



Report No.: 160204001GZU-002
Issued: 2016-02-29

TEST REPORT

Applicant Name & Address : Guangzhou Rayer Acoustic Technology Co., Ltd
520, 192 Kezhu Road, Guangzhou Science Park, Guangzhou, Guangdong, China

Sample Description

Product : Wireless Wifi Speaker System
 FCC ID : 2AHKA-WM32-X61002
 Models No. : WM32, WH32C, MD43259, X61002
 Electrical Rating : For Wi-Fi Speaker:
 Input: 15V , 1.2A
 For Switching Adapter with model no. PS30D150K1200UD:
 Input: 100-240V~, 50/60Hz, 800mA
 Output: 15V , 1200mA
 For Lithium-ion Battery package with model no. ICR 18650*3S1P: 11.1V, 2200mAh

Date Received : 04 February 2016
 Date Test Conducted : 04 February 2016 –26 February 2016
 Test standards : **47 CFR PART 15 Subpart C: 2014 section 15.247**
 Test Result : Pass
 Conclusion : The submitted samples complied with the above rules/standards.

Remark : None.

*****End of Page*****

Prepared and Checked By:

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29 February 2016 *Date*

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

TEST	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.



Remark:

1. Measurement uncertainty:

Test items		uncertainty
Radiated Emission	Below 1GHz	4.87dB
	Above 1GHz	4.79dB
Conducted Emissions at Mains Terminals		2.58dB

2. Model difference: The electronic parts are the same for all models, the differences lie in the model name and outlook, select model WM32 to perform all the tests.

2.0 General Description

2.1 Product Description

Operating Frequency	2412 MHz to 2462 MHz for 802.11b/g/n(HT20) 2422 MHz to 2452 MHz for 802.11n(HT40)
Type of Modulation:	802.11b: DSSS(CCK/QPSK/BPSK) 802.11g: OFDM(BPSK/QPSK/16QAM/64QAM) 802.11n: MIMO 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/72.2Mbps 802.11n(HT40): 150Mbps
Number of Channels	11 Channels for 802.11b/g/n(HT20) 7 Channels for 802.11n(HT40)
Channel Separation:	5 MHz
Antenna Type	The wire antenna that uses a unique coupling to the intentional radiator
Antenna gain:	2 dBi
Function:	Speaker with WIFI function to transmit and receive audio signal.
EUT Power Supply:	For Wi-Fi Speaker: Input: 15V , 1.2A For Switching Adapter with model no. PS30D150K1200UD: Input: 100-240V~, 50/60Hz, 800mA Output: 15V , 1200mA For Lithium-ion Battery package with model no. ICR 18650*3S1P: 11.1V, 2200mAh

EUT channels and frequencies list:

For 802.11b/g/n(HT20): test frequencies are lowest channel 1: 2412 MHz, middle channel 7: 2437 MHz and highest channel 11: 2462 MHz.

For 802.11n(HT40): test frequencies are lowest channel 3: 2422 MHz, middle channel 6: 2437 MHz and highest channel 9: 2452 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.
2. The speaker without WIFI connection function: FCC VOC requirement..

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10:2009. 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 of the tests are performed at:

Intertek Testing Services Shenzhen Ltd. Guangzhou Branch. located at Block E, No.7-2 Guang Dong Software Science Park, Caipin Road, Guangzhou Science City, GETDD Guangzhou, 510663, China. This test facility and site measurement data have been fully placed on file with the FCC, test firm registration number is 549654.

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. During testing, AC power line was manipulated to produce worst case emissions. It was powered by AC 120V/60Hz 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. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. 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

The test was performed under “FC Tool V1.0.04” which was provided by manufacture.

3.3 Special Accessories



No special accessories used.

3.4 Measurement Uncertainty

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 TOP Electric Appliances Industrial 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.

3.6 Support Equipment List and Description

This product was tested with corresponding accessories as below:

Description	Manufacturer	Model No.	SN/Certificate NO
NoteBook	Lenovo	T430	CCHNGZHL0009
Fix board	--	MUZO_BOX_A31	V03
Reticle	--	--	--

Remark: after EUT was fixed the frequency, all support equipments were removed out of the Chamber before test.

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 2 dBi.



4.2 6 dB Bandwidth (DTS bandwidth):

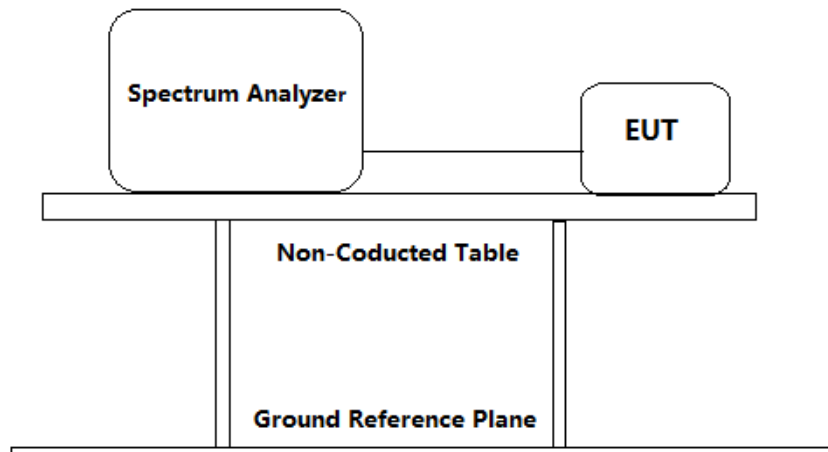
Test Requirement: FCC Part 15 C section 15.247
 (a)(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

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.

Pre-test the EUT in AC mode and B/O mode, find worse case in AC mode.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (attenuator + cable loss = 11.0 dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer:
 - a) Set RBW = 100 kHz For B model, RBW = 300 kHz For G and N20 model, RBW = 1MHz For N40 model
 - 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) $\text{Span} = 2 * \text{BW} \sim 5 * \text{BW}$

3. Repeat until all the test status is investigated.
4. Report the worst case.

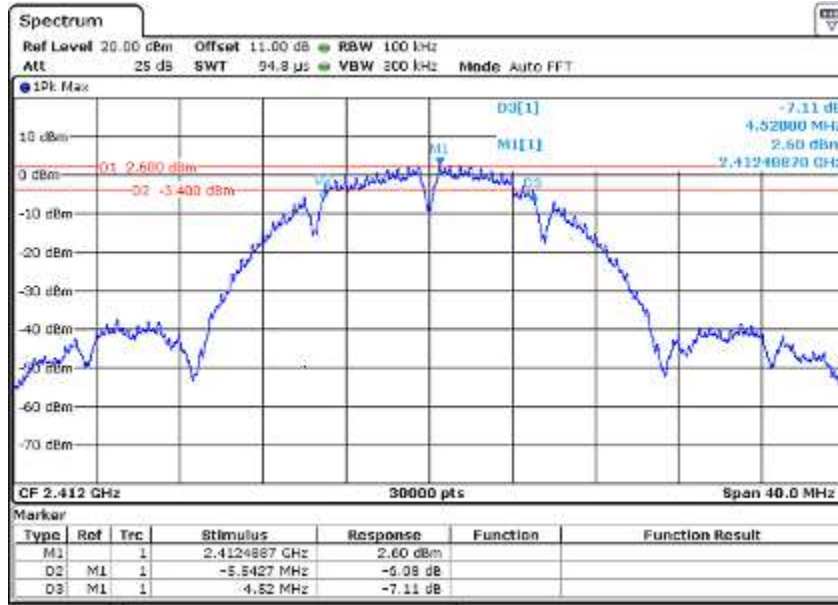
Channel No.	Frequency (MHz)	Mode	Data Rate	Measured 6dB bandwidth (MHz)	Limit	Result
1	2412	802.11b	11 Mbps	10.063	$\geq 500\text{KHz}$	Pass
6	2437		11 Mbps	10.032		Pass
11	2462		11 Mbps	9.511		Pass
1	2412	802.11g	54 Mbps	16.142		Pass
6	2437		54 Mbps	16.340		Pass
11	2462		54 Mbps	16.255		Pass
1	2412	802.11n (HT20)	72.2 Mbps	17.104		Pass
6	2437		72.2 Mbps	17.330		Pass
11	2462		72.2 Mbps	17.210		Pass
3	2422	802.11n (HT40)	150 Mbps	34.869		Pass
6	2437		150 Mbps	34.749		Pass
9	2452		150 Mbps	34.992		Pass

Test result: The unit does meet the FCC requirements.

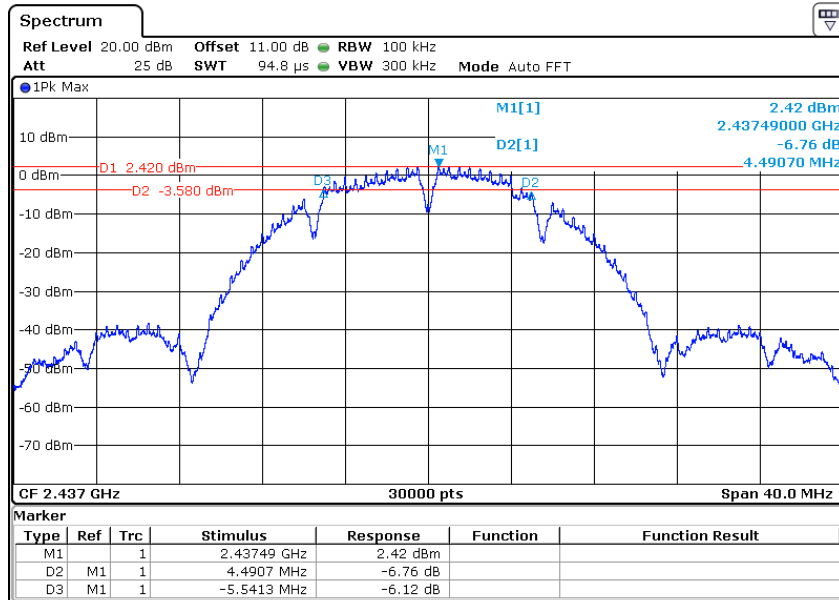
Result plot as follows:

802.11b mode with 11Mbps data rate

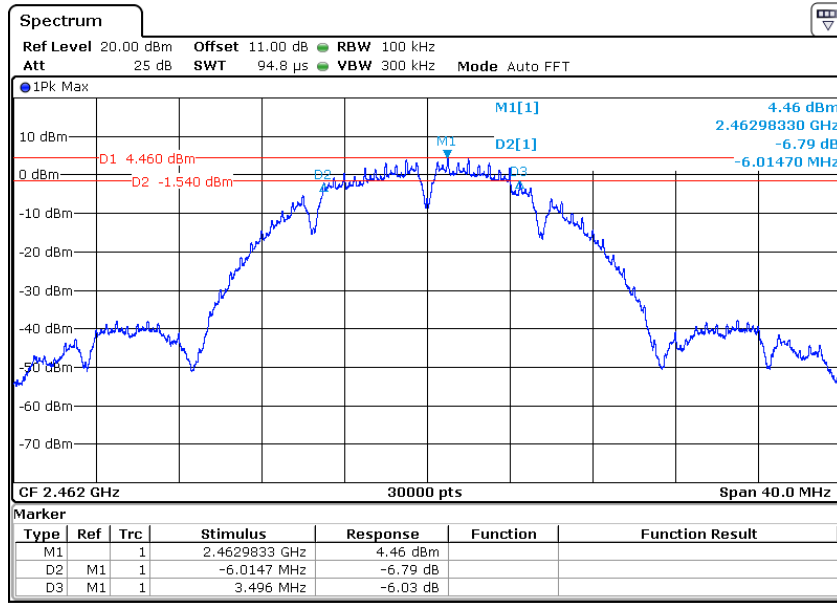
Channel 1: 2.412GHz:



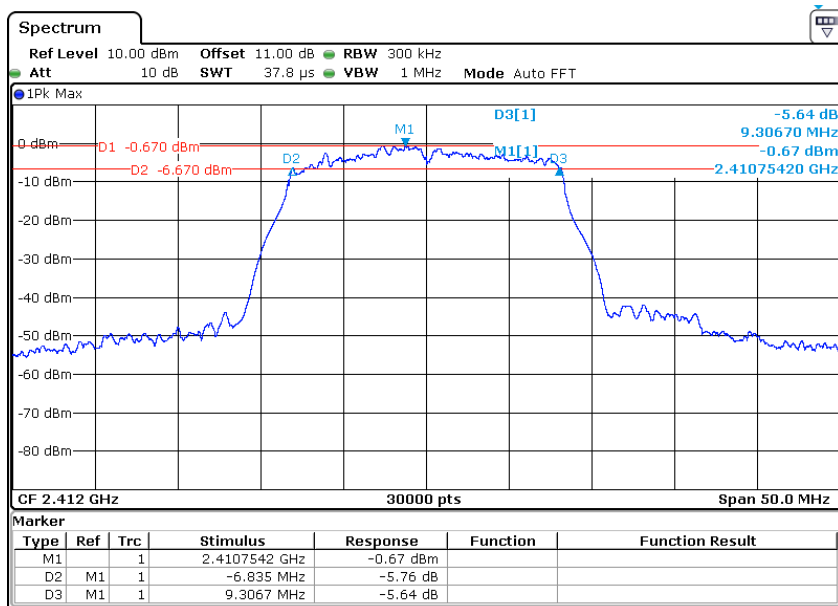
Channel 6: 2.437GHz:



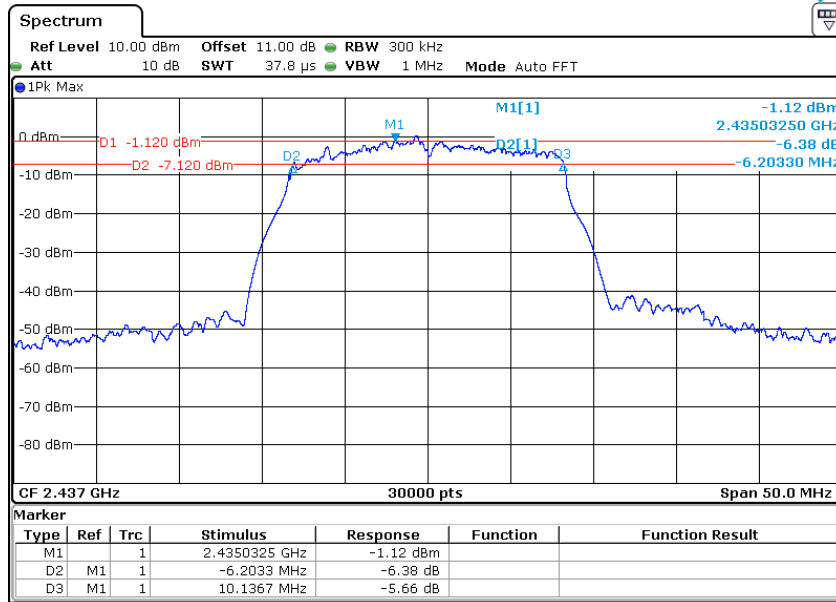
Channel 11: 2.462GHz



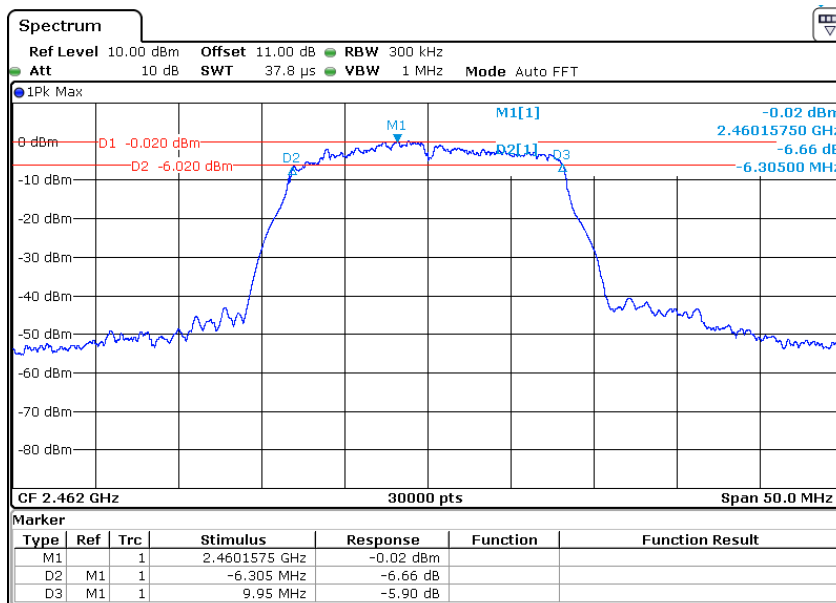
802.11g mode with 54Mbps data rate
 Channel 1: 2.412GHz:



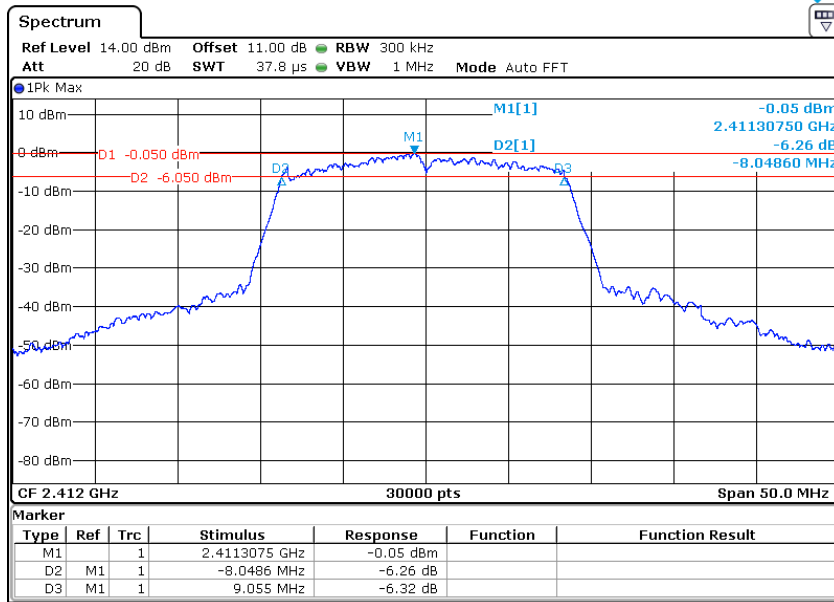
Channel 6: 2.437GHz:



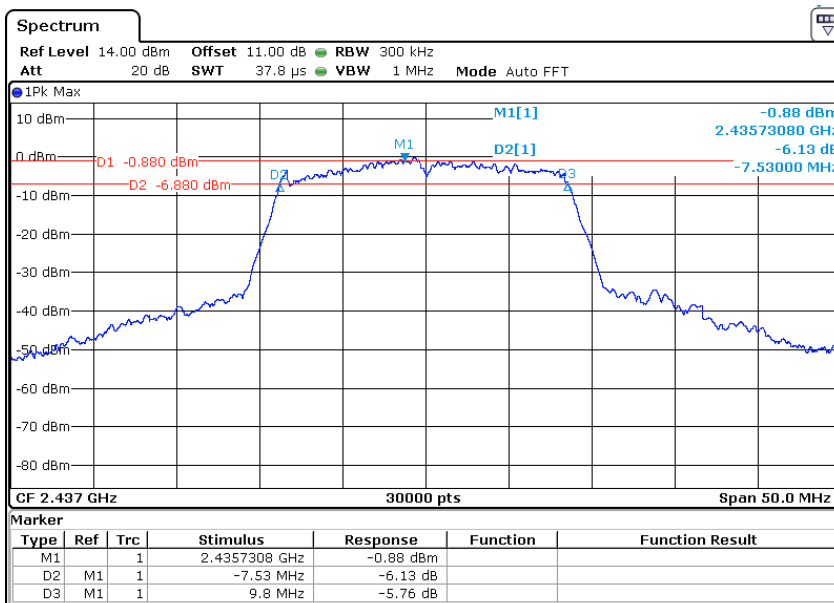
Channel 11: 2.462GHz:



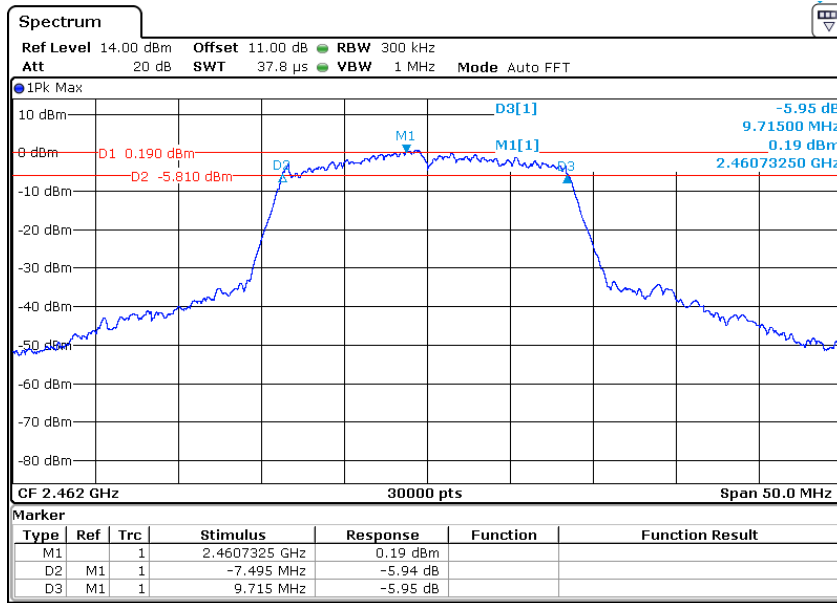
802.11n(HT20) mode with 72.2Mbps data rate
 Channel 1: 2.412GHz:



Channel 6: 2.437GHz:

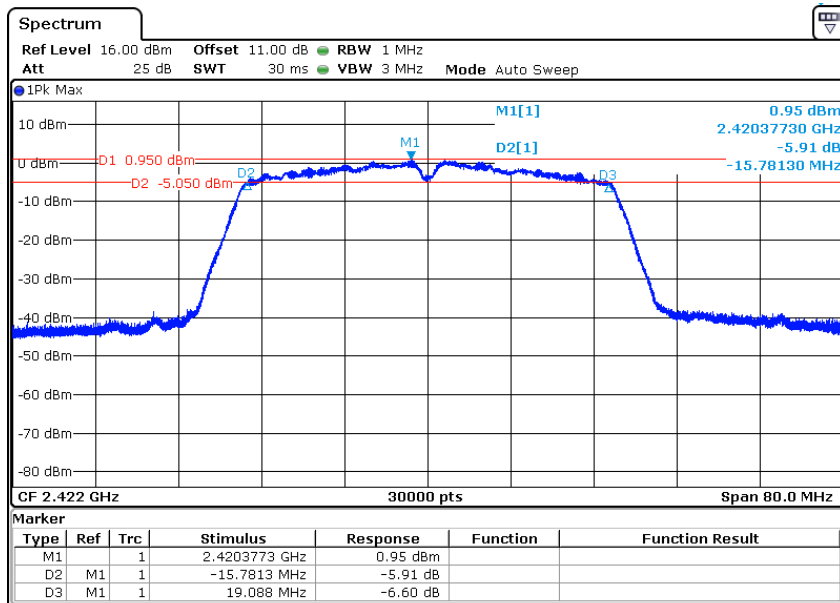


Channel 11: 2.462GHz:

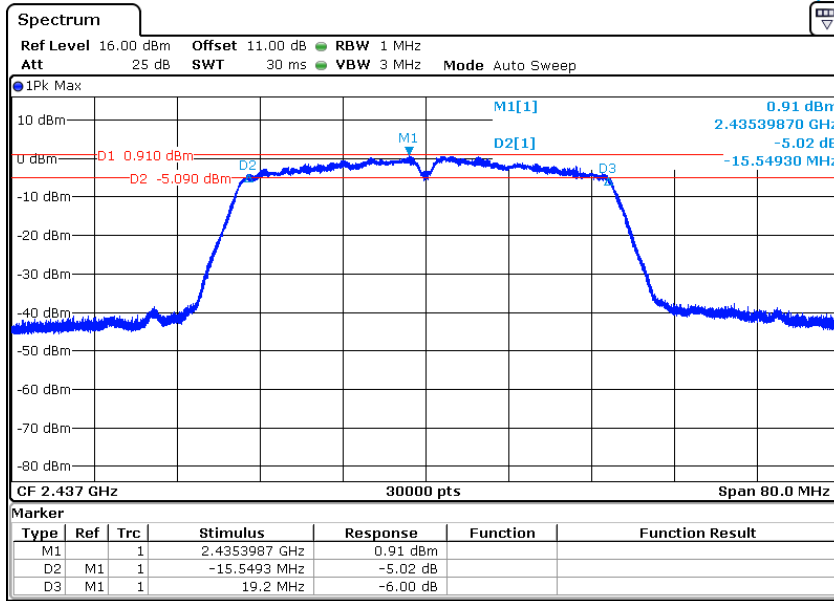


802.11n(HT40) mode with 150Mbps data rate

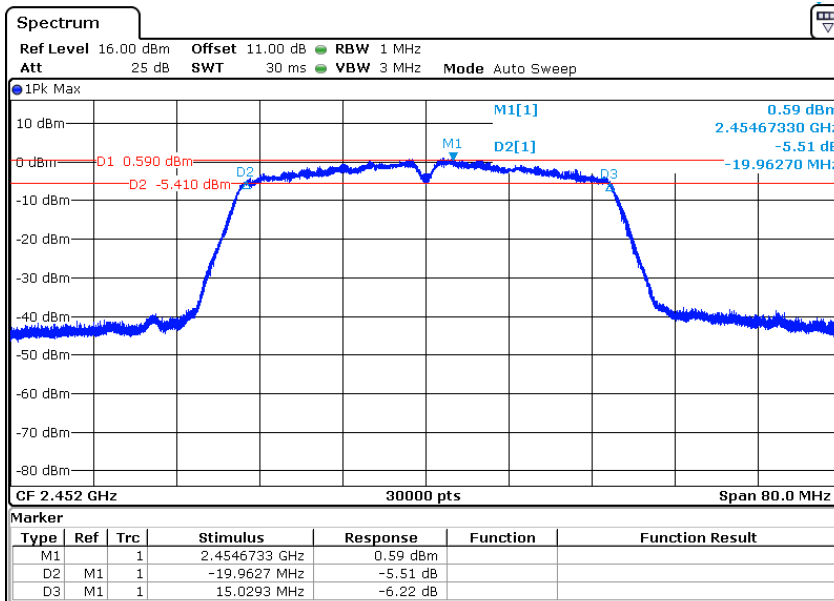
Channel 3: 2.422GHz:



Channel 6: 2.437GHz:



Channel 9: 2.452GHz:



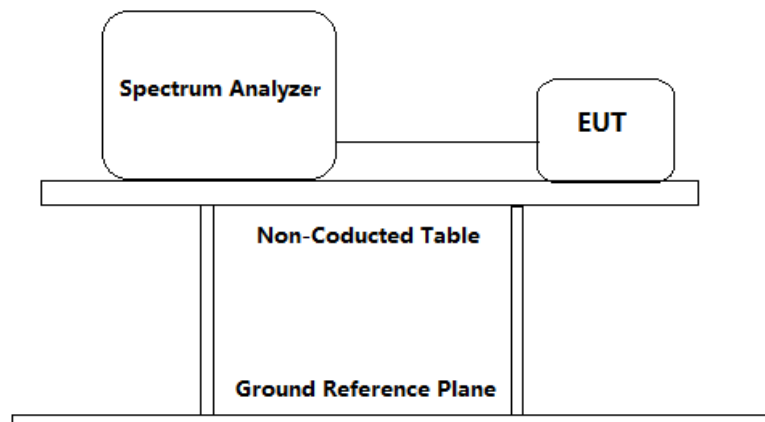
4.3 Maximum Peak Conducted Output Power

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.
Pre-test the EUT in AC mode and B/O mode, find worse case in AC mode.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (attenuator + cable loss =11.0 dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer:
 - a) Set the RBW = 1 MHz.
 - b) Set the VBW $\geq [3 \times \text{RBW}]$.
 - c) Set the span $\geq [1.5 \times \text{DTS bandwidth}]$.
 - 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.



Test result:

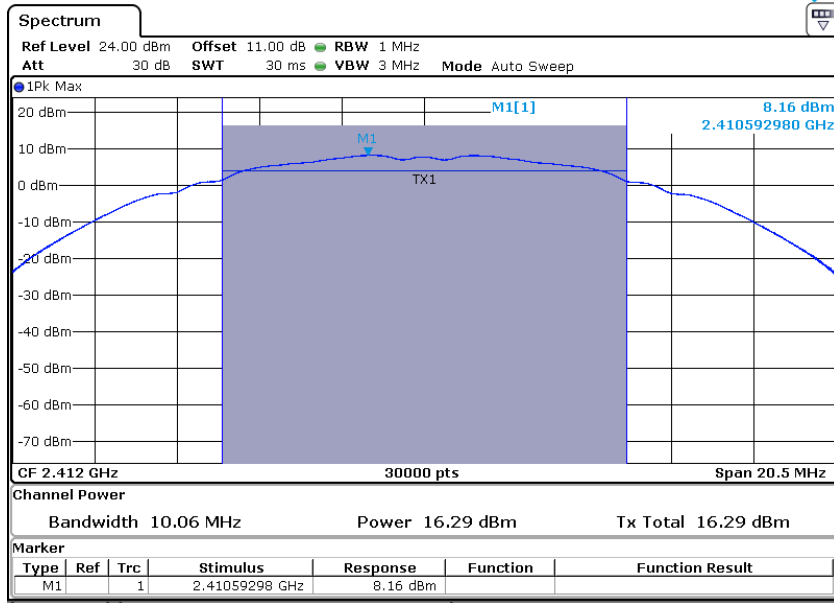
Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Channel Power (dBm)	Limit	Result
1	2412	802.11b	11 Mbps	16.29	1W (30dBm)	Pass
6	2437		11 Mbps	16.20		Pass
11	2462		11 Mbps	16.92		Pass
1	2412	802.11g	54 Mbps	14.28		Pass
6	2437		54 Mbps	14.46		Pass
11	2462		54 Mbps	15.03		Pass
1	2412	802.11n (HT20)	72.2 Mbps	13.34		Pass
6	2437		72.2 Mbps	13.30		Pass
11	2462		72.2 Mbps	14.11		Pass
3	2422	802.11n (HT40)	150 Mbps	12.77		Pass
6	2437		150 Mbps	12.30		Pass
9	2452		150 Mbps	12.46		Pass

Remark: Level = Read Level +Attenuator +Cable Loss
 The unit does meet the FCC requirements.

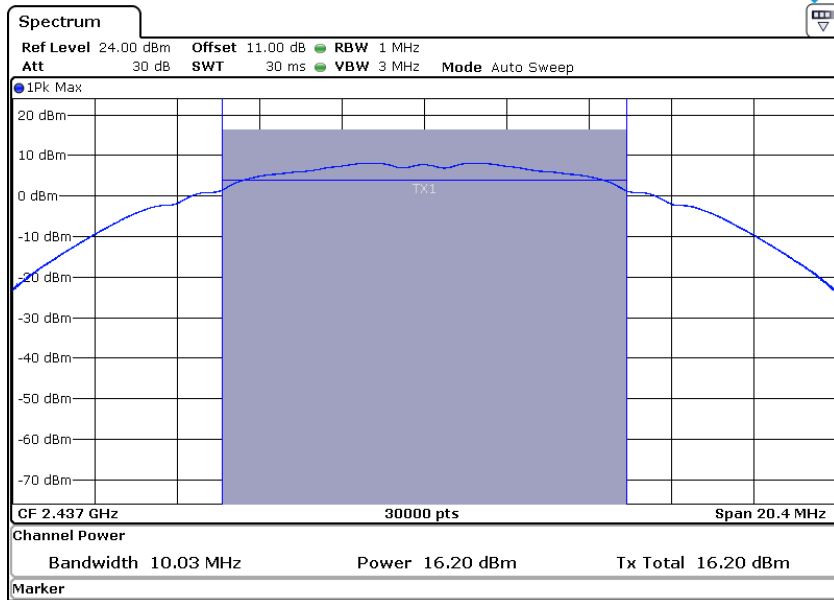
Result plot as follows:

802.11b mode with 11Mbps data rate

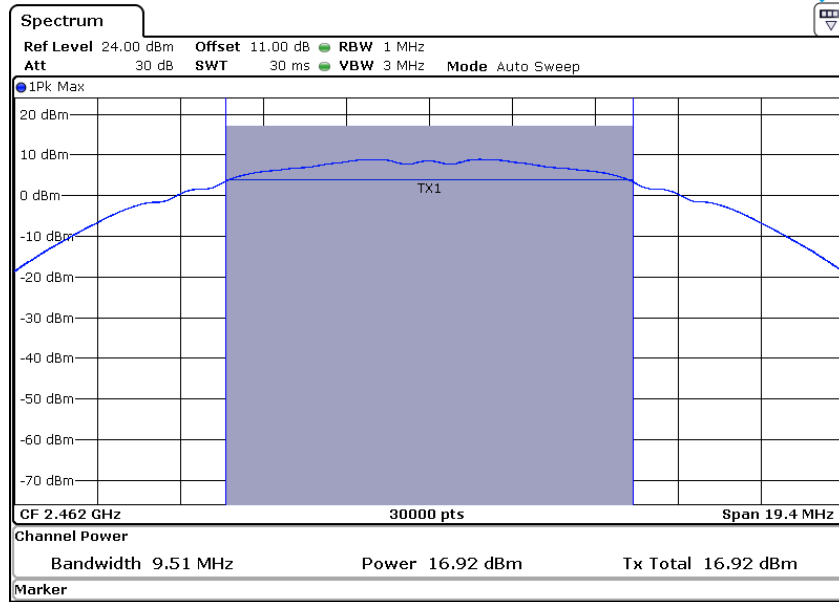
Channel 1: 2.412GHz:



Channel 6: 2.437GHz:

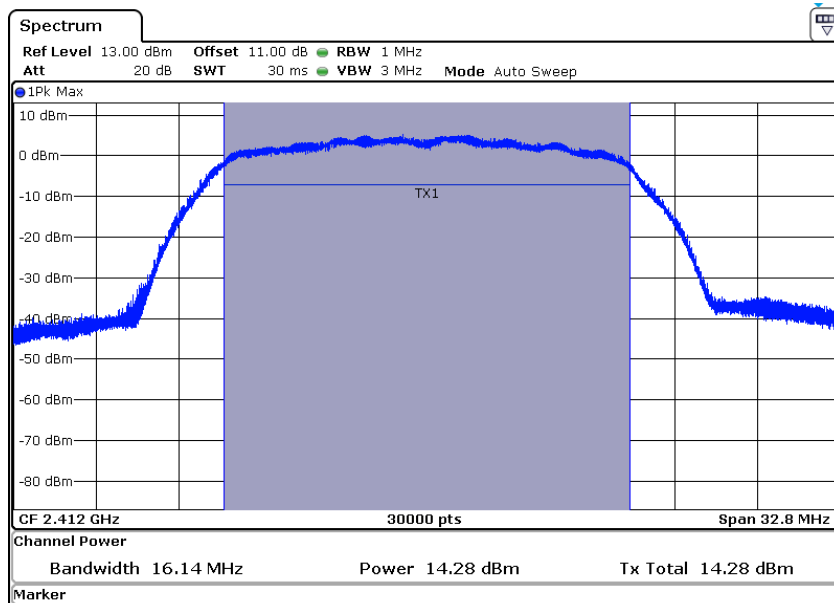


Channel 11: 2.462GHz:

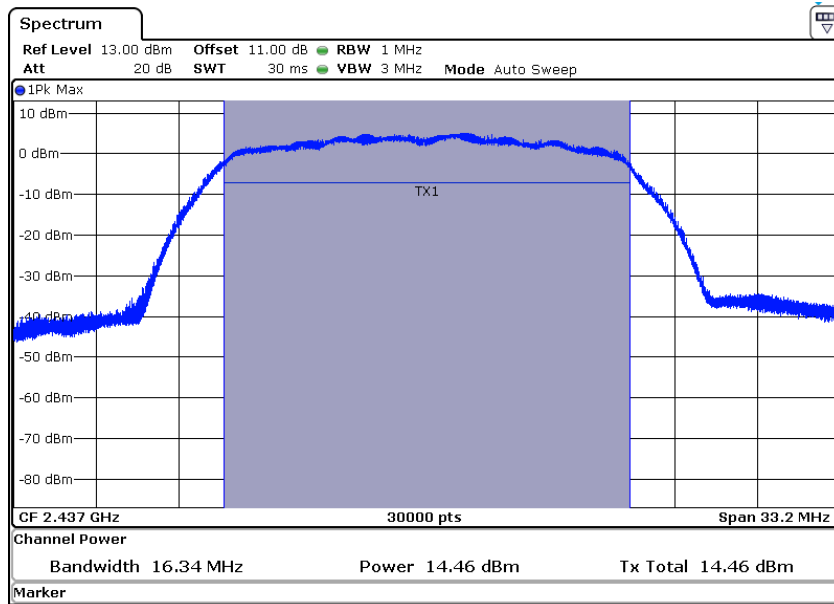


802.11g mode with 54Mbps data rate

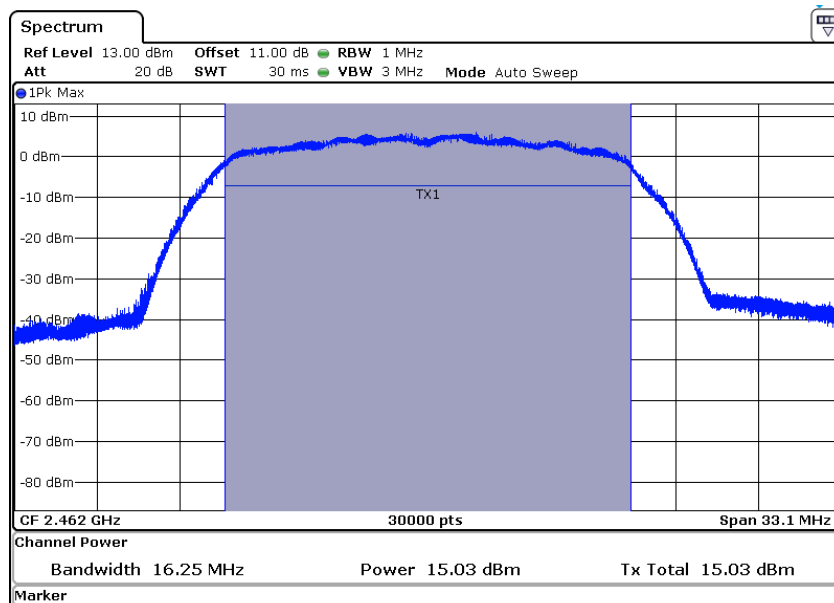
Channel 1: 2.412GHz:



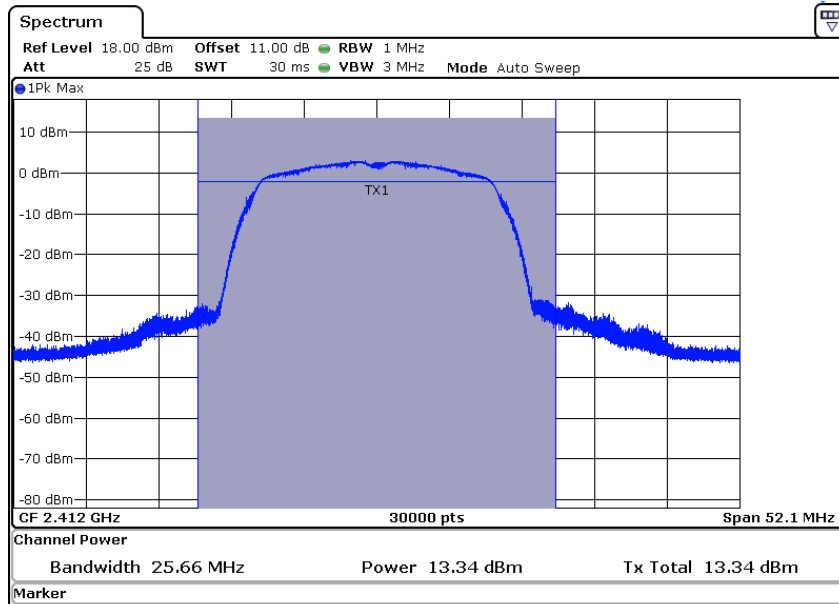
Channel 6: 2.437GHz:



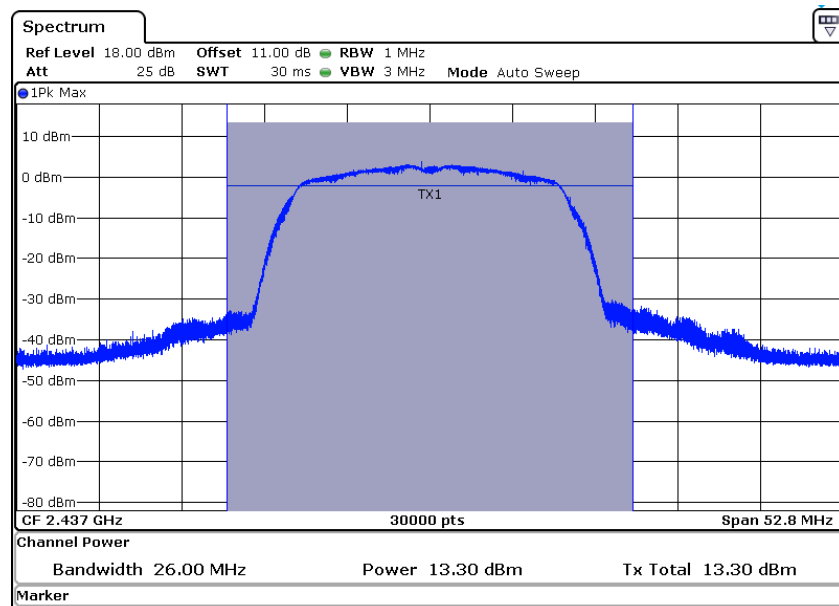
Channel 11: 2.462GHz:



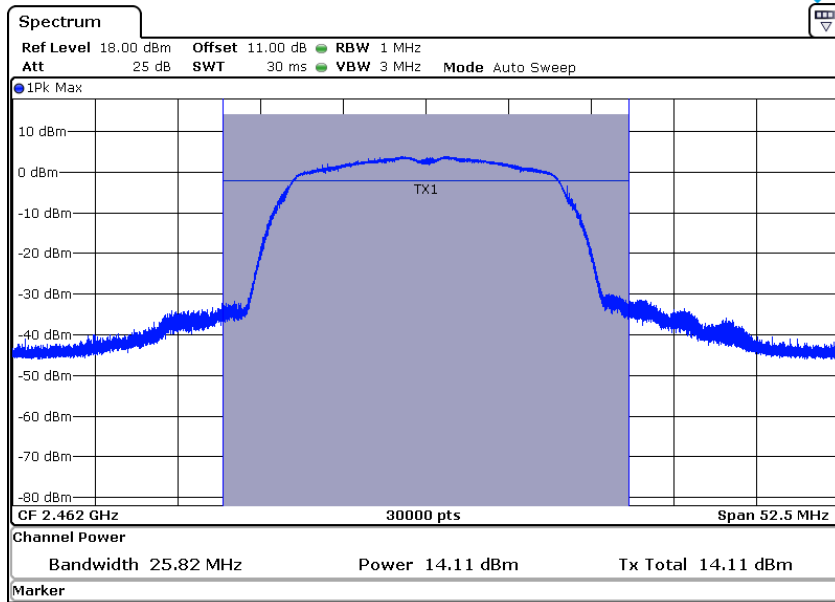
802.11n(HT20) mode with 72.2Mbps data rate
 Channel 1: 2.412GHz:



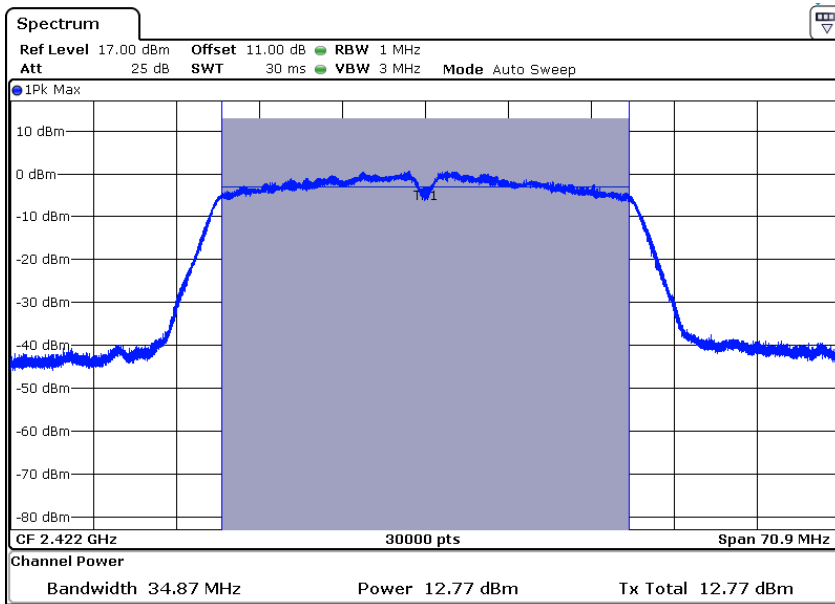
Channel 6: 2.437GHz:



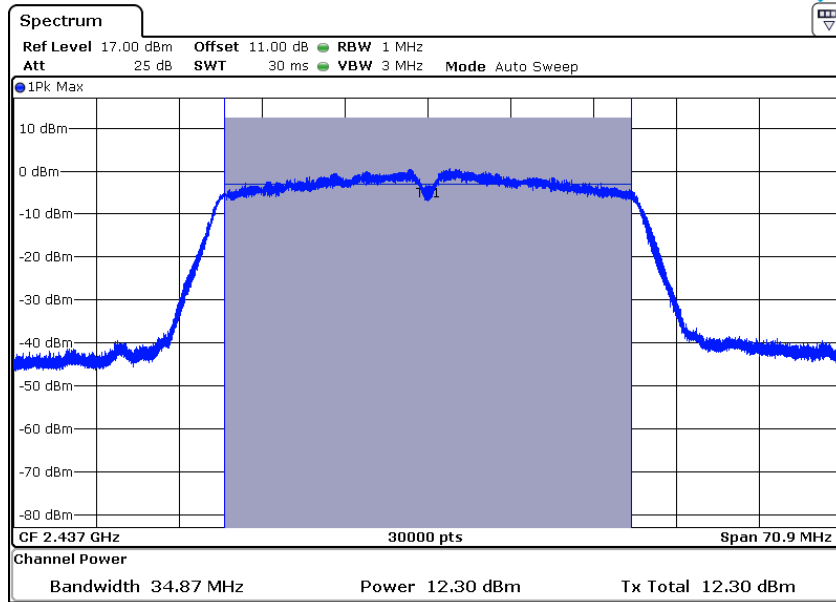
Channel 11: 2.462GHz:



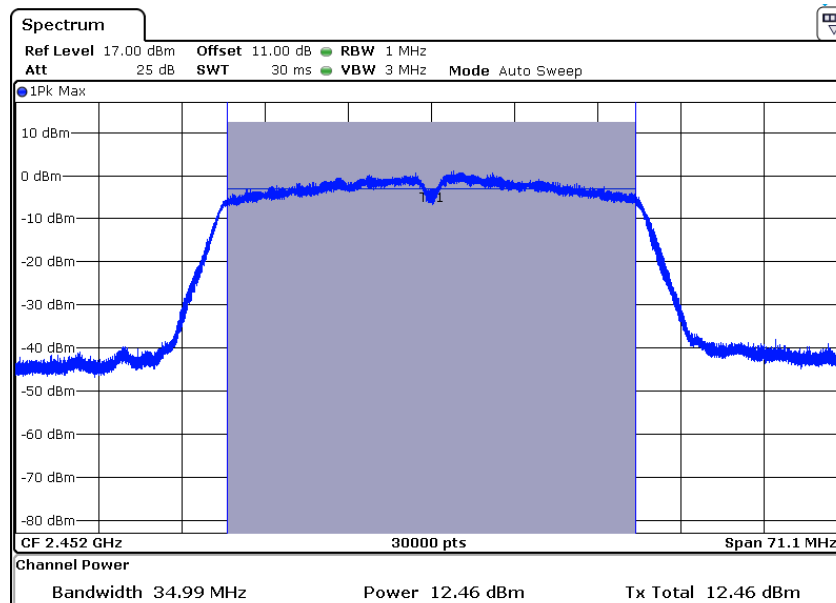
802.11n(HT40) mode with 150Mbps data rate
 Channel 3: 2.422GHz:



Channel 6: 2.437GHz:



Channel 9: 2.452GHz:



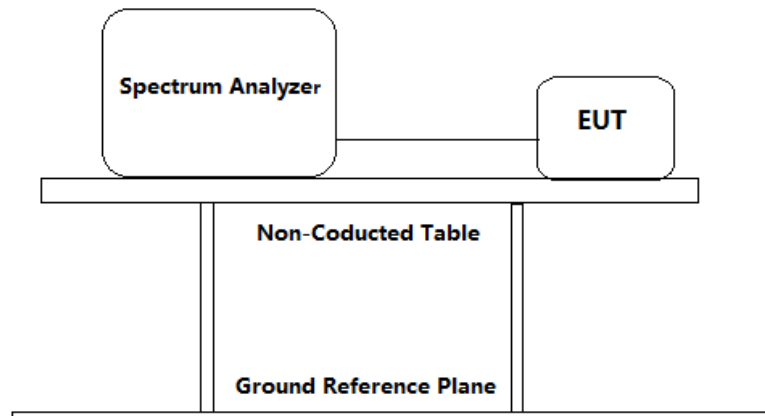
4.4 Peak Power Spectral Density

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.
Pre-test the EUT in AC mode and B/O mode, find worse case in AC mode.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (attenuator +Cable Loss =11.0 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.



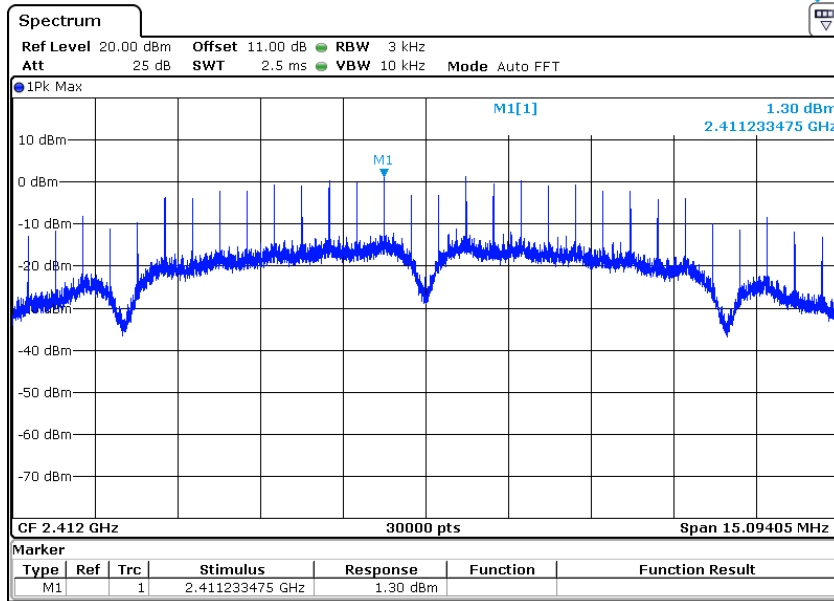
Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Peak Power Spectral Density (dBm/3KHz)	Limit	Result
1	2412	802.11b	11 Mbps	1.30	8dBm/ 3 kHz	Pass
6	2437		11 Mbps	1.20		Pass
11	2462		11 Mbps	2.07		Pass
1	2412	802.11g	54 Mbps	-18.71		Pass
6	2437		54 Mbps	-19.01		Pass
11	2462		54 Mbps	-17.82		Pass
1	2412	802.11n (HT20)	72.2 Mbps	-17.47		Pass
6	2437		72.2 Mbps	-17.07		Pass
11	2462		72.2 Mbps	-17.02		Pass
3	2422	802.11n (HT40)	150 Mbps	-21.84		Pass
6	2437		150 Mbps	-22.33		Pass
9	2452		150 Mbps	-21.92		Pass

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

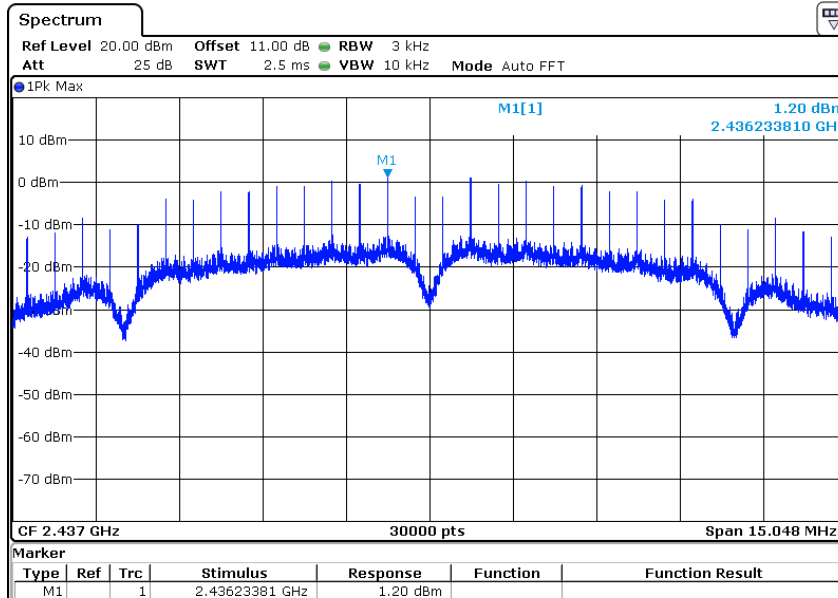
Result plot as follows:

802.11b mode with 11Mbps data rate

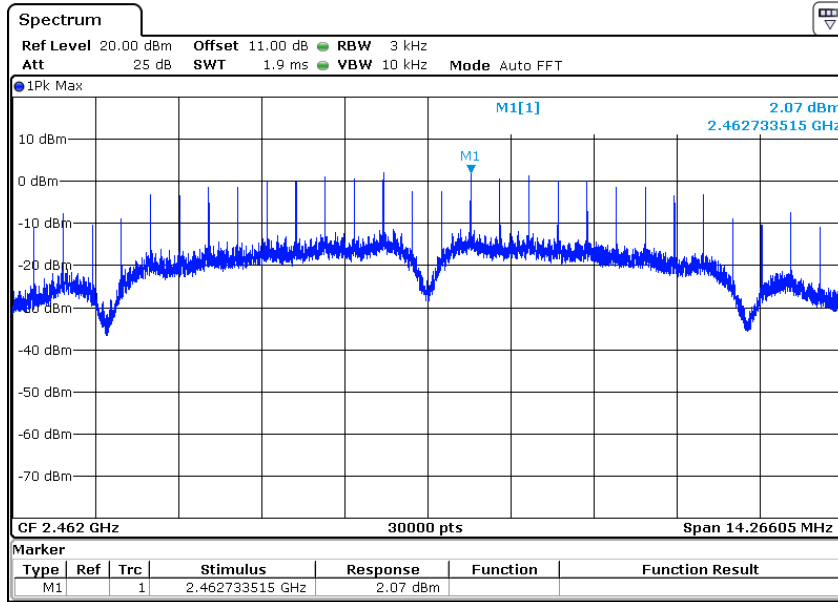
Channel 1: 2.412GHz:



Channel 6: 2.437GHz:

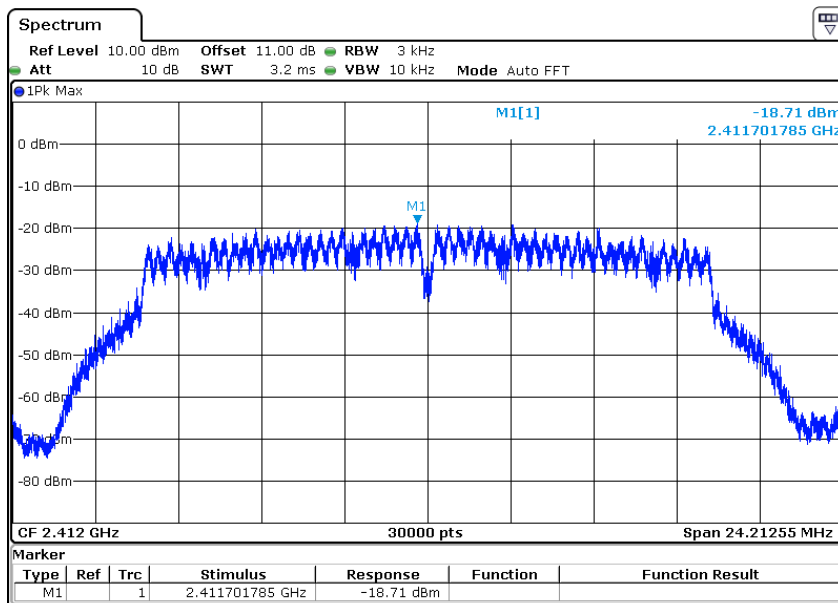


Channel 11: 2.462GHz:

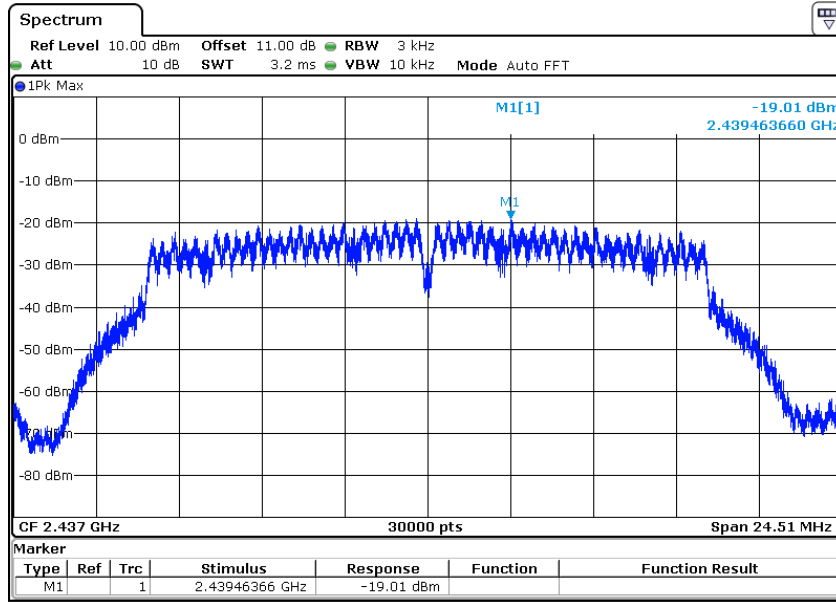


802.11g mode with 54Mbps data rate

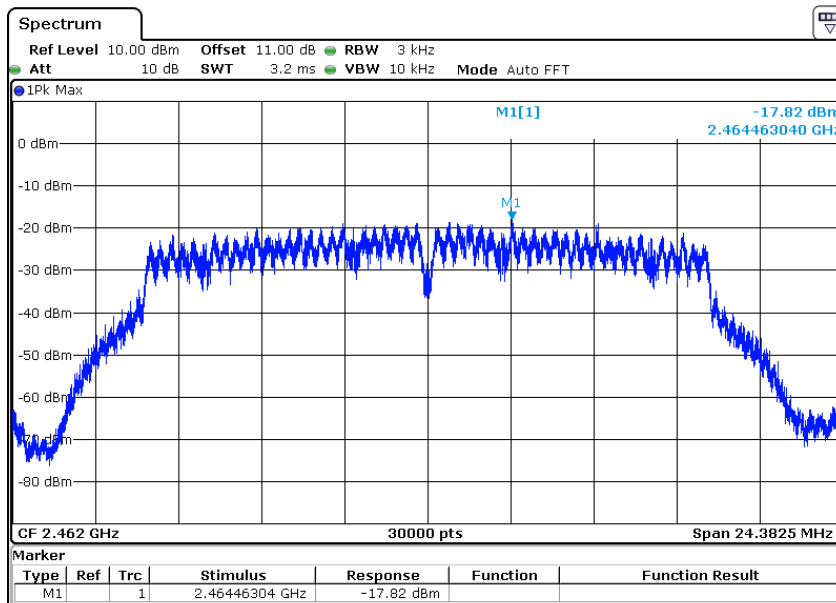
Channel 1: 2.412GHz:



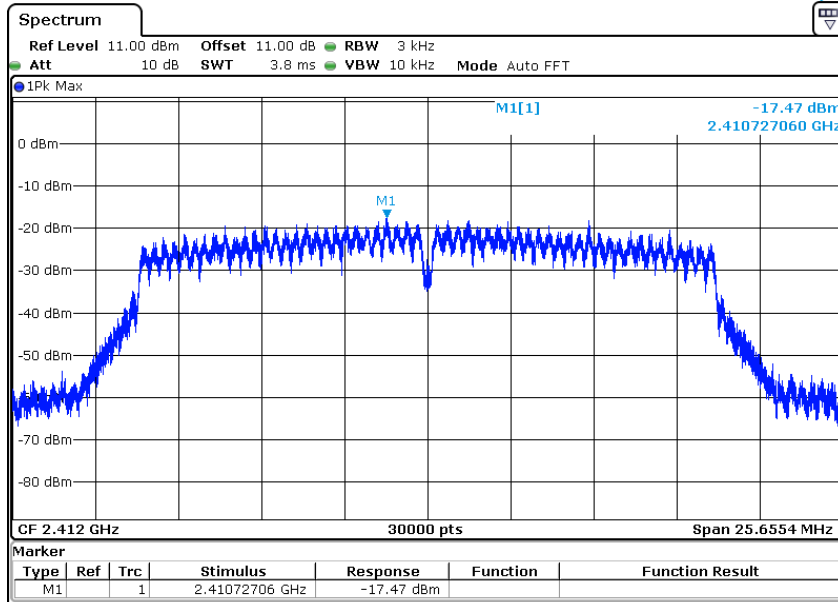
Channel 6: 2.437GHz:



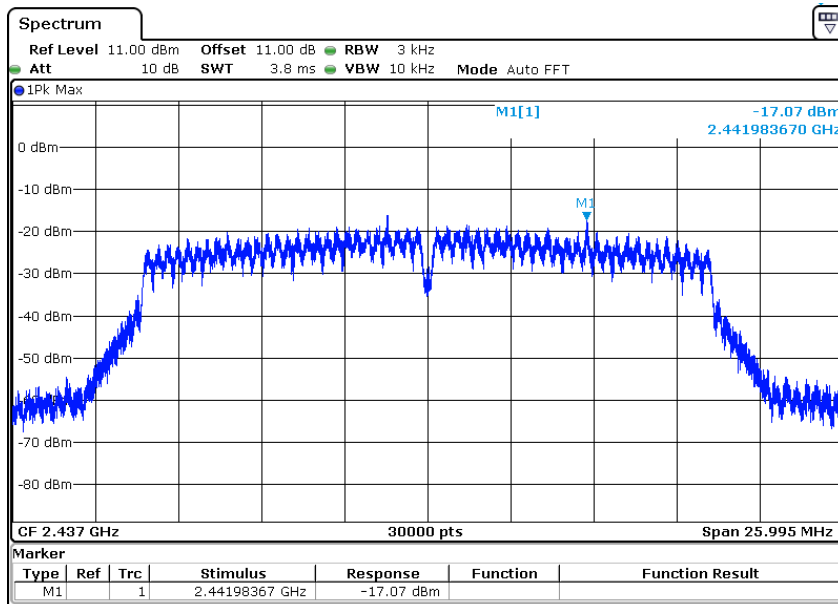
Channel 11: 2.462GHz:



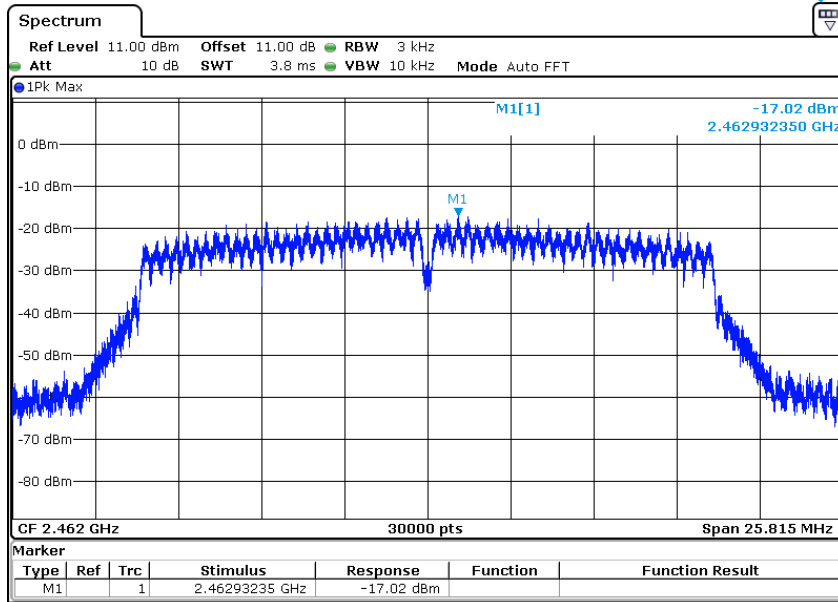
802.11n(HT20) mode with 72.2Mbps data rate
 Channel 1: 2.412GHz:



Channel 6: 2.437GHz:

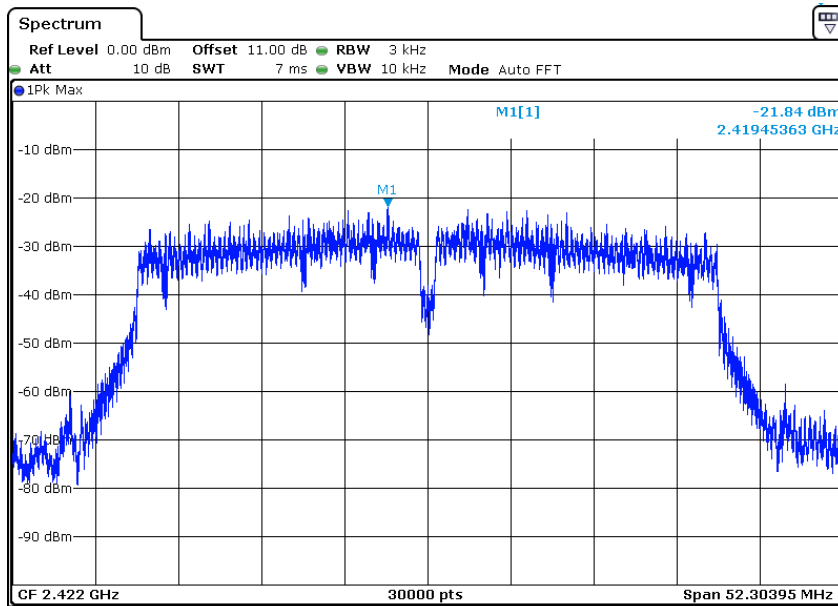


Channel 11: 2.462GHz:

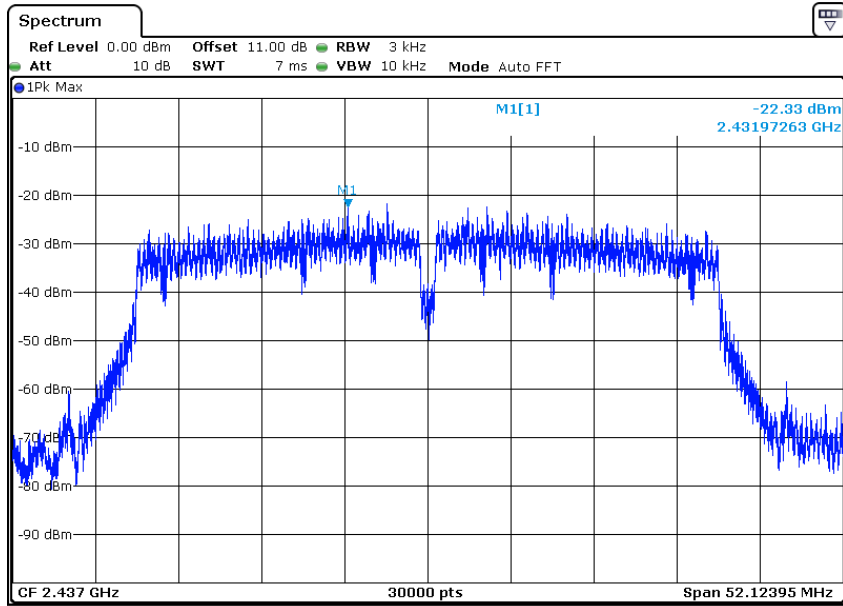


802.11n(HT40) mode with 150Mbps data rate

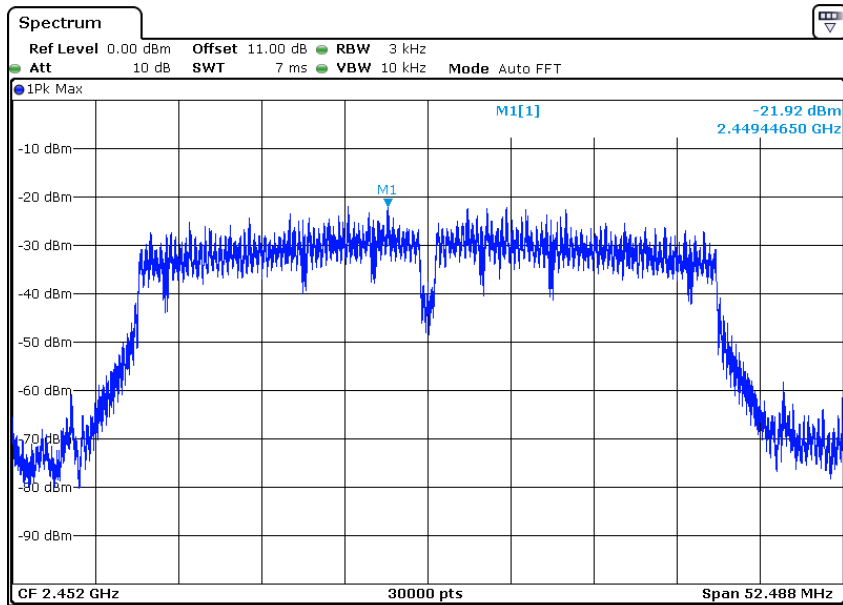
Channel 3: 2.422GHz:



Channel 6: 2.437GHz:



Channel 9: 2.452GHz:



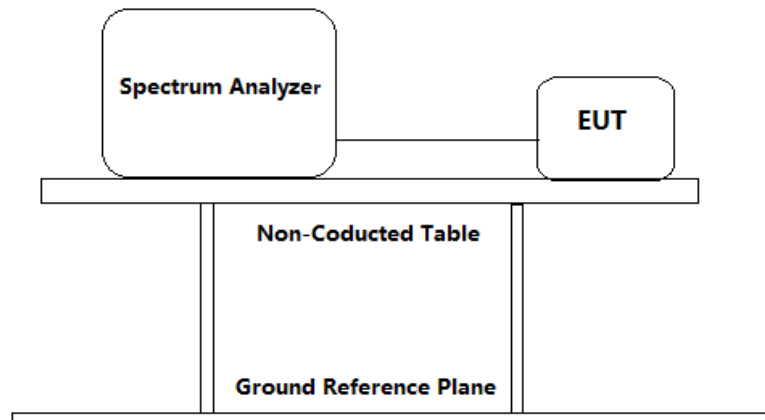
4.5 Out of Band Conducted Emissions

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.
 Pre-test the EUT in AC mode and B/O mode, find worse case in AC mode.

Test Configuration:



Test Procedure:

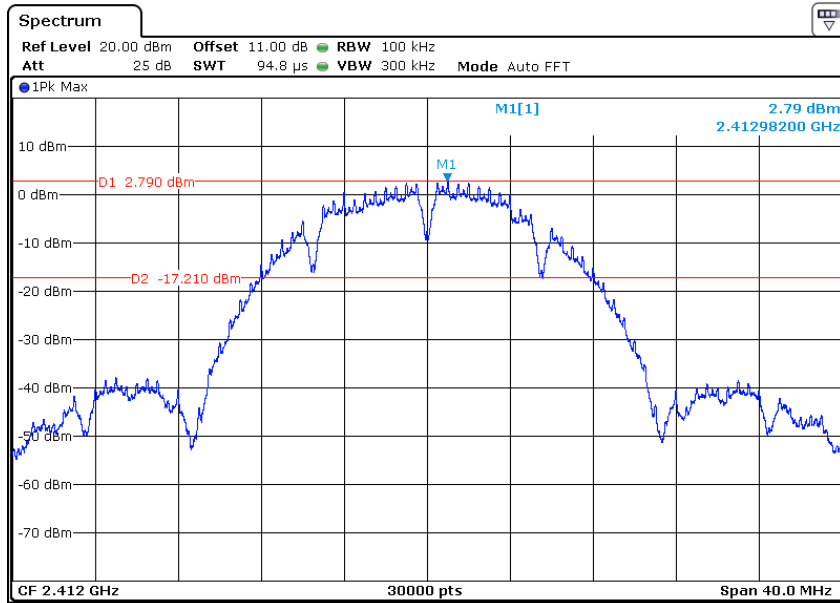
1. Remove the antenna from the EUT and then connect a low RF cable (Attenuator +Cable Loss =11.0dB) from the antenna port to the spectrum analyzer or power meter.
2. Establish a reference level by using the following procedure:
 - a) Set instrument center frequency to DTS channel center frequency.
 - 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 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.

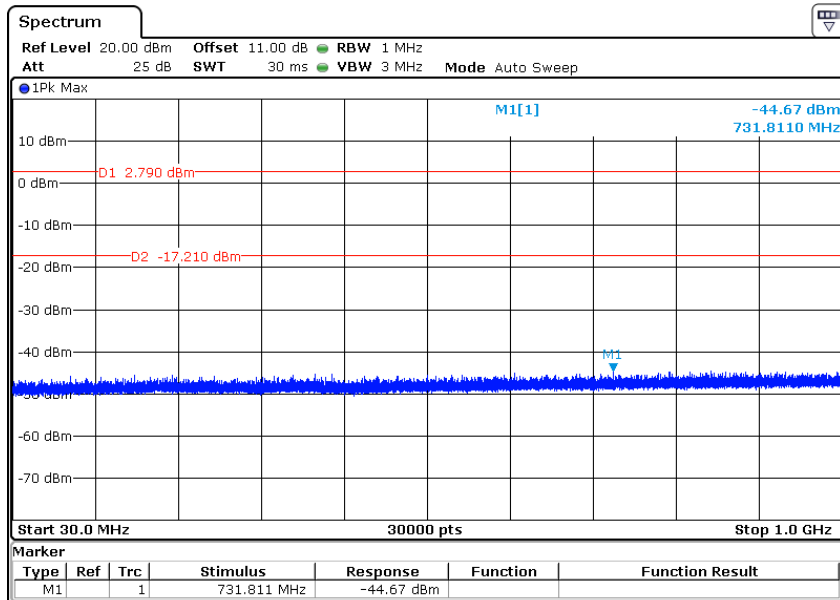
Result plot as follows:

802.11b mode with 11Mbps data rate

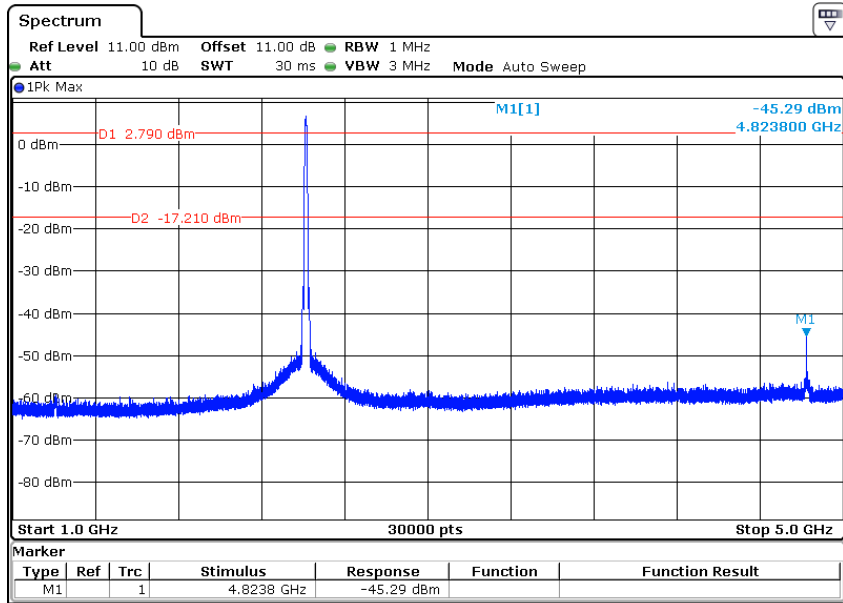
Channel 1: 2.412GHz:



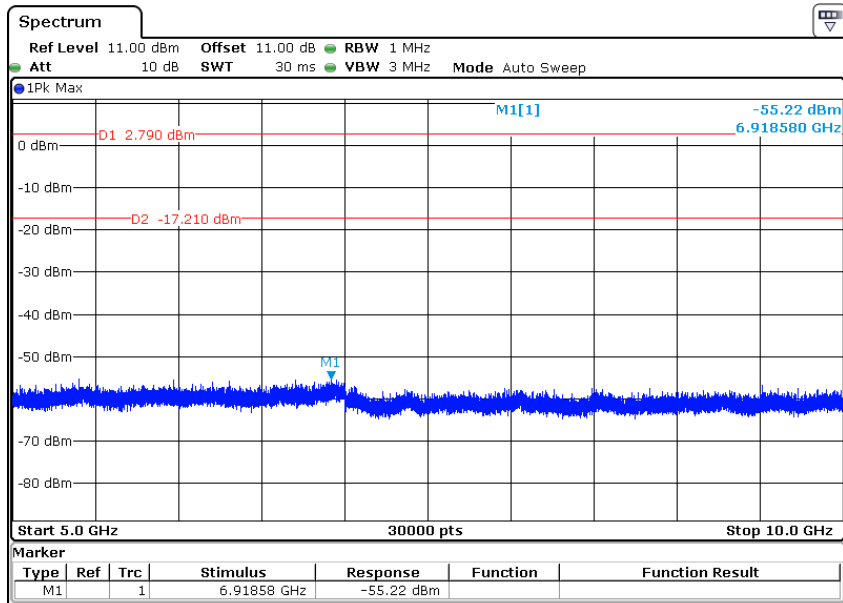
30 MHz to 1GHz:



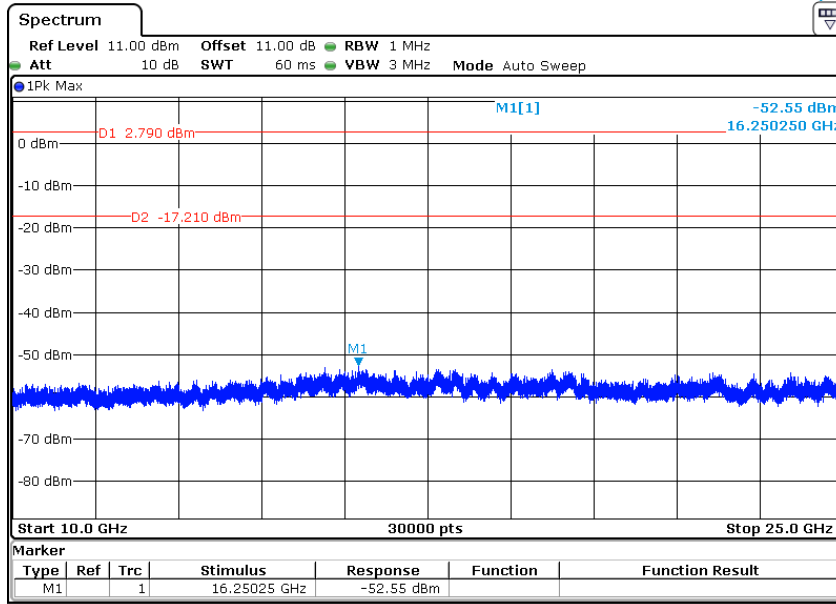
1GHz to 5GHz:



5GHz to 10GHz:

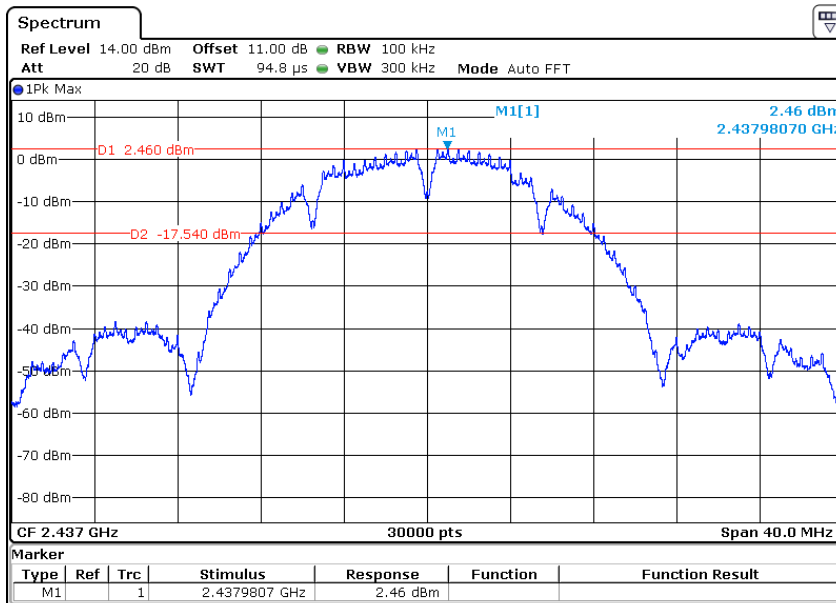


10GHz to 25GHz:

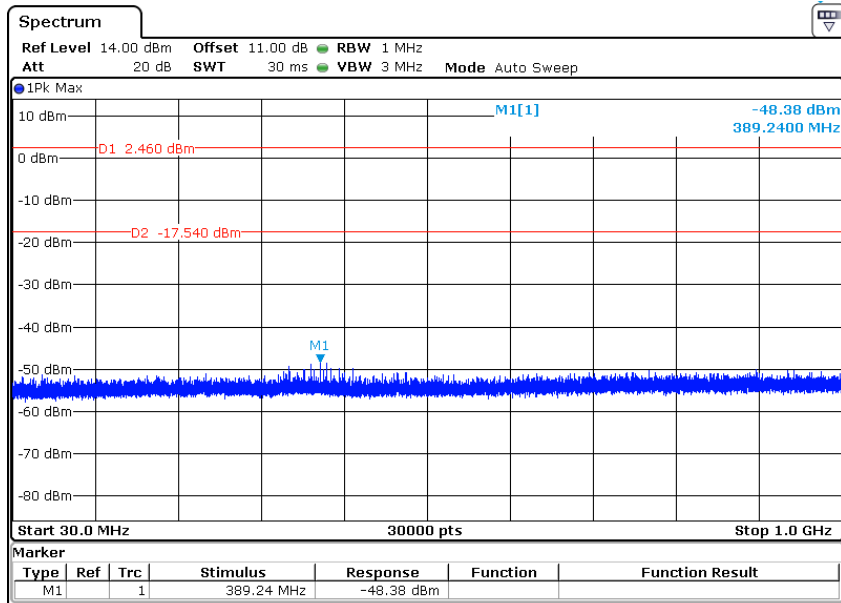


802.11b mode with 11Mbps data rate

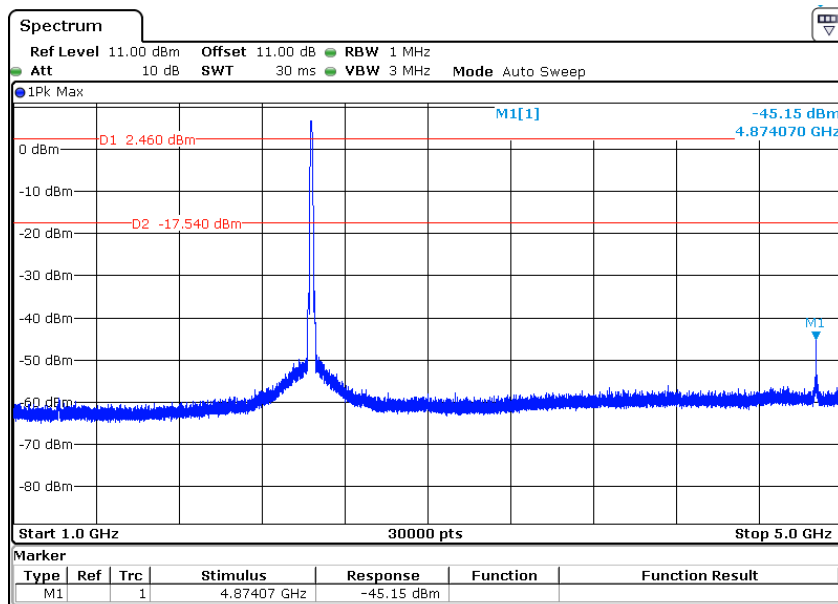
Channel 6: 2.437GHz:



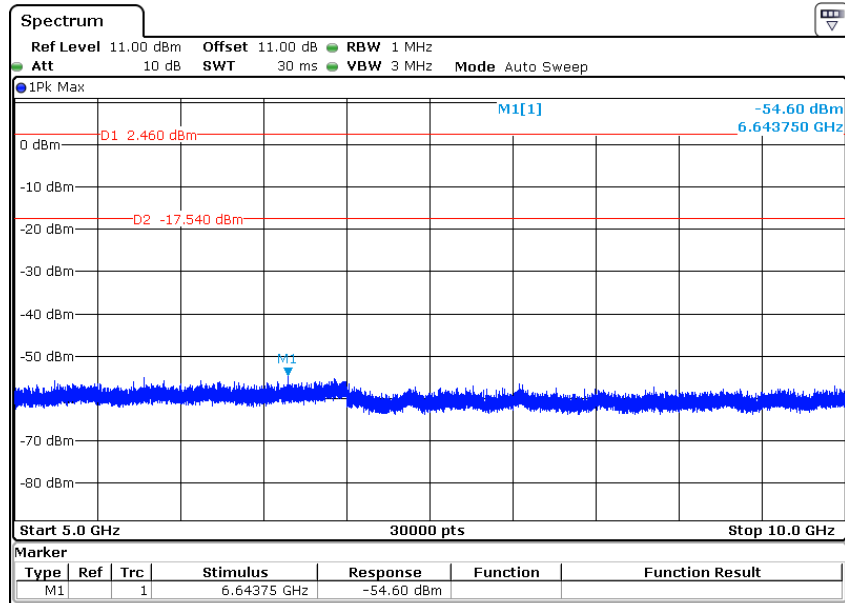
30 MHz to 1GHz:



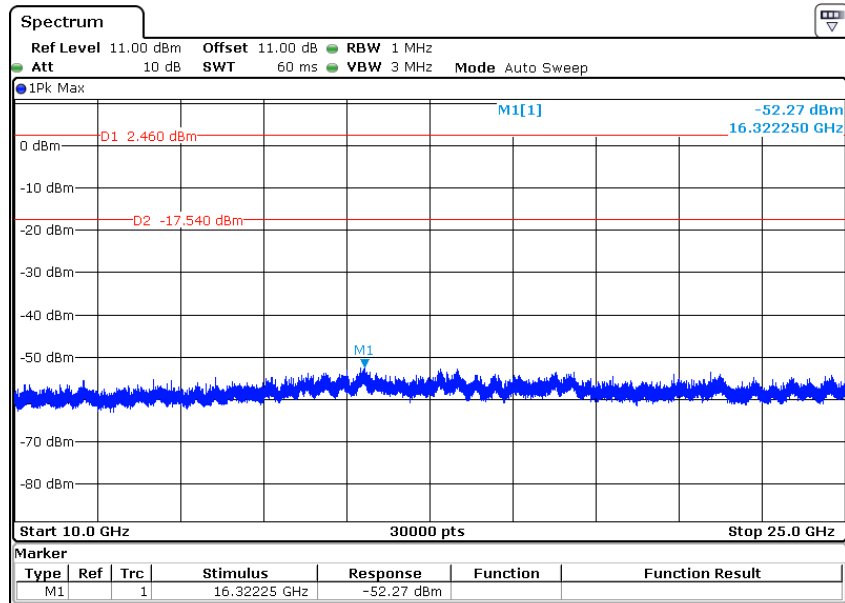
1GHz to 5GHz:



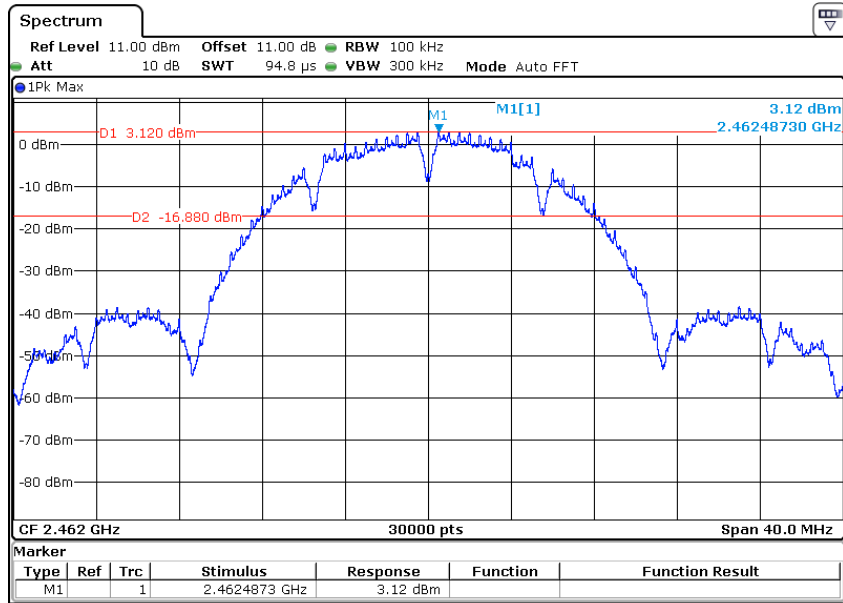
5GHz to 10GHz:



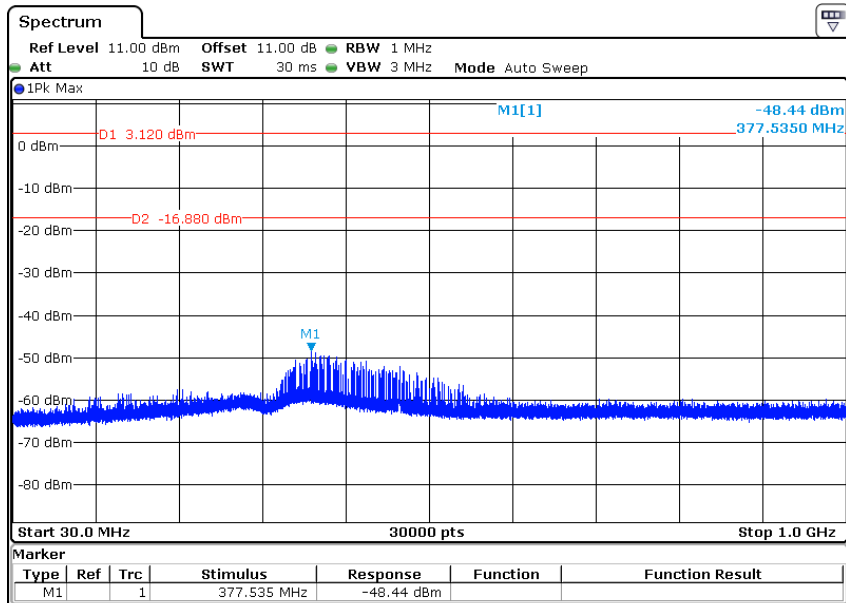
10GHz to 25GHz:



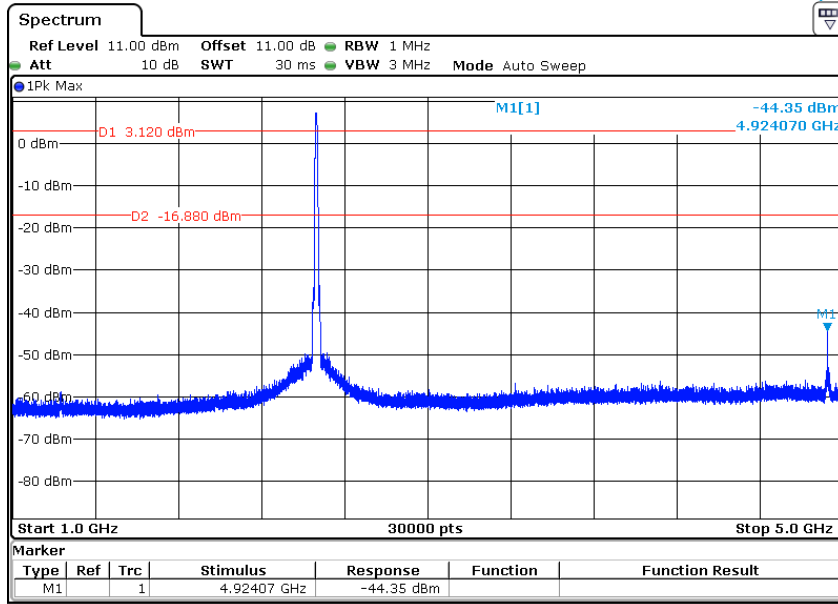
Channel 11: 2.462GHz:



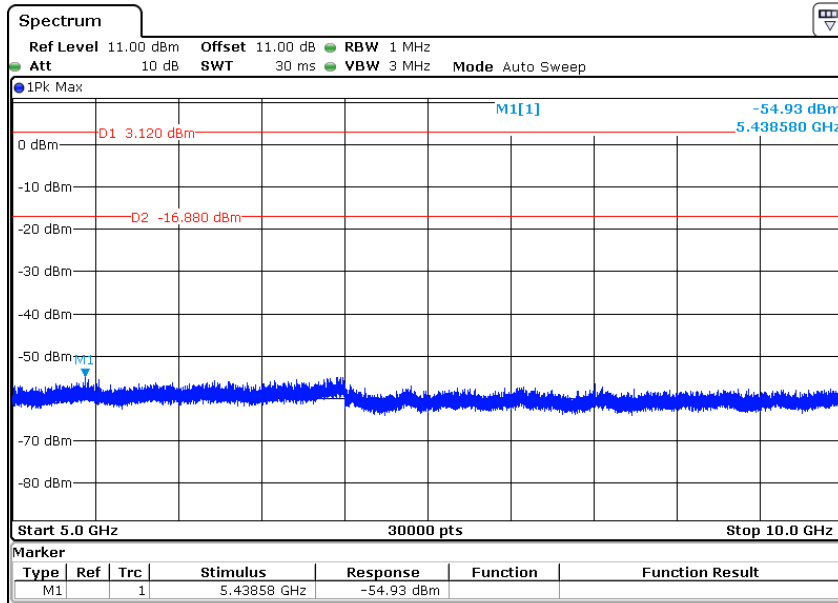
30 MHz to 1GHz:



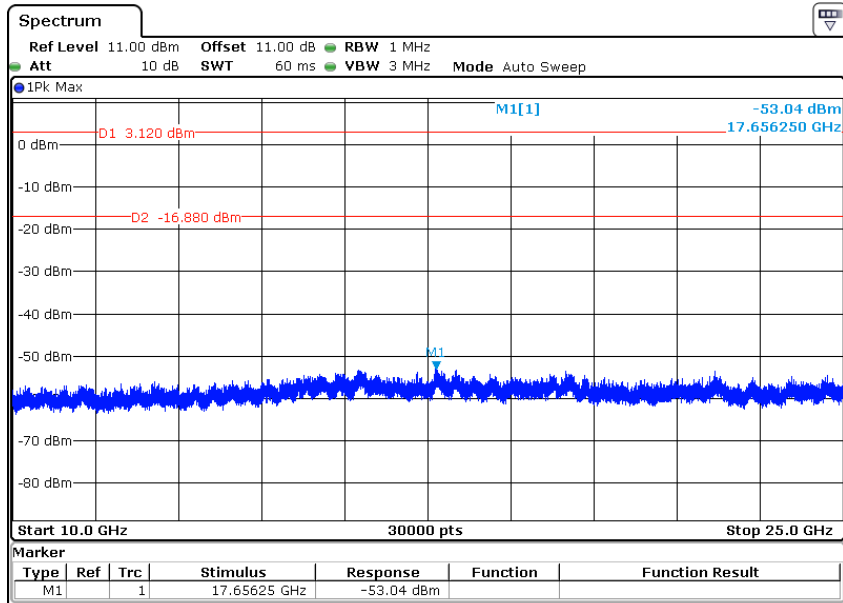
1GHz to 5GHz:



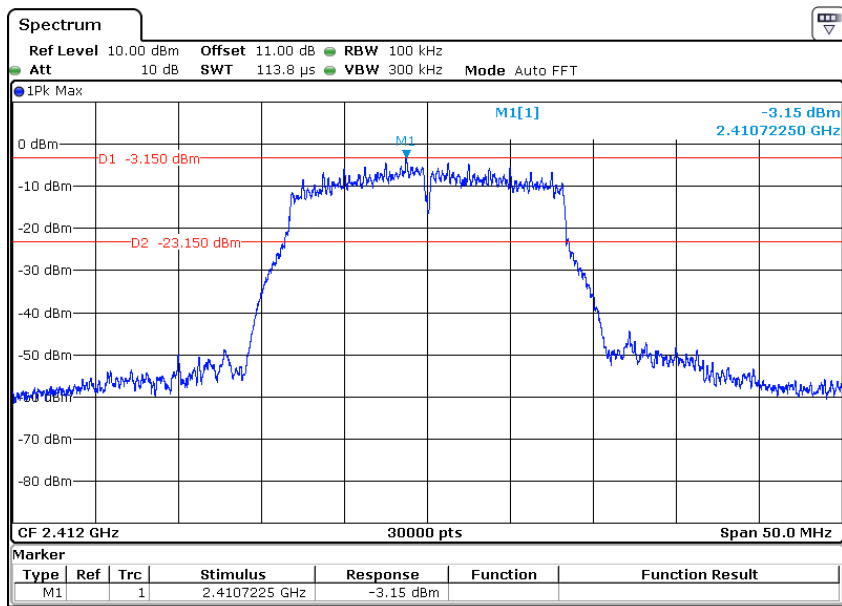
5GHz to 10GHz:



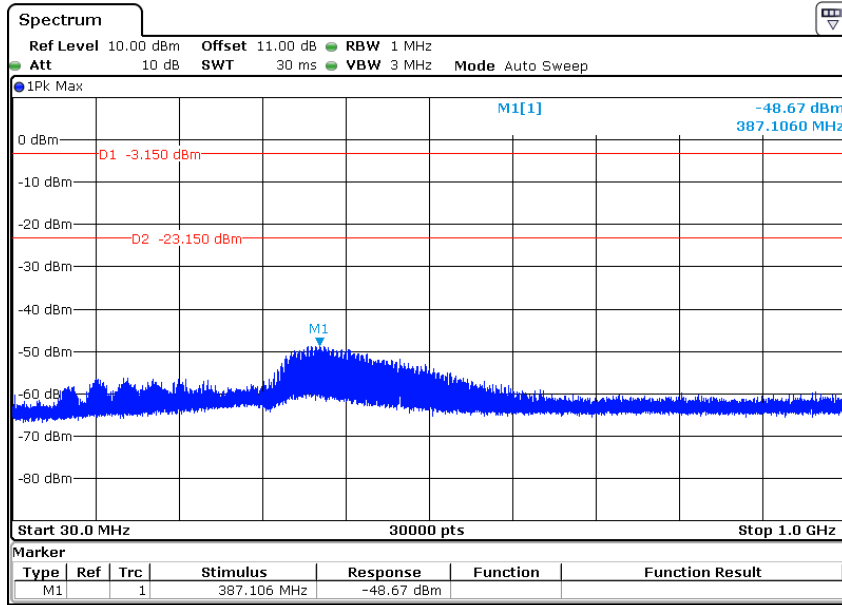
10GHz to 25GHz:



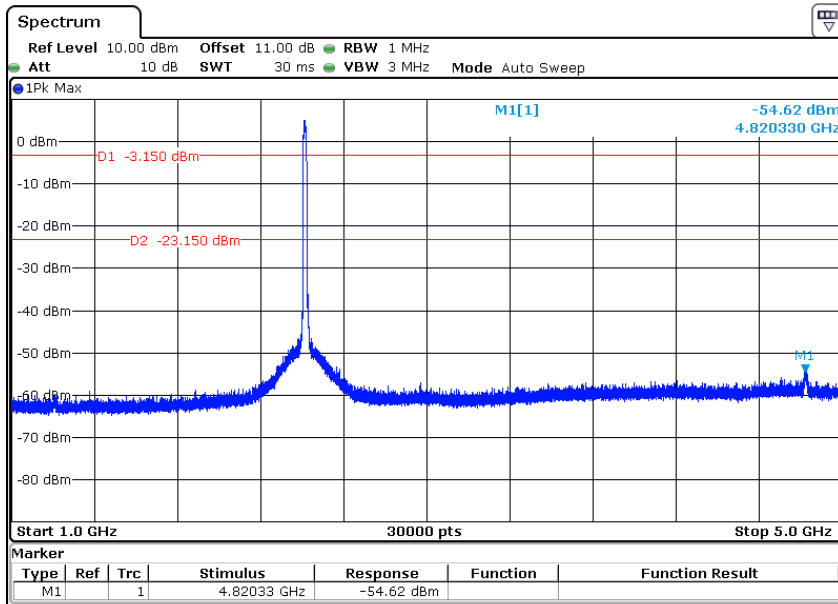
802.11g mode with 54Mbps data rate
 Channel 1: 2.412GHz:



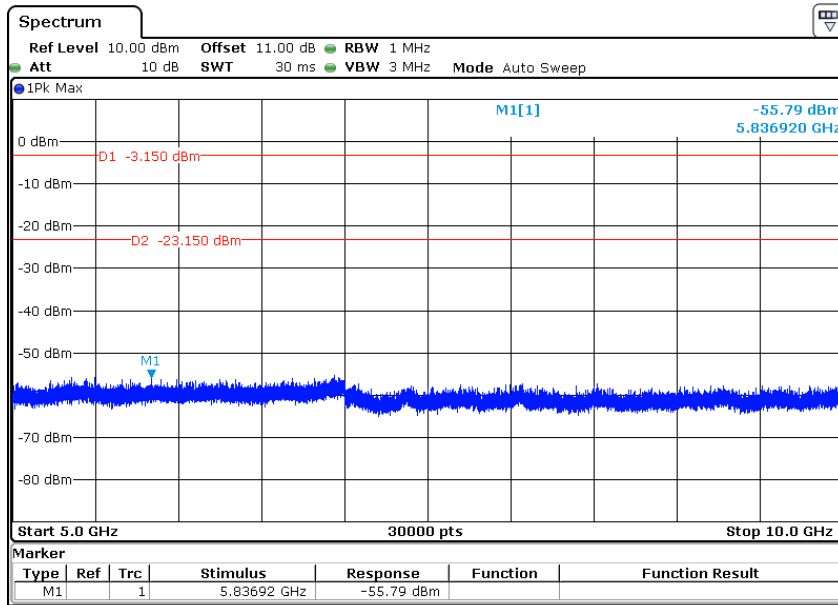
30 MHz to 1GHz:



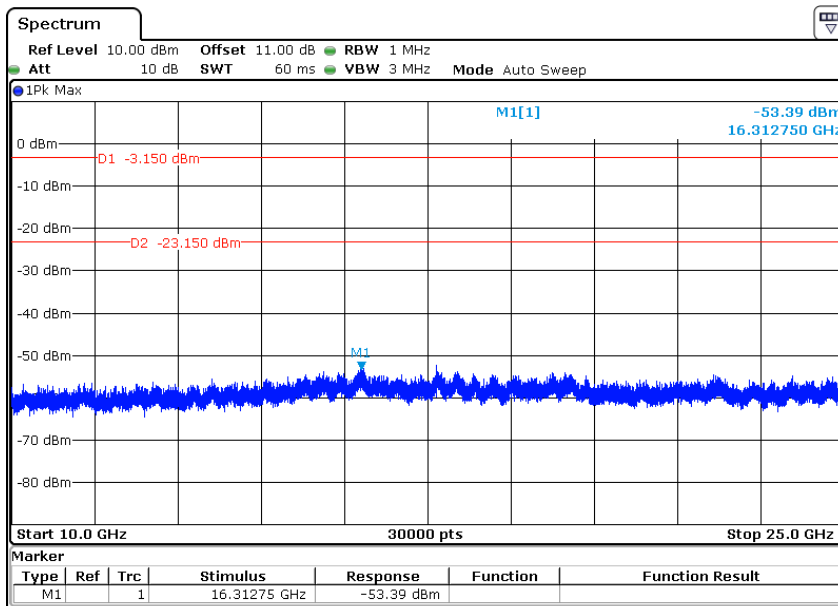
1GHz to 5GHz:



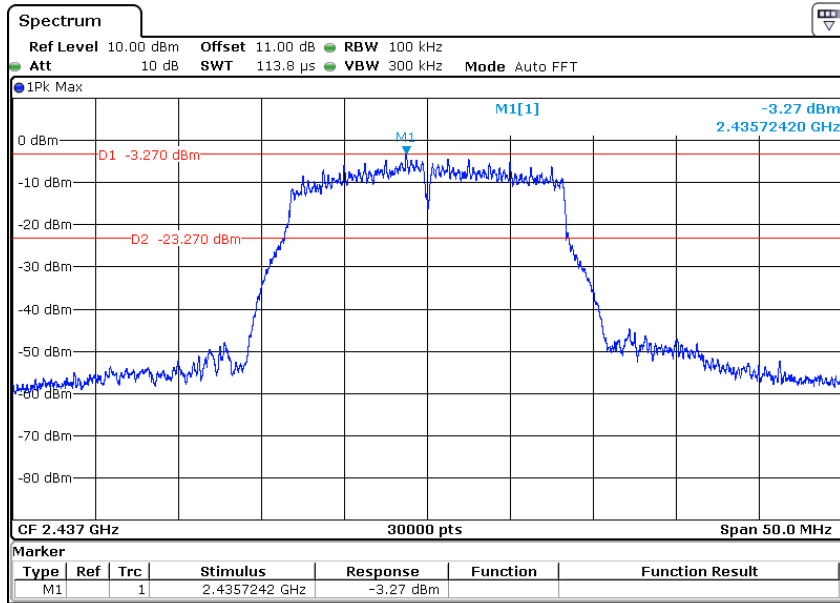
5GHz to 10GHz:



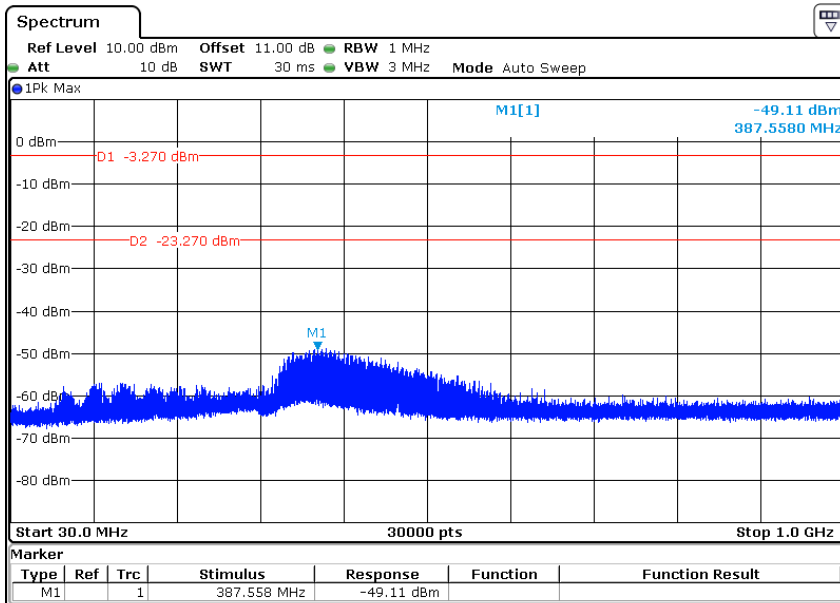
10GHz to 25GHz:



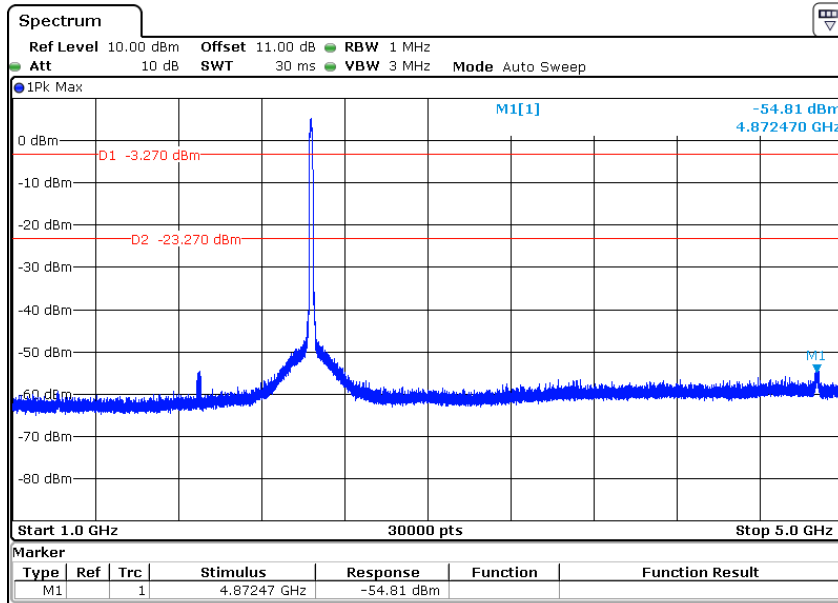
Channel 6: 2.437GHz:



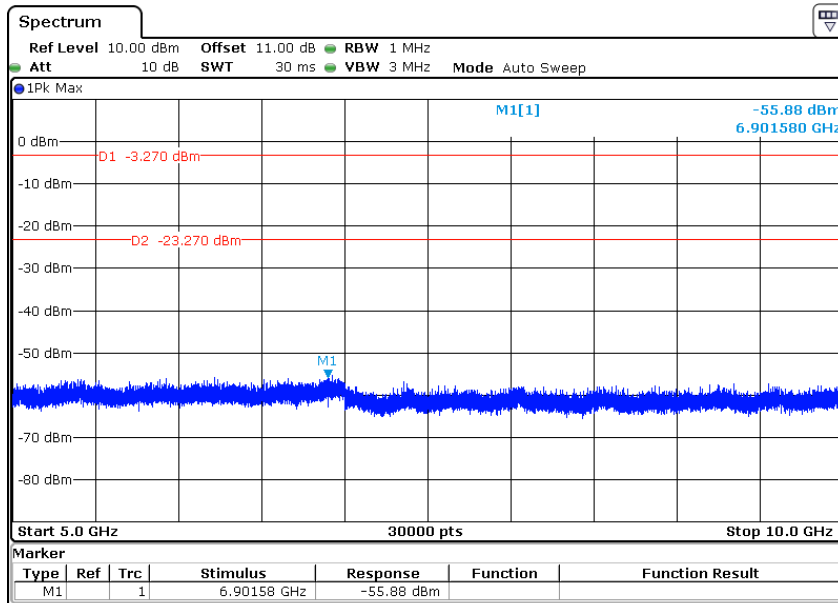
30 MHz to 1GHz:



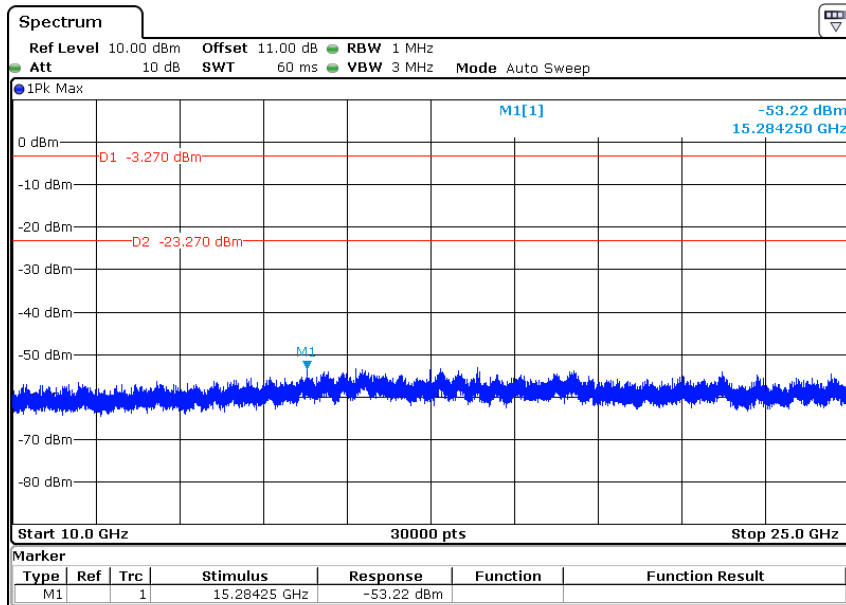
1GHz to 5GHz:



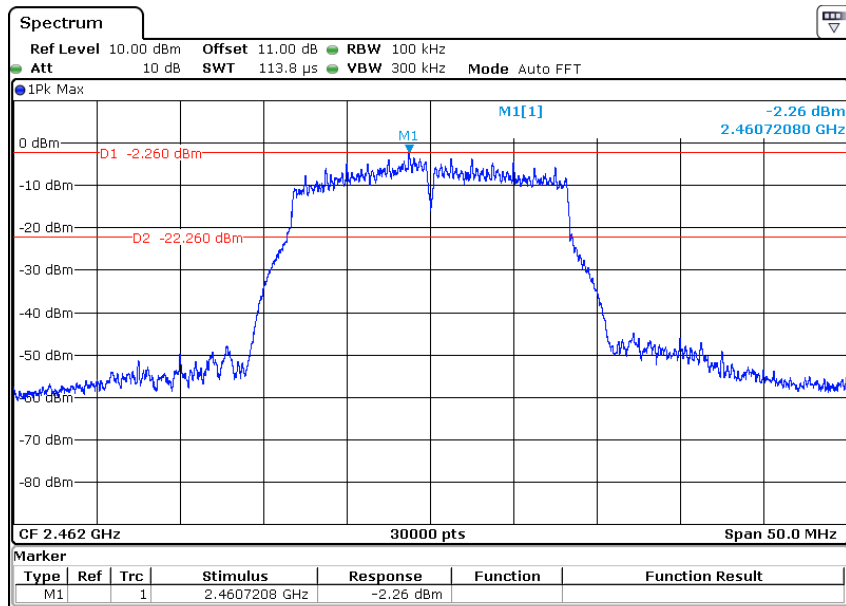
5GHz to 10GHz:



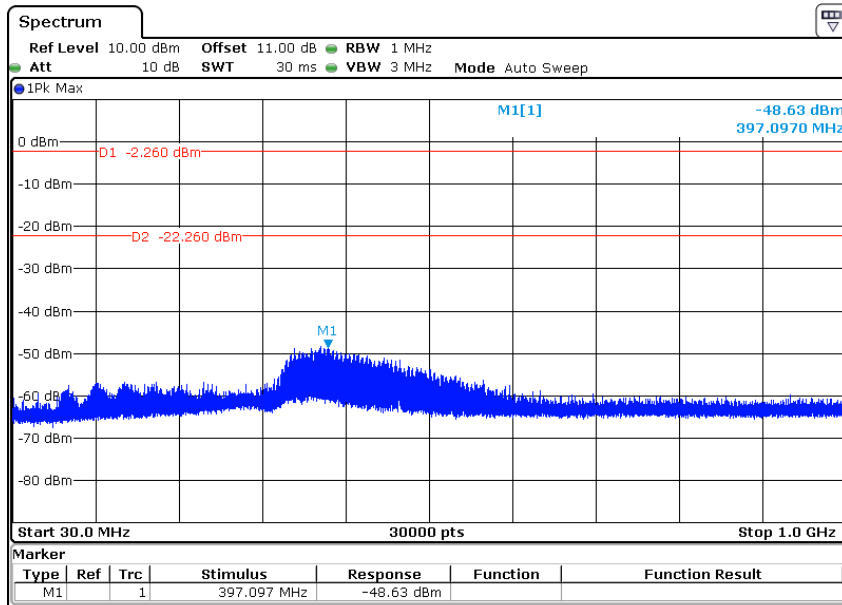
10GHz to 25GHz:



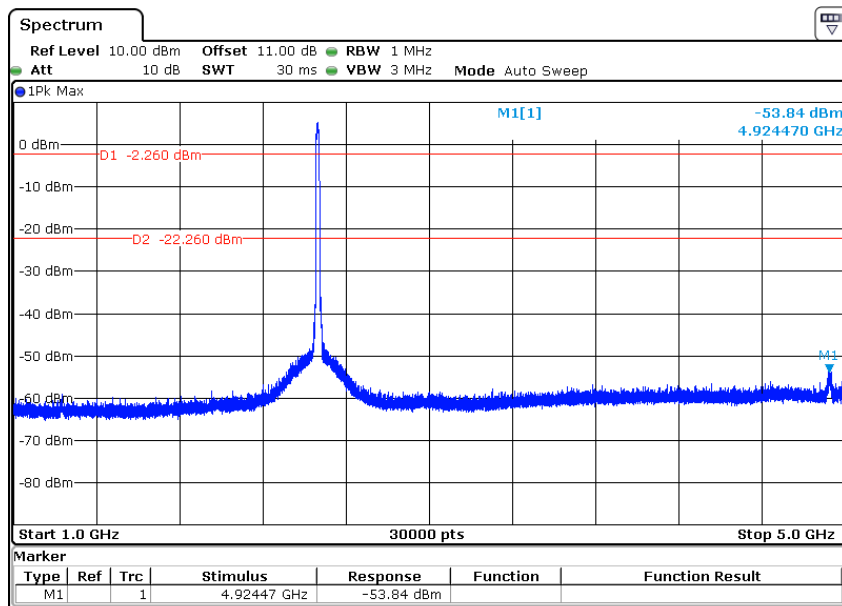
Channel 11:2.462 GHz:



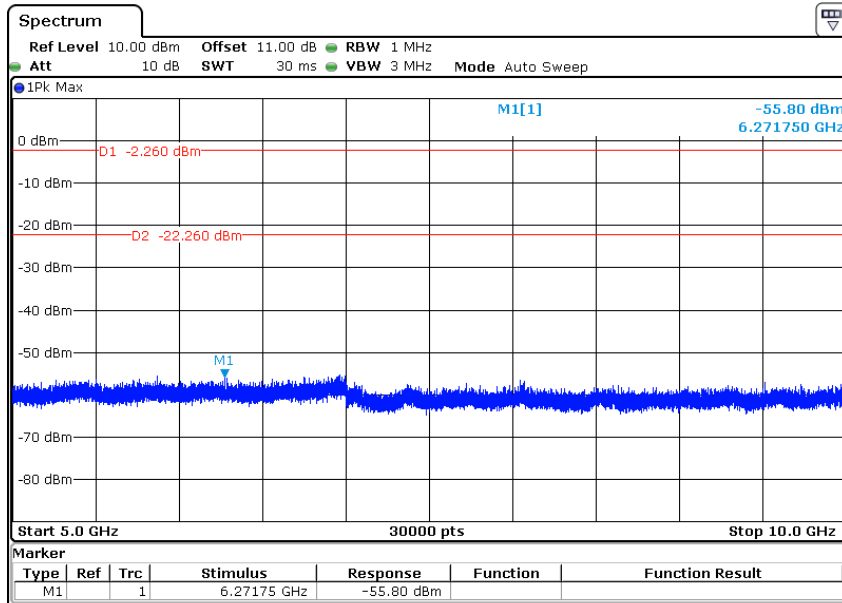
30 MHz to 1GHz:



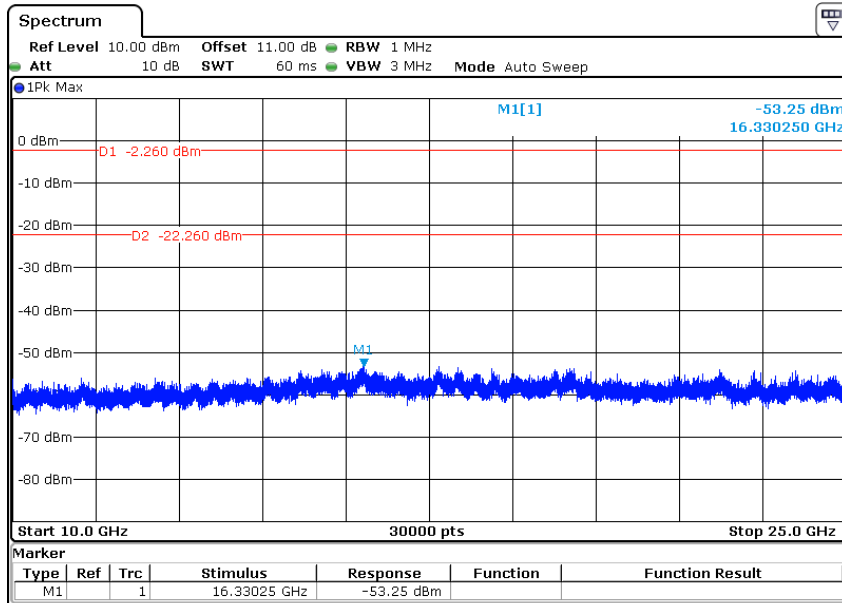
1GHz to 5GHz:



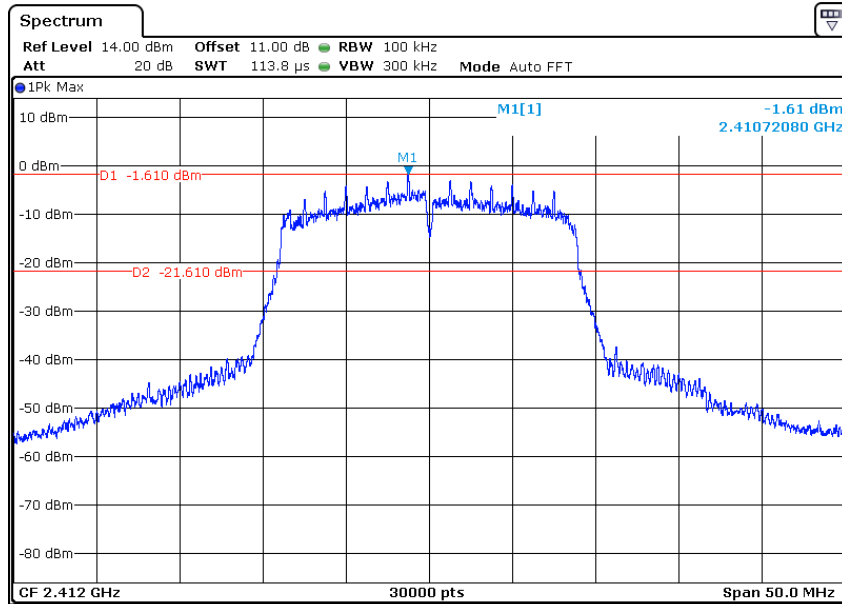
5GHz to 10GHz:



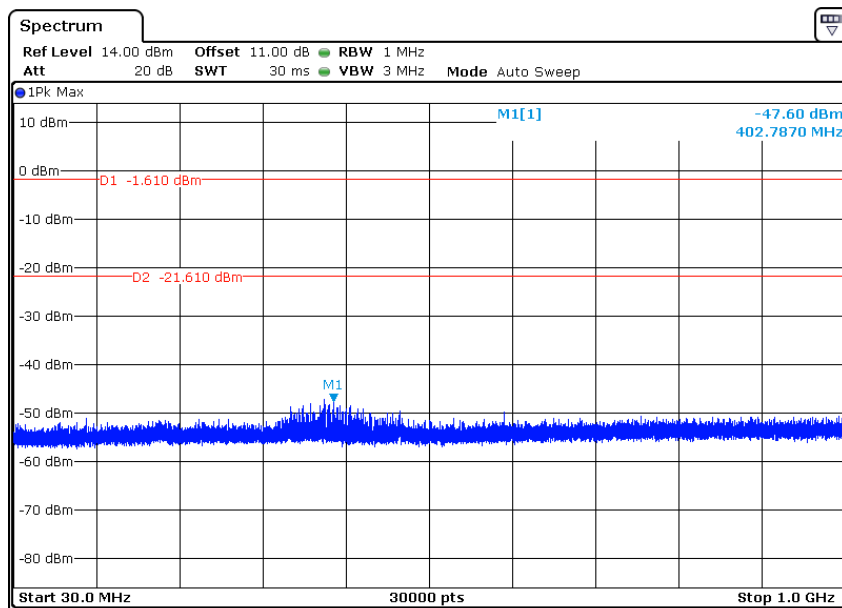
10GHz to 25GHz:



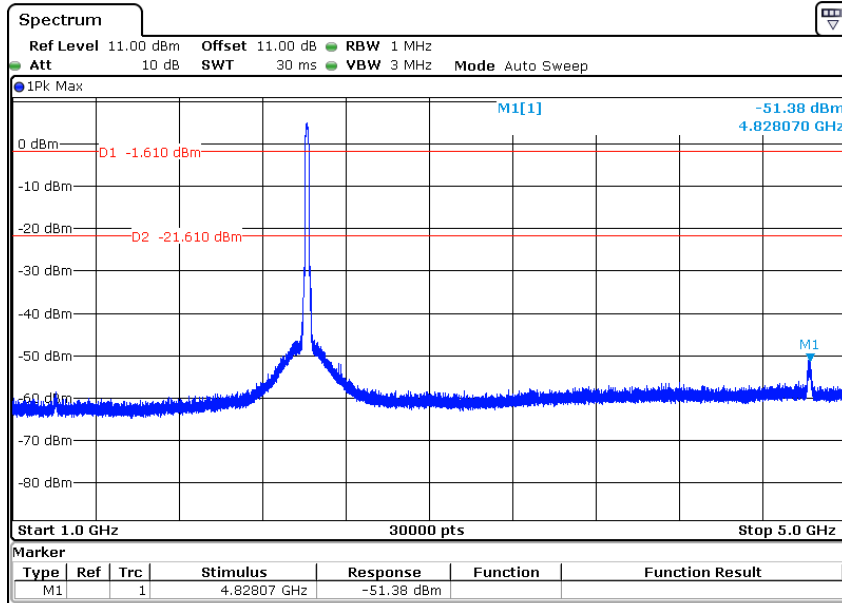
802.11n(HT20) mode with 72.2Mbps data rate
 Channel 1: 2.412GHz:



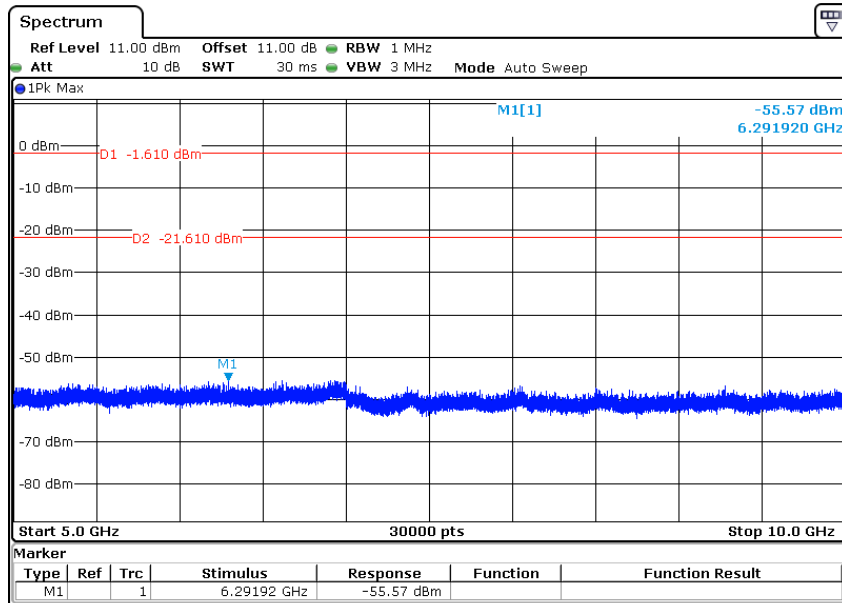
30 MHz to 1GHz:



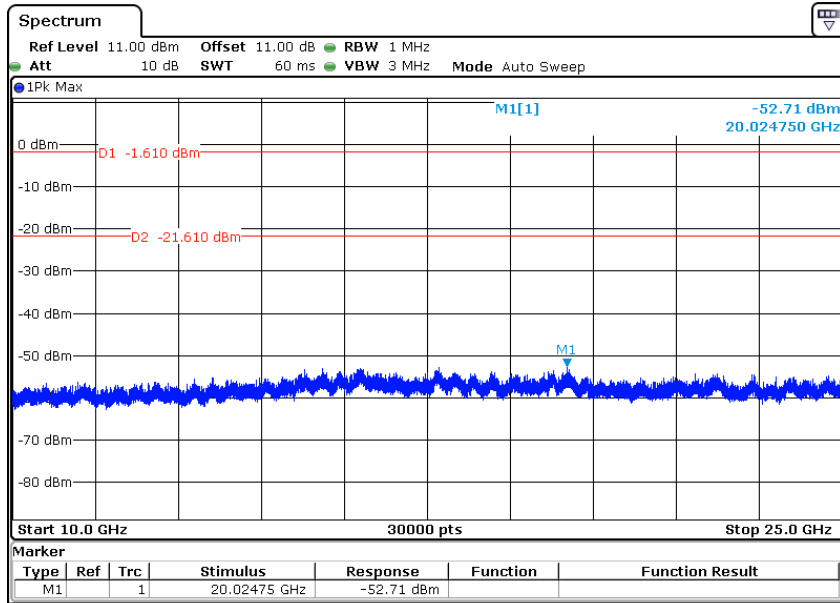
1GHz to 5GHz:



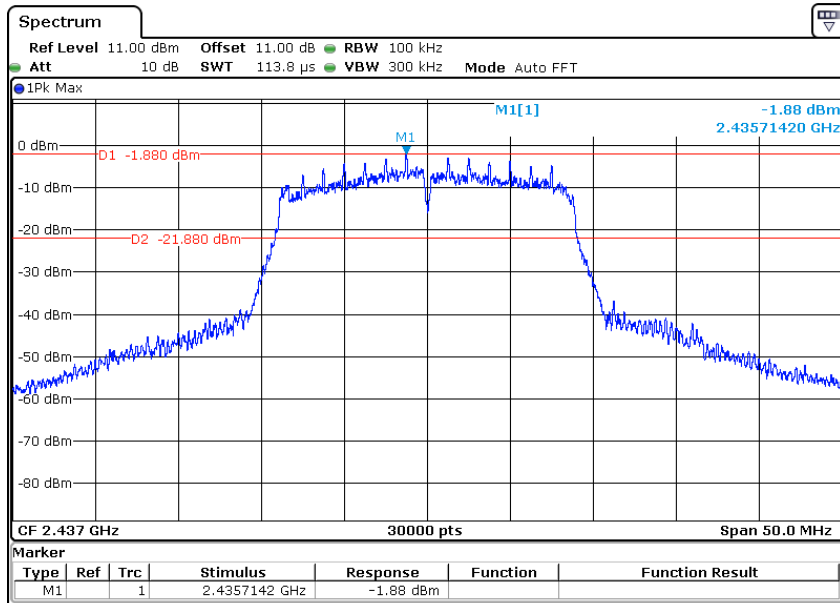
5GHz to 10GHz:



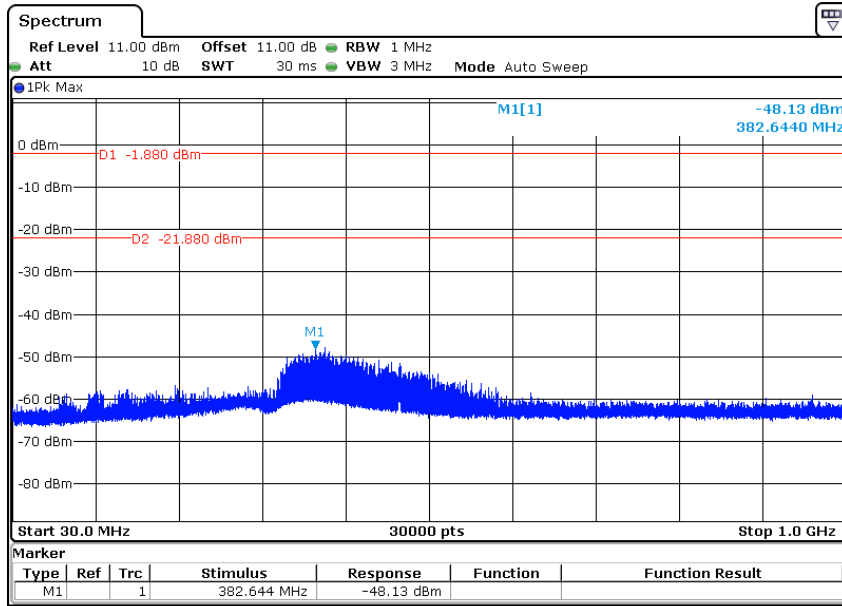
10GHz to 25GHz:



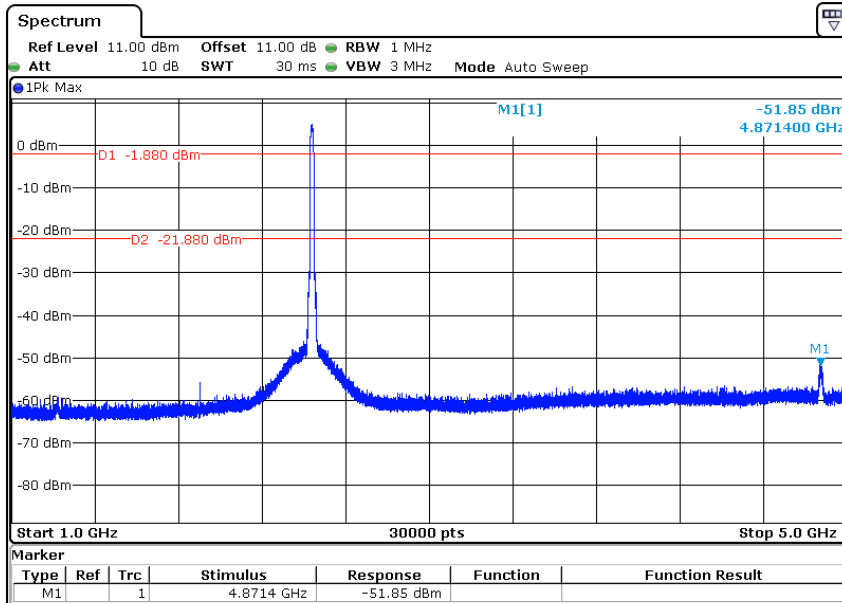
Channel 6: 2.437GHz:



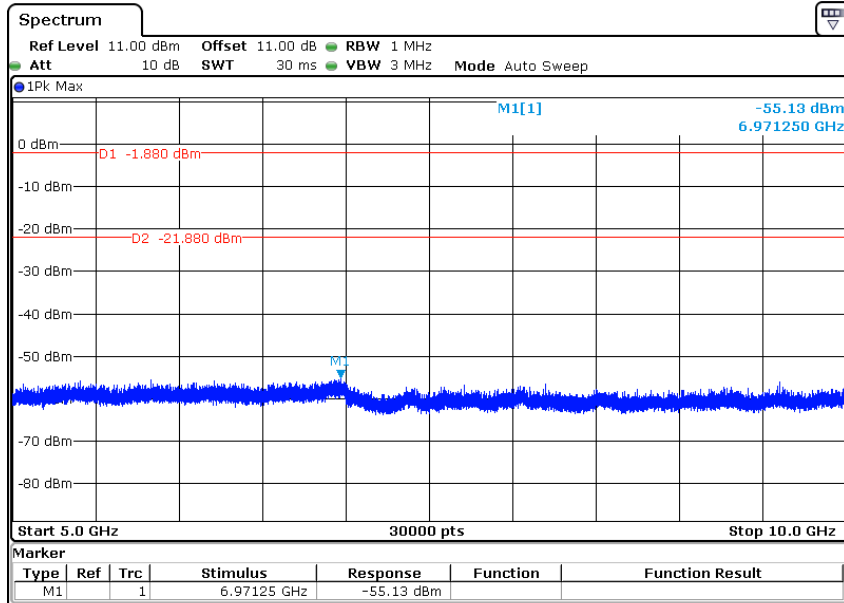
30 MHz to 1GHz:



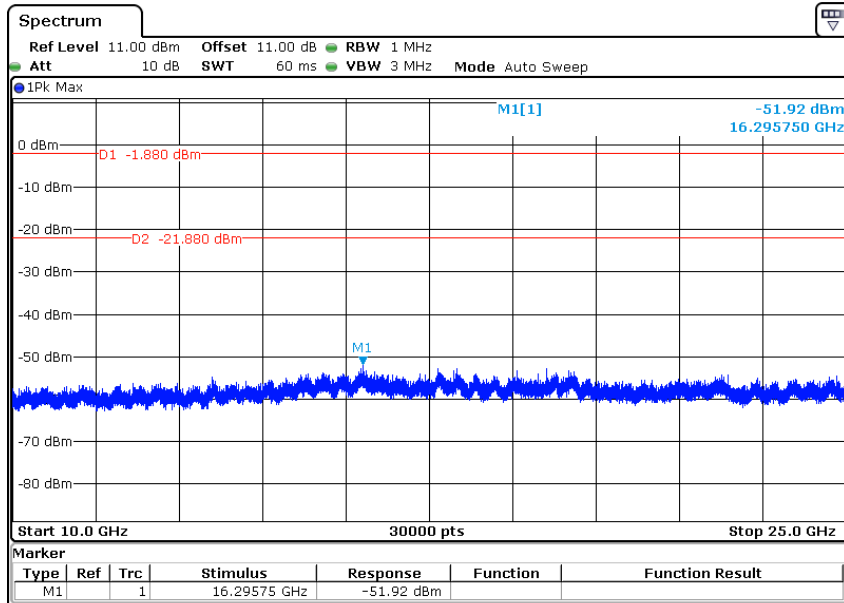
1GHz to 5GHz:



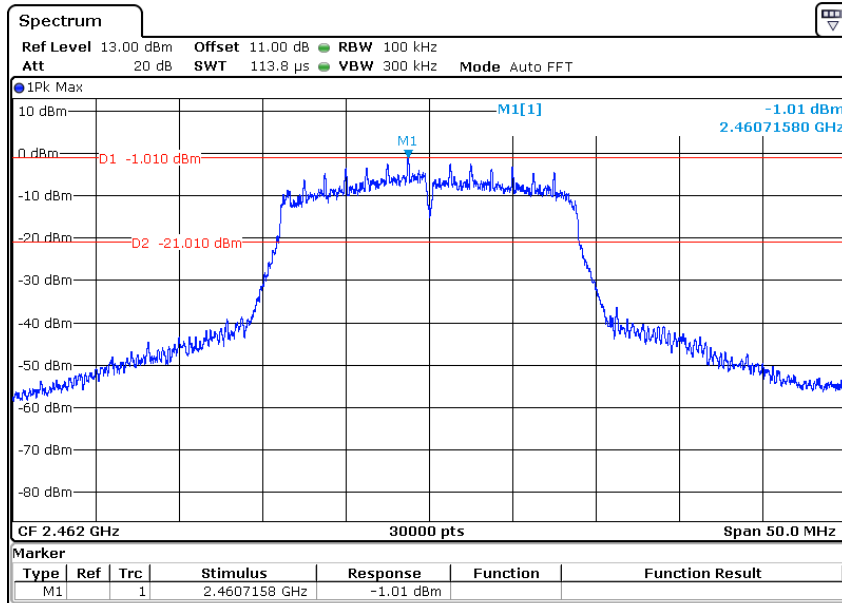
5GHz to 10GHz:



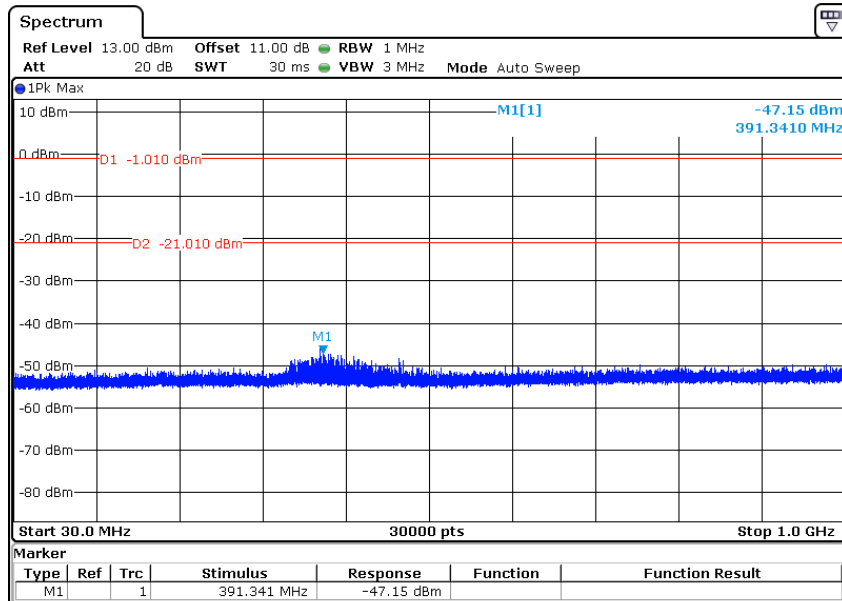
10GHz to 25GHz:



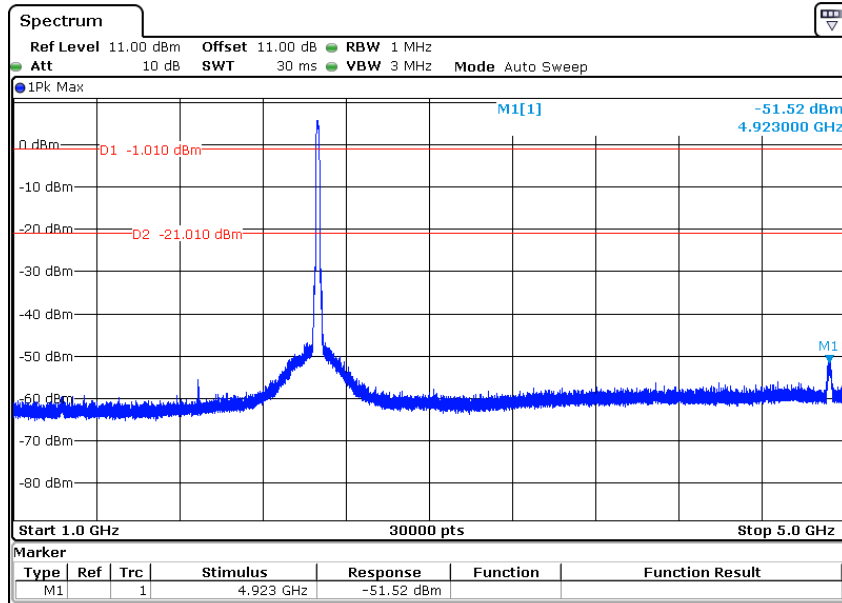
Channel 11:2.462 GHz:



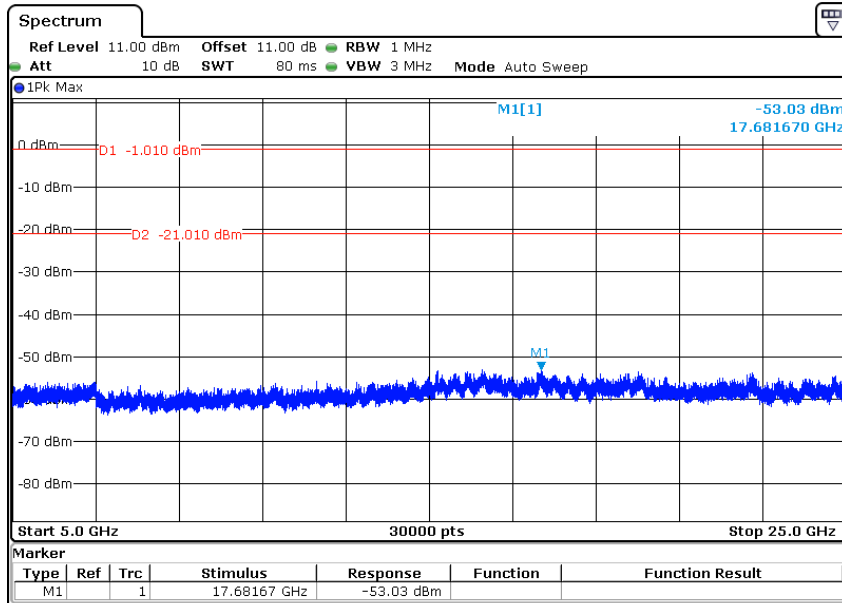
30 MHz to 1GHz:



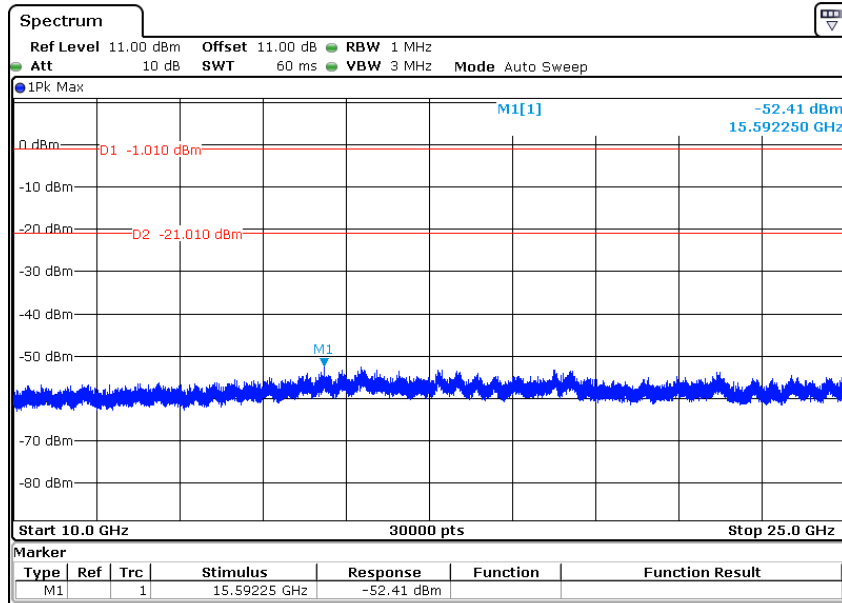
1GHz to 5GHz:



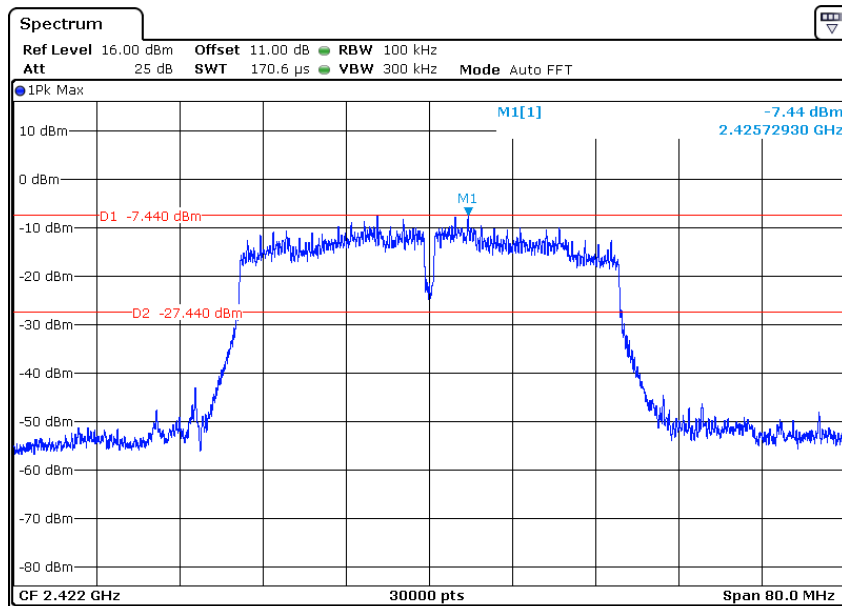
5GHz to 10GHz:



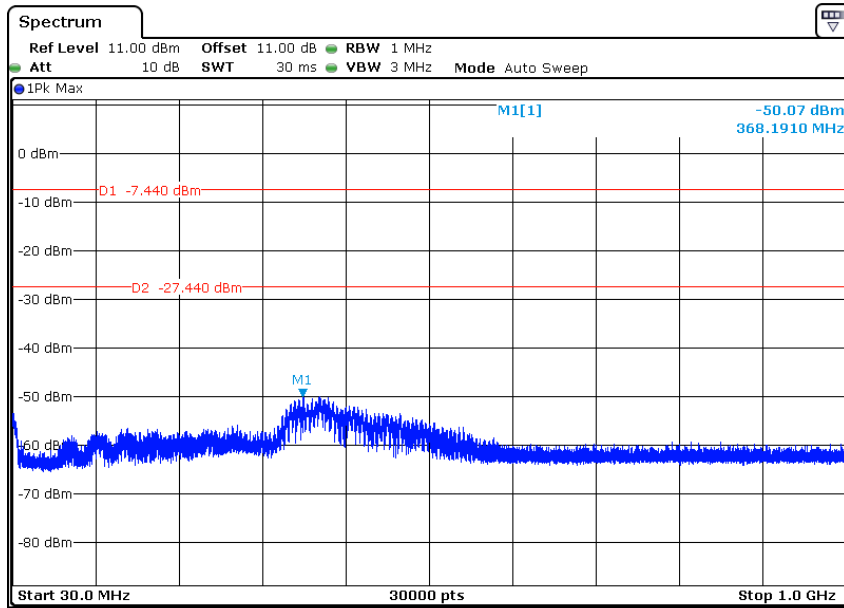
10GHz to 25GHz:



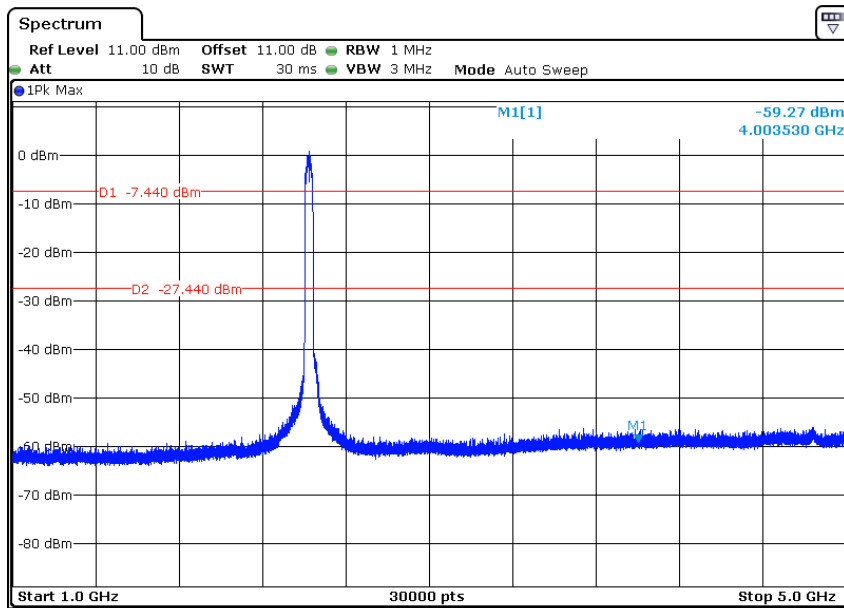
802.11n(HT40) mode with 150Mbps data rate
 Channel 3: 2.422GHz:



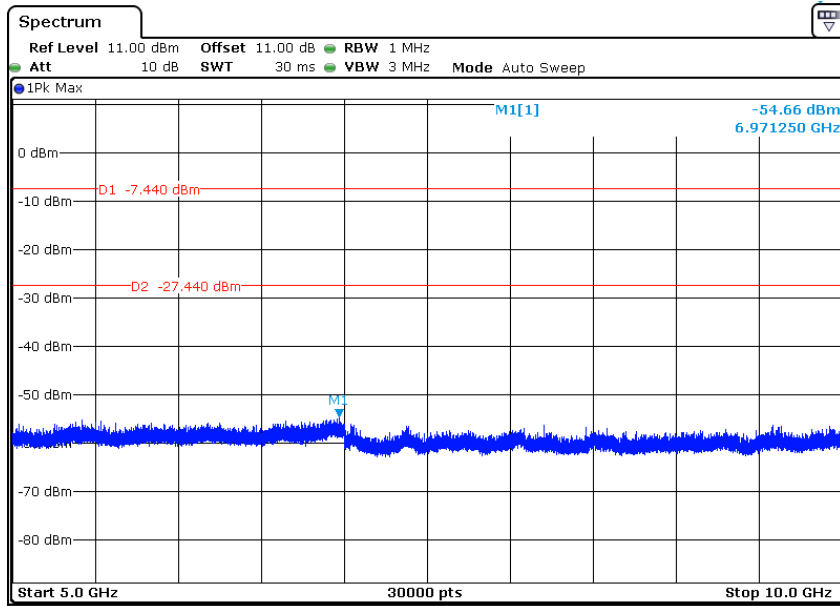
30 MHz to 1GHz:



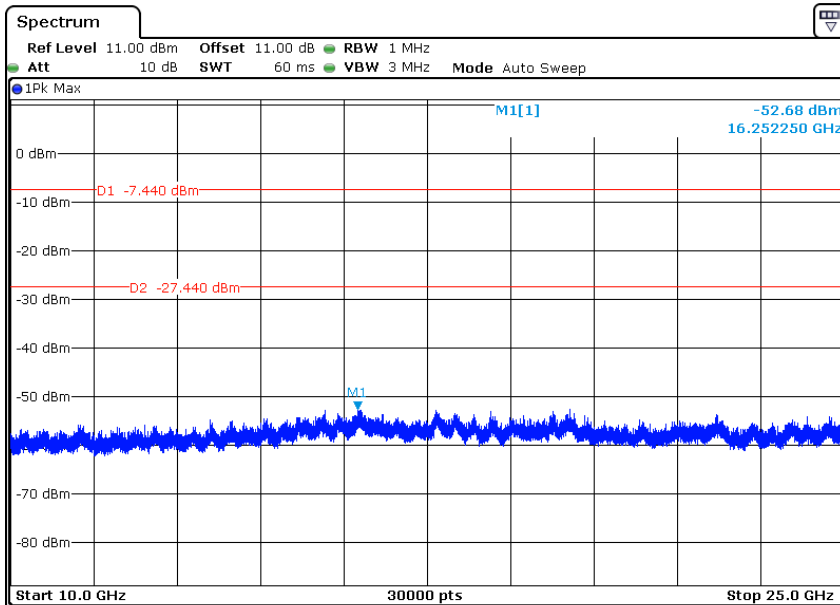
1GHz to 5GHz:



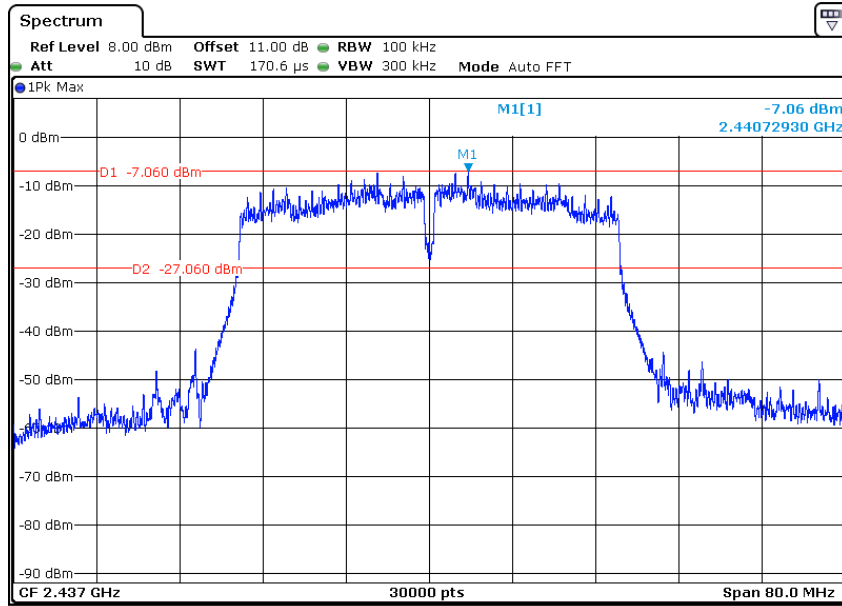
5GHz to 10GHz:



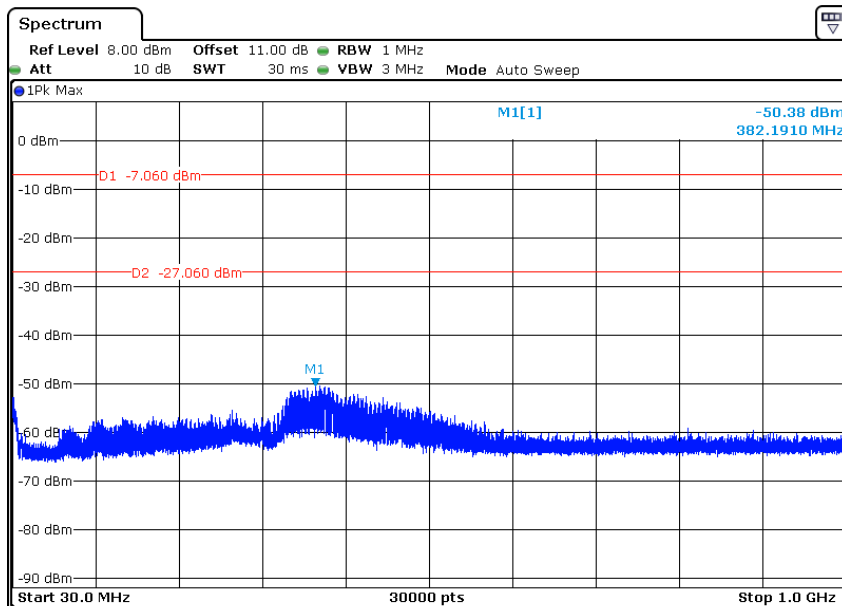
10GHz to 25GHz:



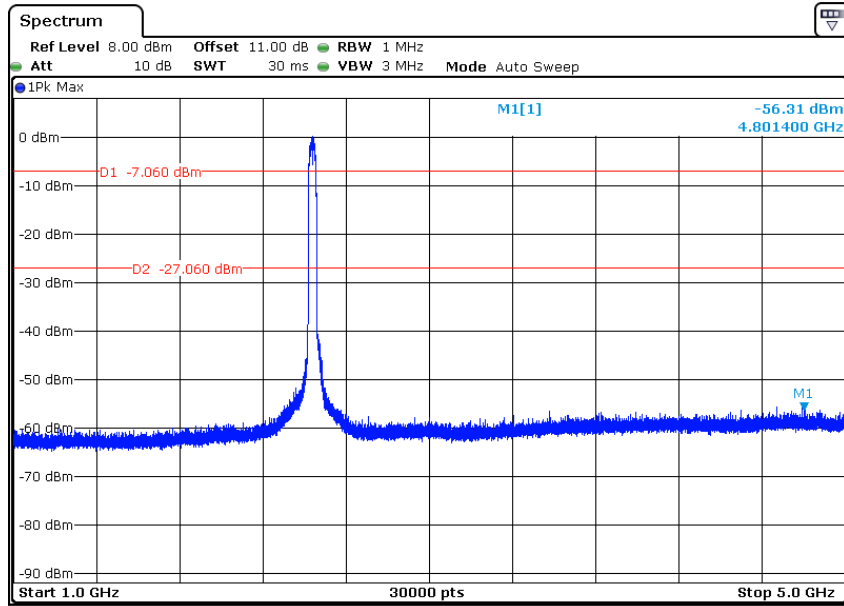
Channel 6: 2.437GHz:



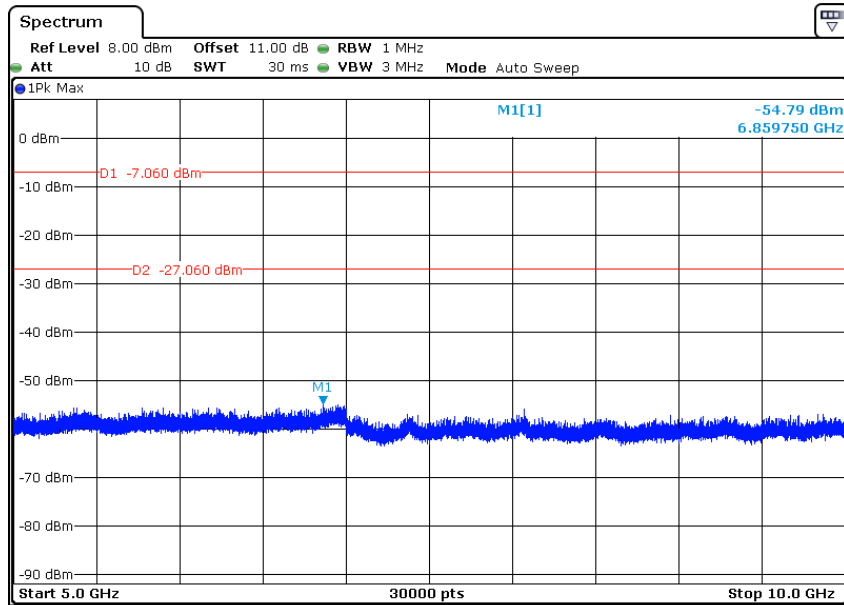
30 MHz to 1GHz:



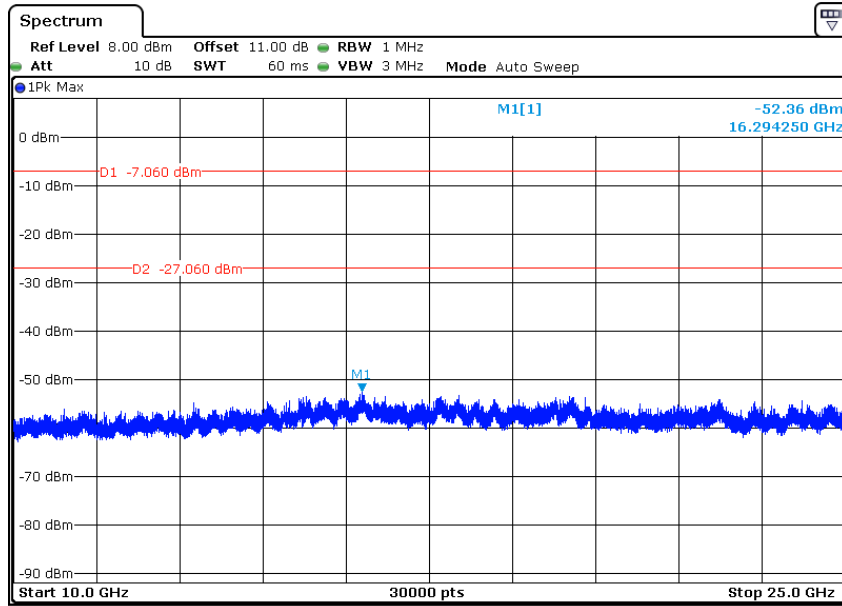
1GHz to 5GHz:



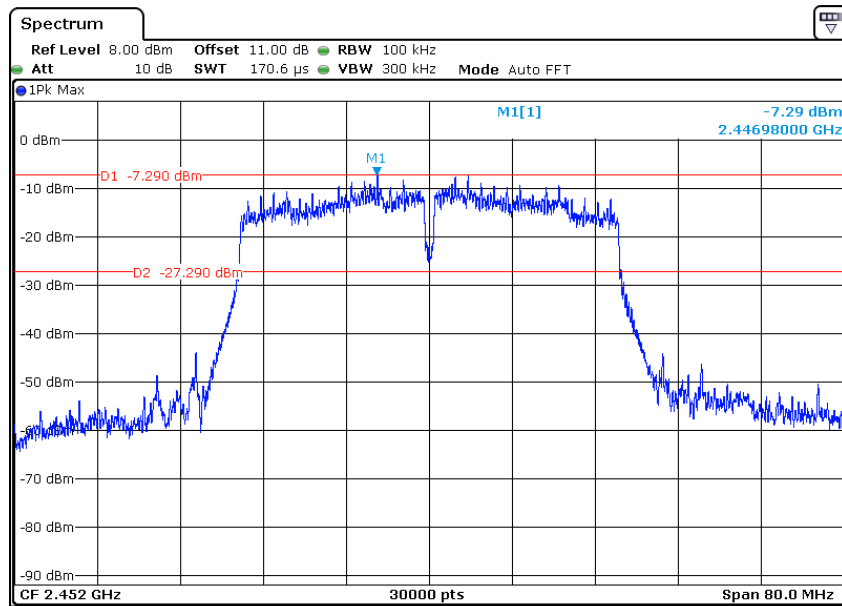
5GHz to 10GHz:



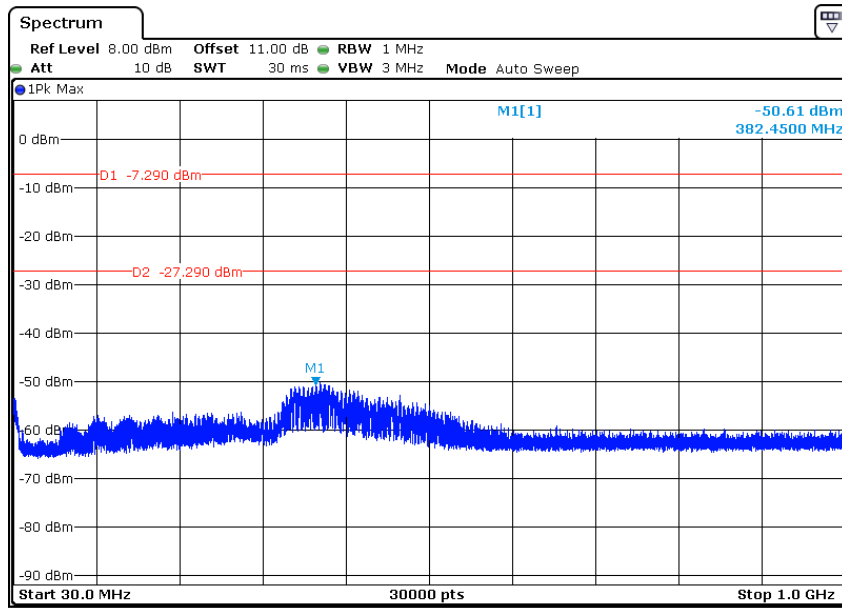
10GHz to 25GHz:



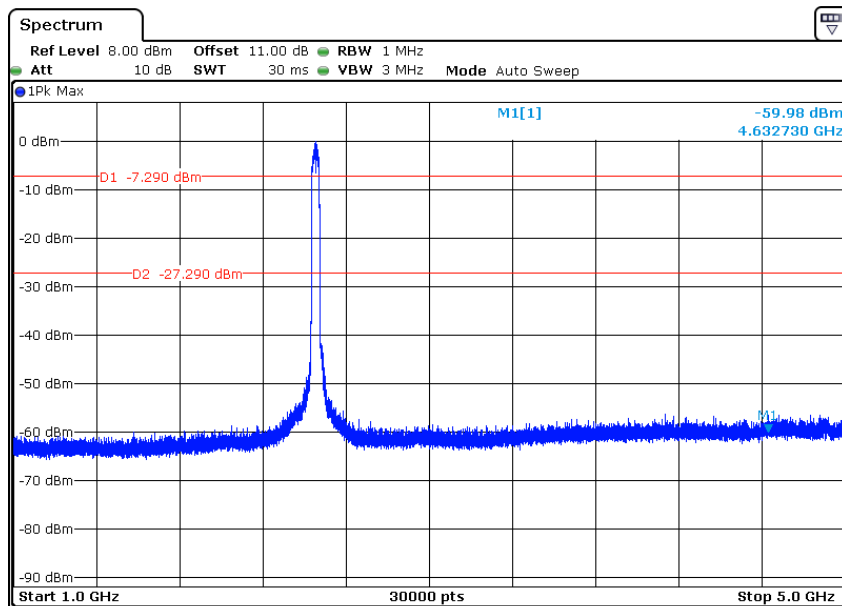
Channel 9: 2.452 GHz:



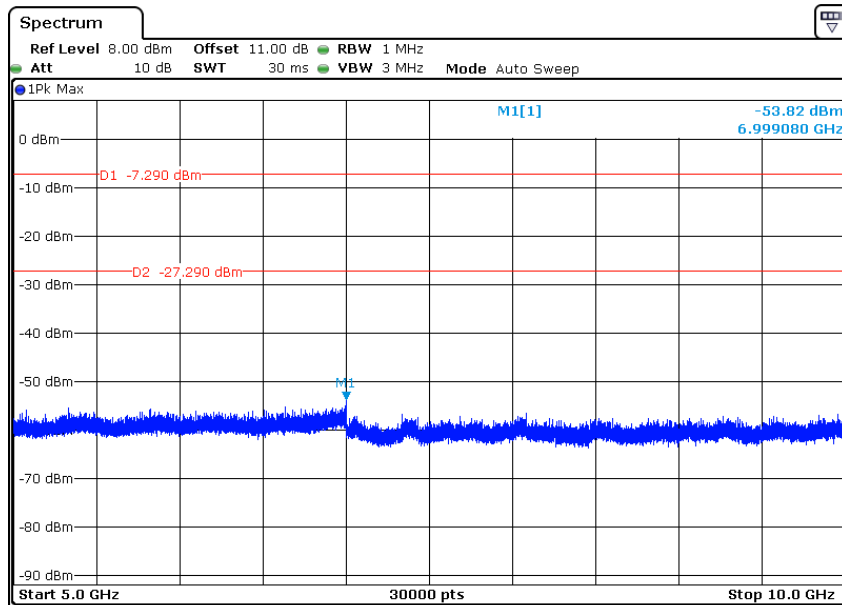
30 MHz to 1GHz:



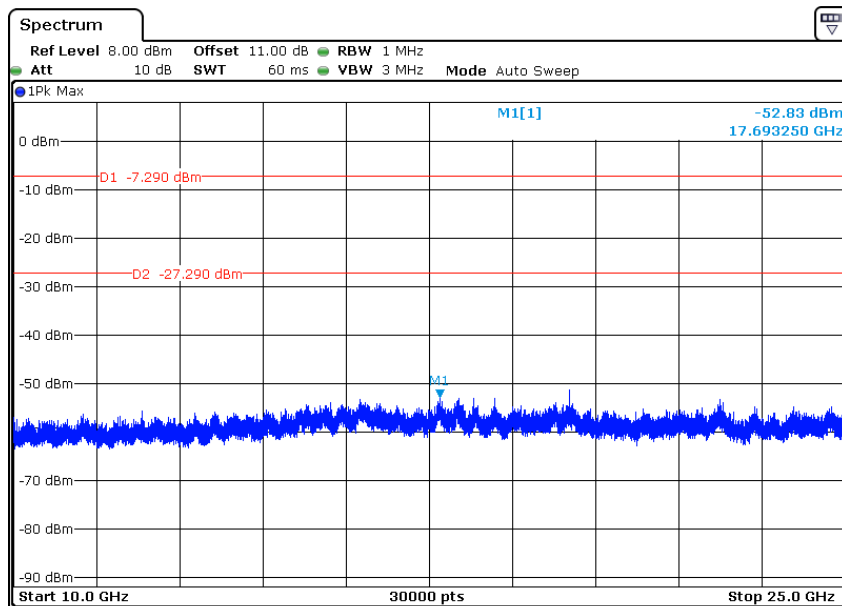
1GHz to 5GHz:



5GHz to 10GHz:



10GHz to 25GHz:





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. Pre-test the EUT in AC mode and B/O mode, find worse case in AC mode.
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: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW=10 Hz Sweep = auto Trace = max hold

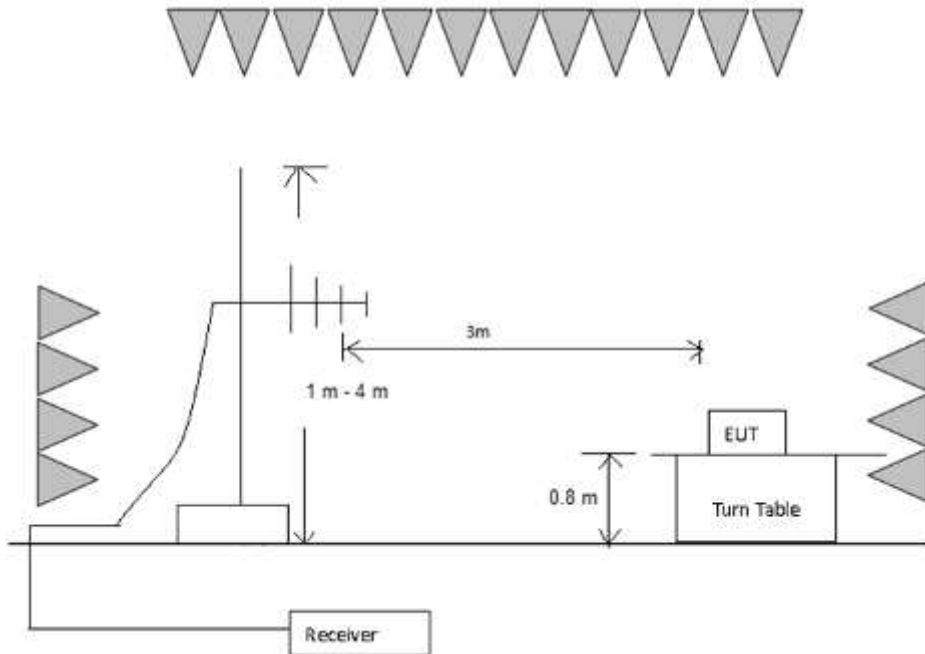
Section 15.205 Restricted bands of operation.

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

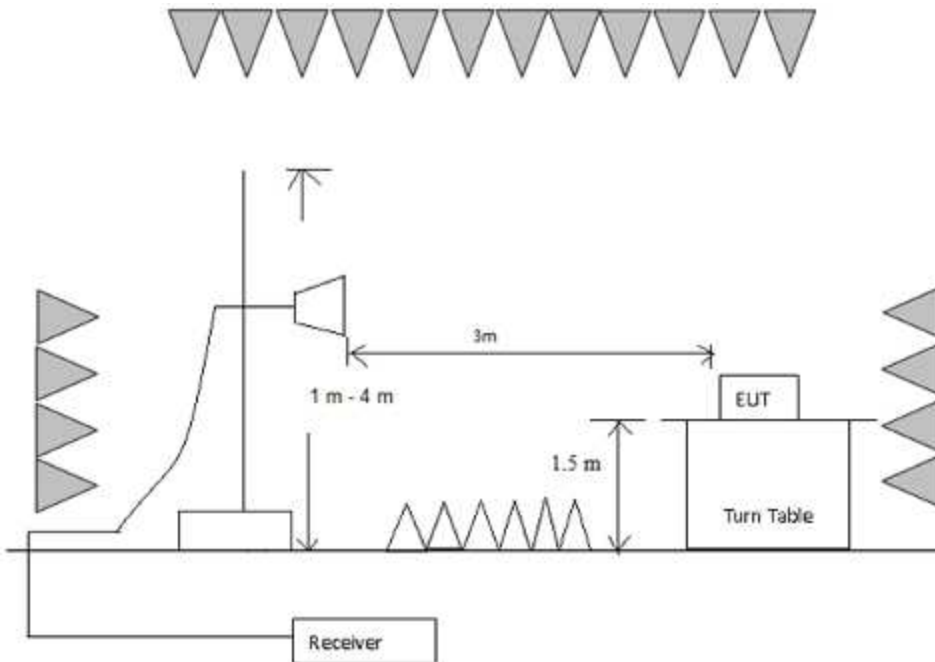
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 -	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.69525	960 - 1240	7.25 - 7.75
4.125 - 4.128	16.80425 -	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	16.80475	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	25.5 - 25.67	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	37.5 - 38.25	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	73 - 74.6	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	74.8 - 75.2	2200 - 2300	14.47 - 14.5
8.291 - 8.294	108 - 121.94	2310 - 2390	15.35 - 16.2
8.362 - 8.366	123 - 138	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	149.9 - 150.05	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.52475 -	3260 - 3267	23.6 - 24.0
12.29 - 12.293	156.52525	3332 - 3339	31.2 - 31.8
12.51975 -	156.7 - 156.9	3345.8 - 3358	36.43 - 36.5
12.52025	162.0125 - 167.17	3600 - 4400	
12.57675 -	167.72 - 173.2		
12.57725	240 - 285		
13.36 - 13.41	322 - 335.4		

Test Configuration:

1) 30 MHz to 1 GHz emissions:



2) 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 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.

802.11b mode with 11Mbps data rate

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

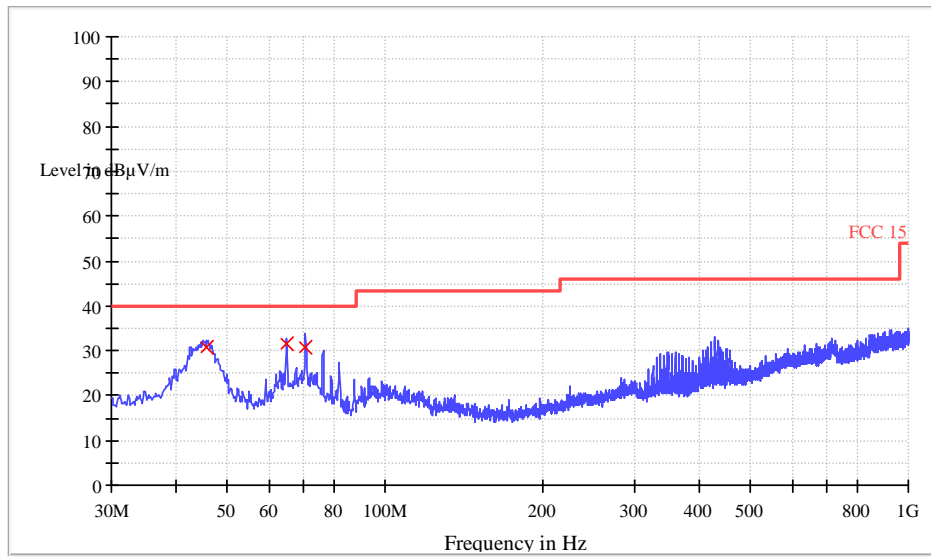
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 1 (2.412 GHz) in transmitting status.

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

Vertical:

Level (dB μ V/m)

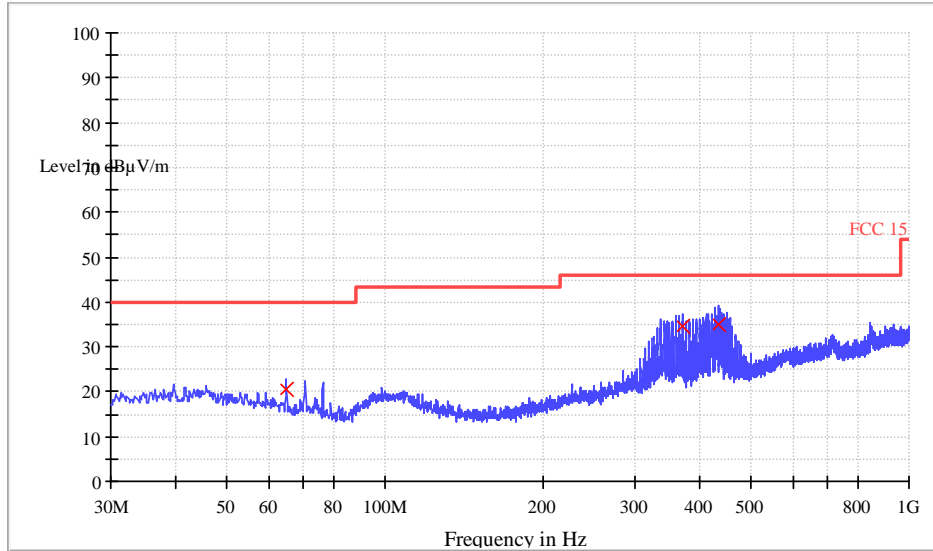


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
45.560000	30.7	120.000	V	13.9	9.3	40.0
64.840000	31.4	120.000	V	10.4	8.6	40.0
70.400000	30.7	120.000	V	8.6	9.3	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
64.840000	20.6	120.000	H	10.4	19.4	40.0
369.960000	34.6	120.000	H	16.1	11.4	46.0
432.240000	35.0	120.000	H	17.5	11.0	46.0

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
2390.0	57.52	-12.9	44.62	74	V
*2400.0	63.52	-12.8	50.72	74	V
4824.0	43.78	-8.8	34.98	74	V
7236.0	41.09	-6.1	34.99	74	V
2390.0	61.17	-12.9	48.27	74	H
*2400.0	66.65	-12.8	53.85	74	H
4824.0	43.20	-8.8	34.41	74	H
7236.0	42.70	-6.1	36.60	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
2390.0	/	-12.9	/	54	V
*2400.0	/	-12.8	/	54	V
4824.0	/	-8.8	/	54	V
7236.0	/	-6.1	/	54	V
2390.0	/	-12.9	/	54	H
*2400.0	/	-12.8	/	54	H
4824.0	/	-8.8	/	54	H
7236.0	/	-6.1	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 When Peak emission level was below AV limit, the AV emission level did not be recorded.

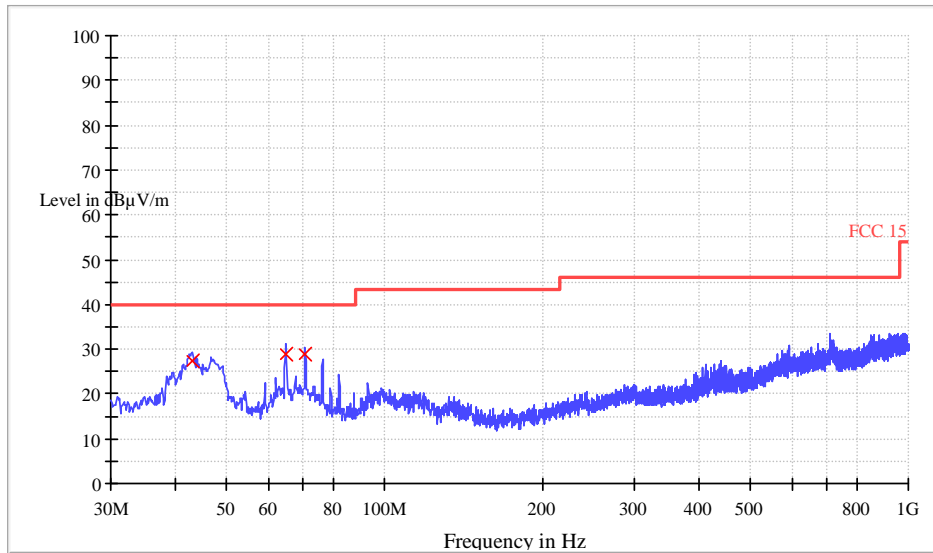
* Band Edges Emission was tested without filter.

Test at Channel 6 (2.437 GHz) in transmitting status

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

Vertical:

Level (dB μ V/m)

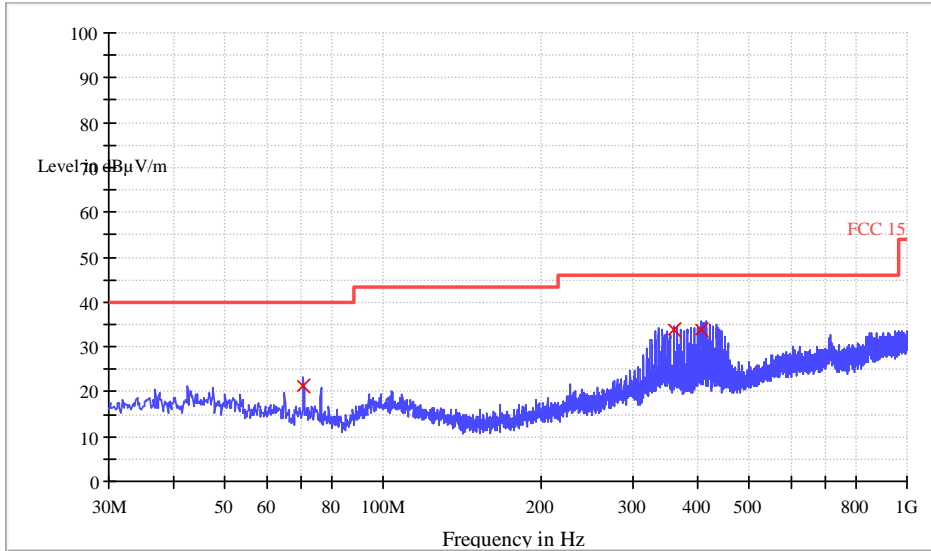


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
43.080000	27.4	120.000	V	13.7	12.6	40.0
64.840000	29.0	120.000	V	10.4	11.0	40.0
70.400000	29.0	120.000	V	8.6	11.0	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.400000	21.5	120.000	H	8.6	18.5	40.0
358.920000	33.8	120.000	H	16.0	12.2	46.0
403.760000	34.0	120.000	H	17.5	12.0	46.0

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
2390.0	54.52	-12.9	41.62	74	V
2483.5	54.94	-12.6	42.34	74	V
4874.0	43.49	-8.6	34.89	74	V
7311.0	41.91	-6.0	35.91	74	V
2390.0	55.24	-12.9	42.34	74	H
2483.5	56.45	-12.6	43.85	74	H
4874.0	43.24	-8.6	34.64	74	H
7311.0	40.82	-6.0	34.82	74	H

AV Measurement:

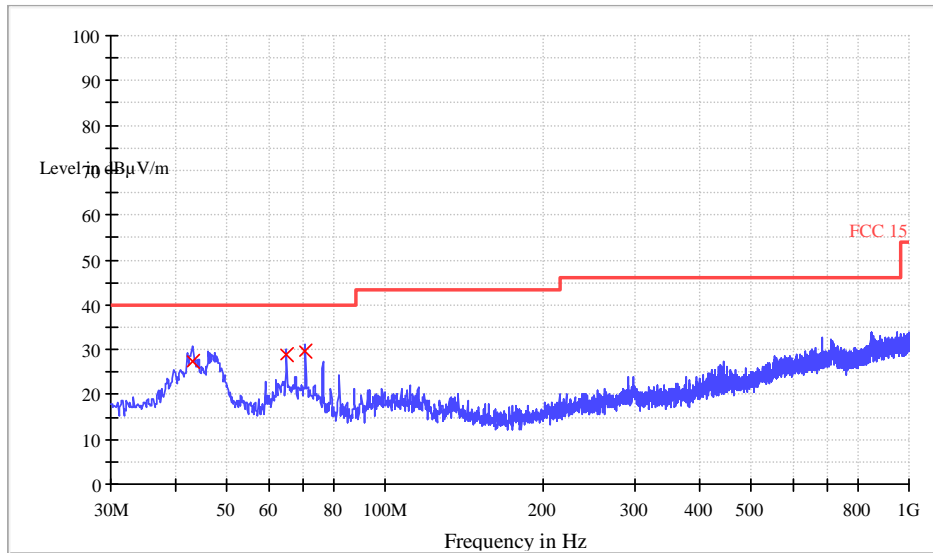
Frequency (MHz)	AV Reading Level (dB μ V)	Correction factors (dB/m)	AV Emission Level (dB μ V/m)	AV Limit (dB μ V/m)	Antenna polarization
2390.0	/	-12.9	/	54	V
2483.5	/	-12.6	/	54	V
4874.0	/	-8.6	/	54	V
7311.0	/	-6.0	/	54	V
2390.0	/	-12.9	/	54	H
2483.5	/	-12.6	/	54	H
4874.0	/	-8.6	/	54	H
7311.0	/	-6.0	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 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:
 Level (dB μ V/m)

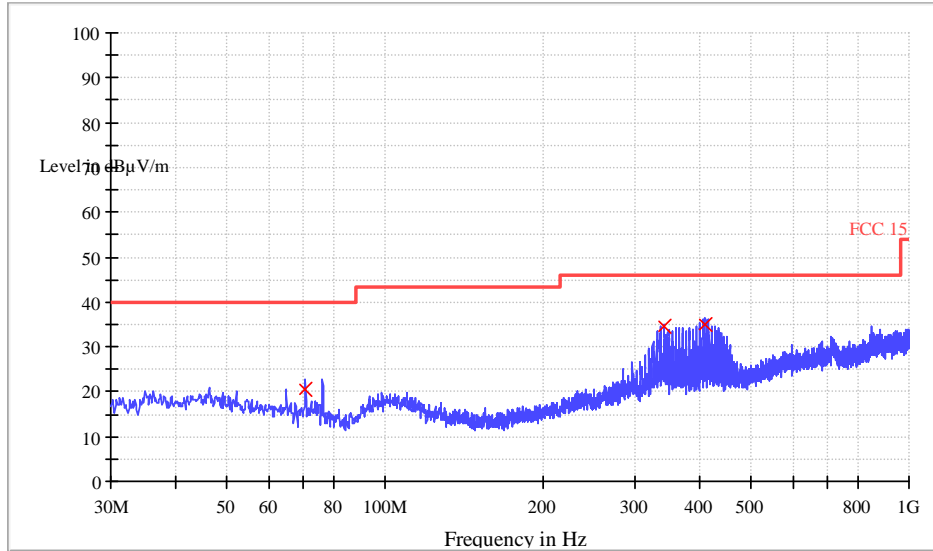


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
43.080000	27.5	120.000	V	13.7	12.5	40.0
64.840000	29.0	120.000	V	10.4	11.0	40.0
70.400000	29.5	120.000	V	8.6	10.5	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.400000	20.4	120.000	H	8.6	19.6	40.0
341.560000	34.5	120.000	H	15.8	11.5	46.0
409.200000	34.9	120.000	H	17.5	11.1	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
*2483.5	63.80	-12.6	51.20	74	V
2500.0	55.40	-12.6	42.80	74	V
4924.0	43.88	-8.9	34.98	74	V
7386.0	40.99	-6.0	34.99	74	V
*2483.5	66.46	-12.6	53.86	74	H
2500.0	58.54	-12.6	45.94	74	H
4924.0	45.16	-8.9	36.26	74	H
7386.0	41.14	-6.0	35.14	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
*2483.5	/	-12.6	/	54	V
2500.0	/	-12.6	/	54	V
4924.0	/	-8.9	/	54	V
7386.0	/	-6.0	/	54	V
*2483.5	/	-12.6	/	54	H
2500.0	/	-12.6	/	54	H
4924.0	/	-8.9	/	54	H
7386.0	/	-6.0	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level

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

* Band Edges Emission was tested without filter.

The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Loss –Preamplifier Factor.

As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

No any other emissions level which are attenuated less than 20dB below the limit.

802.11g mode with 54Mbps data rate

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

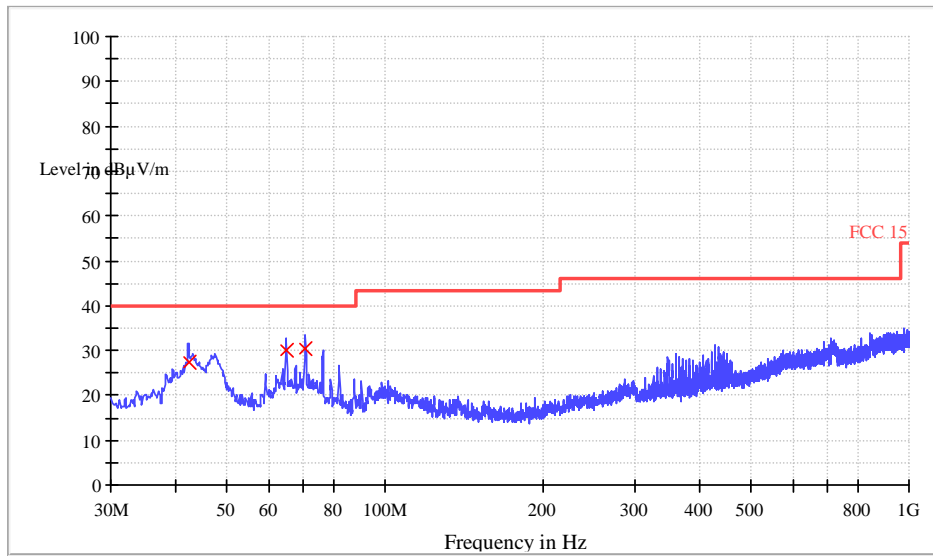
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 1 (2.412 GHz) in transmitting status

30 MHz~1 Radiated Emissions .Quasi-Peak Measurement

Vertical:

Level (dB μ V/m)

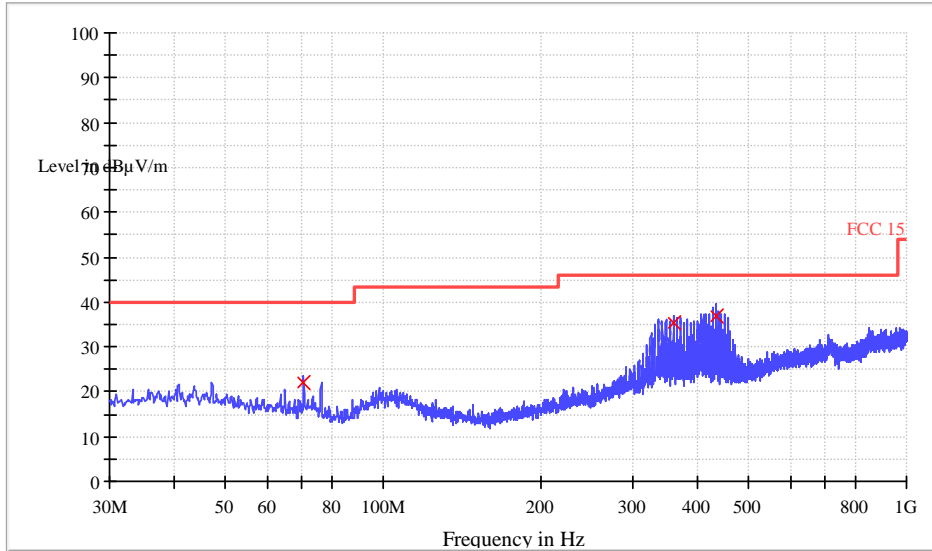


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
42.200000	27.4	120.000	V	13.6	12.6	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.400000	30.5	120.000	V	8.6	9.5	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.560000	21.9	120.000	H	8.5	18.1	40.0
358.640000	35.3	120.000	H	16.0	10.7	46.0
431.960000	36.7	120.000	H	17.5	9.3	46.0

1~25 GHz Radiated Emissions. Peak & Average Measurement

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
2390.0	56.28	-12.9	43.38	74	V
*2400.0	60.55	-12.8	47.75	74	V
4824.0	43.07	-8.8	34.27	74	V
7236.0	40.78	-6.1	34.68	74	V
2390.0	58.32	-12.9	45.42	74	H
*2400.0	62.29	-12.8	49.49	74	H
4824.0	43.11	-8.8	34.31	74	H
7236.0	41.79	-6.1	35.69	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
2390.0	/	-12.9	/	54	V
*2400.0	/	-12.8	/	54	V
4824.0	/	-8.8	/	54	V
7236.0	/	-6.1	/	54	V
2390.0	/	-12.9	/	54	H
*2400.0	/	-12.8	/	54	H
4824.0	/	-8.8	/	54	H
7236.0	/	-6.1	/	54	H

Remark:

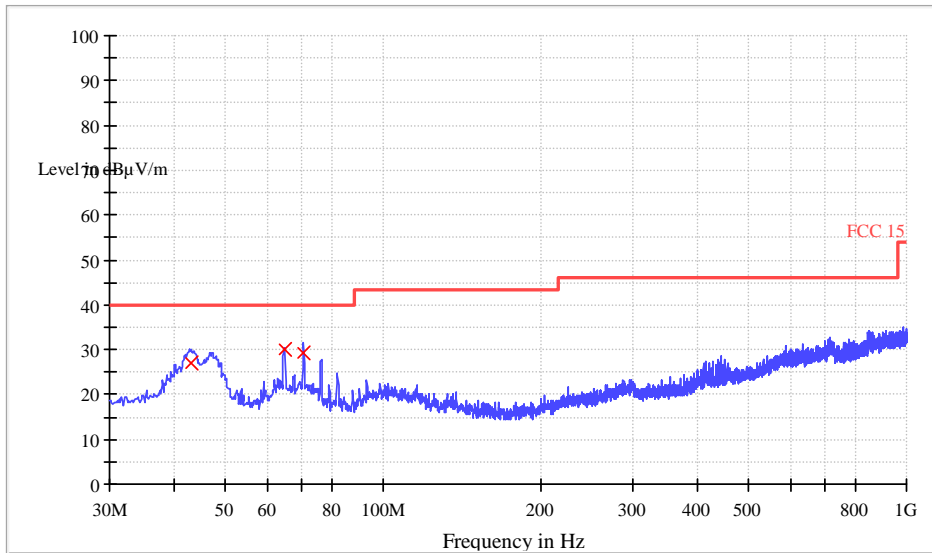
Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 When Peak emission level was below AV limit, the AV emission level did not be recorded.

* Band Edges Emission was tested without filter.

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

Vertical:

Level (dBμV/m)

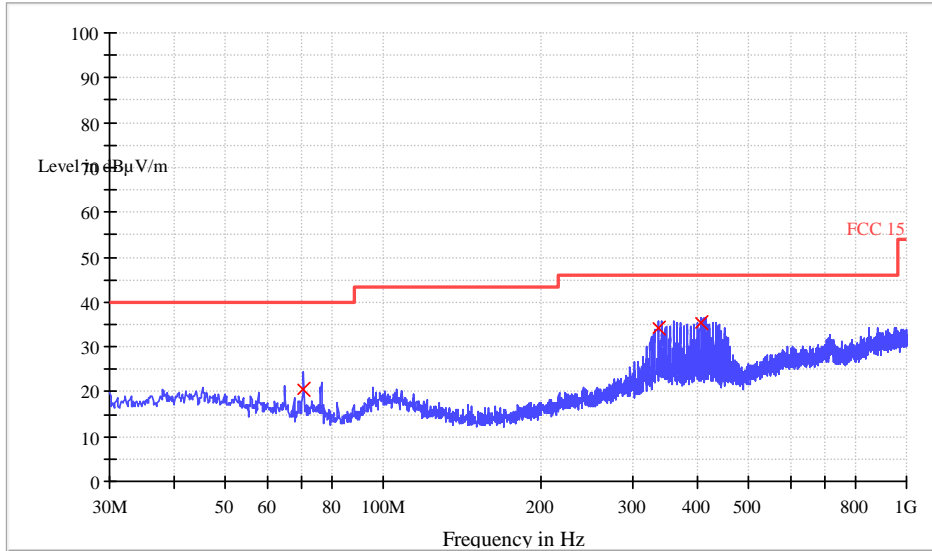


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dBμV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
42.920000	27.2	120.000	V	13.7	12.8	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.400000	29.3	120.000	V	8.6	10.7	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.280000	20.5	120.000	H	8.6	19.6	40.0
336.000000	34.3	120.000	H	15.8	11.7	46.0
403.600000	35.3	120.000	H	17.4	10.7	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
2390.0	53.24	-12.9	40.34	74	V
2483.5	54.27	-12.6	41.67	74	V
4874.0	42.72	-8.6	34.12	74	V
7311.0	40.35	-6.0	34.35	74	V
2390.0	53.94	-12.9	41.04	74	H
2483.5	54.56	-12.6	41.96	74	H
4874.0	43.02	-8.6	34.42	74	H
7311.0	40.98	-6.0	34.98	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
2390.0	/	-12.9	/	54	V
2483.5	/	-12.6	/	54	V
4874.0	/	-8.6	/	54	V
7311.0	/	-6.0	/	54	V
2390.0	/	-12.9	/	54	H
2483.5	/	-12.6	/	54	H
4874.0	/	-8.6	/	54	H
7311.0	/	-6.0	/	54	H

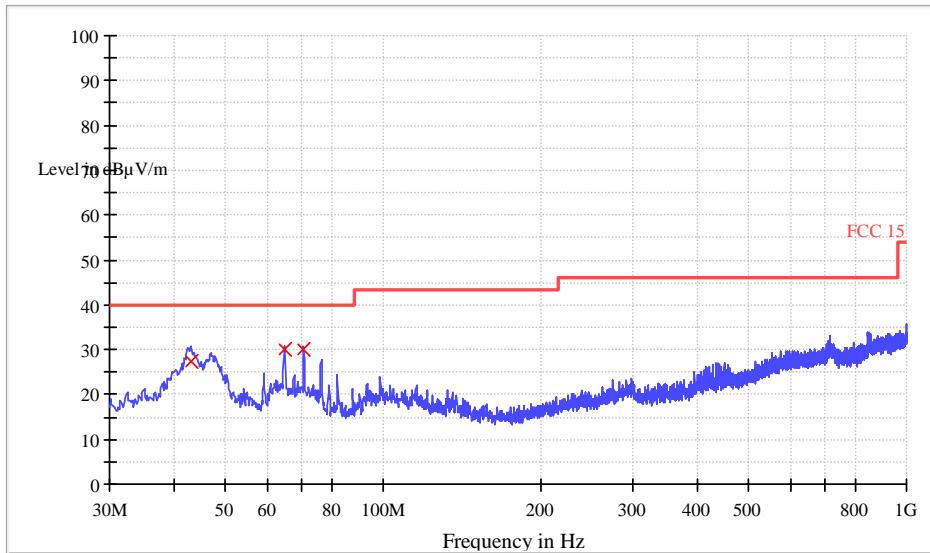
Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 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:

Level (dBμV/m)

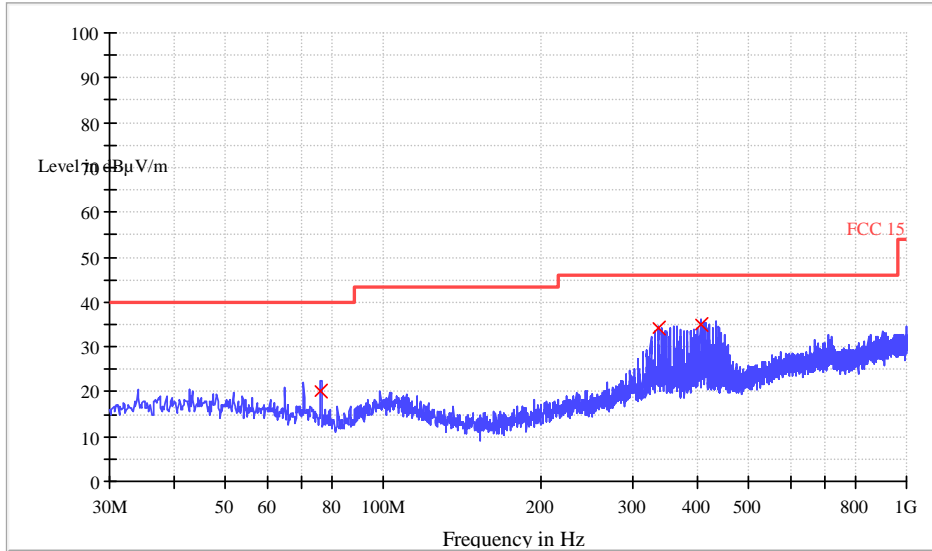


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dBμV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
42.920000	27.5	120.000	V	13.7	12.5	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.400000	29.9	120.000	V	8.6	10.1	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
76.000000	20.3	120.000	H	7.8	19.7	40.0
336.000000	34.4	120.000	H	15.8	11.6	46.0
403.760000	35.0	120.000	H	17.5	11.0	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
*2483.5	63.34	-12.6	50.74	74	V
2500.0	55.20	-12.6	42.60	74	V
4924.0	43.43	-8.9	34.53	74	V
7386.0	38.89	-6.0	32.89	74	V
*2483.5	63.19	-12.6	50.59	74	H
2500.0	55.80	-12.6	43.20	74	H
4924.0	44.25	-8.9	35.35	74	H
7386.0	40.49	-6.0	34.49	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
*2483.5	/	-12.9	/	54	V
2500.0	/	-12.6	/	54	V
4924.0	/	-8.9	/	54	V
7386.0	/	-6.0	/	54	V
*2483.5	/	-12.9	/	54	H
2500.0	/	-12.6	/	54	H
4924.0	/	-8.9	/	54	H
7386.0	/	-6.0	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level

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

* Band Edges Emission was tested without filter.

The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor –Preamplifier Factor.

No any other emissions level which are attenuated less than 20dB below the limit.

802.11n (HT20) mode with 72.2Mbps data rate

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

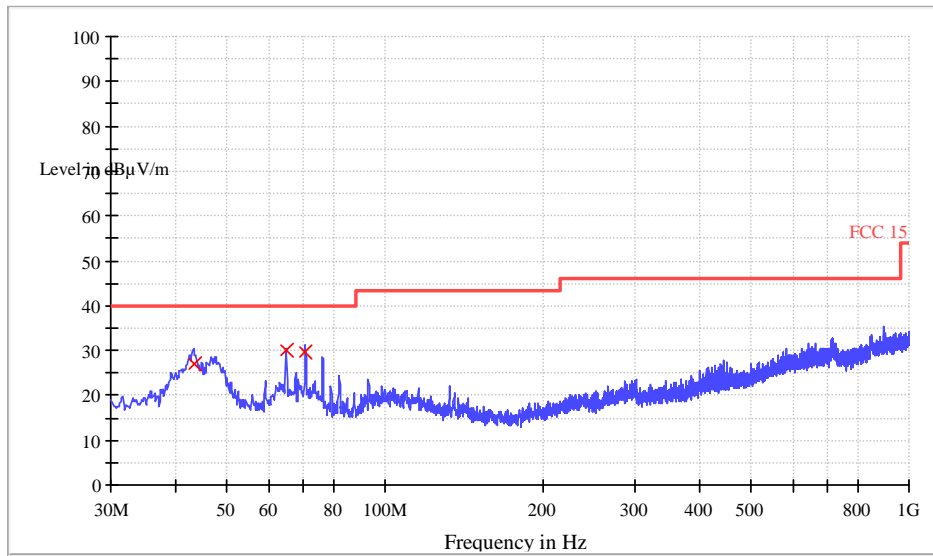
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 1 (2.412 GHz) in transmitting status

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

Vertical:

Level (dB μ V/m)

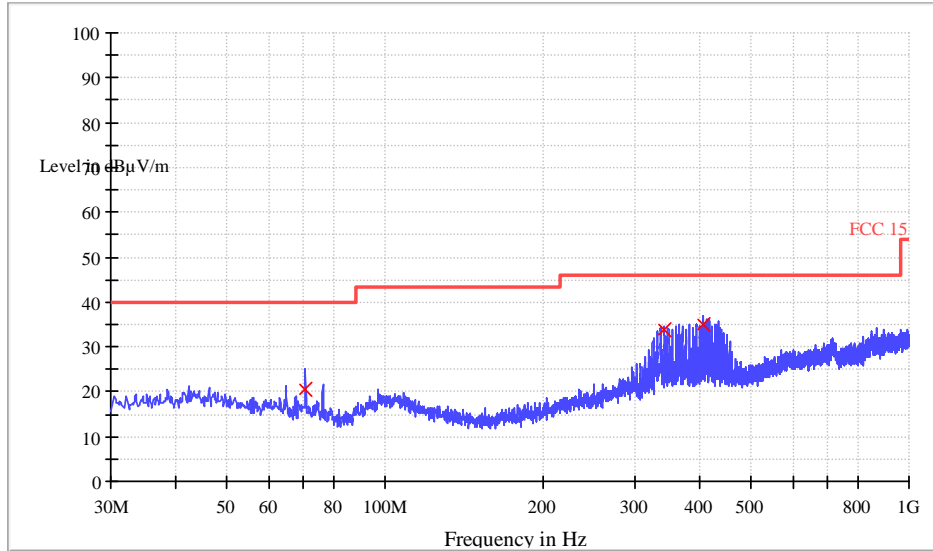


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
43.240000	27.1	120.000	V	13.7	13.0	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.400000	29.8	120.000	V	8.6	10.2	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement:

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.400000	20.4	120.000	H	8.6	19.6	40.0
341.720000	34.0	120.000	H	15.8	12.0	46.0
404.040000	35.0	120.000	H	17.5	11.0	46.0

1~25 GHz Radiated Emissions. Peak & Average Measurement

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
2390.0	55.87	-12.9	42.97	74	V
*2400.0	61.69	-12.8	48.89	74	V
4824.0	42.05	-8.8	33.25	74	V
7236.0	39.88	-6.1	33.78	74	V
2390.0	56.86	-12.9	43.96	74	H
*2400.0	62.17	-12.8	49.37	74	H
4824.0	42.59	-8.8	33.79	74	H
7236.0	40.62	-6.1	34.52	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
2390.0	/	-12.9	/	54	V
*2400.0	/	-12.8	/	54	V
4824.0	/	-8.8	/	54	V
7236.0	/	-6.1	/	54	V
2390.0	/	-12.9	/	54	H
*2400.0	/	-12.8	/	54	H
4824.0	/	-8.8	/	54	H
7236.0	/	-6.1	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 When Peak emission level was below AV limit, the AV emission level did not be recorded.

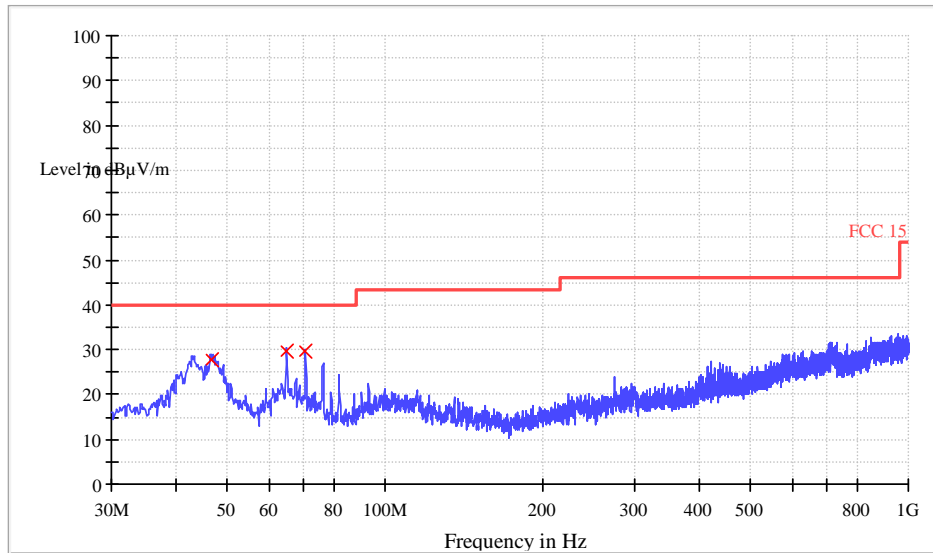
* Band Edges Emission was tested without filter.

Test at Channel 6 (2.437 GHz) in transmitting status

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

Vertical:

Level (dB μ V/m)

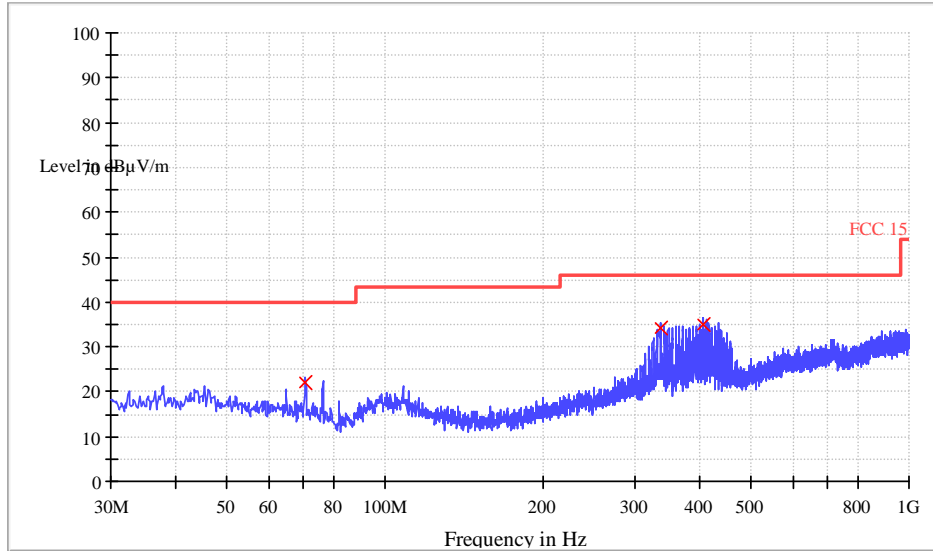


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
43.240000	27.1	120.000	V	13.7	13.0	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.400000	29.8	120.000	V	8.6	10.2	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.560000	22.0	120.000	H	8.5	18.0	40.0
336.000000	34.3	120.000	H	15.8	11.7	46.0
403.760000	35.1	120.000	H	17.5	11.0	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
2390.0	53.11	-12.9	40.21	74	V
2483.5	54.12	-12.6	41.52	74	V
4874.0	42.94	-8.6	34.34	74	V
7311.0	40.33	-6.0	34.33	74	V
2390.0	53.92	-12.9	41.02	74	H
2483.5	54.47	-12.6	41.87	74	H
4874.0	42.99	-8.6	34.39	74	H
7311.0	40.74	-6.0	34.74	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
2390.0	/	-12.9	/	54	V
2483.5	/	-12.6	/	54	V
4874.0	/	-8.6	/	54	V
7311.0	/	-6.0	/	54	V
2390.0	/	-12.9	/	54	H
2483.5	/	-12.6	/	54	H
4874.0	/	-8.6	/	54	H
7311.0	/	-6.0	/	54	H

Remark:

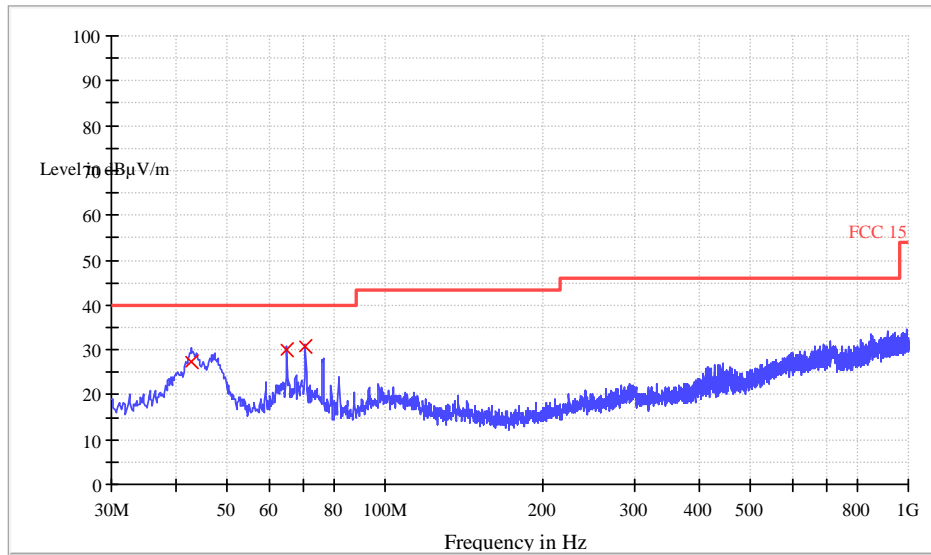
Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 When Peak emission level was below AV limit, the AV emission level did not be recorded.

Test at Channel 11 (2.462 GHz) in transmitting status

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

Vertical:

Level (dB μ V/m)

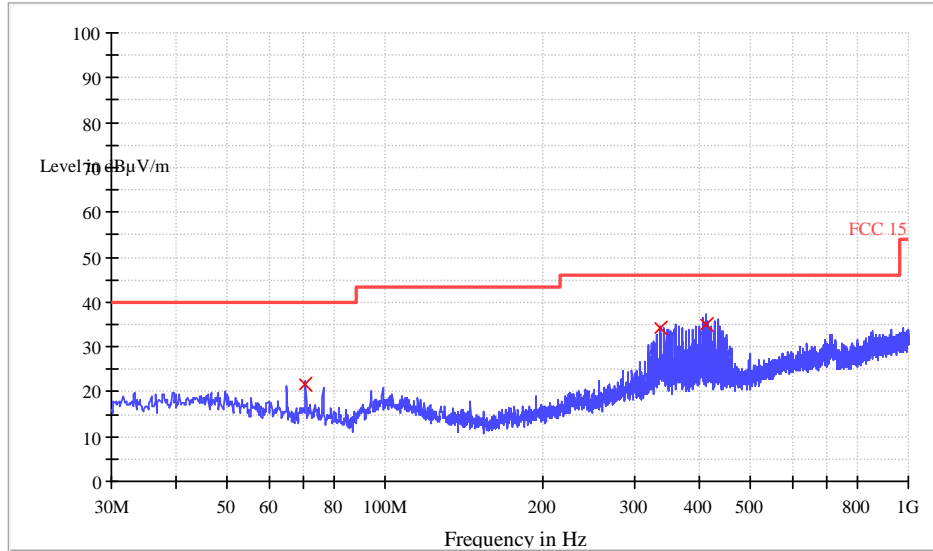


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
42.640000	27.3	120.000	V	13.7	12.7	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.280000	31.0	120.000	V	8.6	9.0	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.560000	21.8	120.000	H	8.5	18.2	40.0
336.000000	34.4	120.000	H	15.8	11.6	46.0
409.480000	34.9	120.000	H	17.5	11.1	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
*2483.5	62.81	-12.6	50.21	74	V
2500.0	54.94	-12.6	42.34	74	V
4924.0	43.55	-8.9	34.65	74	V
7386.0	38.79	-6.0	32.79	74	V
*2483.5	62.98	-12.6	50.38	74	H
2500.0	55.27	-12.6	42.67	74	H
4924.0	44.18	-8.9	35.28	74	H
7386.0	40.45	-6.0	34.45	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
*2483.5	/	-12.9	/	54	V
2500.0	/	-12.6	/	54	V
4924.0	/	-8.9	/	54	V
7386.0	/	-6.0	/	54	V
*2483.5	/	-12.9	/	54	H
2500.0	/	-12.6	/	54	H
4924.0	/	-8.9	/	54	H
7386.0	/	-6.0	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level

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

* Band Edges Emission was tested without filter.

The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Loss –Preamplifier Factor.

As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

No any other emissions level which are attenuated less than 20dB below the limit.

802.11n (HT40) mode with 150Mbps data rate

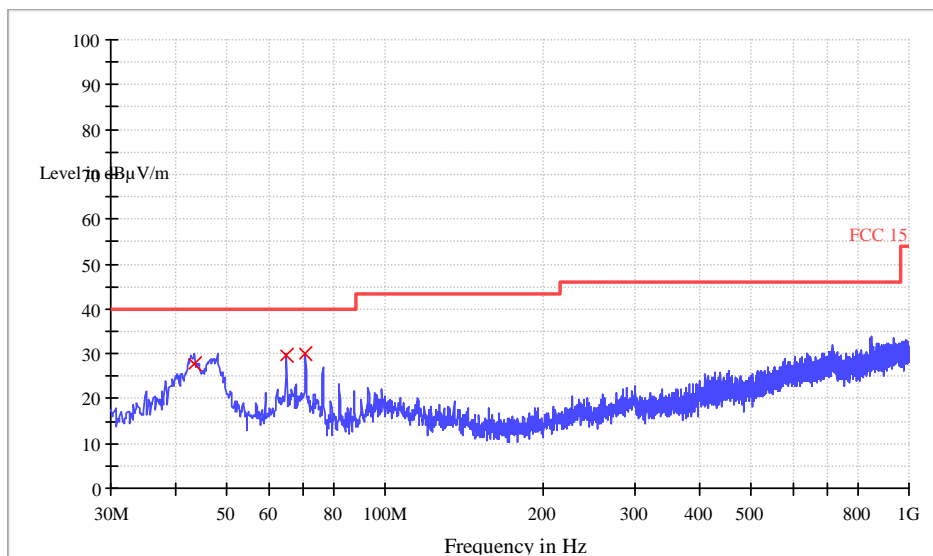
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement
 The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Test at Channel 3 (2.422 GHz) in transmitting status

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

Vertical:

Level (dB μ V/m)

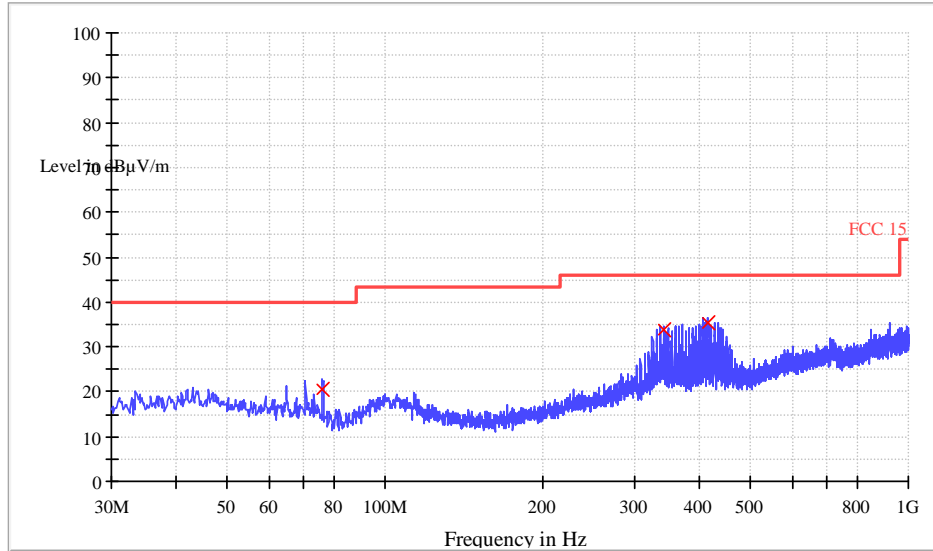


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
43.360000	27.7	120.000	V	13.7	12.3	40.0
64.840000	29.8	120.000	V	10.4	10.2	40.0
70.560000	30.2	120.000	V	8.5	9.8	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
75.840000	20.7	120.000	H	7.8	19.3	40.0
341.720000	34.0	120.000	H	15.8	12.0	46.0
414.920000	35.2	120.000	H	17.6	10.8	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
2390.0	55.79	-12.9	42.89	74	V
*2400.0	61.43	-12.8	48.63	74	V
4844.0	42.01	-8.8	33.21	74	V
7266.0	39.84	-6.1	33.74	74	V
2390.0	56.22	-12.9	43.32	74	H
*2400.0	62.01	-12.8	49.21	74	H
4844.0	42.56	-8.8	33.76	74	H
7266.0	40.52	-6.1	34.42	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
2390.0	/	-12.9	/	54	V
*2400.0	/	-12.8	/	54	V
4824.0	/	-8.8	/	54	V
7236.0	/	-6.1	/	54	V
2390.0	/	-12.9	/	54	H
*2400.0	/	-12.8	/	54	H
4824.0	/	-8.8	/	54	H
7236.0	/	-6.1	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 When Peak emission level was below AV limit, the AV emission level did not be recorded.

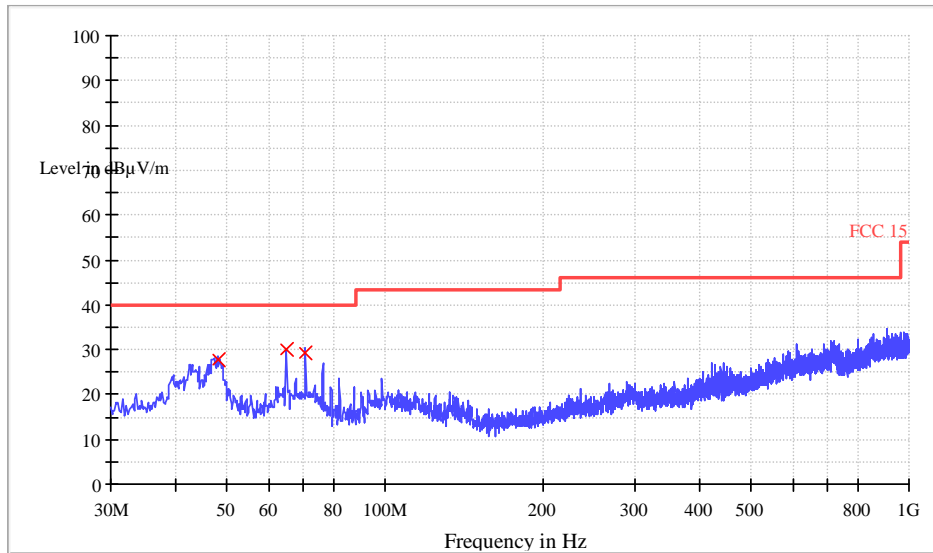
* Band Edges Emission was tested without filter.

Test at Channel 6 (2.437 GHz) in transmitting status

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

Vertical:

Level (dBμV/m)

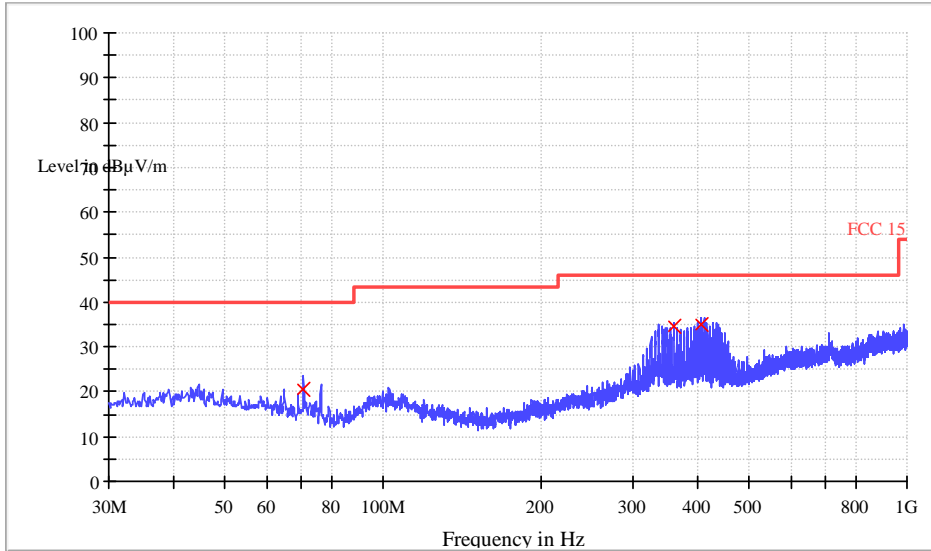


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dBμV/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
47.920000	27.8	120.000	V	13.4	12.2	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.560000	29.2	120.000	V	8.5	10.8	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.400000	20.4	120.000	H	8.6	19.6	40.0
358.640000	34.4	120.000	H	16.0	11.6	46.0
403.760000	35.1	120.000	H	17.5	10.9	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
2390.0	53.09	-12.9	40.19	74	V
2483.5	54.17	-12.6	41.57	74	V
4874.0	42.84	-8.6	34.24	74	V
7311.0	40.15	-6.0	34.15	74	V
2390.0	53.69	-12.9	40.79	74	H
2483.5	54.18	-12.6	41.58	74	H
4874.0	42.83	-8.6	34.23	74	H
7311.0	40.45	-6.0	34.45	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
2390.0	/	-12.9	/	54	V
2483.5	/	-12.6	/	54	V
4874.0	/	-8.6	/	54	V
7311.0	/	-6.0	/	54	V
2390.0	/	-12.9	/	54	H
2483.5	/	-12.6	/	54	H
4874.0	/	-8.6	/	54	H
7311.0	/	-6.0	/	54	H

Remark:

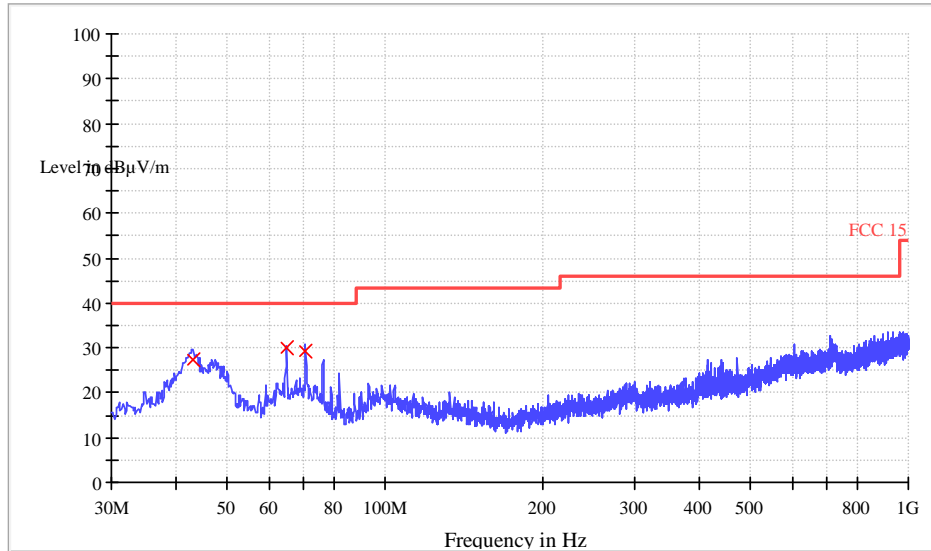
Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level
 When Peak emission level was below AV limit, the AV emission level did not be recorded.

Test at Channel 11 (2.452 GHz) in transmitting status

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

Vertical:

Level (dB μ V/m)

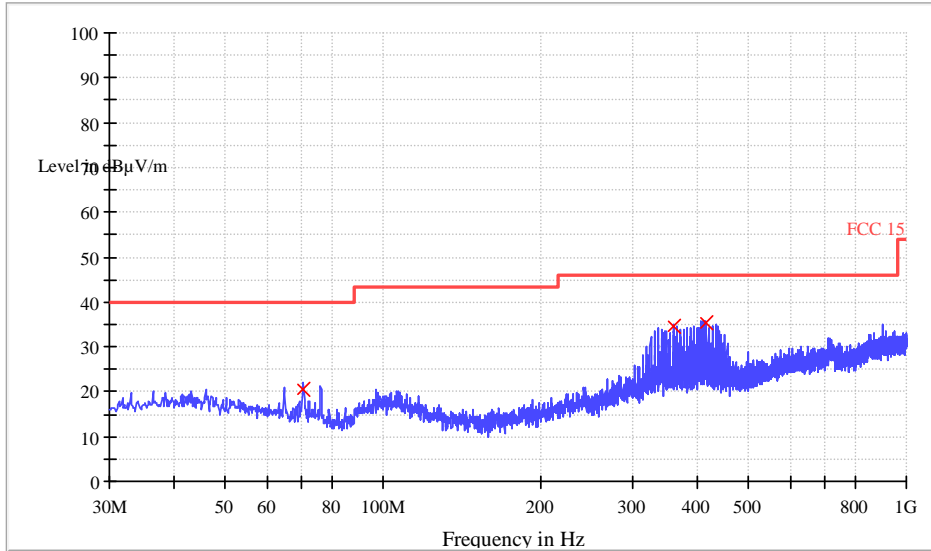


Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
43.080000	27.4	120.000	V	13.7	12.6	40.0
64.840000	29.9	120.000	V	10.4	10.1	40.0
70.400000	29.3	120.000	V	8.6	10.7	40.0

Horizontal:

Level (dB μ V/m)



Quasi-peak measurement

Frequency (MHz)	Quasi Peak (dB μ V/m)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
70.400000	20.4	120.000	H	8.6	19.6	40.0
358.640000	34.5	120.000	H	16.0	11.5	46.0
414.920000	35.5	120.000	H	17.6	10.5	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
*2483.5	62.39	-12.6	49.79	74	V
2500.0	54.72	-12.6	42.12	74	V
4904.0	43.48	-8.9	34.58	74	V
7356.0	38.74	-6.0	32.74	74	V
*2483.5	62.62	-12.6	50.02	74	H
2500.0	54.94	-12.6	42.34	74	H
4904.0	44.17	-8.9	35.27	74	H
7356.0	40.34	-6.0	34.34	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
*2483.5	/	-12.9	/	54	V
2500.0	/	-12.6	/	54	V
4904.0	/	-8.9	/	54	V
7356.0	/	-6.0	/	54	V
*2483.5	/	-12.9	/	54	H
2500.0	/	-12.6	/	54	H
4904.0	/	-8.9	/	54	H
7356.0	/	-6.0	/	54	H

Remark:

Harmonic Emissions was tested with filter (Product name: MICRO-TRONICS, model name: BRM50702), other radiated emissions were found below the reference noise level

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

* Band Edges Emission was tested without filter.

The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Loss –Preamplifier Factor.

As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

No any other emissions level which are attenuated less than 20dB below the limit.

4.8 Band Edges Requirement

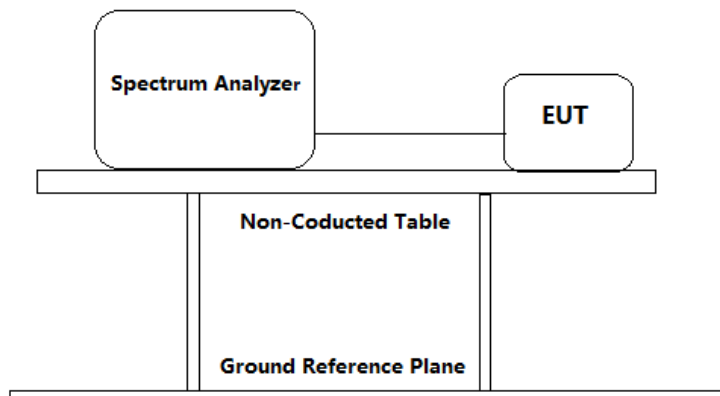
Test Requirement: FCC Part 15 C section 15.247
 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 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.
 Pre-test the EUT in AC mode and B/O mode, find worse case in AC mode.

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 $[3 \times \text{RBW}]$.
 - 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.

Test result with plots as follows:

For conduct mode:

The band edges was measured and recorded Result:

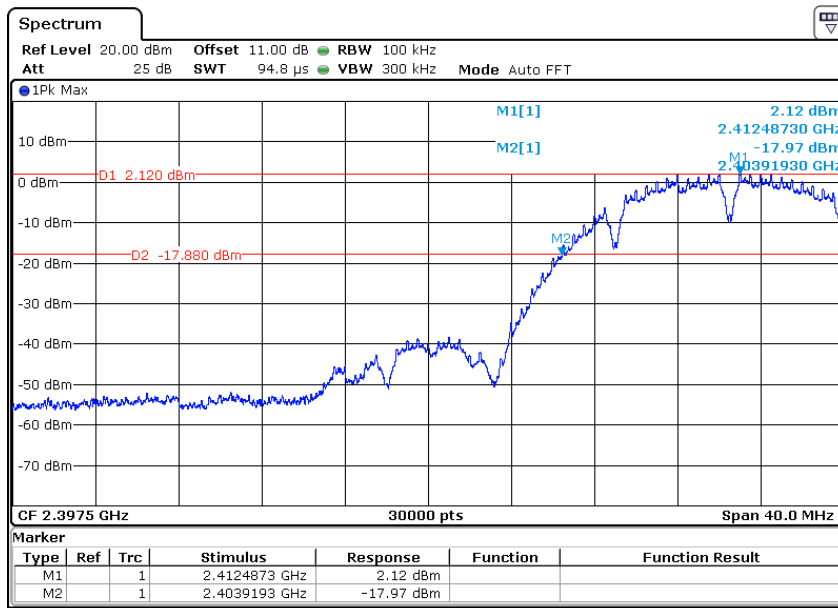
The Lower Edges attenuated more than 20dB.

The Upper Edges attenuated more than 20dB.

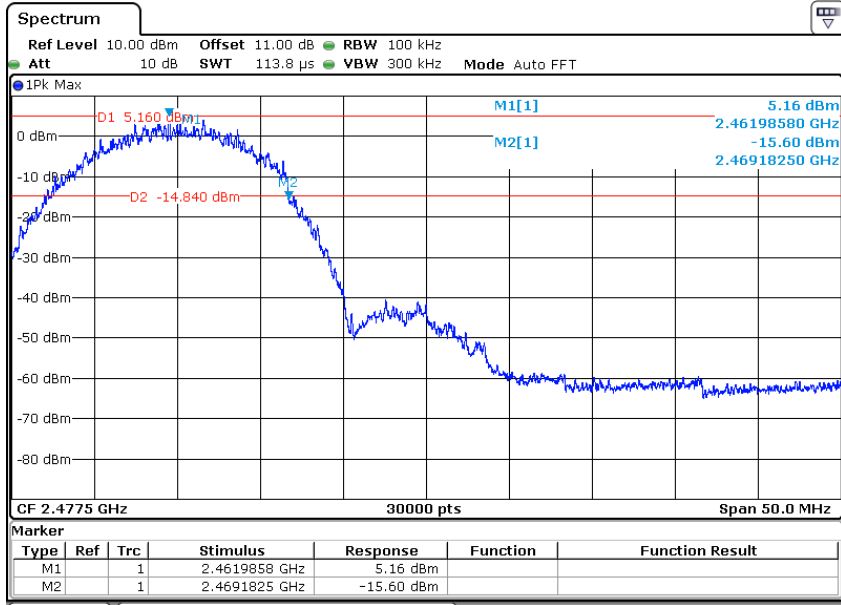
Result plots as follows:

802.11b mode with 11 Mbps data rate

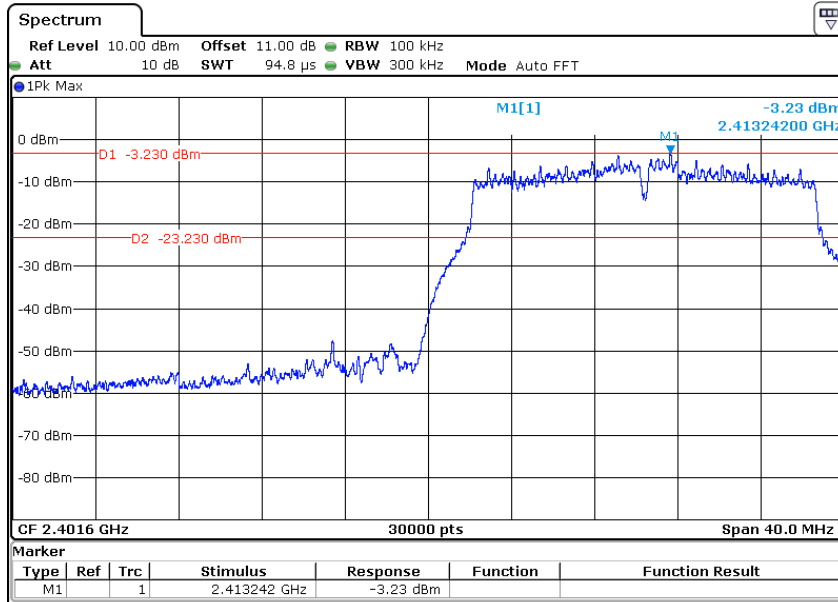
Channel1: 2.412 GHz



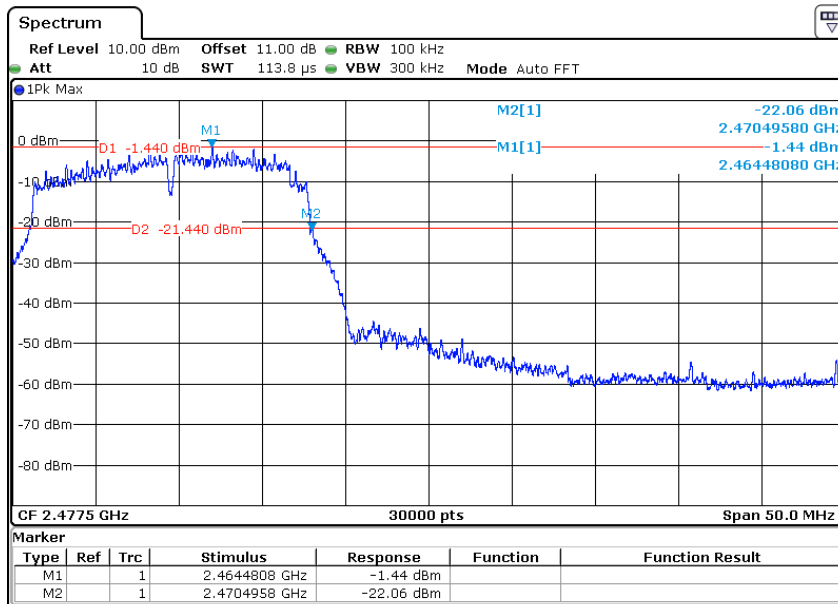
Channel 11: 2.462 GHz



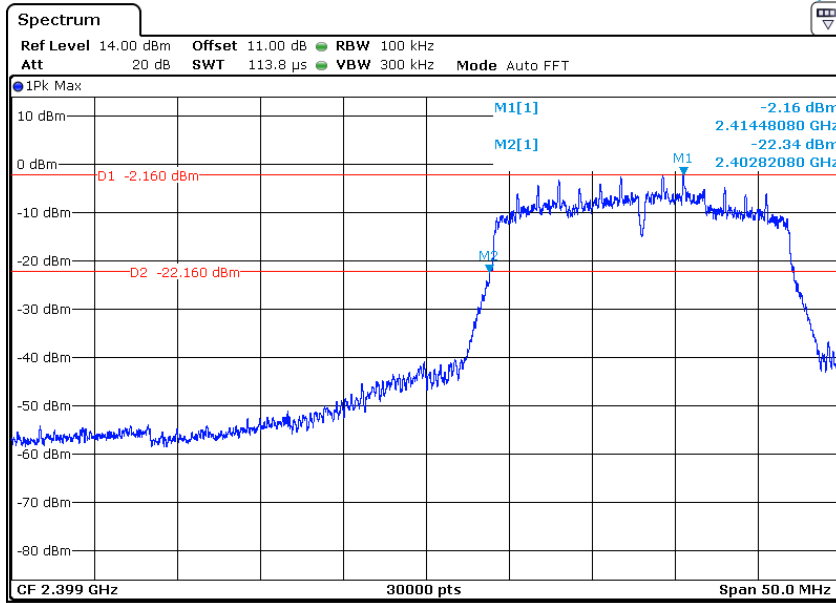
802.11g mode with 54 Mbps data rate
 Channel 1: 2.412 GHz



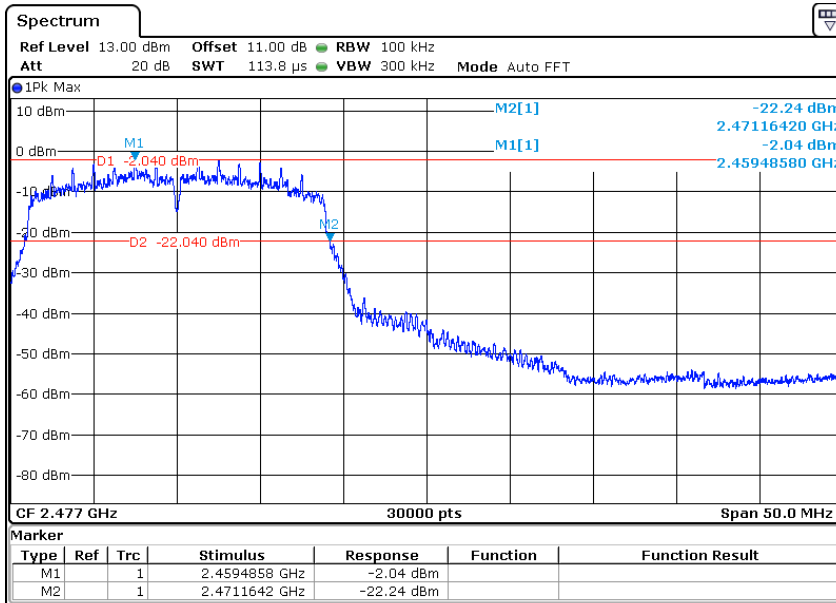
Channel 11: 2.462 GHz



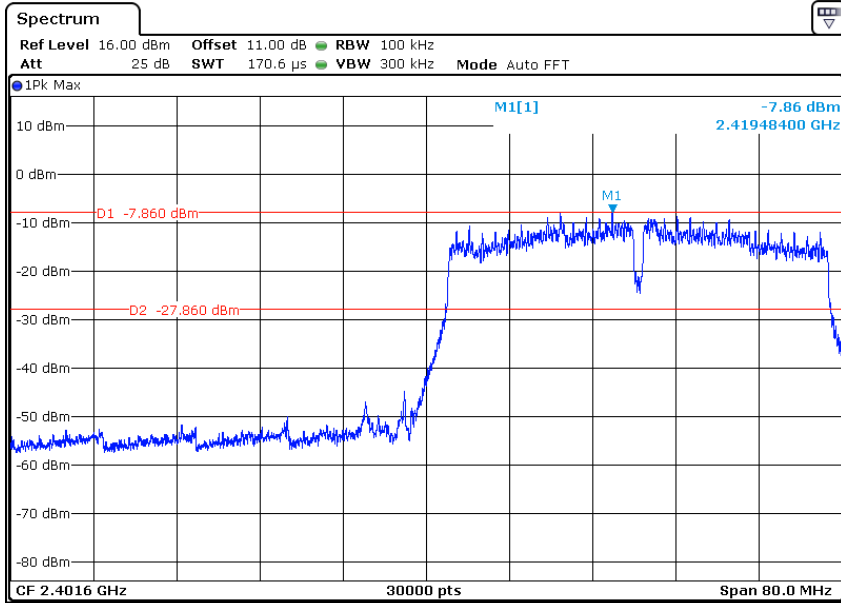
802.11n(HT20) mode with 72.2Mbps data rate
 Channel1: 2.412 GHz



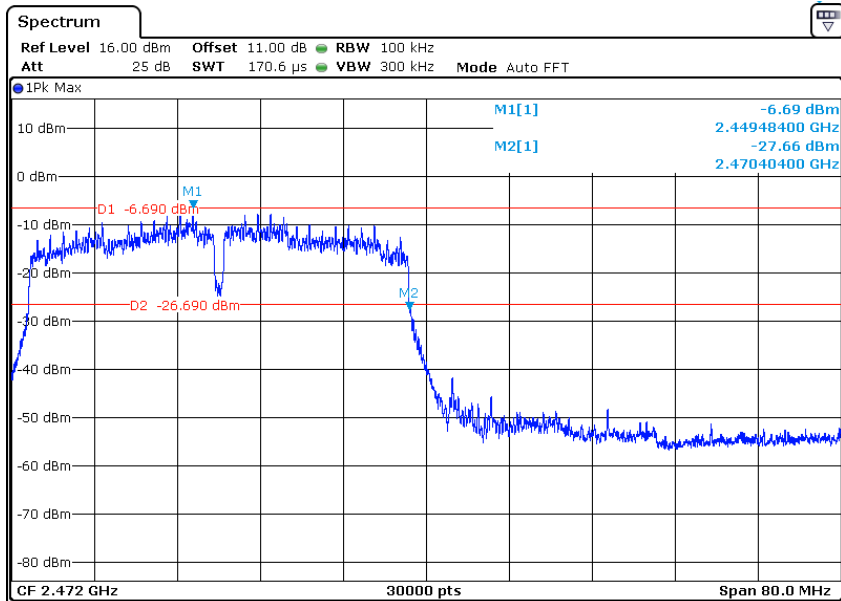
Channel 11: 2.462 GHz



802.11n(HT40) mode with 150Mbps data rate
 Channel 3: 2.422 GHz



Channel 9: 2.452 GHz

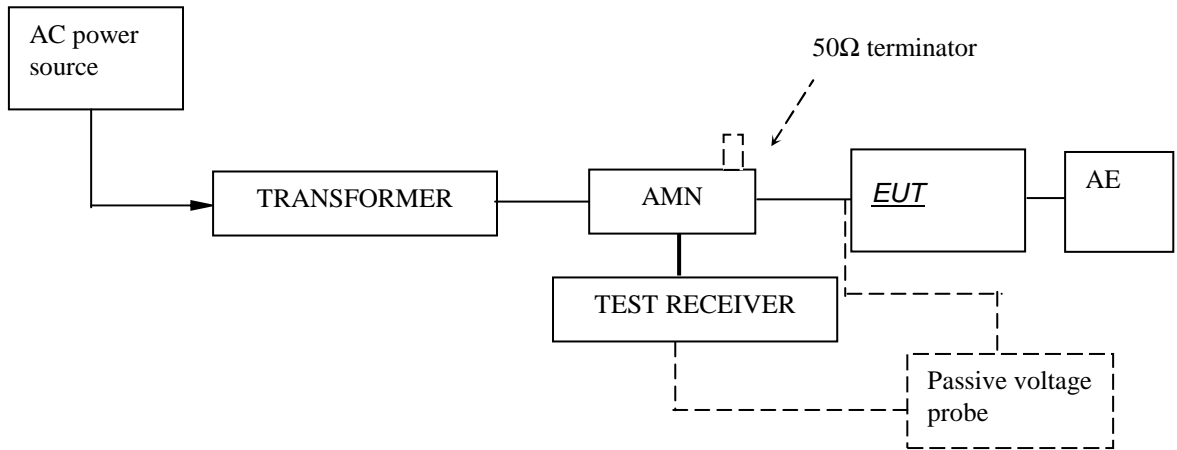


For Radiated mode :

Please refer Clause 4.7 Radiated Emissions in Restricted Bands of this test report for more details. The resultant field strength in band edges meet the general radiated emission limit in section 15.209, which does not exceed 74 dB μ V/m (Peak Limit) and 54dB μ V/m (Average Limit).

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 Data

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
1 Quasi Peak	338 kHz	49.78	L1	-9.46
2 Average	346 kHz	41.90	L1	-7.15
2 Average	370 kHz	38.17	L1	-10.33

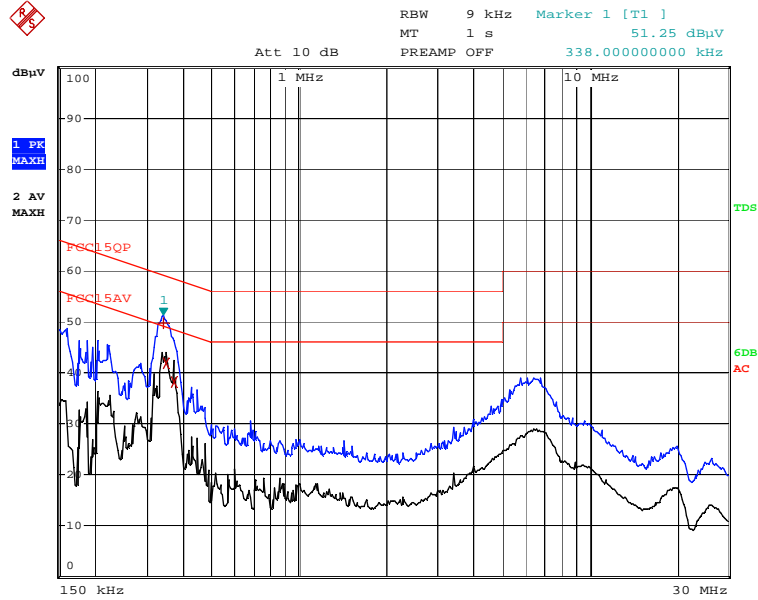
Tested Wire: Neutral

Operation Mode: transmitting mode

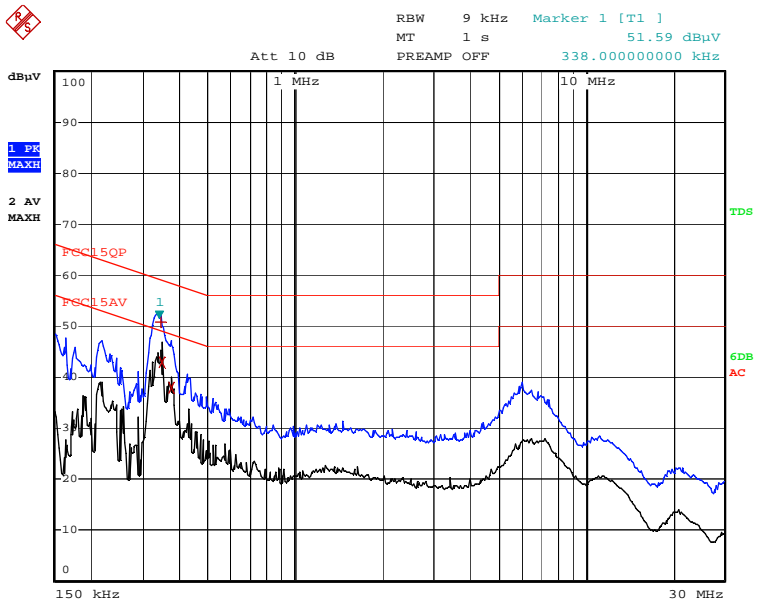
EDIT PEAK LIST (Final Measurement Results)				
Trace1:	FCC15QP			
Trace2:	FCC15AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1 Quasi Peak	342 kHz	50.77	L1	-8.38
2 Average	346 kHz	43.04	L1	-6.01
2 Average	374 kHz	37.86	L1	-10.55

Emission Curve

Tested Wire: Live



Tested Wire: Neutral



5.0 Test Equipment List

Radiated Emission

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date (YYYY-MM-DD)	Calibration Interval
EM030-01	3m Semi-Anechoic Chamber	9×6×6 m ³	ETS•LINDGREN	2016-04-02	1Y
EM030-02	Control room for 3m Semi-Anechoic Chamber	4×4×3 m ³	ETS•LINDGREN		
EM031-02	EMI Test Receiver (9 kHz~7 GHz)	R&S ESR7	R&S	2016-06-03	1Y
EM031-03	Signal and Spectrum Analyzer (10 Hz~40 GHz)	R&S FSV40	R&S	2016-06-03	1Y
EM011-04	Loop antenna (9 kHz-30 MHz)	HFH2-Z2	R&S	2016-05-25	1Y
EM061-03	TRILOG Super Broadband test Antenna (30 MHz-1.5 GHz)	VULB 9161	SCHWARZBECK	2016-05-25	1Y
EM033-02	Bouble-Ridged Waveguide Horn Antenna (800 MHz-18 GHz)	R&S HF907	R&S	2016-05-25	1Y
EM033-03	High Frequency Antenna & preamplifier (18 GHz~26.5 GHz)	R&S SCU- 26	R&S	2016-05-25	1Y
EM033-04	High Frequency Antenna & preamplifier (26 GHz-40 GHz)	R&S SCU- 40	R&S	2016-05-25	1Y
EM031-02-01	Coaxial cable(9 kHz-1 GHz)	/	R&S	2016-06-03	1Y
EM033-02-02	Coaxial cable(1 GHz-18 GHz)	/	R&S	2016-06-09	
EM033-04-02	Coaxial cable (18~40) GHz	/	R&S	2016-06-09	
EM022-03	2.45 GHz Filter	BRM 50702	Micro-Tronics	2016-05-06	1Y

Conducted emission at the mains terminals test

Equipment No.	Equipment	Model	Manufacturer	Cal.Due date (YYYY-MM-DD)	Calibration Interval
EM080-05	EMI receiver	ESCI	R&S	2016-08-04	1Y
EM006-05	LISN	ENV216	R&S	2016-09-12	1Y
EM006-06	LISN	ENV216	R&S	2016-09-12	1Y
EM006-06-01	Coaxial cable	/	R&S	2016-04-12	1Y
EM004-04	EMC shield Room	8m×3m×3m	Zhongyu	2016-08-04	1Y