



**FCC PART 15 SUBPART C
CERTIFICATION TEST REPORT**

For

LED Lamp

**MODEL NUMBER: MK-020011002114,
MK-020011002120, MK-020011002121**

FCC ID: 2AY5GMK020011002114

REPORT NUMBER: 4789738938.2-12

ISSUE DATE: Mar 10, 2021

Prepared for

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10-EM-F0878 – Issue 2.0

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/10/2021	Initial Issue	--



Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	6 dB Bandwidth	FCC 15.247 (a) (2)	Pass
2	Peak Conducted Output Power	FCC 15.247 (b) (3)	Pass
3	Power Spectral Density	FCC 15.247 (e)	Pass
4	Conducted Bandedge and Spurious Emission	FCC 15.247 (d)	Pass
5	Radiated Bandedge and Spurious Emission	FCC 15.247 (d) FCC 15.209 FCC 15.205	Pass
6	Conducted Emission Test For AC Power Port	FCC 15.207	Pass
7	Antenna Requirement	FCC 15.203	Pass
Remark: 1) The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C, when <Accuracy Method> decision rule is applied.			



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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Zhejiang MEKA Electric Co.,Ltd
Address: NO.8 Canghai Road,Lihai Town,Binhai New
City,Shaoxing,zhejiang Province

Manufacturer Information

Company Name: Zhejiang MEKA Electric Co.,Ltd
Address: NO.8 Canghai Road,Lihai Town,Binhai New
City,Shaoxing,zhejiang Province

EUT Description

EUT Name: LED Lamp
Model: MK-020011002114, MK-020011002120, MK-020011002121
Model Difference: Only the model name, appearance, size and power are different,
the others are the same
Brand Name: MKOPTO
Sample Status: Normal
Sample ID: N/A
Sample Received Date: Feb 25, 2021
Date of Tested: Feb 25, 2021 ~ Mar 10, 2021

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC Part 15 Subpart C	PASS

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Tom Tang
Associate Project Engineer



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, FCC CFR 47 Part 2, FCC CFR 47 Part 15 ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 4338.01) Shenzhen STS Test Services Co., Ltd. has been assessed and proved to be in compliance with A2LA. CNAS (Registration No.: L7649) Shenzhen STS Test Services Co., Ltd. has been assessed and proved to be in compliance with CNAS. FCC (FCC Designation No.: 625569) Shenzhen STS Test Services Co., Ltd. has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules IC(Company No.: 12108A) Shenzhen STS Test Services Co., Ltd. has been registered and fully described in a report filed with Industry Canada. The Company Number is 12108A.
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Note: All tests measurement facilities use to collect the measurement data are located at A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China



4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	RF output power, conducted	$\pm 0.7\text{dB}$
2	Unwanted Emissions, conducted	$\pm 3.0\text{dB}$
3	All emissions, radiated 9K-30MHz	$\pm 2.7\text{dB}$
4	All emissions, radiated 30M-1GHz	$\pm 4.4\text{dB}$
5	All emissions, radiated 1G-6GHz	$\pm 5.1\text{dB}$
6	All emissions, radiated >6G	$\pm 5.5\text{dB}$
7	Conducted Emission (9KHz-150KHz)	$\pm 2.8\text{dB}$
8	Conducted Emission (150KHz-30MHz)	$\pm 2.8\text{dB}$



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	LED Lamp
EUT Description	The EUT is a LED Lamp.
Model	MK-020011002114
Radio Technology	IEEE802.11b/g/n HT20
Operation frequency	IEEE 802.11b: 2412MHz—2462MHz IEEE 802.11g: 2412MHz—2462MHz IEEE 802.11n HT20: 2412MHz—2462MHz
Modulation	IEEE 802.11b: DSSS(CCK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)
Power Supply	Input: AC 110-130V 60Hz
Hardware Version	1.0.3
Software Version	2.9.12

5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit Chains (NTX)	IEE Std. 802.11	Frequency (MHz)	Channel Number	Max PK Conducted Power (dBm)
2400-2483.5	1	IEEE 802.11b	2412-2462	1-11[11]	16.32
2400-2483.5	1	IEEE 802.11g	2412-2462	1-11[11]	22.87
2400-2483.5	1	IEEE 802.11nHT20	2412-2462	1-11[11]	21.49

5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency(MHz)	Channel	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2425	8	2447	N/A	N/A



5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
WiFi TX(802.11b)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11g)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11n HT20)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz

5.5. THE WORSE CASE CONFIGURATIONS

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band							
Modulation Mode	Transmit Antenna Number	Test Channel					
		NCB: 20MHz			NCB: 40MHz		
		CH 1	CH 6	CH 11	CH 3	CH 6	CH 09
802.11b	1	Default	Default	Default	N/A		
802.11g	1	Default	Default	Default			
802.11n HT20	1	Default	Default	Default			
802.11n HT40	1	N/A			Default	Default	Default

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2412-2462	PCB Antenna	1

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
IEEE 802.11g	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
IEEE 802.11n HT20	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
IEEE 802.11n HT40	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.



5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	PC	LENOVO	ThinkPad E470	N/A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(cm)	Remarks
1	USB Cable	N/A	N/A	150cm	N/A

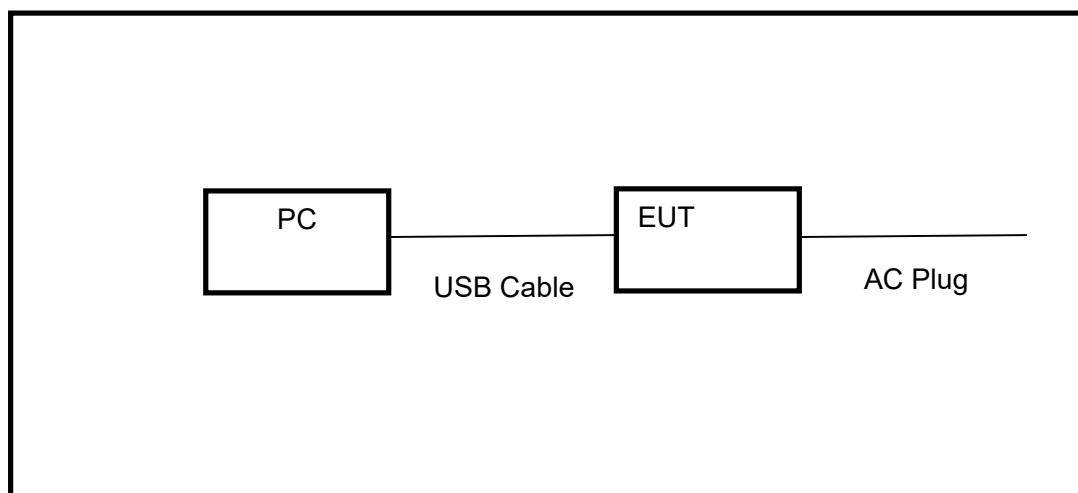
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

TEST SETUP

The EUT can work in engineering mode with firmware QRCT from QUALCOMM through a Laptop.

SETUP DIAGRAM FOR TESTS





6. MEASURING INSTRUMENT AND SOFTWARE USED

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2020.10.12	2021.10.11
Signal Analyzer	R&S	FSV 40-N	101823	2020.10.10	2021.10.09
Active loop Antenna	ZHINAN	ZN30900C	16035	2019.07.11	2021.07.10
Bilog Antenna	TESEQ	CBL6111D	34678	2020.10.12	2022.10.11
Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2019.10.15	2021.10.14
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2020.10.12	2022.10.11
Pre-Amplifier (0.1M-3GHz)	EM	EM330	060665	2020.10.12	2021.10.11
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2020.10.12	2021.10.11
Pre-Amplifier (18G-40GHz)	SKET	LNPA-1840-50	SK2018101801	2020.10.10	2021.10.09
Temperature & Humidity	HH660	Mieo	N/A	2020.10.12	2021.10.11
Turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Band Reject Filter (2.4-2.5GHz)	COM-MW	ZBSF-2400-2500	N/A	2020.10.12	2021.10.11
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2020.10.12	2021.10.11
LISN	R&S	ENV216	101242	2020.10.12	2021.10.11
LISN	EMCO	3810/2NM	23625	2020.10.12	2021.10.11
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			



RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Power Sensor	Keysight	U2021XA	MY55520005	2020.10.10	2021.10.09
			MY55520006	2020.10.10	2021.10.09
			MY56120038	2020.10.10	2021.10.09
			MY56280002	2020.10.10	2021.10.09
Signal Analyzer	Agilent	N9020A	MY51110105	2020.03.05	2021.03.04
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
MIMO Power measurement test Set	Keysight	U2021XA	MY55520005	2020.10.10	2021.10.09
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			



7. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6 dB Bandwidth	558074 D01 15.247 Meas Guidance v05r02	8.2
2	Peak Output Power	558074 D01 15.247 Meas Guidance v05r02	8.1.3
3	Power Spectral Density	558074 D01 15.247 Meas Guidance v05r02	8.4
4	Out-of-band emissions in non-restricted bands	558074 D01 15.247 Meas Guidance v05r02	8.5
5	Out-of-band emissions in restricted bands	558074 D01 15.247 Meas Guidance v05r02	8.6
6	Band-edge	558074 D01 15.247 Meas Guidance v05r02	8.7
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	6.2



8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

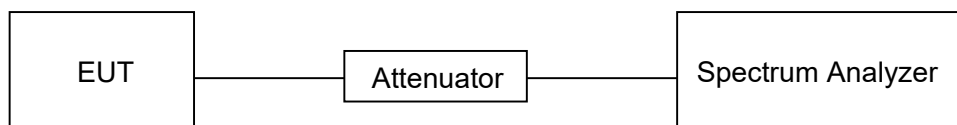
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

RESULTS

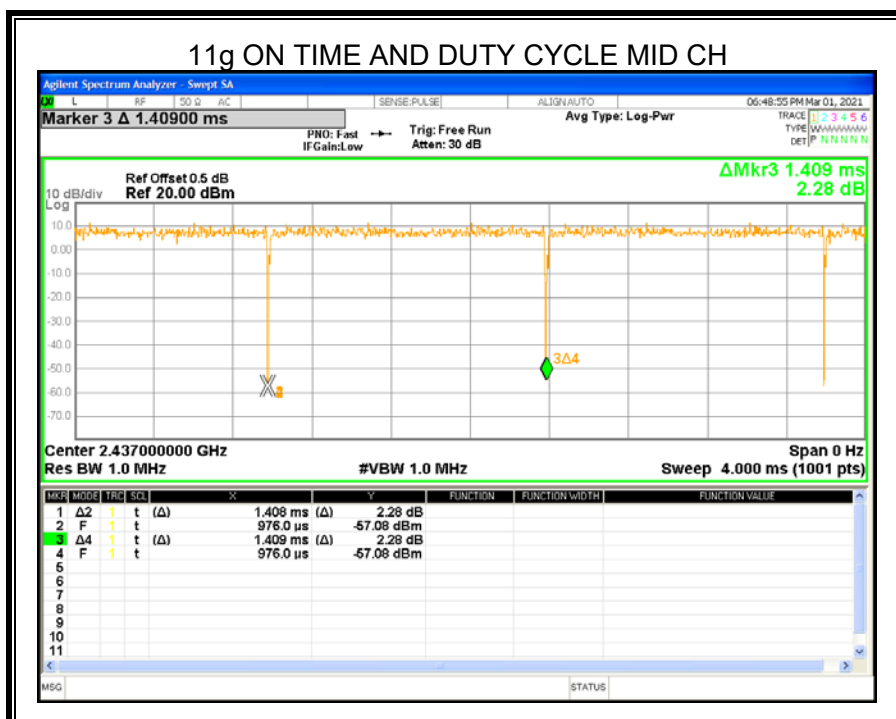
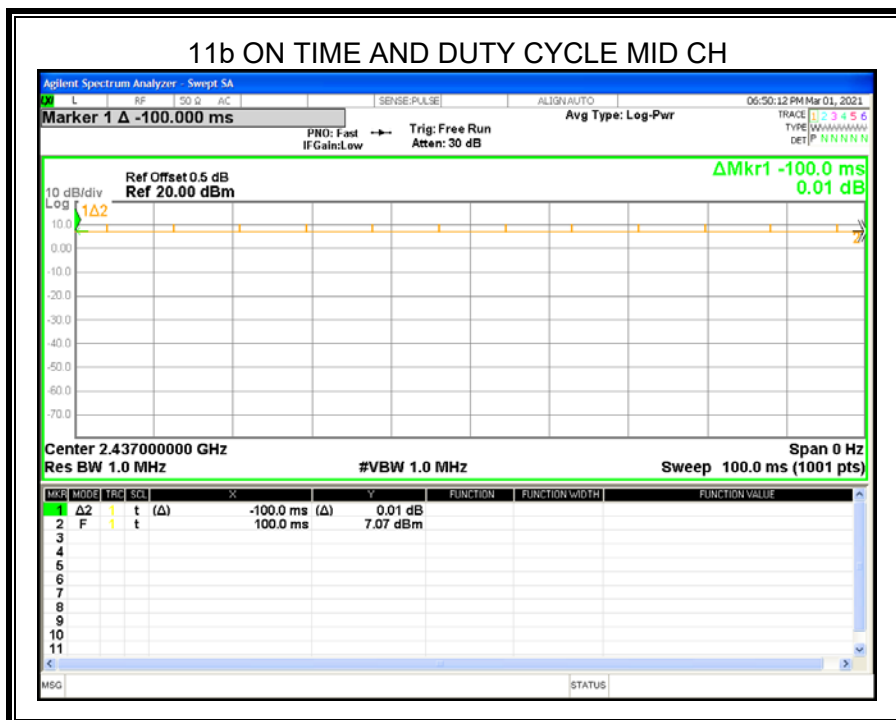
Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/B Minimum VBW (KHz)
11b	100.000	100.000	0.0100	100.00	0.00	0.01
11g	1.408	1.409	0.9993	99.93	0.01	0.71
11n20	1.312	1.313	0.9992	99.92	0.01	0.76

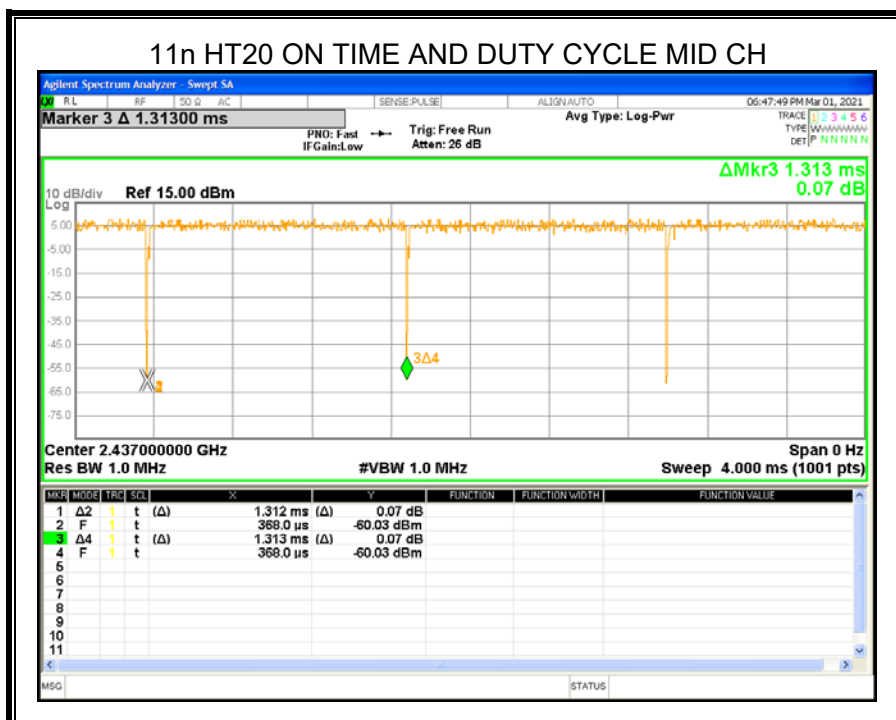
Note: Duty Cycle Correction Factor=10log(1/x).

Where: x is Duty Cycle(Linear)

Where: B is On Time

Duty Cycle > 98%, set the final test VBW = 10KHz (VBW ≤ RBW/100)







8.2. 6 dB DTS BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2)	6 dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5

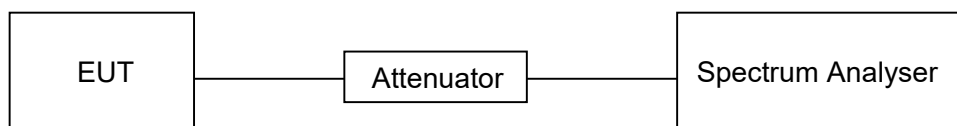
TEST PROCEDURE

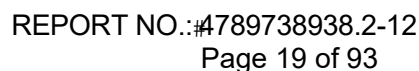
Connect the UUT to the spectrum analyzer and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6dB Bandwidth : 100K
VBW	For 6dB Bandwidth : $\geq 3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and 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.

TEST SETUP

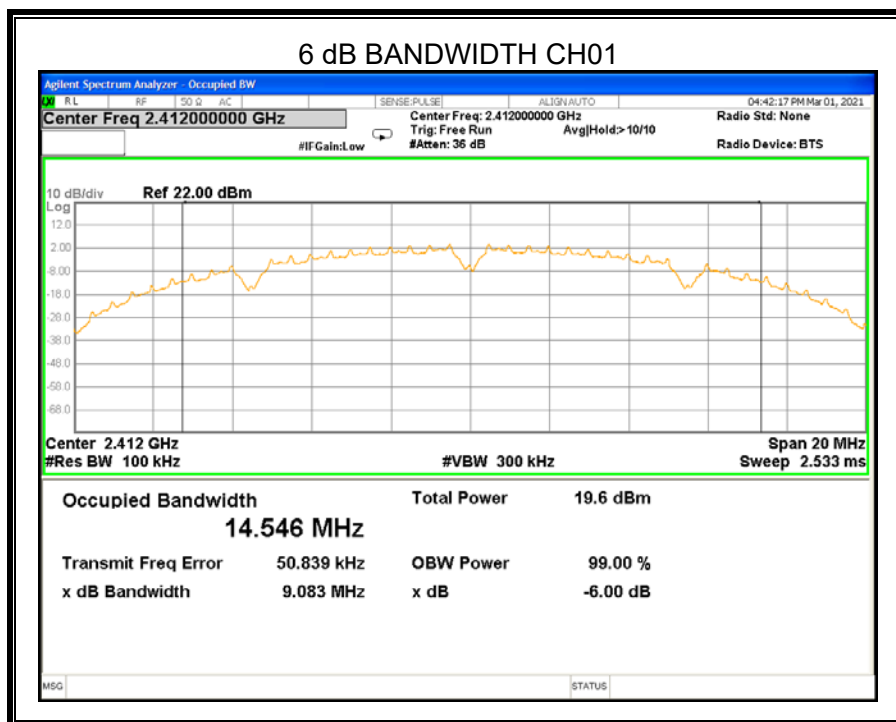


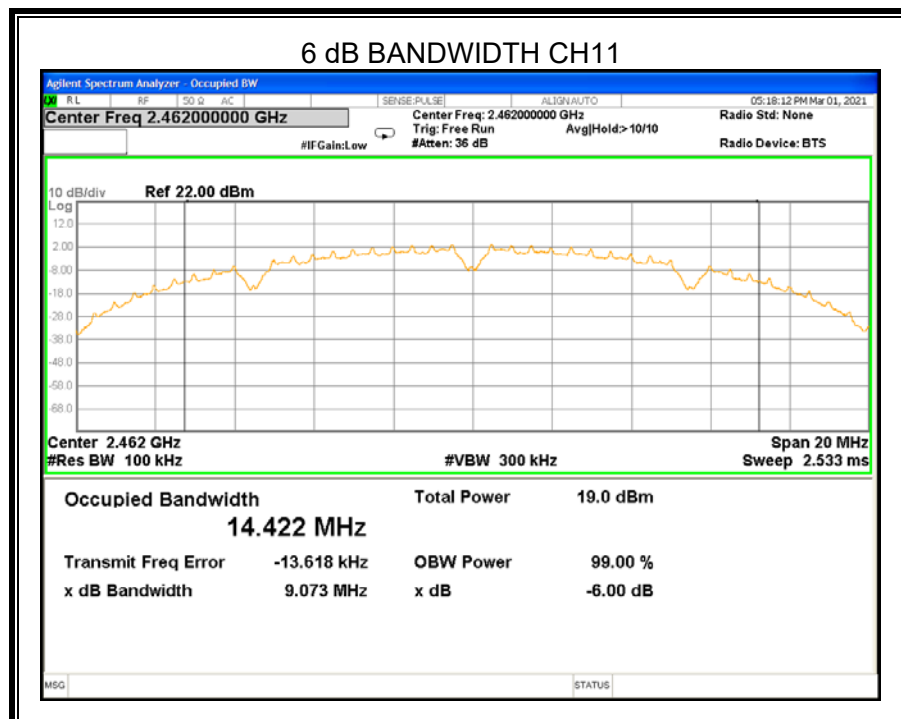
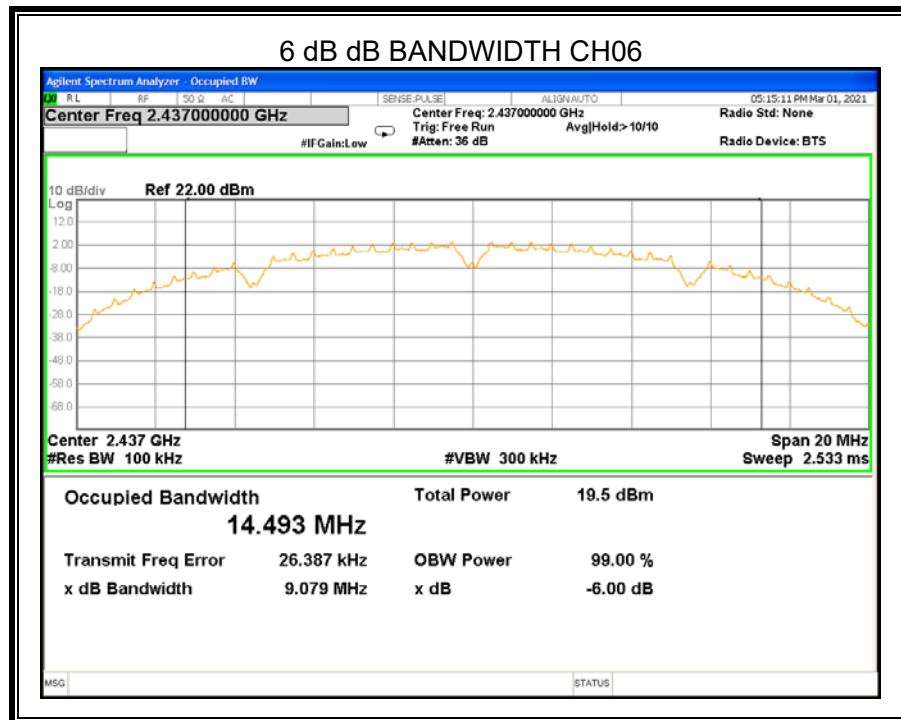


Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

8.2.1. 802.11b MODE

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
CH01	2412	9.083	≥500KHz	Pass
CH06	2437	9.079	≥500KHz	Pass
CH11	2462	9.073	≥500KHz	Pass

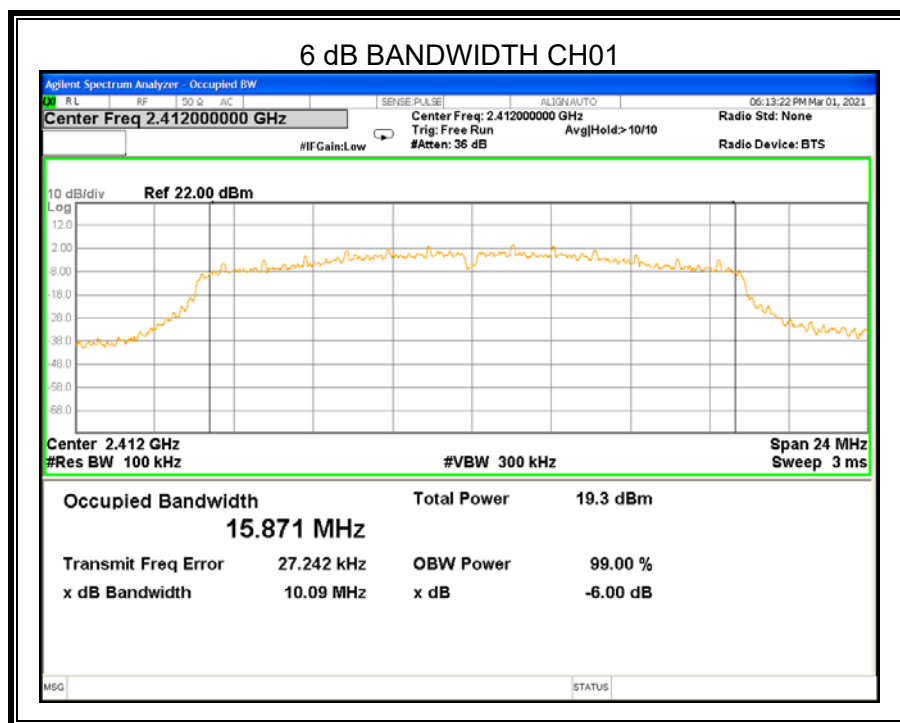


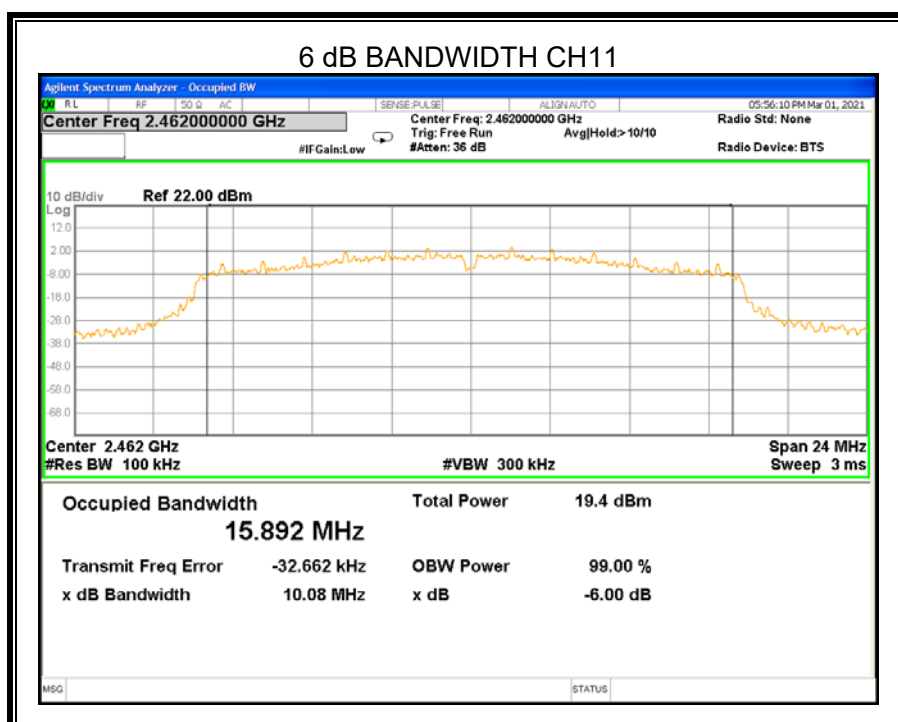
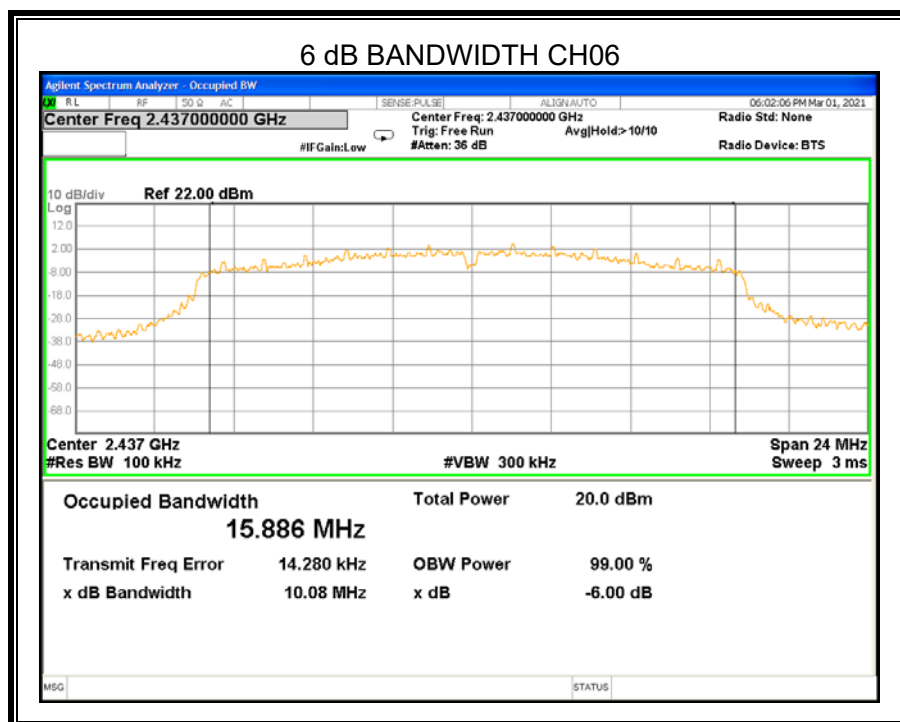




8.2.2. 802.11g MODE

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
CH01	2412	10.09	≥500KHz	Pass
CH06	2437	10.08	≥500KHz	Pass
CH11	2462	10.08	≥500KHz	Pass

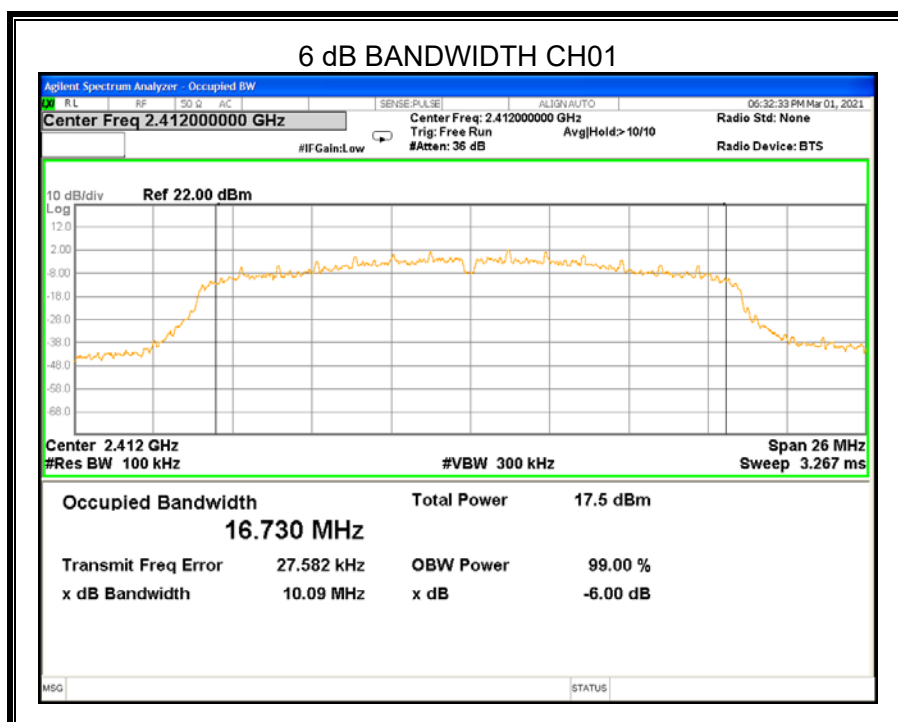


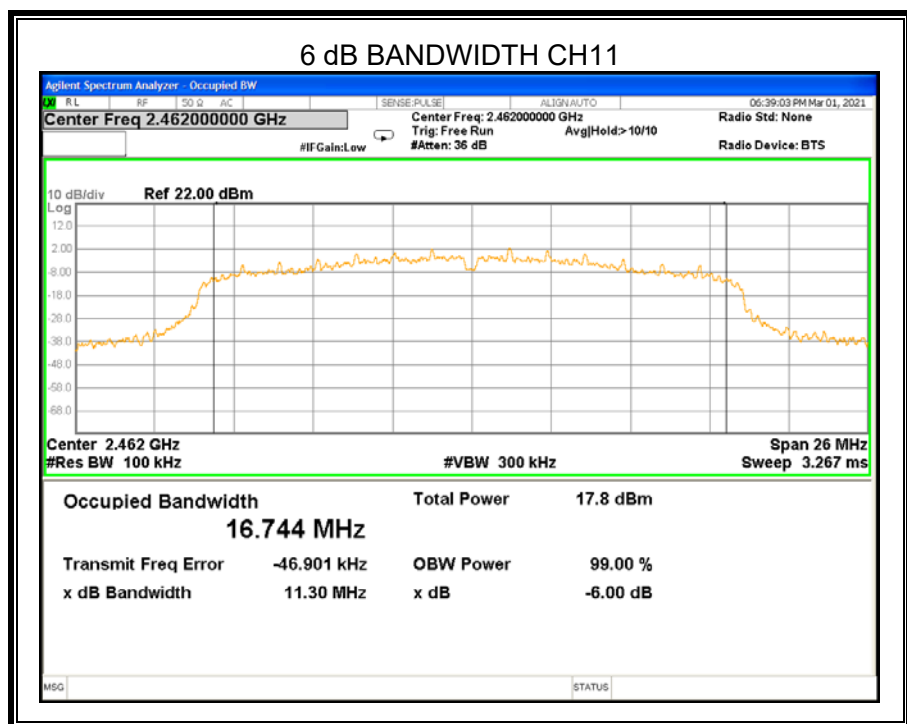
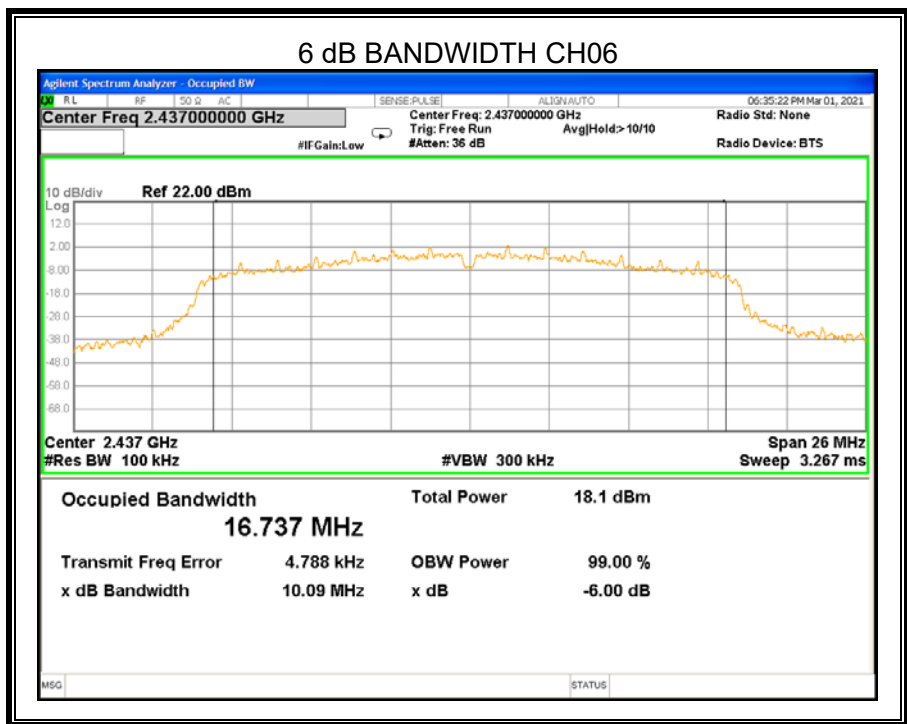




8.2.3. 802.11n HT20 MODE

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
CH01	2412	10.09	≥500KHz	Pass
CH06	2437	10.09	≥500KHz	Pass
CH11	2462	11.30	≥500KHz	Pass







8.3. PEAK CONDUCTED OUTPUT POWER

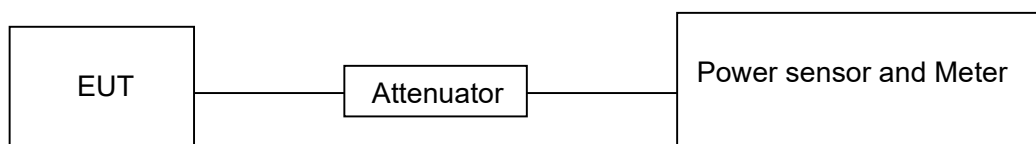
LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5

TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.
Measure peak power each channel.

TEST SETUP



TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz



RESULTS

8.3.1. 802.11b MODE

Test Channel	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	dBm
CH01	2412	16.32	30
CH06	2437	16.01	30
CH11	2462	16.00	30

8.3.2. 802.11g MODE

Test Channel	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	dBm
CH01	2412	22.87	30
CH06	2437	22.74	30
CH11	2462	22.12	30

8.3.3. 802.11n HT20 MODE

Test Channel	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	dBm
CH01	2412	20.87	30
CH06	2437	21.49	30
CH11	2462	20.55	30



8.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

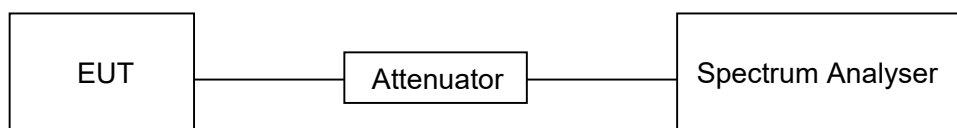
Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	$3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



TEST ENVIRONMENT

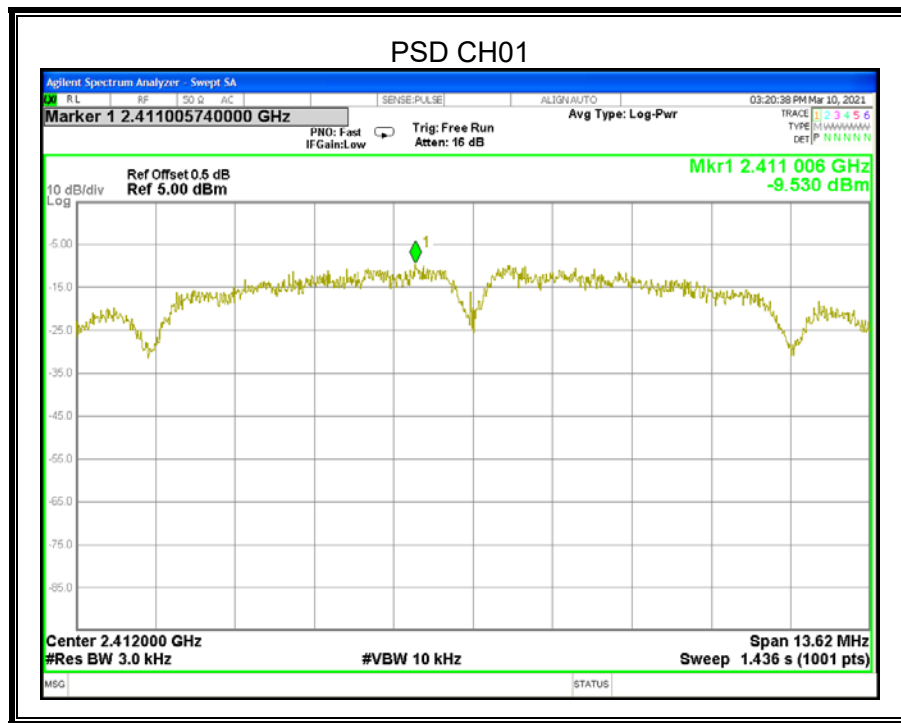
Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

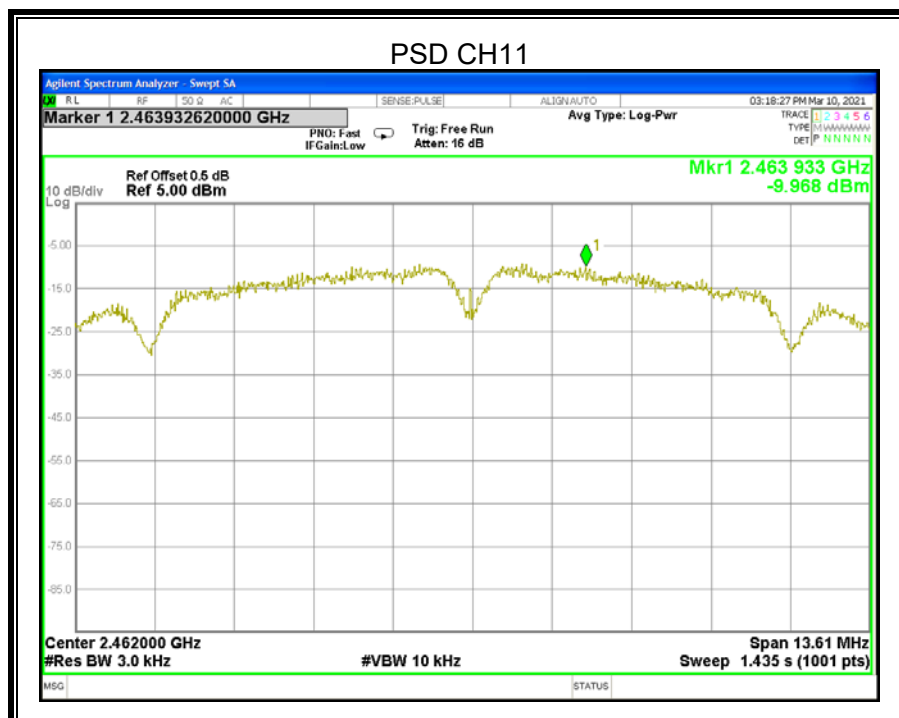
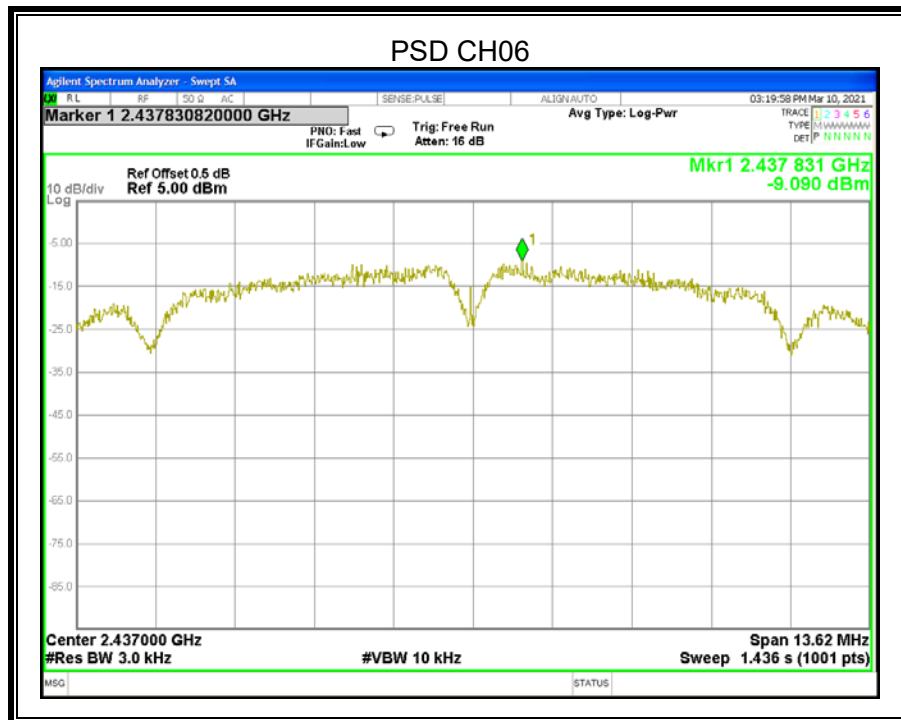


RESULTS

8.4.1. 802.11b MODE

Test Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
CH01	2412	-9.530	≤8	PASS
CH06	2437	-9.090	≤8	PASS
CH11	2462	-9.968	≤8	PASS

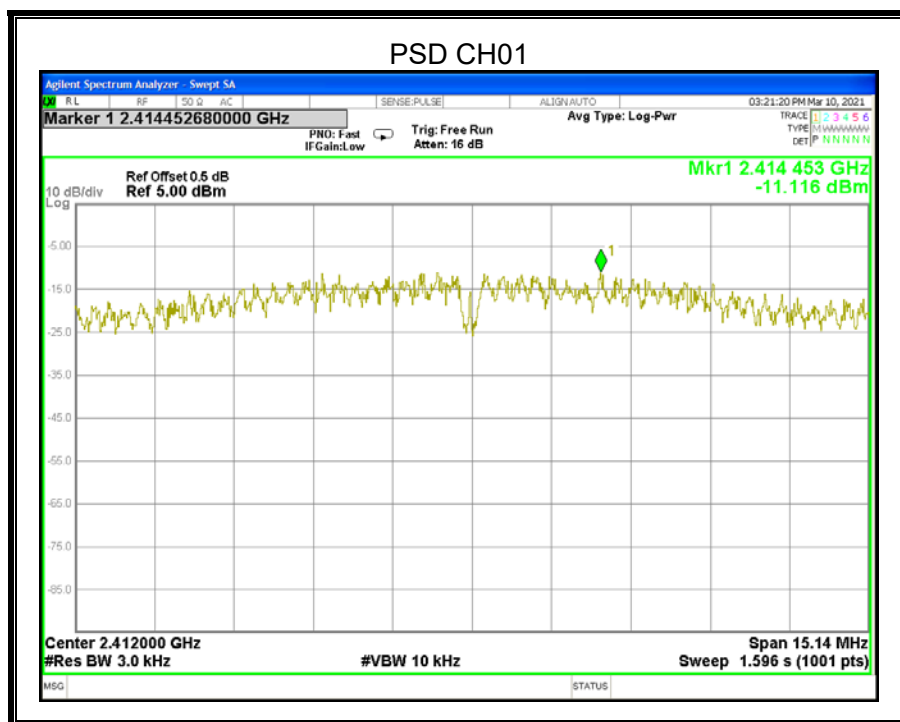


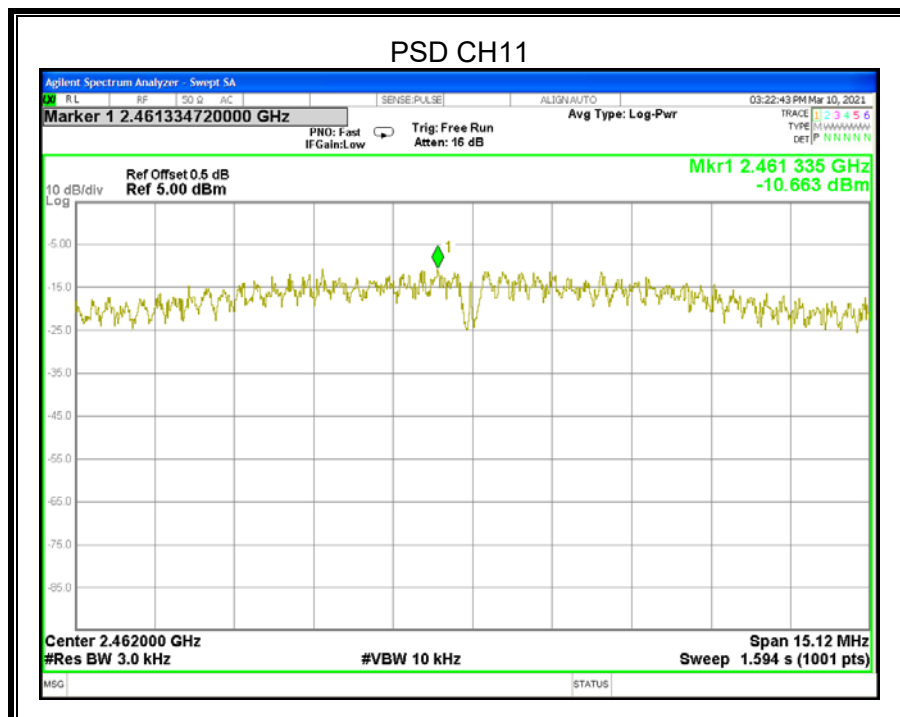
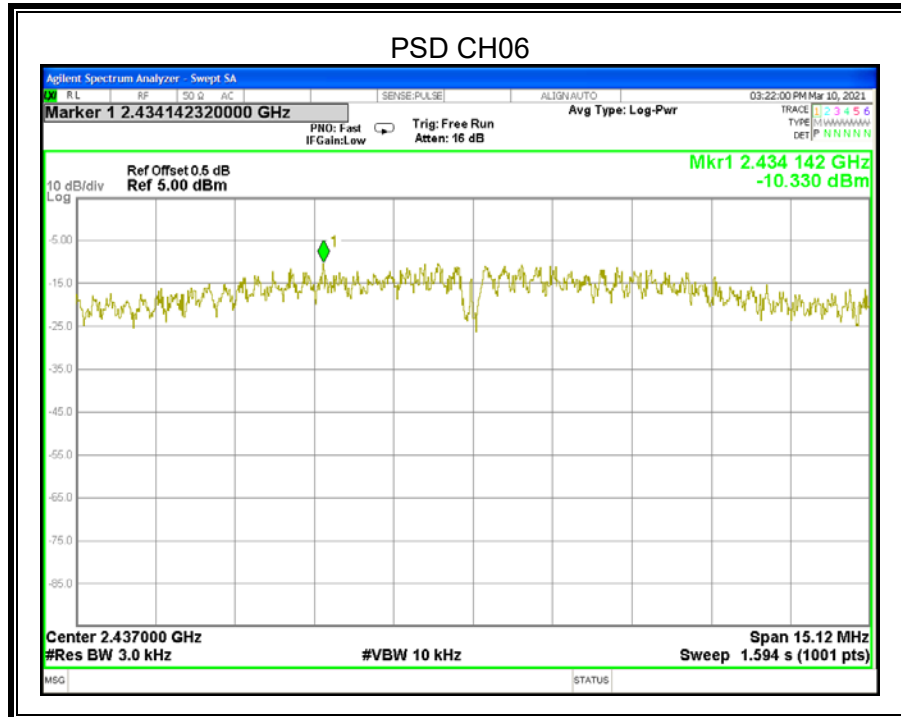




8.4.2. 802.11g MODE

Test Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
CH01	2412	-11.116	≤8	PASS
CH06	2437	-10.330	≤8	PASS
CH11	2462	-10.663	≤8	PASS

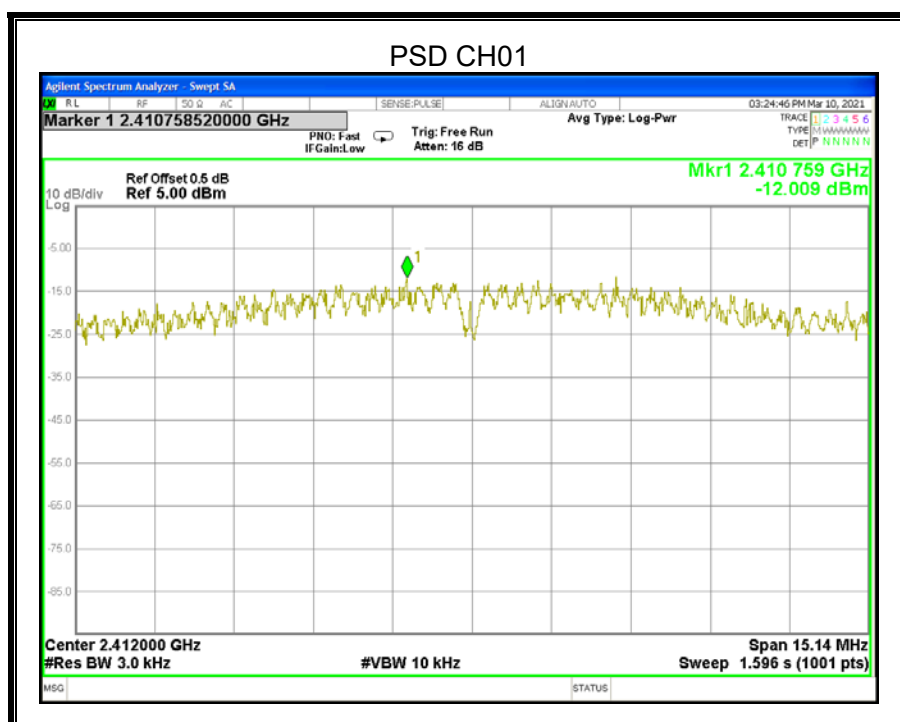


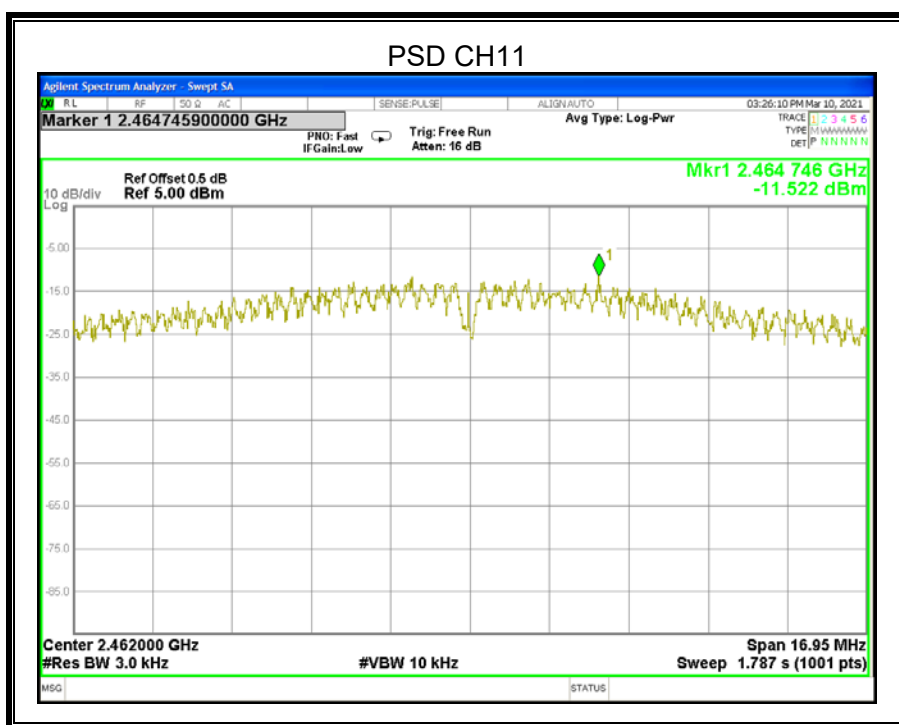
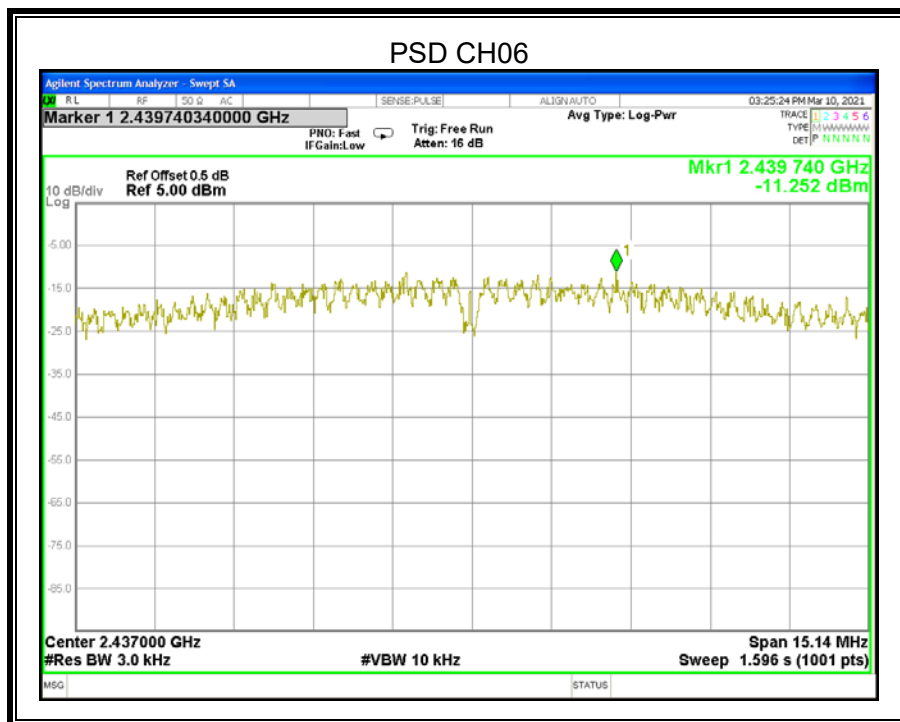




8.4.3. 802.11n HT20 MODE

Test Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
CH01	2412	-12.009	≤8	PASS
CH06	2437	-11.252	≤8	PASS
CH11	2462	-11.522	≤8	PASS







8.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

FCC Part15 (15.247) Subpart C		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

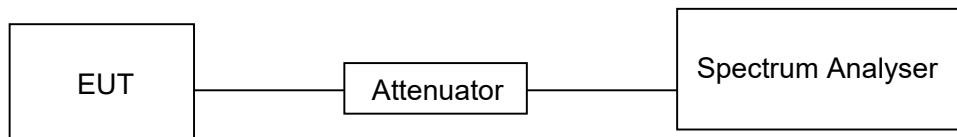
Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.



TEST SETUP

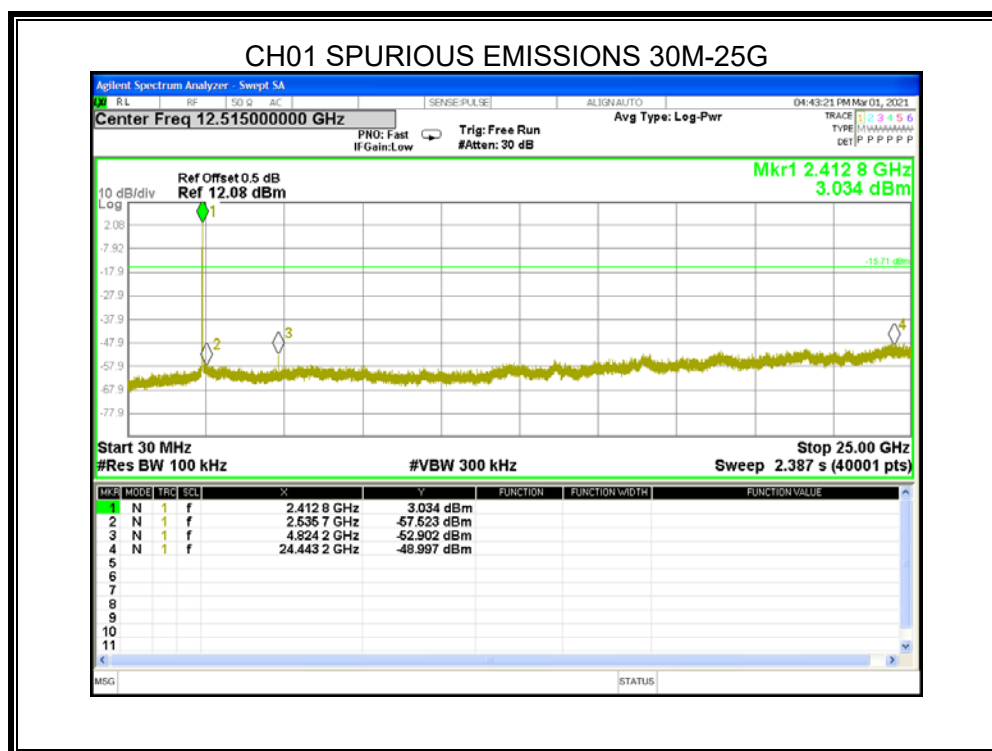


TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

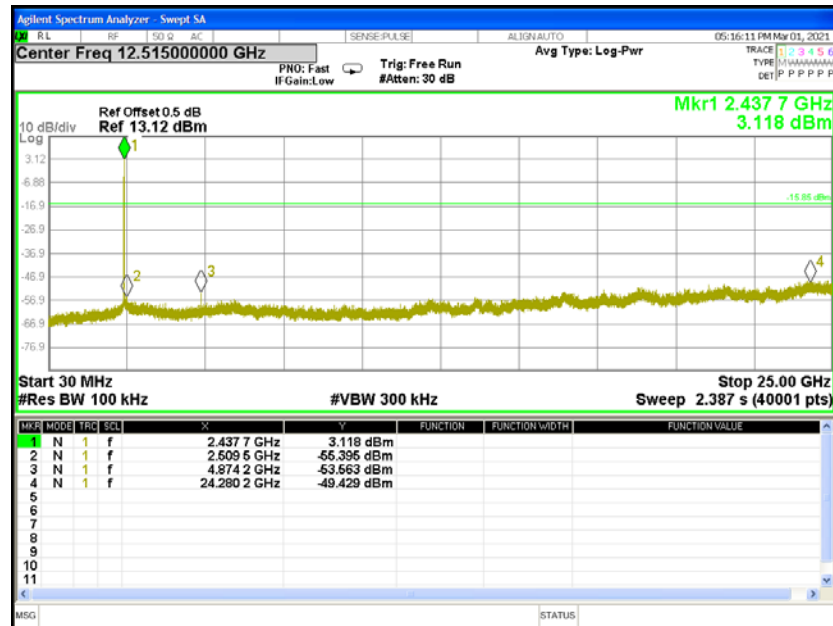
RESULTS

8.5.1. 802.11b MODE

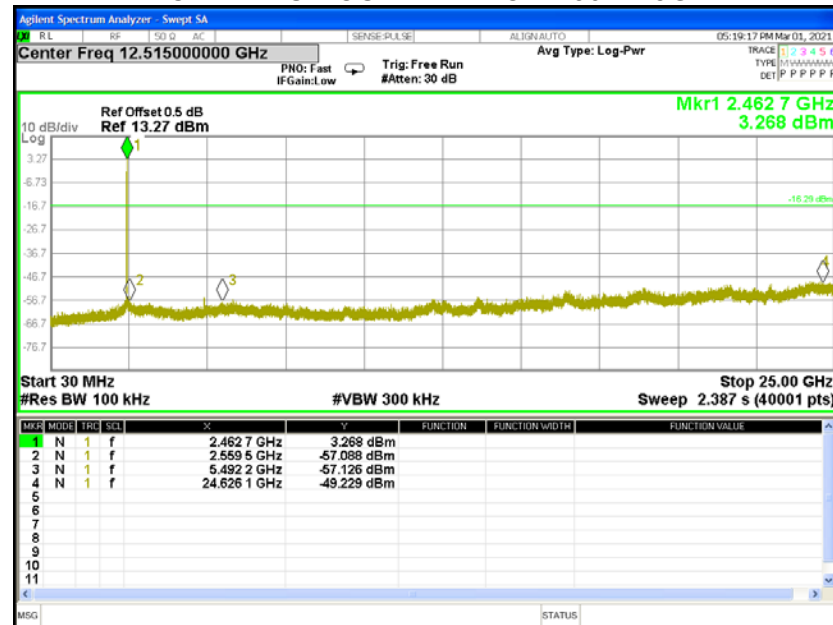


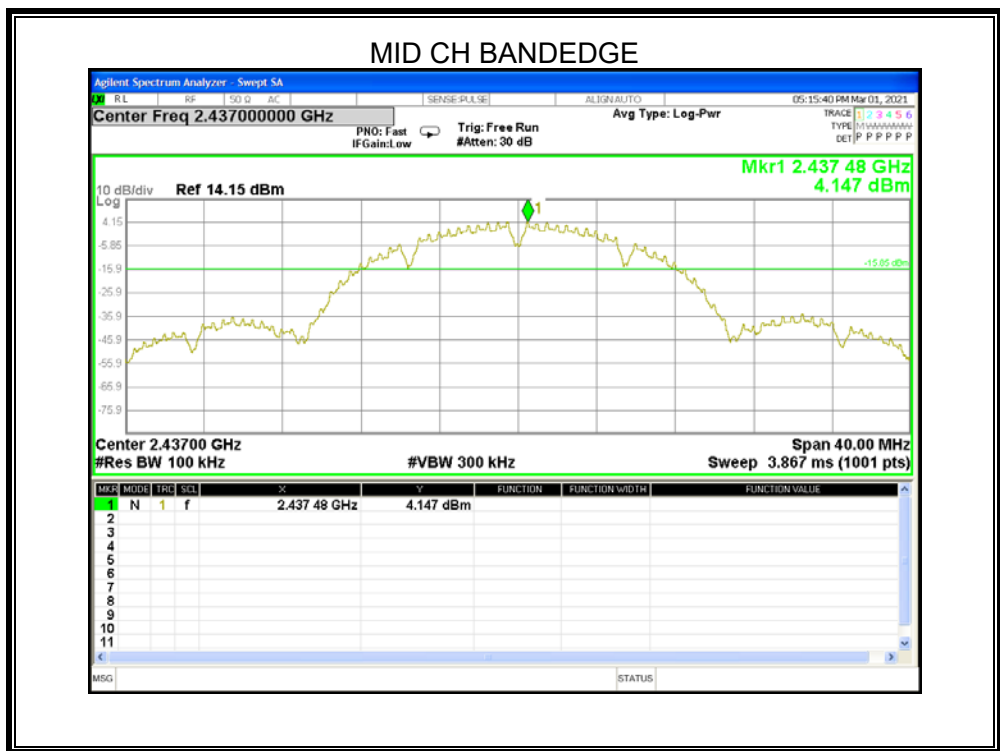
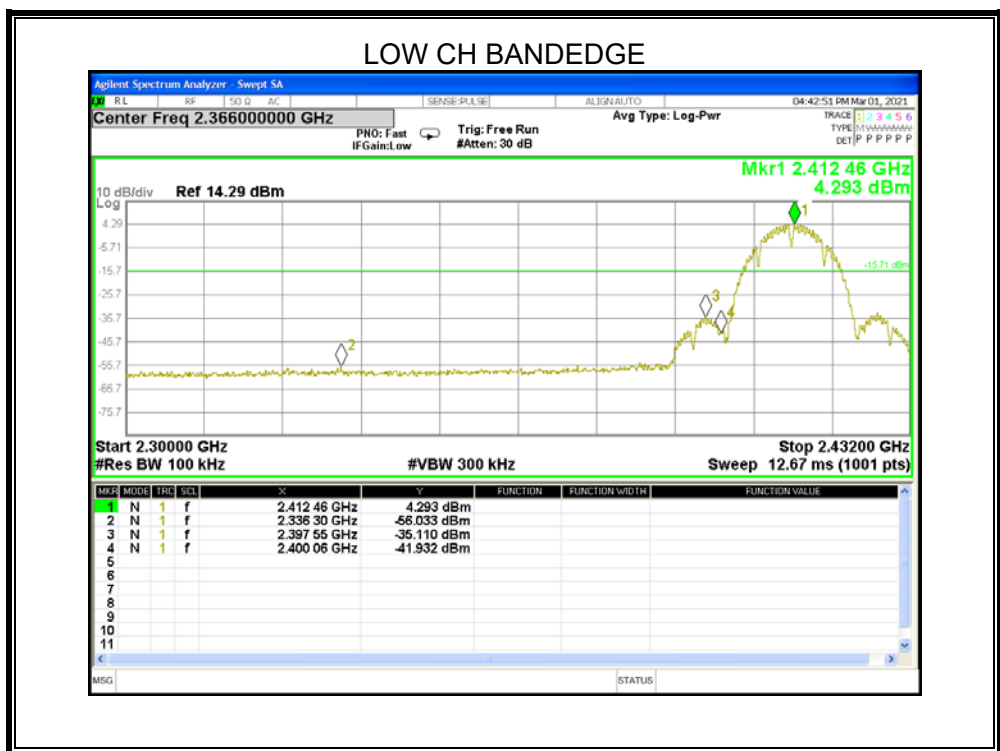


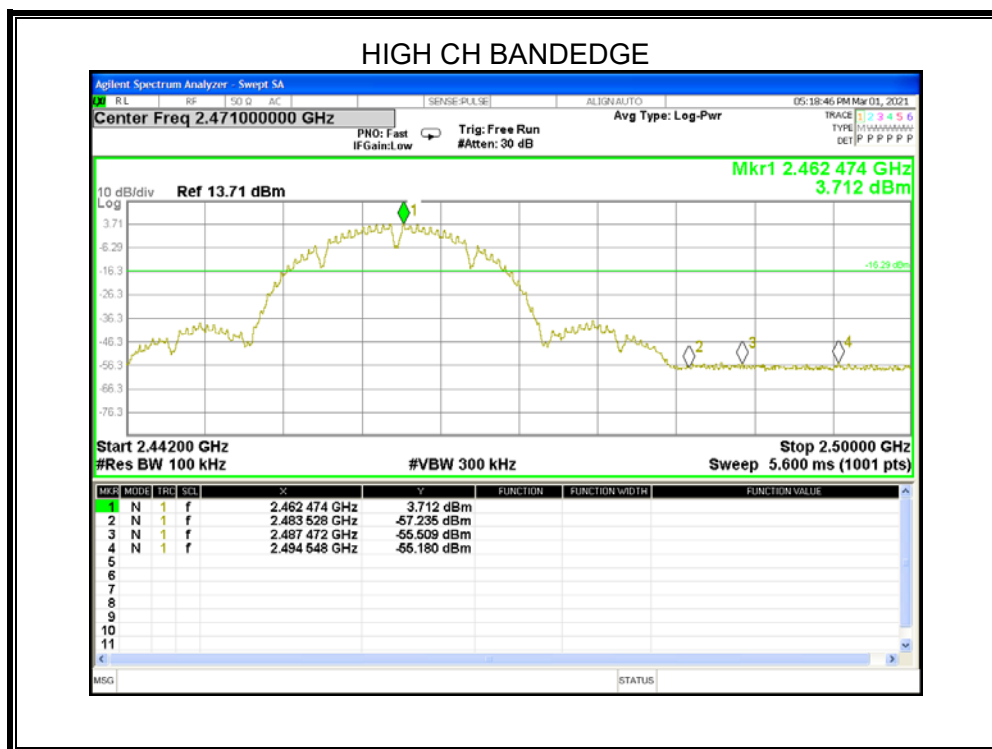
CH06 SPURIOUS EMISSIONS 30M-25G



CH11 SPURIOUS EMISSIONS 30M-25G

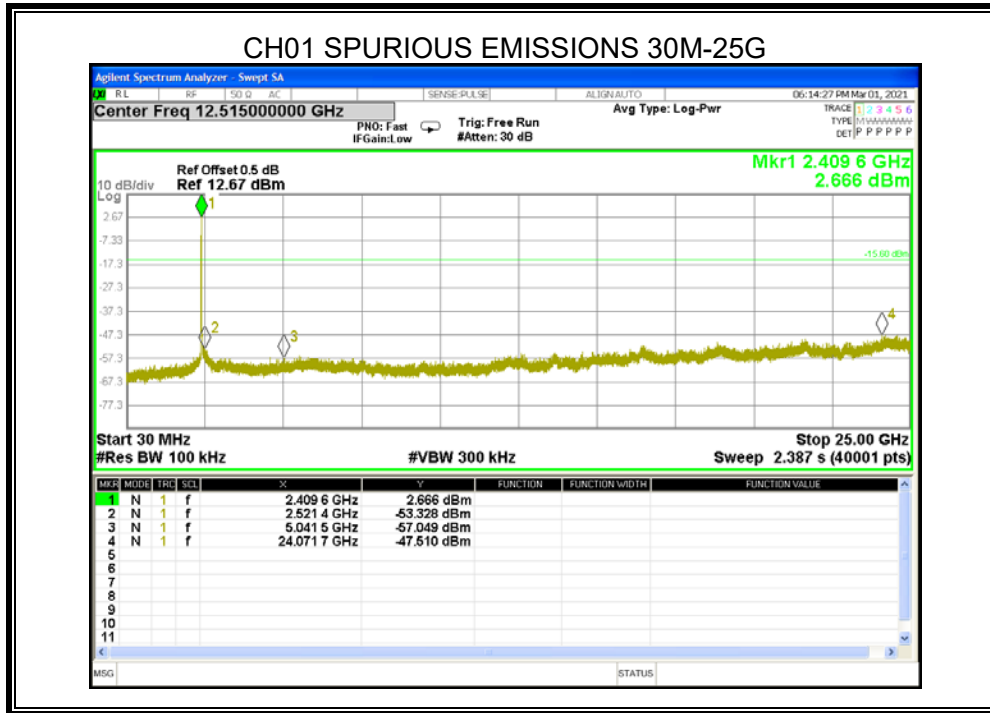






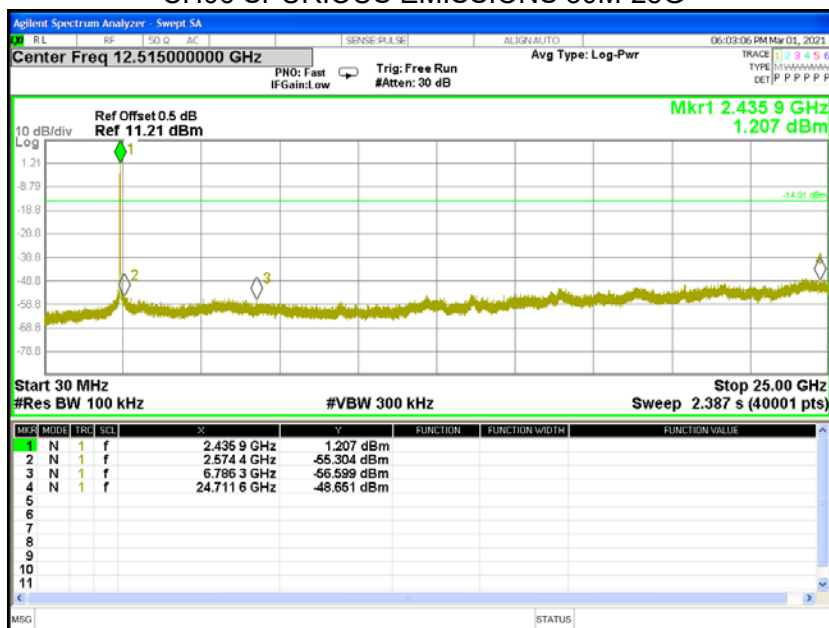


8.5.2. 802.11g MODE

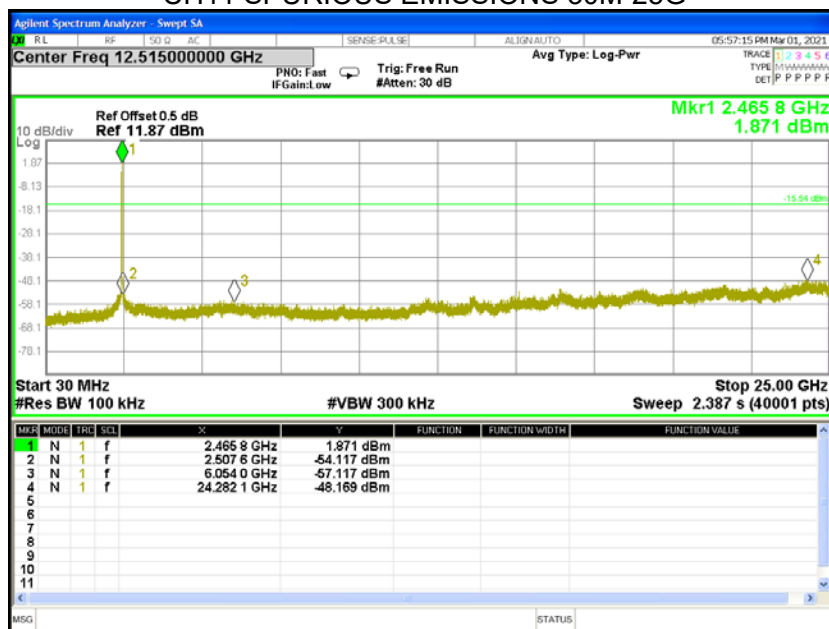




CH06 SPURIOUS EMISSIONS 30M-25G

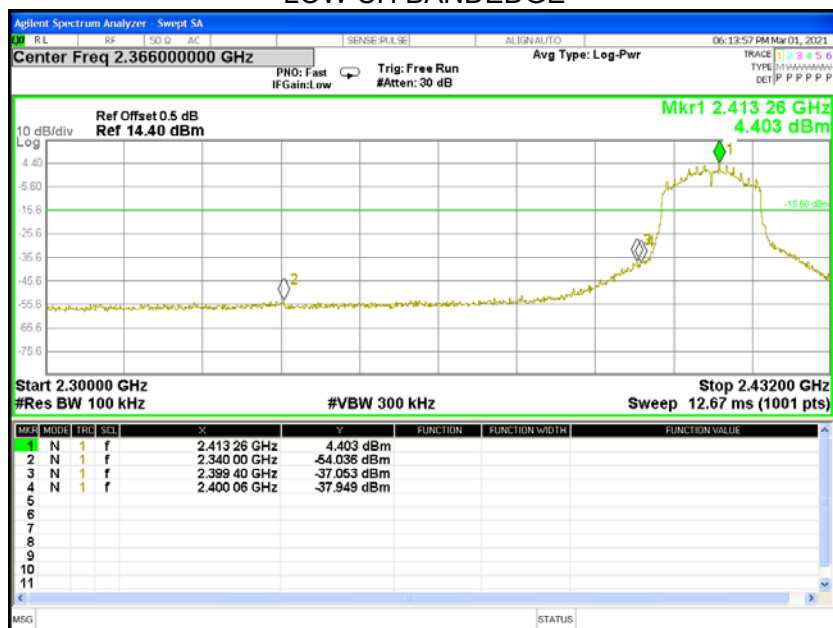


CH11 SPURIOUS EMISSIONS 30M-25G

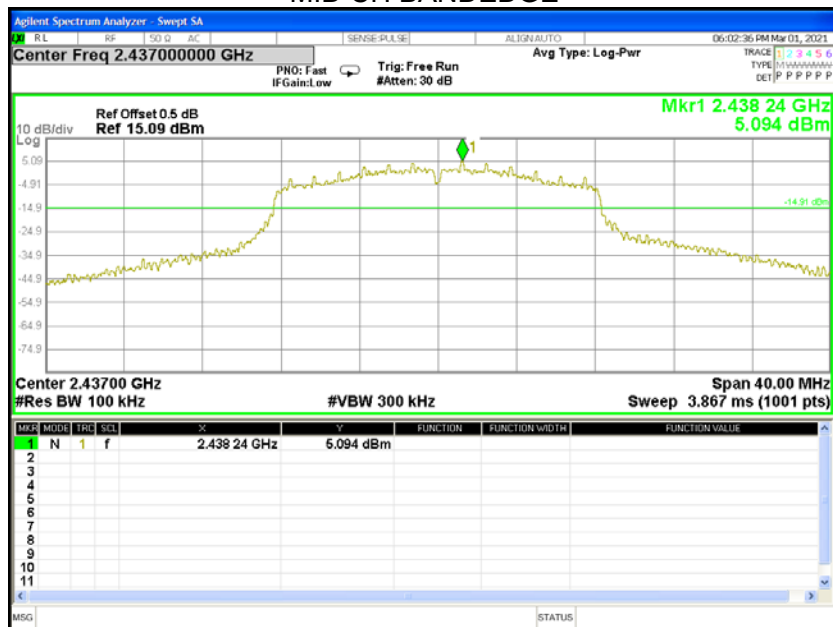


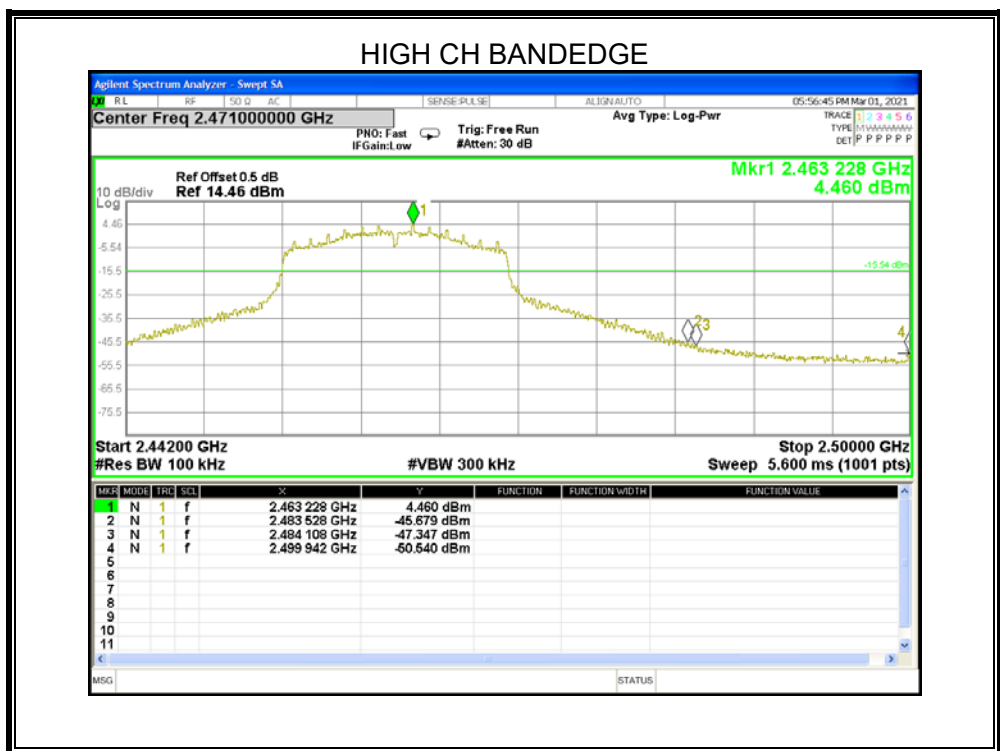


LOW CH BANDEDGE



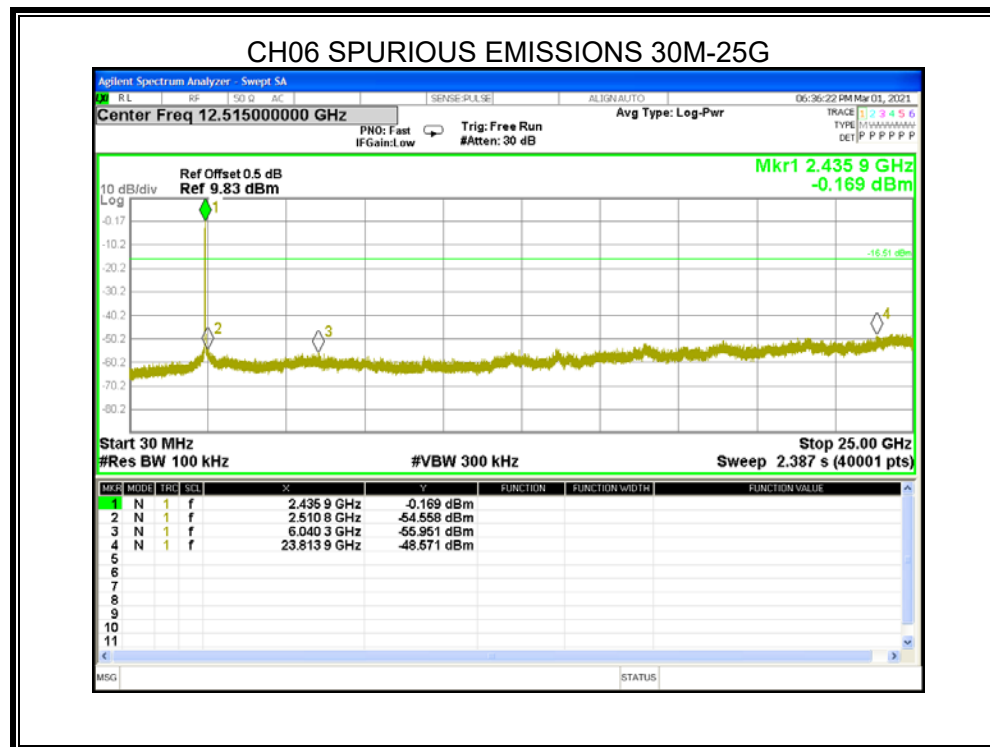
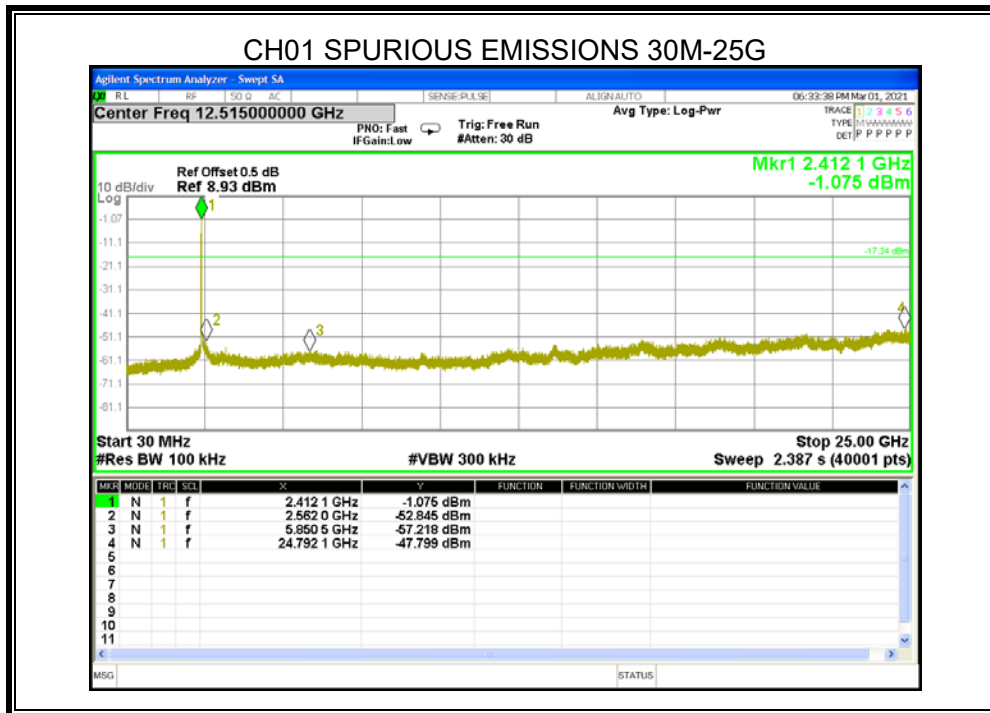
MID CH BANDEDGE





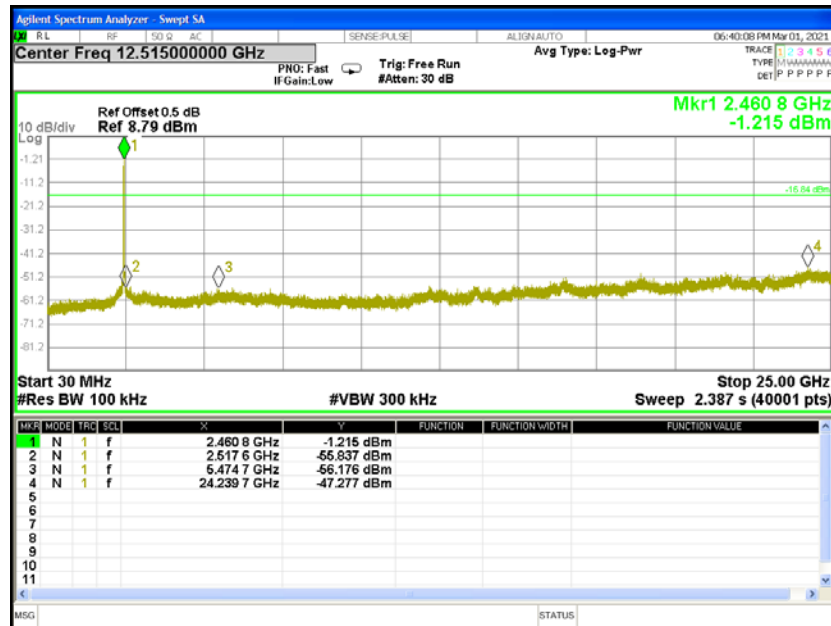


8.5.3. 802.11n HT20 MODE

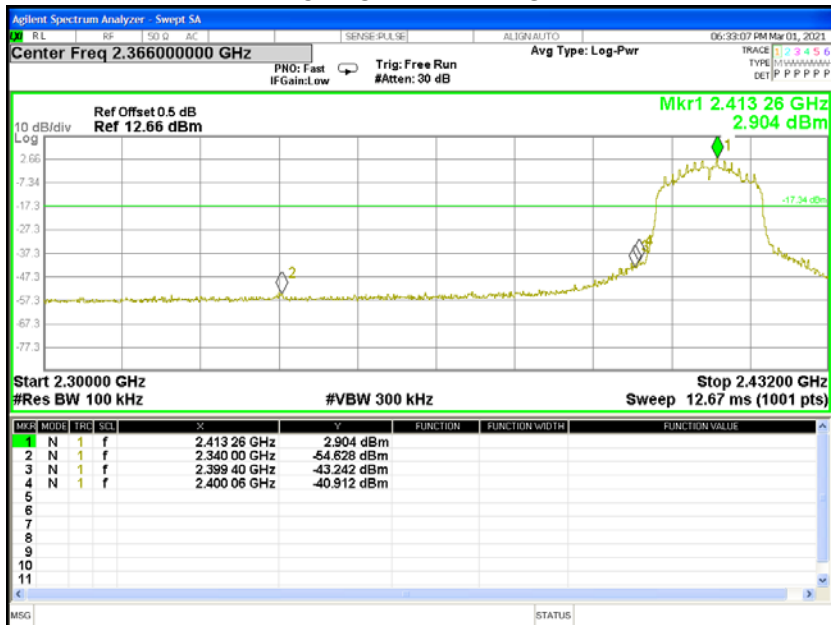




CH11 SPURIOUS EMISSIONS 30M-25G

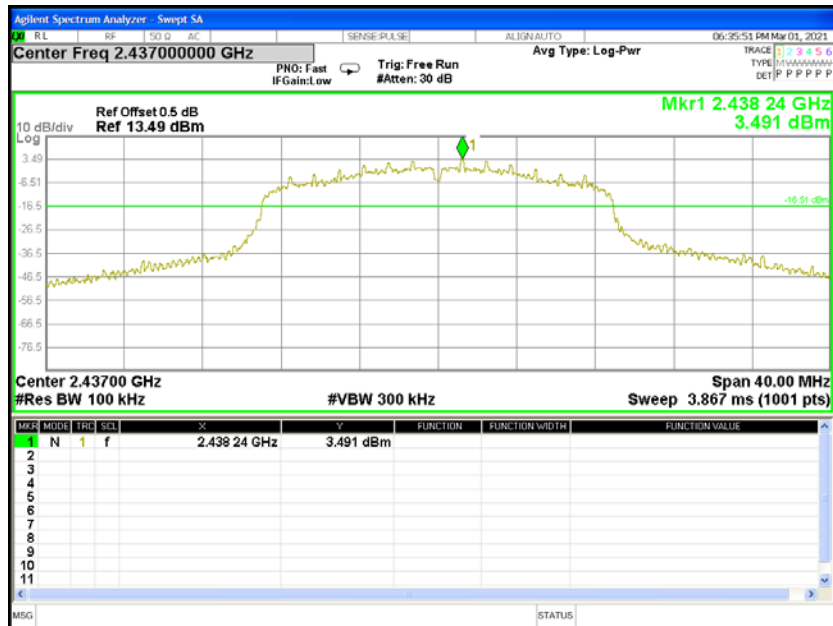


LOW CH BANDEDGE

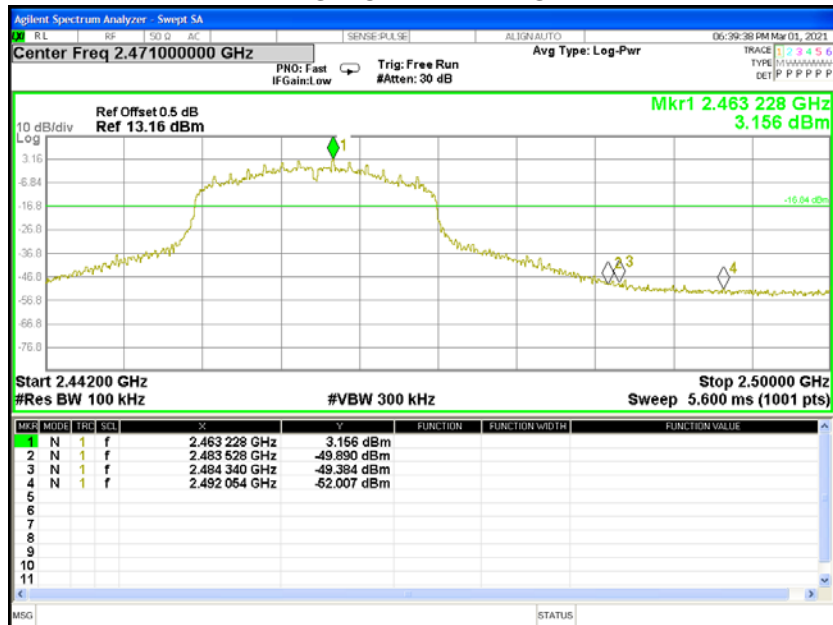




MID CH BANDEDGE



HIGH CH BANDEDGE





9. RADIATED TEST RESULTS

LIMITS

Please refer to FCC §15.205 and §15.209

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.



Radiation Disturbance Test Limit for FCC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Restricted bands of operation

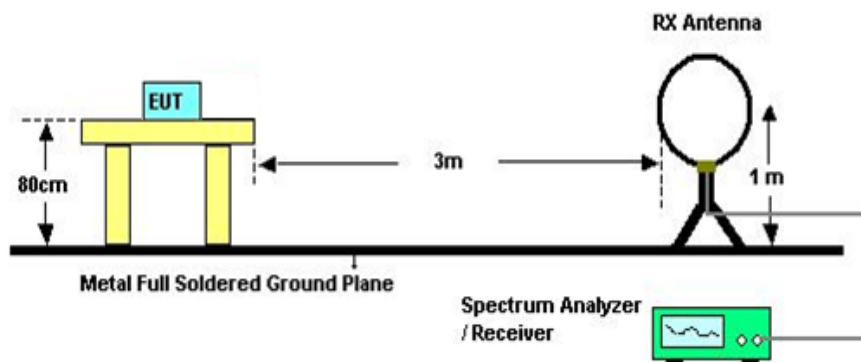
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	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	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

TEST SETUP AND PROCEDURE

Below 30MHz



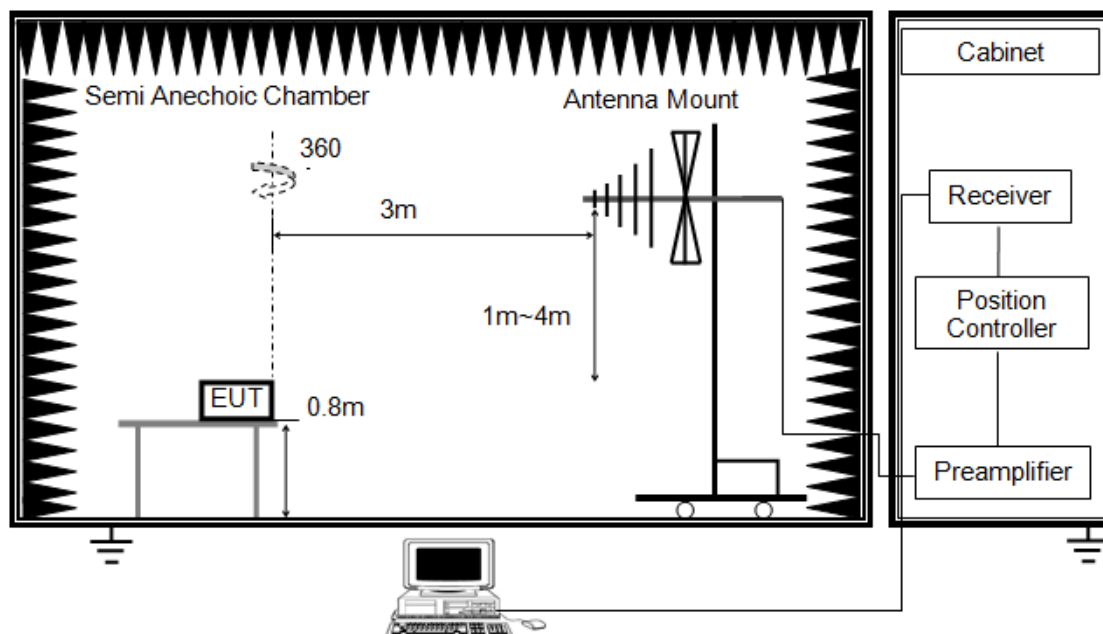
The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Note: Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Below 1G

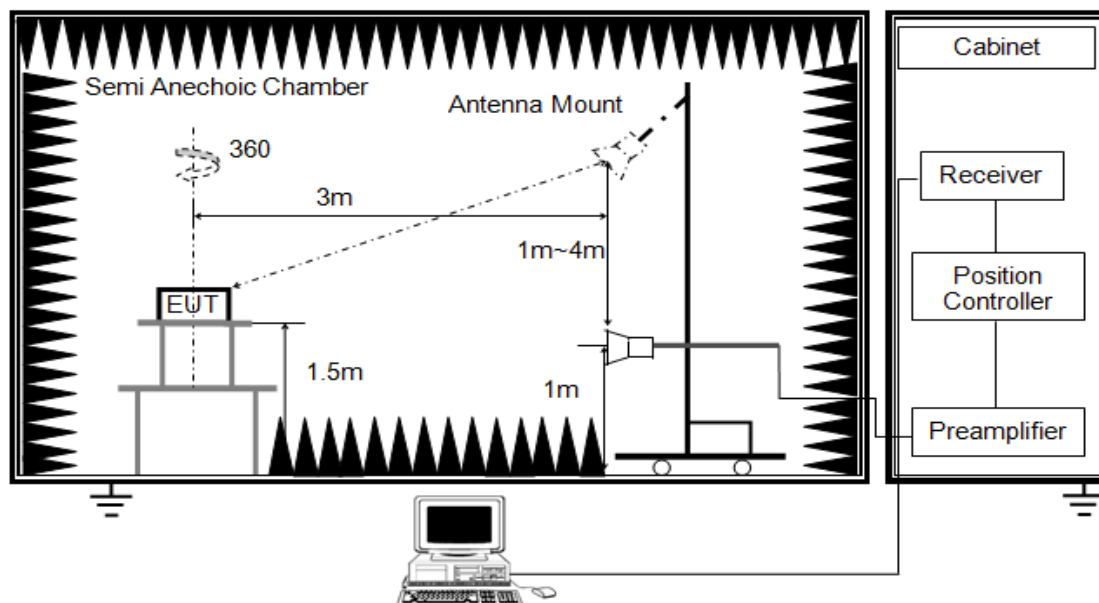


The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

ABOVE 1G



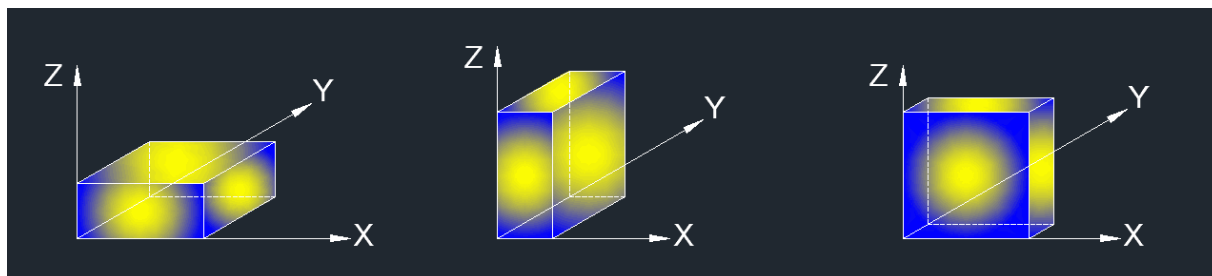
The setting of the spectrum analyser

RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 10KHz video bandwidth with peak detector for average measurements.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)



X axis, Y axis, Z axis positions:



8.The EUT as shown in Figure 1 is the worst mode, the report only shown the worst mode data.

TEST ENVIRONMENT

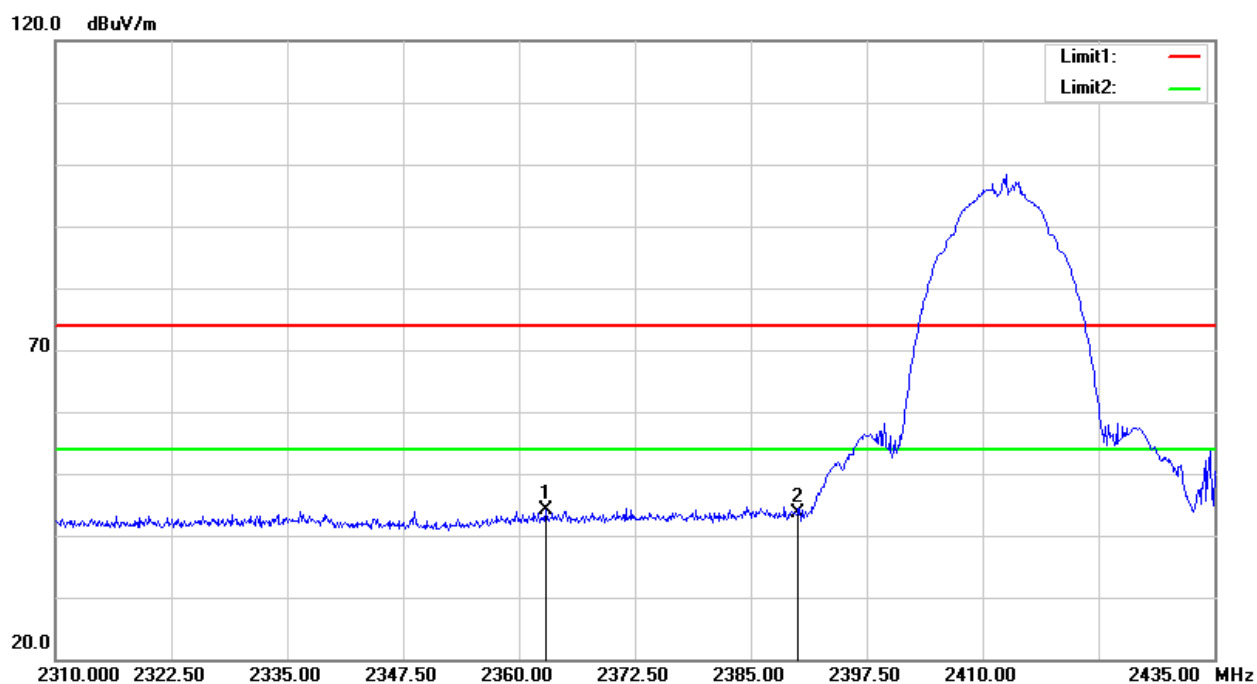
Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz



9.1. RESTRICTED BANDEDGE

802.11 b mode

RESTRICTED BANDEDGE (01 CHANNEL, HORIZONTAL)

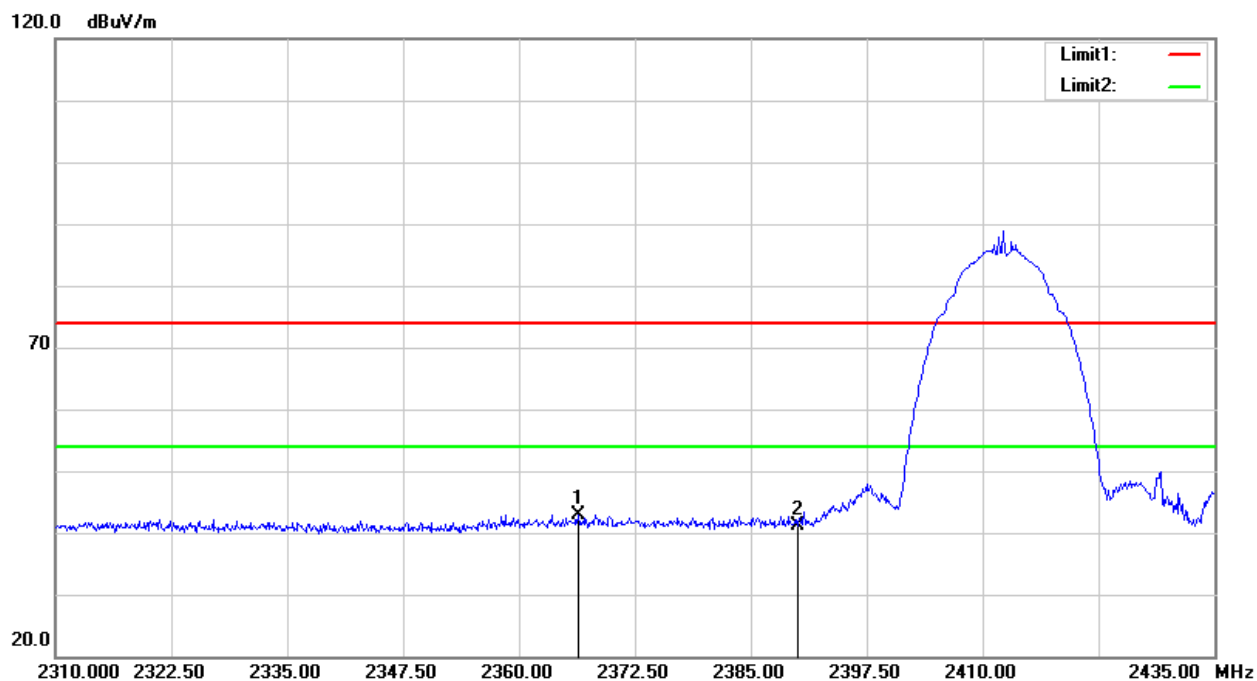


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2362.875	40.12	3.93	44.05	74.00	-29.95	peak
2	2390.000	39.36	4.34	43.70	74.00	-30.30	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (01 CHANNEL, VERTICAL)

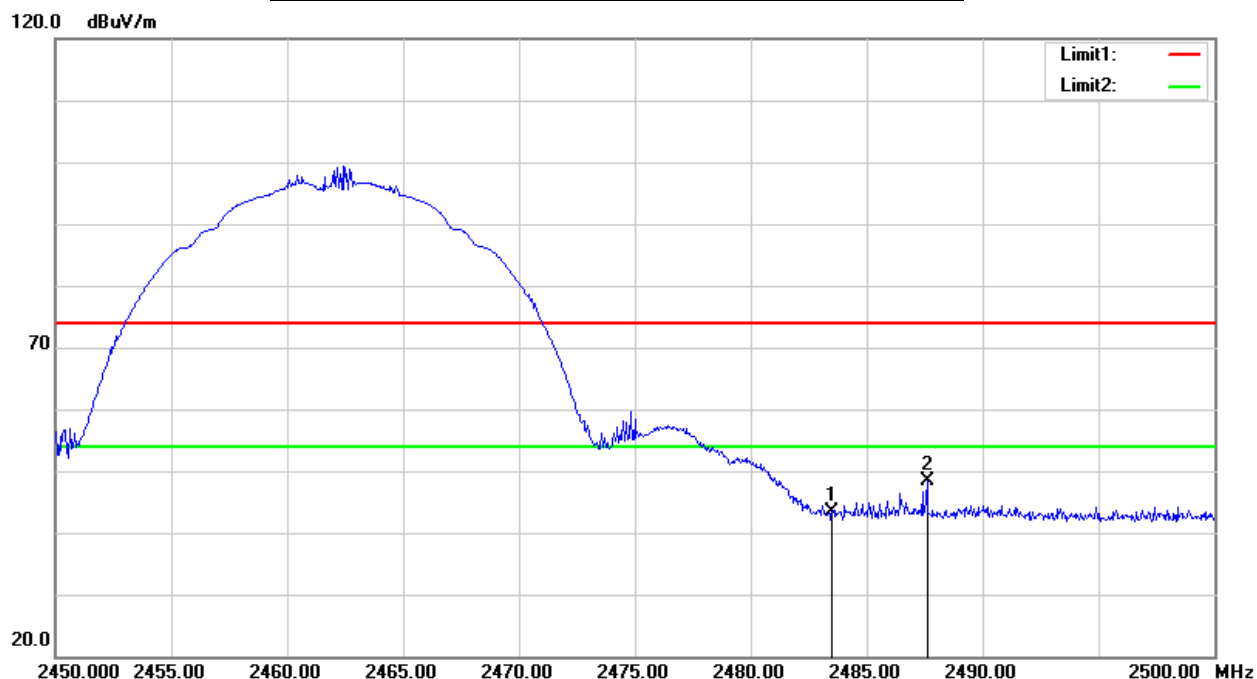


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2366.375	38.92	3.99	42.91	74.00	-31.09	peak
2	2390.000	36.75	4.34	41.09	74.00	-32.91	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (11 CHANNEL, HORIZONTAL)

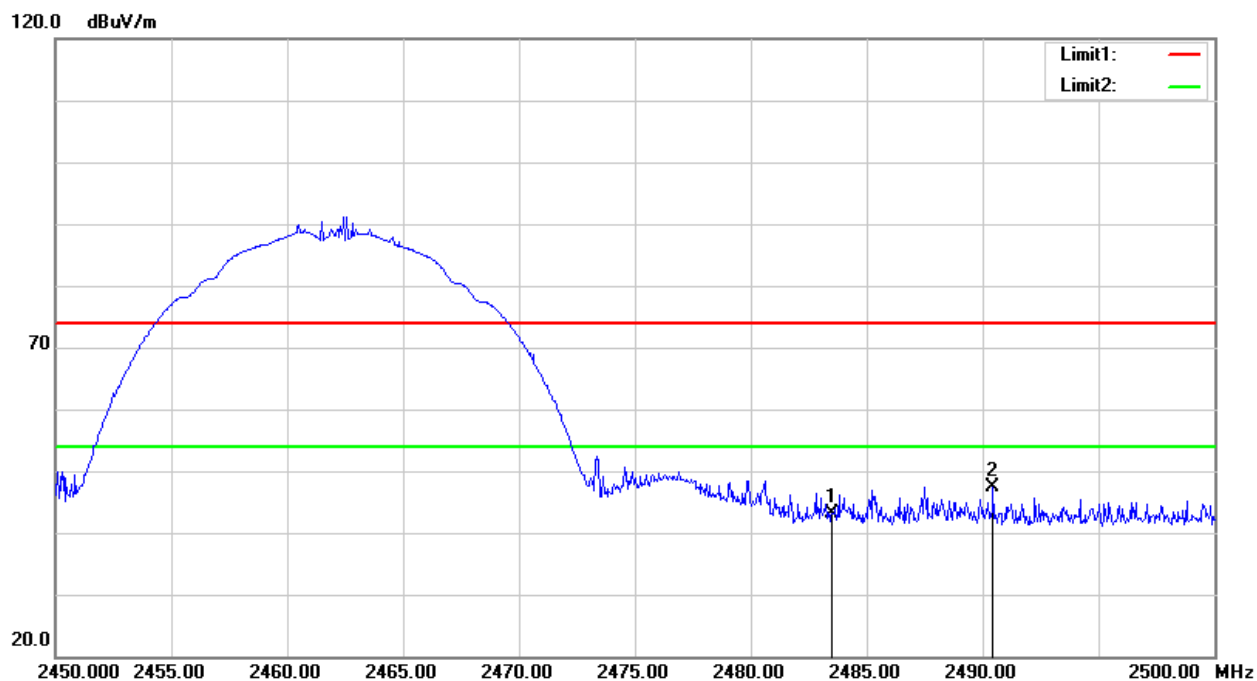


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	38.72	4.60	43.32	74.00	-30.68	peak
2	2487.600	43.82	4.62	48.44	74.00	-25.56	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (11 CHANNEL, VERTICAL)



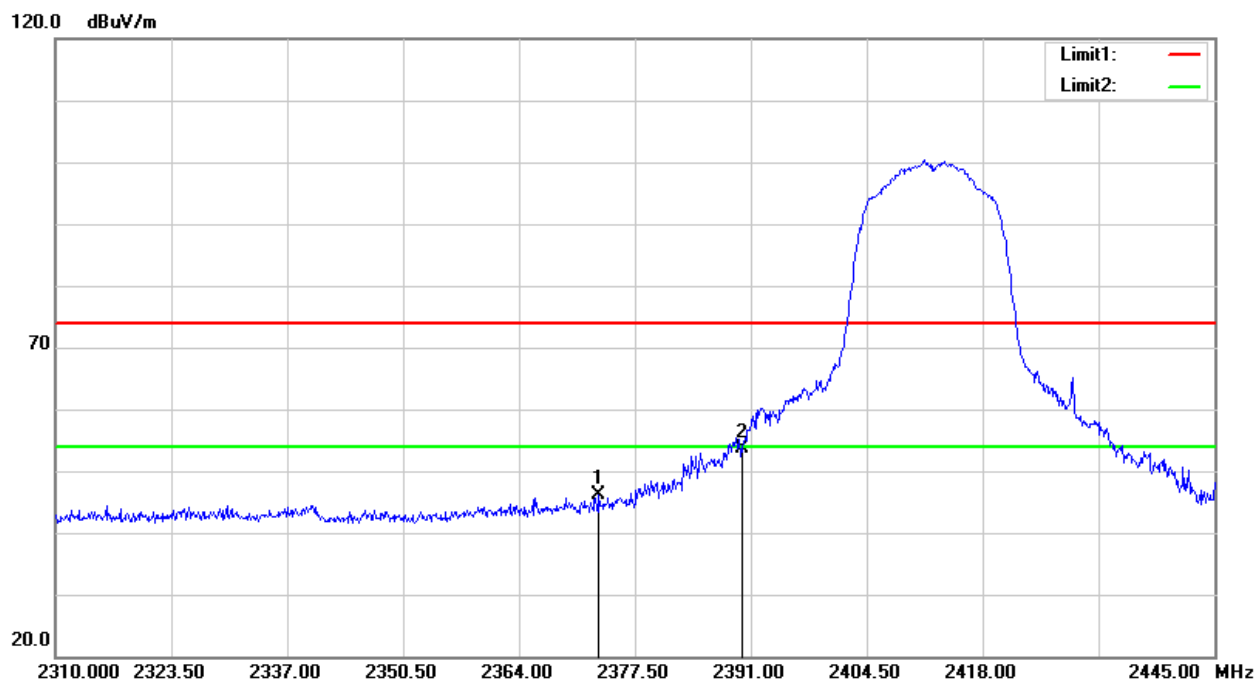
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	38.63	4.60	43.23	74.00	-30.77	peak
2	2490.450	42.67	4.63	47.30	74.00	-26.70	peak

Note: Measurement = Reading Level + Correct Factor.



802.11 g mode

RESTRICTED BANDEDGE (01 CHANNEL, HORIZONTAL)

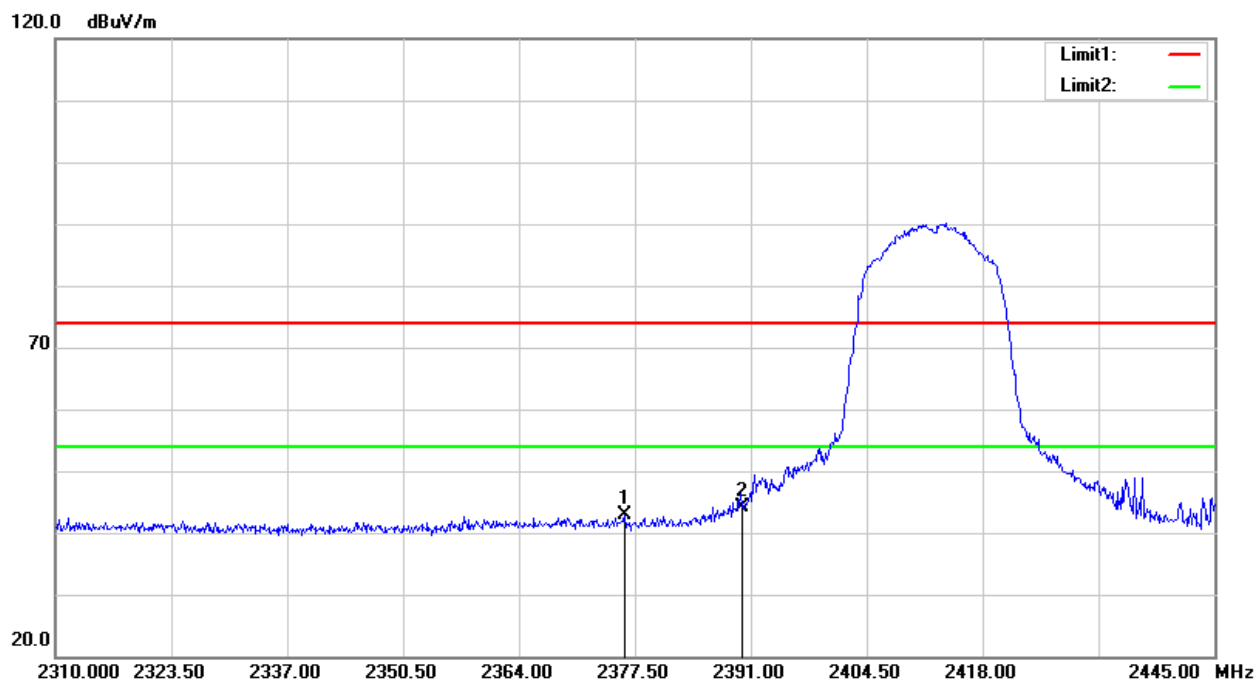


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2373.315	42.04	4.09	46.13	74.00	-27.87	peak
2	2390.000	49.40	4.34	53.74	74.00	-20.26	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (01 CHANNEL, VERTICAL)

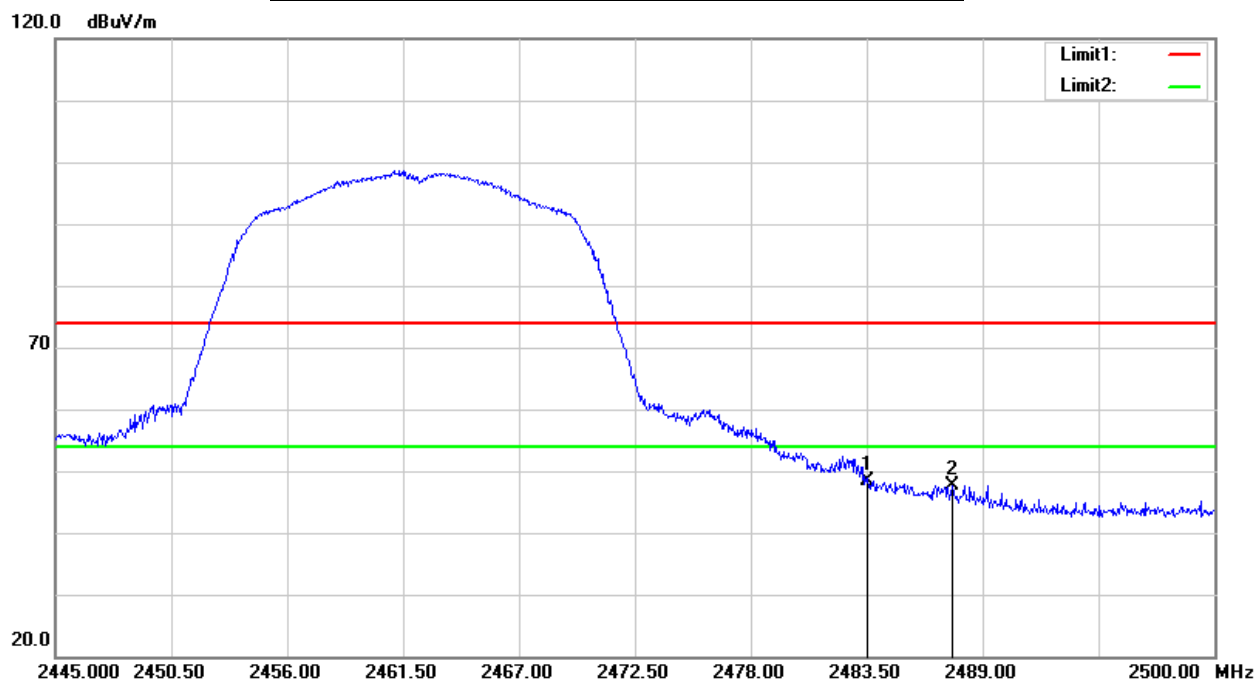


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2376.285	38.69	4.13	42.82	74.00	-31.18	peak
2	2390.000	39.87	4.34	44.21	74.00	-29.79	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (11 CHANNEL, HORIZONTAL)

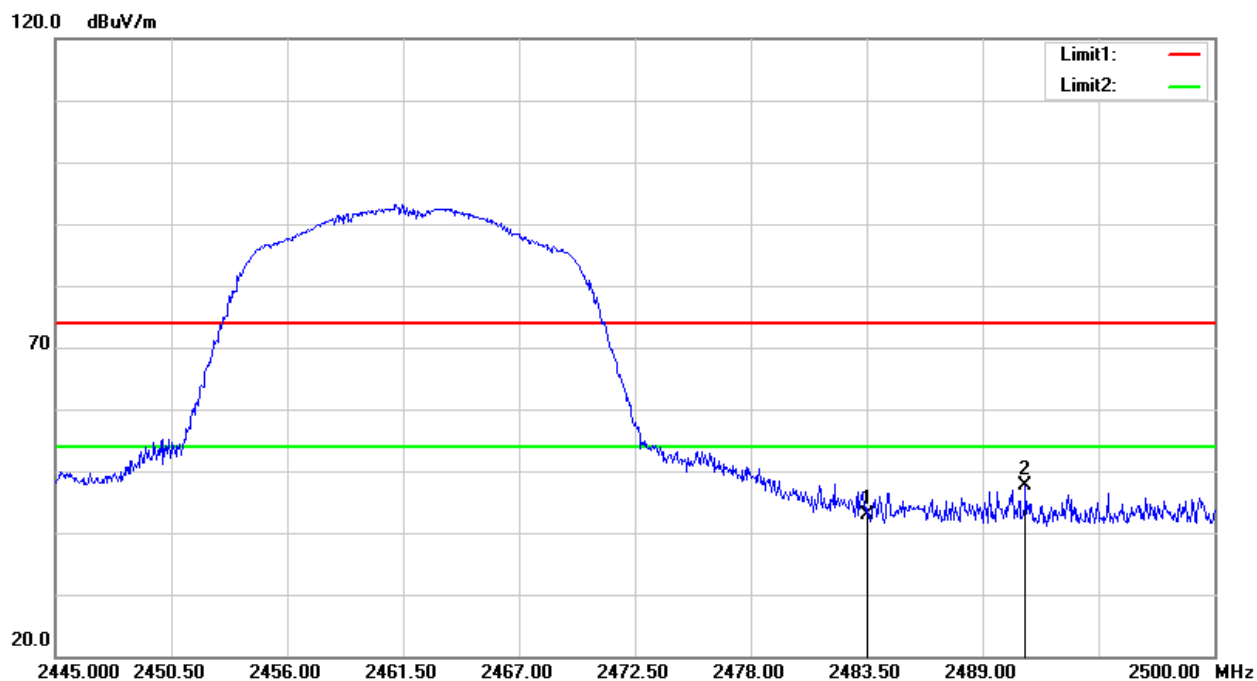


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	43.80	4.60	48.40	74.00	-25.60	peak
2	2487.570	43.13	4.62	47.75	74.00	-26.25	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (11 CHANNEL, VERTICAL)



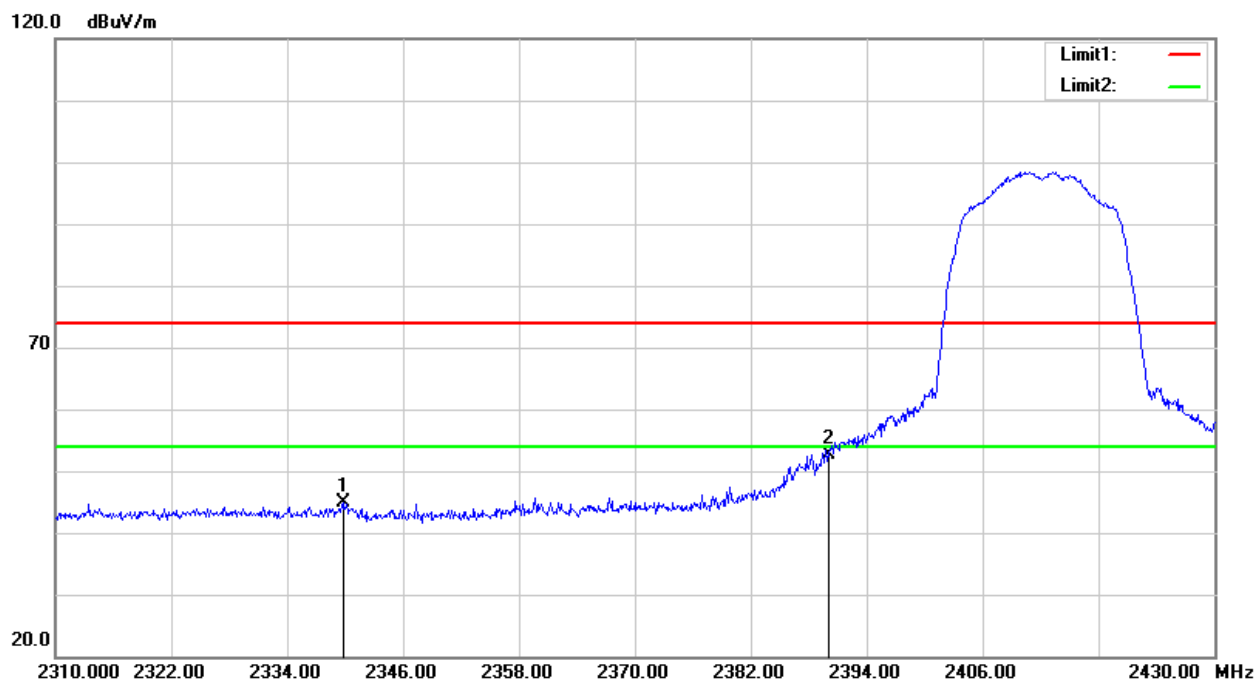
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	38.26	4.60	42.86	74.00	-31.14	peak
2	2491.035	42.93	4.63	47.56	74.00	-26.44	peak

Note: Measurement = Reading Level + Correct Factor.



802.11 n20 mode

RESTRICTED BANDEDGE (01 CHANNEL, HORIZONTAL)

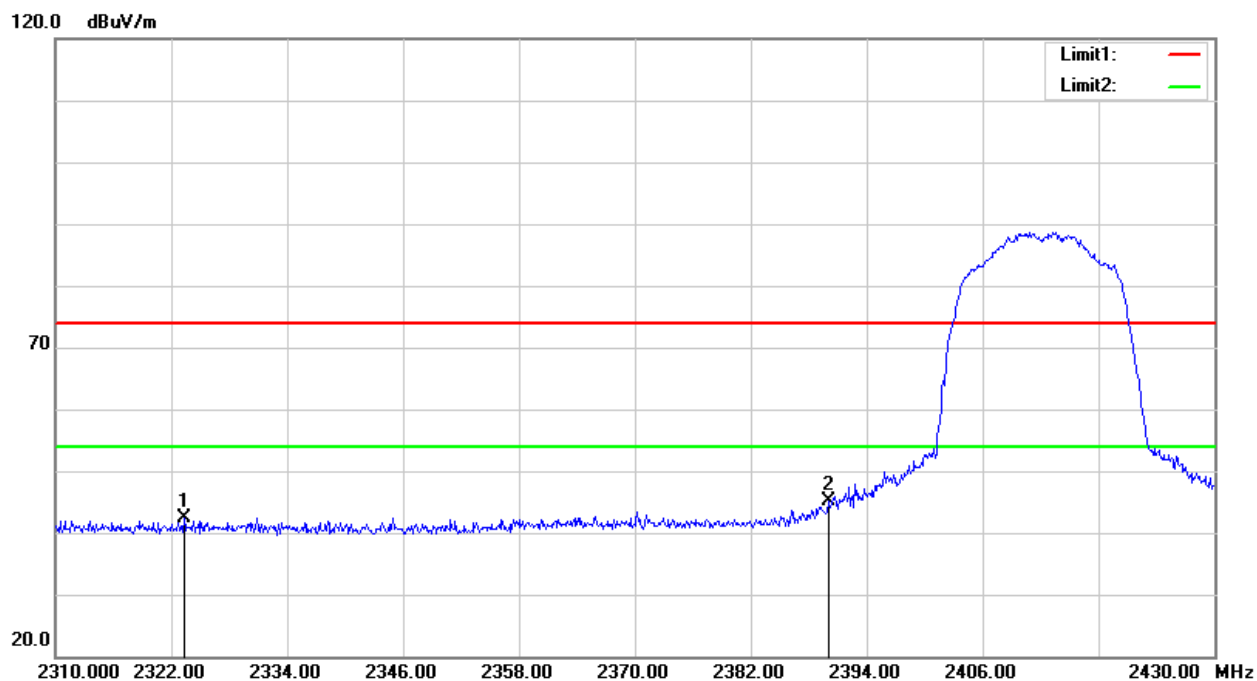


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2339.760	41.20	3.69	44.89	74.00	-29.11	peak
2	2390.000	48.25	4.34	52.59	74.00	-21.41	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (01 CHANNEL, VERTICAL)

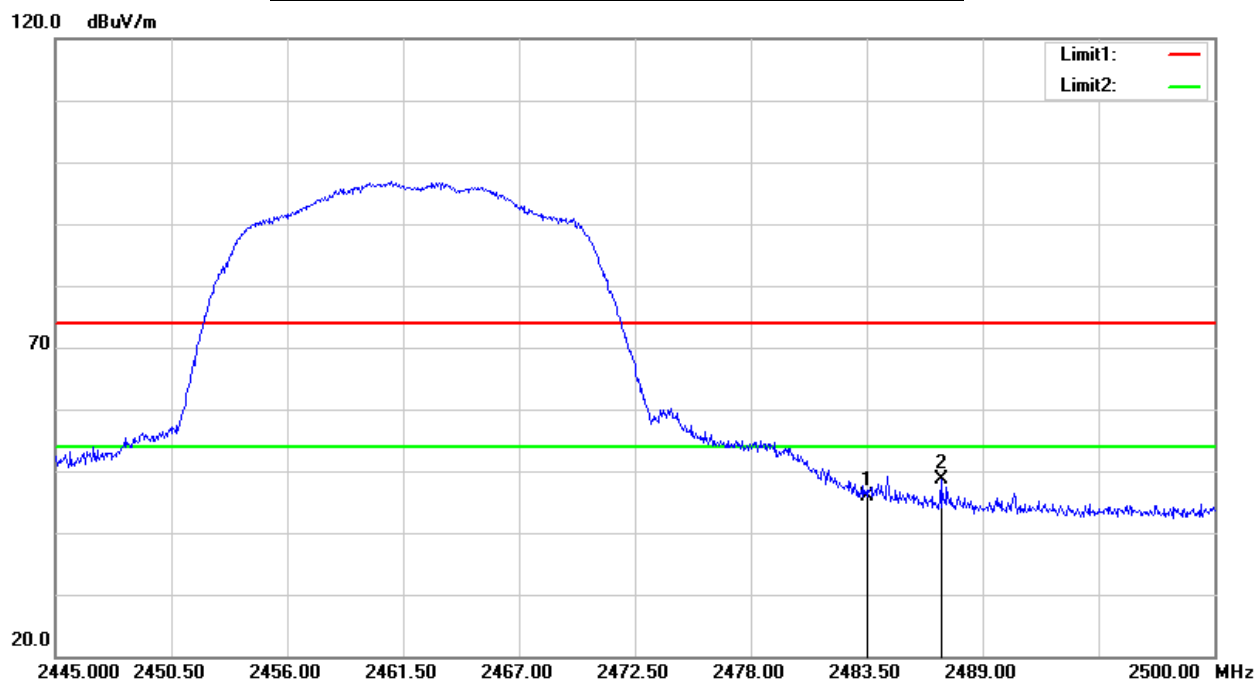


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.320	38.80	3.60	42.40	74.00	-31.60	peak
2	2390.000	40.75	4.34	45.09	74.00	-28.91	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (11 CHANNEL, HORIZONTAL)

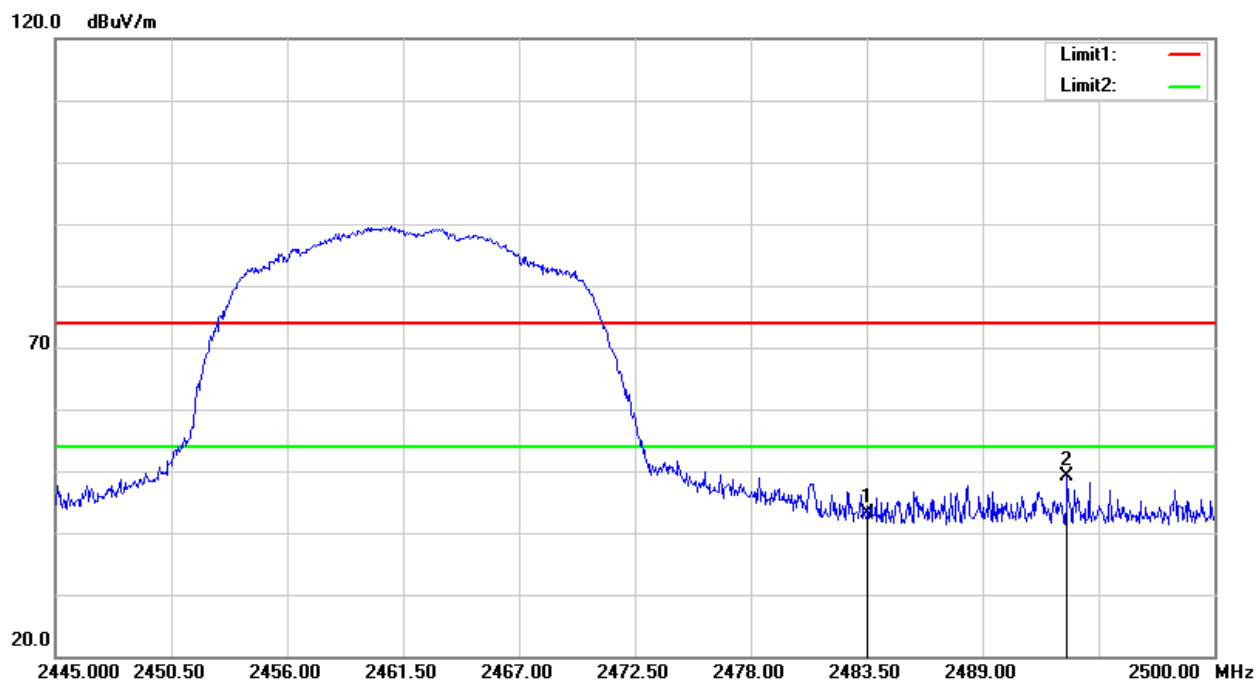


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	41.21	4.60	45.81	74.00	-28.19	peak
2	2487.020	43.96	4.62	48.58	74.00	-25.42	peak

Note: Measurement = Reading Level + Correct Factor.



RESTRICTED BANDEDGE (11 CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	38.62	4.60	43.22	74.00	-30.78	peak
2	2493.015	44.47	4.64	49.11	74.00	-24.89	peak

Note: Measurement = Reading Level + Correct Factor.

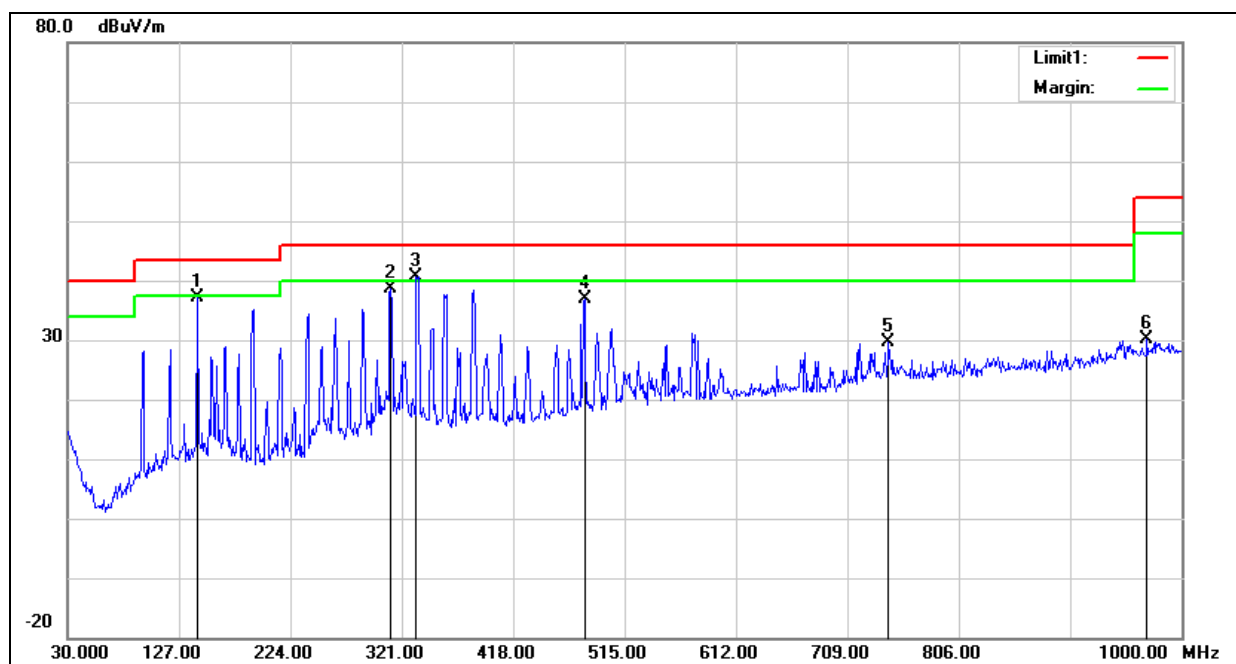


9.2. SPURIOUS EMISSIONS (30-1GHz)

Note: All the channels had been tested, but only the worst data recorded in the report.

802.11 b mode

HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	143.4900	55.37	-18.23	37.14	43.50	-6.36	QP
2	311.3000	52.99	-14.40	38.59	46.00	-7.41	QP
3	333.6100	54.17	-13.59	40.58	46.00	-5.42	QP
4	480.0800	45.55	-8.65	36.90	46.00	-9.10	QP
5	744.8900	31.84	-2.13	29.71	46.00	-16.29	QP
6	969.9300	28.04	2.00	30.04	54.00	-23.96	QP

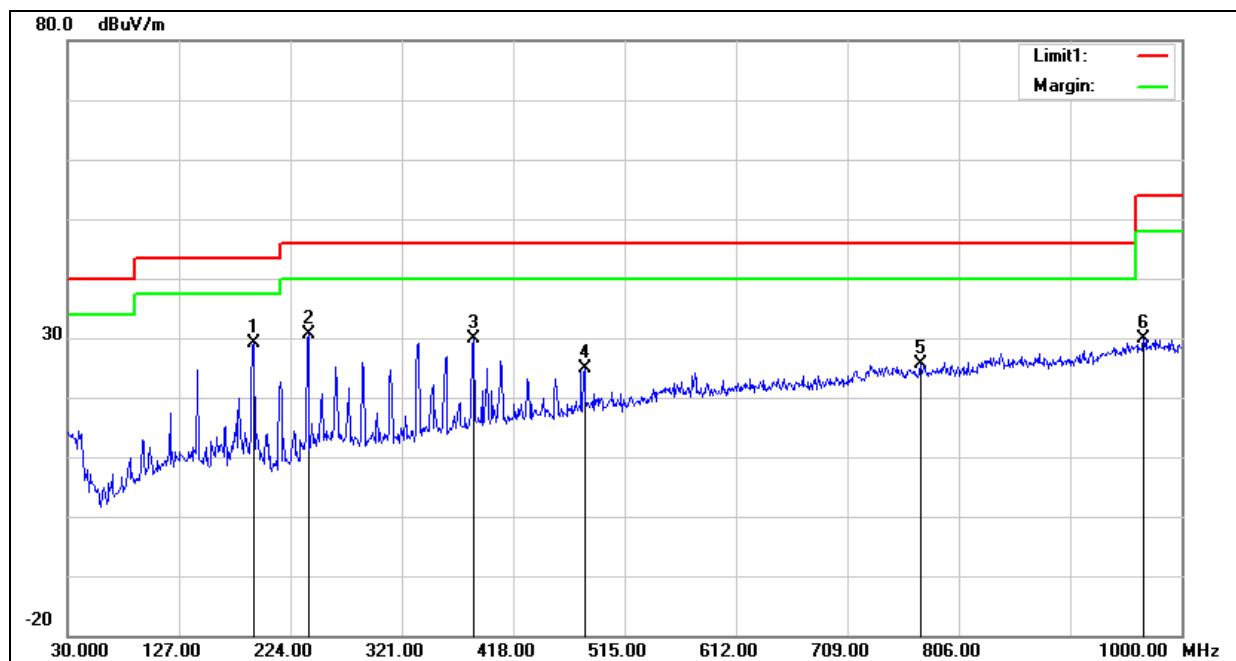
Note: Measurement = Reading Level + Correct Factor.

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HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



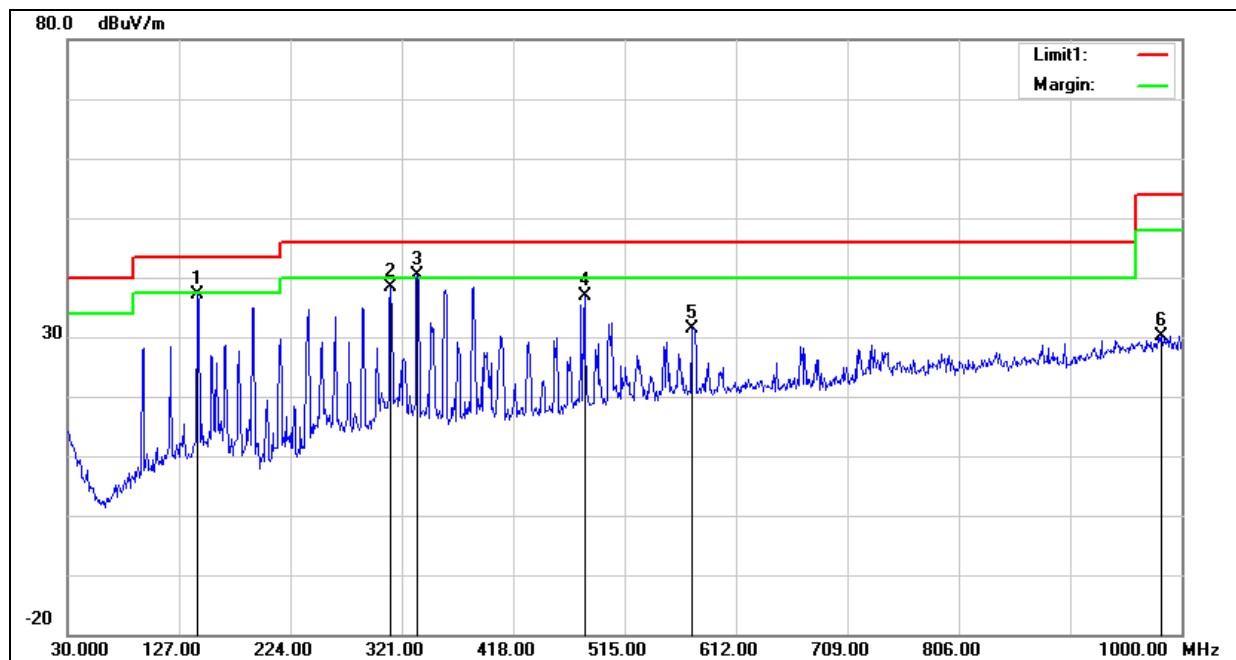
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	191.9900	50.12	-21.04	29.08	43.50	-14.42	QP
2	239.5200	48.75	-18.10	30.65	46.00	-15.35	QP
3	384.0500	41.87	-11.99	29.88	46.00	-16.12	QP
4	480.0800	33.48	-8.65	24.83	46.00	-21.17	QP
5	773.0200	27.84	-2.30	25.54	46.00	-20.46	QP
6	967.0200	27.90	1.93	29.83	54.00	-24.17	QP

Note: Measurement = Reading Level + Correct Factor.



802.11 g mode

HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)

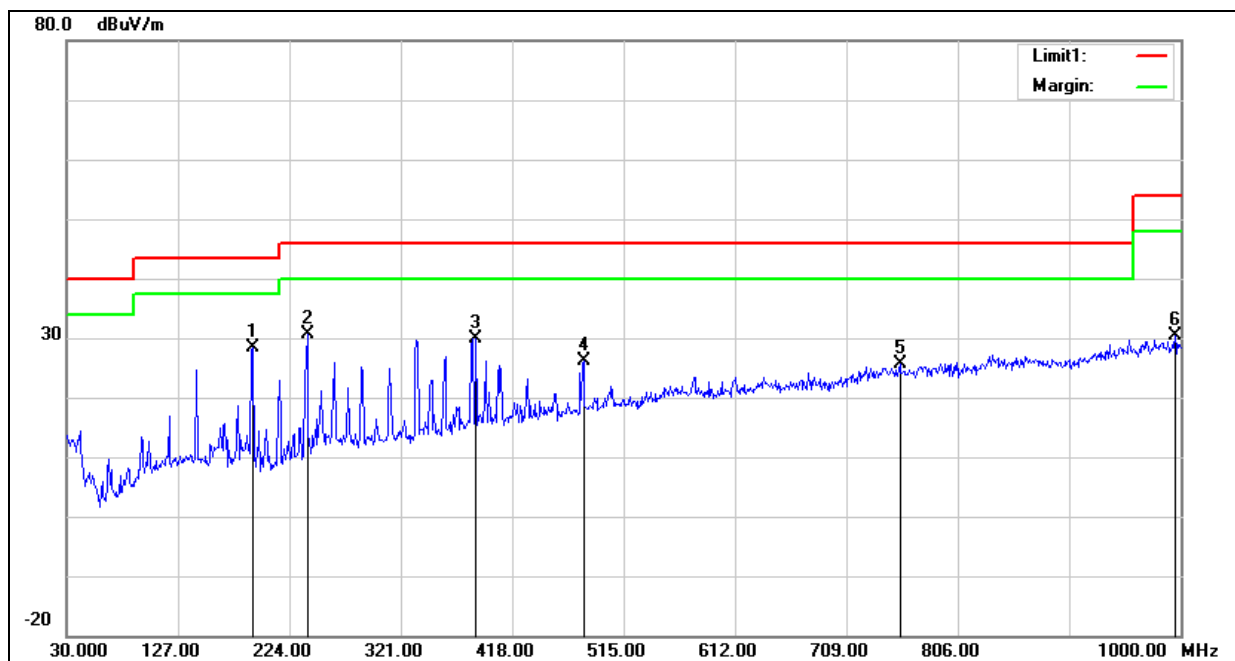


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	143.4900	55.24	-18.23	37.01	43.50	-6.49	QP
2	311.3000	52.74	-14.40	38.34	46.00	-7.66	QP
3	334.5800	53.95	-13.56	40.39	46.00	-5.61	QP
4	480.0800	45.52	-8.65	36.87	46.00	-9.13	QP
5	574.1700	37.11	-5.67	31.44	46.00	-14.56	QP
6	982.5400	27.67	2.52	30.19	54.00	-23.81	QP

Note: Measurement = Reading Level + Correct Factor.



HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



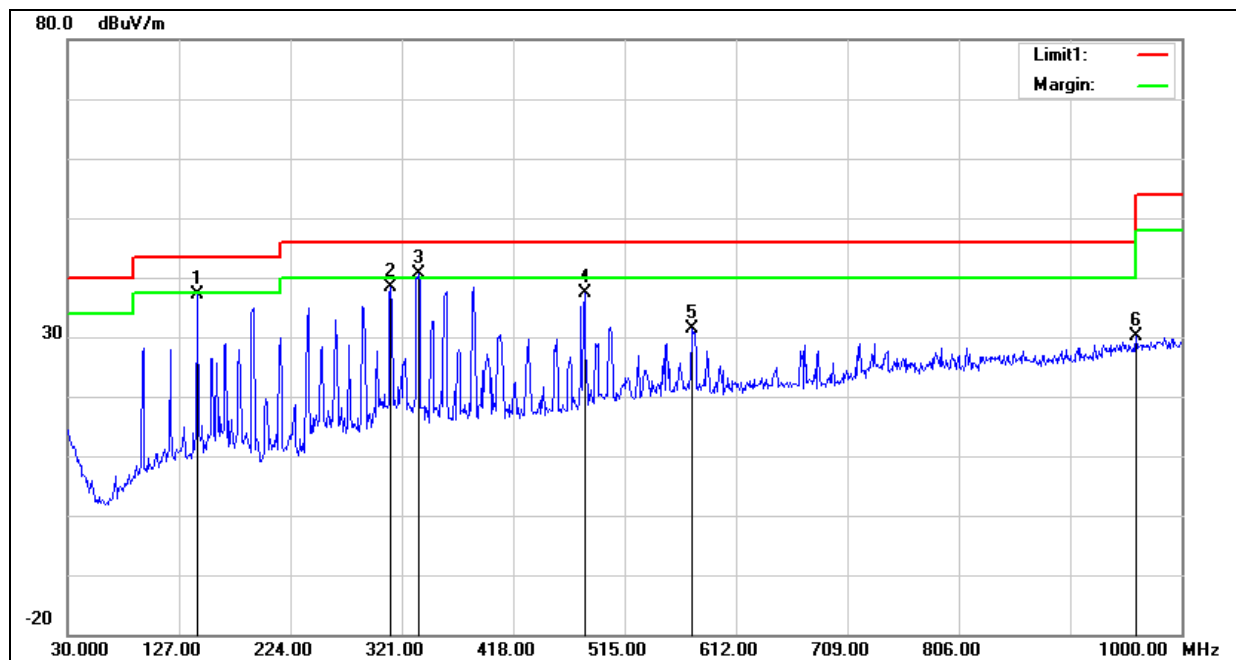
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	191.9900	49.44	-21.04	28.40	43.50	-15.10	QP
2	239.5200	48.68	-18.10	30.58	46.00	-15.42	QP
3	385.9900	41.71	-11.86	29.85	46.00	-16.15	QP
4	480.0800	34.87	-8.65	26.22	46.00	-19.78	QP
5	755.5600	27.87	-2.17	25.70	46.00	-20.30	QP
6	995.1500	28.33	2.04	30.37	54.00	-23.63	QP

Note: Measurement = Reading Level + Correct Factor.



802.11 n20 mode

HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)

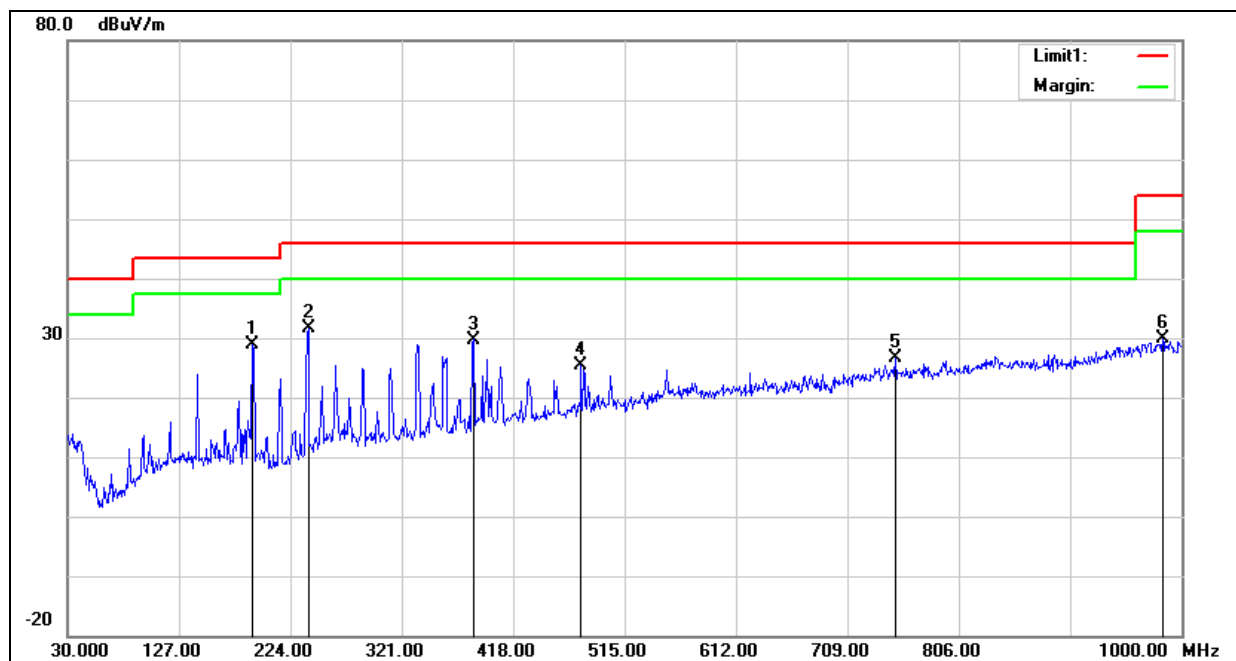


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	143.4900	55.41	-18.23	37.18	43.50	-6.32	QP
2	311.3000	52.78	-14.40	38.38	46.00	-7.62	QP
3	335.5500	54.15	-13.54	40.61	46.00	-5.39	QP
4	480.0800	46.02	-8.65	37.37	46.00	-8.63	QP
5	574.1700	37.16	-5.67	31.49	46.00	-14.51	QP
6	960.2300	28.26	1.76	30.02	54.00	-23.98	QP

Note: Measurement = Reading Level + Correct Factor.



HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	191.0200	49.82	-21.01	28.81	43.50	-14.69	QP
2	239.5200	49.61	-18.10	31.51	46.00	-14.49	QP
3	383.0800	41.81	-12.06	29.75	46.00	-16.25	QP
4	477.1700	34.16	-8.75	25.41	46.00	-20.59	QP
5	750.7100	28.75	-2.16	26.59	46.00	-19.41	QP
6	983.5100	27.38	2.46	29.84	54.00	-24.16	QP

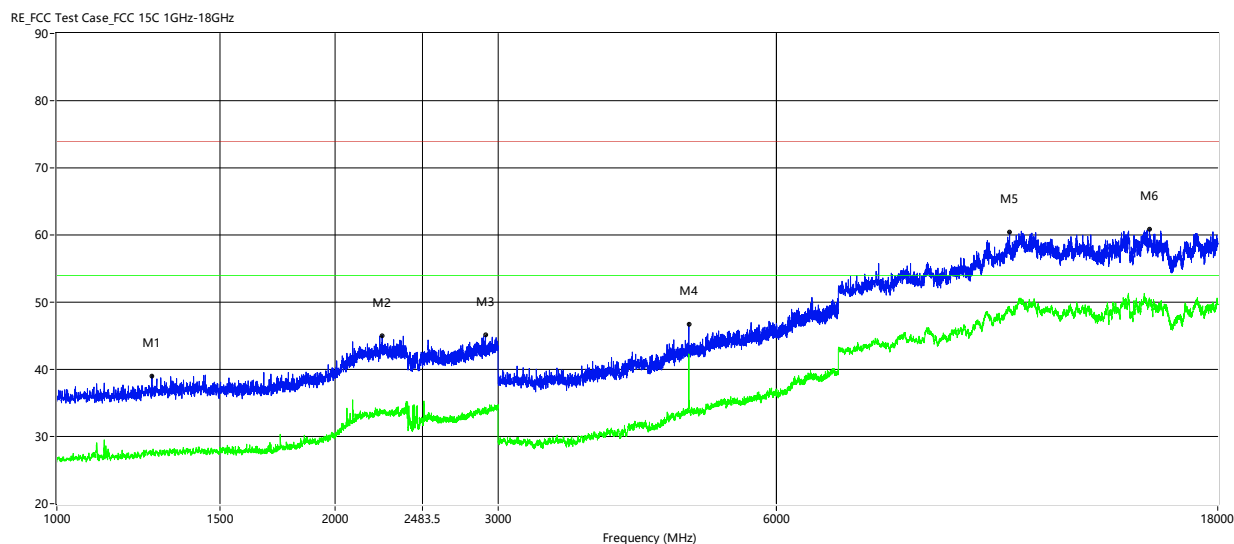
Note: Measurement = Reading Level + Correct Factor.



9.3. SPURIOUS EMISSIONS (1GHz-18GHz)

802.11 b mode

HARMONICS AND SPURIOUS EMISSIONS (01 CHANNEL, HORIZONTAL)



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1267.000	38.99	27.45	-0.92	74.0	54.0	-26.55	Horizontal	Pass
2248.000	45.07	33.51	4.62	74.0	54.0	-20.49	Horizontal	Pass
2907.500	45.07	33.51	5.65	74.0	54.0	-20.49	Horizontal	Pass
4824.000	46.68	42.29	-6.84	74.0	54.0	-11.71	Horizontal	Pass
10720.750	60.38	48.89	8.33	74.0	54.0	-5.11	Horizontal	Pass
15189.500	60.79	50.02	10.96	74.0	54.0	-3.98	Horizontal	Pass

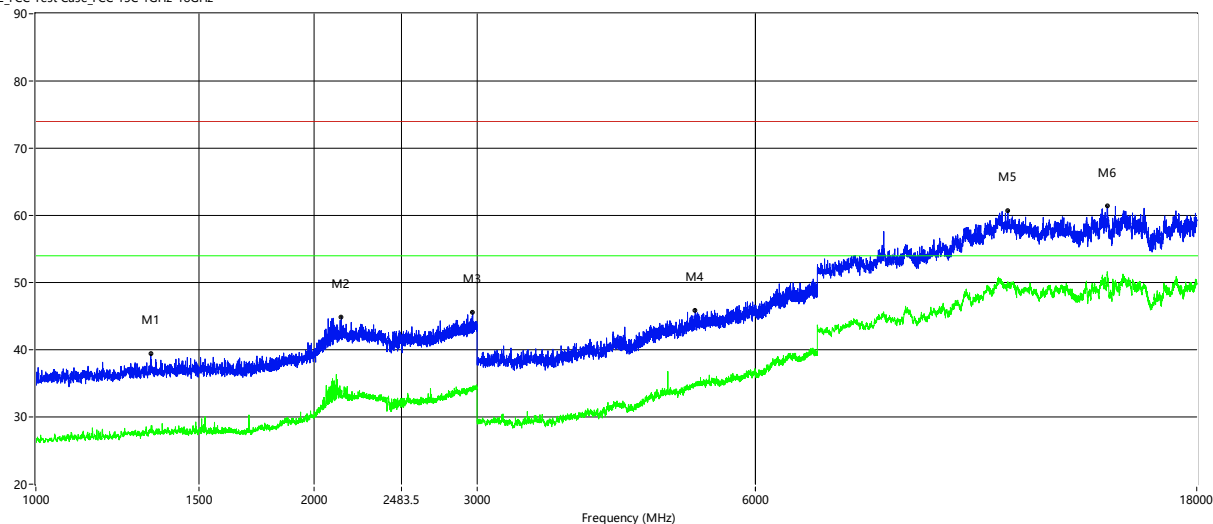
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (01 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1331.000	39.36	27.95	-0.85	74.0	54.0	-26.05	Vertical	Pass
2140.000	44.84	33.14	4.47	74.0	54.0	-20.86	Vertical	Pass
2967.000	45.52	34.21	5.97	74.0	54.0	-19.79	Vertical	Pass
5164.000	45.84	34.97	-5.12	74.0	54.0	-19.03	Vertical	Pass
11248.750	60.70	50.13	9.57	74.0	54.0	-3.87	Vertical	Pass
14416.750	61.40	51.07	11.23	74.0	54.0	-2.93	Vertical	Pass

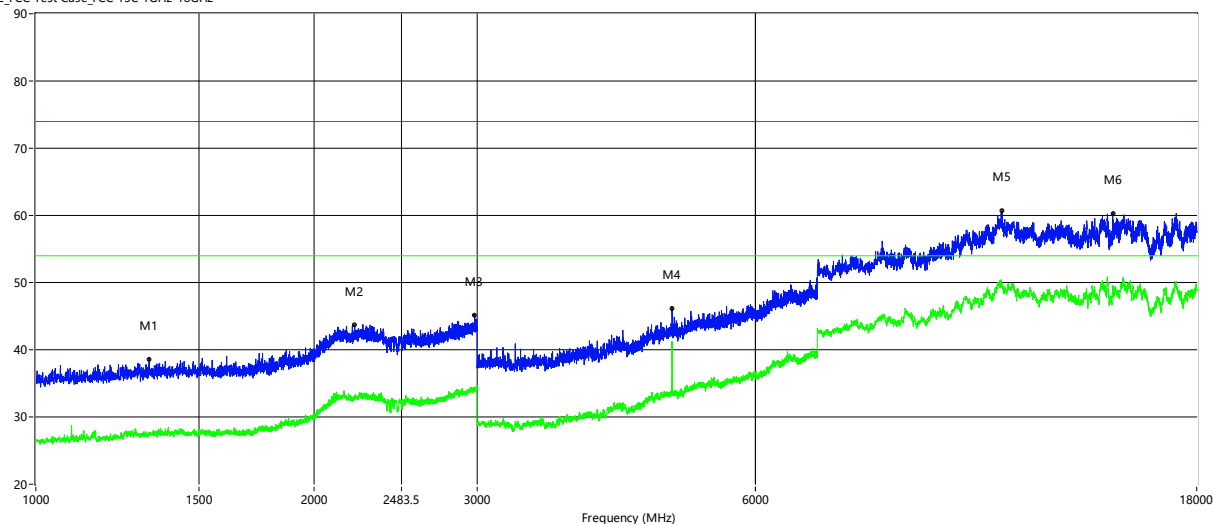
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (06 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1325.500	38.54	27.71	-0.86	74.0	54.0	-26.29	Horizontal	Pass
2211.500	43.67	32.64	4.22	74.0	54.0	-21.36	Horizontal	Pass
2982.500	45.20	33.96	6.03	74.0	54.0	-20.04	Horizontal	Pass
4874.000	46.10	41.24	-6.54	74.0	54.0	-12.76	Horizontal	Pass
11094.750	60.65	49.51	9.71	74.0	54.0	-4.49	Horizontal	Pass
14606.500	60.31	49.17	11.14	74.0	54.0	-4.83	Horizontal	Pass

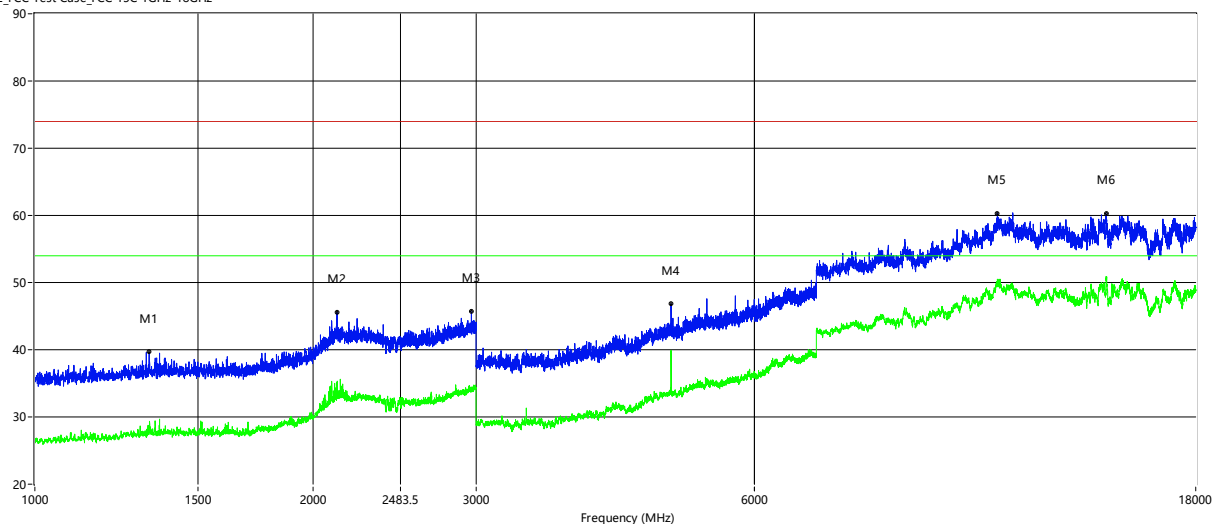
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (06 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1329.000	39.65	28.75	-0.85	74.0	54.0	-25.25	Vertical	Pass
2121.000	45.54	35.11	4.14	74.0	54.0	-18.89	Vertical	Pass
2965.000	45.64	34.02	5.96	74.0	54.0	-19.98	Vertical	Pass
4874.000	46.85	39.93	-6.54	74.0	54.0	-14.07	Vertical	Pass
10984.750	60.32	50.50	10.10	74.0	54.0	-3.50	Vertical	Pass
14414.000	60.25	50.52	11.26	74.0	54.0	-3.48	Vertical	Pass

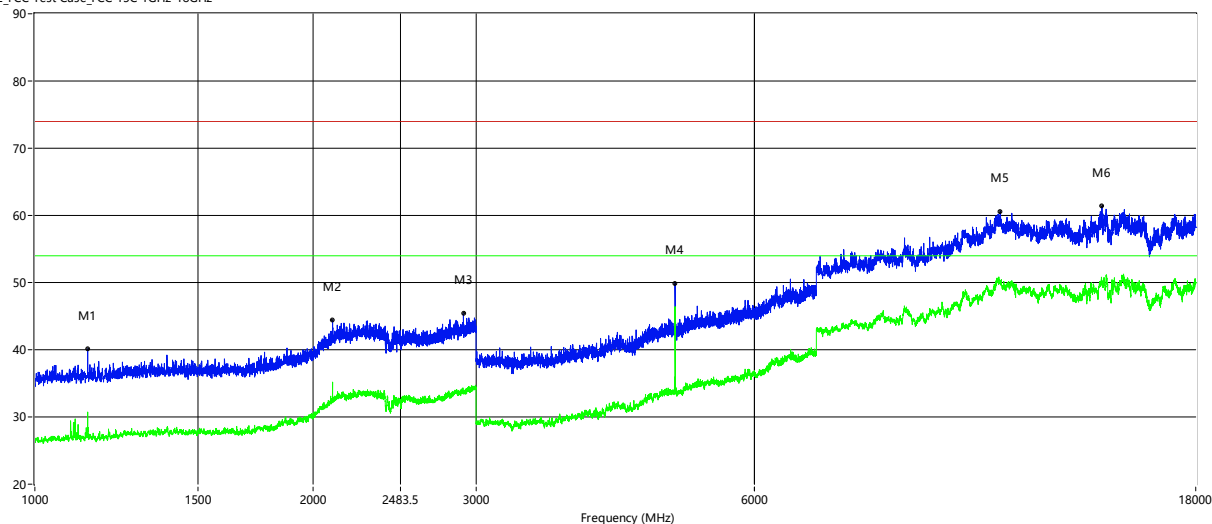
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (11 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1140.500	40.15	30.73	-1.40	74.0	54.0	-23.27	Horizontal	Pass
2098.500	44.45	35.18	3.76	74.0	54.0	-18.82	Horizontal	Pass
2907.000	45.37	33.81	5.65	74.0	54.0	-20.19	Horizontal	Pass
4924.000	49.91	46.44	-6.39	74.0	54.0	-7.56	Horizontal	Pass
11070.000	60.56	50.19	9.84	74.0	54.0	-3.81	Horizontal	Pass
14254.500	61.37	49.85	11.18	74.0	54.0	-4.15	Horizontal	Pass

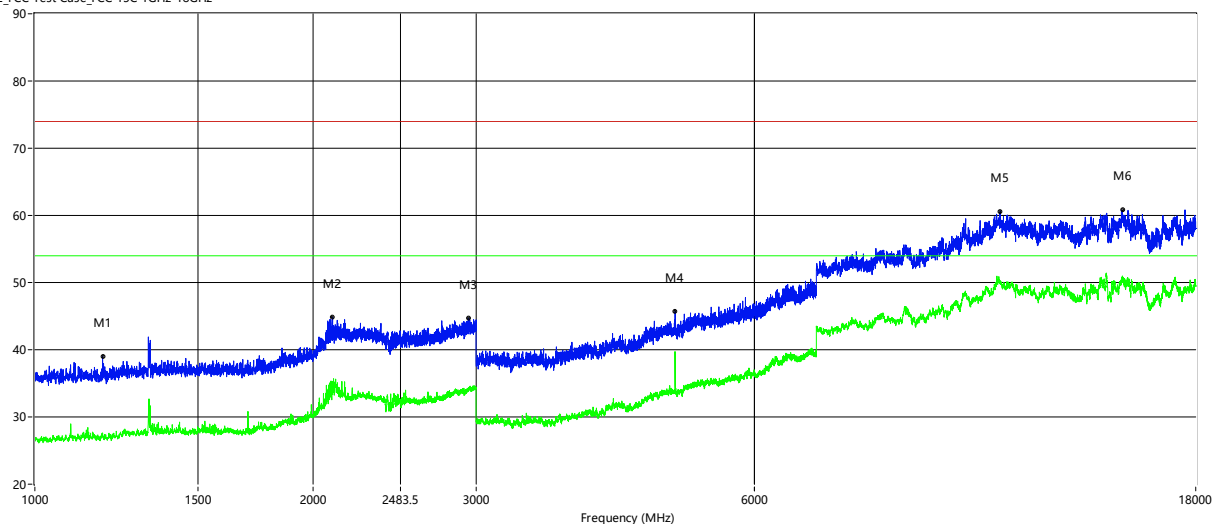
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (11 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1183.500	39.05	27.62	-1.27	74.0	54.0	-26.38	Vertical	Pass
2098.500	44.79	34.33	3.76	74.0	54.0	-19.67	Vertical	Pass
2942.500	44.69	33.97	5.85	74.0	54.0	-20.03	Vertical	Pass
4925.000	45.74	34.73	-6.39	74.0	54.0	-19.27	Vertical	Pass
11064.500	60.63	49.90	9.87	74.0	54.0	-4.10	Vertical	Pass
14997.000	60.79	50.96	10.38	74.0	54.0	-3.04	Vertical	Pass

Remark:

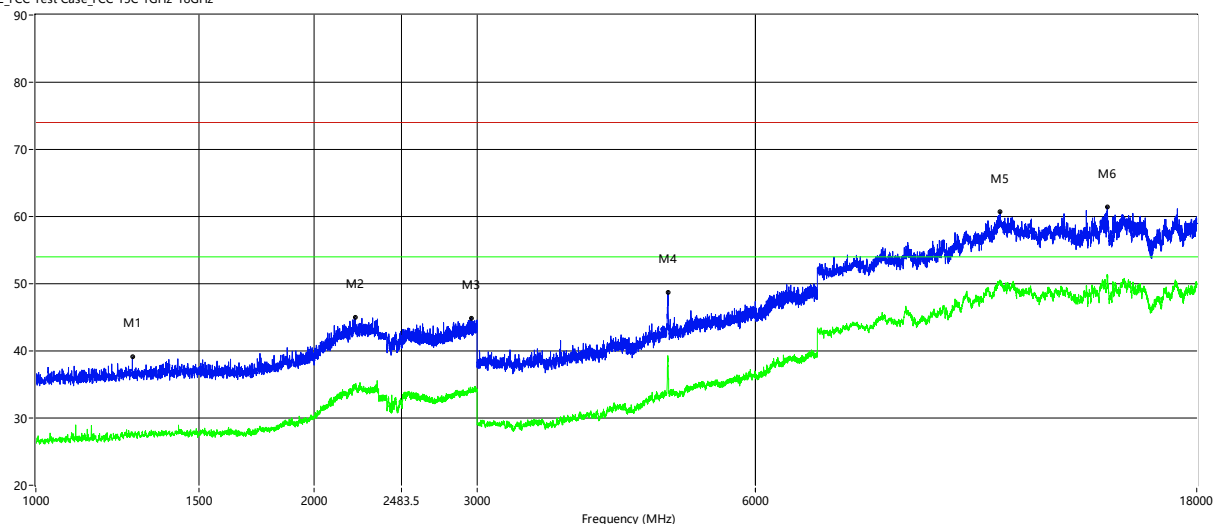
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



802.11 g mode

HARMONICS AND SPURIOUS EMISSIONS (01 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1271.500	39.08	27.49	-0.92	74.0	54.0	-26.51	Horizontal	Pass
2214.000	44.95	34.45	4.25	74.0	54.0	-19.55	Horizontal	Pass
2954.500	44.89	34.02	5.91	74.0	54.0	-19.98	Horizontal	Pass
4825.000	48.71	38.63	-6.83	74.0	54.0	-15.37	Horizontal	Pass
11034.250	60.73	50.17	10.04	74.0	54.0	-3.83	Horizontal	Pass
14403.000	61.46	51.21	11.39	74.0	54.0	-2.79	Horizontal	Pass

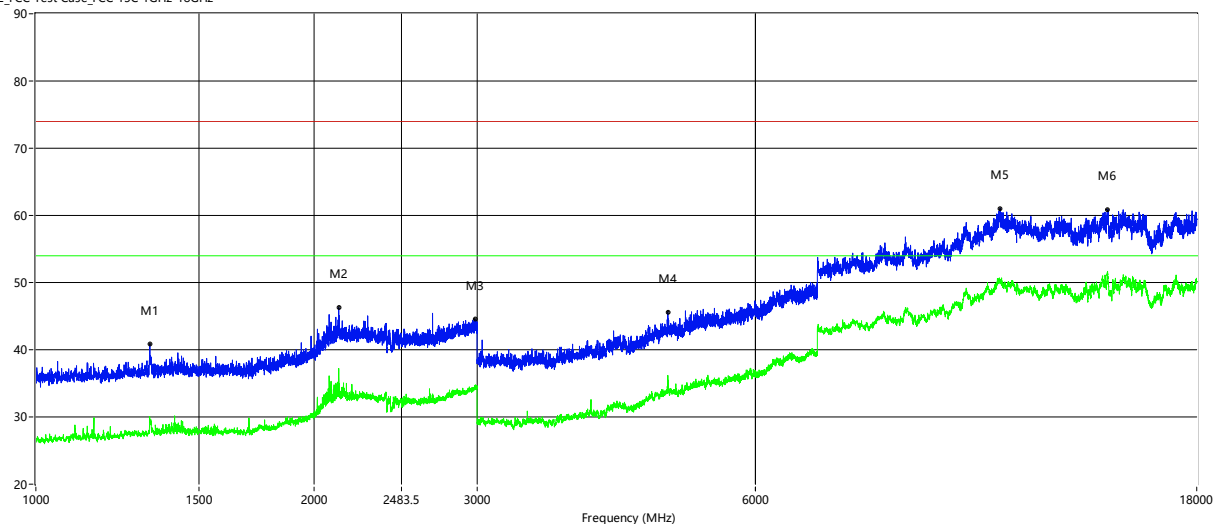
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (01 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1328.000	40.86	29.42	-0.86	74.0	54.0	-24.58	Vertical	Pass
2125.500	46.26	37.21	4.22	74.0	54.0	-16.79	Vertical	Pass
2985.500	44.51	34.23	6.05	74.0	54.0	-19.77	Vertical	Pass
4824.000	45.54	36.17	-6.84	74.0	54.0	-17.83	Vertical	Pass
11037.000	61.06	50.32	10.02	74.0	54.0	-3.68	Vertical	Pass
14416.750	60.87	51.67	11.23	74.0	54.0	-2.33	Vertical	Pass

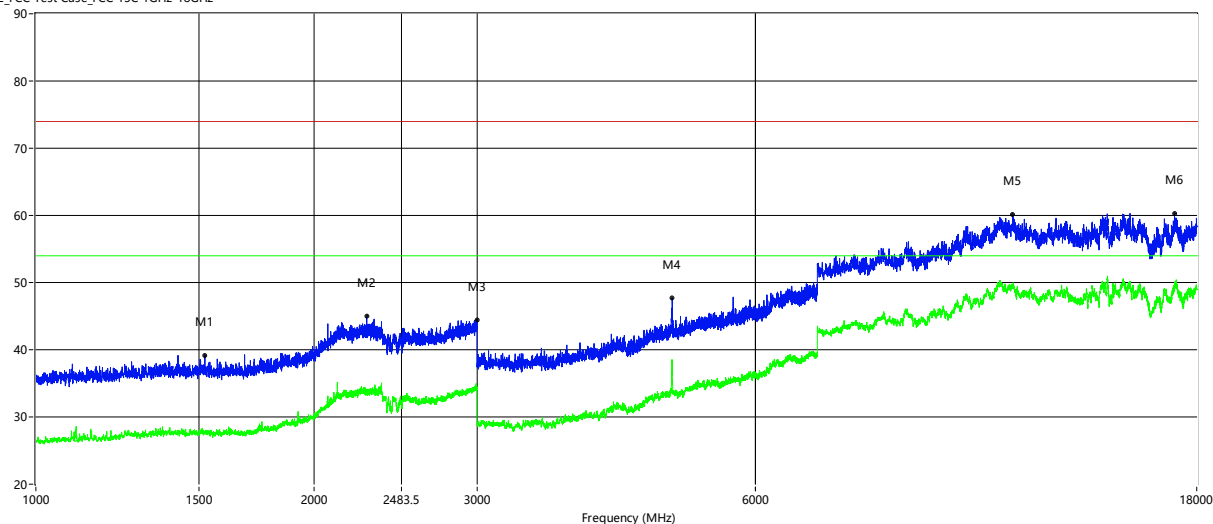
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (06 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1523.000	39.17	27.86	-0.59	74.0	54.0	-26.14	Horizontal	Pass
2279.000	44.93	33.64	4.61	74.0	54.0	-20.36	Horizontal	Pass
2998.000	44.47	34.06	6.10	74.0	54.0	-19.94	Horizontal	Pass
4877.000	47.68	36.49	-6.53	74.0	54.0	-17.51	Horizontal	Pass
11380.750	60.12	49.55	9.70	74.0	54.0	-4.45	Horizontal	Pass
17034.750	60.25	49.43	10.01	74.0	54.0	-4.57	Horizontal	Pass

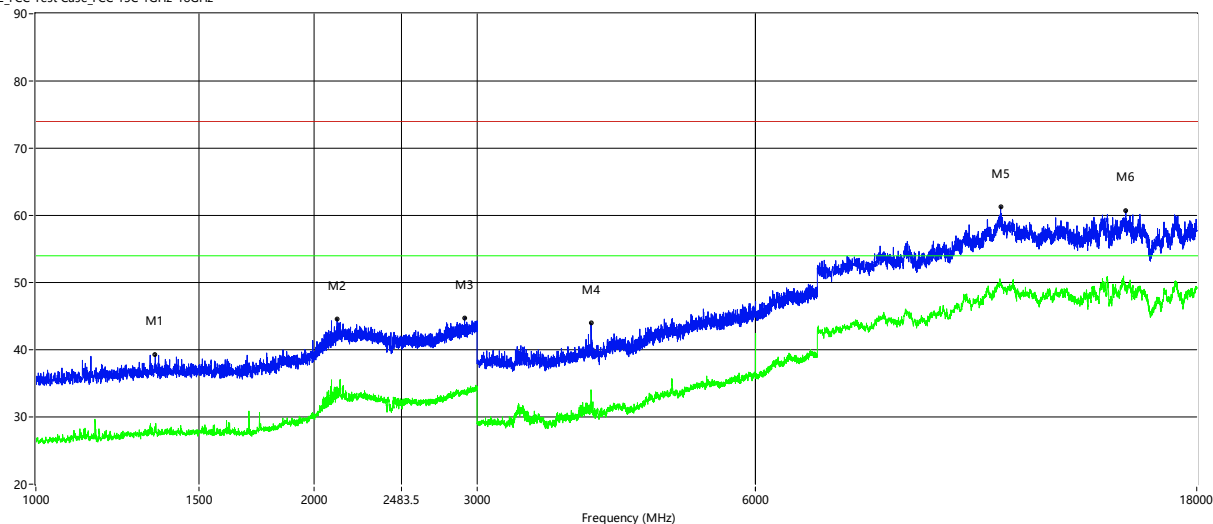
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (06 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1346.000	39.25	28.50	-0.80	74.0	54.0	-25.50	Vertical	Pass
2117.000	44.56	34.32	4.08	74.0	54.0	-19.68	Vertical	Pass
2908.500	44.77	33.92	5.66	74.0	54.0	-20.08	Vertical	Pass
3984.000	43.93	34.06	-10.26	74.0	54.0	-19.94	Vertical	Pass
11045.250	61.30	49.85	9.98	74.0	54.0	-4.15	Vertical	Pass
15087.750	60.69	49.51	10.32	74.0	54.0	-4.49	Vertical	Pass

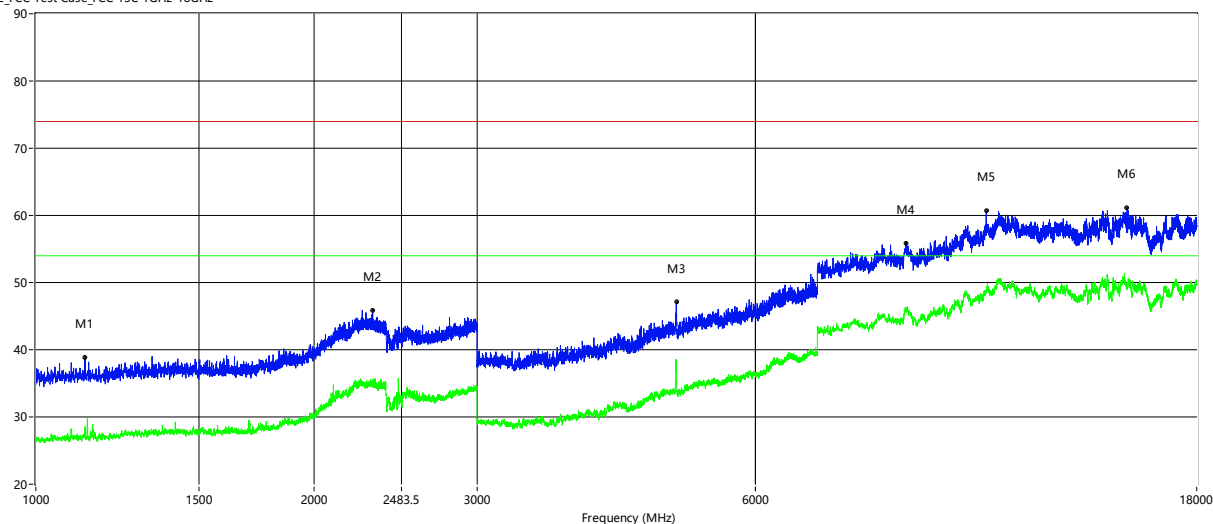
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (11 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1130.000	38.85	28.57	-1.42	74.0	54.0	-25.43	Horizontal	Pass
2313.000	45.88	35.51	4.53	74.0	54.0	-18.49	Horizontal	Pass
4926.000	47.09	36.73	-6.39	74.0	54.0	-17.27	Horizontal	Pass
8732.500	55.87	45.84	5.06	74.0	54.0	-8.16	Horizontal	Pass
10657.500	60.68	48.75	8.24	74.0	54.0	-5.25	Horizontal	Pass
15137.250	61.19	49.49	10.58	74.0	54.0	-4.51	Horizontal	Pass

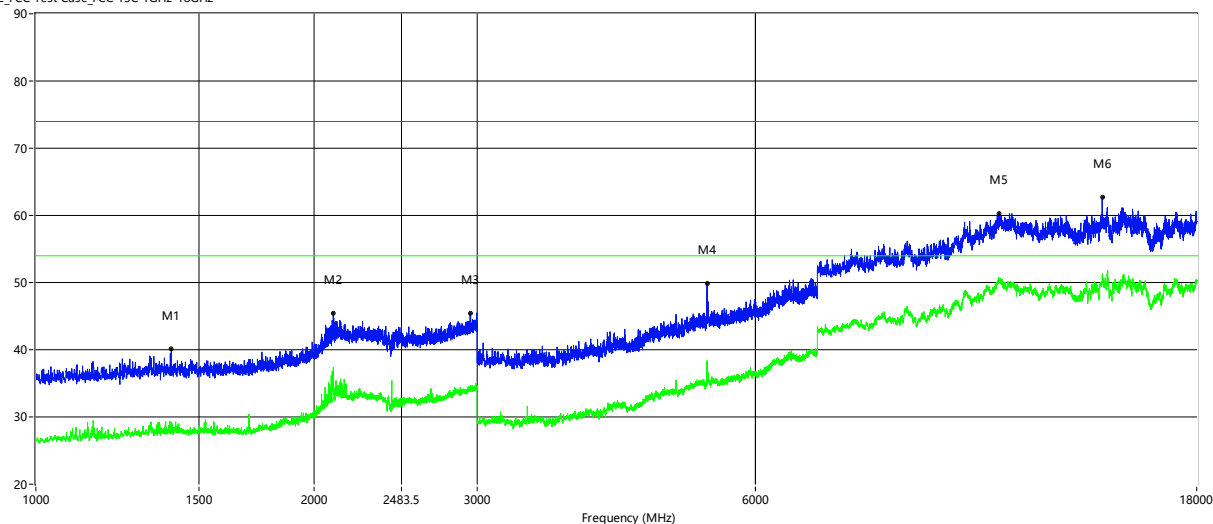
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (11 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1401.000	40.21	28.97	-0.66	74.0	54.0	-25.03	Vertical	Pass
2097.000	45.40	37.41	3.73	74.0	54.0	-16.59	Vertical	Pass
2948.500	45.41	34.38	5.89	74.0	54.0	-19.62	Vertical	Pass
5318.000	49.84	38.38	-4.96	74.0	54.0	-15.62	Vertical	Pass
11001.250	60.33	50.18	10.21	74.0	54.0	-3.82	Vertical	Pass
14227.000	62.66	50.85	11.39	74.0	54.0	-3.15	Vertical	Pass

Remark:

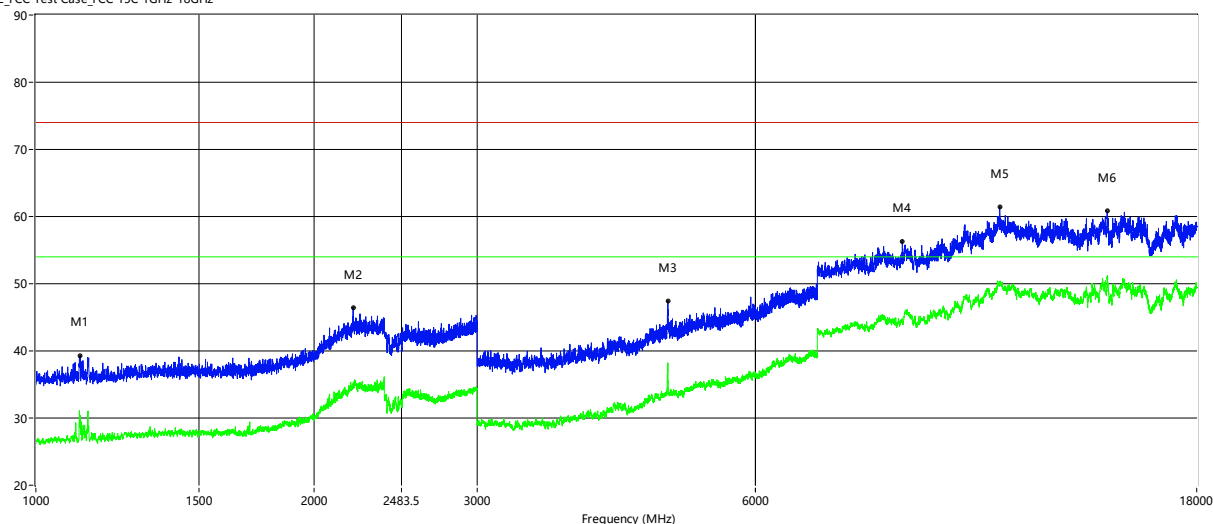
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



802.11 n20 mode

HARMONICS AND SPURIOUS EMISSIONS (01 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1117.000	39.31	29.56	-1.45	74.0	54.0	-24.44	Horizontal	Pass
2203.500	46.49	35.25	4.14	74.0	54.0	-18.75	Horizontal	Pass
4824.000	47.38	38.21	-6.84	74.0	54.0	-15.79	Horizontal	Pass
8650.000	56.29	44.41	4.60	74.0	54.0	-9.59	Horizontal	Pass
11023.250	61.43	50.39	10.09	74.0	54.0	-3.61	Horizontal	Pass
14403.000	60.79	50.70	11.39	74.0	54.0	-3.30	Horizontal	Pass

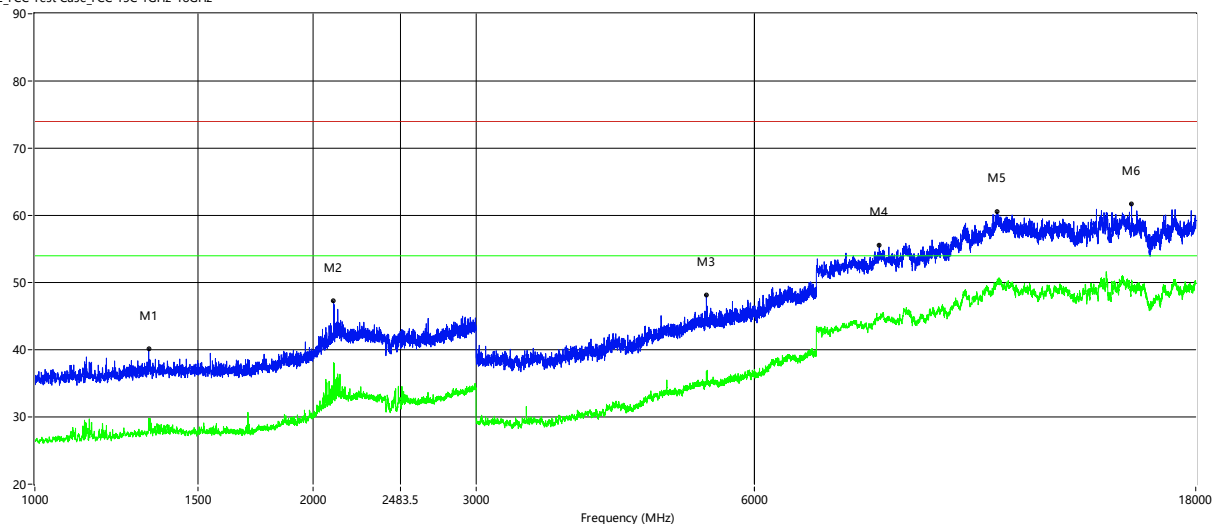
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (01 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1327.500	40.14	29.80	-0.86	74.0	54.0	-24.20	Vertical	Pass
2104.000	47.22	38.08	3.86	74.0	54.0	-15.92	Vertical	Pass
5323.000	48.13	36.80	-4.95	74.0	54.0	-17.20	Vertical	Pass
8188.000	55.52	44.67	4.20	74.0	54.0	-9.33	Vertical	Pass
10979.250	60.52	49.76	10.06	74.0	54.0	-4.24	Vertical	Pass
15343.500	61.71	50.38	10.40	74.0	54.0	-3.62	Vertical	Pass

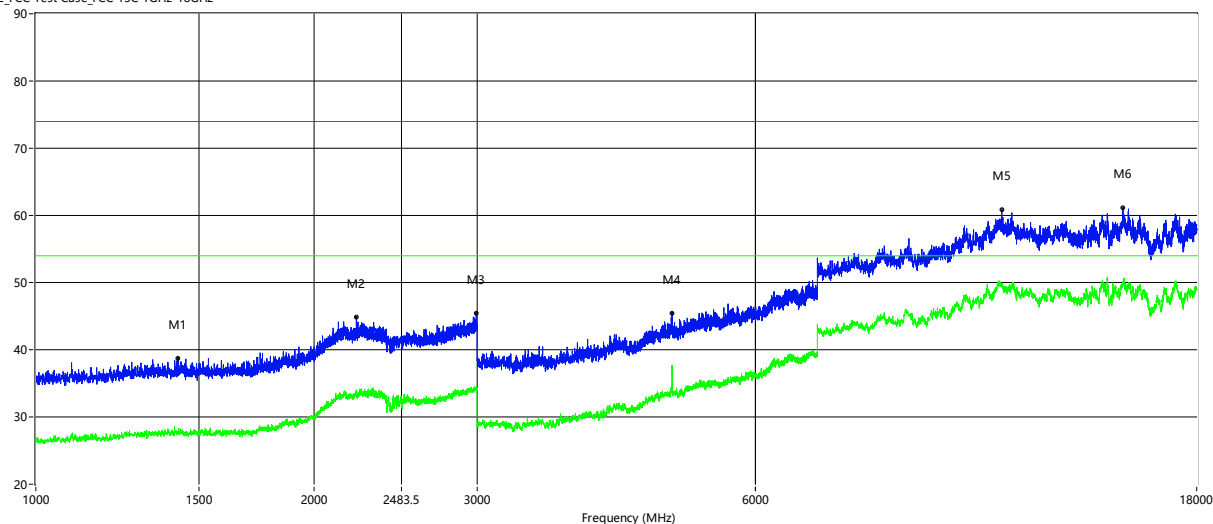
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (06 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1424.000	38.75	27.46	-0.62	74.0	54.0	-26.54	Horizontal	Pass
2221.500	44.81	33.17	4.33	74.0	54.0	-20.83	Horizontal	Pass
2993.500	45.37	34.18	6.08	74.0	54.0	-19.82	Horizontal	Pass
4873.000	45.43	34.99	-6.55	74.0	54.0	-19.01	Horizontal	Pass
11078.250	60.83	49.38	9.80	74.0	54.0	-4.62	Horizontal	Pass
14983.250	61.15	49.98	10.31	74.0	54.0	-4.02	Horizontal	Pass

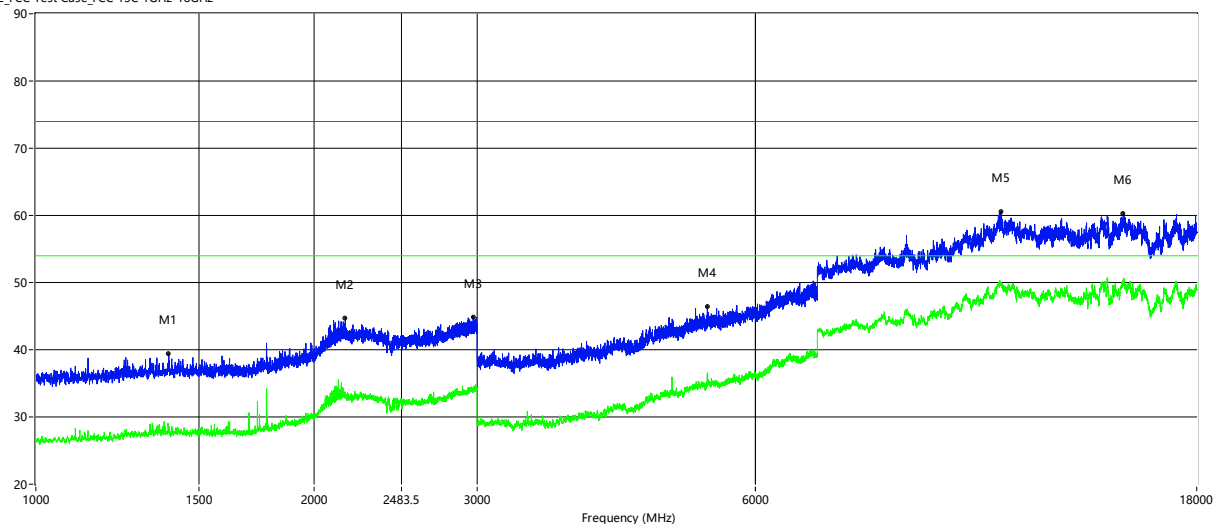
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (06 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1392.000	39.41	28.28	-0.68	74.0	54.0	-25.72	Vertical	Pass
2160.500	44.65	33.73	4.52	74.0	54.0	-20.27	Vertical	Pass
2971.000	44.90	33.84	5.99	74.0	54.0	-20.16	Vertical	Pass
5322.000	46.41	36.57	-4.95	74.0	54.0	-17.43	Vertical	Pass
11059.000	60.60	49.80	9.90	74.0	54.0	-4.20	Vertical	Pass
14988.750	60.31	50.36	10.34	74.0	54.0	-3.64	Vertical	Pass

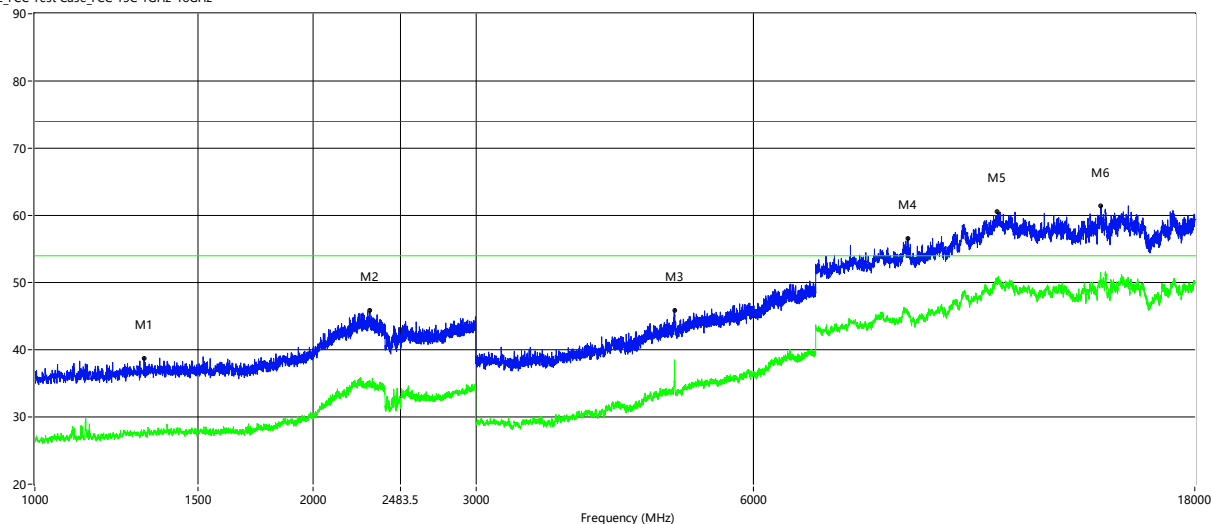
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (11 CHANNEL, HORIZONTAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1312.500	38.73	27.82	-0.90	74.0	54.0	-26.18	Horizontal	Pass
2304.500	45.81	34.56	4.56	74.0	54.0	-19.44	Horizontal	Pass
4924.000	45.91	38.51	-6.39	74.0	54.0	-15.49	Horizontal	Pass
8809.500	56.64	45.46	4.79	74.0	54.0	-8.54	Horizontal	Pass
11012.250	60.53	50.37	10.15	74.0	54.0	-3.63	Horizontal	Pass
14251.750	61.40	50.30	11.20	74.0	54.0	-3.70	Horizontal	Pass

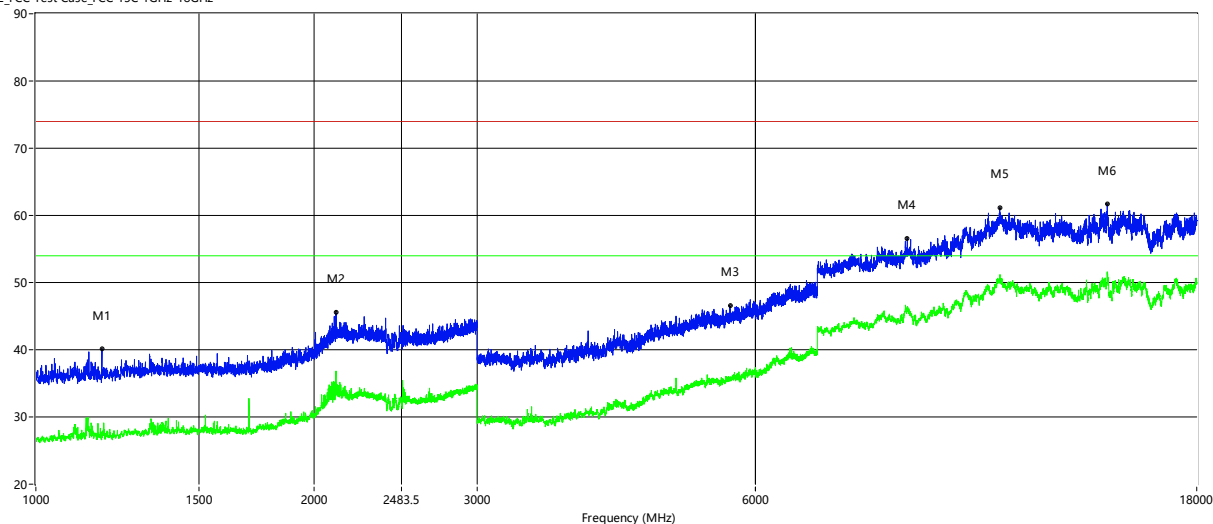
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



HARMONICS AND SPURIOUS EMISSIONS (11 CHANNEL, VERTICAL)

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1178.500	40.16	27.81	-1.28	74.0	54.0	-26.19	Vertical	Pass
2111.500	45.50	35.52	3.98	74.0	54.0	-18.48	Vertical	Pass
5631.000	46.56	35.47	-4.06	74.0	54.0	-18.53	Vertical	Pass
8757.250	56.61	46.45	4.98	74.0	54.0	-7.55	Vertical	Pass
11023.250	61.14	50.42	10.09	74.0	54.0	-3.58	Vertical	Pass
14405.750	61.72	51.27	11.36	74.0	54.0	-2.73	Vertical	Pass

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.
2. Margin = Limit - Emission Level
3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.
4. Above 18GHz emissions are mainly from the environment noise, not show in report.



9.4. SPURIOUS EMISSIONS BELOW 30M

Freq.	Reading	Limit	Margin	State	Test Result
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	
--	--	--	--	--	PASS
--	--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

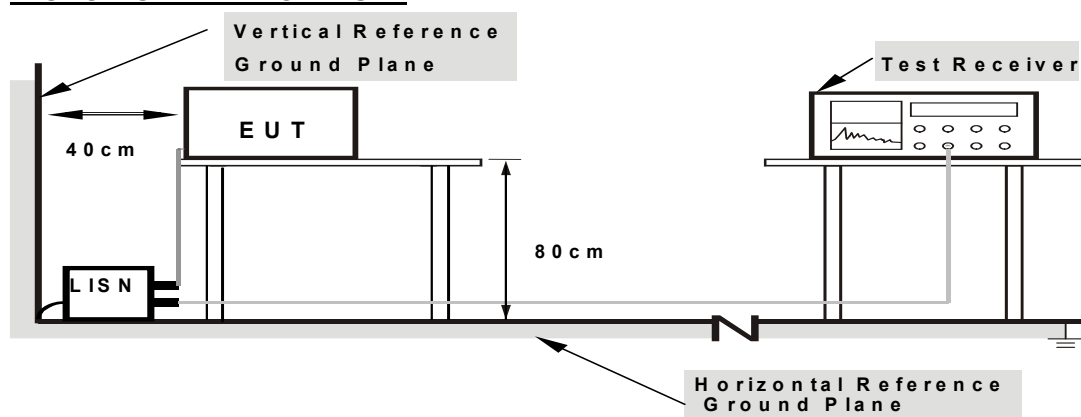
10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a)

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST SETUP AND PROCEDURE



- Note: 1.Support units were connected to second LISN .
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

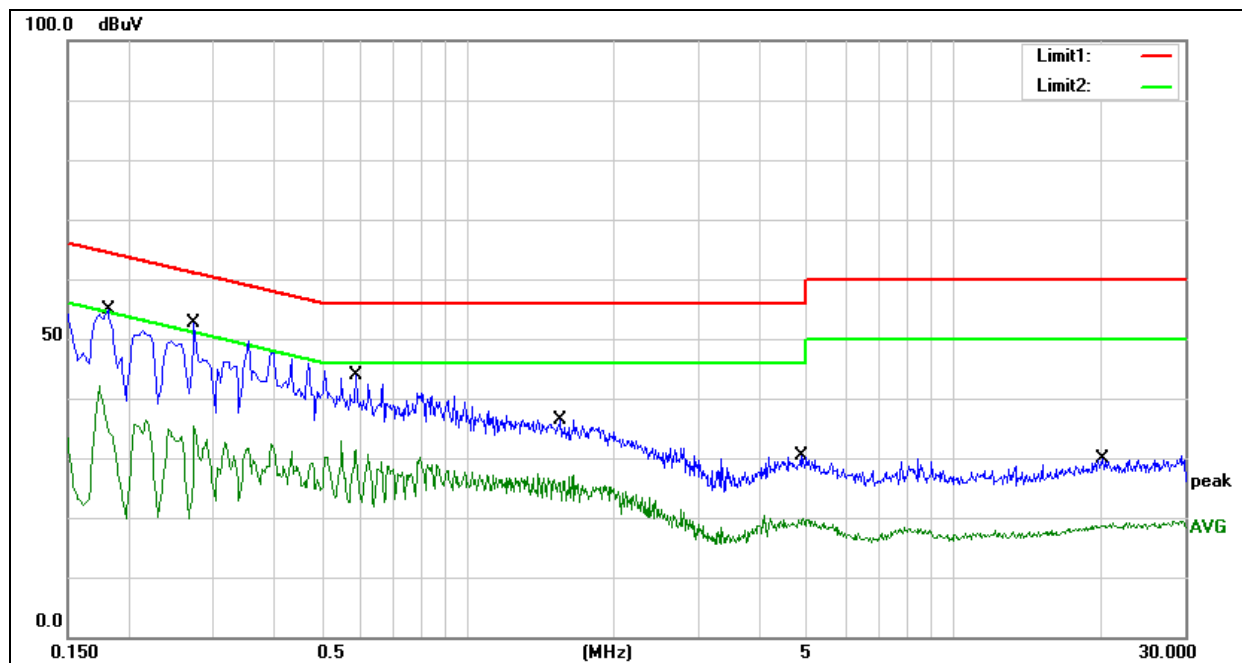
TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz



TEST RESULTS

Neutral N RESULTS



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1820	34.48	20.31	54.79	64.39	-9.60	QP
2	0.1820	14.01	20.31	34.32	54.39	-20.07	AVG
3	0.2740	31.96	20.63	52.59	61.00	-8.41	QP
4	0.2740	14.71	20.63	35.34	51.00	-15.66	AVG
5	0.5900	23.47	20.45	43.92	56.00	-12.08	QP
6	0.5900	10.91	20.45	31.36	46.00	-14.64	AVG
7	1.5540	16.18	20.30	36.48	56.00	-19.52	QP
8	1.5540	6.06	20.30	26.36	46.00	-19.64	AVG
9	4.8700	10.01	20.45	30.46	56.00	-25.54	QP
10	4.8700	-0.65	20.45	19.80	46.00	-26.20	AVG
11	20.3580	7.09	22.88	29.97	60.00	-30.03	QP
12	20.3580	-3.94	22.88	18.94	50.00	-31.06	AVG

Note: 1. Result = Reading +Correct Factor.

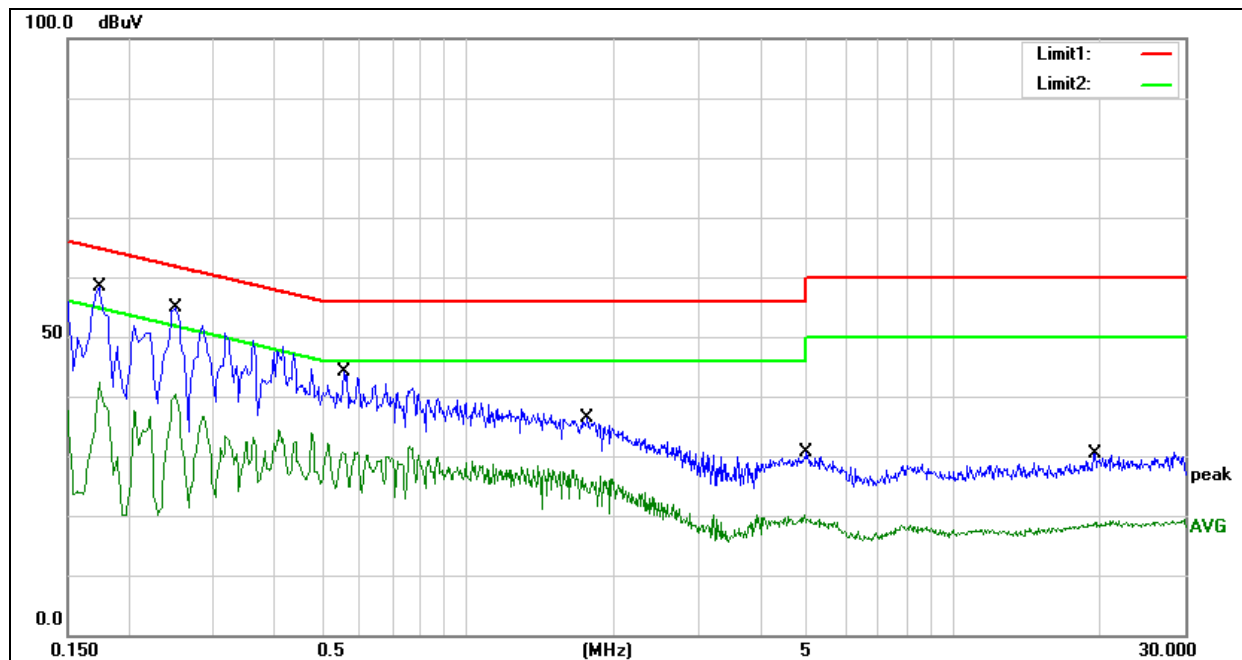
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



LINE L RESULTS



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1740	38.08	20.33	58.41	64.77	-6.36	QP
2	0.1740	22.00	20.33	42.33	54.77	-12.44	AVG
3	0.2500	34.32	20.53	54.85	61.76	-6.91	QP
4	0.2500	19.82	20.53	40.35	51.76	-11.41	AVG
5	0.5580	23.70	20.48	44.18	56.00	-11.82	QP
6	0.5580	10.17	20.48	30.65	46.00	-15.35	AVG
7	1.7660	16.01	20.30	36.31	56.00	-19.69	QP
8	1.7660	5.43	20.30	25.73	46.00	-20.27	AVG
9	4.9820	10.08	20.46	30.54	56.00	-25.46	QP
10	4.9820	-0.43	20.46	20.03	46.00	-25.97	AVG
11	19.5780	7.67	22.80	30.47	60.00	-29.53	QP
12	19.5780	-4.00	22.80	18.80	50.00	-31.20	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



11. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. 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.

ANTENNA CONNECTOR

EUT has a PCB Antenna without antenna connector.

ANTENNA GAIN

The antenna gain of EUT is less than 6 dBi.



Test photos

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

END OF REPORT