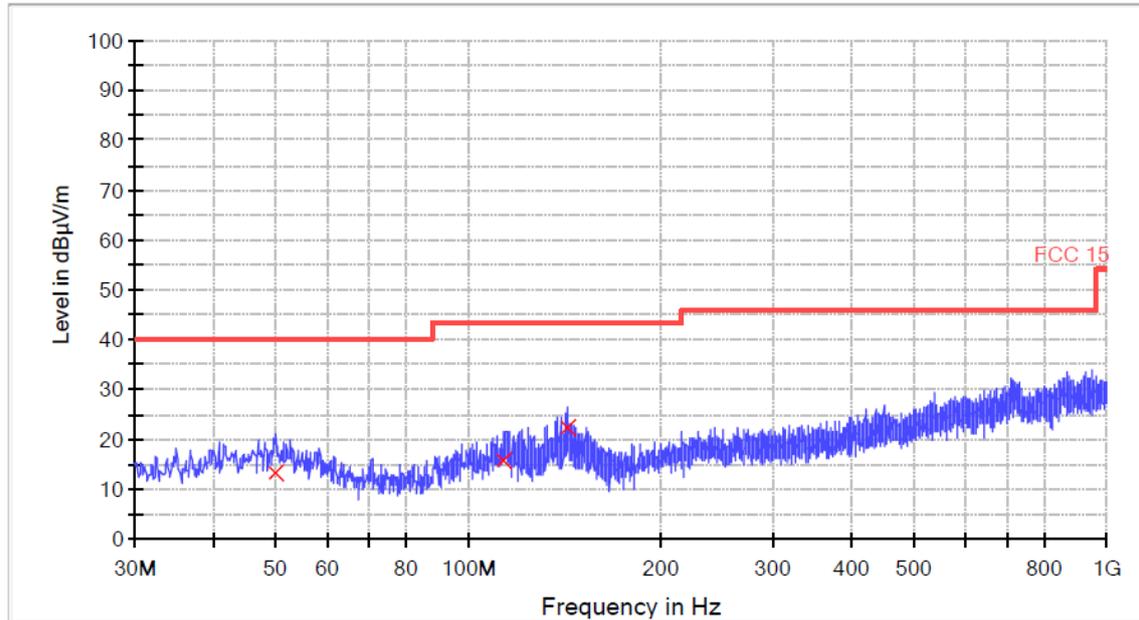


QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
110.760000	23.7	120.000	V	13.0	19.8	43.5
121.160000	25.2	120.000	V	10.7	18.3	43.5
147.240000	21.0	120.000	V	9.9	22.5	43.5

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
50.000000	13.2	120.000	H	15.3	26.8	40.0
113.560000	15.8	120.000	H	12.4	27.7	43.5
143.360000	22.5	120.000	H	9.7	21.0	43.5

1~25 GHz Radiated Emissions. Peak & Average Measurement

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	54.116	-12.7	41.416	74	V
1958.375	51.952	-11.1	40.852	74	V
10407.375	40.179	9.6	49.779	74	V
1535.500	59.032	-12.7	46.332	74	H
2442.875	47.998	-11.1	36.898	74	H
3071.875	31.331	9.6	40.931	74	H

TEST REPORT

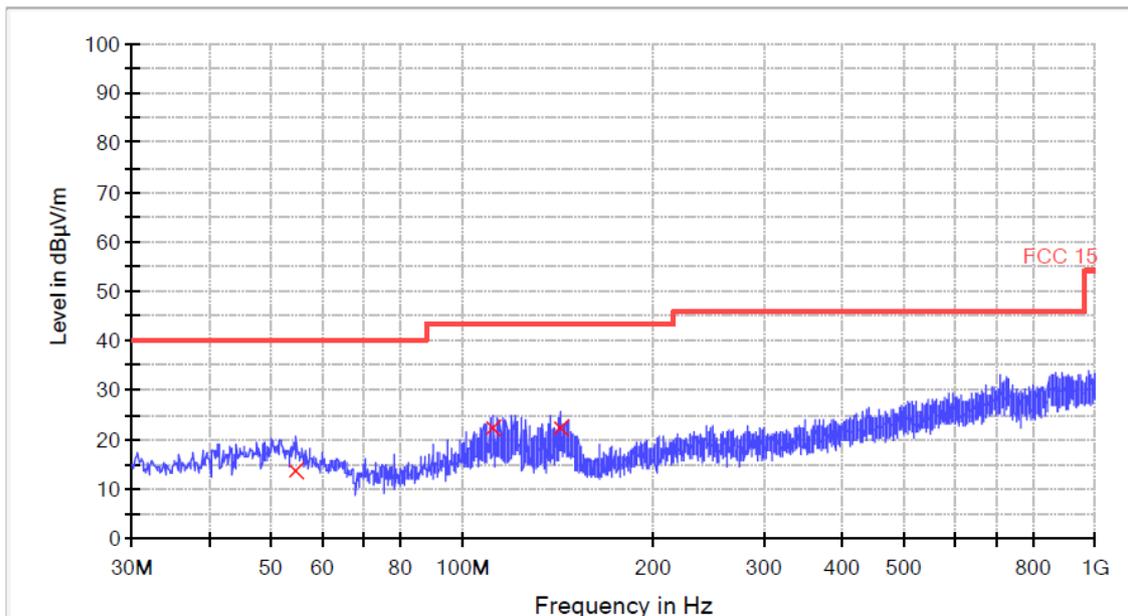
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
1958.375	-	-11.1	-	54	V
10407.375	-	9.6	-	54	V
1535.500	-	-12.7	-	54	H
2442.875	-	-11.1	-	54	H
3071.875	-	9.6	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be record.

Test at Channel 11 (2.462 GHz) in transmitting status
30 MHz~1 GHz Radiated Emissions .Quasi-Peak Measurement

Vertical:

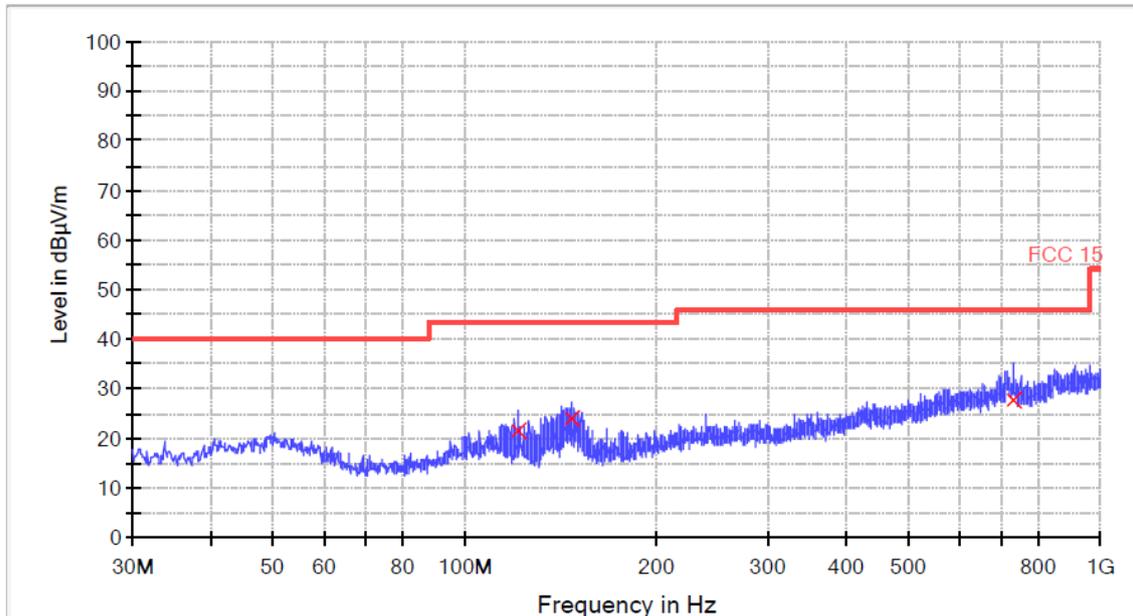


QP

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
54.720000	13.8	120.000	V	14.3	26.3	40.0
112.080000	22.3	120.000	V	12.7	21.2	43.5
143.480000	22.3	120.000	V	9.7	21.2	43.5

TEST REPORT

Horizontal:



QP

Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
121.320000	21.4	120.000	H	10.7	22.1	43.5
147.360000	23.9	120.000	H	9.9	19.6	43.5
729.240000	27.9	120.000	H	23.3	18.1	46.0

1~25 GHz Radiated Emissions. Peak & Average Measurement

PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
1535.500	54.66	-12.7	41.960	74	V
4944.000	40.539	-2.5	38.039	74	V
7383.500	39.68	6.9	46.580	74	V
9876.125	38.385	8.9	47.285	74	V
1535.500	60.154	-12.7	47.454	74	H
4973.750	41.045	-2.5	38.545	74	H
7332.500	40.023	6.7	46.723	74	H
9846.375	38.855	8.8	47.655	74	H

TEST REPORT

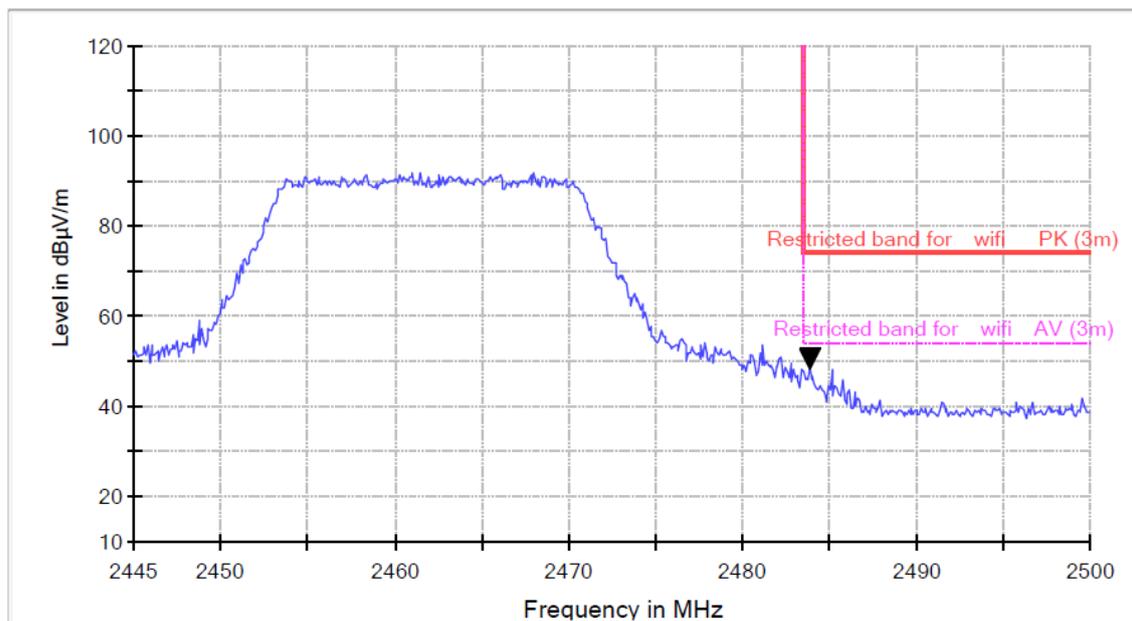
AV Measurement:

Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
1535.500	-	-12.7	-	54	V
4944.000	-	-2.5	-	54	V
7383.500	-	6.9	-	54	V
9876.125	-	8.9	-	54	V
1535.500	-	-12.7	-	54	H
4973.750	-	-2.5	-	54	H
7332.500	-	6.7	-	54	H
9846.375	-	8.8	-	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be record.

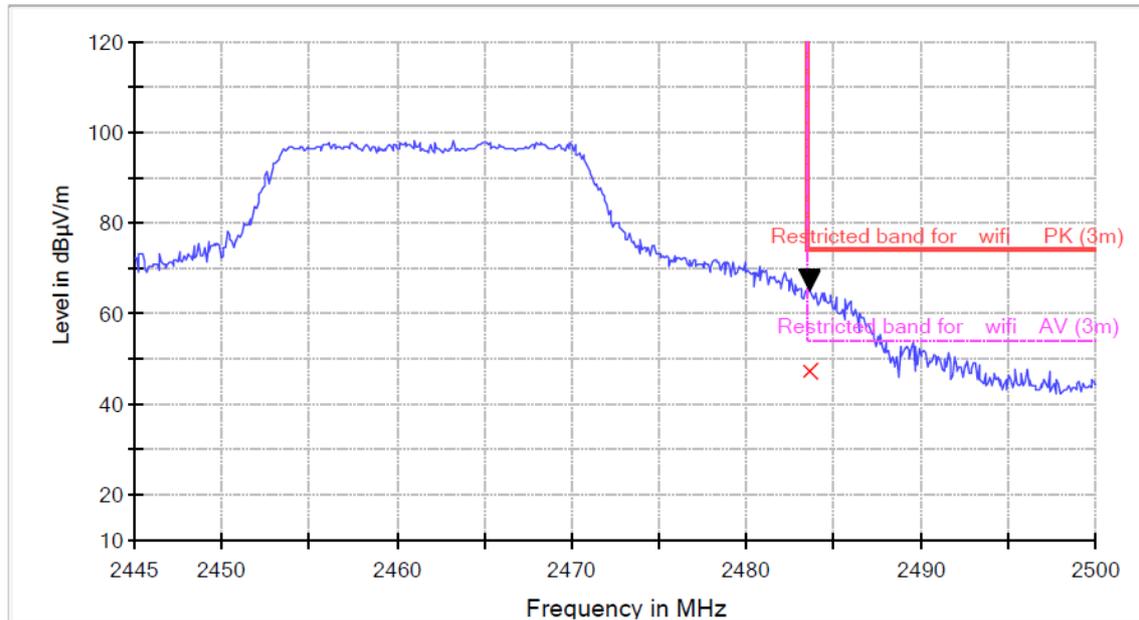
Restricted Bands Measurement

Vertical



TEST REPORT

Horizontal



PK Measurement:

Frequency (MHz)	PK Reading Level (dBµV)	Correction factors (dB/m)	PK Emission Level (dBµV/m)	PK Limit (dBµV/m)	Antenna polarization
2483.867	57.514	-8.7	48.814	74	V
2483.592	74.226	-8.7	65.526	74	H

AV Measurement:

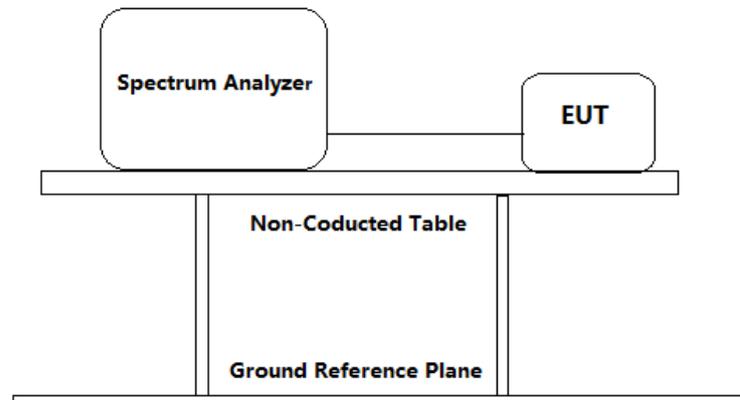
Frequency (MHz)	AV Reading Level (dBµV)	Correction factors (dB/m)	AV Emission Level (dBµV/m)	AV Limit (dBµV/m)	Antenna polarization
2483.867	-	-8.7	-	54	V
2483.592	56.2	-8.7	47.5	54	H

Remark: When Peak emission level was below AV limit, the AV emission level did not be recorded.

TEST REPORT

4.8 Band Edges Requirement

Test Requirement:	FCC Part 15 C section 15.247 (d) 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.
Frequency Band:	2400 MHz to 2483.5 MHz
Test Method:	ANSI C63.10: Clause 11.11 and 11.13
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test Configuration:	For Band Edges Emission in Radiated mode, Please refer to clause 4.7



Test Procedure: For Band Edges Emission in Radiated mode, Please refer to clause 4.7

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
 - a) Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).
 - b) Set the center frequency and span to encompass frequency range to be measured.
 - c) RBW = 100 kHz.
 - d) VBW \geq [3 \times RBW].
 - e) Detector = peak.
 - f) Sweep time = auto.
 - g) Trace mode = max hold.

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- h) Allow sweep to continue until the trace stabilizes (required measurement time may increase for low-duty-cycle applications).
 - i) For radiated Band-edge emissions within a restricted band and within 2 MHz of an authorized band edge, integration method is considered.
2. Repeat until all the test status is investigated.
 3. Report the worst case.

Used Test Equipment List:

3m Semi-Anechoic Chamber, EMI Test Receiver (9 kHz~7 GHz), Signal and Spectrum Analyzer (10 Hz~40 GHz), Loop antenna (9 kHz-30 MHz). TRILOG Super Broadband test Antenna(30 MHz-3 GHz) (RX), Bouble-Ridged Waveguide Horn Antenna (800 MHz-18 GHz)(RX) and High Frequency Antenna & preamplifier(18 GHz~26.5 GHz) (RX). Refer to Clause 5 Test Equipment List for details.

Test result with plots as follows:

For conduct mode:

The band edges was measured and recorded Result:

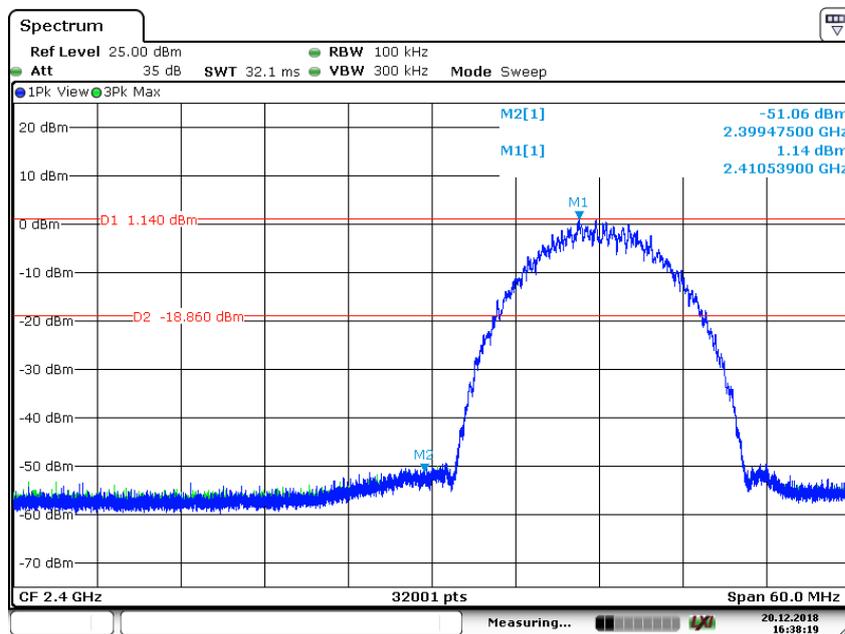
The Lower Edges attenuated more than 20dB.

The Upper Edges attenuated more than 20dB.

Result plots as follows:

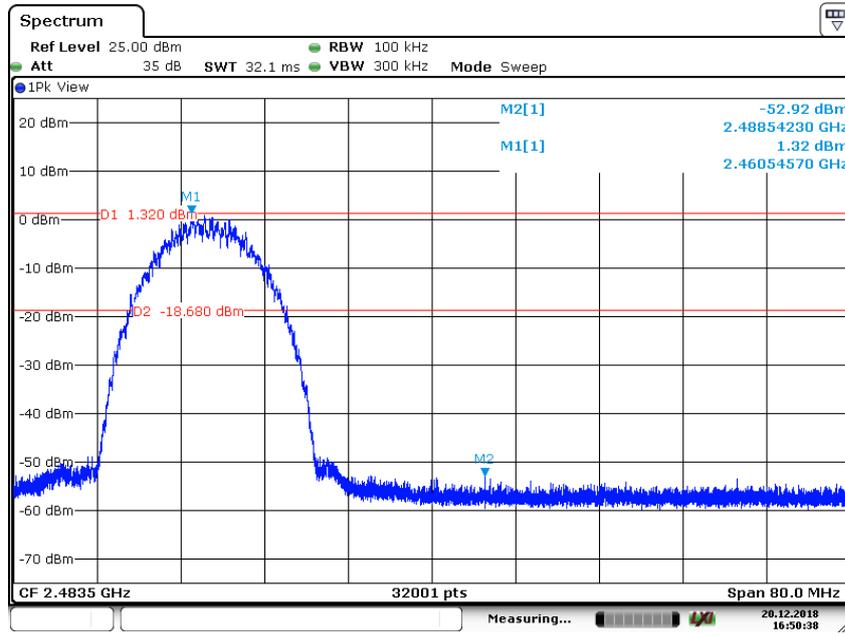
802.11b mode with 11 Mbps data rate

Channel1: 2.412 GHz



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Channel 11: 2.462 GHz

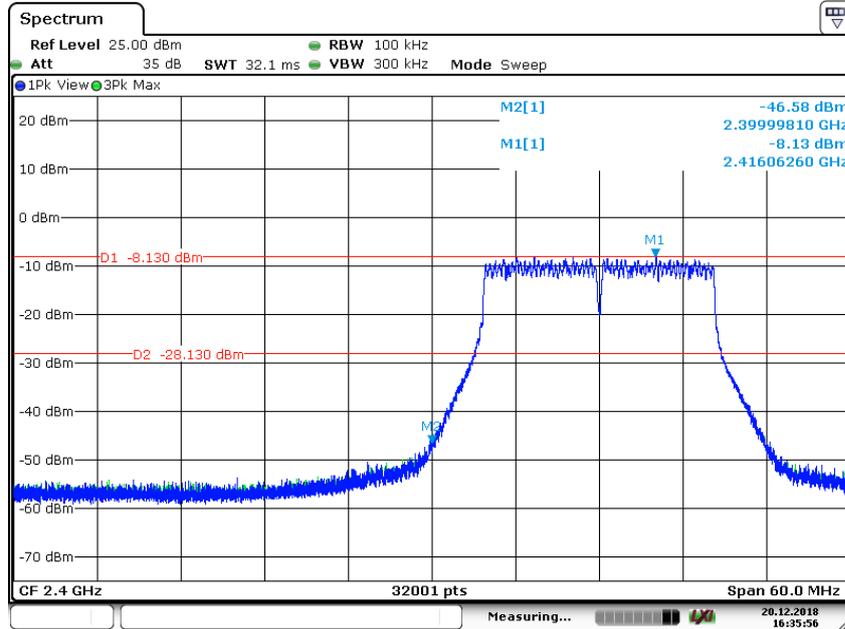


Date: 20.DEC.2018 16:50:39

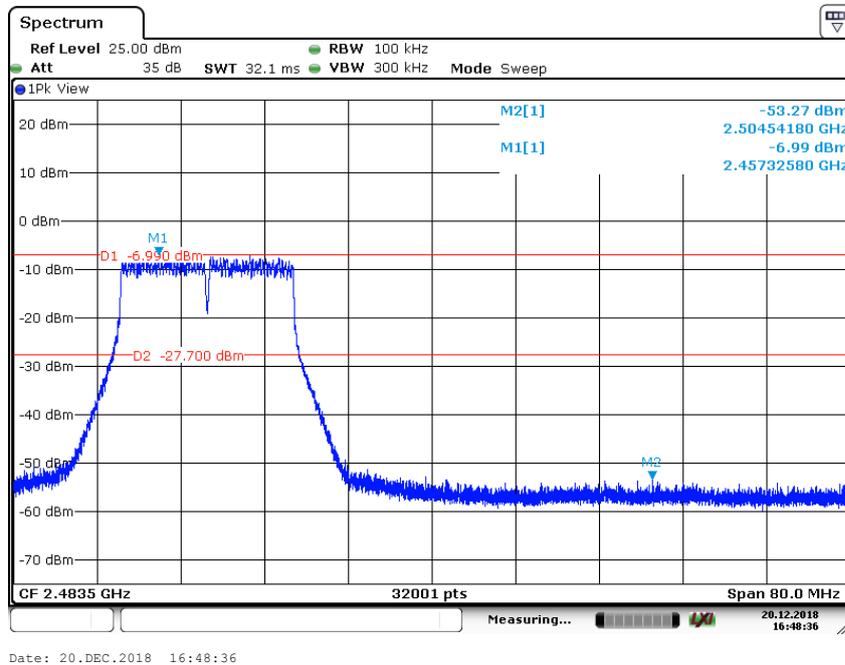
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802.11g mode with 54 Mbps data rate

Channel1: 2.412 GHz



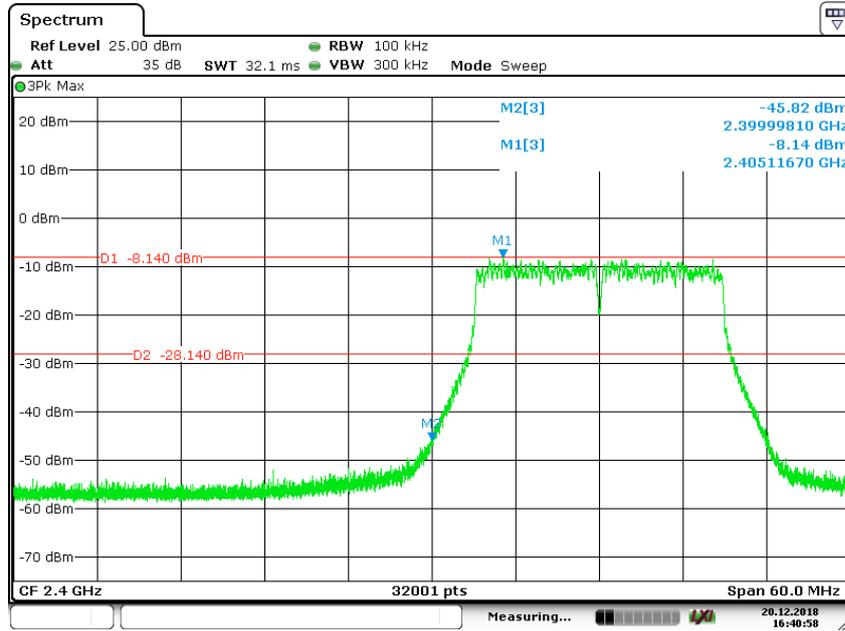
Channel 11: 2.462 GHz



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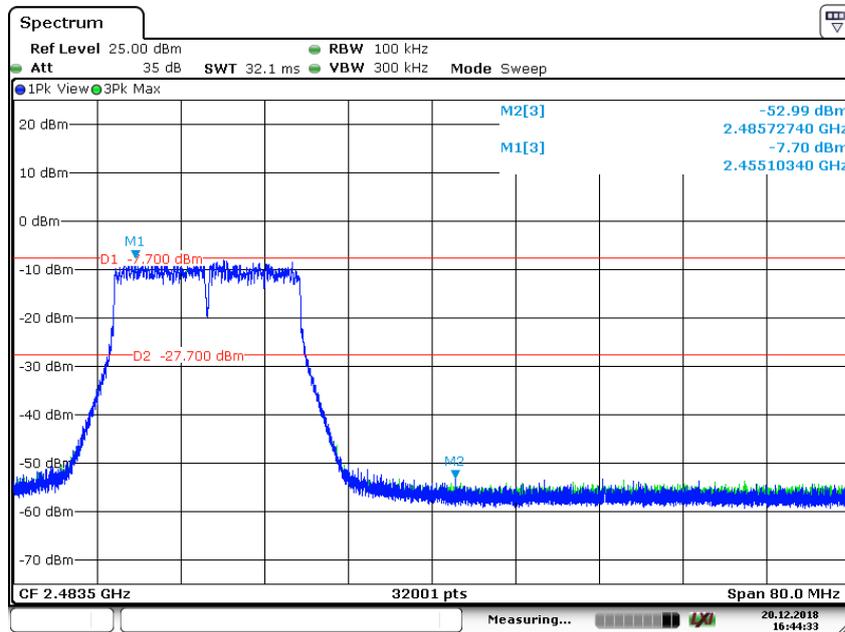
802.11n(HT20) mode with 65Mbps data rate

Channel 1: 2.412 GHz



Date: 20. DEC. 2018 16:40:59

Channel 11: 2.462 GHz

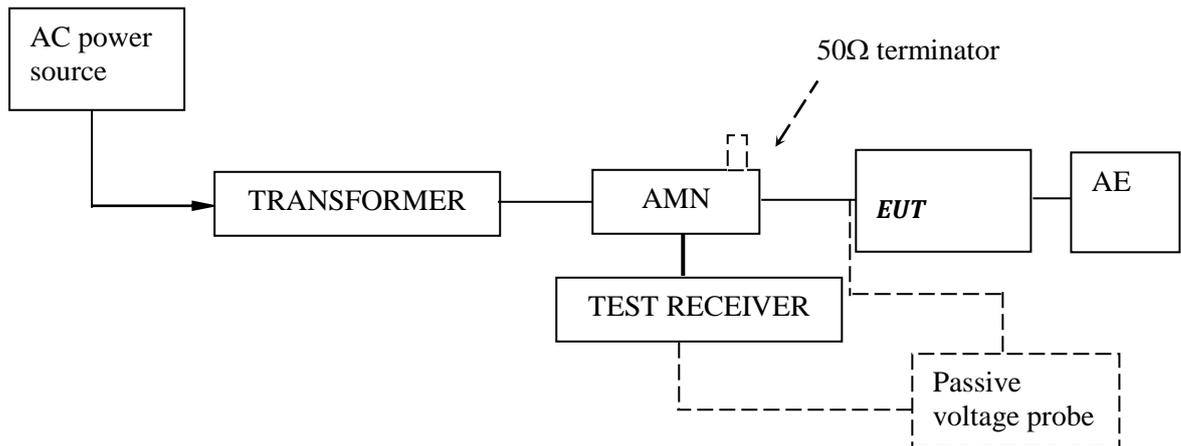


Date: 20. DEC. 2018 16:44:33

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4.9 Conducted Emission Test

Test Configuration:



Test Setup and Procedure:

Test was performed according to ANSI C63.10 Clause 6.2. The EUT was set to achieve the maximum emission level. The mains terminal disturbance voltage was measured with the EUT in a shielded room. The EUT was connected to AC power source through an Artificial Mains Network which provides a 50Ω linear impedance. Artificial hand is used if appropriate (for handheld apparatus). The load/control terminal disturbance voltage was measured with passive voltage probe if appropriate.

The table-top EUT was placed on a 0.8m high non-metallic table above earthed ground plane (Ground Reference Plane). And for floor standing EUT, was placed on a 0.1m high non-metallic supported on GRP. The EUT keeps a distance of at least 0.8m from any other of the metallic surface. The Artificial Mains Network is situated at a distance of 0.8m from the EUT.

During the test, mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m

The bandwidth of test receiver was set at 9 kHz. The frequency range from 150 kHz to 30MHz was checked.

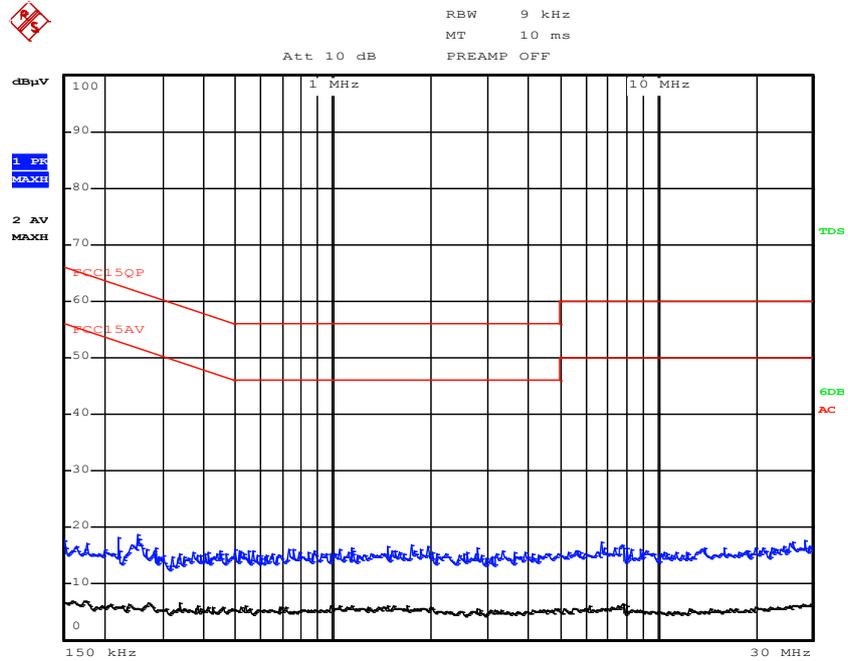
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Test Data and Curve

At main terminal: Pass

Tested Wire: Live

Operation Mode: transmitting mode



All emission levels are more than 10 dB below the limit.

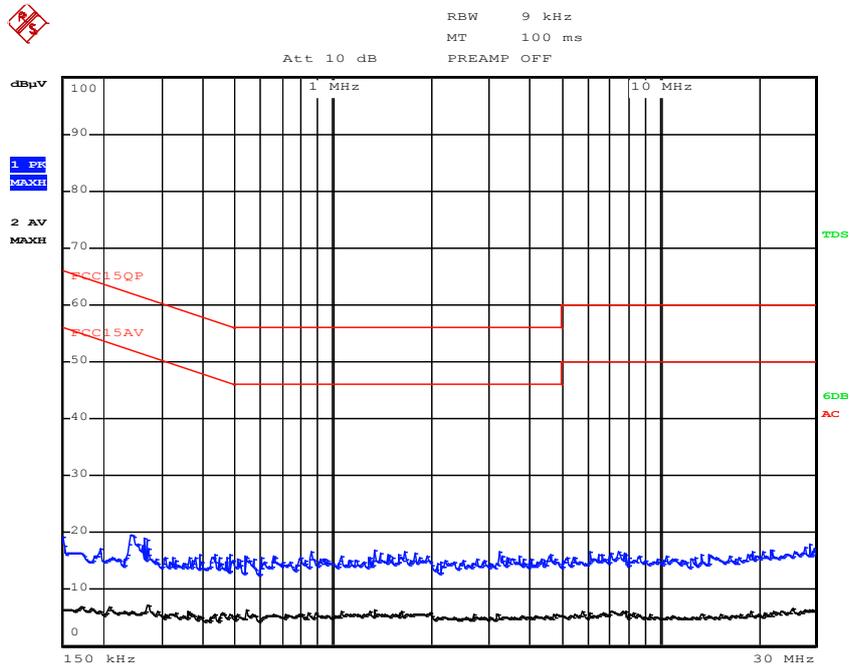
Remark:

1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBµV) = Corr. (dB) + Read Level (dBµV)
3. Delta Limit (dB) = Level (dBµV)-Limit (dBµV)

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Tested Wire: Neutral

Operation Mode: transmitting mode



All emission levels are more than 10 dB below the limit.

Remark:

1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBµV) = Corr. (dB) + Read Level (dBµV)
3. Delta Limit (dB) = Level (dBµV)-Limit (dBµV)

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5.0 Test Equipment List

Radiated Emission/Radio

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date (YYYY-MM-DD)	Calibration Interval
EM030-04	3m Semi-Anechoic Chamber	9×6×6 m ³	ETS·LINDGREN	5/6/2019	1Y
EM031-02	EMI Test Receiver (9 kHz~7 GHz)	R&S ESR7	R&S	2/28/2020	1Y
EM031-03	Signal and Spectrum Analyzer (10 Hz~40 GHz)	R&S FSV40	R&S	9/9/2019	1Y
EM011-04	Loop antenna (9 kHz-30 MHz)	HFH2-Z2	R&S	6/14/2019	1Y
EM061-03	TRILOG Super Broadband test Antenna (30 MHz-1.5 GHz) (TX)	VULB 9161	SCHWARZBEC K	6/4/2019	1Y
EM033-01	TRILOG Super Broadband test Antenna(30 MHz-3 GHz) (RX)	VULB 9163	SCHWARZBEC K	9/20/2019	1Y
EM033-02	Bouble-Ridged Waveguide Horn Antenna (800 MHz-18 GHz)(RX)	R&S HF907	R&S	6/14/2019	1Y
EM033-03	High Frequency Antenna & preamplifier(18 GHz~26.5 GHz) (RX)	R&S SCU-26	R&S	5/4/2019	1Y
EM033-04	High Frequency Antenna & preamplifier (26 GHz-40 GHz)	R&S SCU-40	R&S	5/4/2019	1Y
EM031-02-01	Coaxial cable(9 kHz-1 GHz)	N/A	R&S	5/6/2019	1Y
EM033-02-02	Coaxial cable(1 GHz-18 GHz)	N/A	R&S	5/6/2019	1Y
EM033-04-02	Coaxial cable(18 GHz~40 GHz)	N/A	R&S	5/1/2019	1Y
EM031-01	Signal Generator (9 kHz~6 GHz)	SMB100A	R&S	7/18/2019	1Y
EM085-02	Signal Generator (10MHz-40GHz)	68369B	Wiltron	7/19/2019	1Y
EM040-01	Band Reject/Notch Filter	WRHFV	Wainwright	N/A	1Y
EM040-02	Band Reject/Notch Filter	WRCGV	Wainwright	N/A	1Y
EM040-03	Band Reject/Notch Filter	WRCGV	Wainwright	N/A	1Y
EM022-03	2.45 GHz Filter	BRM50702	Micro-Tronics	5/21/2019	1Y
SA016-16	Programmable Temperature & Humidity Test Chamber	MHU-800LJ	TERCHY	10/10/2019	1Y
SA016-22	Climatic Test Chamber	C7-1500	Vötsch	11/1/2019	1Y
SA012-74	Digital Multimeter	FLUKE175	FLUKE	10/10/2019	1Y
EM010-01	Regulated DC Power supply	PAB-3003A	GUANHUA	N/A	1Y
SA040-22	Regulated DC Power supply	IT6721	ITECH	9/9/2019	1Y
EM084-06	Audio Analyzer	8903B	HP	4/13/2019	1Y
EM045-01-01	EMC32 software (RE/RS)	V10.01.00	R&S	N/A	N/A
EM045-01-09	EMC32 software (328/893)	V9.26.01	R&S	N/A	N/A

Conducted emission at the mains terminals

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date (YYYY-MM-DD)	Calibration Interval
EM080-05	EMI receiver	ESCI	R&S	7/18/2019	1Y
EM006-05	LISN	ENV216	R&S	6/6/2019	1Y
EM006-06	LISN	ENV216	R&S	9/9/2019	1Y
EM006-06-01	Coaxial cable	/	R&S	4/7/2019	1Y
EM004-04	EMC shield Room	8m×3m×3m	Zhongyu	1/13/2020	1Y

*****End of the test report*****