Gerber Products Company, Inc

TEST REPORT

SCOPE OF WORK
EMC TESTING–9311B

REPORT NUMBER
170122076GZU-002

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PAGES
82

DOCUMENT CONTROL NUMBER
FCC WIFI-c

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TEST REPORT

Applicant Name & Address	:	Gerber Products Company, Inc 12 Vreeland Rd FLORHAM PARK NJ 07932 USA
Manufacturing Site	:	Shenzhen WIK Domestic Appliances Co., Ltd. Block 1, 2, 3, 4, 5, HuangPu, 2nd Industrial Estate, ShaJing street, BaoAn District, ShenZhen City, GuangDong Province, P.R. China
Intertek Report No:		170122076GZU-002
FCC ID:		2ABBQ9311B

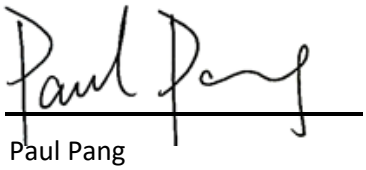
Test standards

47 CFR PART 15 Subpart C: 2016 section 15.247

Sample Description

Product	:	BabyNes
Model No.	:	120 Vac, 60 Hz, 1450 W
Electrical Rating	:	9311B
Serial No.		Not Labeled
Date Received	:	08 October 2017
Date Test Conducted	:	08 October 2017 to 30 October 2017

Prepared and Checked By



Paul Pang

Project Engineer

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Team Leader

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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

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

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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): 6.5/13/19.5/26/39/52/58.5/65/72.2Mbps
Number of Channels	11 Channels for 802.11b/g/n(HT20)
Channel Separation:	5 MHz
Antenna Type	The wire antenna that uses a unique coupling to the intentional radiator
Function:	BabyNes with BT and WIFI functions
EUT Power Supply:	120 Vac, 60 Hz, 1450 W
Power cord:	1.1 m x 3 wires unscreened AC supply cable

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	/	

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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.
2. The milk heating function: exempt from FCC requirement.

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 AC 120V/60Hz supply.

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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:

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	WIK	BabyNes_CC3200_Programming_R2.6.0_20161212	Version:2.6.0	WIK

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3.3 Special Accessories

No special accessories used.

3.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	20 dB Bandwidth	2.3%
2	Carrier Frequencies Separated	2.3%
3	Maximum Peak Conducted Output Power	1.5
4	Out of Band Conducted Emissions	1.5
5	Radiated Emissions	4.7 dB (25 MHz-1 GHz)
		4.8 dB (1 GHz-18 GHz)
6	Conducted Emissions at Mains Terminals	2.58
7	Temperature	0.5 °C
8	Humidity	0.4 %
9	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 Gerber Products Company, Inc. 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	HP	Compaq 6710b	SN:CNU8240LF9	Intertek
Control Board	WIK	BabyNes	Version:2.3	WIK

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)	WIK

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4.0 Measurement Results

4.1 Antenna Requirement

Standard requirement:

15.203 requirement:

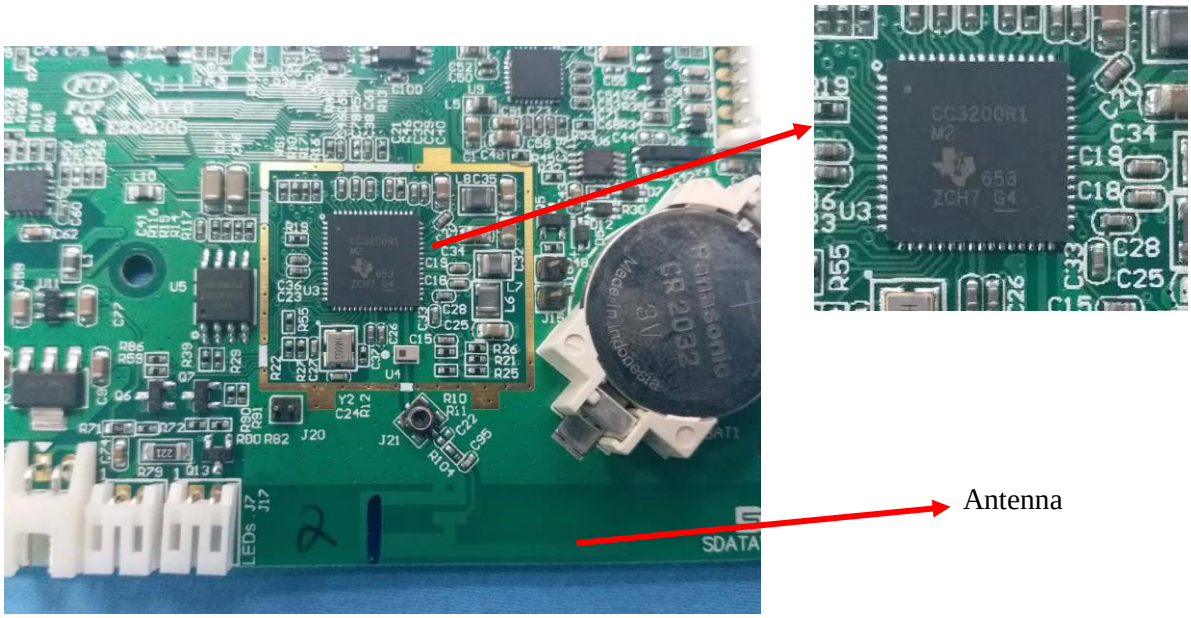
For intentional device. According to 15.203 an intentional radiator shall be designed to Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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 5 dBi.



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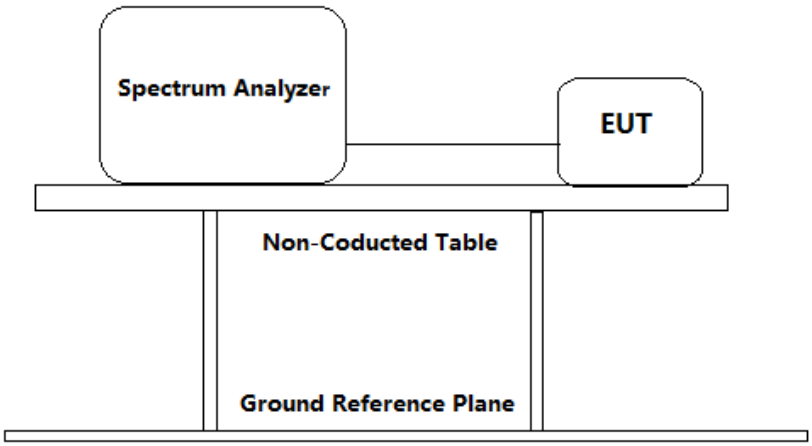
4.2 6 dB Bandwidth (DTS bandwidth)

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 dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer:
   a) Set RBW = 100 kHz
   b) Set the VBW≥ [3 × 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	9.957	≥500KHz	Pass
6	2437		11 Mbps	9.957		Pass
11	2462		11 Mbps	9.957		Pass
1	2412	802.11g	54 Mbps	16.498		Pass
6	2437		54 Mbps	16.498		Pass
11	2462		54 Mbps	16.440		Pass
1	2412	802.11n (HT20)	72.2 Mbps	17.728		Pass
6	2437		72.2 Mbps	17.728		Pass
11	2462		72.2 Mbps	17.728		Pass

Test result: The unit does meet the FCC requirements.

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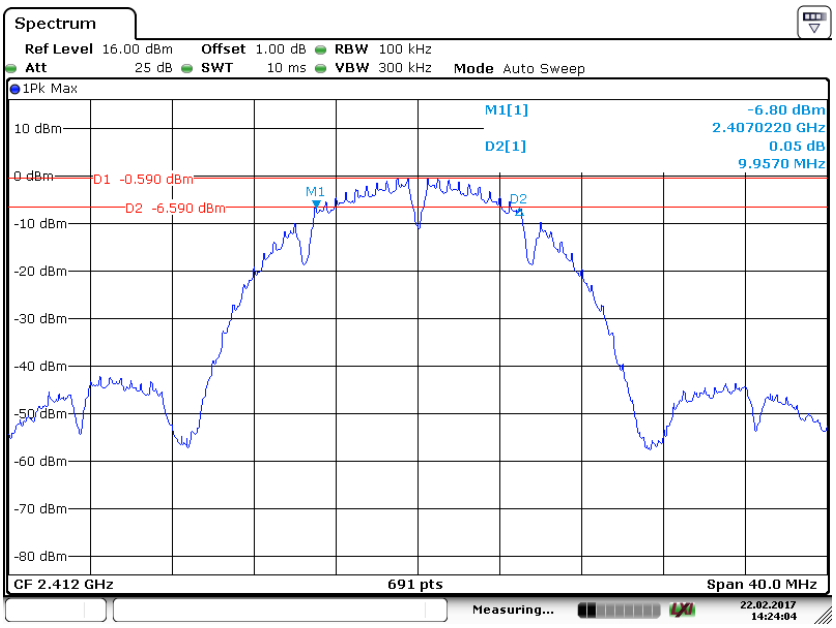
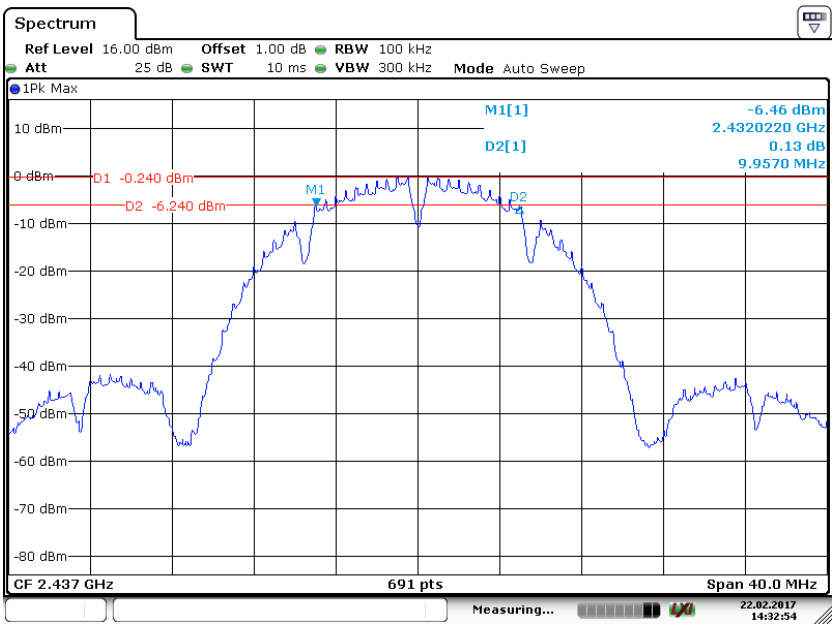
Result plot as follows:

802.11b mode with 11Mbps data rate

Channel 1: 2.412GHz



Channel 6: 2.437GHz:



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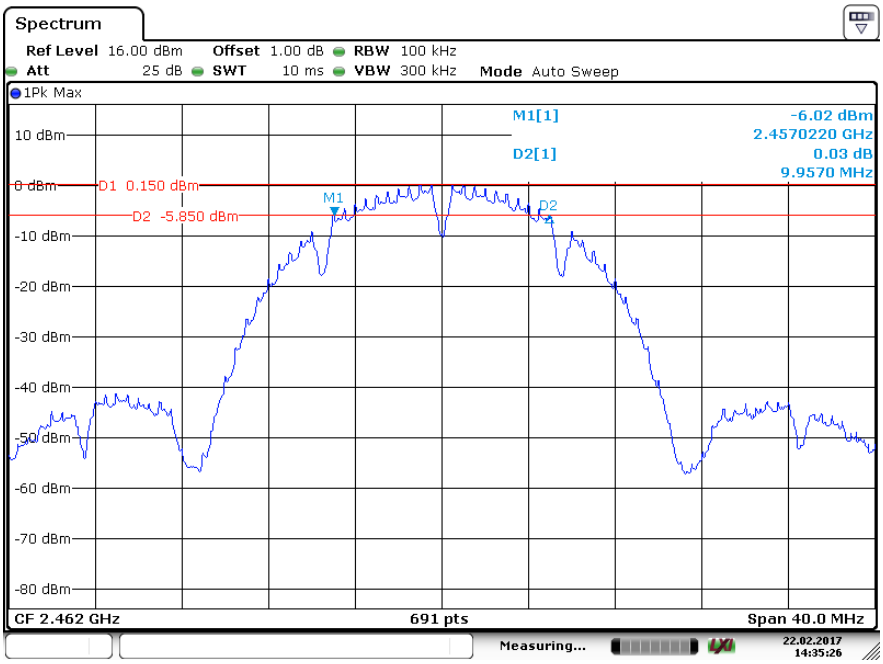
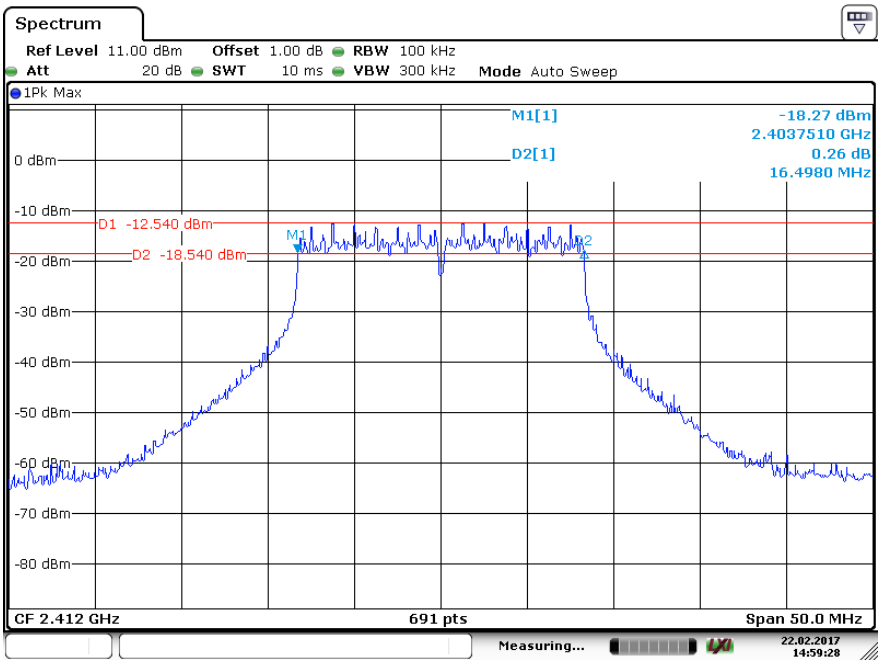
Channel 11: 2.462GHz:



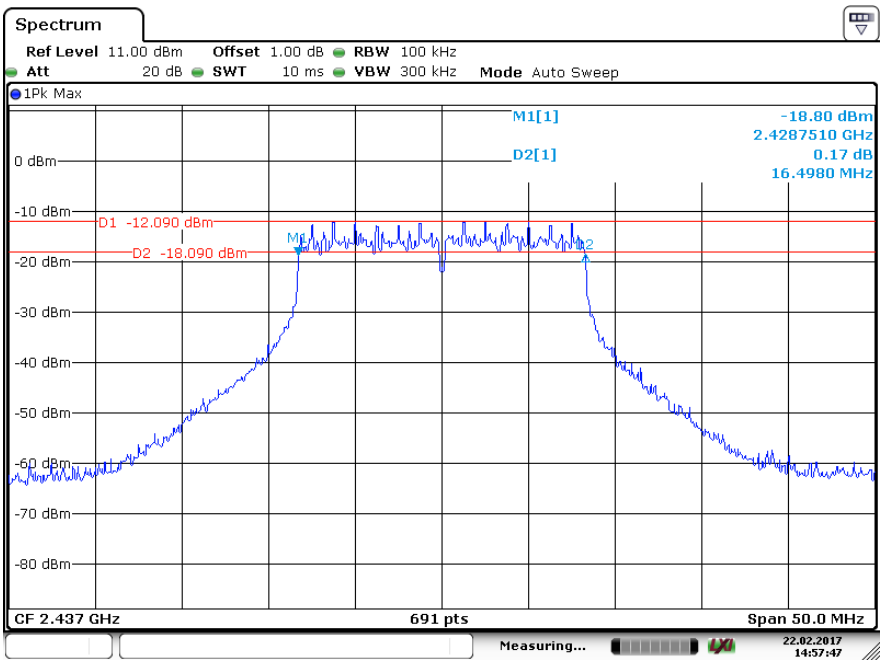
802.11g mode with 54Mbps data rate

Channel 1: 2.412GHz:

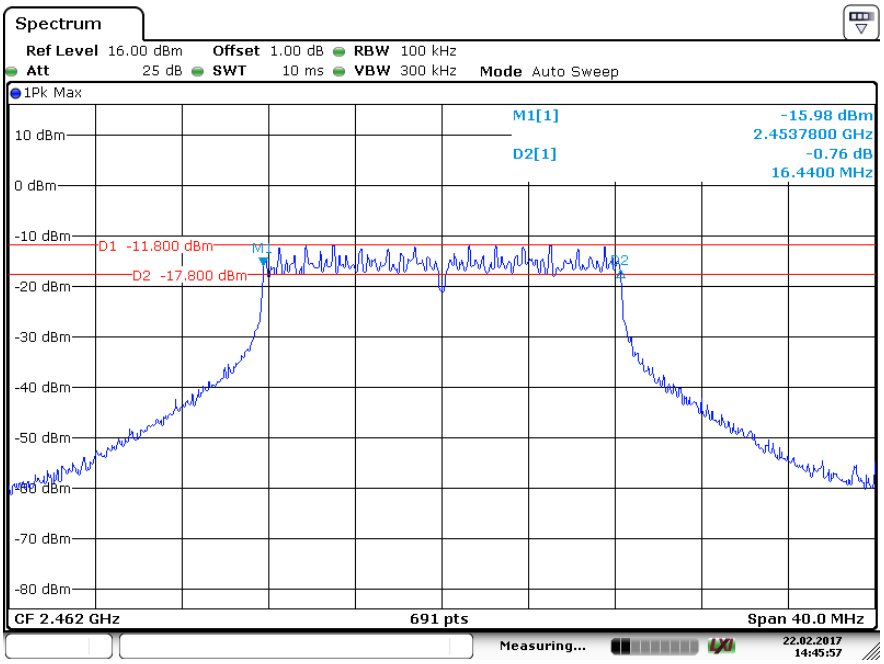


TEST REPORT

Channel 6: 2.437GHz:



Channel 11: 2.462GHz:



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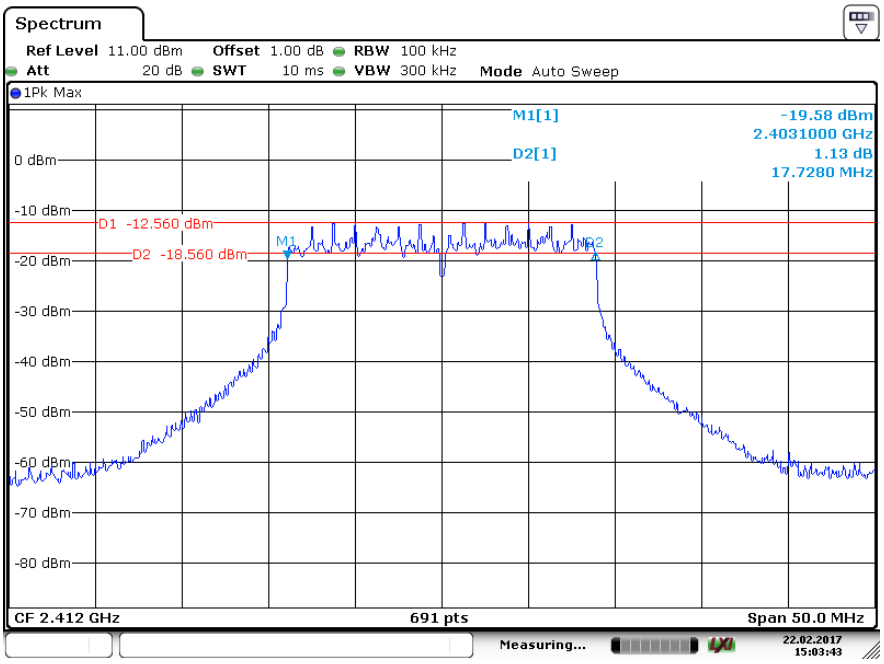
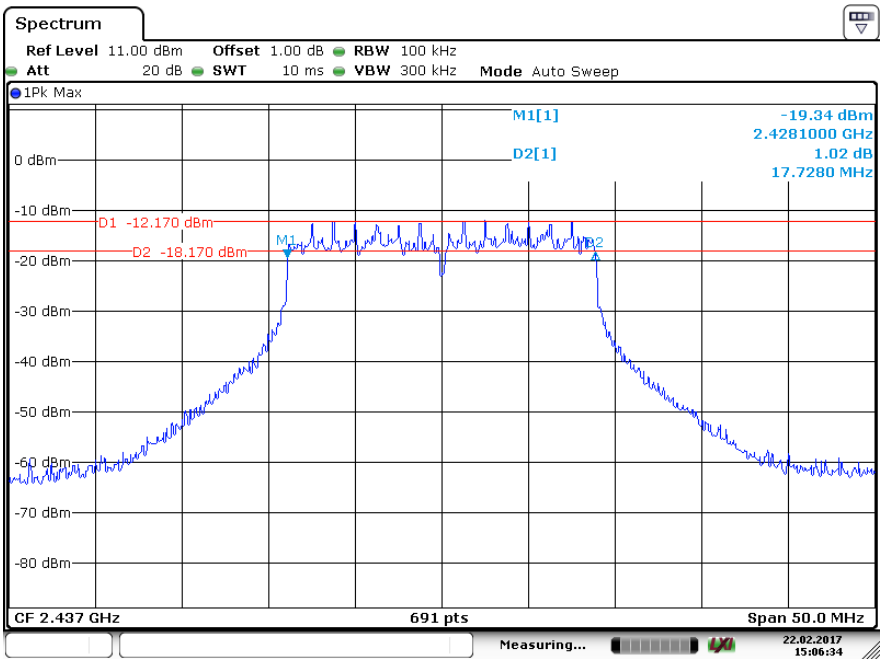
802.11n(HT20) mode with 72.2Mbps data rate
Channel 1: 2.412GHz:



Channel 6: 2.437GHz:



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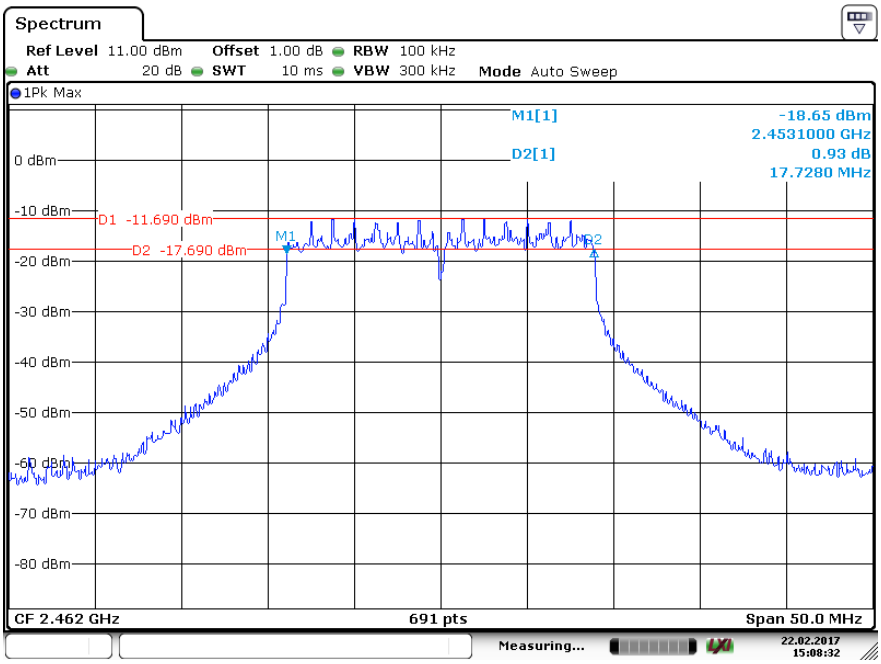
Channel 11: 2.462GHz:



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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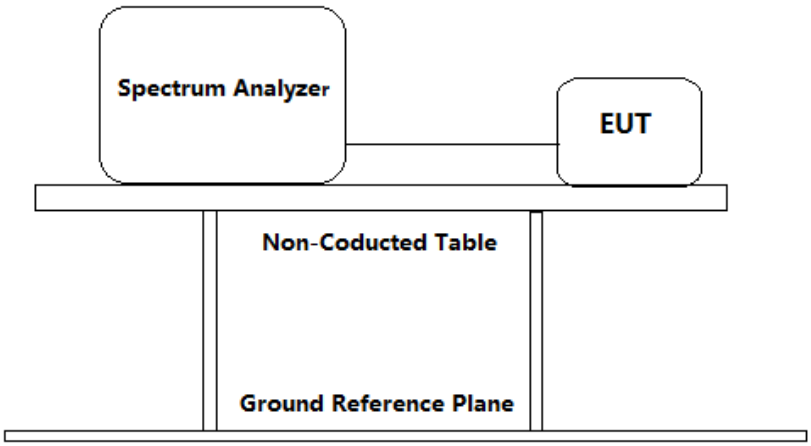

Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (cable loss =1 dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer:
   a) Set the RBW = 1 MHz.
   b) Set the VBW≥[3 × RBW].
   c) Set the span≥[1.5 × 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.

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Test result:

Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Channel Power (dBm)	Limit	Result
1	2412	802.11b	11 Mbps	12.25	1W (30dBm)	Pass
6	2437		11 Mbps	12.66		Pass
11	2462		11 Mbps	13.06		Pass
1	2412	802.11g	54 Mbps	6.72		Pass
6	2437		54 Mbps	7.28		Pass
11	2462		54 Mbps	7.61		Pass
1	2412	802.11n (HT20)	72.2 Mbps	6.04		Pass
6	2437		72.2 Mbps	6.90		Pass
11	2462		72.2 Mbps	7.28		Pass

Remark: Level = Read Level + Cable Loss

The unit does meet the FCC requirements.

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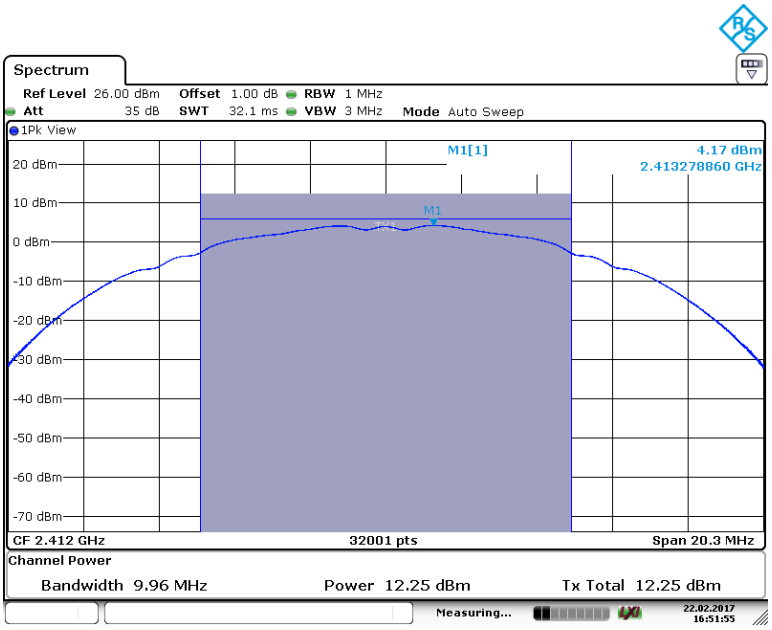
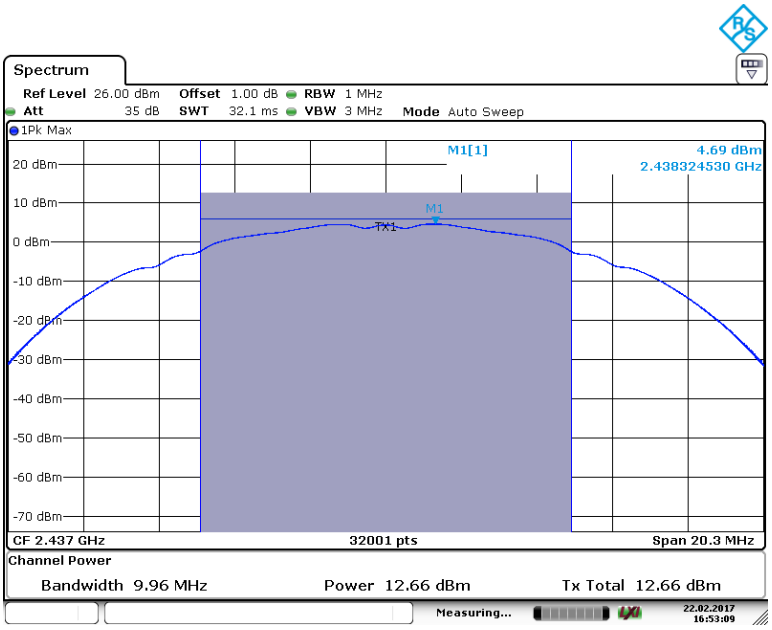
Result plot as follows:

802.11b mode with 11Mbps data rate

Channel 1: 2.412GHz:



Channel 6: 2.437GHz:



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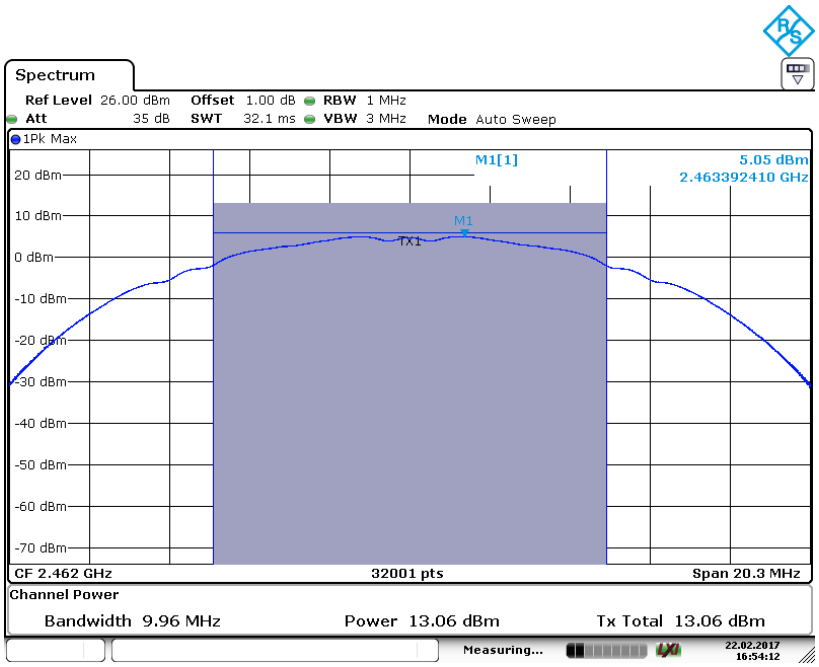
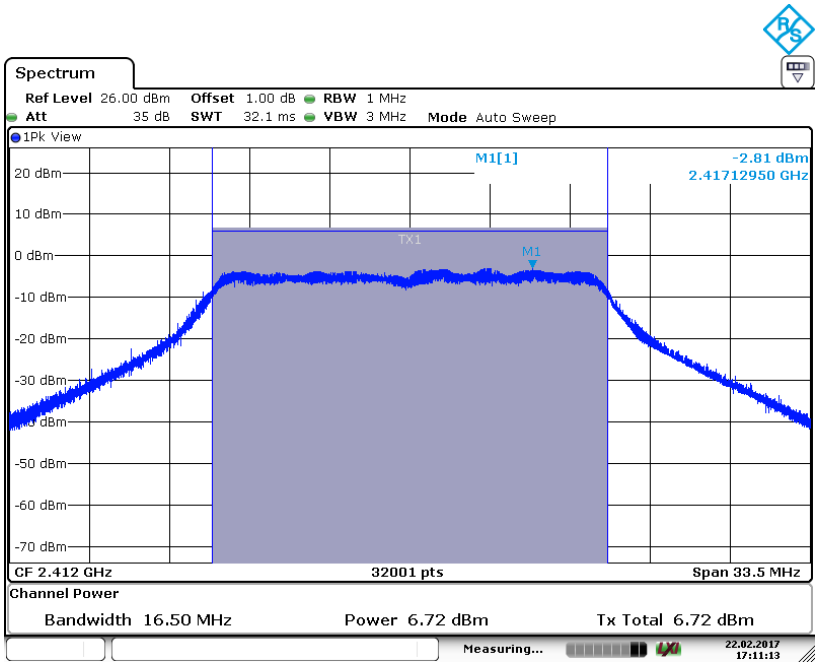
Channel 11: 2.462GHz:



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



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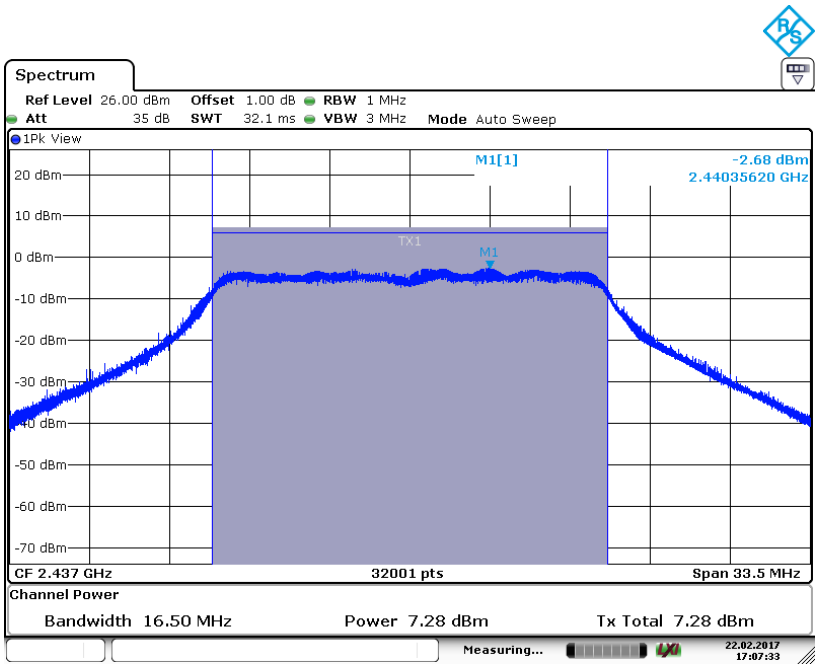
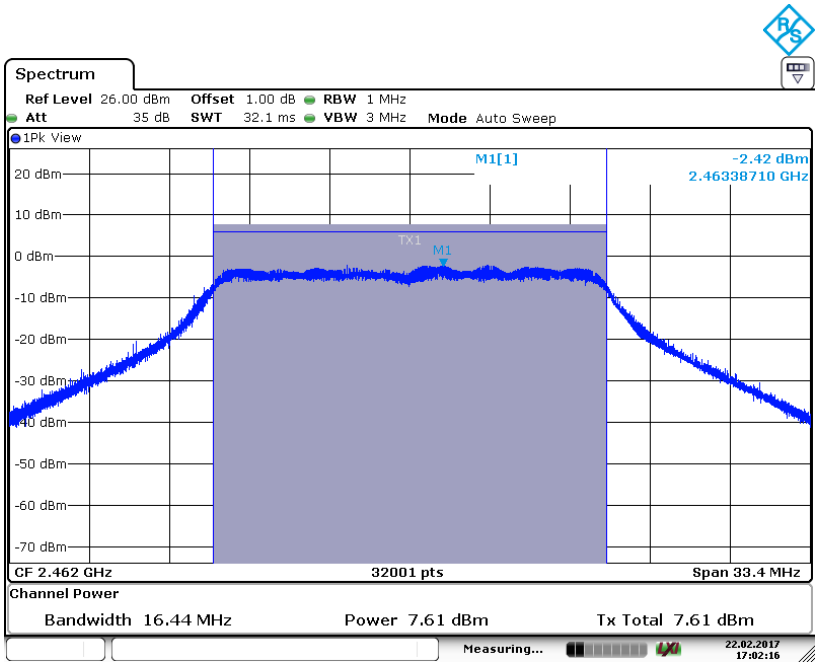
Channel 6: 2.437GHz:



Channel 11: 2.462GHz:



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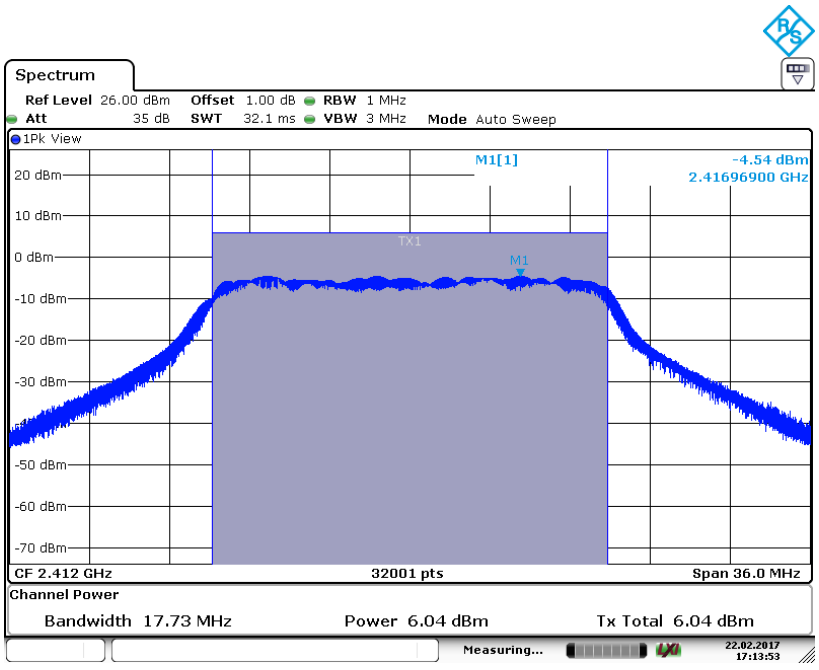
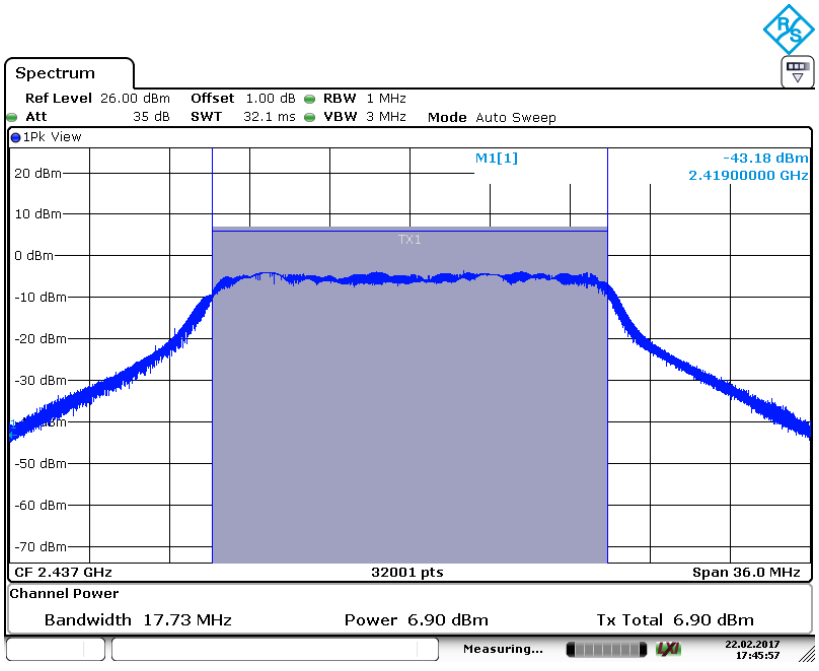
802.11n(HT20) mode with 72.2Mbps data rate
Channel 1: 2.412GHz:

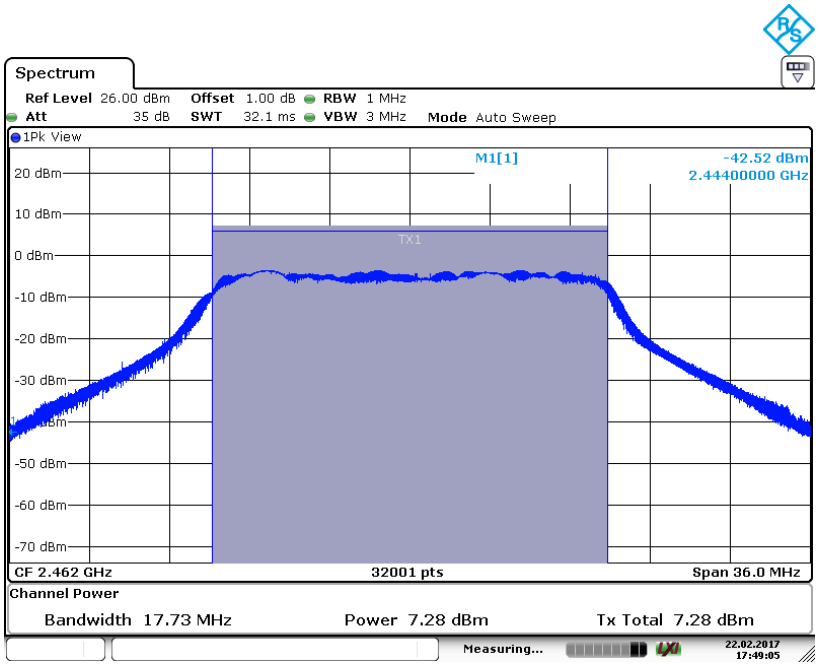


Channel 6: 2.437GHz:



TEST REPORT

Channel 11: 2.462GHz:

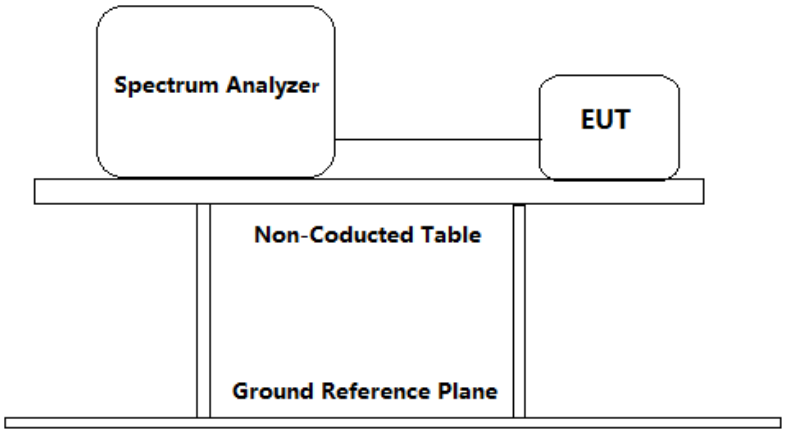


Test result: The unit does meet the FCC requirements.

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:	

TEST REPORT



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable(cable loss =1 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 × DTS bandwidth.
   c) Set the RBW to 3 kHz $\leqslant$ RBW $\leqslant$ 100 kHz.
   d) Set the VBW $\geqslant$ [3 × 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:

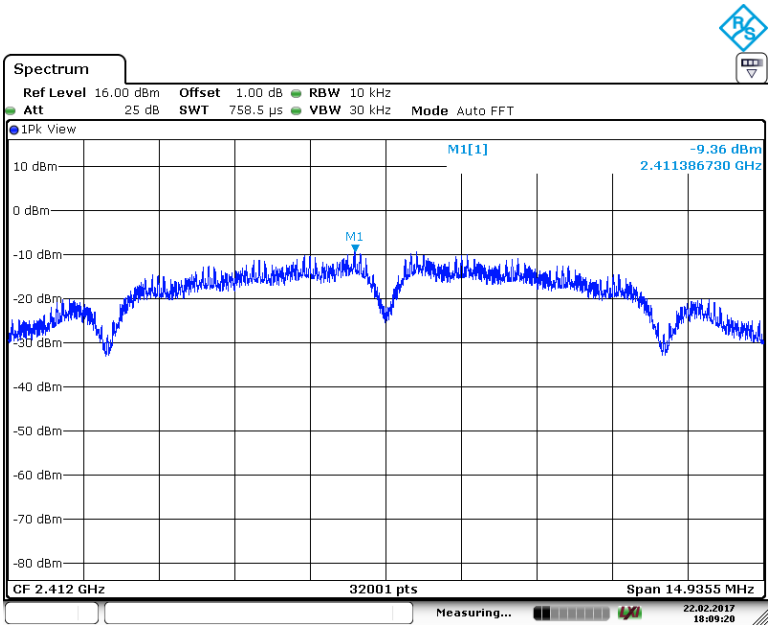
Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Peak Power Spectral Density (dBm/10kHz)	Limit	Result
1	2412	802.11b	11 Mbps	-9.36	8dBm/ 3 KHz	Pass
6	2437		11 Mbps	-9.18		Pass
11	2462		11 Mbps	-8.78		Pass
1	2412	802.11g	54 Mbps	-19.97		Pass
6	2437		54 Mbps	-17.64		Pass
11	2462		54 Mbps	-18.31		Pass
1	2412	802.11n (HT20)	72.2 Mbps	-19.06		Pass
6	2437		72.2 Mbps	-17.64		Pass
11	2462		72.2 Mbps	-17.98		Pass

Test result: Level = Read Level + Cable Loss.
The unit does meet the FCC requirements.

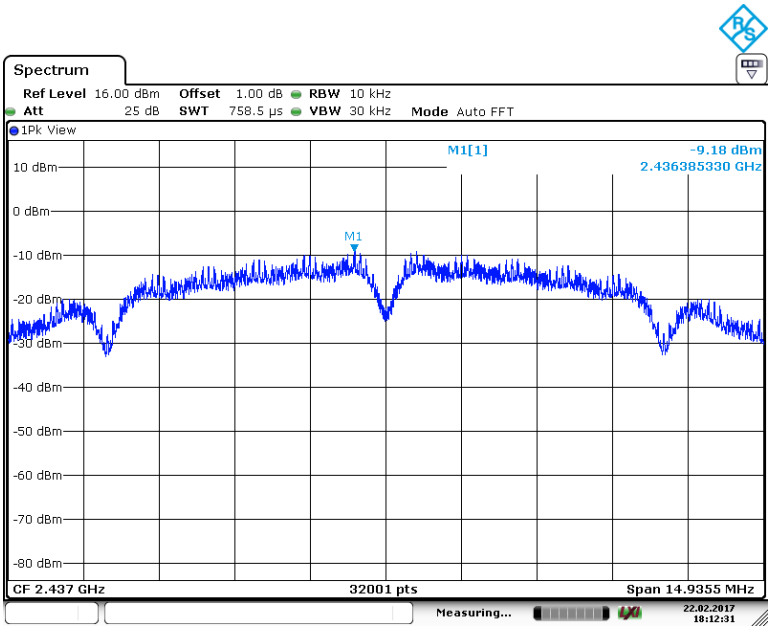
TEST REPORT

Result plot as follows:

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

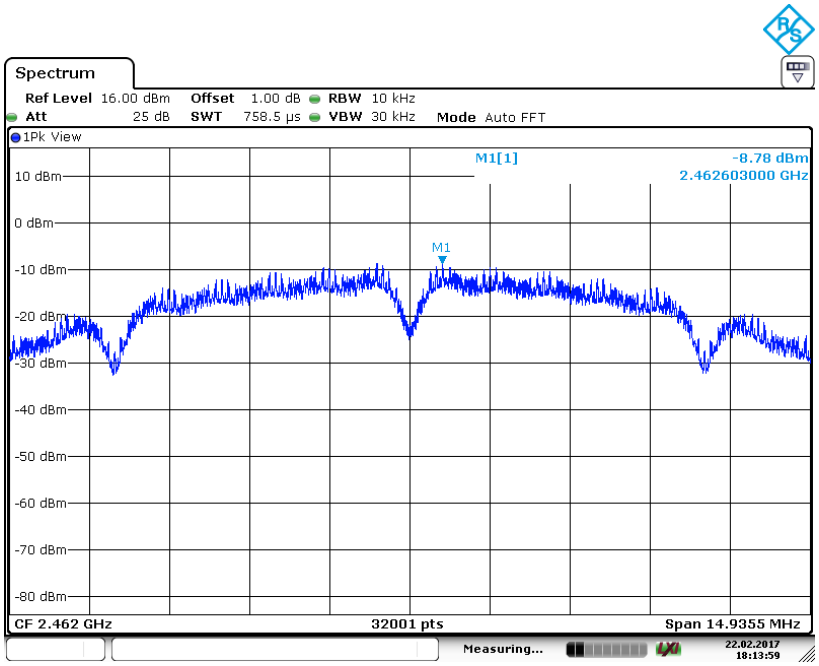


Channel 6: 2.437GHz:

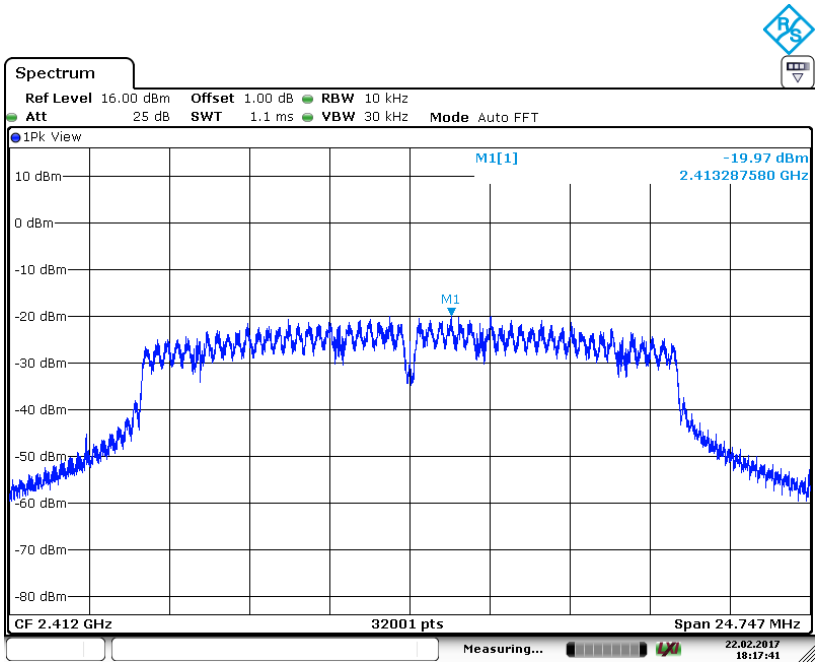


TEST REPORT

Channel 11: 2.462GHz:

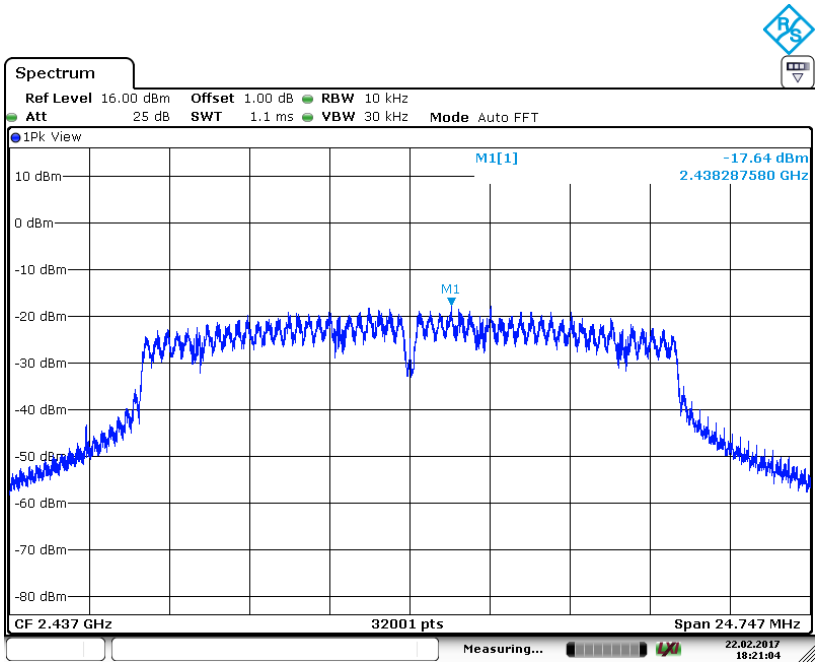


802.11g mode with 54Mbps data rate
Channel 1: 2.412GHz:

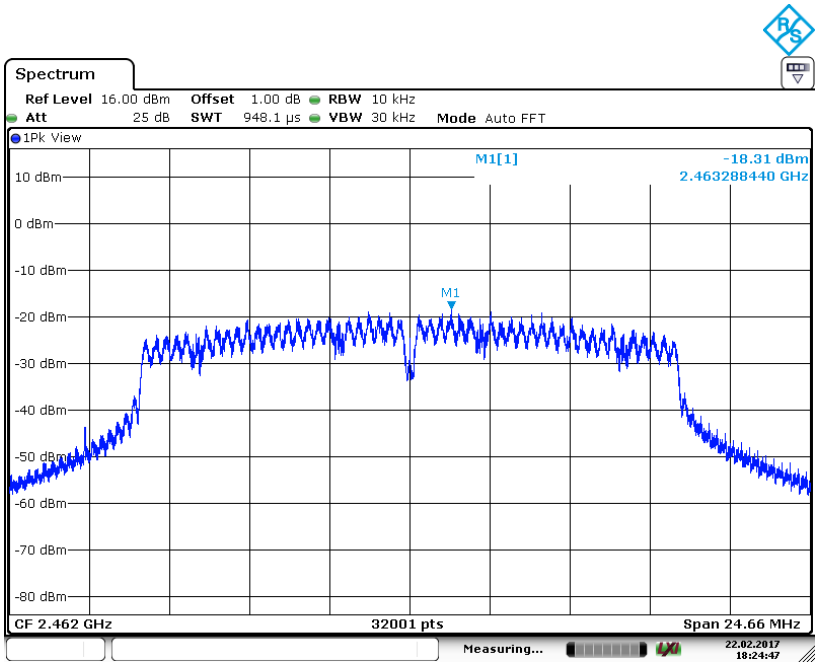


TEST REPORT

Channel 6: 2.437GHz:

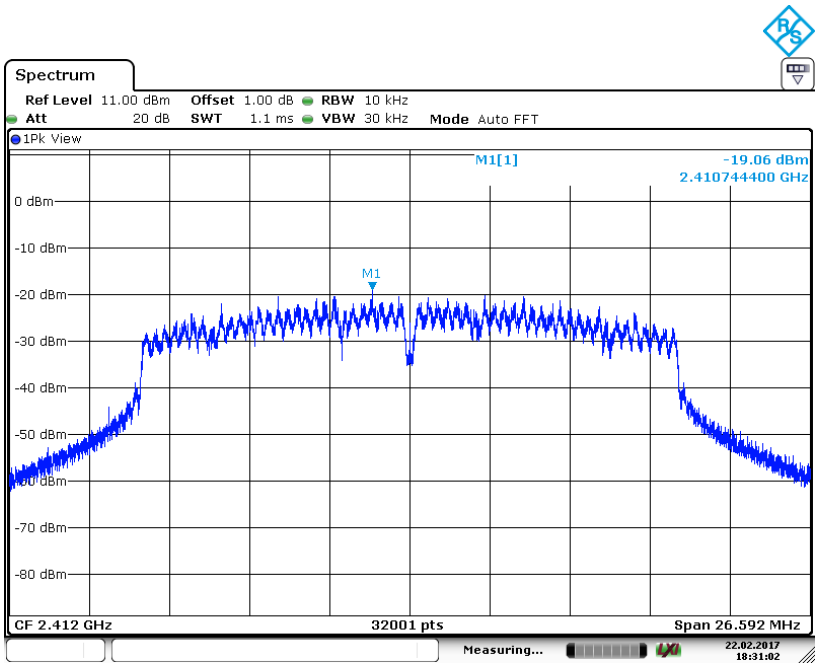


Channel 11: 2.462GHz:

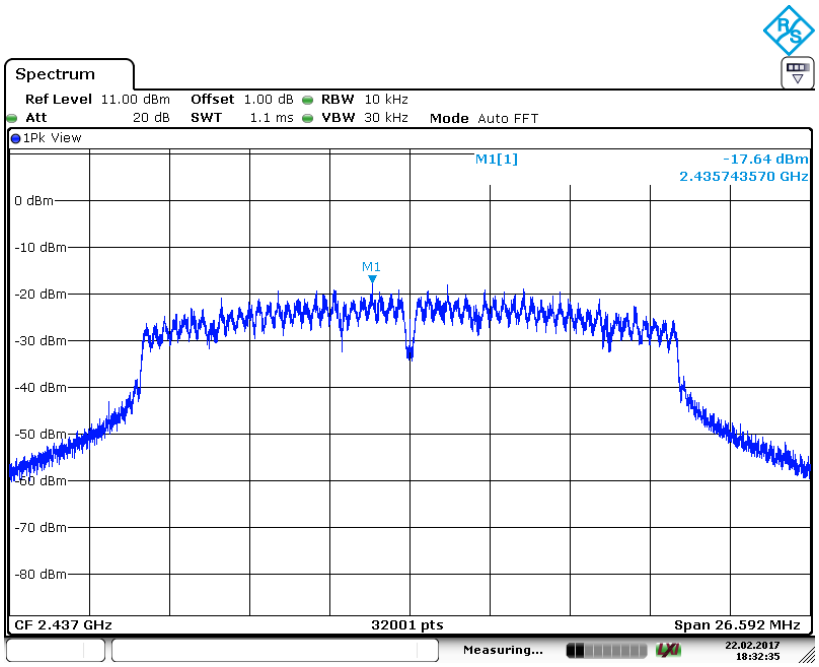


TEST REPORT

802.11n(HT20) mode with 72.2Mbps data rate
Channel 1: 2.412GHz:

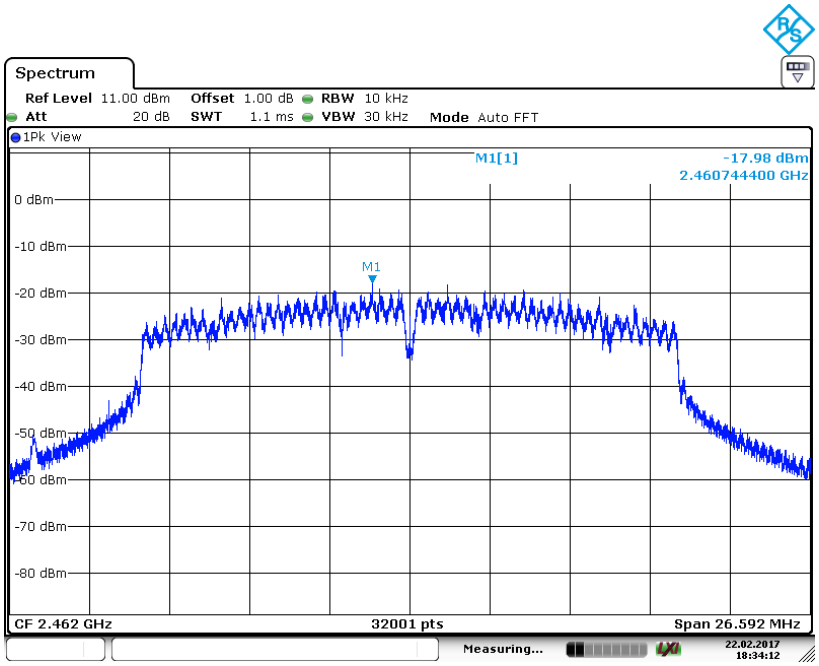


Channel 6: 2.437GHz:



TEST REPORT

Channel 11: 2.462GHz:

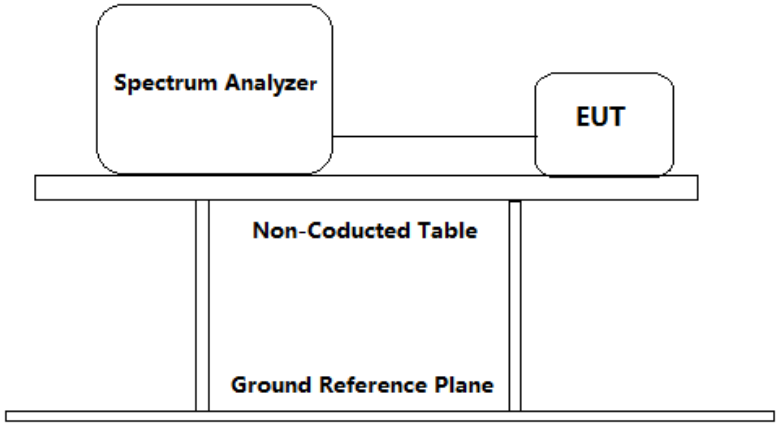


4.5 Out of Band Conducted Emissions

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 REPORT

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable (cable loss =2dB) 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 ≥ 1.5 × DTS bandwidth.
   c) Set the RBW = 100 kHz.
   d) Set the VBW ≥ [3 × 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 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 ≥ [3 × 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.

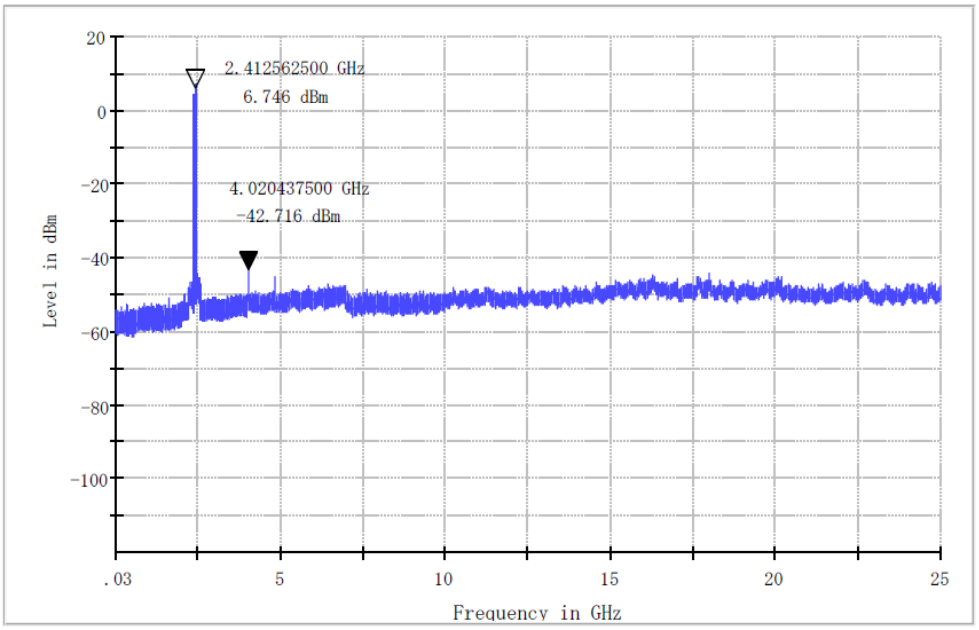
TEST REPORT

Used Test Equipment List

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

Result plot as follows:

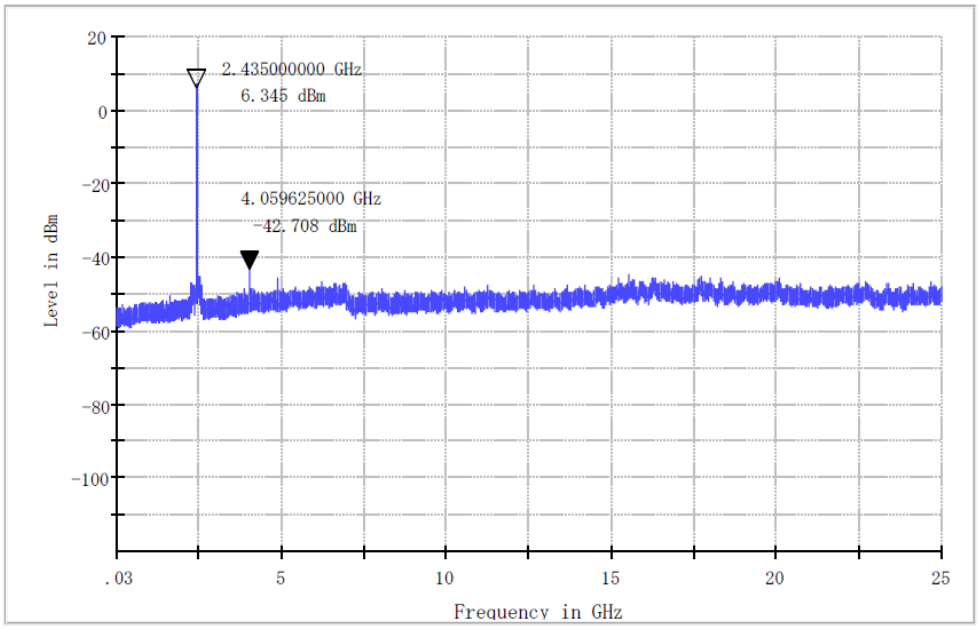
802.11b mode with 11Mbps data rate
Channel 1: 2.412GHz:



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.

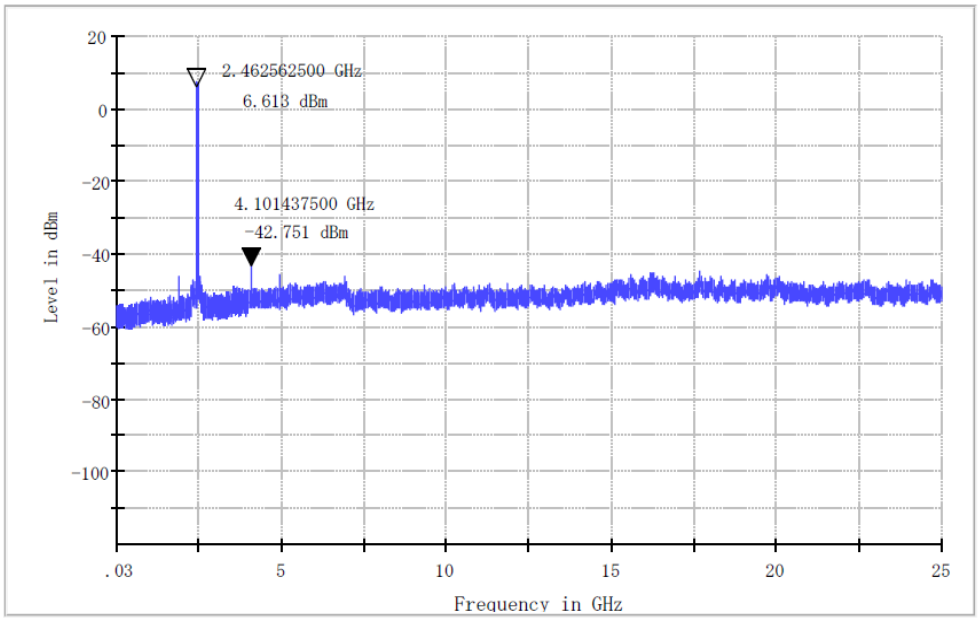
Channel 6: 2.437GHz:

TEST REPORT



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:

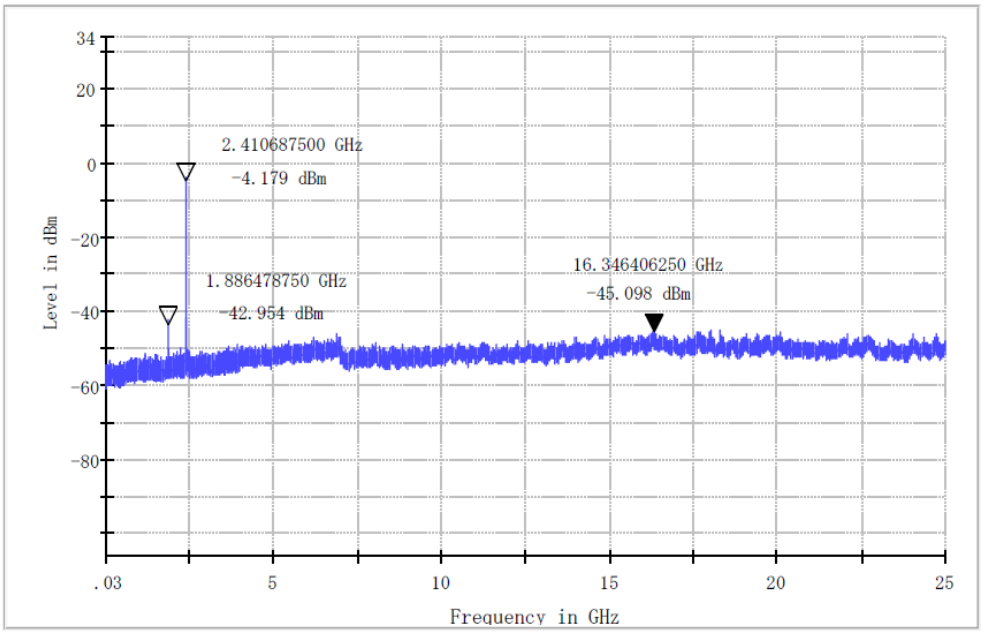


In any 100kHz bandwidth, the Conducted Spurious Emissions from 30 MHz to 25 GHz were greater than 20dB below the peak emission within the band that contains the highest level of the desired power.

802.11g mode with 54Mbps data rate

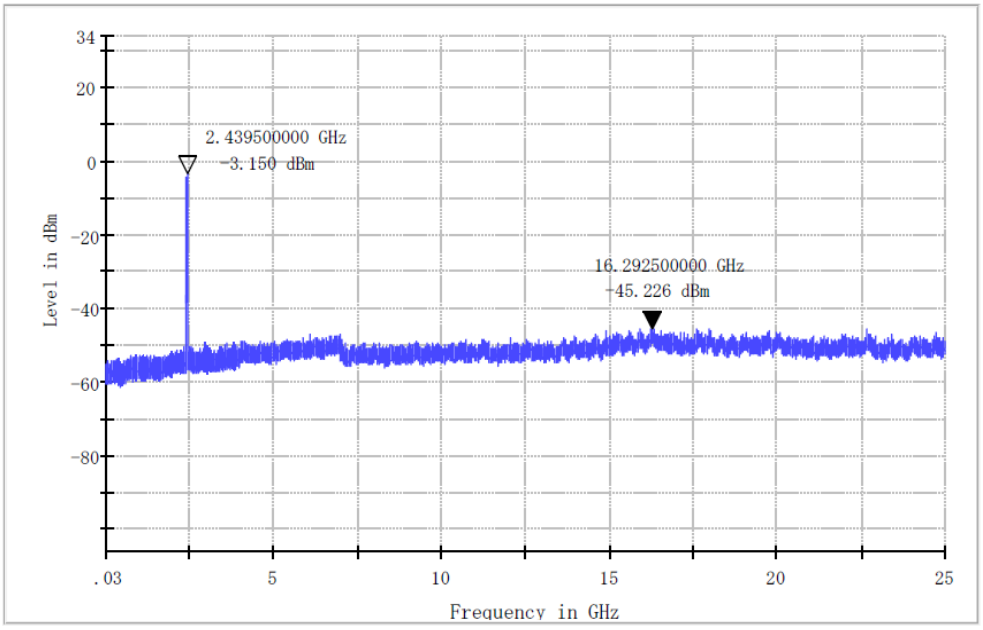
Channel 1: 2.412GHz:

TEST REPORT



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.

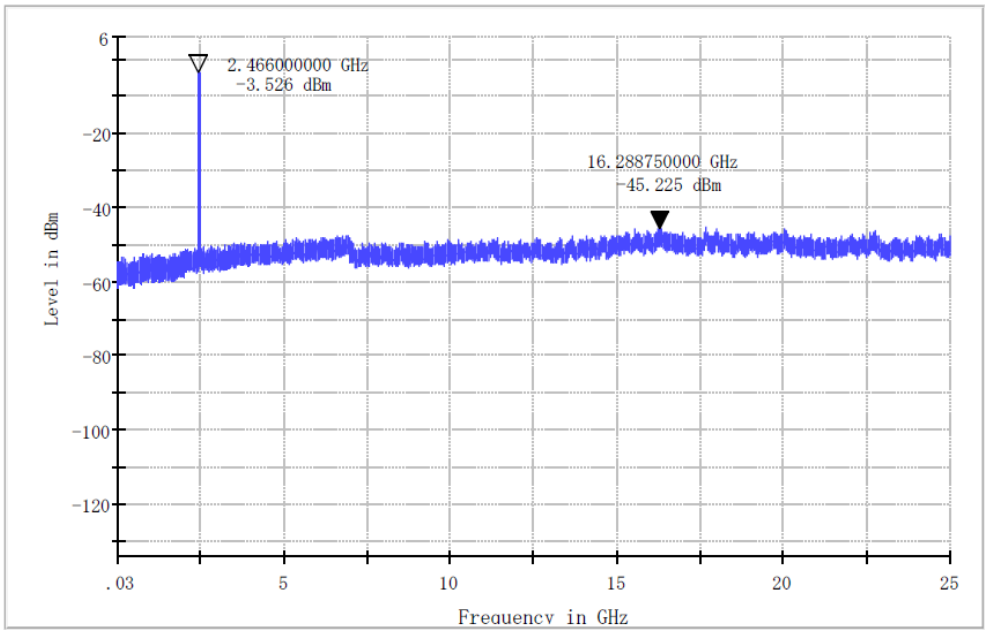
Channel 6: 2.437GHz:



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 the desired power.

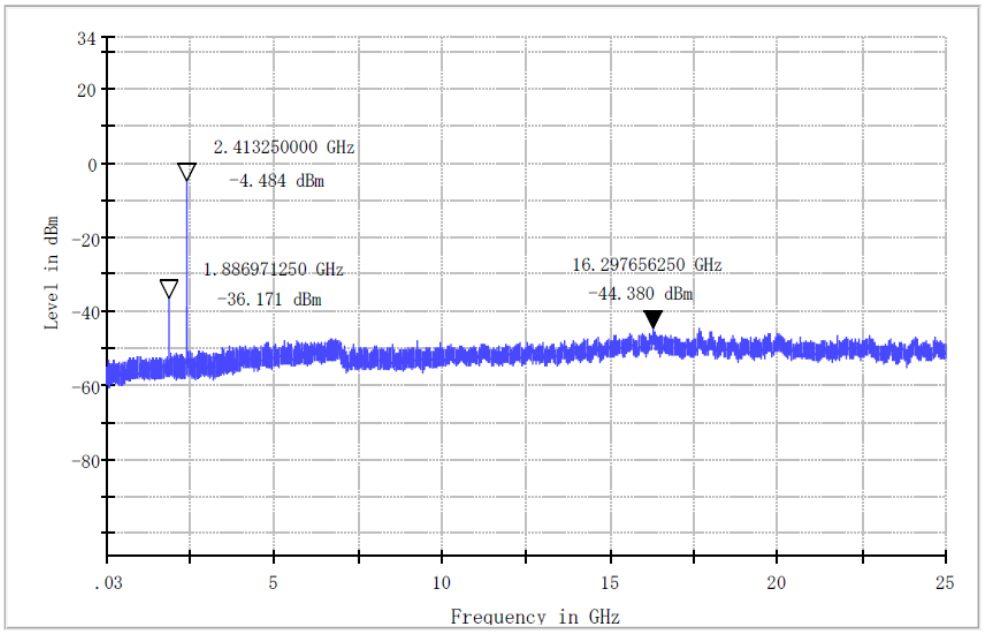
Channel 11: 2.462 GHz:

TEST REPORT



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.

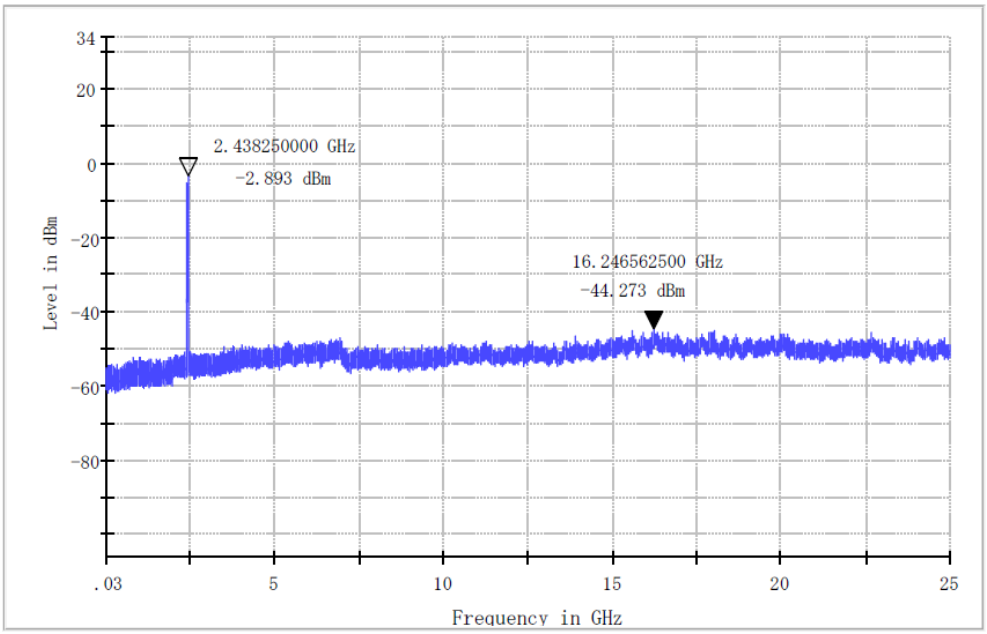
802.11n(HT20) mode with 72.2Mbps data rate
Channel 1: 2.412GHz:



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.

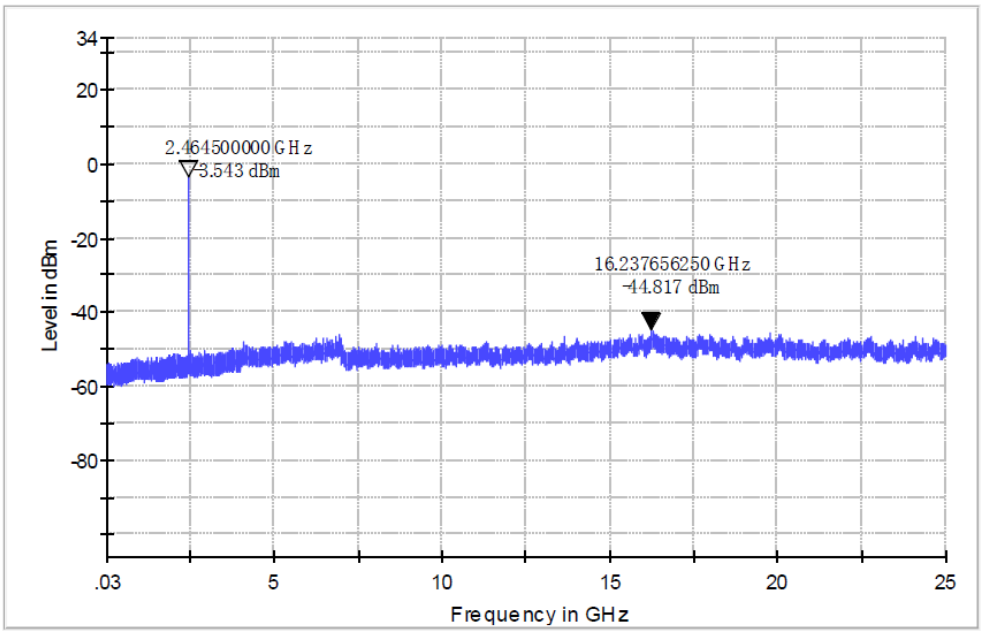
Channel 6: 2.437GHz:

TEST REPORT



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 the desired power.

TEST REPORT

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 dBμV/m between 30MHz & 88MHz; 43.5 dBμV/m between 88MHz & 216MHz; 46.0 dBμV/m between 216MHz & 960MHz; 54.0 dBμV/m above 960MHz.
Detector:	For Peak and Quasi-Peak value: RBW = 1 MHz for f ≥ 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 ≥ RBW Sweep = auto Detector function = peak for f ≥ 1 GHz, QP for f < 1 GHz Trace = max hold For AV value: RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz VBW=10 Hz Sweep = auto Trace = max hold

TEST REPORT

Field Strength Calculation: 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:

FS = RA + AF + CF - AG + PD + AV
FS = RA + Correct Factor + AV
FS = Field Strength in dBµV/m

Where:
RA = Receiver Amplitude (including preamplifier) in dBµV
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 dBµV 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 dBµV/m.
RA = 62.0 dBµV
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 dBµV/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:

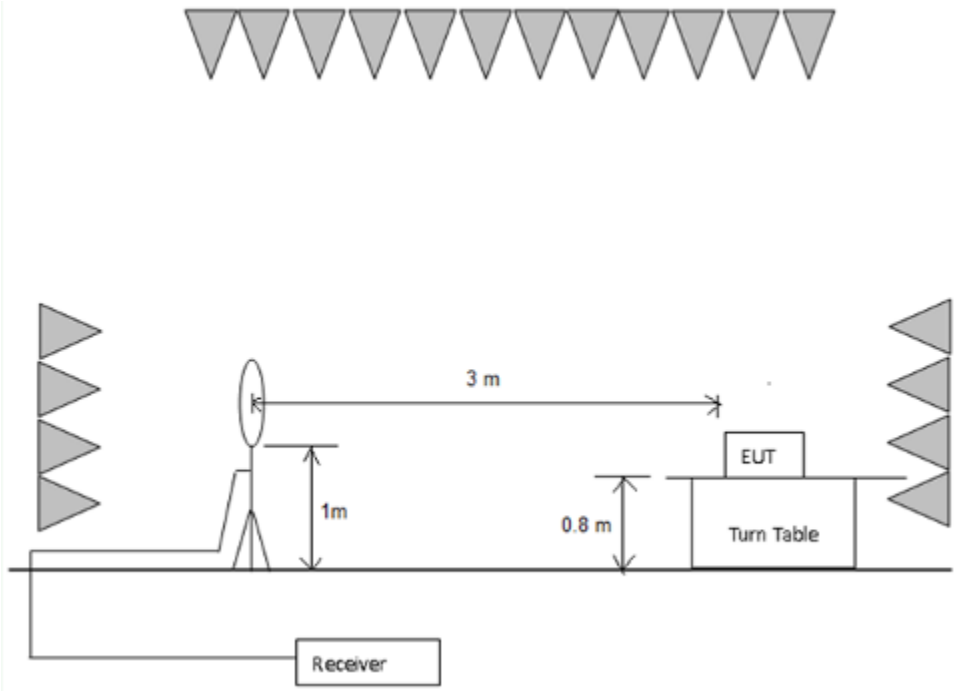
MHz	MHz	MHz	GHz

TEST REPORT

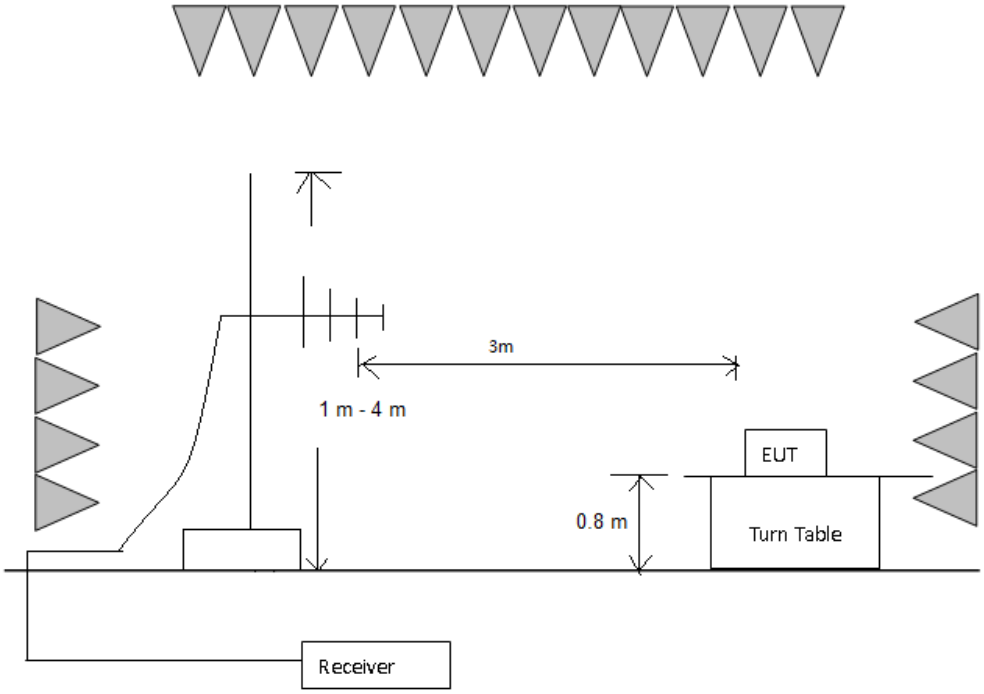
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
10.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	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:

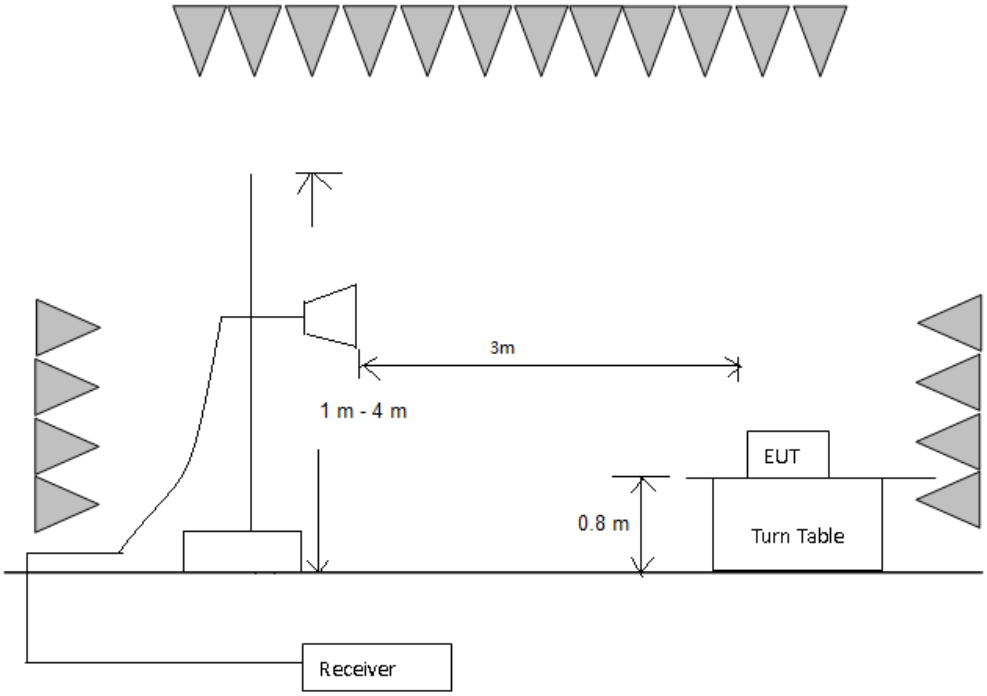


2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 40 GHz emissions:

TEST REPORT



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 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

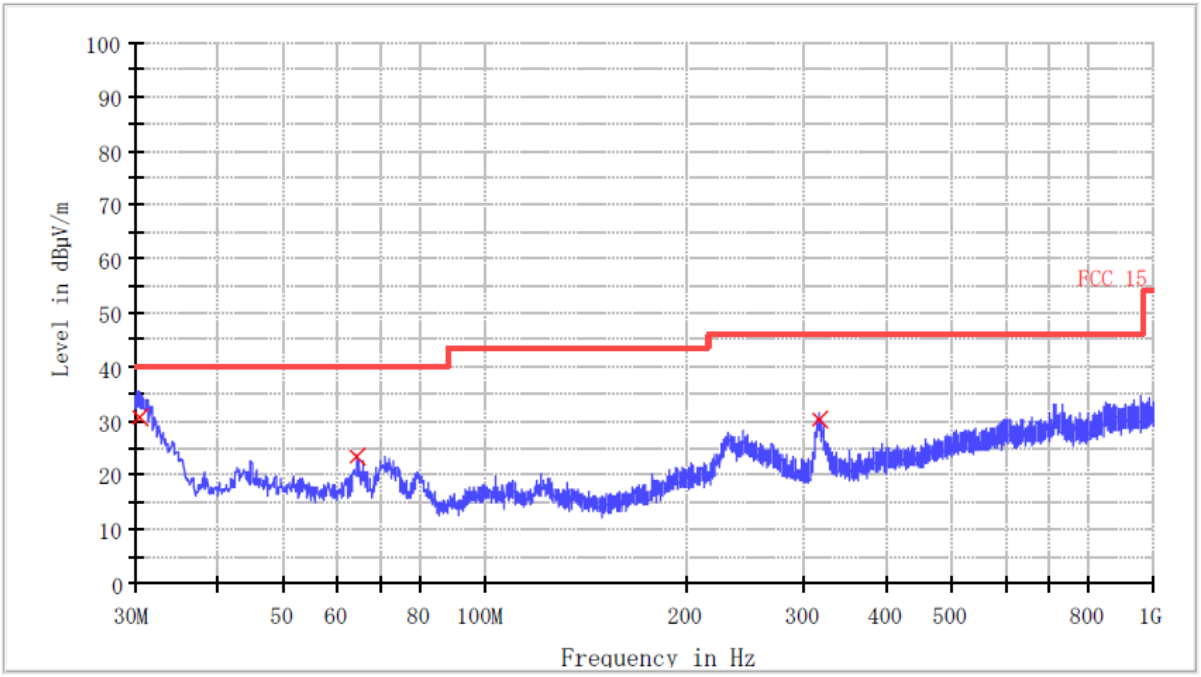
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 1 (2.412 GHz) in transmitting status

TEST REPORT

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

Vertical:



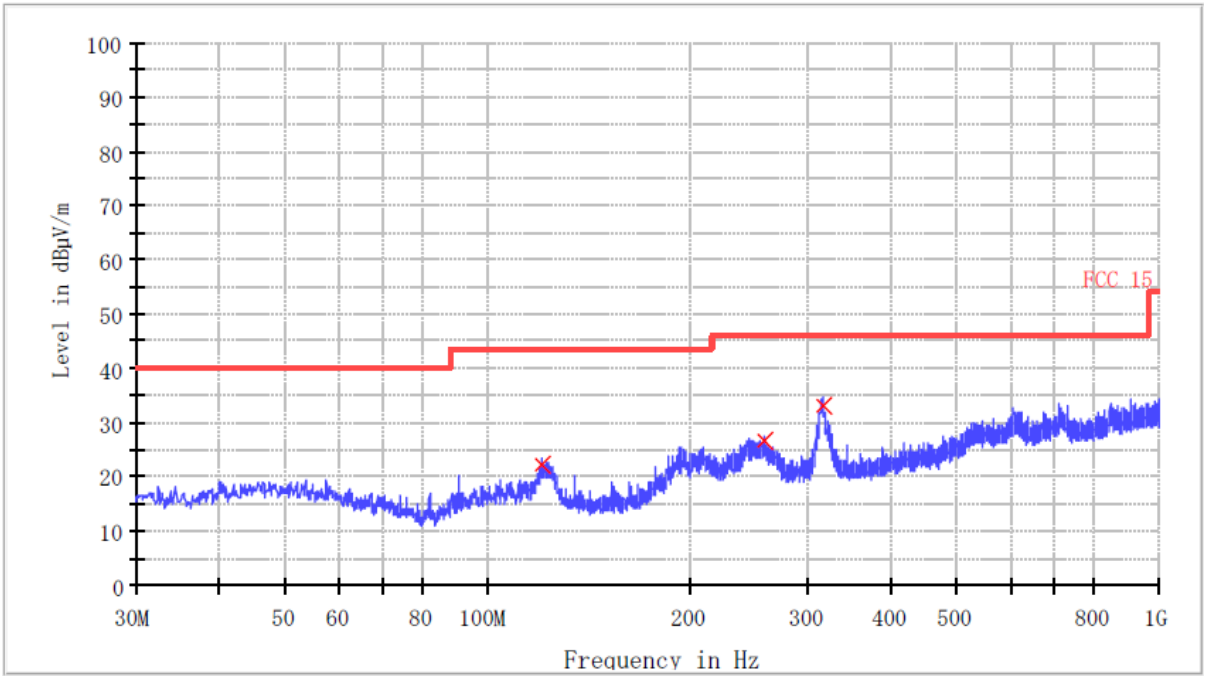
Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.400000	30.5	120.000	V	11.2	9.5	40.0
64.440000	23.3	120.000	V	11.6	16.7	40.0
317.120000	30.3	120.000	V	15.7	15.7	46.0

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

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
120.520000	22.3	120.000	H	10.5	21.2	43.5
258.040000	26.6	120.000	H	14.3	19.4	46.0
315.960000	32.9	120.000	H	15.7	13.1	46.0

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)

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
4018.563	50.215	-2.5	47.715	74	V
2258.012	54.515	-7.5	47.015	74	H
10255.600	41.112	7.7	48.812	74	H

TEST REPORT

AV Measurement:

Frequency (MHz)	AV Reading Level (dBμV)	Correction factors (dB/m)	AV Emission Level (dBμV/m)	AV Limit (dBμV/m)	Antenna polarization
4018.563	-	-2.5	-	54	V
2258.012	-	-7.5	-	54	H
10255.600	-	7.7	-	54	H

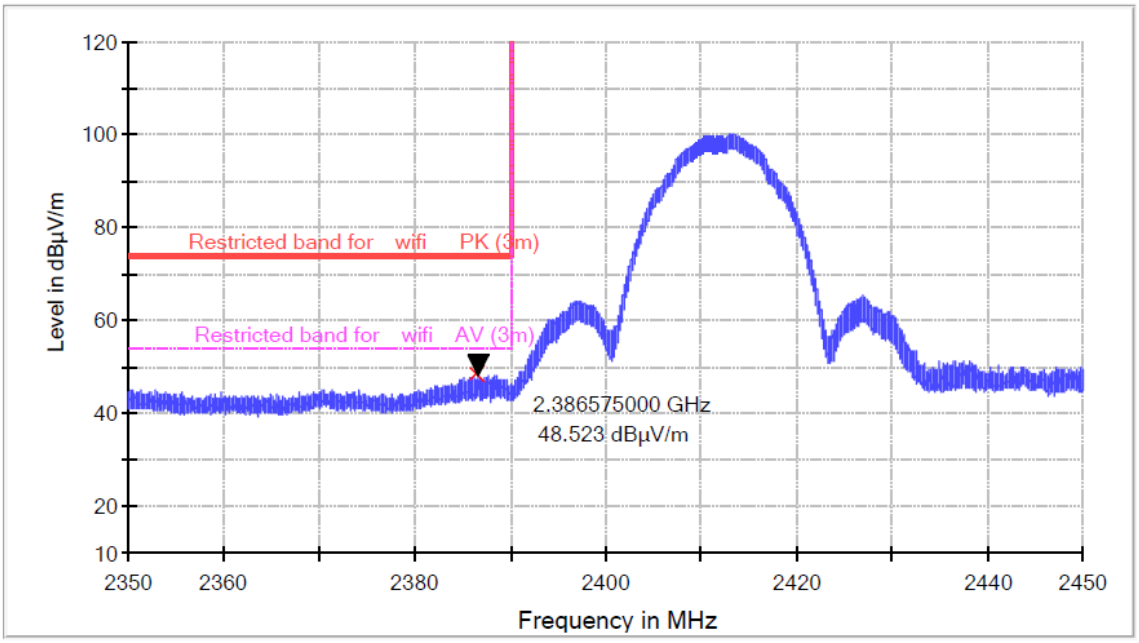
Remark:

1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. When Peak emission level was below AV limit, the AV emission level did not be recorded.

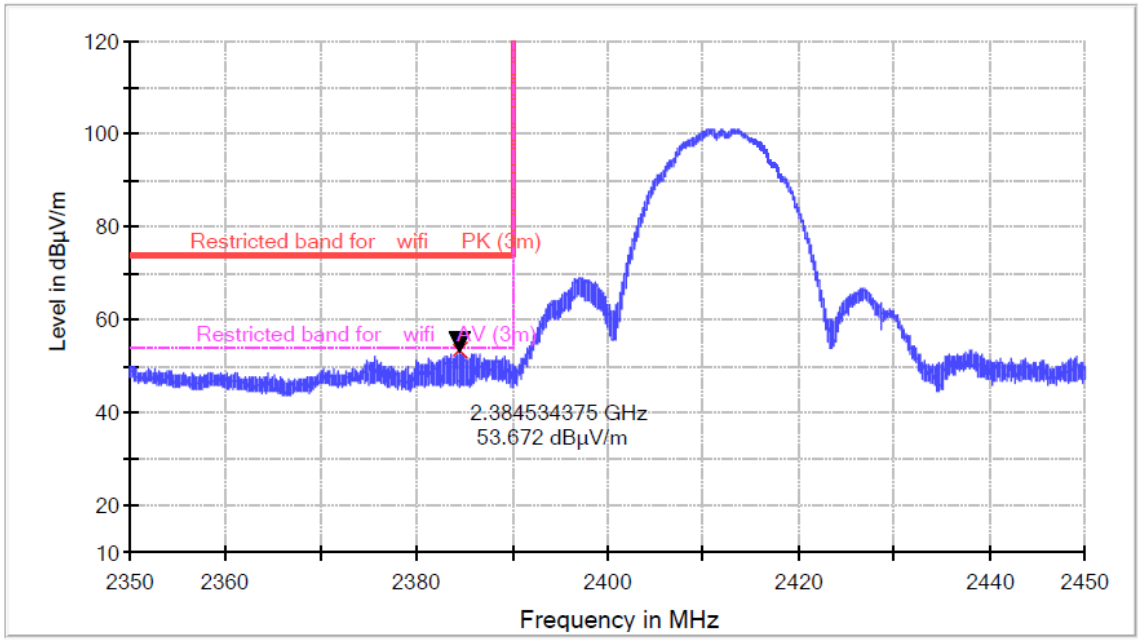
TEST REPORT

Restricted Bands measurement

Vertical



Horizontal



TEST REPORT

Peak Measurement:

Frequency (MHz)	PK Reading Level (dBμV)	Correction factors (dB/m)	PK Emission Level (dBμV/m)	PK Limit (dBμV/m)	Antenna polarization
2386.575	55.823	-7.3	48.523	74	V
2384.534	60.972	-7.3	53.672	74	H

Average Measurement:

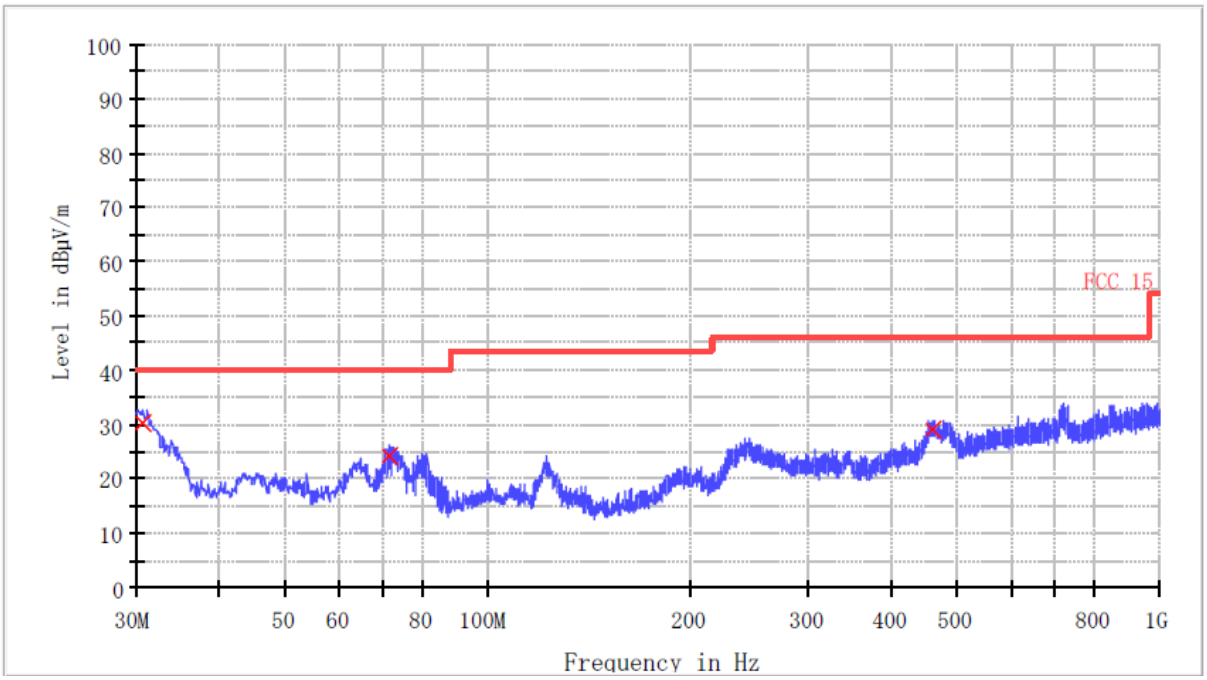
Frequency (MHz)	AV Reading Level (dBμV)	Correction factors (dB/m)	AV Emission Level (dBμV/m)	AV Limit (dBμV/m)	Antenna polarization
2386.575	-	-7.3	-	54	V
2384.534	-	-7.3	-	54	H

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

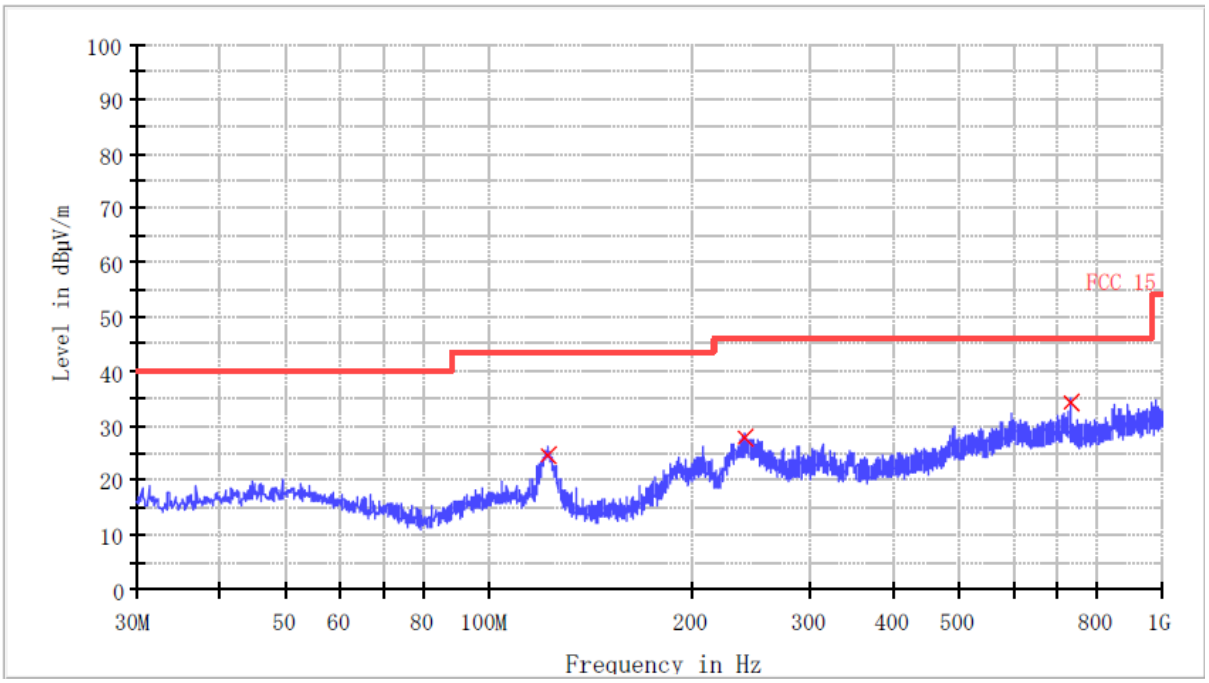
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.760000	30.2	120.000	V	11.2	9.8	40.0
71.400000	24.4	120.000	V	9.9	15.6	40.0
460.080000	29.1	120.000	V	18.8	16.9	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
122.520000	24.4	120.000	H	10.2	19.1	43.5
240.600000	27.7	120.000	H	13.8	18.3	46.0
729.080000	34.3	120.000	H	23.3	11.7	46.0

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
4063.188	50.657	-2.3	48.357	74	V
4873.875	44.486	-0.5	43.986	74	V
7609.813	42.221	4.6	46.821	74	V
2252.156	52.536	-7.5	45.036	74	H
4062.656	52.164	-2.3	49.864	74	H
7727.750	43.174	4.7	47.874	74	H

TEST REPORT

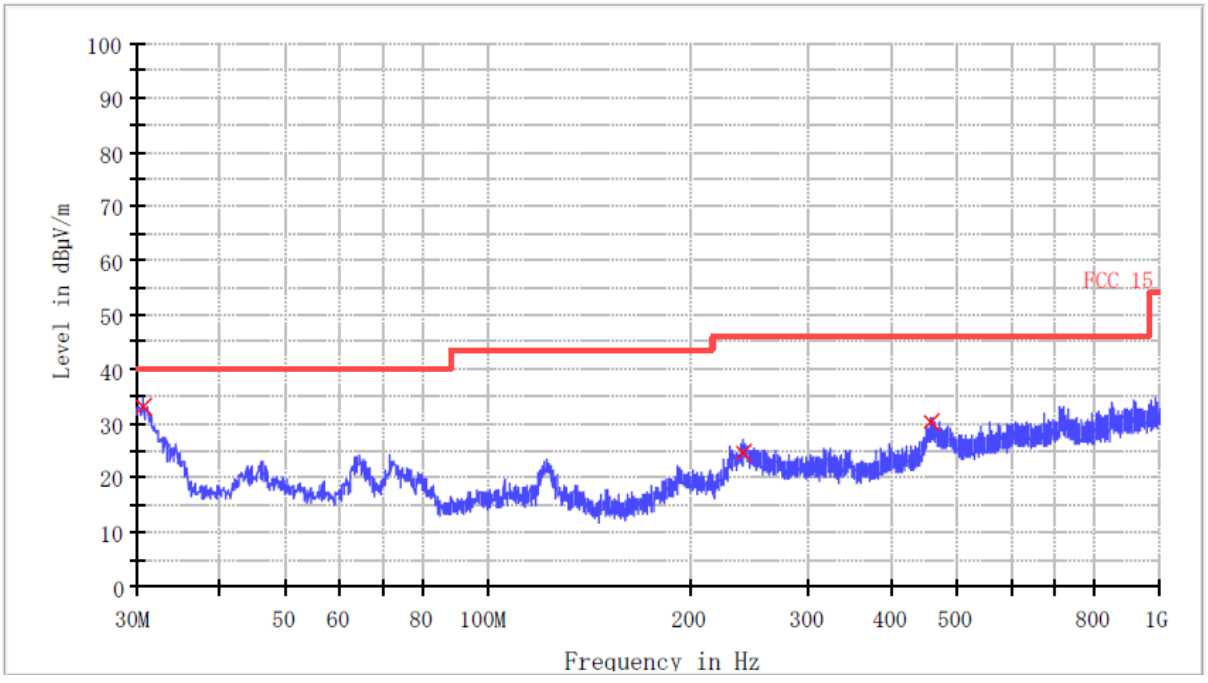
AV Measurement:

Frequency (MHz)	AV Reading Level (dBµV)	Correction factors (dB/m)	AV Emission Level (dBµV/m)	AV Limit (dBµV/m)	Antenna polarization
4063.188	-	-2.3	-	54	V
4873.875	-	-0.5	-	54	V
7609.813	-	4.6	-	54	V
2252.156	-	-7.5	-	54	H
4062.656	-	-2.3	-	54	H
7727.750	-	4.7	-	54	H

Remark:
1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. 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

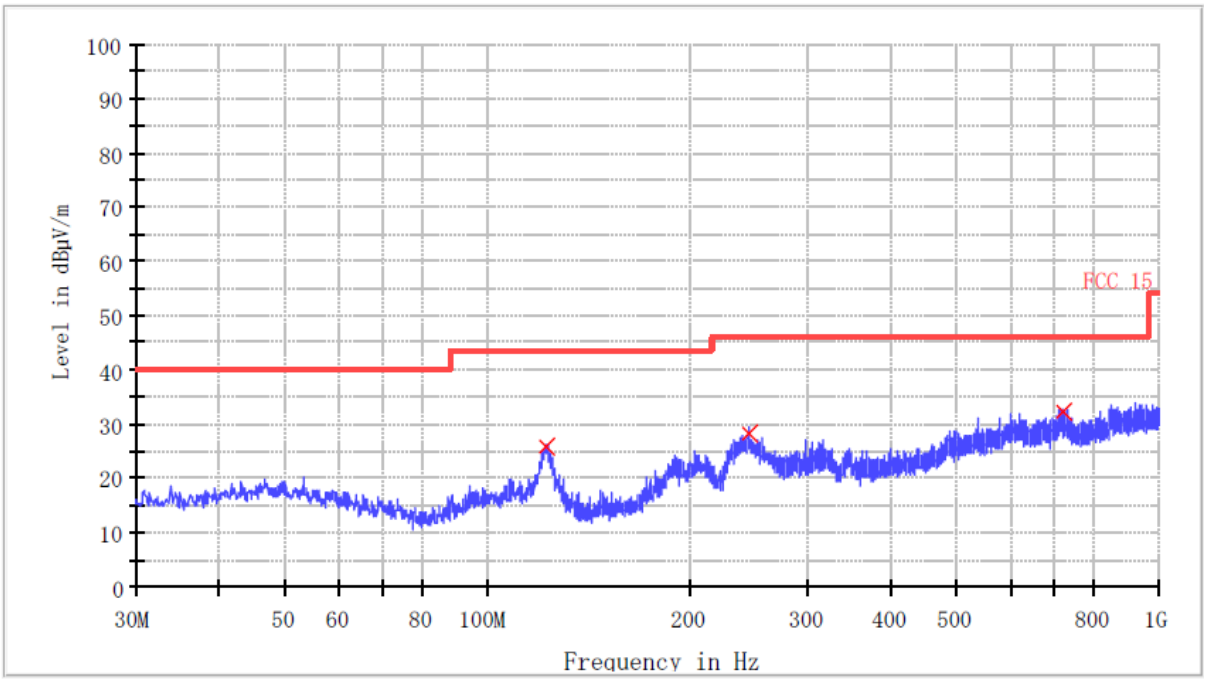
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.680000	33.2	120.000	V	11.2	6.8	40.0
239.920000	24.8	120.000	V	13.8	21.2	46.0
457.760000	30.3	120.000	V	18.8	15.8	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
121.960000	25.7	120.000	H	10.3	17.8	43.5
244.760000	28.1	120.000	H	13.9	17.9	46.0
719.280000	32.3	120.000	H	23.2	13.7	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
4104.094	50.154	-2.1	48.054	74	V
4101.969	46.557	-2.1	44.457	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
4104.094	-	-2.1	-	54	V
4101.969	-	-2.1	-	54	H

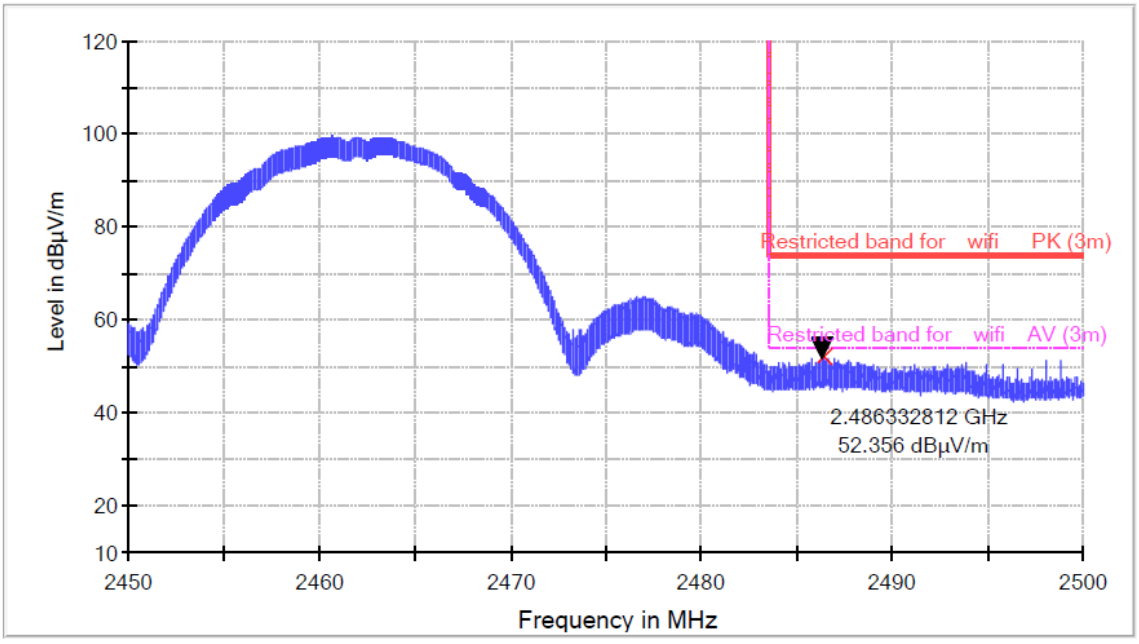
TEST REPORT

Remark:

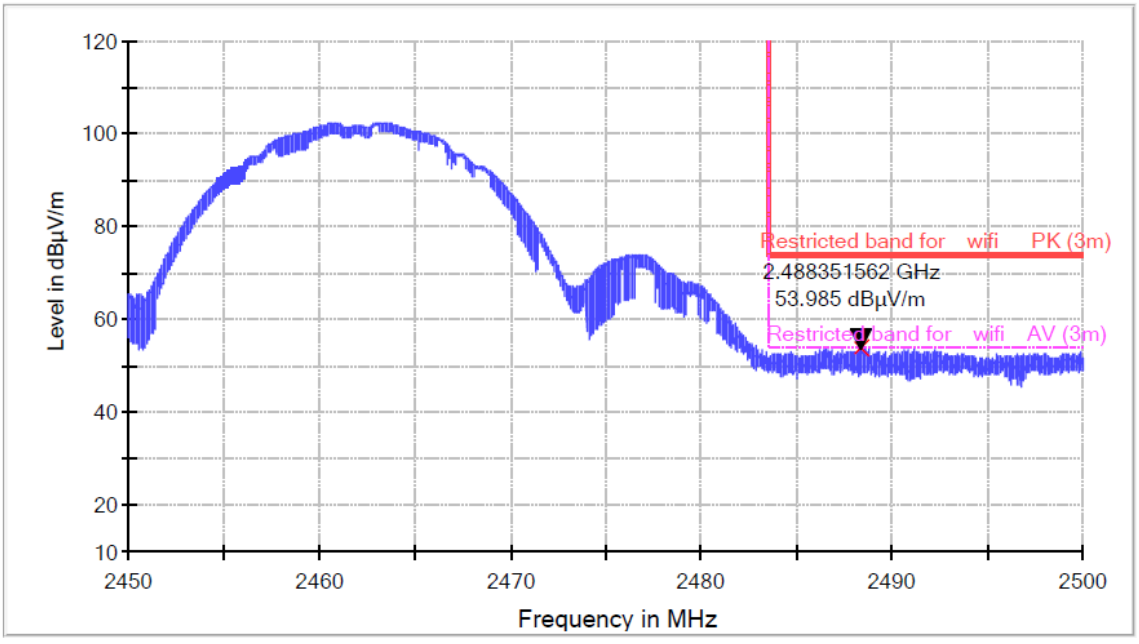
1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. When Peak emission level was below AV limit, the AV emission level did not be recorded.

Restricted Bands measurement

Vertical



Horizontal



TEST REPORT

Peak Measurement:

Frequency (MHz)	PK Reading Level (dBμV)	Correction factors (dB/m)	PK Emission Level (dBμV/m)	PK Limit (dBμV/m)	Antenna polarization
2486.333	59.456	-7.1	52.356	74	V
2488.352	60.985	-7.1	53.885	74	H

Average Measurement:

Frequency (MHz)	AV Reading Level (dBμV)	Correction factors (dB/m)	AV Emission Level (dBμV/m)	AV Limit (dBμV/m)	Antenna polarization
2486.333	-	-7.1	-	54	V
2488.352	-	-7.1	-	54	H

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

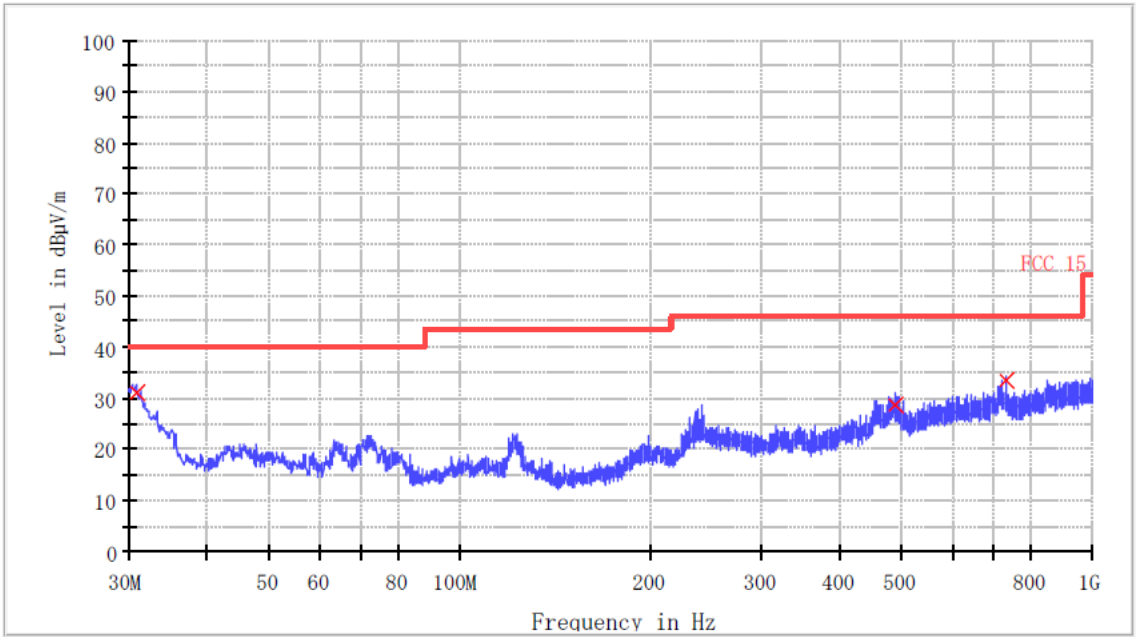
TEST REPORT

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

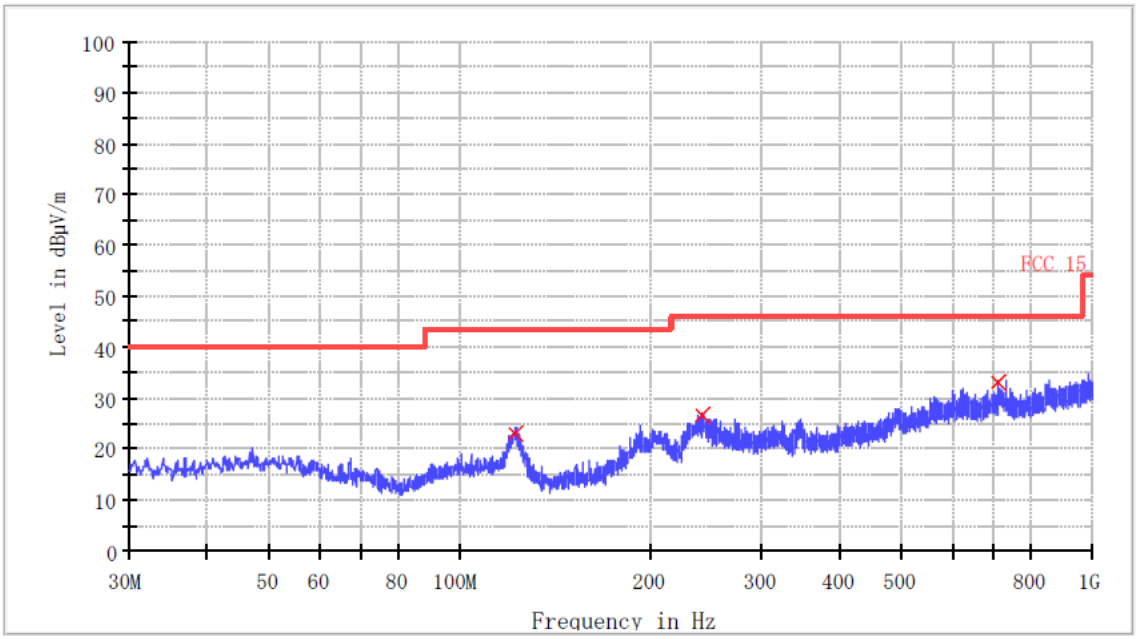
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.880000	31.0	120.000	V	11.2	9.0	40.0
487.560000	28.7	120.000	V	19.3	17.3	46.0
729.840000	33.6	120.000	V	23.3	12.4	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
122.040000	23.1	120.000	H	10.3	20.4	43.5
241.560000	26.4	120.000	H	13.8	19.6	46.0
711.240000	33.0	120.000	H	23.1	13.0	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
8330.326	41.622	4.9	46.522	74	V
12099.406	41.815	7.8	49.615	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
2389.291	-	-7.3	-	54	V
2389.594	-	-7.3	-	54	H

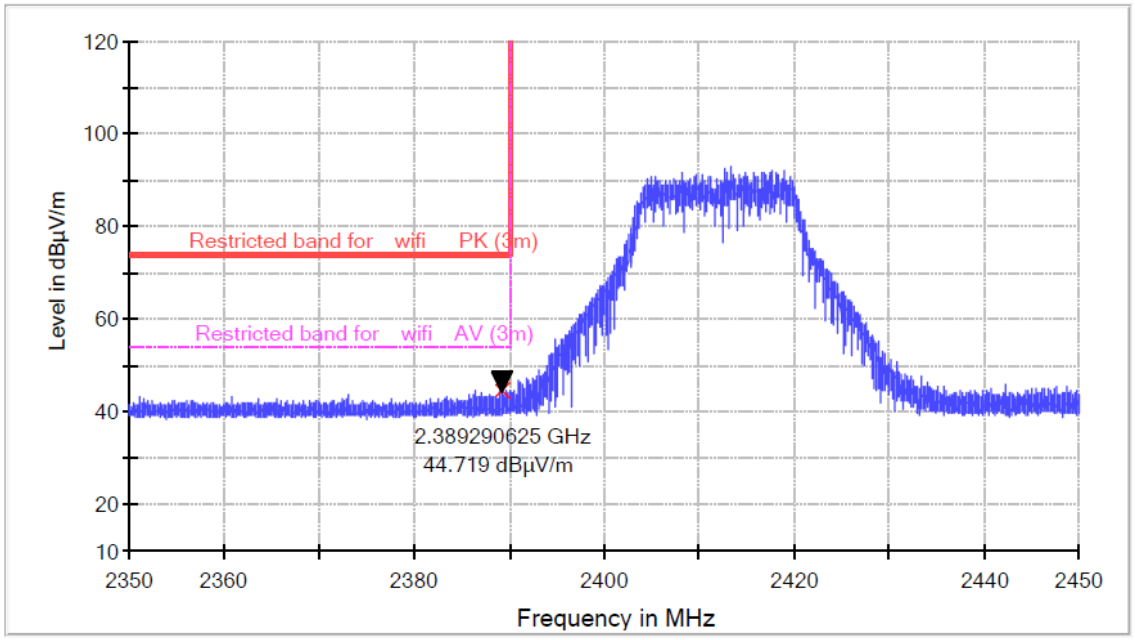
TEST REPORT

Remark:

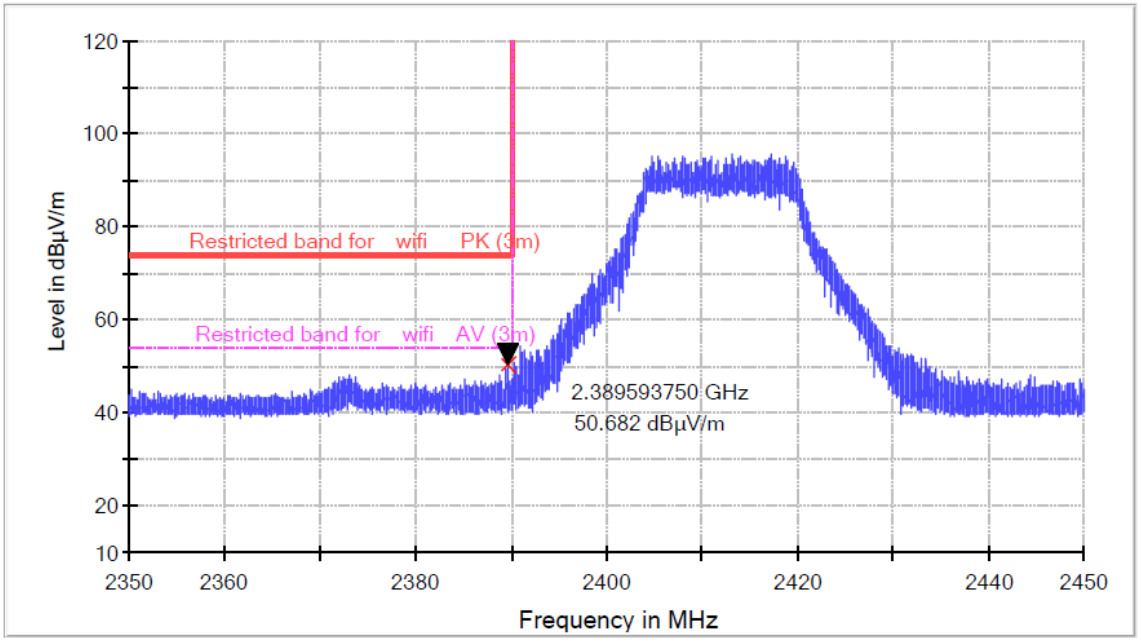
1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. When Peak emission level was below AV limit, the AV emission level did not be recorded.

Restricted Bands measurement

Vertical



Horizontal



TEST REPORT

Peak Measurement:

Frequency (MHz)	PK Reading Level (dBμV)	Correction factors (dB/m)	PK Emission Level (dBμV/m)	PK Limit (dBμV/m)	Antenna polarization
2389.291	52.019	-7.3	44.719	74	V
2389.594	57.982	-7.3	50.682	74	H

Average Measurement:

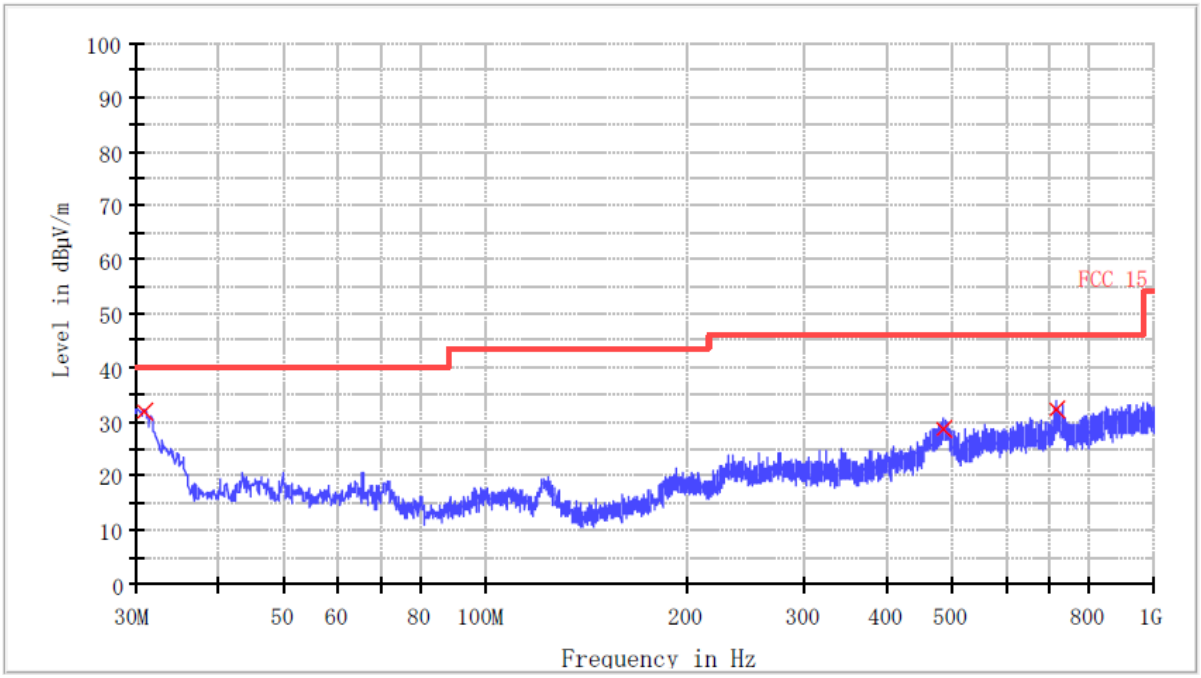
Frequency (MHz)	AV Reading Level (dBμV)	Correction factors (dB/m)	AV Emission Level (dBμV/m)	AV Limit (dBμV/m)	Antenna polarization
2389.291	-	-7.3	-	54	V
2389.594	-	-7.3	-	54	H

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

TEST REPORT

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

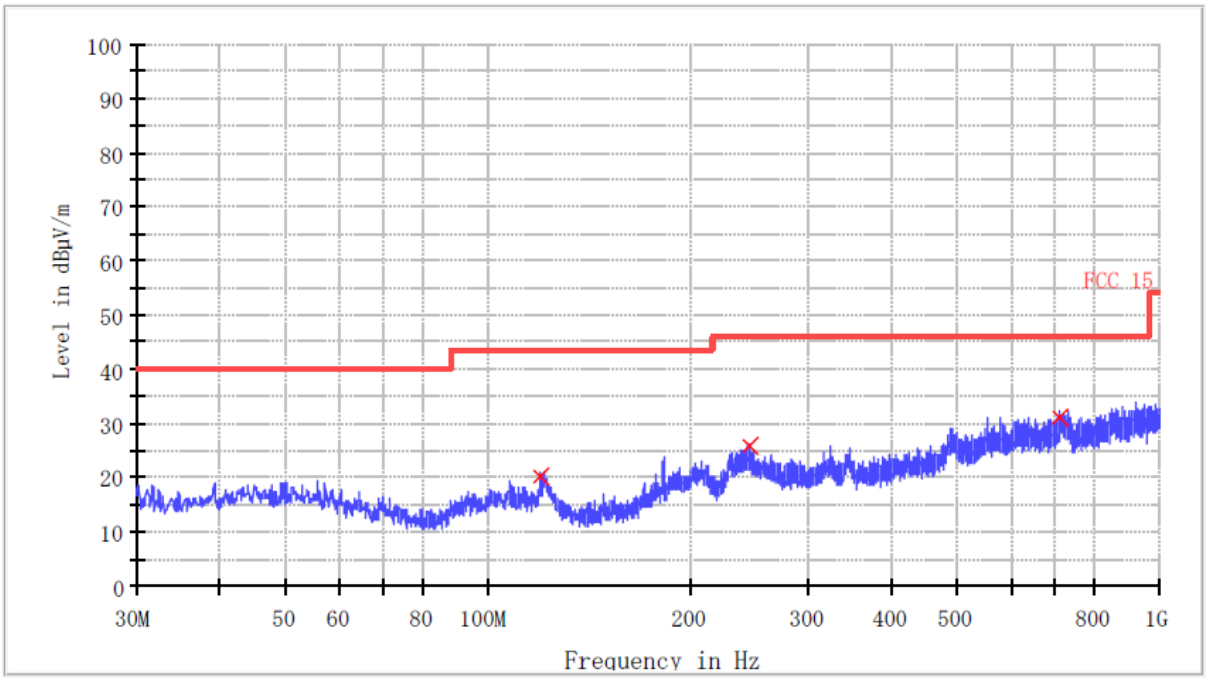
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.960000	31.8	120.000	V	11.2	8.2	40.0
485.120000	28.6	120.000	V	19.3	17.4	46.0
712.280000	32.1	120.000	V	23.1	13.9	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
120.000000	20.3	120.000	H	10.6	23.2	43.5
245.040000	25.9	120.000	H	13.9	20.1	46.0
709.480000	31.1	120.000	H	23.0	14.9	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
4589.656	42.738	-0.5	42.238	74	V
7594.406	41.811	4.5	46.311	74	V
7720.844	41.783	4.7	46.483	74	V
4648.094	43.39	-0.5	42.890	74	H
7298.500	42.494	3.7	46.194	74	H
7749.531	42.11	4.8	46.910	74	H

TEST REPORT

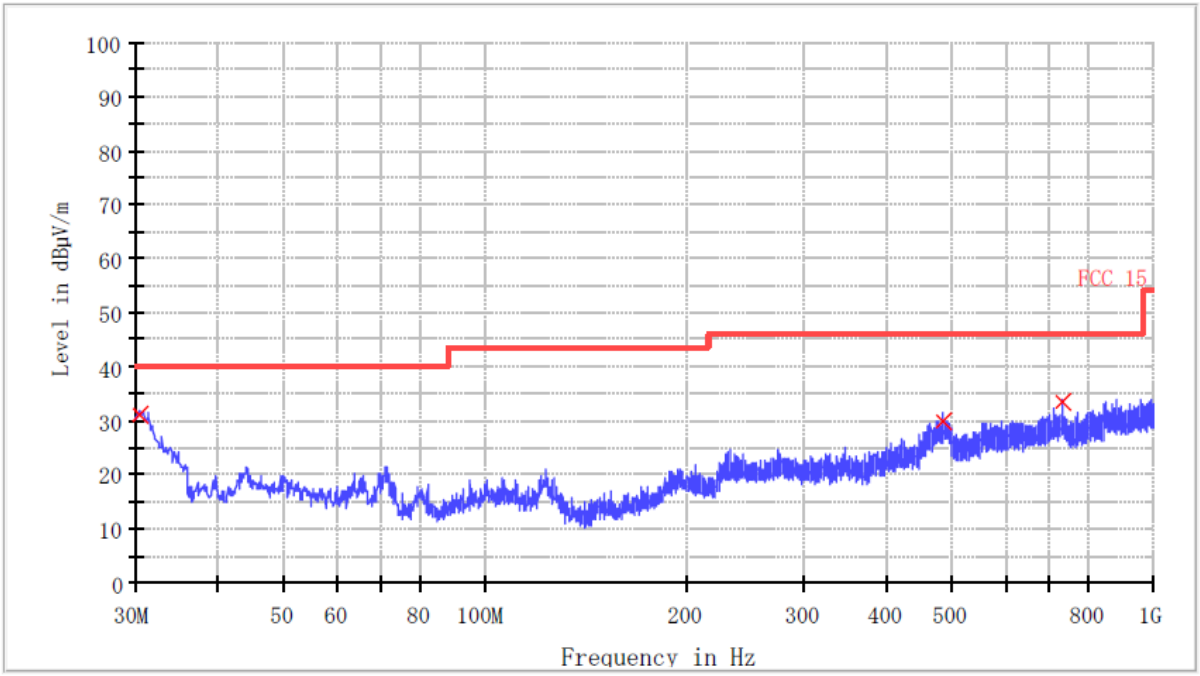
AV Measurement:

Frequency (MHz)	AV Reading Level (dBµV)	Correction factors (dB/m)	AV Emission Level (dBµV/m)	AV Limit (dBµV/m)	Antenna polarization
4589.656	-	-0.5	-	54	V
7594.406	-	4.5	-	54	V
7720.844	-	4.7	-	54	V
4648.094	-	-0.5	-	54	H
7298.500	-	3.7	-	54	H
7749.531	-	4.8	-	54	H

Remark:
1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. 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

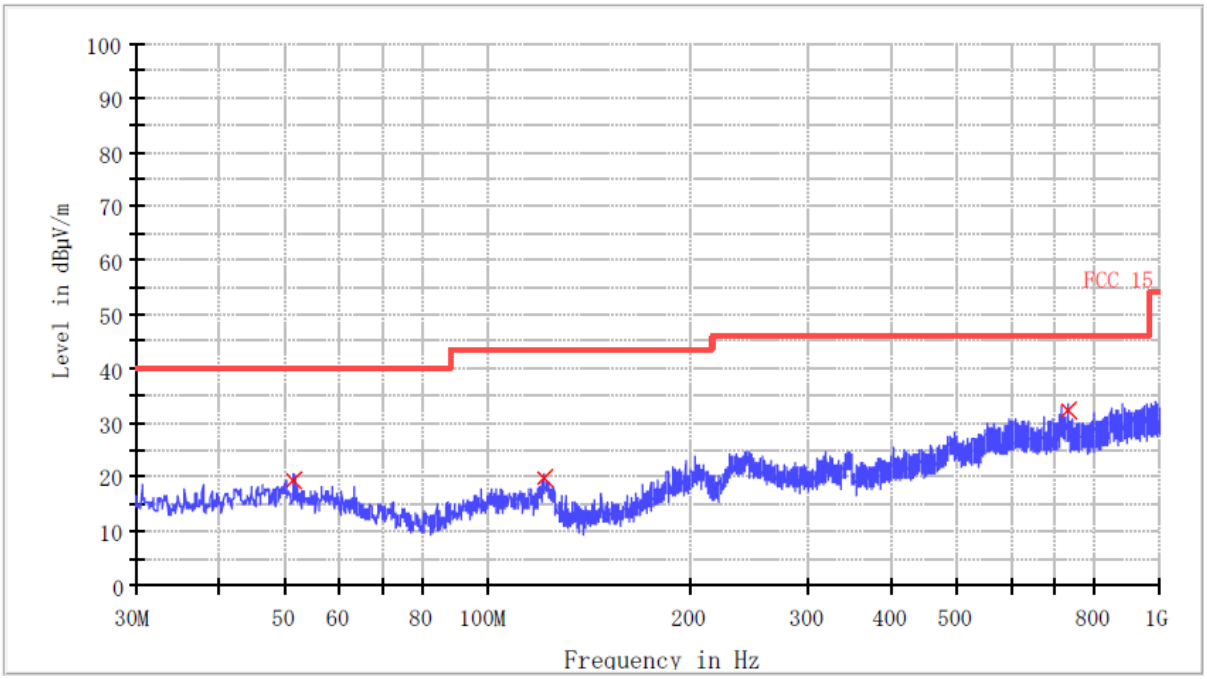
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.400000	31.0	120.000	V	11.2	9.0	40.0
485.240000	30.0	120.000	V	19.3	16.0	46.0
729.160000	33.5	120.000	V	23.3	12.5	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
51.520000	19.5	120.000	H	13.9	20.5	40.0
121.160000	19.7	120.000	H	10.4	23.8	43.5
728.400000	32.4	120.000	H	23.3	13.6	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
3709.375	46.251	-4.1	42.151	74	V
7663.469	41.755	4.6	46.355	74	V
4692.719	44.47	-0.5	43.970	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
3709.375	-	-4.1	-	54	V
7663.469	-	4.6	-	54	V
4692.719	-	-0.5	-	54	H

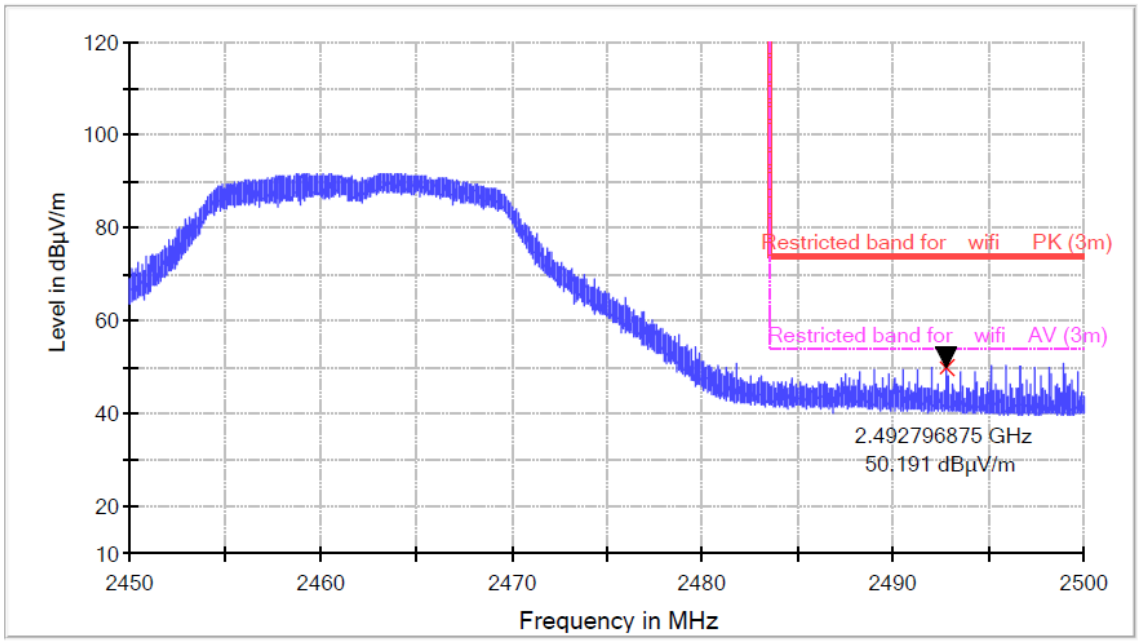
TEST REPORT

Remark:

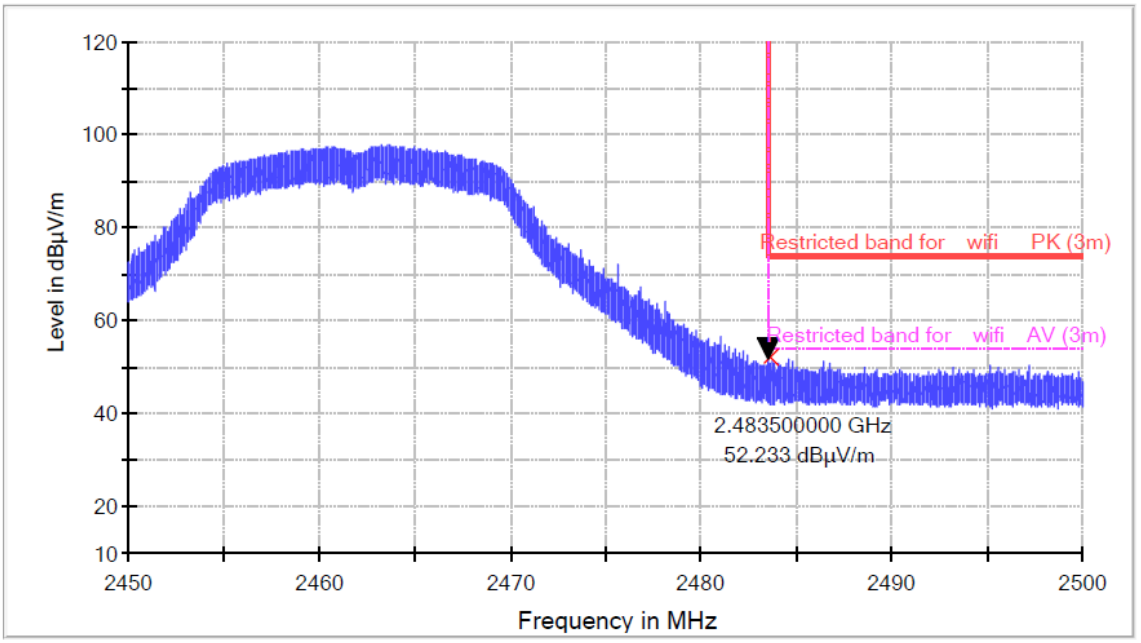
1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. When Peak emission level was below AV limit, the AV emission level did not be recorded.

Restricted Bands measurement

Vertical



Horizontal



TEST REPORT

Peak Measurement:

Frequency (MHz)	PK Reading Level (dBμV)	Correction factors (dB/m)	PK Emission Level (dBμV/m)	PK Limit (dBμV/m)	Antenna polarization
2492.797	57.291	-7.1	50.191	74	V
2483.500	59.333	-7.1	52.233	74	H

Average Measurement:

Frequency (MHz)	AV Reading Level (dBμV)	Correction factors (dB/m)	AV Emission Level (dBμV/m)	AV Limit (dBμV/m)	Antenna polarization
2492.797	-	-7.1	-	54	V
2483.500	-	-7.1	-	54	H

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

TEST REPORT

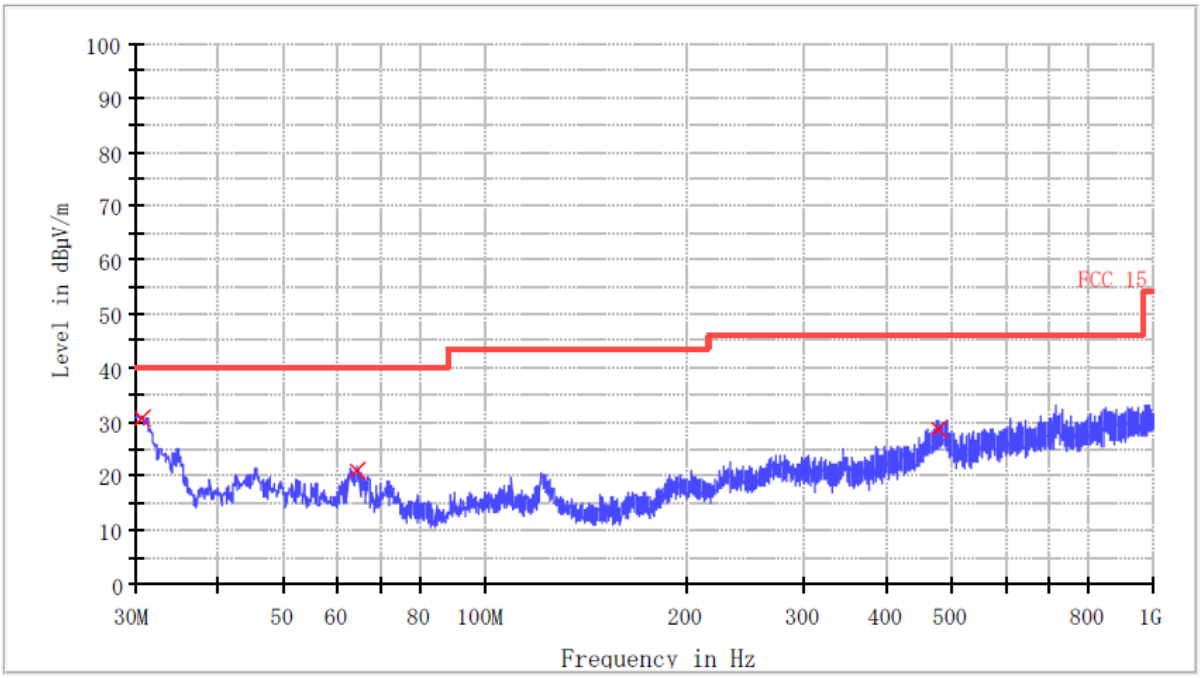
802.11n (HT20) mode with 72.2Mbps data rate
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

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

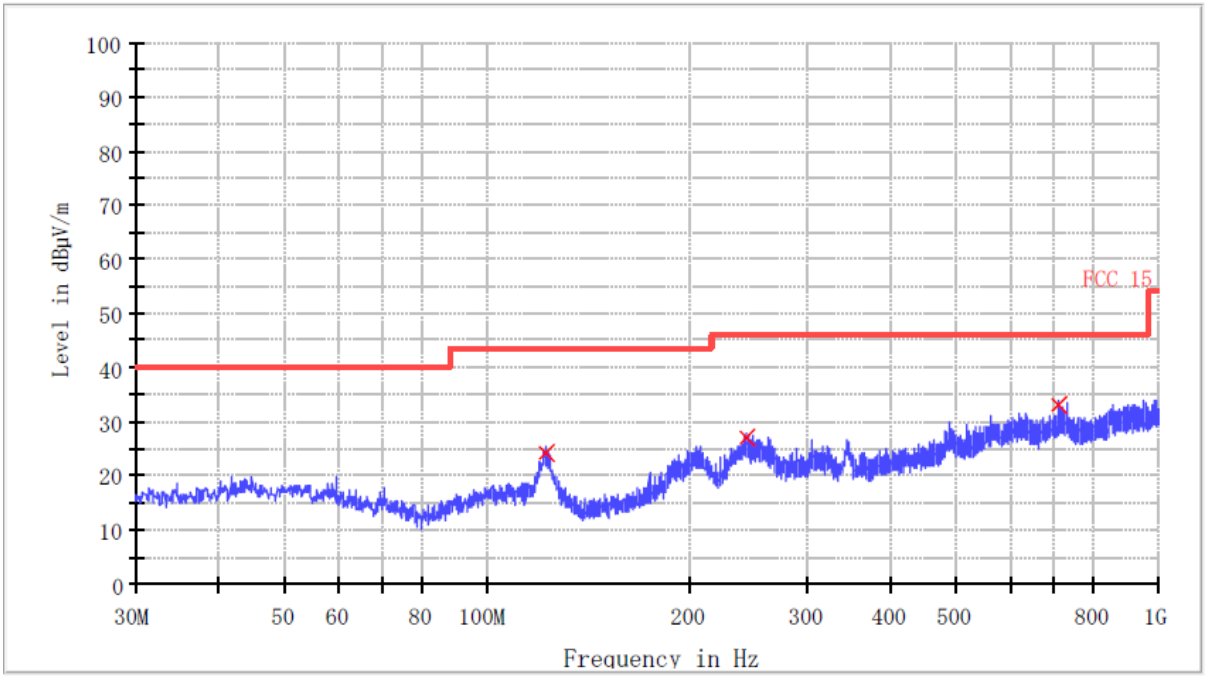
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.680000	30.6	120.000	V	11.2	9.4	40.0
64.440000	21.0	120.000	V	11.6	19.0	40.0
476.800000	28.5	120.000	V	19.1	17.5	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
122.160000	24.2	120.000	H	10.3	19.3	43.5
244.000000	27.2	120.000	H	13.9	18.8	46.0
711.520000	33.1	120.000	H	23.1	12.9	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
7324.412	41.800	3.8	45.600	74	V
7600.822	41.600	4.5	46.100	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
7324.412	-	3.8	-	54	V
7600.822	-	4.5	-	54	H

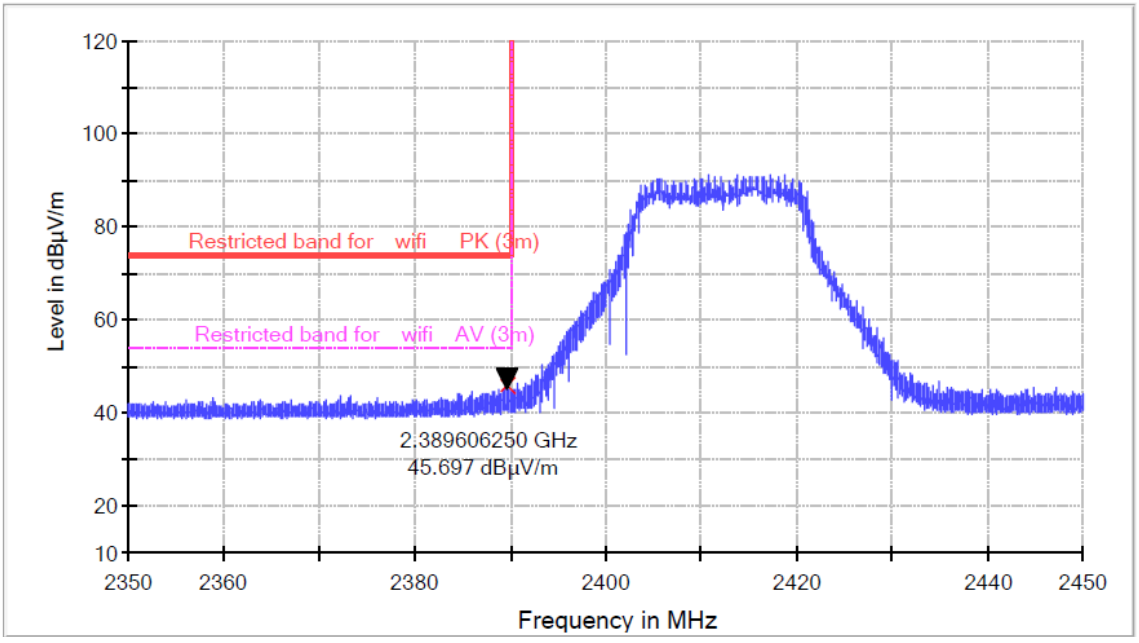
TEST REPORT

Remark:

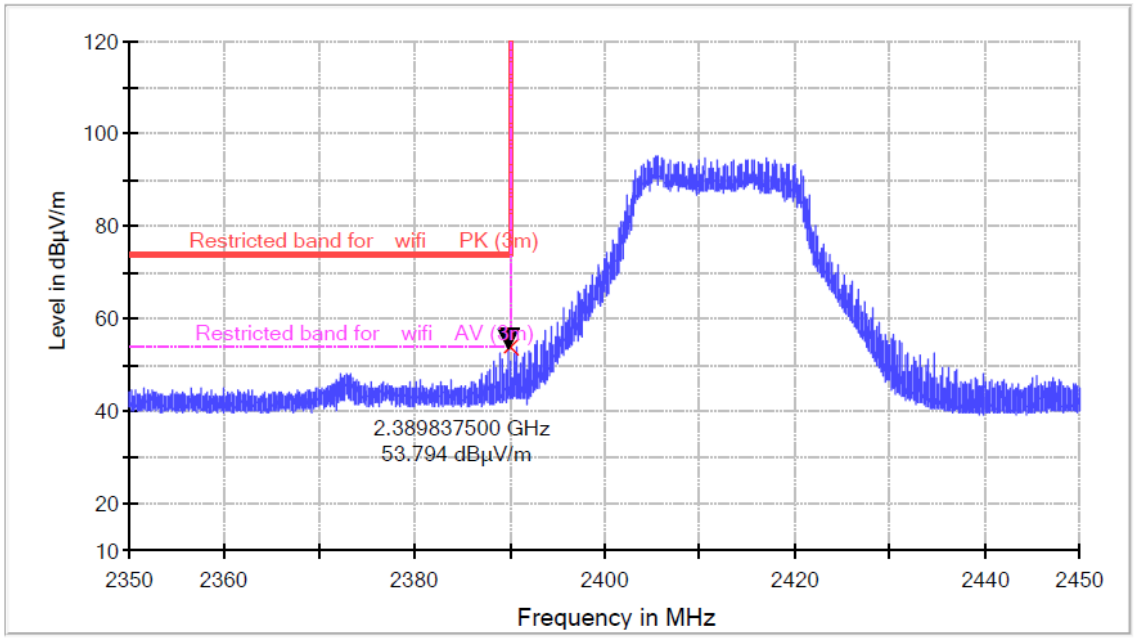
1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. When Peak emission level was below AV limit, the AV emission level did not be recorded.

Restricted Bands measurement

Vertical



Horizontal



TEST REPORT

Peak Measurement:

Frequency (MHz)	PK Reading Level (dBμV)	Correction factors (dB/m)	PK Emission Level (dBμV/m)	PK Limit (dBμV/m)	Antenna polarization
2389.606	52.997	-7.3	45.697	74	V
2389.838	61.094	-7.3	53.794	74	H

Average Measurement:

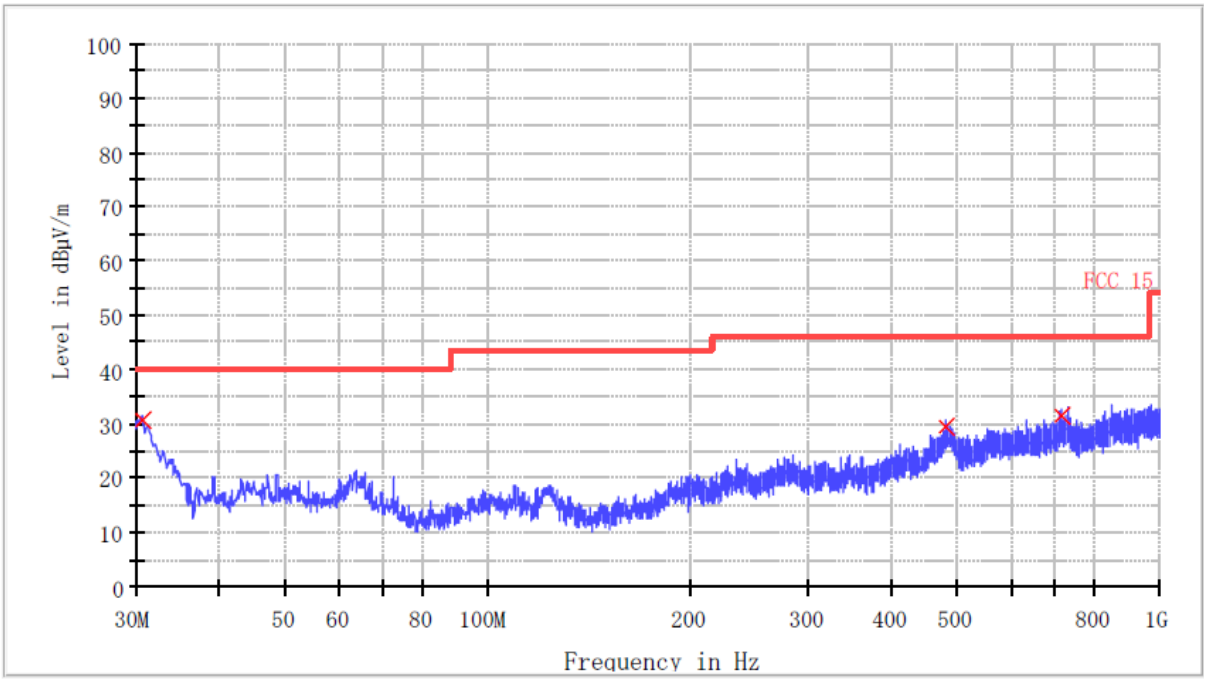
Frequency (MHz)	AV Reading Level (dBμV)	Correction factors (dB/m)	AV Emission Level (dBμV/m)	AV Limit (dBμV/m)	Antenna polarization
2389.606	-	-7.3	-	54	V
2389.838	-	-7.3	-	54	H

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

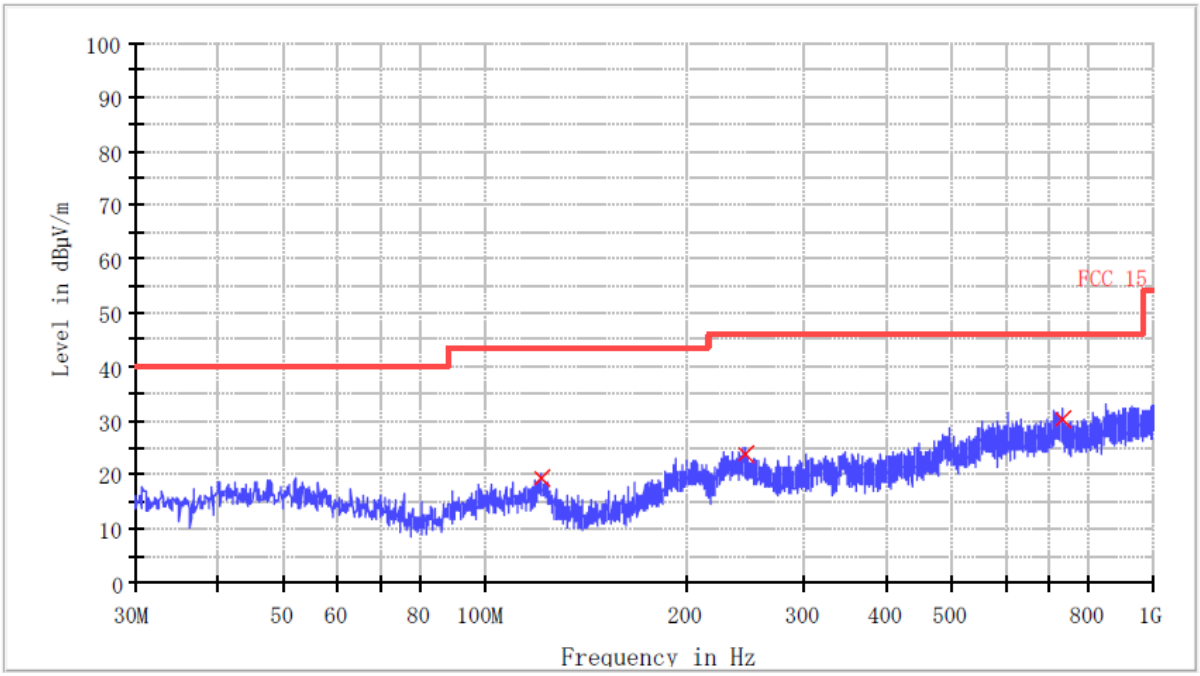
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.600000	30.6	120.000	V	11.2	9.4	40.0
480.560000	29.6	120.000	V	19.2	16.4	46.0
711.920000	31.6	120.000	V	23.1	14.4	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
121.160000	19.5	120.000	H	10.4	24.0	43.5
244.560000	23.9	120.000	H	13.9	22.1	46.0
729.360000	30.4	120.000	H	23.3	15.6	46.0

TEST REPORT

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
3223.281	43.819	-4.0	39.819	74	V
4380.875	43.037	-1.0	42.037	74	V
7748.102	42.000	4.7	46.700	74	V
4344.219	43.028	-1.1	41.928	74	H
7318.688	41.722	3.8	45.522	74	H
7598.125	42.440	4.5	46.940	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
3223.281	-	-4.0	-	54	V
4380.875	-	-1.0	-	54	V
7748.102	-	4.7	-	54	V
4344.219	-	-1.1	-	54	H
7318.688	-	3.8	-	54	H
7598.125	-	4.5	-	54	H

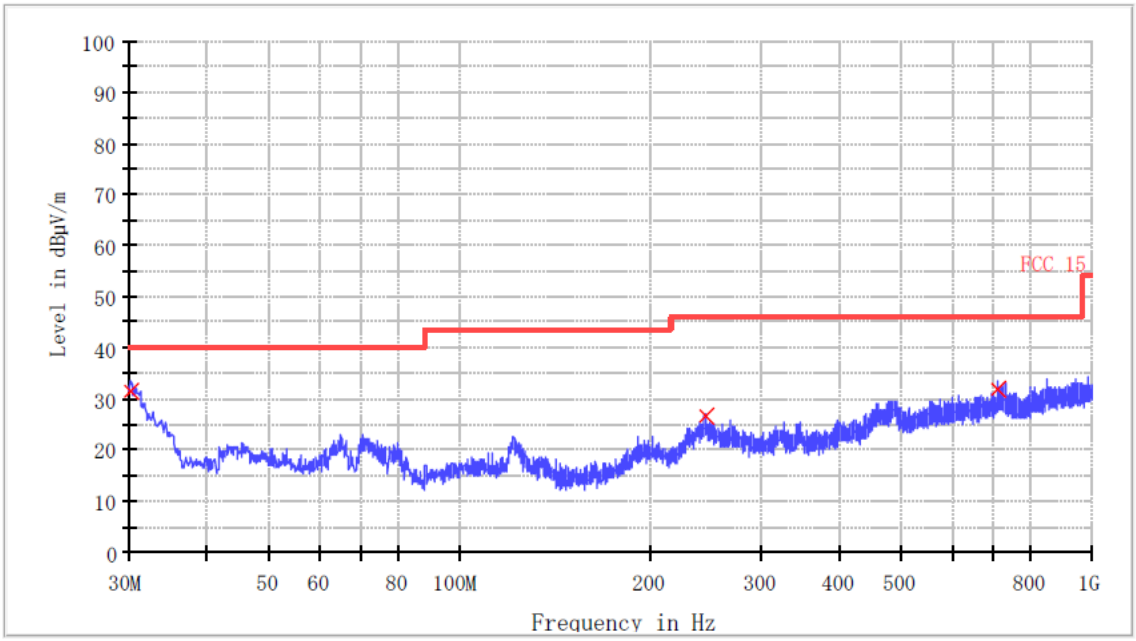
Remark:

1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. When Peak emission level was below AV limit, the AV emission level did not be recorded.

TEST REPORT

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

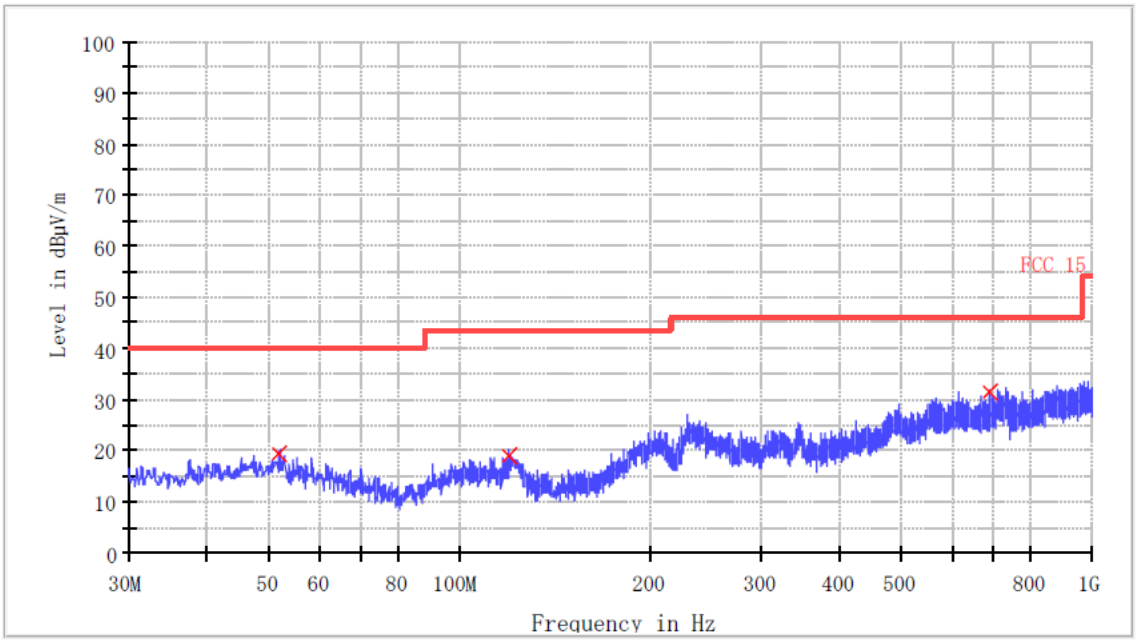
Vertical:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.280000	31.4	120.000	V	11.2	8.6	40.0
244.840000	26.5	120.000	V	13.9	19.5	46.0
710.640000	31.9	120.000	V	23.1	14.1	46.0

TEST REPORT

Horizontal:



Frequency (MHz)	Quasi Peak (dBµV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
51.920000	19.5	120.000	H	13.8	20.5	40.0
119.920000	19.1	120.000	H	10.6	24.4	43.5
689.880000	31.5	120.000	H	22.8	14.5	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
7322.000	52.400	-10.5	45.900	74	V
7363.200	41.900	3.9	45.800	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
7322.000	-	-10.5	-	54	V
7363.200	-	3.9	-	54	H

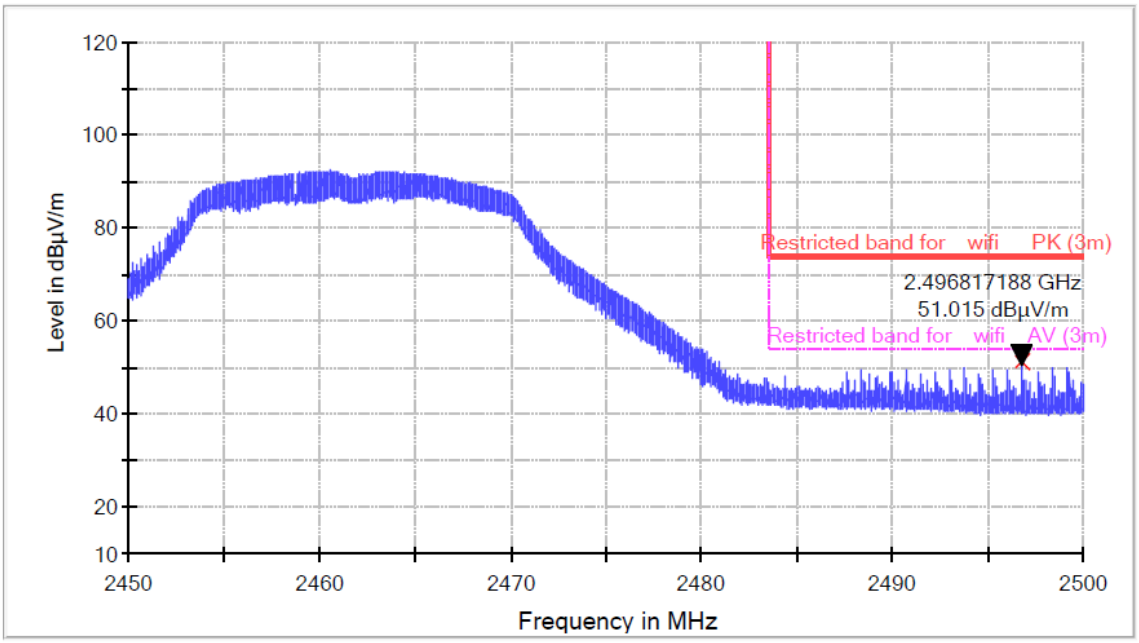
TEST REPORT

Remark:

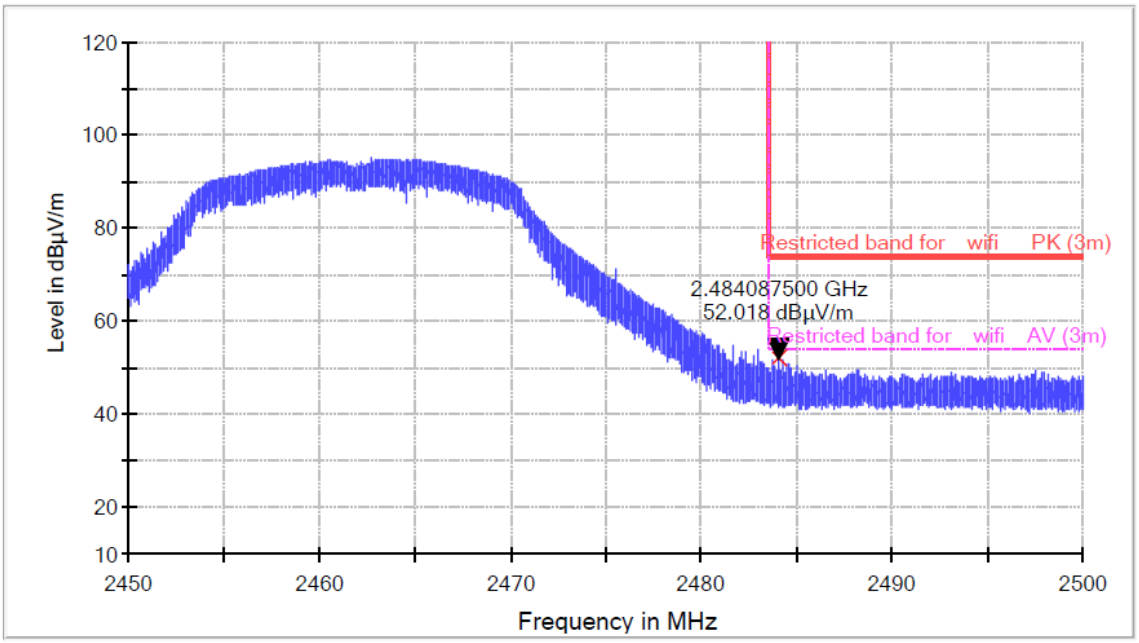
1. Different combinations of emitting for WIFI and Bluetooth functions have been evaluated, and the worst case presents in the test report.
2. When Peak emission level was below AV limit, the AV emission level did not be recorded.

Restricted Bands measurement

Vertical



Horizontal



TEST REPORT

Peak Measurement:

Frequency (MHz)	PK Reading Level (dBμV)	Correction factors (dB/m)	PK Emission Level (dBμV/m)	PK Limit (dBμV/m)	Antenna polarization
2496.817	58.115	-7.1	51.015	74	V
2484.088	59.118	-7.1	52.018	74	H

Average Measurement:

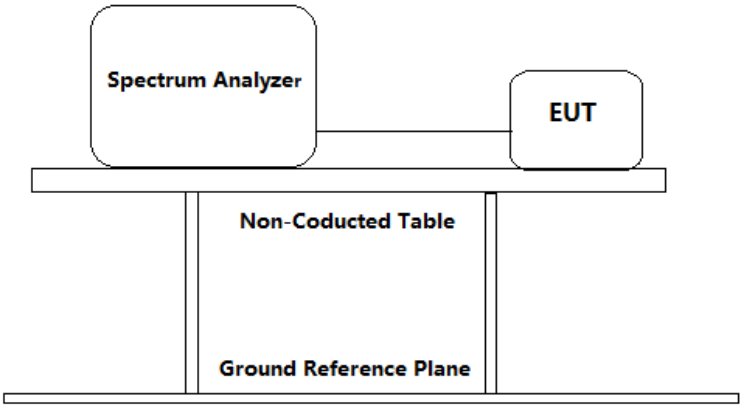
Frequency (MHz)	AV Reading Level (dBμV)	Correction factors (dB/m)	AV Emission Level (dBμV/m)	AV Limit (dBμV/m)	Antenna polarization
2496.817	-	-7.1	-	54	V
2484.088	-	-7.1	-	54	H

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

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 REPORT



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 ≥ [3 × RBW].
   e) Detector = peak.
   f) Sweep time = auto.
   g) Trace mode = max hold.
   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:

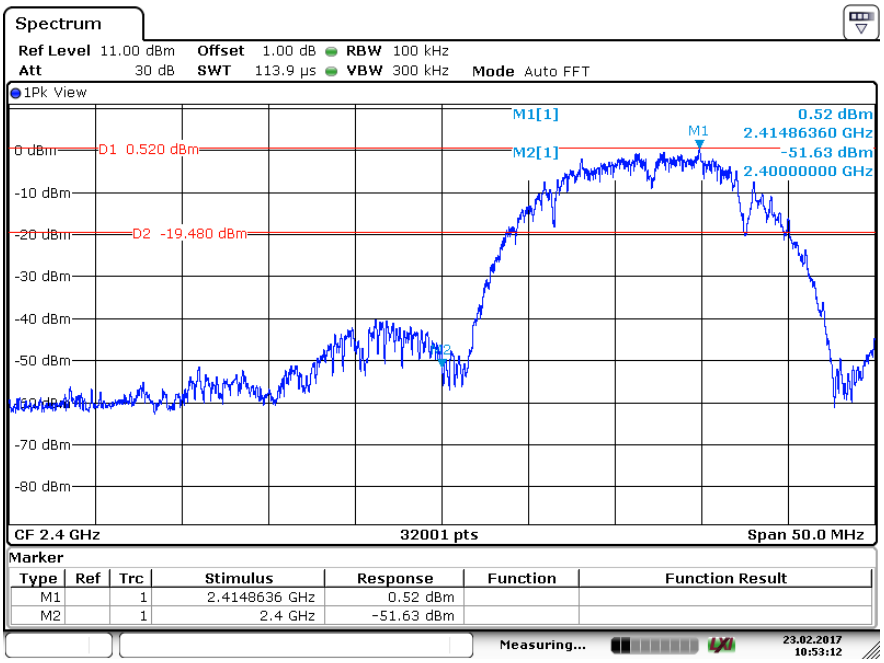
The band edges was measured and recorded Result:

The Lower Edges attenuated more than 20dB.

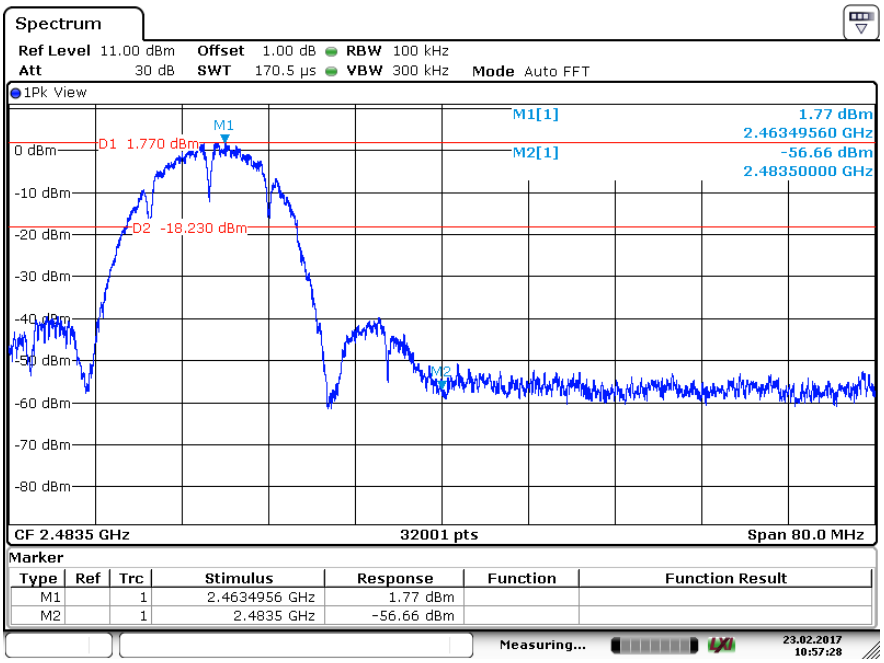
The Upper Edges attenuated more than 20dB.

TEST REPORT

Result plots as follows:
802.11b mode with 11 Mbps data rate
Channel1: 2.412 GHz



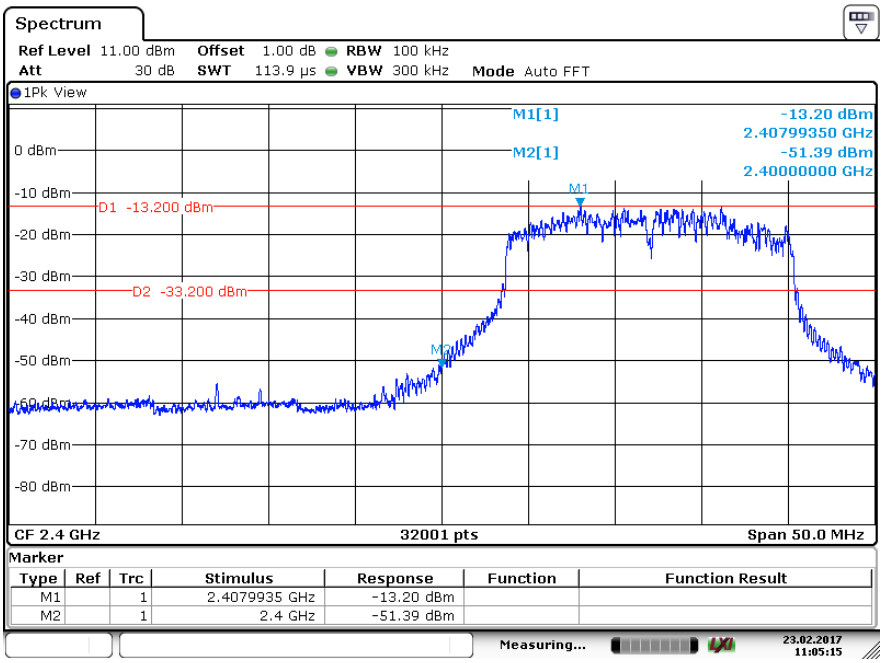
Channel 11: 2.462 GHz



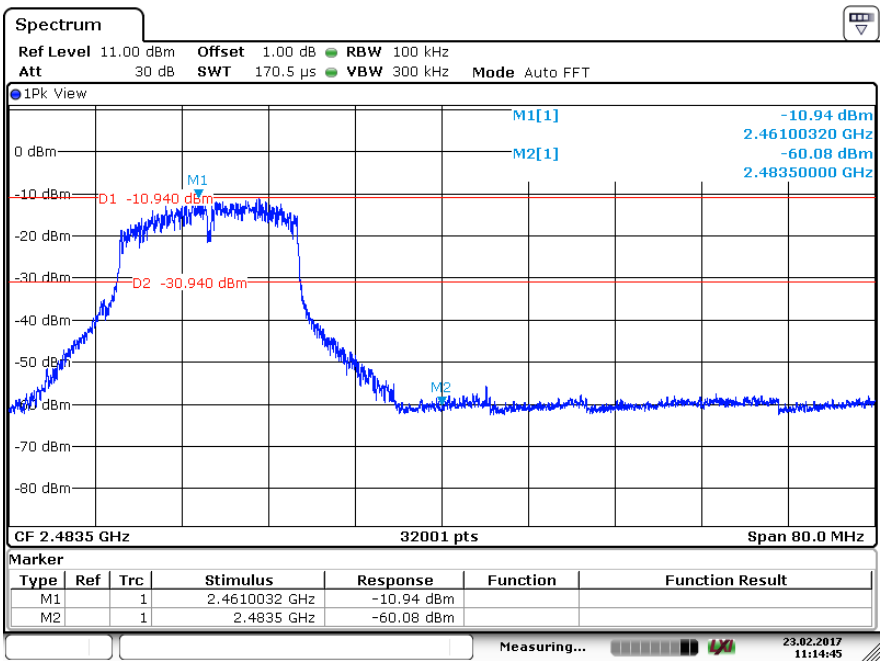
TEST REPORT

802.11g mode with 54 Mbps data rate

Channel1: 2.412 GHz



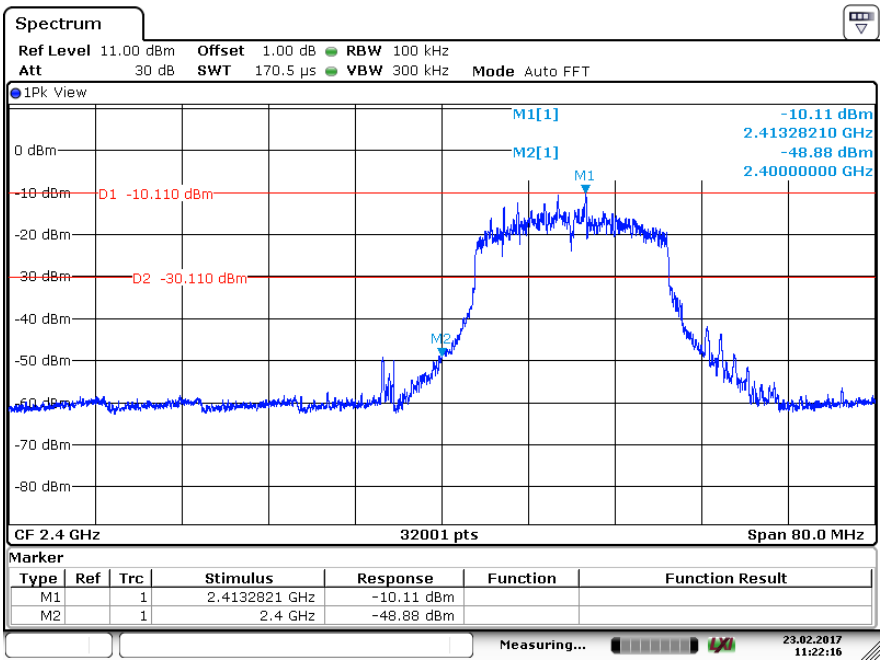
Channel 11: 2.462 GHz



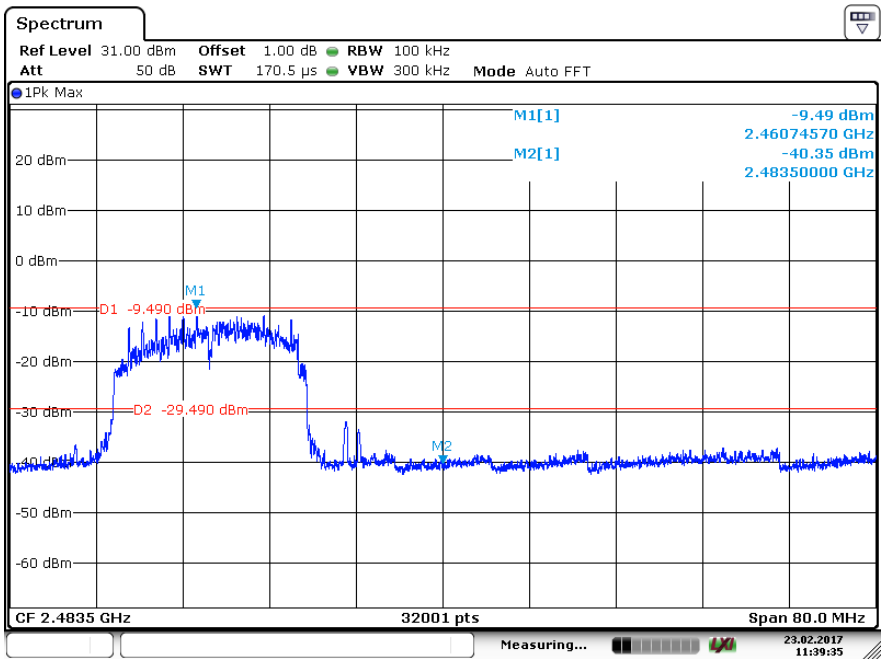
TEST REPORT

802.11n(HT20) mode with 72.2Mbps data rate

Channel 1: 2.412 GHz



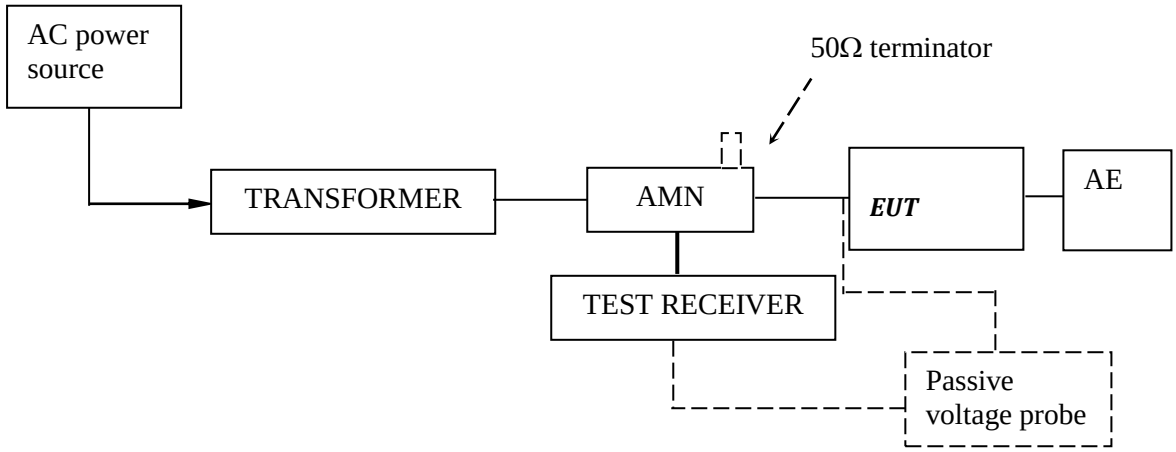
Channel 11: 2.462 GHz



TEST REPORT

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

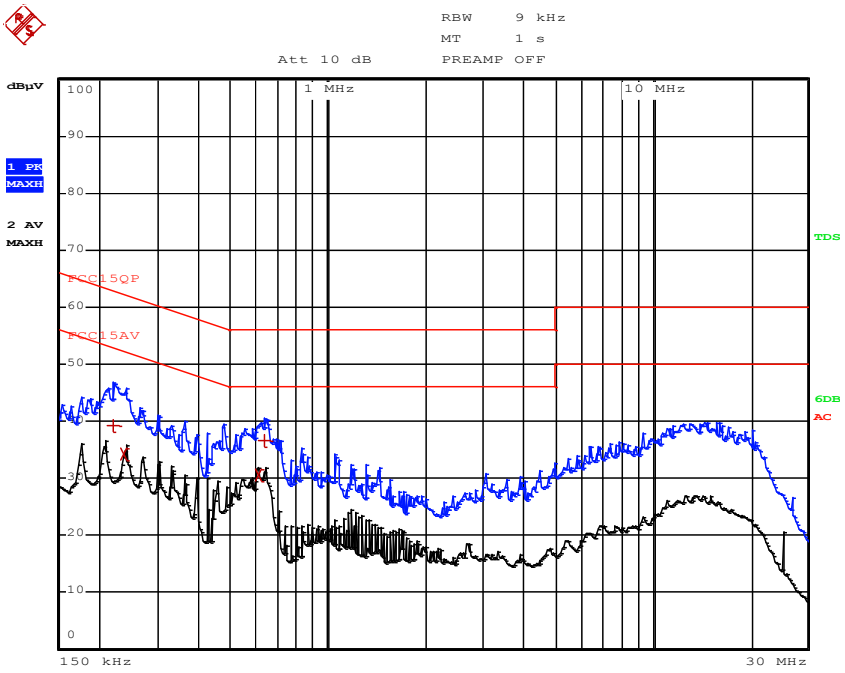
The bandwidth of test receiver was set at 9 kHz. The frequency range from 150 kHz to 30MHz was checked.

TEST REPORT

Test Data and Curve

At main terminal: Pass

Tested Wire: Live Operation Mode: transmitting mode



EDIT PEAK LIST (Final Measurement Results)

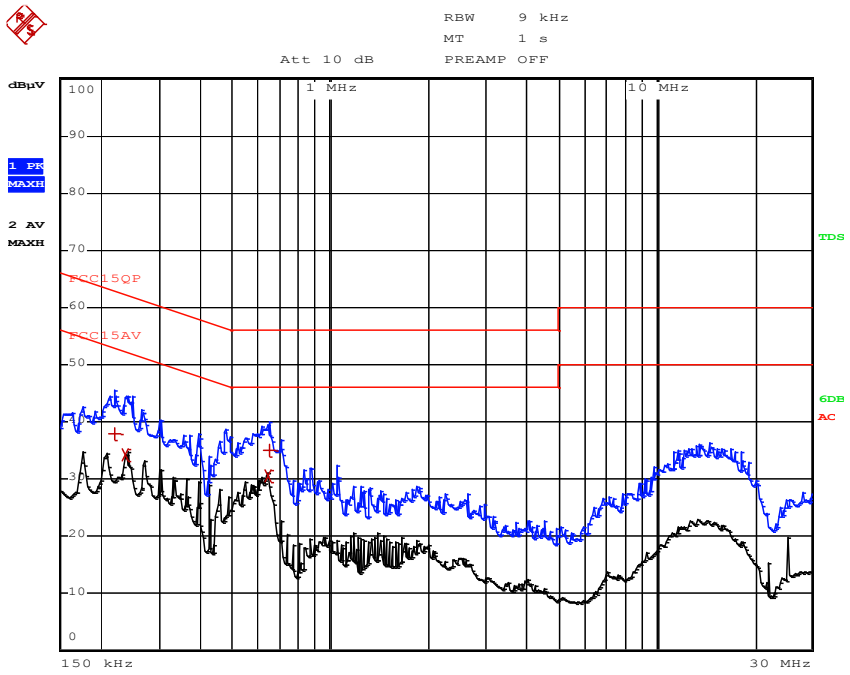
Trace1:	FCC15QP
Trace2:	FCC15AV
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2 Average	610 kHz	30.45	L1	-15.54
2 Average	238 kHz	34.28	L1	-17.88
1 Quasi Peak	634 kHz	36.69	L1	-19.30
1 Quasi Peak	218 kHz	39.14	L1	-23.74

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)

TEST REPORT

Tested Wire: Neutral Operation Mode: transmitting mode



EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC15QP
Trace2:	FCC15AV
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	646 kHz	30.63 L1	-15.36
2 Average	238 kHz	34.16 L1	-18.00
1 Quasi Peak	650 kHz	34.93 L1	-21.06
1 Quasi Peak	218 kHz	37.82 L1	-25.07

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)

TEST REPORT

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	2018/5/1	1Y
EM031-02	EMI Test Receiver (9 kHz~7 GHz)	R&S ESR7	R&S	2018/3/27	1Y
EM031-03	Signal and Spectrum Analyzer (10 Hz~40 GHz)	R&S FSV40	R&S	2018/5/18	1Y
EM011-04	Loop antenna (9 kHz-30 MHz)	HFH2-Z2	R&S	2018/6/14	1Y
EM061-03	TRILOG Super Broadband test Antenna (30 MHz-1.5 GHz）(TX)	VULB 9161	SCHWARZBECK	2018/6/7	1Y
EM033-01	TRILOG Super Broadband test Antenna(30 MHz-3 GHz）(RX)	VULB 9163	SCHWARZBECK	2018/9/19	1Y
EM033-02	Bouble-Ridged Waveguide Horn Antenna (800 MHz-18 GHz)(RX)	R&S HF907	R&S	2018/6/7	1Y
EM033-03	High Frequency Antenna & preamplifier(18 GHz~26.5 GHz) (RX)	R&S SCU-26	R&S	2018/5/4	1Y
EM033-04	High Frequency Antenna & preamplifier (26 GHz-40 GHz)	R&S SCU-40	R&S	2018/5/4	1Y
EM031-02-01	Coaxial cable(9 kHz-1 GHz)	N/A	R&S	2018/5/18	1Y
EM033-02-02	Coaxial cable(1 GHz-18 GHz)	N/A	R&S	2018/5/18	1Y
EM033-04-02	Coaxial cable(18 GHz~40 GHz)	N/A	R&S	2018/5/25	1Y
EM031-01	Signal Generator (9 kHz~6 GHz)	SMB100A	R&S	2018/8/1	1Y
EM085-02	Signal Generator (10MHz-40GHz)	68369B	Wiltron	2018/5/31	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	2018/5/9	1Y
SA016-16	Programmable Temperature & Humidity Test Chamber	MHU-800LJ	TERCHY	2018/10/15	1Y
SA016-22	Climatic Test Chamber	C7-1500	Vötsch	2018/10/27	1Y
SA012-74	Digital Multimeter	FLUKE175	FLUKE	2018/10/15	1Y
EM010-01	Regulated DC Power supply	PAB-3003A	GUANHUA	N/A	1Y
SA040-22	Regulated DC Power supply	IT6721	ITECH	2018/9/14	1Y
EM084-06	Audio Analyzer	8903B	HP	2018/4/3	1Y
EM084-07	Modulation Analyzer	8901B	HP	2018/6/15	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	2018/7/24	1Y
EM006-05	LISN	ENV216	R&S	2018/6/4	1Y
EM006-06	LISN	ENV216	R&S	2018/9/14	1Y
EM006-06-01	Coaxial cable	/	R&S	2018/4/6	1Y
EM004-04	EMC shield Room	8m×3m×3m	Zhongyu	2019/1/7	1Y

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