

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
FCC ID	M82-UTC520FPIKA0E
Brand name	ADVANTECH
Product name	Computer
Model No.	UTC-520F, UTC-520FXXXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank)
Test Result	Pass

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).



Approved by:

A handwritten signature in black ink, appearing to read "Sam Chuang", written over a horizontal line.

Sam Chuang
Manager

Tested by:

A handwritten signature in black ink, appearing to read "Jerry Chuang", written over a horizontal line.

Jerry Chuang
Engineer

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	January 31, 2018	Initial Issue	ALL	Allison Chen
01	March 28, 2018	1. Modify operation transmitter. 2. Added KDB 662911D01 V02r01. 3. Added test procedure for 99% OBW in section 5.2.2 and test plot for 99% OBW in section 5.2.4. 4. Removed the EIRP limit in section 5.3.1.	P.8, P.10, P.16, P.24-29, P.30	Allison Chen

Table of contents

1.	GENERAL INFORMATION.....	4
1.1	EUT INFORMATION.....	4
1.2	EUT CHANNEL INFORMATION.....	5
1.3	ANTENNA INFORMATION.....	5
1.4	MEASUREMENT UNCERTAINTY.....	6
1.5	FACILITIES AND TEST LOCATION.....	7
1.6	INSTRUMENT CALIBRATION	7
1.7	SUPPORT AND EUT ACCESSORIES EQUIPMENT	8
1.8	TEST METHODOLOGY AND APPLIED STANDARDS.....	8
2.	TEST SUMMERY.....	9
3.	DESCRIPTION OF TEST MODES.....	10
3.1	THE WORST MODE OF OPERATING CONDITION	10
3.2	THE WORST MODE OF MEASUREMENT.....	11
4.	EUT DUTY CYCLE	12
5.	TEST RESULT.....	13
5.1	AC POWER LINE CONDUCTED EMISSION.....	13
5.2	6DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%).....	16
5.3	OUTPUT POWER MEASUREMENT	30
5.4	POWER SPECTRAL DENSITY	32
5.5	CONDUCTED BANDEDGE AND SPURIOUS EMISSION.....	40
5.6	RADIATION BANDEDGE AND SPURIOUS EMISSION.....	59
	APPENDIX-A TEST PHOTO.....	A-1
	APPENDIX 1 - PHOTOGRAPHS OF EUT	

1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Advantech Co.Ltd. No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.
Manufacturer	Advantech Co.Ltd. No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.
Equipment	Computer
Model Name	UTC-520F, UTC-520FXXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank)
Model Discrepancy	All the above models are identical except for the designation of model numbers. The suffix of (X= a-z / 0-9 or blank) on model number is just for marketing purpose only.
Received Date	December 08, 2017
Date of Test	January 18 ~ January 26, 2018
Output Power(W)	IEEE 802.11b mode: 0.0399 IEEE 802.11g mode: 0.1059 IEEE 802.11n 20 MHz mode: 0.1726 IEEE 802.11n 40 MHz mode: 0.1493
Power Supply	Powered from AC adapter. Brand / Model: FSP / FSP084-DIBAN2 Input: 100-240Vac, 1.3A, 50-60Hz Output: 12Vdc, 7A

1.2 EUT CHANNEL INFORMATION

Frequency Range	802.11b/g/n 20: 2412MHz ~ 2462MHz 802.11n HT 40: 2422MHz ~ 2452MHz
Modulation Type	1. IEEE 802.11b mode: CCK 2. IEEE 802.11g mode: OFDM 3. IEEE 802.11n 20 MHz mode : OFDM 4. IEEE 802.11n 40 MHz mode : OFDM
Bandwidth	1. IEEE 802.11b mode: 11 Channels 2. IEEE 802.11g mode: 11 Channels 3. IEEE 802.11n 20 MHz mode : 11 Channels 4. IEEE 802.11n 40 MHz mode : 7 Channels

Remark:

Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 and RSS-GEN Table A1 for test channels

Number of frequencies to be tested		
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

1.3 ANTENNA INFORMATION

Antenna Type	☒ PIFA ☐ PCB ☐ Dipole ☐ Coils																		
Antenna Gain	<table> <tr> <th></th><th>Description</th><th>Type</th><th>Peak Gain</th></tr> <tr> <td>Ant 1</td><td>WIFI black</td><td>PIFA</td><td>3.03dBi</td></tr> <tr> <td>Ant 2</td><td>WIFI white</td><td>PIFA</td><td>2.67dBi</td></tr> <tr> <td colspan="2">Power Directional Gain</td><td colspan="2">2.85dBi</td></tr> </table>				Description	Type	Peak Gain	Ant 1	WIFI black	PIFA	3.03dBi	Ant 2	WIFI white	PIFA	2.67dBi	Power Directional Gain		2.85dBi	
	Description	Type	Peak Gain																
Ant 1	WIFI black	PIFA	3.03dBi																
Ant 2	WIFI white	PIFA	2.67dBi																
Power Directional Gain		2.85dBi																	

Notes:

1. Power Directional Gain: $10\text{LOG}(((10^{(\text{Ant1}/10)} + 10^{(\text{Ant2}/10)})/2))$

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 30 to 1000 MHz	+/- 3.97
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 1 to 18GHz	+/- 3.58
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 18 to 26 GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 26 to 40 GHz	+/- 3.81
Conducted Emission (Mains Terminals), 9kHz to 30MHz	+/- 2.48

Remark:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at
No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	Eric Lee	-
Radiation	Jerry Chuang	-
RF Conducted	Jerry Chuang	-

Remark: The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Power Meter	Anritsu	ML2495A	1033009	04/11/2017	04/10/2018
Power Sensor	Anritsu	MA2411B	917072	07/03/2017	07/02/2018
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018
Directional Coupler	Agilent	87301D	MY44350252	07/25/2017	07/24/2018
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Divider	Solvang Technology	2-18GHz 4Way	ST108-0015	07/26/2017	07/25/2018
3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018
Horn Antenna	EMCO	3117	55165	02/20/2017	02/19/2018
Pre-Amplifier	EMEC	EM330	60609	06/07/2017	06/06/2018
Spectrum Analyzer	Agilent	E4446A	US42510252	11/27/2017	11/26/2018
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Pre-Amplifier	HP	8449B	3008A00965	06/27/2017	06/26/2018
Filter	N/A	2400-2500	N/A	N/A	N/A
Filter	N/A	0-6000	N/A	N/A	N/A
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	07/31/2017	07/30/2018
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018
AC line Conduction Test Room					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018
Horn Antenna	EMCO	3117	55165	02/20/2017	02/19/2018
Pre-Amplifier	EMEC	EM330	60609	06/07/2017	06/06/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

Support Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074 D01 V04, KDB 662911D01 V02r01.

2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.2	Antenna Requirement	Pass
15.207(a)	5.1	AC Conducted Emission	Pass
15.247(a)(2)	5.2	6 dB Bandwidth	Pass
-	5.2	Occupied Bandwidth (99%)	Pass
15.247(b)	5.3	Output Power Measurement	Pass
15.247(e)	5.4	Power Spectral Density	Pass
15.247(d)	5.5	Conducted Band Edge	Pass
15.247(d)	5.5	Conducted Emission	Pass
15.247(d)	5.6	Radiation Band Edge	Pass
15.247(d)	5.6	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	IEEE 802.11b mode :1Mbps IEEE 802.11g mode :6Mbps IEEE 802.11n 20MHz mode :MCS8 IEEE 802.11n 40MHz mode :MCS8
Test Channel Frequencies	IEEE 802.11b mode : 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz IEEE 802.11g mode : 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz IEEE 802.11n 20MHz mode : 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz IEEE 802.11n 40MHz mode : 1. Lowest Channel : 2422MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2452MHz
Operation Transmitter	IEEE 802.11b mode :1T1R IEEE 802.11g mode : 1T1R IEEE 802.11n 20MHz mode : 2T2R IEEE 802.11n 40MHz mode : 2T2R

Remark:

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by AC adapter via power cable.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Radiated Emission Measurement Above 1G	
Test Condition	Band edge, Emission for Unwanted and Fundamental
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by AC adapter via power cable.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4
Worst Position	☐ Placed in fixed position. ☐ Placed in fixed position at X-Plane (E2-Plane) ☒ Placed in fixed position at Y-Plane (E1-Plane) ☐ Placed in fixed position at Z-Plane (H-Plane)
Worst Polarity	☒ Horizontal ☐ Vertical

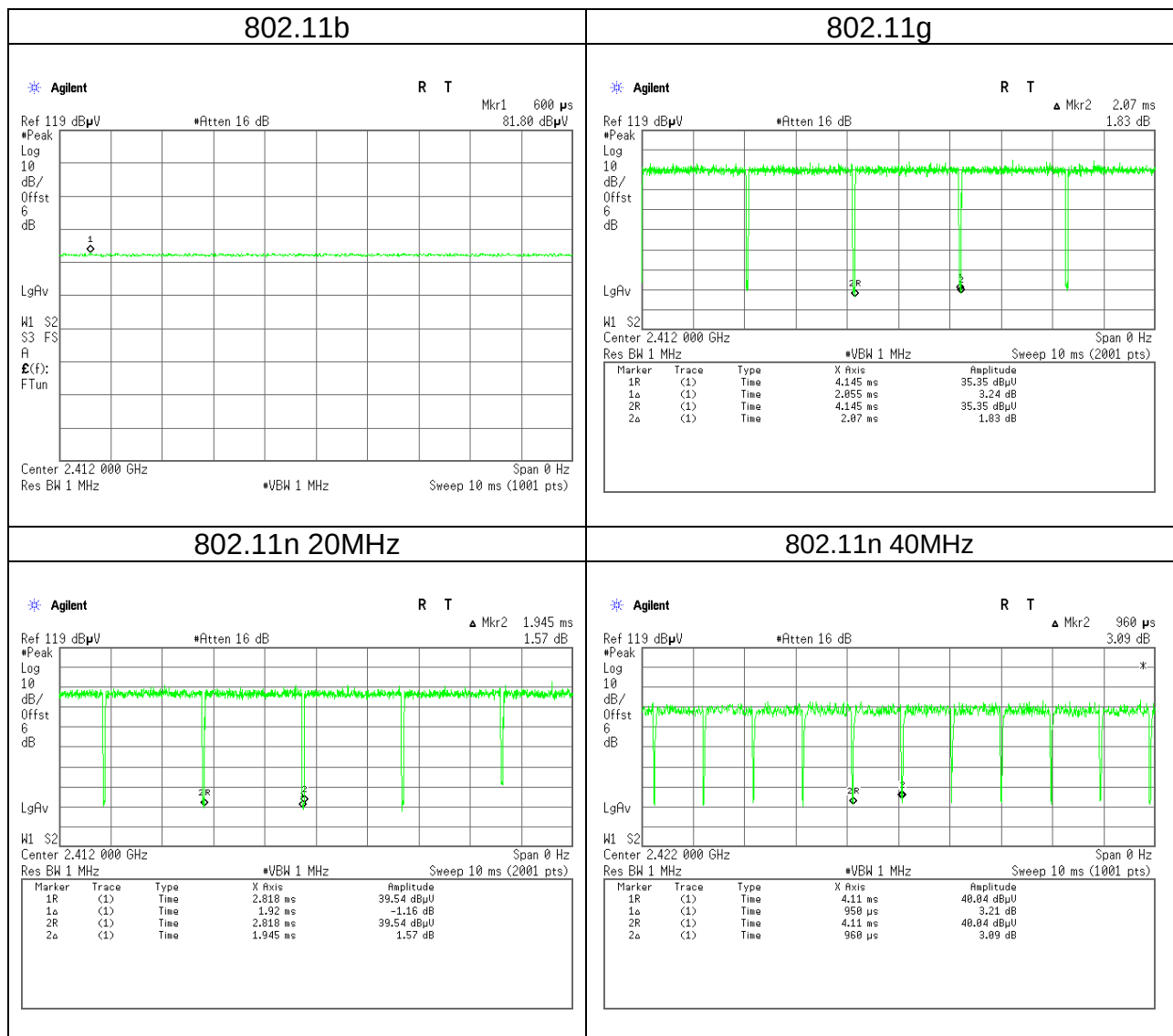
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by AC adapter via power cable.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case(Y-Plane and Horizontal) were recorded in this report
3. For below 1G, AC power line conducted emission and radiation emission were performed the EUT transmit at the highest output power channel as worse case.

4. EUT DUTY CYCLE

Duty Cycle				
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)
802.11b	100.0000	100.0000	100.00%	0.00
802.11g	2.0550	2.0700	99.28%	0.03
802.11n 20MHz	1.9200	1.9450	98.71%	0.06
802.11n 40MHz	0.9500	0.9600	98.96%	0.05



5. TEST RESULT

5.1 AC POWER LINE CONDUCTED EMISSION

5.1.1 Test Limit

According to §15.207(a)(2),

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

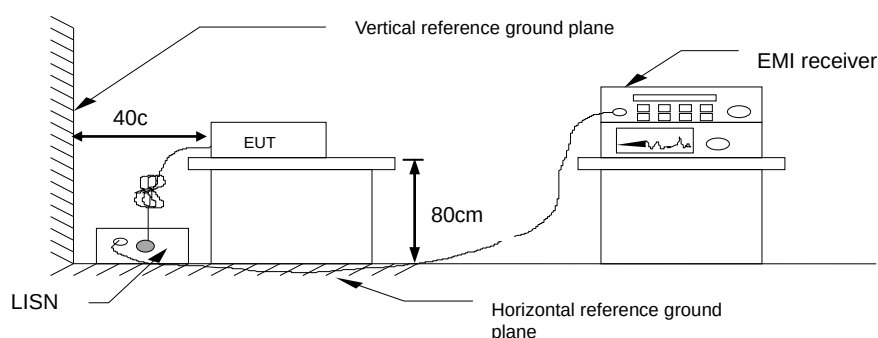
* Decreases with the logarithm of the frequency.

5.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

5.1.3 Test Setup

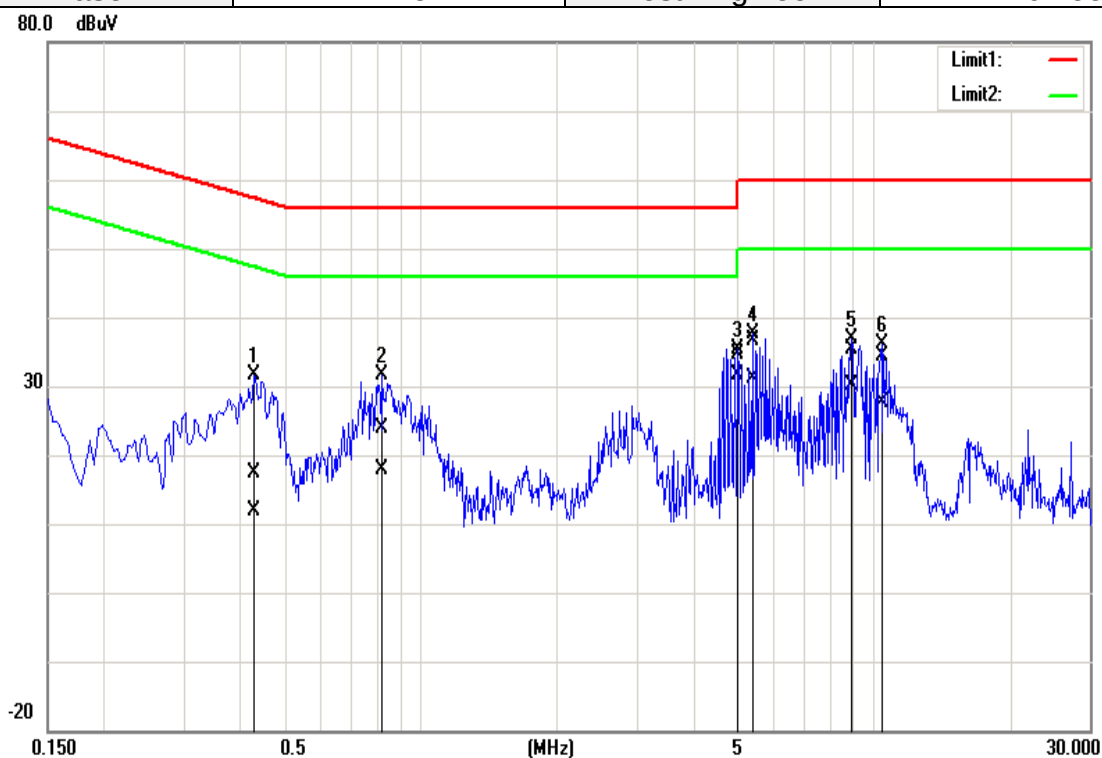


5.1.4 Test Result

Pass.

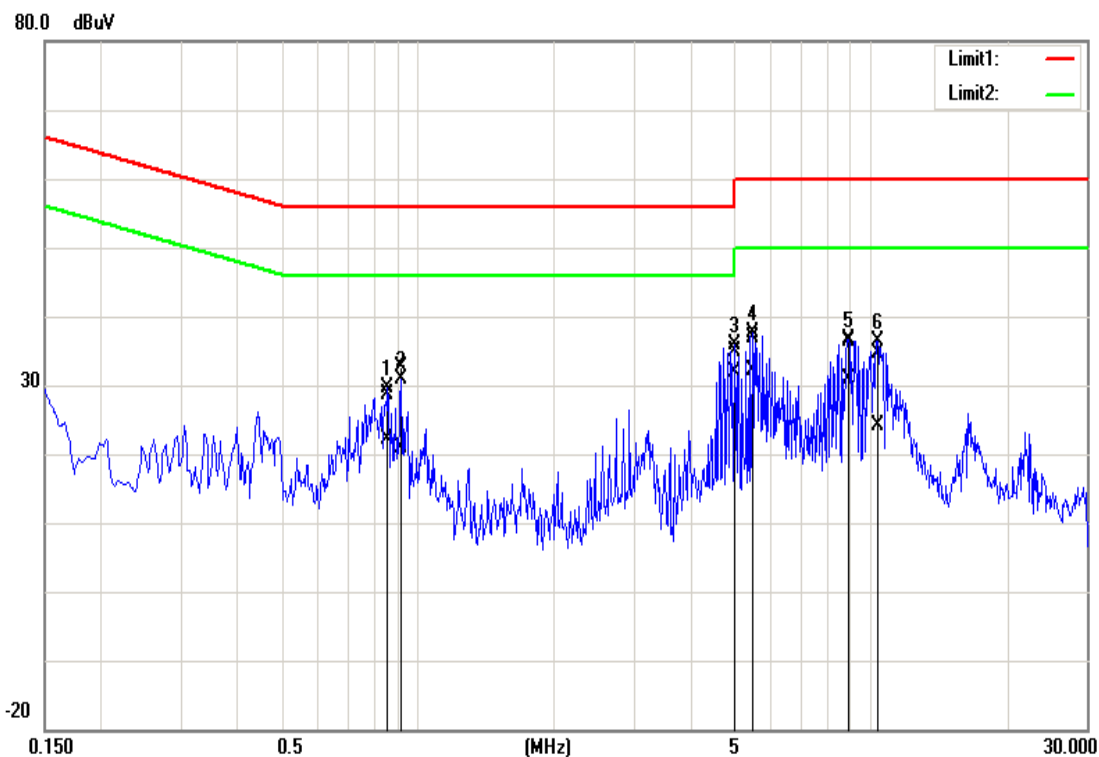
Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	January 26, 2018
Phase:	Line	Test Engineer	Eric Lee



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.4300	17.44	11.76	0.05	17.49	11.81	57.25	47.25	-39.76	-35.44	Pass
0.8260	23.73	17.88	0.06	23.79	17.94	56.00	46.00	-32.21	-28.06	Pass
5.0300	34.52	31.57	0.09	34.61	31.66	60.00	50.00	-25.39	-18.34	Pass
5.4140	36.55	30.99	0.08	36.63	31.07	60.00	50.00	-23.37	-18.93	Pass
8.9220	35.52	30.18	-0.05	35.47	30.13	60.00	50.00	-24.53	-19.87	Pass
10.4380	34.46	27.61	-0.06	34.40	27.55	60.00	50.00	-25.60	-22.45	Pass

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	January 26, 2018
Phase:	Line	Test Engineer	Eric Lee



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.8580	28.52	22.08	0.15	28.67	22.23	56.00	46.00	-27.33	-23.77	Pass
0.9220	32.50	20.74	0.15	32.65	20.89	56.00	46.00	-23.35	-25.11	Pass
5.0260	34.76	31.63	0.23	34.99	31.86	60.00	50.00	-25.01	-18.14	Pass
5.4980	36.54	31.94	0.24	36.78	32.18	60.00	50.00	-23.22	-17.82	Pass
8.9180	36.16	30.58	0.32	36.48	30.90	60.00	50.00	-23.52	-19.10	Pass
10.3460	34.31	23.83	0.35	34.66	24.18	60.00	50.00	-25.34	-25.82	Pass

5.2 6DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

5.2.1 Test Limit

According to §15.247(a)(2),

6 dB Bandwidth :

Limit	Shall be at least 500kHz
-------	--------------------------

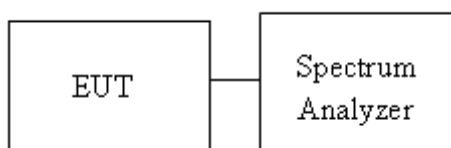
Occupied Bandwidth(99%) : For reporting purposes only.

5.2.2 Test Procedure

Test method Refer as KDB 558074 D01 v04, Section 8.1 and ANSI 63.10:2013 clause 6.9.2,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW =100KHz , VBW = 300KHz and Detector = Peak, to measurement 6dB Bandwidth
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

5.2.3 Test Setup



5.2.4 Test Result

Test mode: IEEE 802.11b mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain 0 OBW(99%) (MHz)	Chain 1 OBW(99%) (MHz)	Chain 0 6dB BW (MHz)	Chain 1 6dB BW (MHz)	6dB limit (kHz)
Low	2412	14.2402	-	10.1304	-	≥500
Mid	2437	14.2402	-	10.1304	-	
High	2462	14.2836	-	10.1304	-	

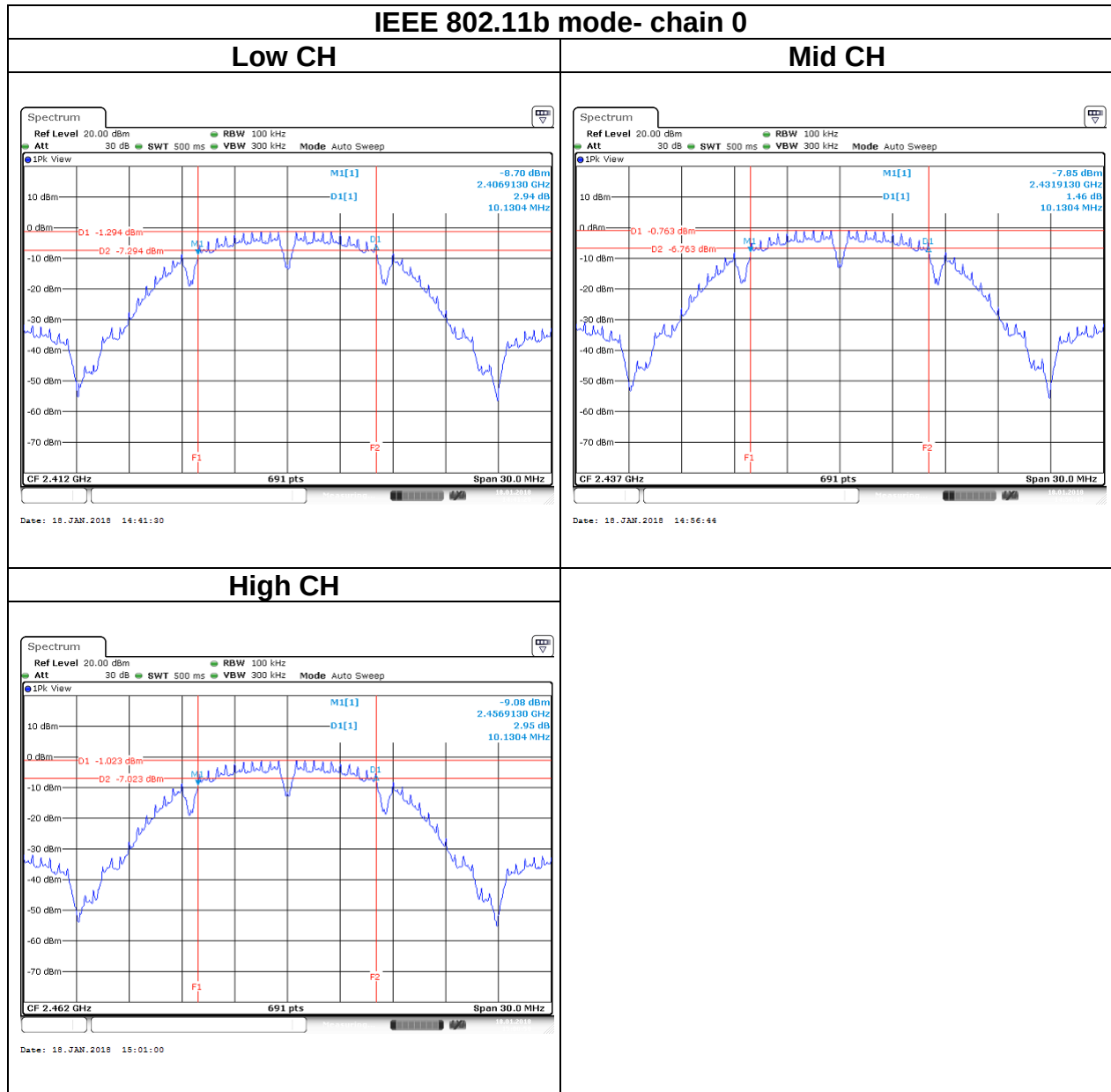
Test mode: IEEE 802.11g mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain 0 OBW(99%) (MHz)	Chain 1 OBW(99%) (MHz)	Chain 0 6dB BW (MHz)	Chain 1 6dB BW (MHz)	6dB limit (kHz)
Low	2412	16.9753	-	16.3478	-	≥500
Mid	2437	17.0188	-	16.3478	-	
High	2462	16.9753	-	16.3478	-	

Test mode: IEEE 802.11n 20 MHz mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain 0 OBW(99%) (MHz)	Chain 1 OBW(99%) (MHz)	Chain 0 6dB BW (MHz)	Chain 1 6dB BW (MHz)	6dB limit (kHz)
Low	2412	18.0607	18.0173	17.5652	17.5652	≥500
Mid	2437	18.0607	18.0173	17.5652	17.5652	
High	2462	18.0173	18.0607	17.5652	17.5652	

Test mode: IEEE 802.11n 40 MHz mode / 2422-2452 MHz						
Channel	Frequency (MHz)	Chain 0 OBW(99%) (MHz)	Chain 1 OBW(99%) (MHz)	Chain 0 6dB BW (MHz)	Chain 1 6dB BW (MHz)	6dB limit (kHz)
Low	2422	39.4790	40.8683	36.406	36.406	>500
Mid	2437	39.3632	39.4790	36.406	36.406	
High	2452	39.0159	39.5947	36.406	36.406	

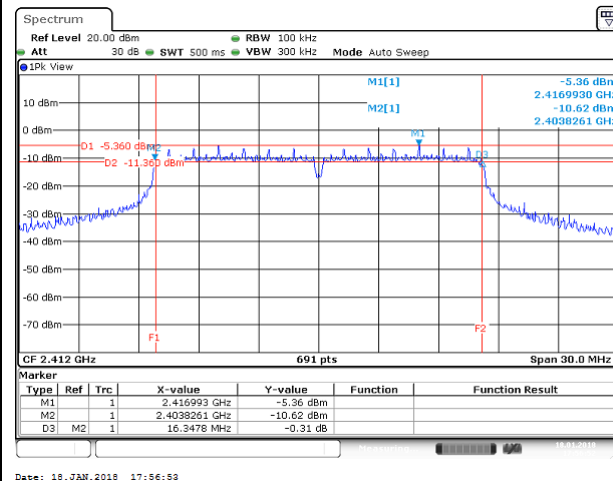
Test Data

6dB

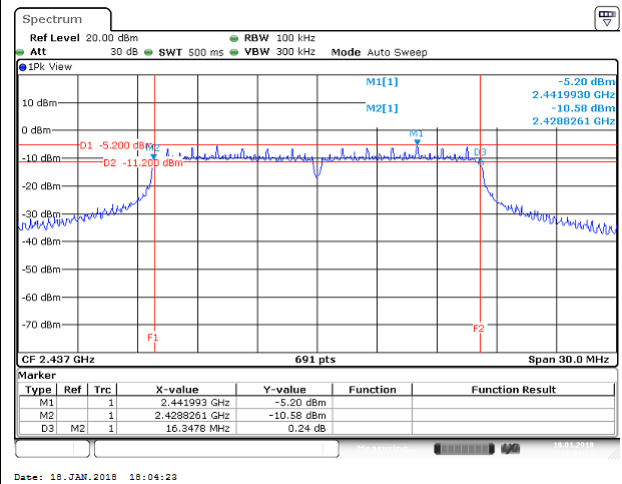


IEEE 802.11g mode- chain 0

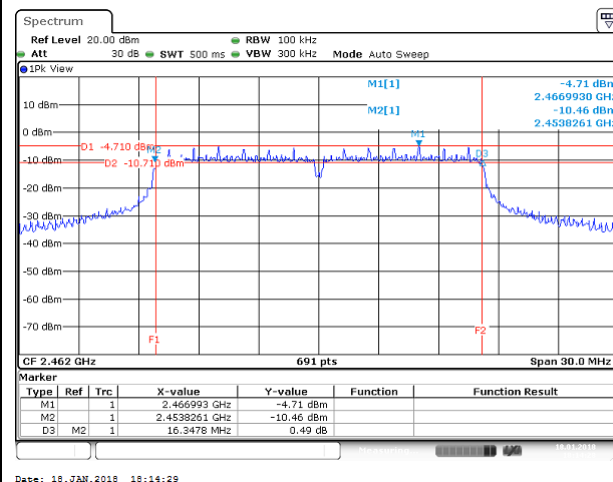
Low CH



Mid CH

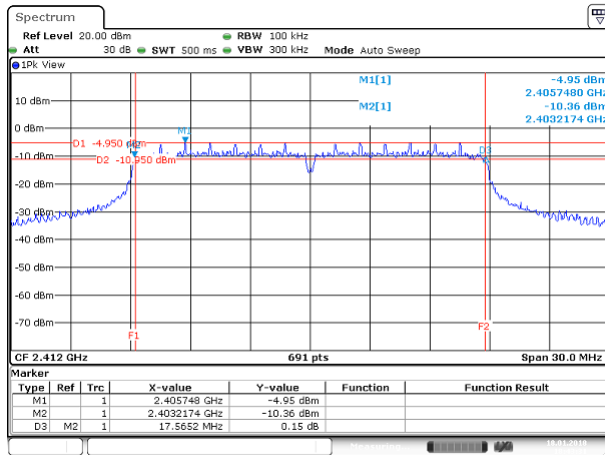


High CH

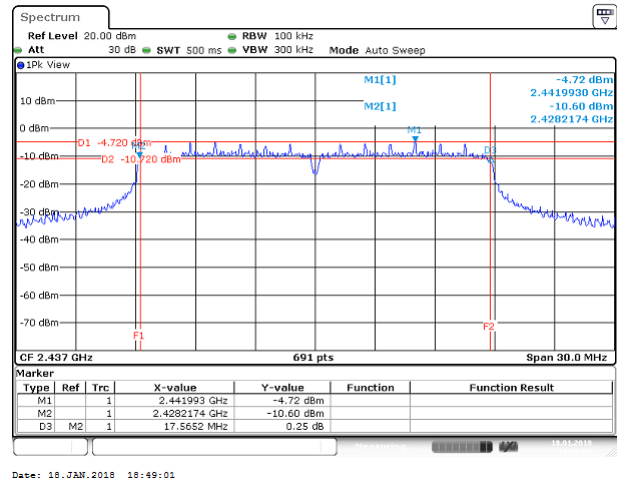


IEEE 802.11n 20MHz mode- chain 0

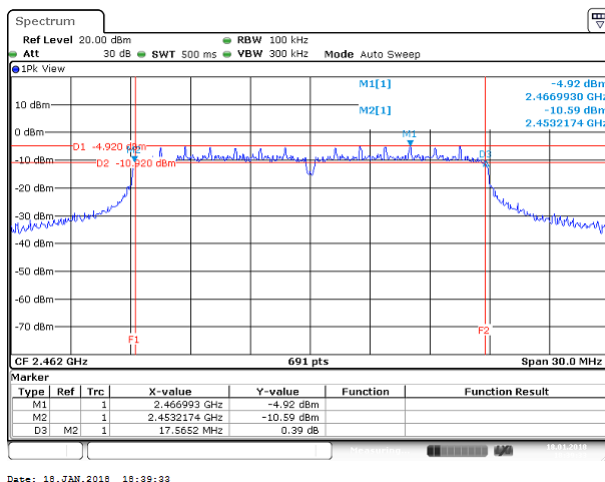
Low CH



Mid CH

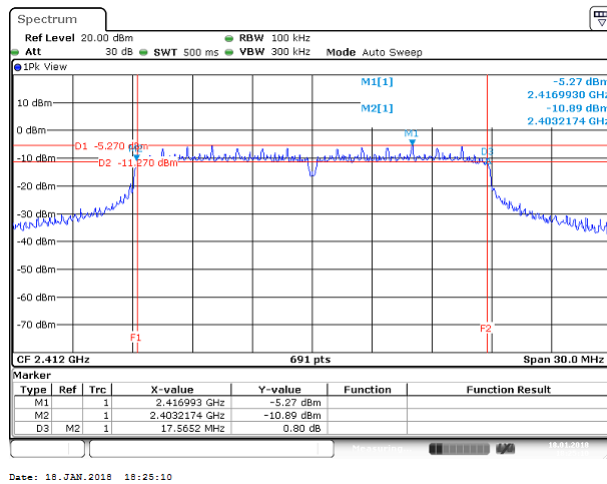


High CH

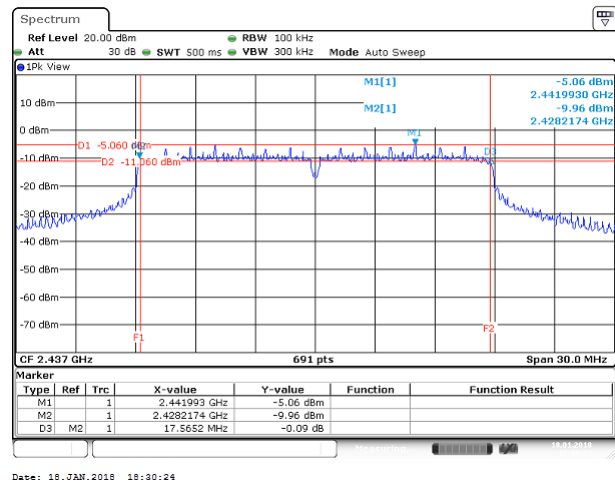


IEEE 802.11n 20MHz mode- chain 1

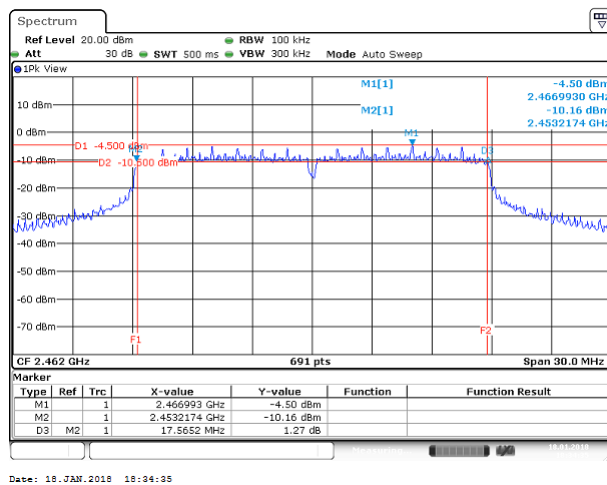
Low CH



Mid CH

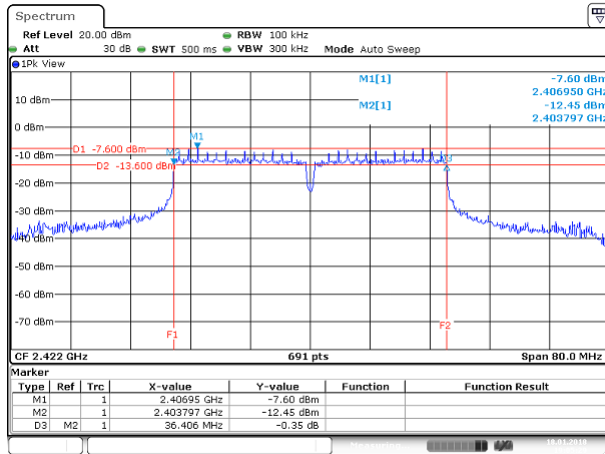


High CH

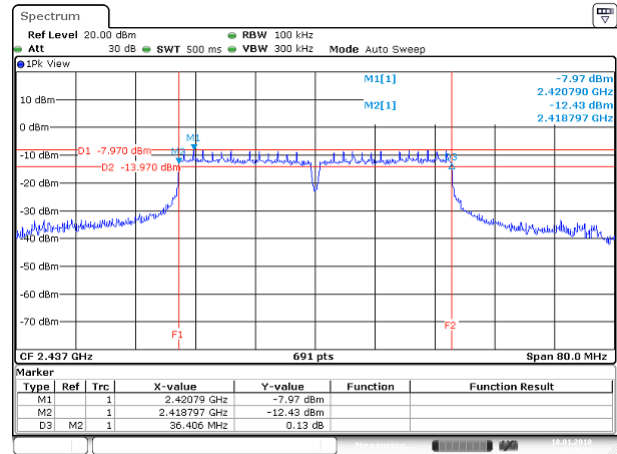


IEEE 802.11n 40MHz mode- chain 0

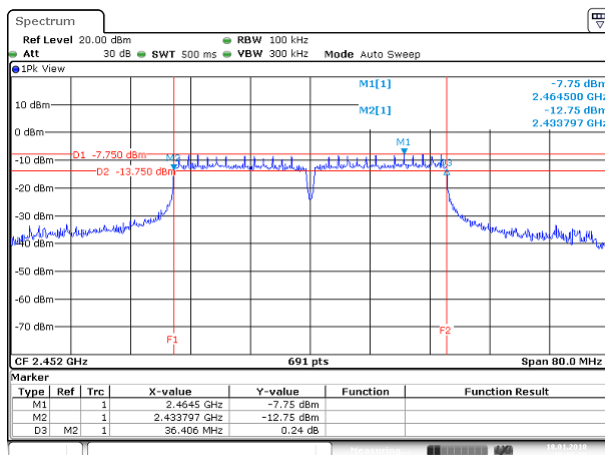
Low CH



Mid CH

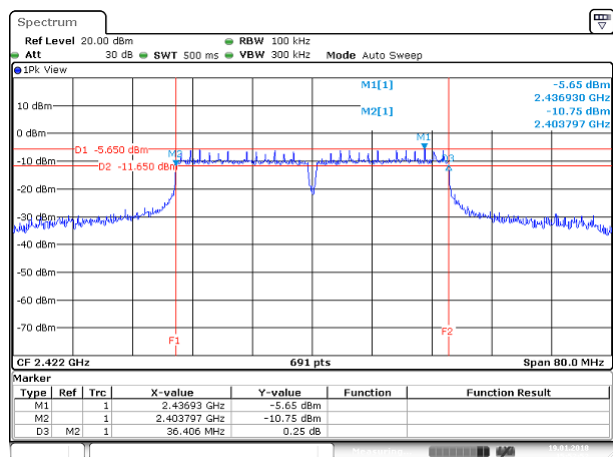


High CH

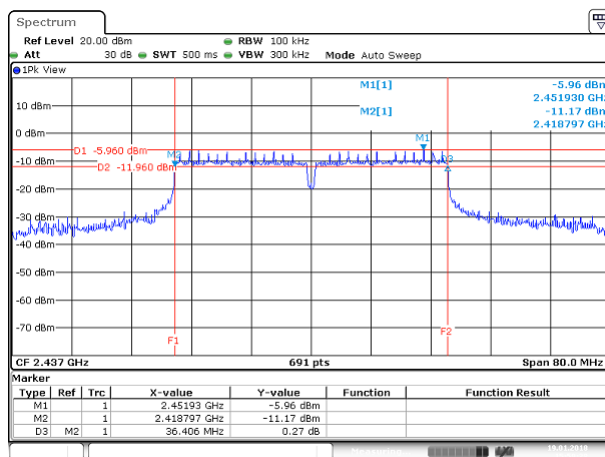


IEEE 802.11n 40MHz mode- chain 1

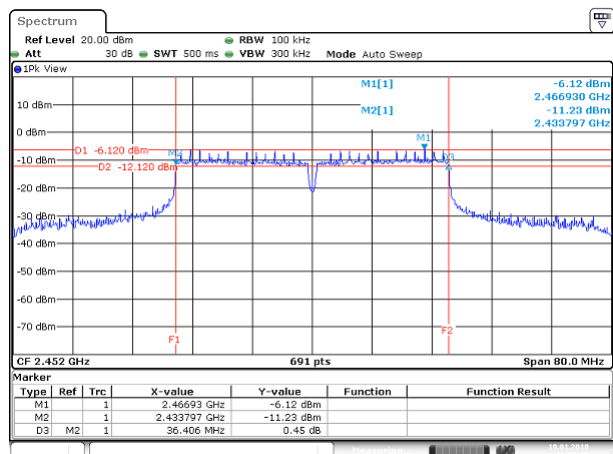
Low CH



Mid CH

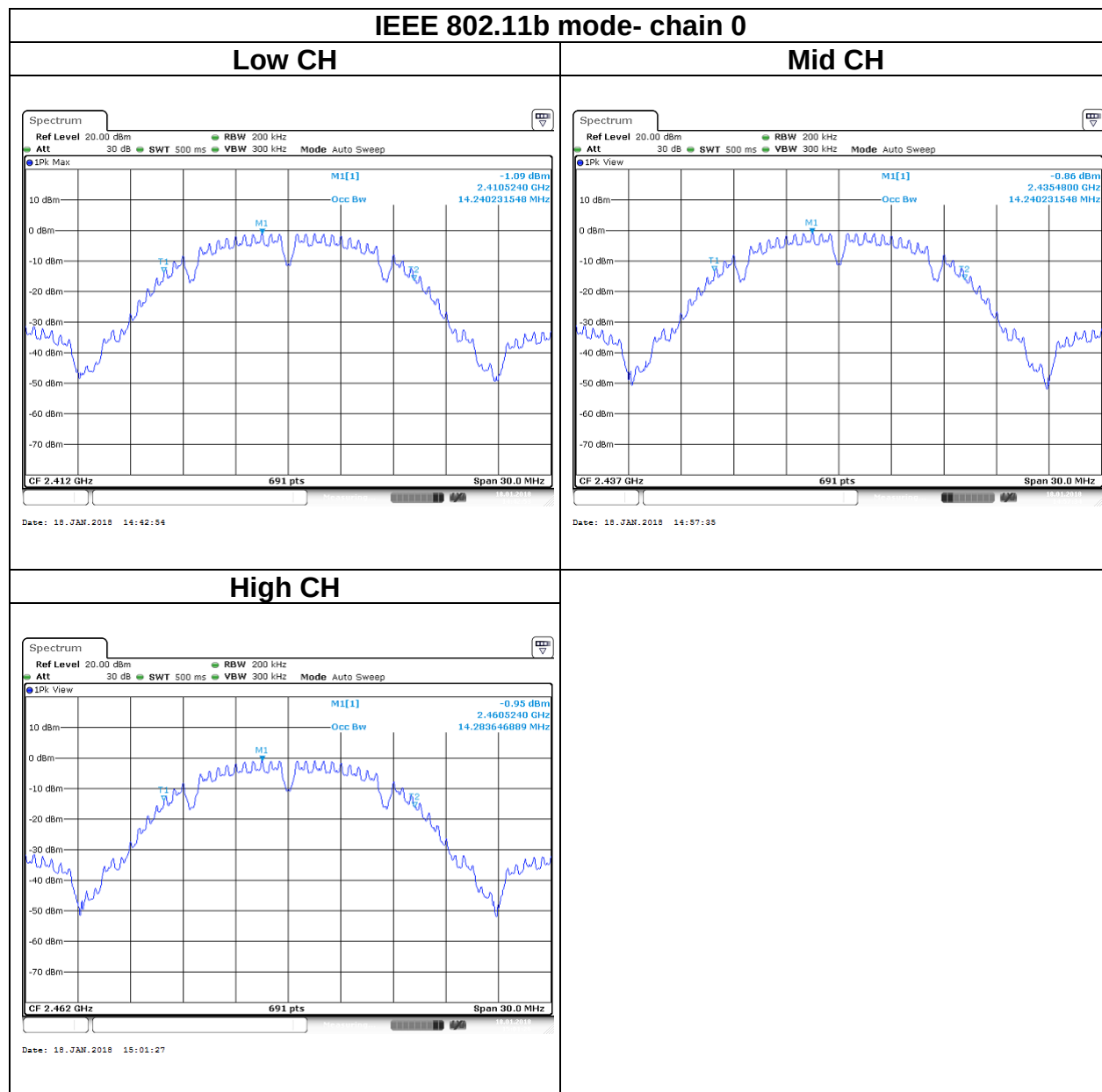


High CH



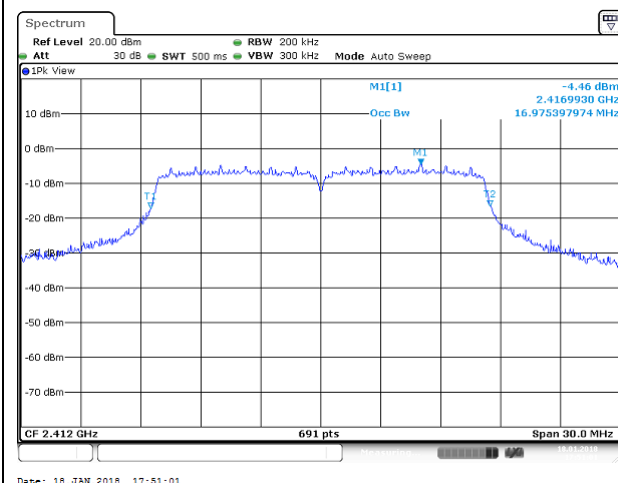
Test Data

OBW(99%)

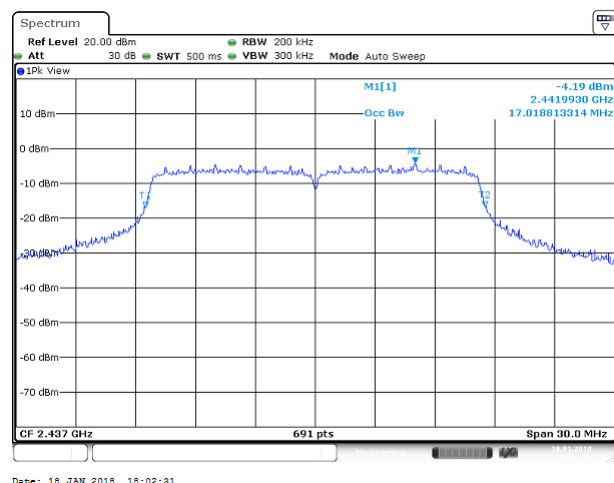


IEEE 802.11g mode- chain 0

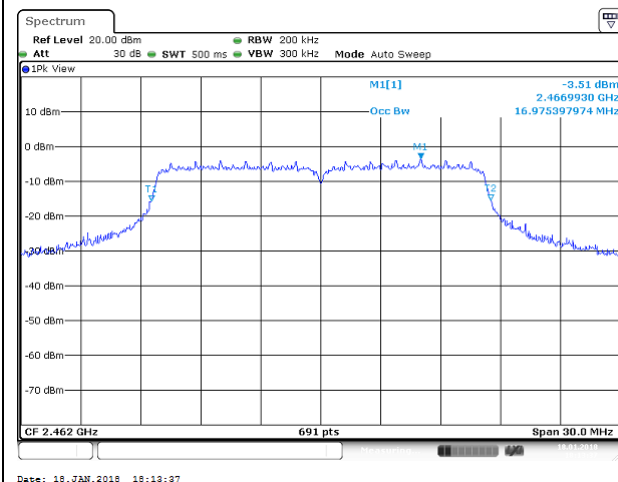
Low CH



Mid CH

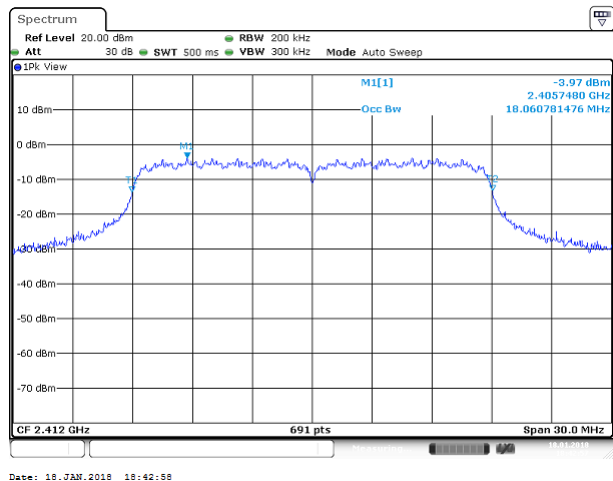


High CH

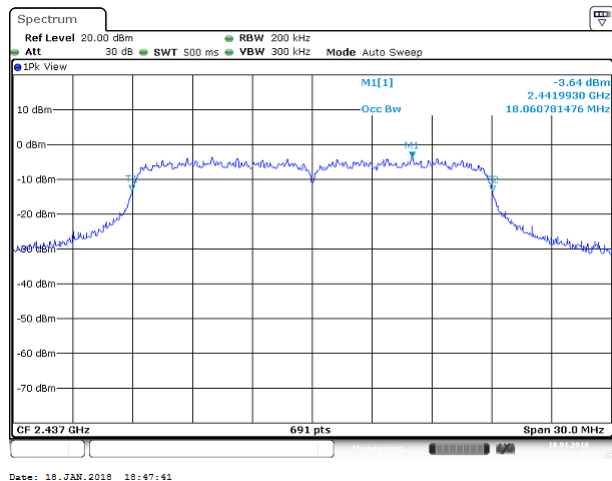


IEEE 802.11n 20MHz mode- chain 0

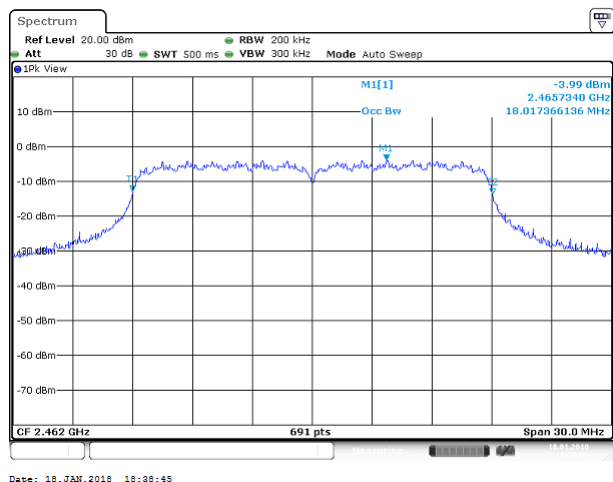
Low CH



Mid CH

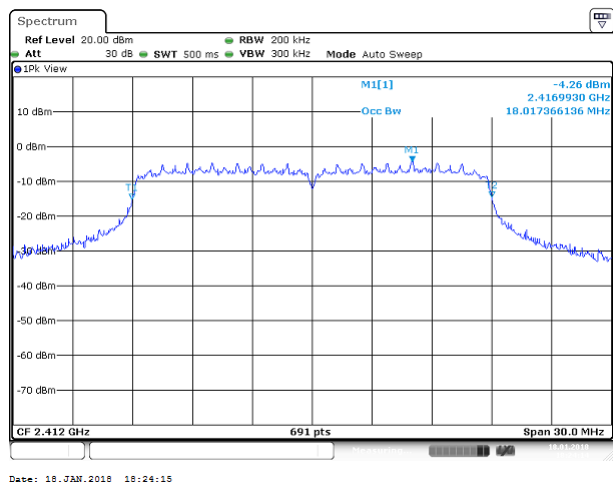


High CH

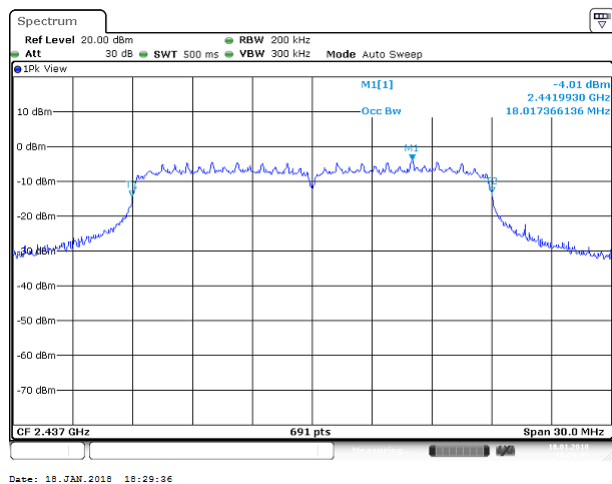


IEEE 802.11n 20MHz mode- chain 1

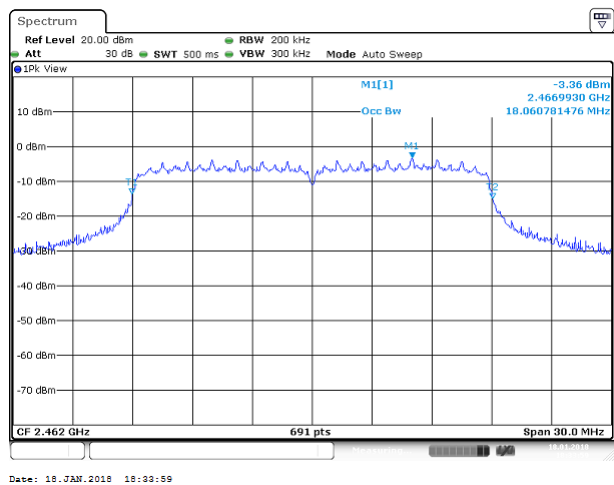
Low CH



Mid CH

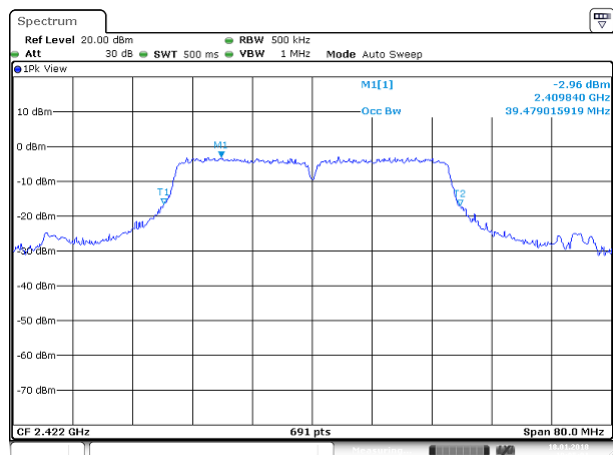


High CH

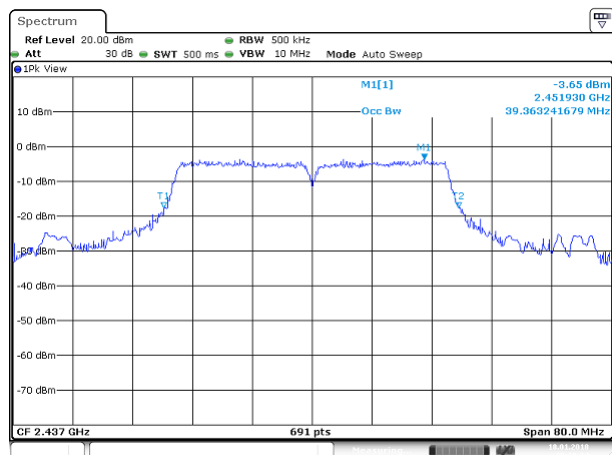


IEEE 802.11n 40MHz mode- chain 0

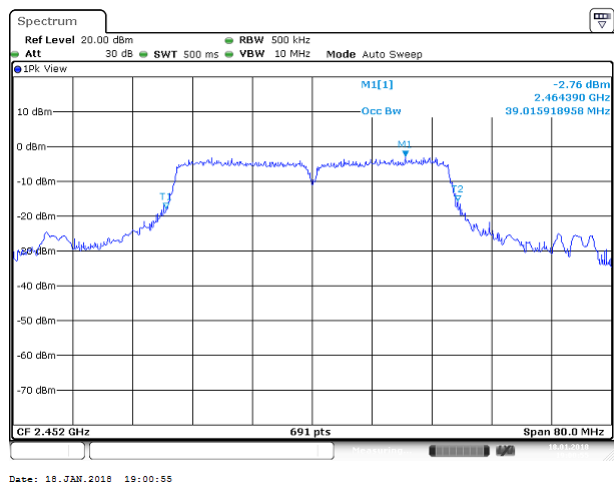
Low CH



Mid CH

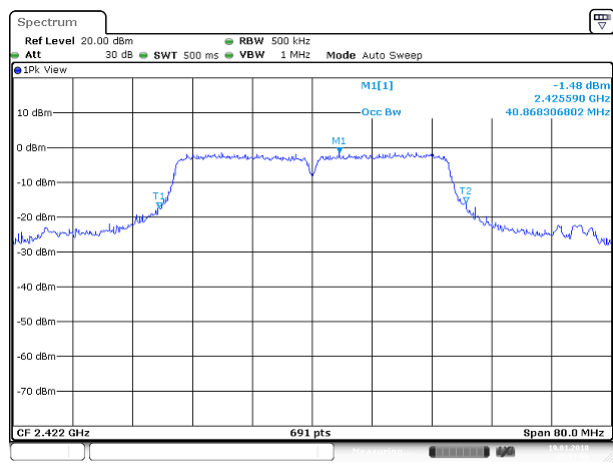


High CH



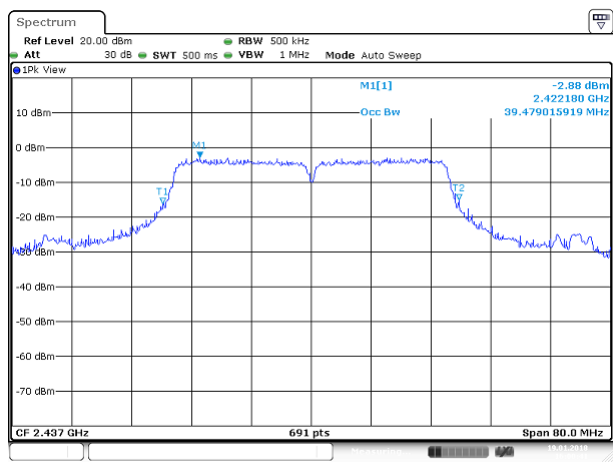
IEEE 802.11n 40MHz mode- chain 1

Low CH



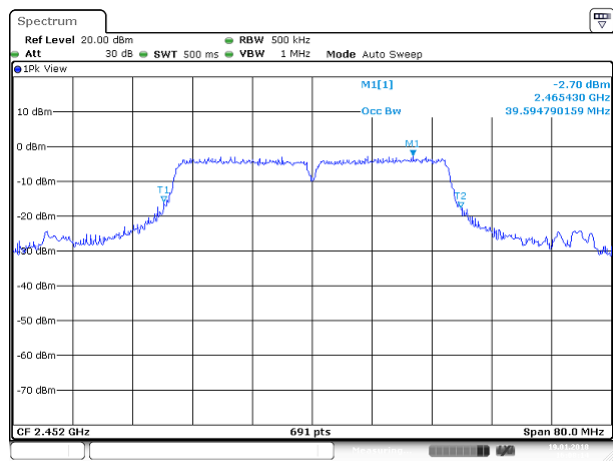
Date: 19 JAN 2018 15:54:06

Mid CH



Date: 19 JAN 2018 16:00:42

High CH



Date: 19 JAN 2018 16:08:14

5.3 OUTPUT POWER MEASUREMENT

5.3.1 Test Limit

According to §15.247(b),

Peak output power :

For systems using digital modulation in the 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt(30 dBm), base on the use of antennas with directional gain not exceed 6 dBi. If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Limit	☒ Antenna not exceed 6 dBi : 30dBm ☐ Antenna with DG greater than 6 dBi : [Limit = 30 – (DG – 6)] ☐ Point-to-point operation :
-------	---

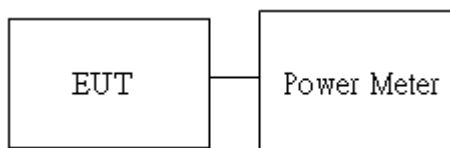
Average output power : For reporting purposes only.

5.3.2 Test Procedure

Test method Refer as KDB 558074 D01 v04, Section 9.1.3.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

5.3.3 Test Setup



5.3.4 Test Result

Peak output power :

Wifi 2.4G									
Config	CH	Freq. (MHz)	power set		PK Power(dBm)		PK Total Power (dBm)	PK Total Power (W)	Limit (dBm)
			chain0	chain1	chain0	chain1			
IEEE 802.11b Data rate: 1Mbps	Low	2412	-	17.5	-	16.01	16.01	0.0399	30
	Mid	2437	-	14.0	-	12.44	12.44	0.0175	
	High	2462	-	14.5	-	12.13	12.13	0.0163	
IEEE 802.11g Data rate: 6Mbps	Low	2412	-	13.0	-	14.24	14.24	0.0265	
	Mid	2437	-	31.5	-	20.25	20.25	0.1059	
	High	2462	-	11.0	-	11.48	11.48	0.0141	
IEEE 802.11n 20MHz Data rate: MCS8	Low	2412	10.5	10.5	11.54	11.26	14.41	0.0276	
	Mid	2437	31.5	31.5	19.47	19.25	22.37	0.1726	
	High	2462	10.0	10.0	10.67	9.93	13.33	0.0215	
IEEE 802.11n 40MHz Data rate: MCS8	Low	2422	8.0	8.0	8.87	9.55	12.23	0.0167	
	Mid	2437	31.5	31.5	18.53	18.92	21.74	0.1493	
	High	2452	7.0	7.0	8.74	8.51	11.64	0.0146	

Average output power :

Wifi 2.4G					
Config	CH	Freq. (MHz)	AV Power(dBm)		AV Total Power (dBm)
			chain0	chain1	
IEEE 802.11b Data rate: 1Mbps	Low	2412	-	13.99	13.99
	Mid	2437	-	10.36	10.36
	High	2462	-	10.07	10.07
IEEE 802.11g Data rate: 6Mbps	Low	2412	-	9.75	9.75
	Mid	2437	-	16.61	16.61
	High	2462	-	6.67	6.67
IEEE 802.11n 20MHz Data rate: MCS8	Low	2412	7.14	6.79	9.98
	Mid	2437	15.72	15.96	18.85
	High	2462	6.55	5.62	9.12
IEEE 802.11n 40MHz Data rate: MCS8	Low	2422	4.40	5.26	7.86
	Mid	2437	15.63	15.88	18.77
	High	2452	4.13	4.03	7.09

5.4 POWER SPECTRAL DENSITY

5.4.1 Test Limit

According to §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.

Limit	☒ Antenna not exceed 6 dBi : 8dBm ☐ Antenna with DG greater than 6 dBi : [Limit = 8 – (DG – 6)] ☐ Point-to-point operation :
-------	---

5.4.2 Test Procedure

Test method Refer as KDB 558074 D01 v04, Section 10.2

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

5.4.3 Test Setup



5.4.4 Test Result

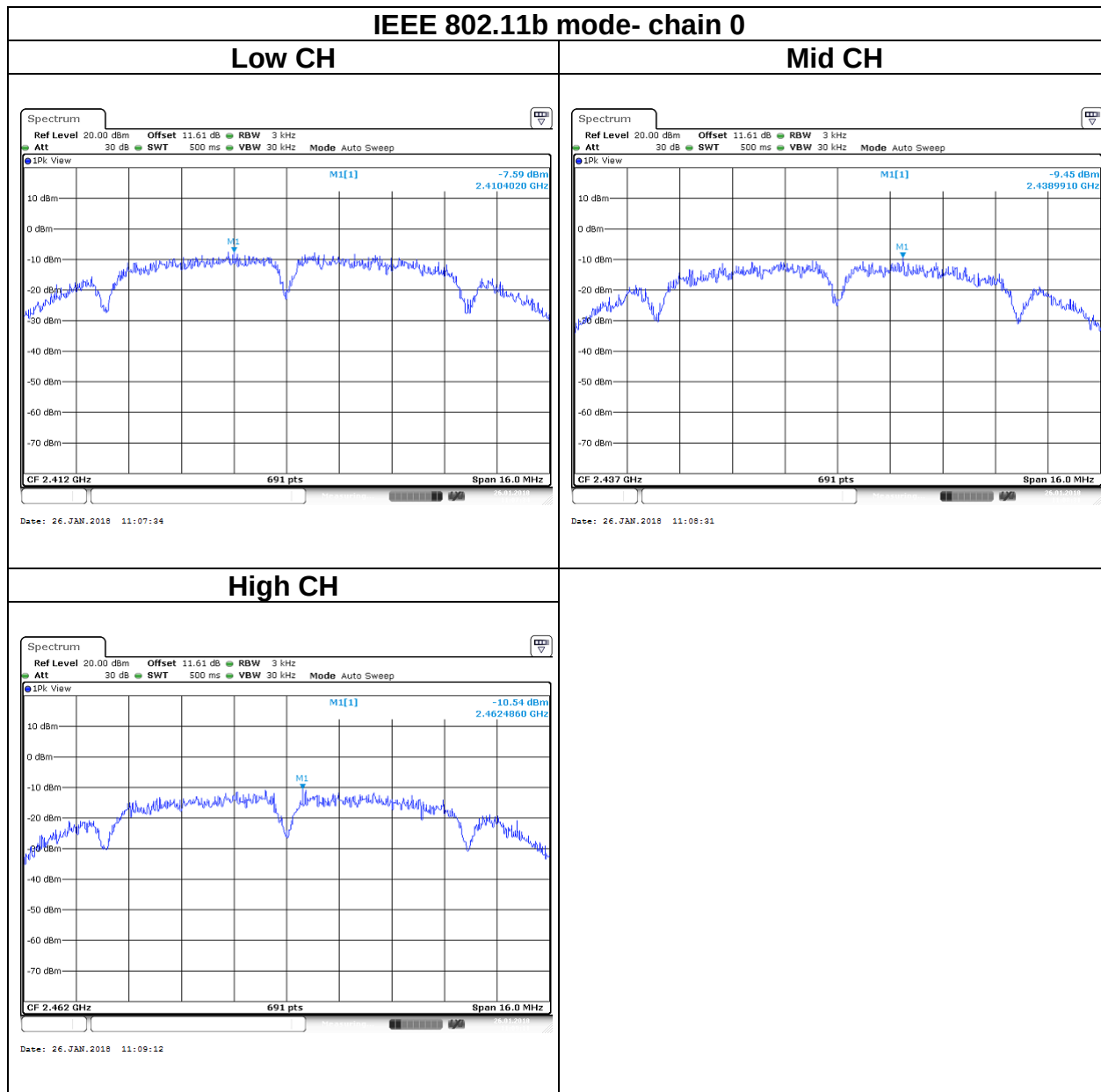
Test mode: IEEE 802.11b mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSSD (dBm)	Chain 1 PPSSD (dBm)	Total PPSSD (dBm)	Limit (dBm)
Low	2412	-7.59	-	-7.59	8
Mid	2437	-9.45	-	-9.45	
High	2462	-10.54	-	-10.54	

Test mode: IEEE 802.11g mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSSD (dBm)	Chain 1 PPSSD (dBm)	Total PPSSD (dBm)	Limit (dBm)
Low	2412	-12.84	-	-12.84	8
Mid	2437	-5.85	-	-5.85	
High	2462	-14.15	-	-14.15	

Test mode: IEEE 802.11n 20MHz mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSSD (dBm)	Chain 1 PPSSD (dBm)	Total PPSSD (dBm)	Limit (dBm)
Low	2412	-14.81	-14.60	-11.69	8
Mid	2437	-5.20	-6.37	-2.74	
High	2462	-14.67	-15.75	-12.17	

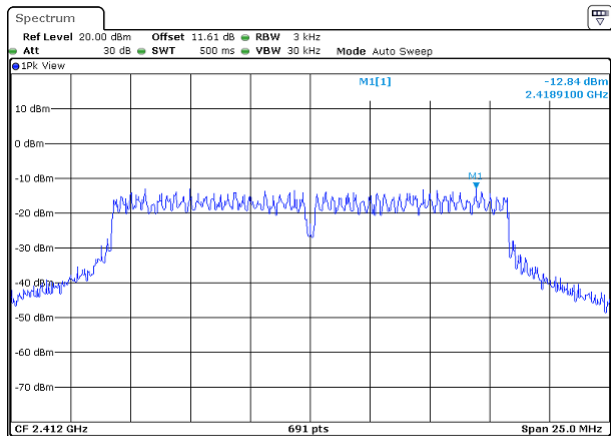
Test mode: IEEE 802.11n 40MHz mode / 2422-2452 MHz					
Channel	Frequency (MHz)	Chain 0 PPSSD (dBm)	Chain 1 PPSSD (dBm)	Total PPSSD (dBm)	Limit (dBm)
Low	2422	-18.00	-16.82	-14.36	8
Mid	2437	-5.36	-5.88	-2.60	
High	2452	-17.12	-18.77	-14.86	

Test Data

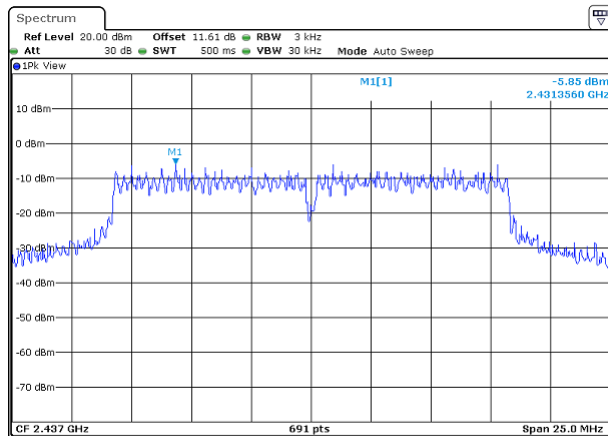


IEEE 802.11g mode- chain 0

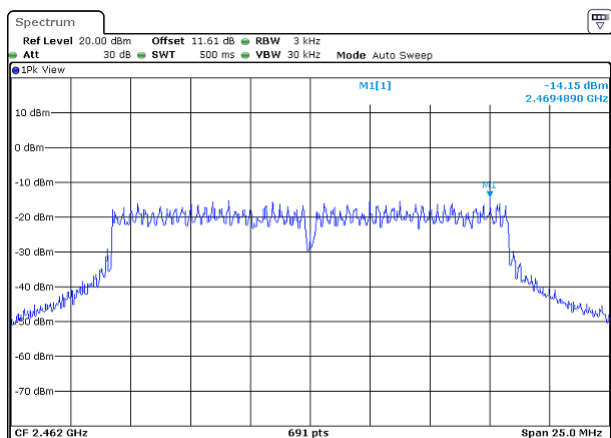
Low CH



Mid CH

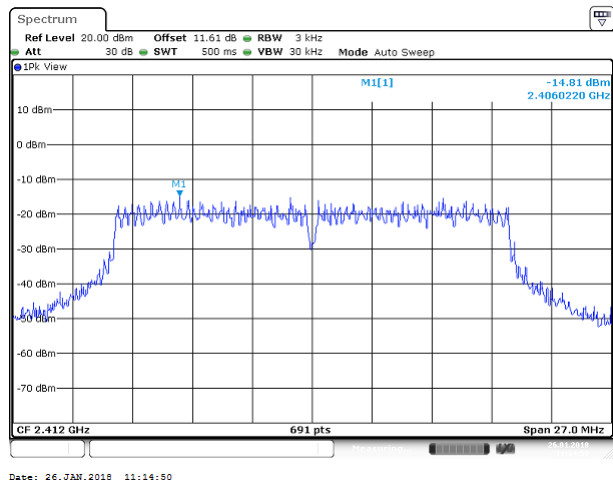


High CH

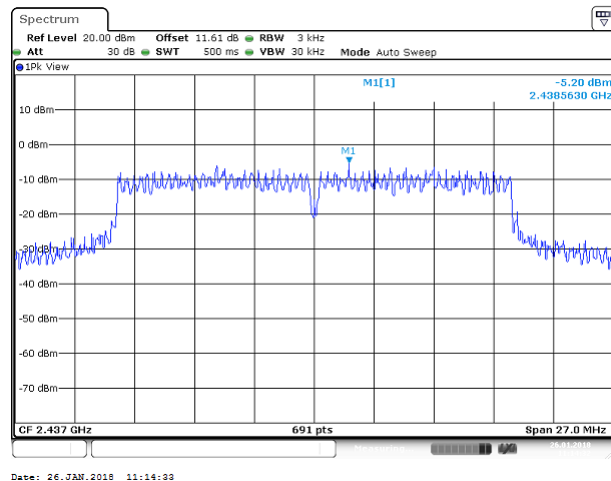


IEEE 802.11n 20MHz mode- chain 0

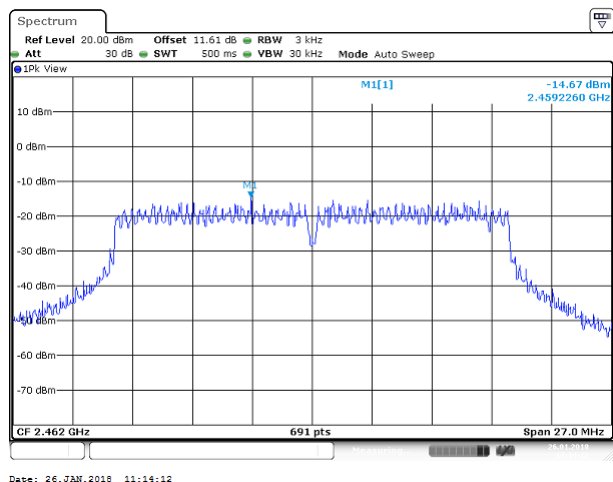
Low CH



Mid CH

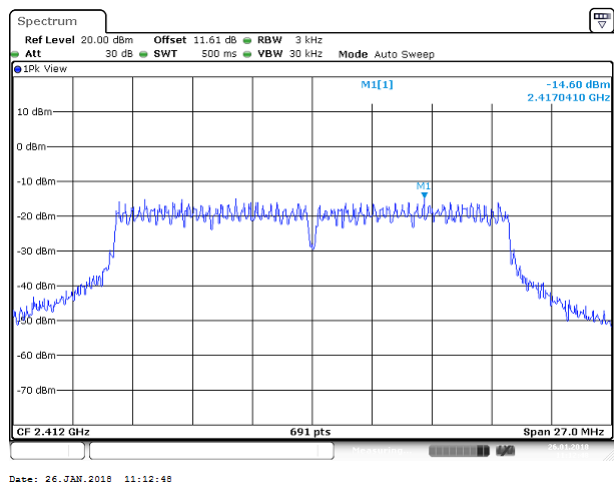


High CH

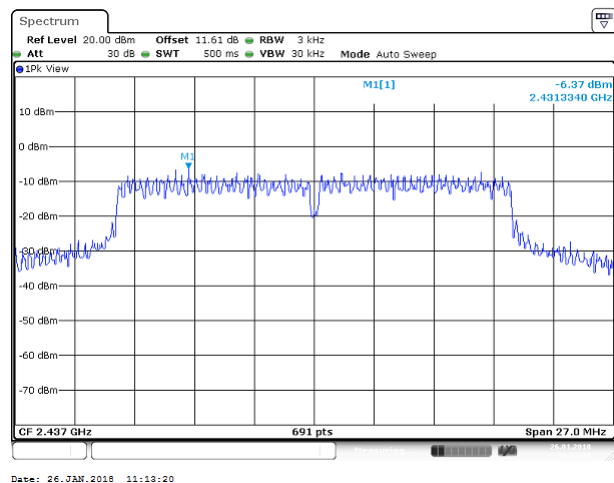


IEEE 802.11n 20MHz mode- chain 1

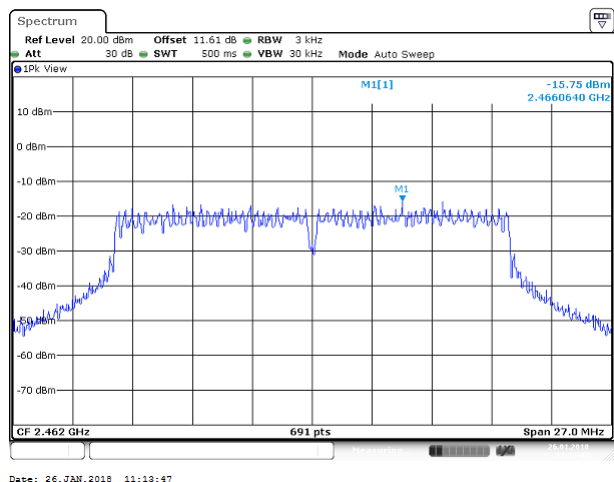
Low CH



Mid CH

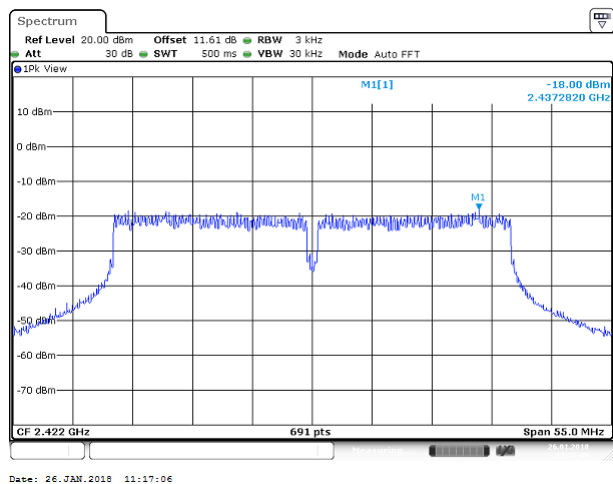


High CH

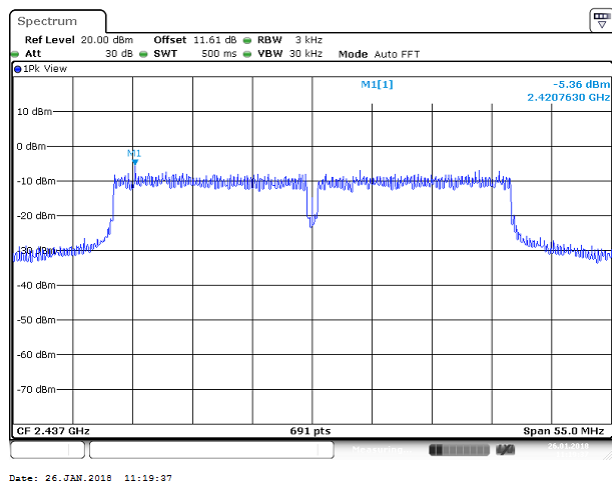


IEEE 802.11n 40MHz mode- chain 0

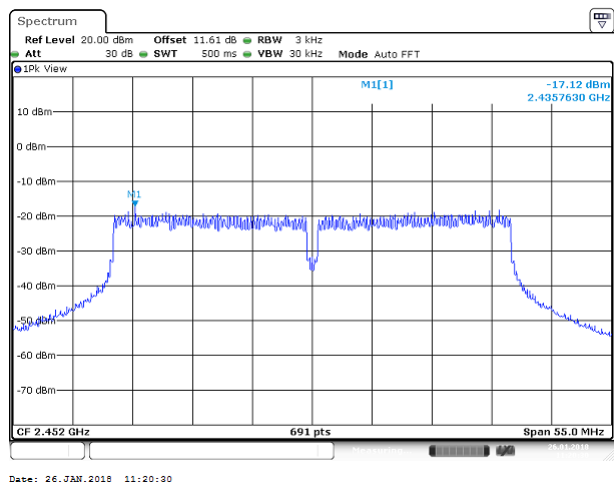
Low CH



Mid CH

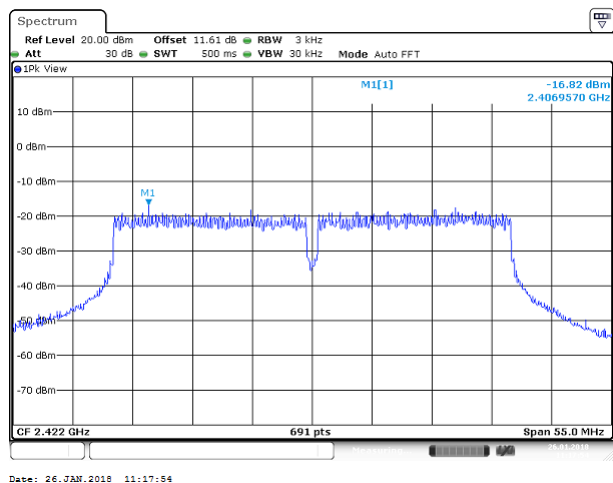


High CH

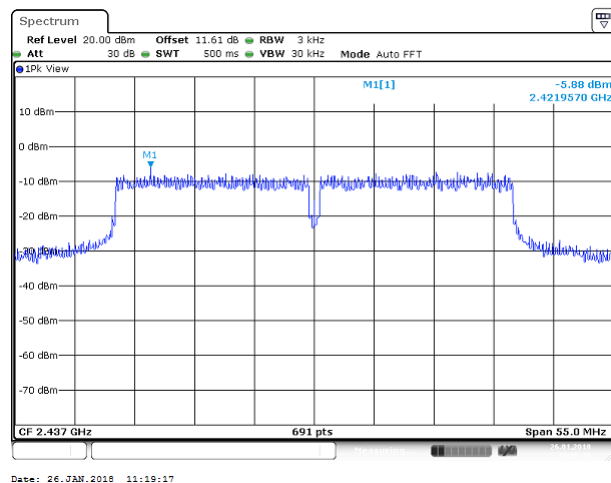


IEEE 802.11n 40MHz mode- chain 0

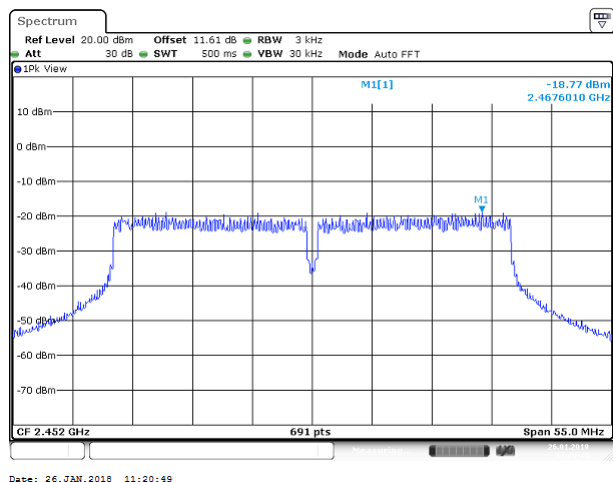
Low CH



Mid CH



High CH



5.5 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

5.5.1 Test Limit

According to §15.247(d),

In any 100 kHz bandwidth outside the authorized frequency band,

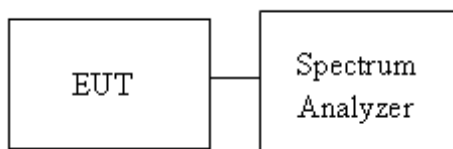
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

5.5.2 Test Procedure

Test method Refer as KDB 558074 D01 v04, Section 11.

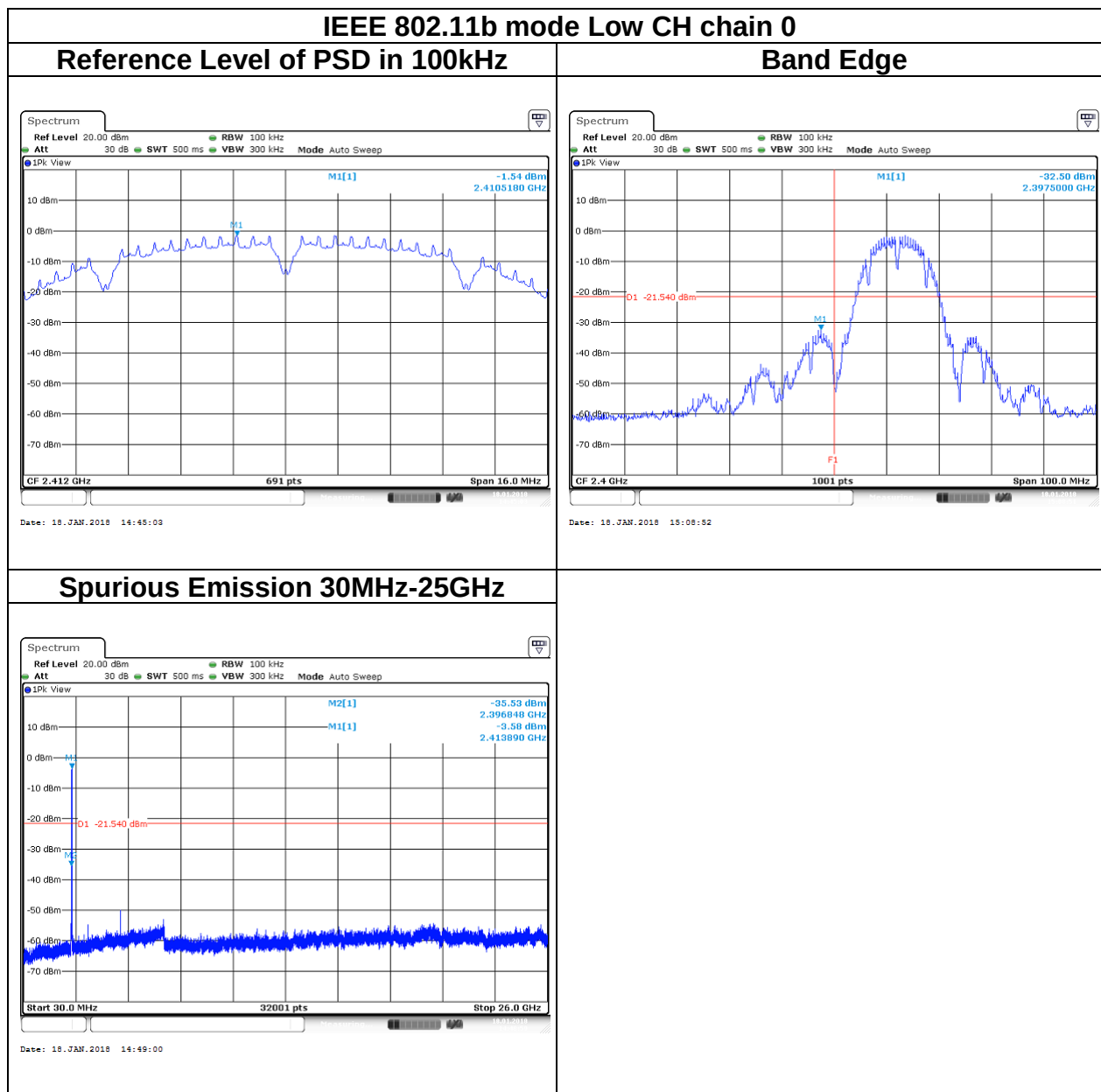
1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.5.3 Test Setup



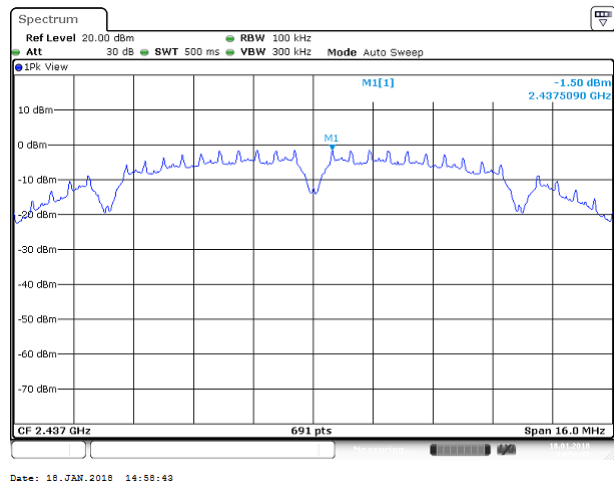
5.5.4 Test Result

Test Data

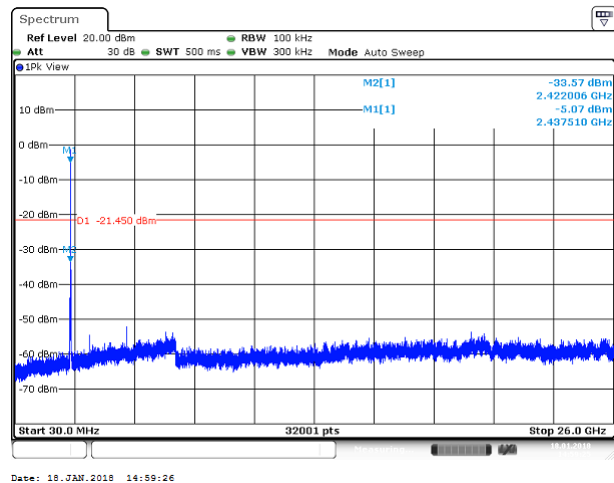


IEEE 802.11b mode Mid CH chain 0

Reference Level of PSD in 100kHz

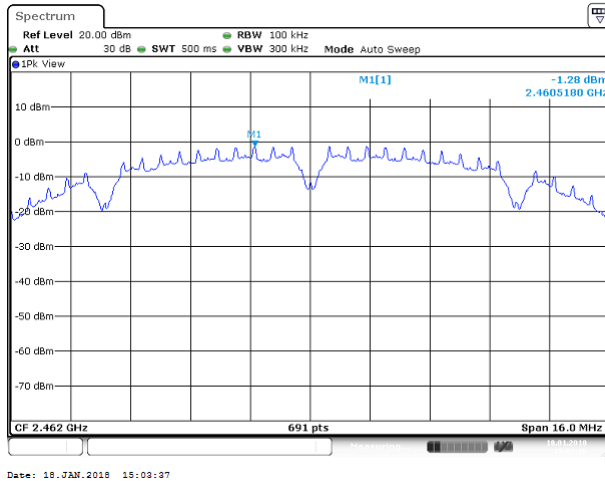


Spurious Emission 30MHz-25GHz

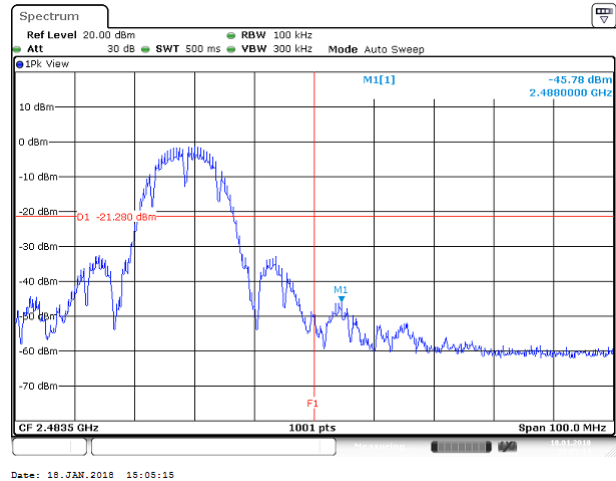


IEEE 802.11b mode High CH chain 0

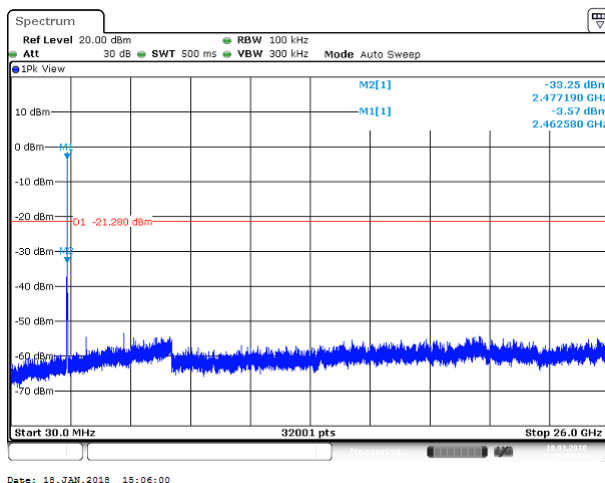
Reference Level of PSD in 100kHz



Band Edge

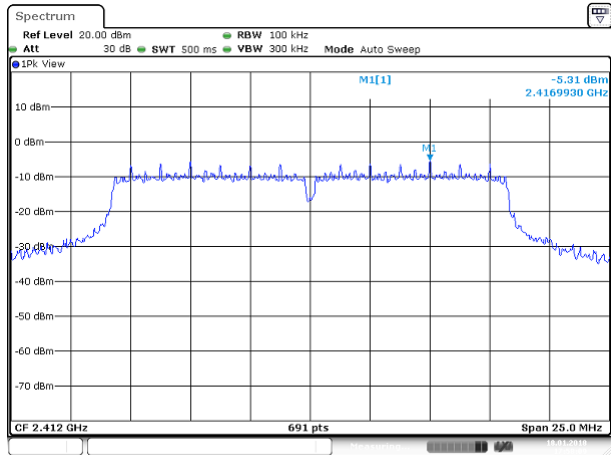


Spurious Emission 30MHz-25GHz

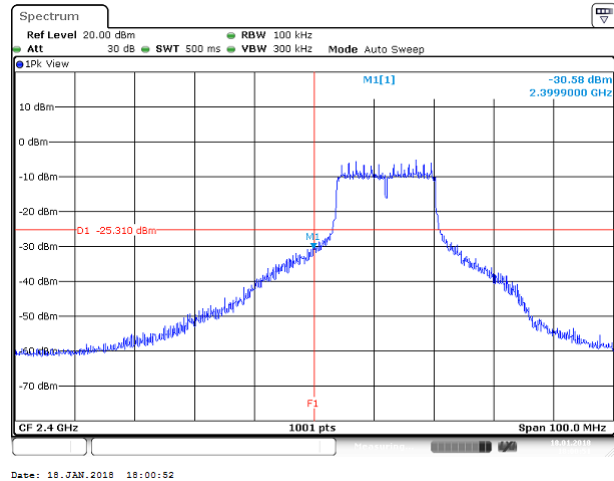


IEEE 802.11g mode Low CH chain 0

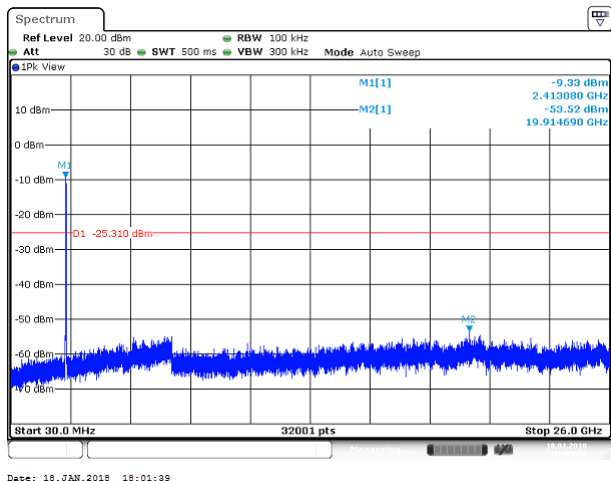
Reference Level of PSD in 100kHz

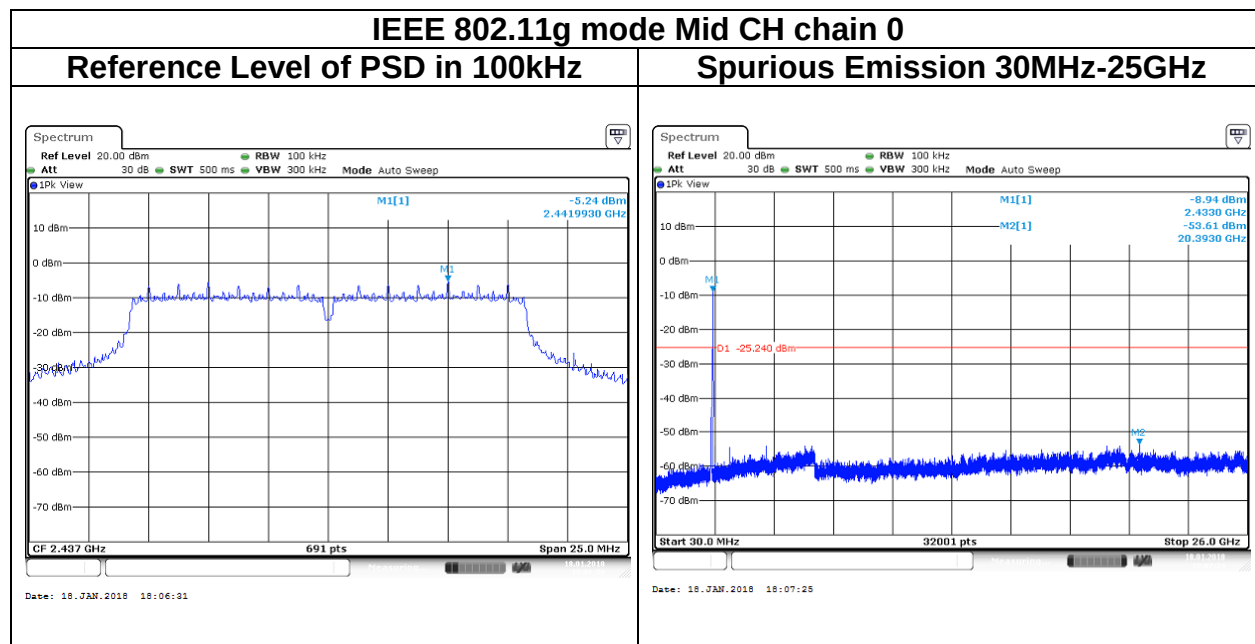


Band Edge



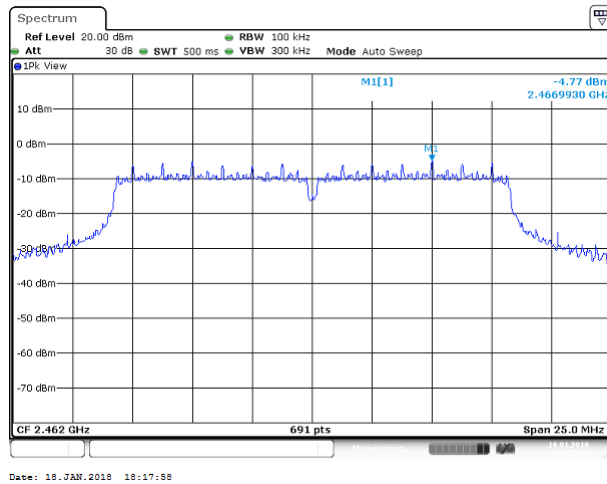
Spurious Emission 30MHz-25GHz



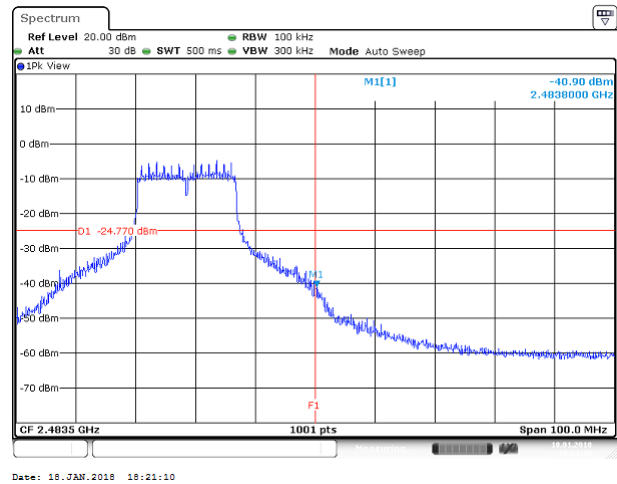


IEEE 802.11g mode High CH chain 0

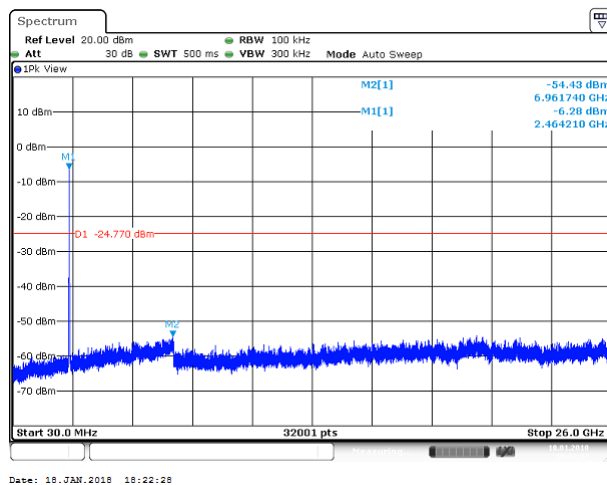
Reference Level of PSD in 100kHz



Band Edge

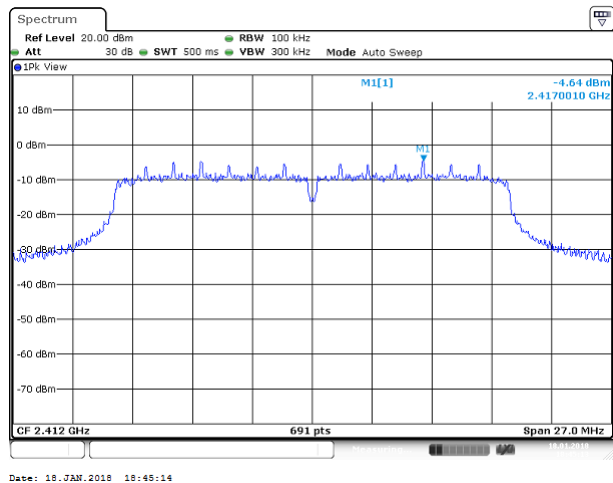


Spurious Emission 30MHz-25GHz

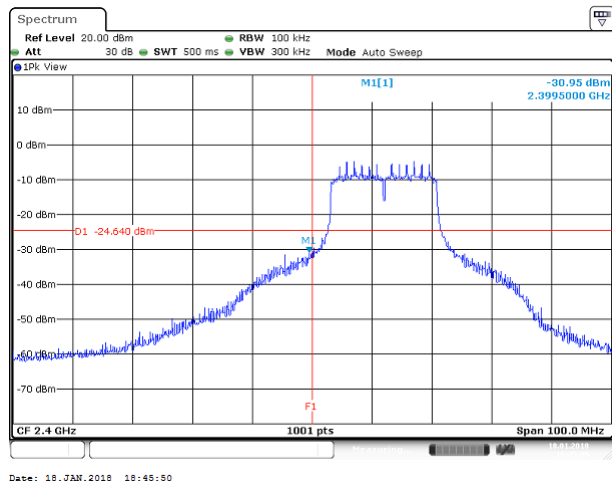


IEEE 802.11 n 20MHz mode Low CH chain 0

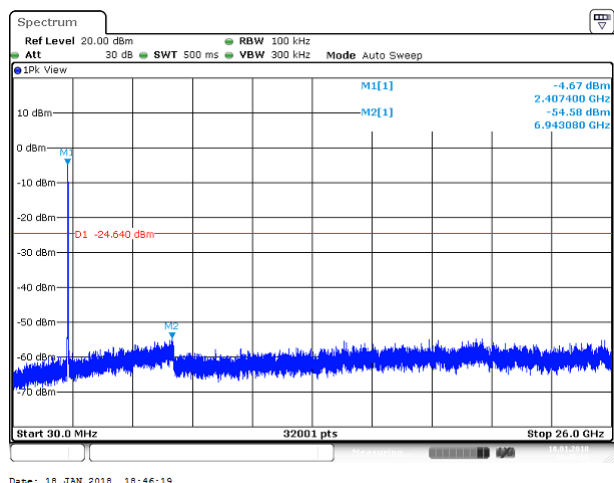
Reference Level of PSD in 100kHz

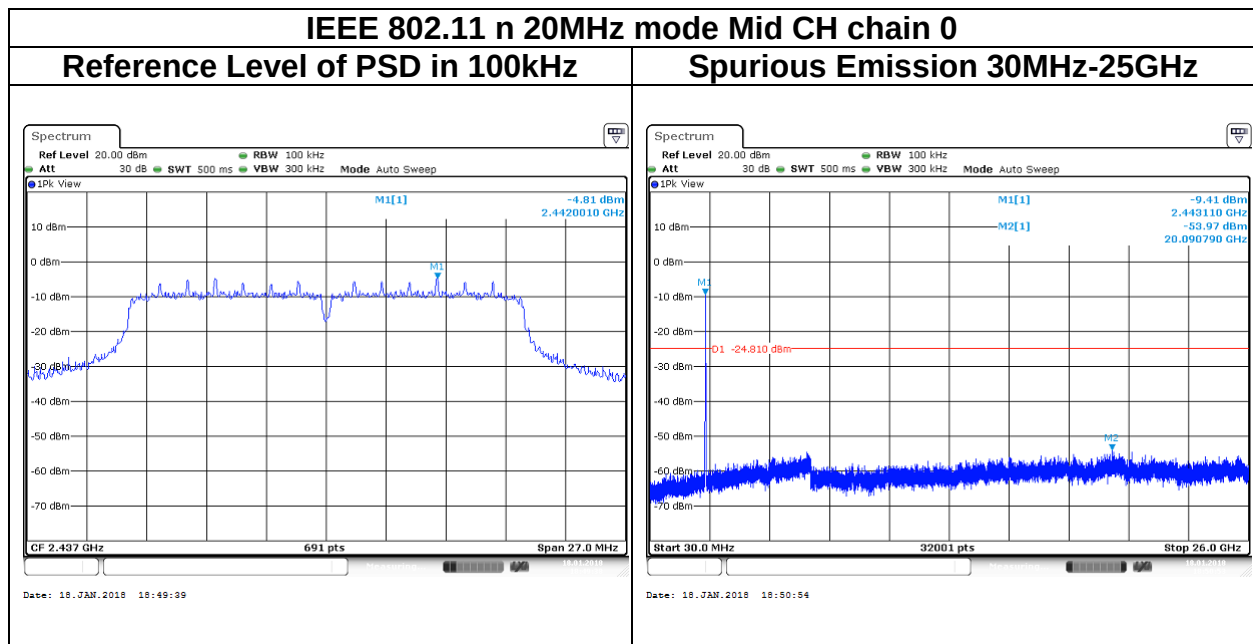


Band Edge



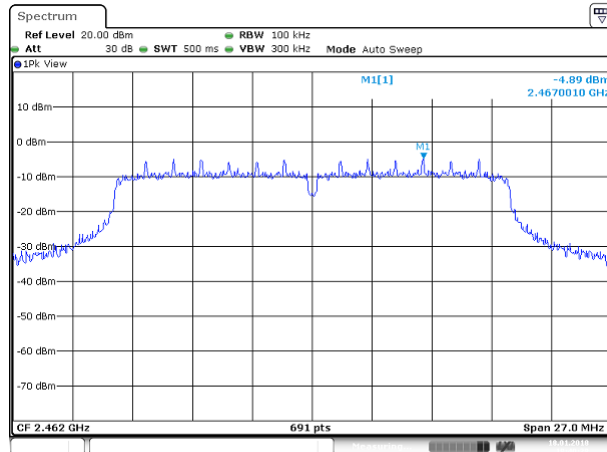
Spurious Emission 30MHz-25GHz



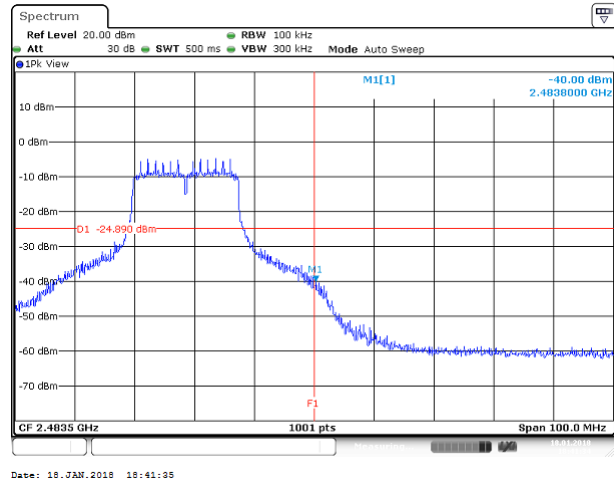


IEEE 802.11n 20MHz mode High CH chain 0

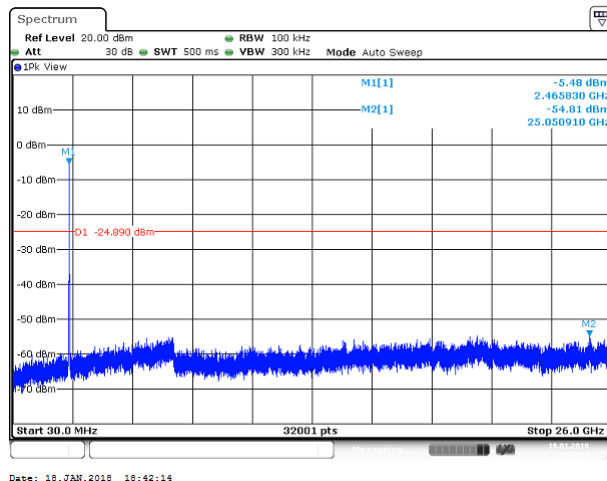
Reference Level of PSD in 100kHz



Band Edge

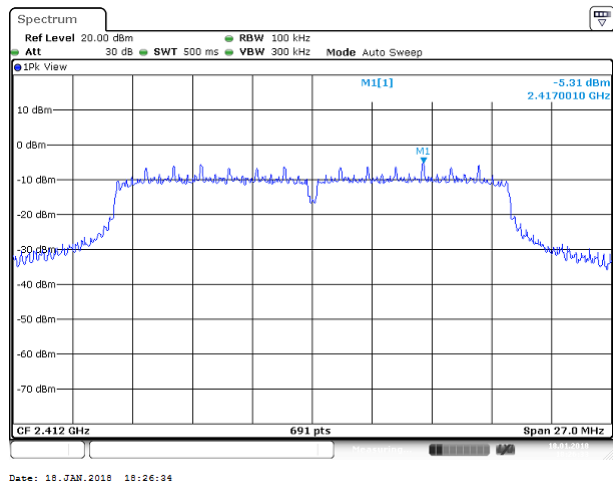


Spurious Emission 30MHz-25GHz

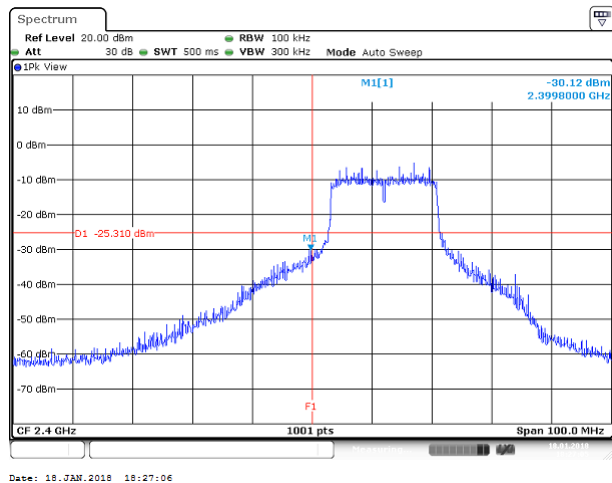


IEEE 802.11 n 20MHz mode Low CH chain 1

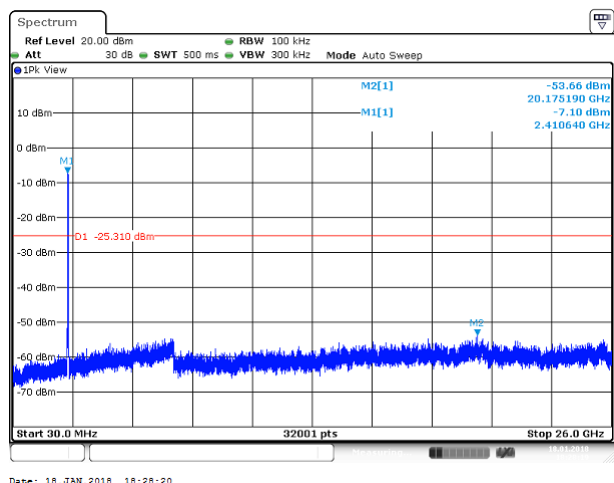
Reference Level of PSD in 100kHz

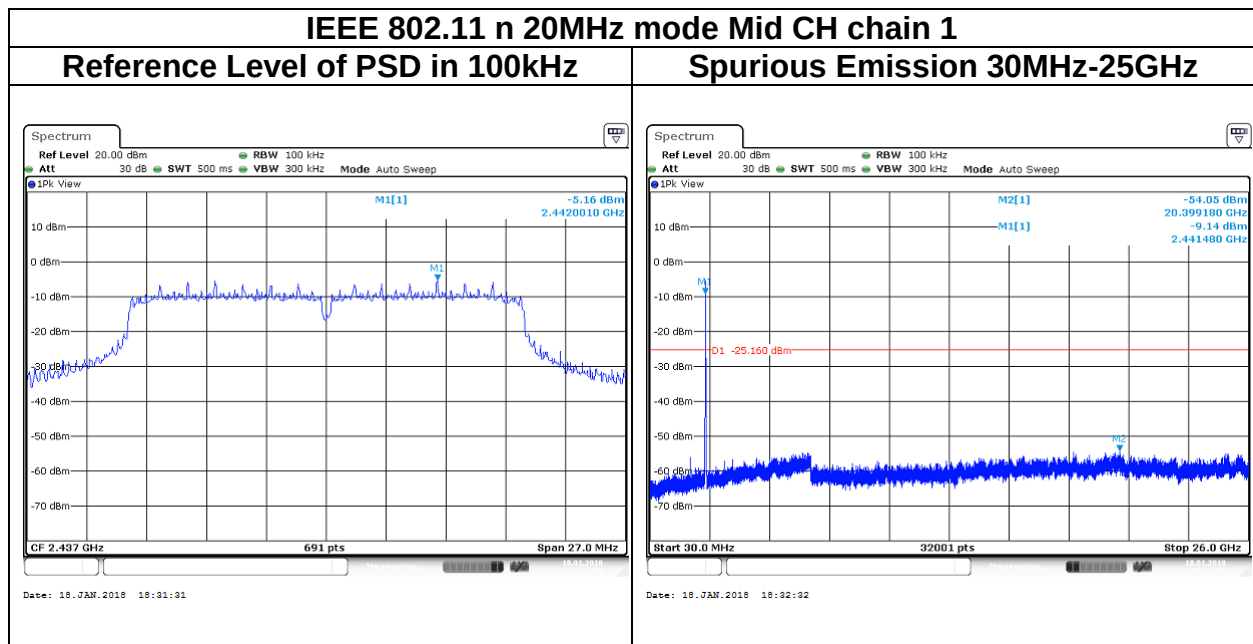


Band Edge



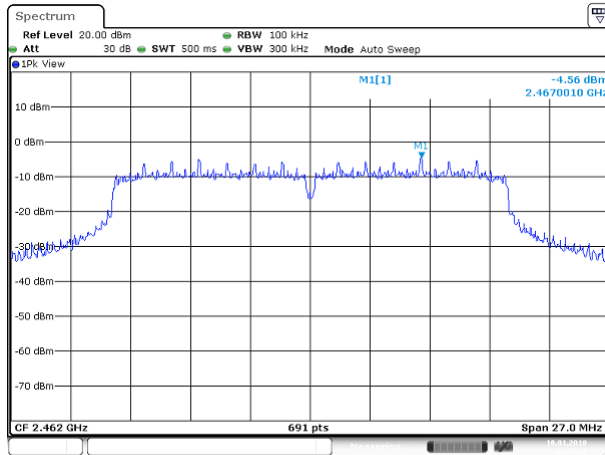
Spurious Emission 30MHz-25GHz



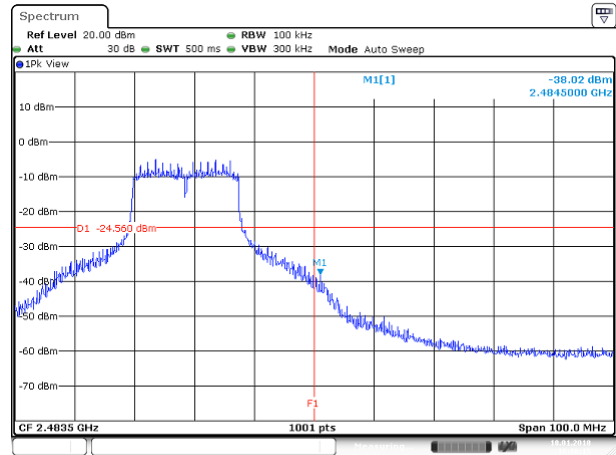


IEEE 802.11n 20MHz mode High CH chain 1

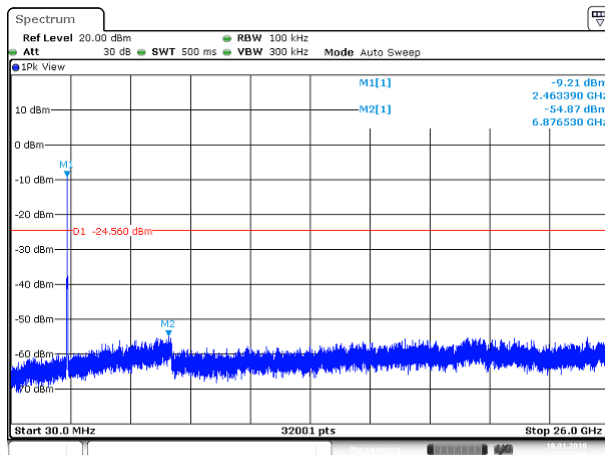
Reference Level of PSD in 100kHz



Band Edge

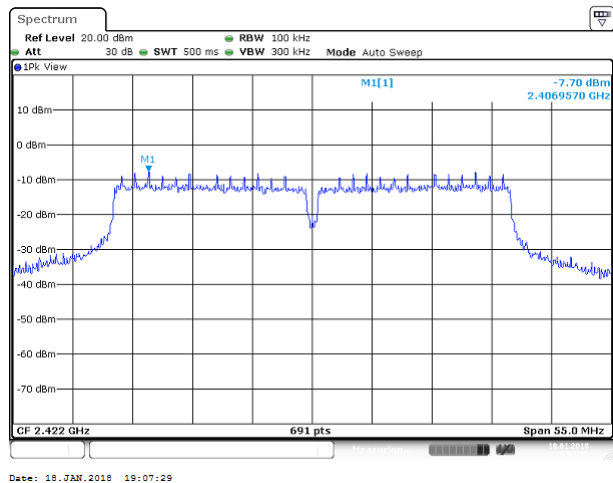


Spurious Emission 30MHz-25GHz

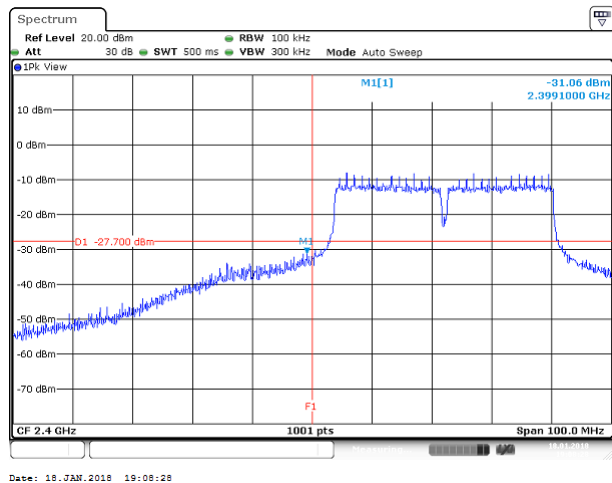


IEEE 802.11 n 40MHz mode Low CH chain 0

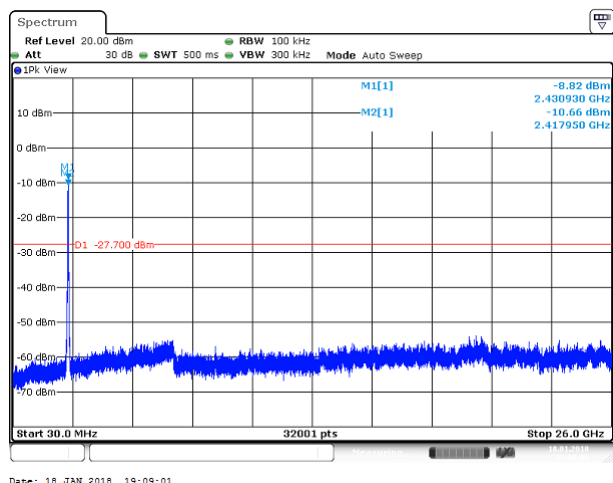
Reference Level of PSD in 100kHz

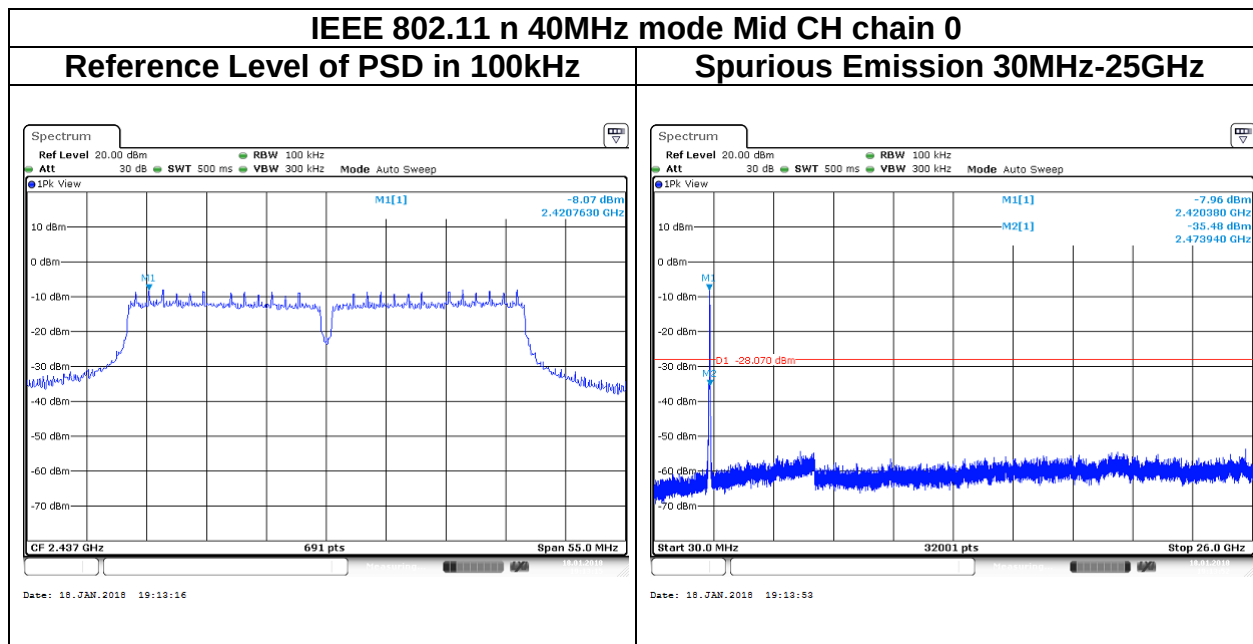


Band Edge



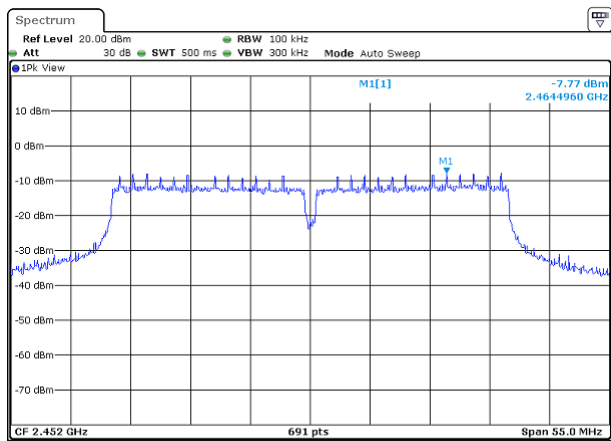
Spurious Emission 30MHz-25GHz





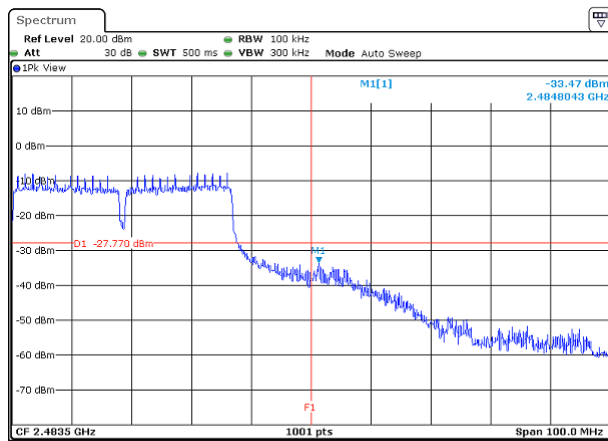
IEEE 802.11n 40MHz mode High CH chain 0

Reference Level of PSD in 100kHz



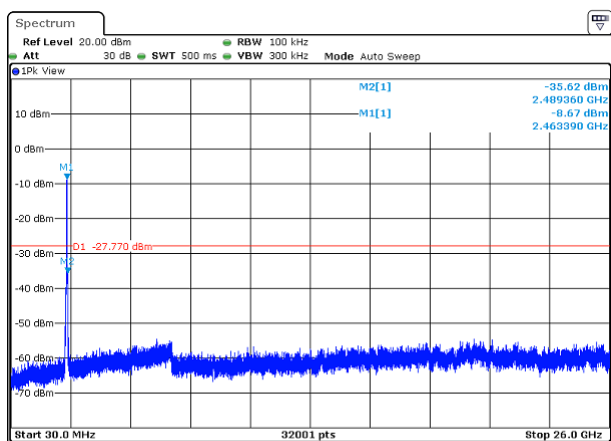
Date: 18.JAN.2018 19:02:28

Band Edge



Date: 18.JAN.2018 19:02:10

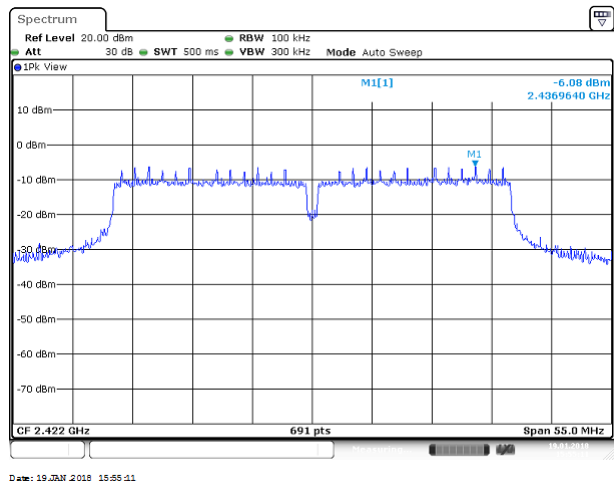
Spurious Emission 30MHz-25GHz



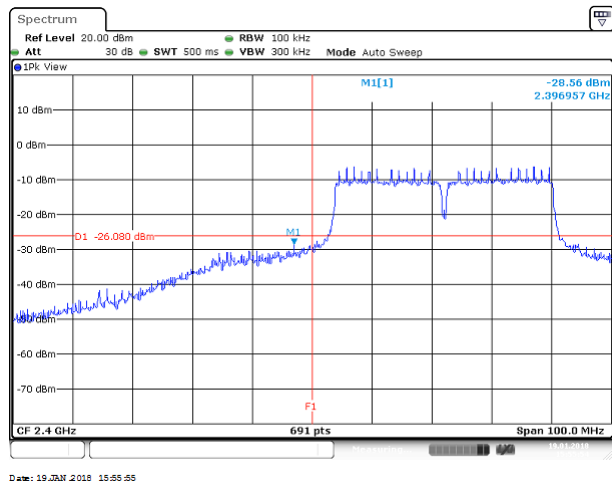
Date: 18.JAN.2018 19:04:10

IEEE 802.11 n 40MHz mode Low CH chain 1

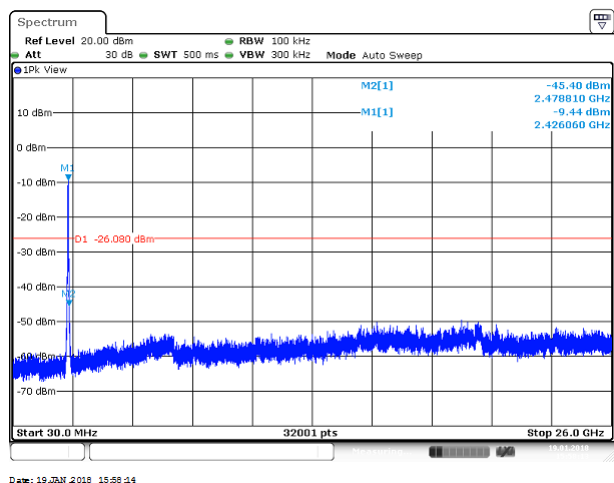
Reference Level of PSD in 100kHz

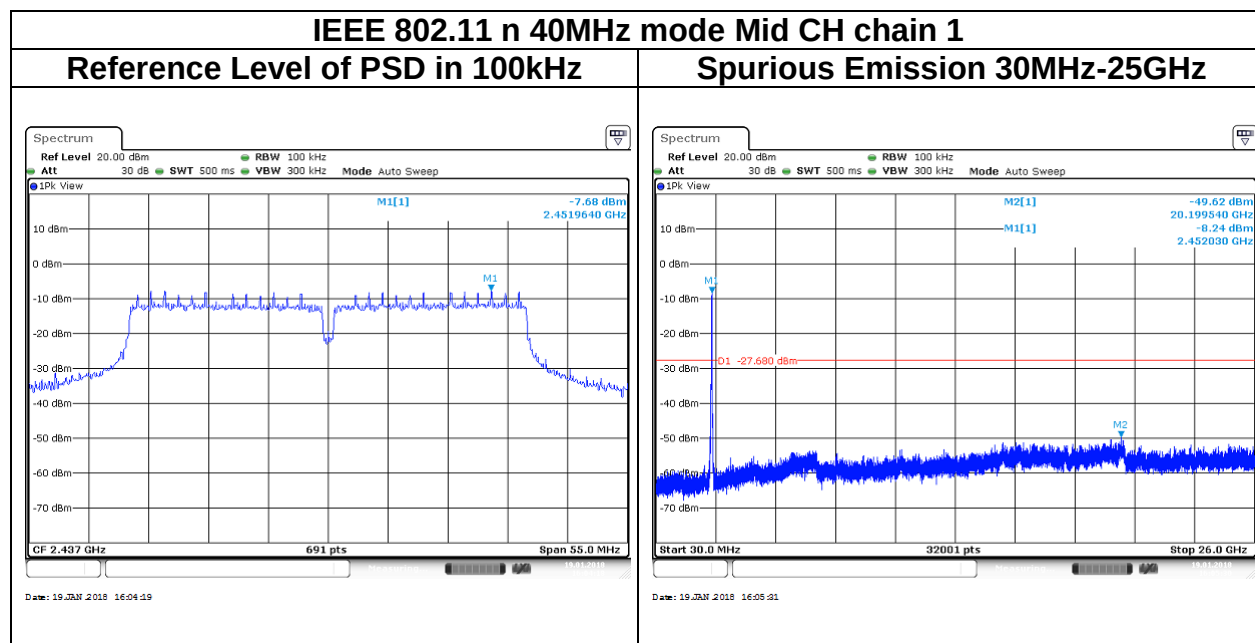


Band Edge



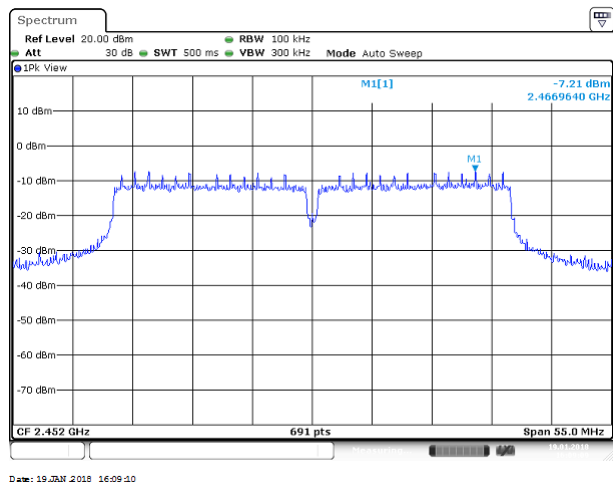
Spurious Emission 30MHz-25GHz



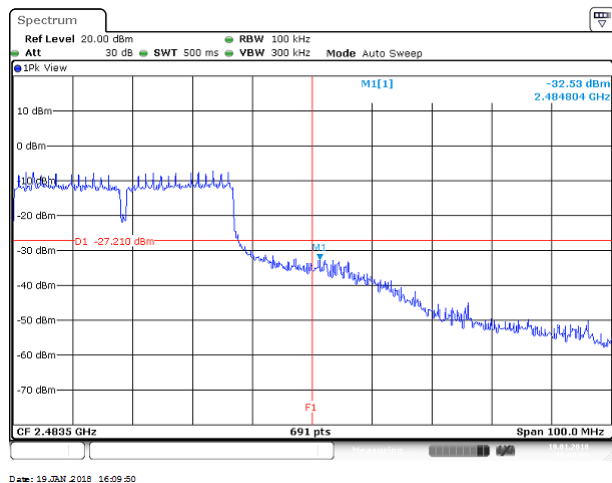


IEEE 802.11n 40MHz mode High CH chain 1

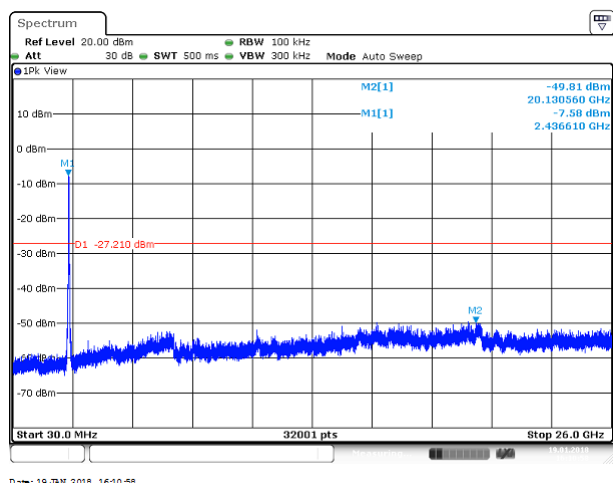
Reference Level of PSD in 100kHz



Band Edge



Spurious Emission 30MHz-25GHz



5.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

5.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency	Field Strength (microvolts/m)	Measurement Distance (metres)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

5.6.2 Test Procedure

Test method Refer as KDB 558074 D01 v04, Section 12.1.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9kHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Note: No emission found between lowest internal used/generated frequency to 30MHz (9KHz~30MHz)

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are 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 937606.

4. The SA setting following :

(1) Below 1G : RBW = 100kHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G :

(2.1) For Peak measurement : RBW = 1MHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement : RBW = 1MHz, VBW

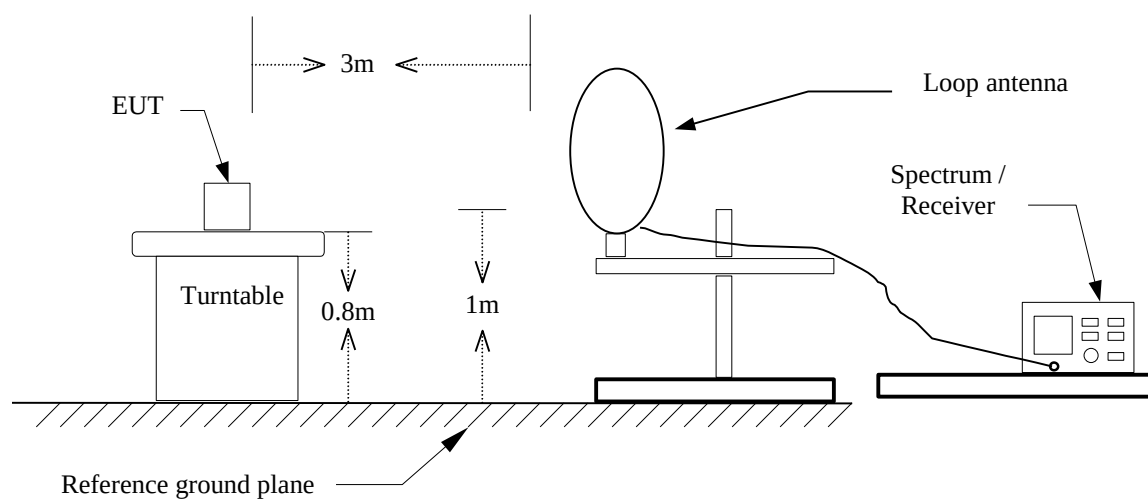
·If Duty Cycle $\geq$ 98%, VBW=10Hz.

·If Duty Cycle < 98%, VBW=1/T.5

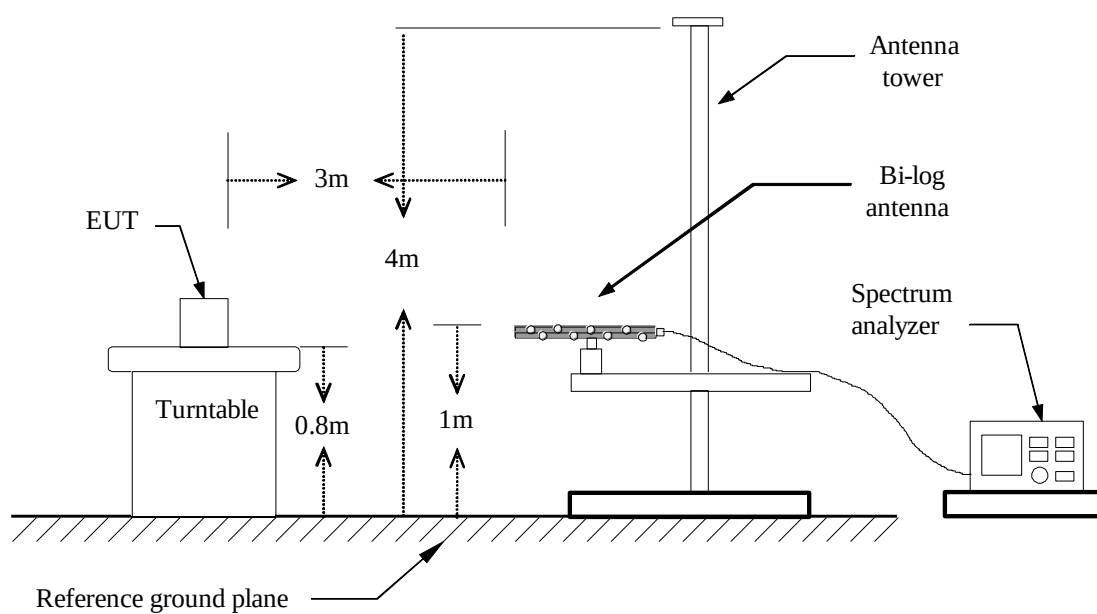
Configuration	Duty Cycle (%)	T(ms)	1/T (kHz)	VBW Setting
802.11b	100%	100.0000	-	10Hz
802.11g	99%	2.0550	-	10Hz
802.11n 20MHz	99%	1.9200	-	10Hz
802.11n 40MHz	99%	0.9500	-	10Hz

5.6.3 Test Setup

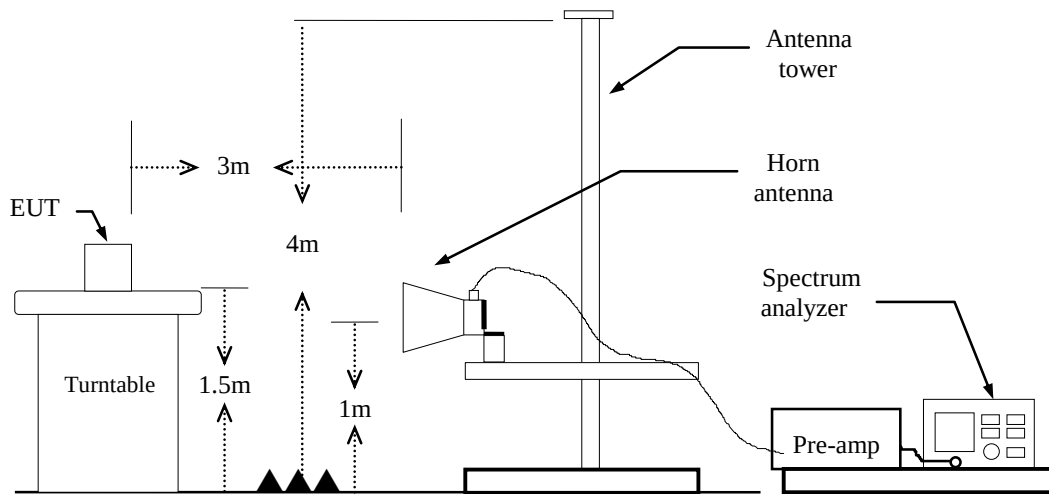
9kHz ~ 30MHz



30MHz ~ 1GHz



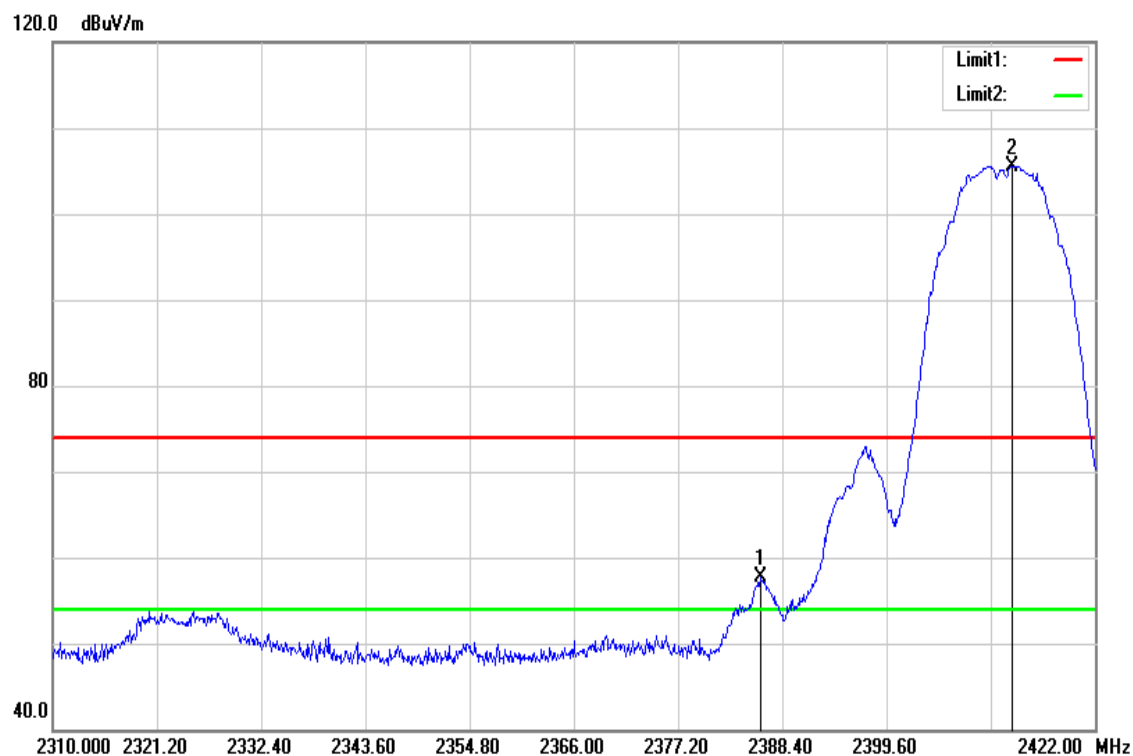
Above 1 GHz



5.6.4 Test Result

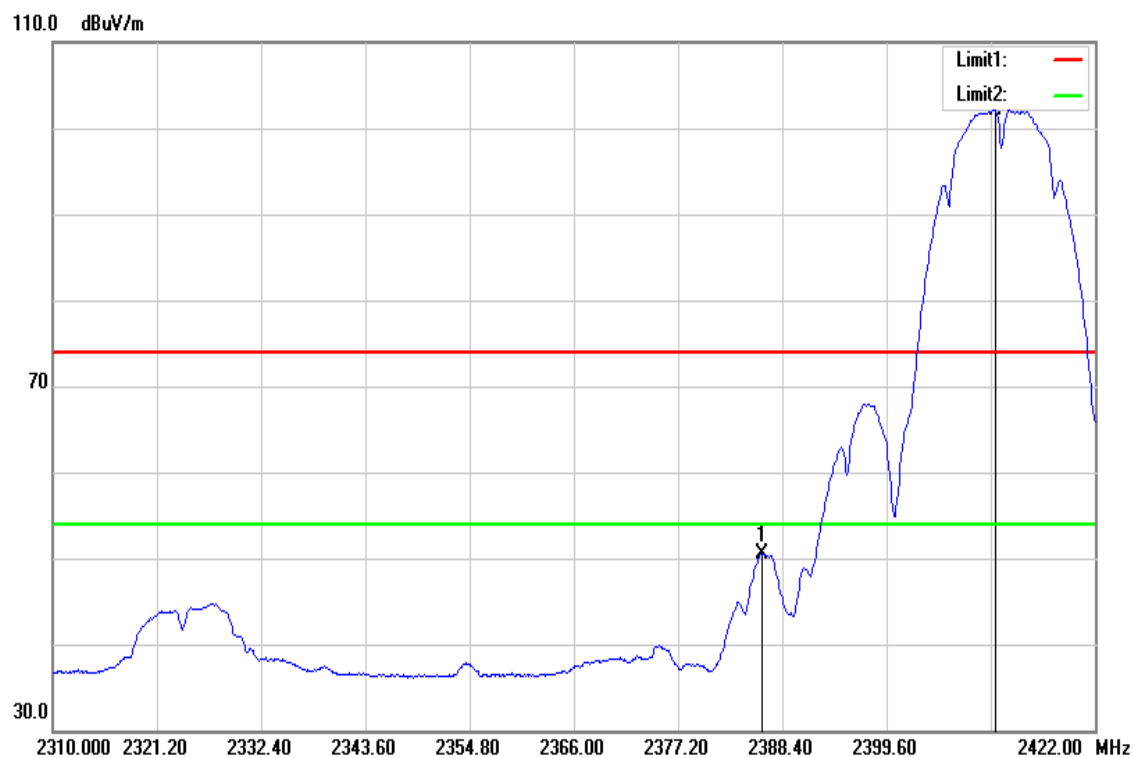
Band Edge Test Data

Test Mode	IEEE 802.11b Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



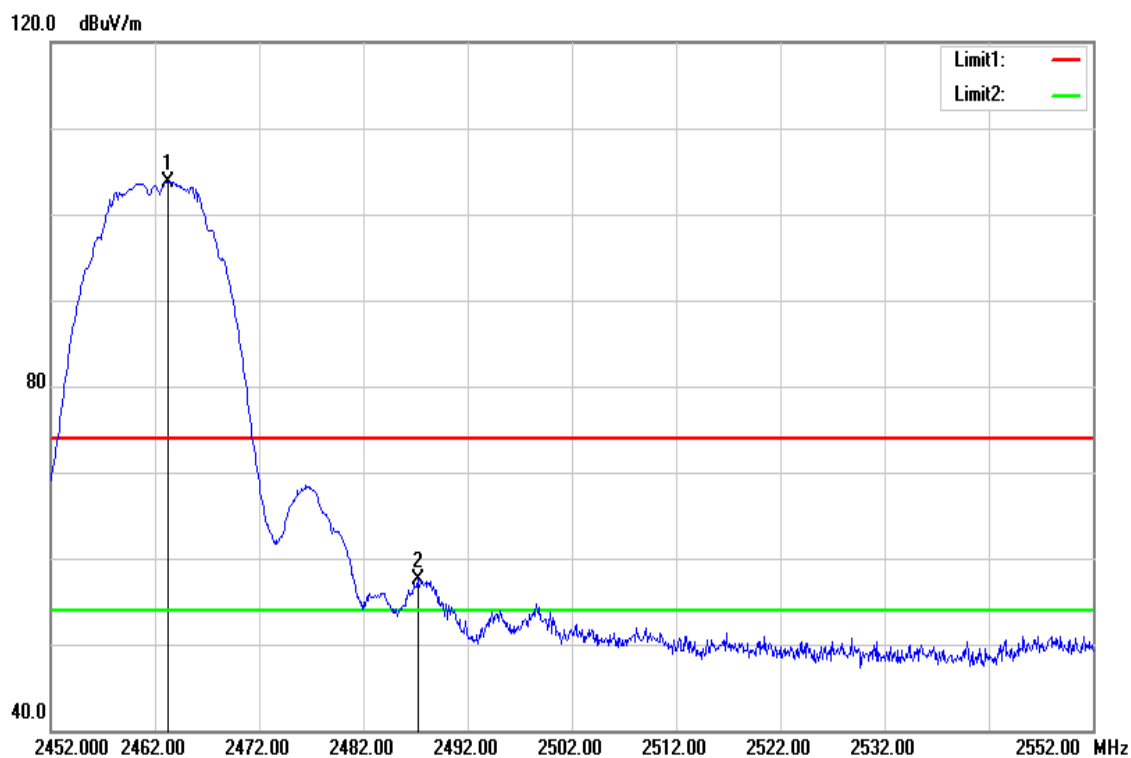
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2386.048	60.65	-2.99	57.66	74.00	-16.34	peak
2413.208	108.46	-2.90	105.56	-	-	peak

Test Mode	IEEE 802.11b Low CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



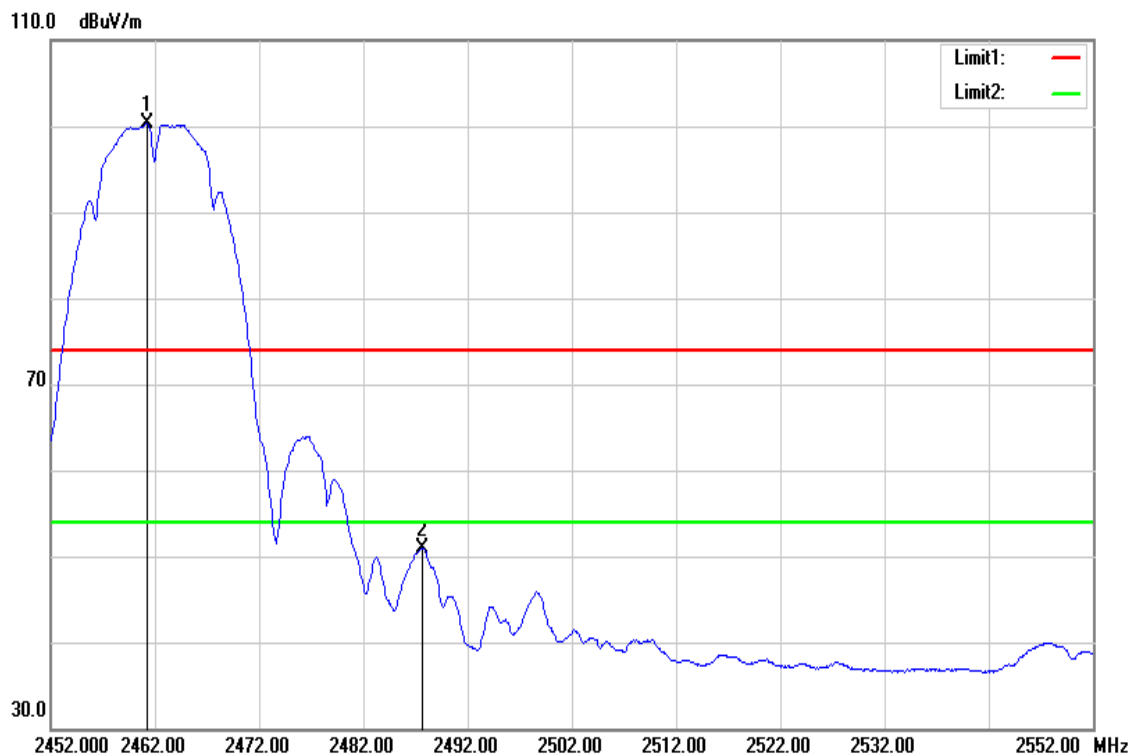
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2386.272	53.53	-2.99	50.54	54.00	-3.46	AVG
2411.248	105.09	-2.92	102.17	-	-	AVG

Test Mode	IEEE 802.11b High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



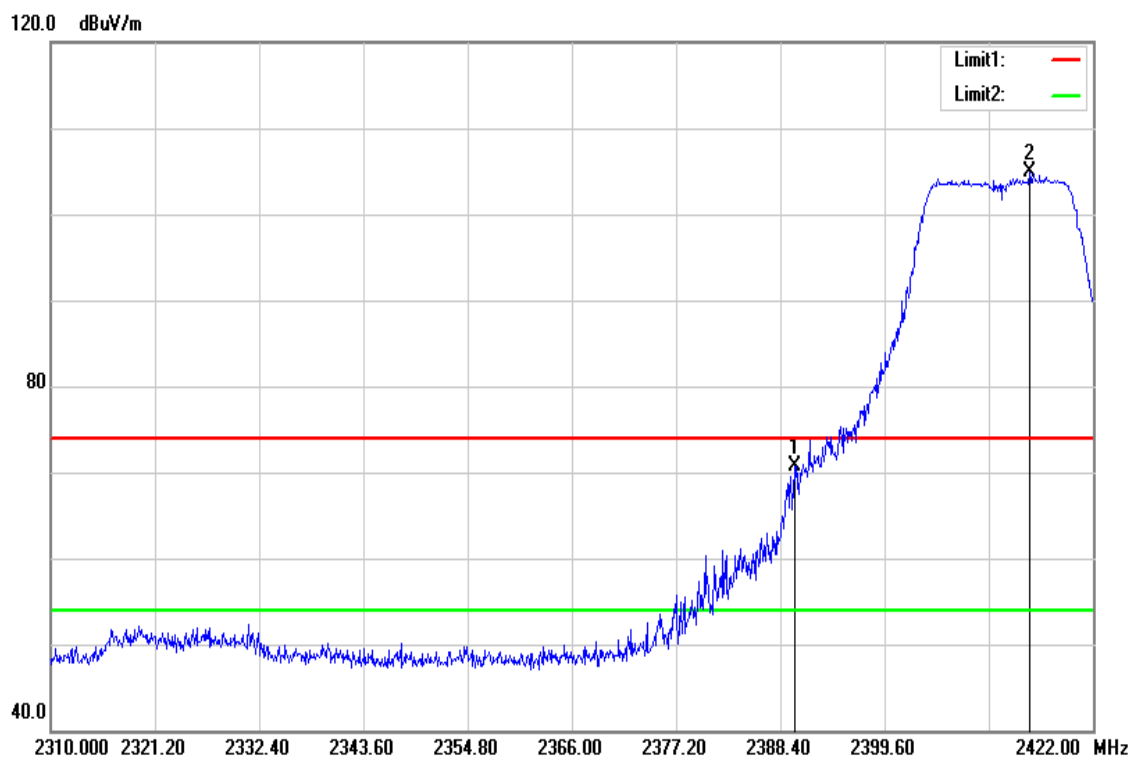
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2463.250	106.52	-2.75	103.77	-	-	peak
2487.200	60.28	-2.68	57.60	74.00	-16.40	peak

Test Mode	IEEE 802.11b High CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



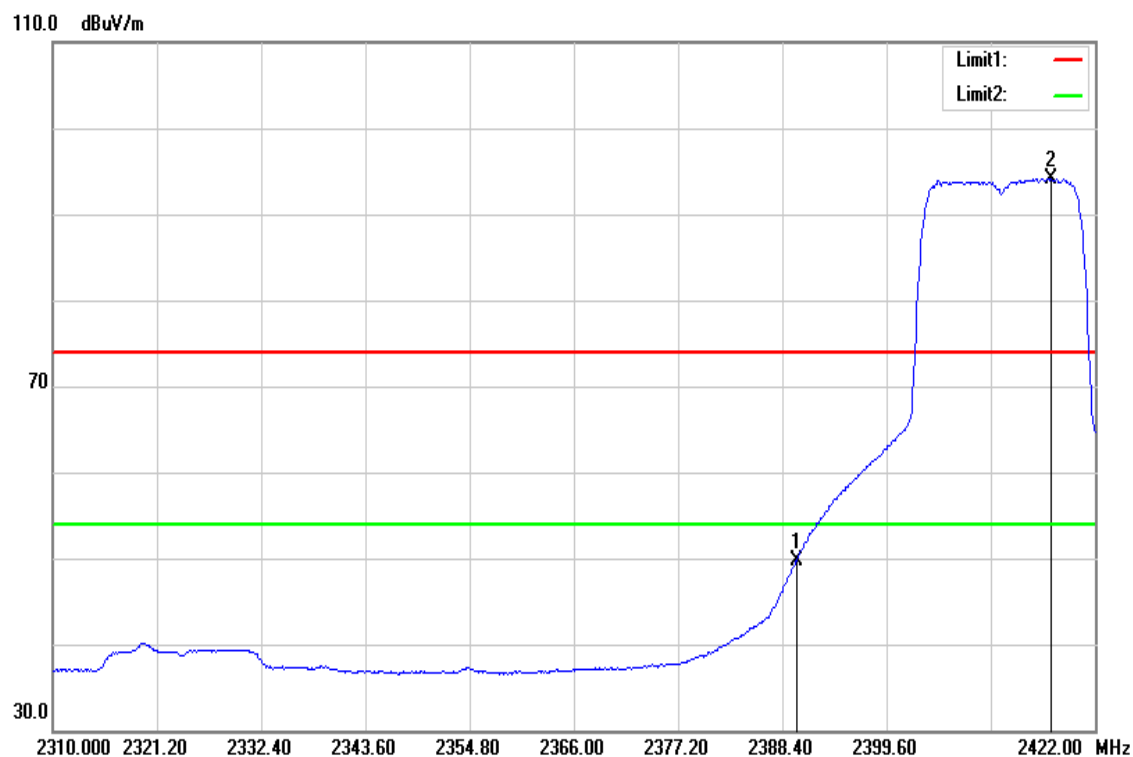
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2461.250	103.04	-2.76	100.28	-	-	AVG
2487.700	53.58	-2.67	50.91	54.00	-3.09	AVG

Test Mode	IEEE 802.11g Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



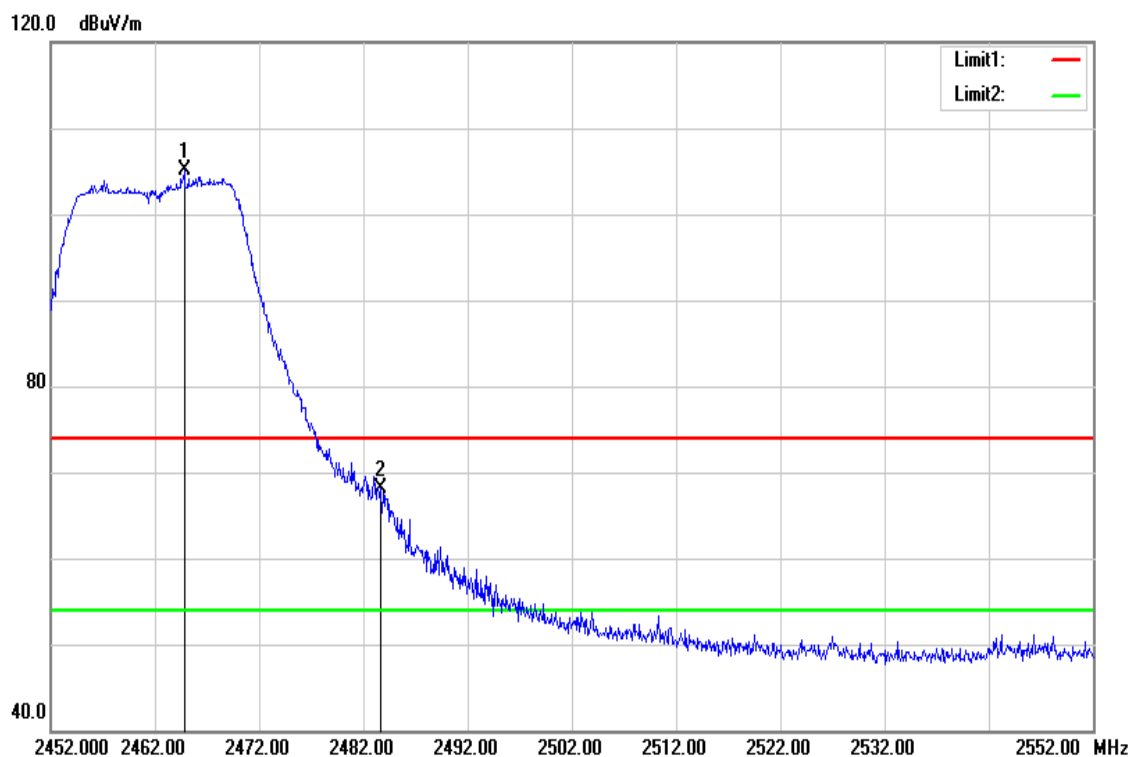
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	73.59	-2.98	70.61	74.00	-3.39	peak
2415.224	107.76	-2.90	104.86	-	-	peak

Test Mode	IEEE 802.11g Low CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



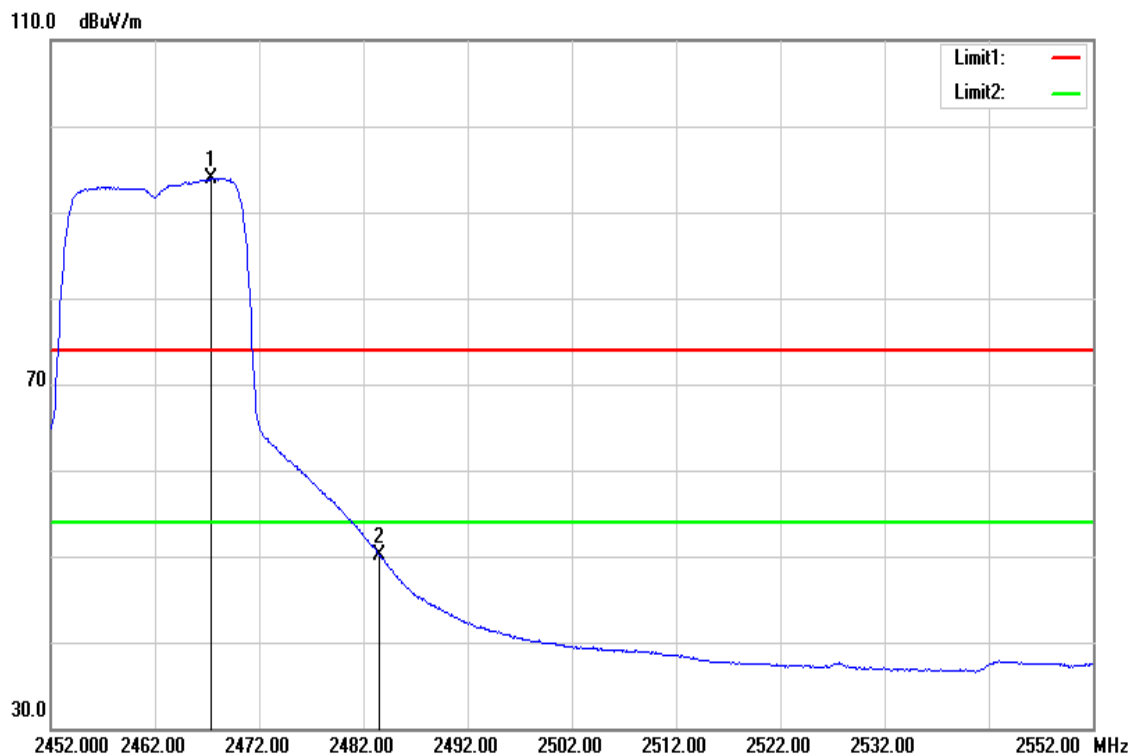
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	52.78	-2.98	49.80	54.00	-4.20	AVG
2417.296	97.00	-2.90	94.10	-	-	AVG

Test Mode	IEEE 802.11g High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



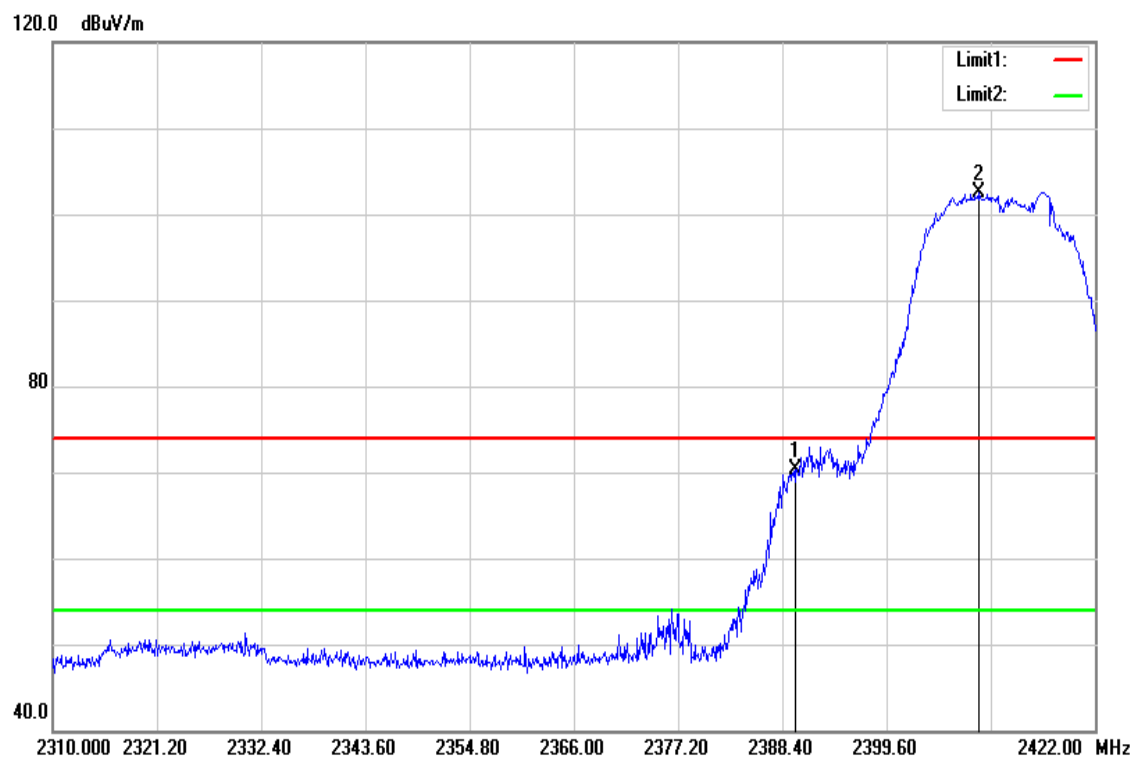
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2464.800	107.83	-2.75	105.08	-	-	peak
2483.700	70.75	-2.69	68.06	74.00	-5.94	peak

Test Mode	IEEE 802.11g High CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



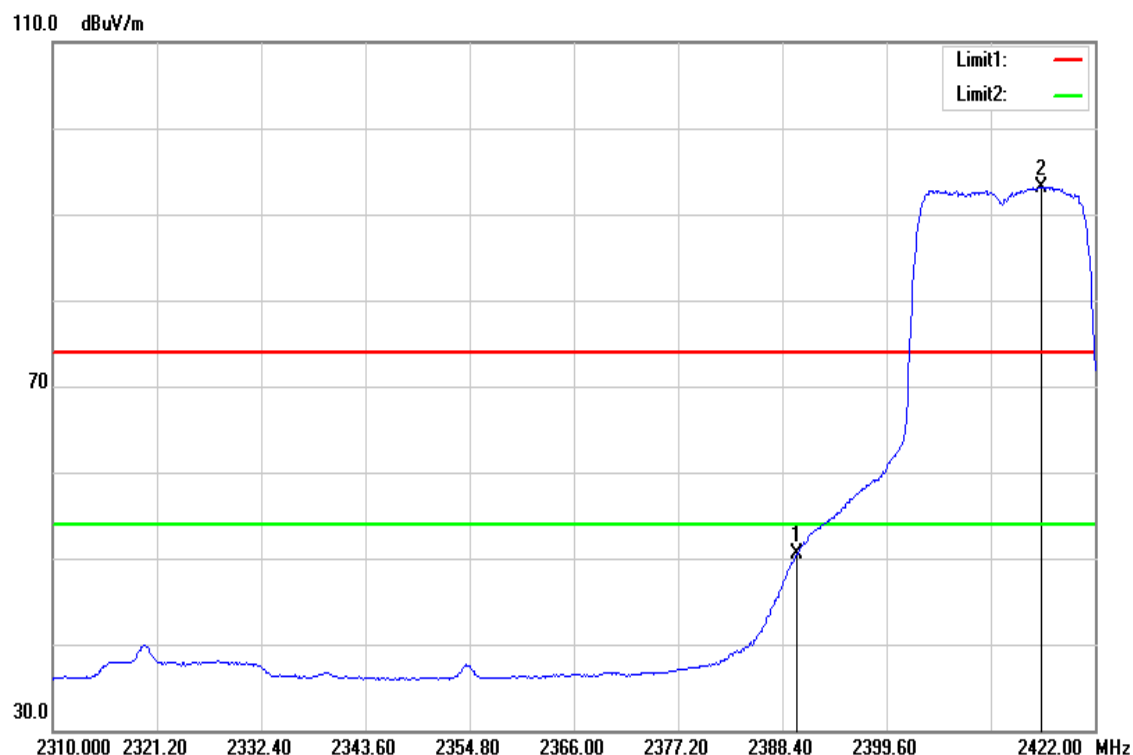
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2467.400	96.68	-2.75	93.93	-	-	AVG
2483.500	52.87	-2.69	50.18	54.00	-3.82	AVG

Test Mode	IEEE 802.11n 20MHz Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



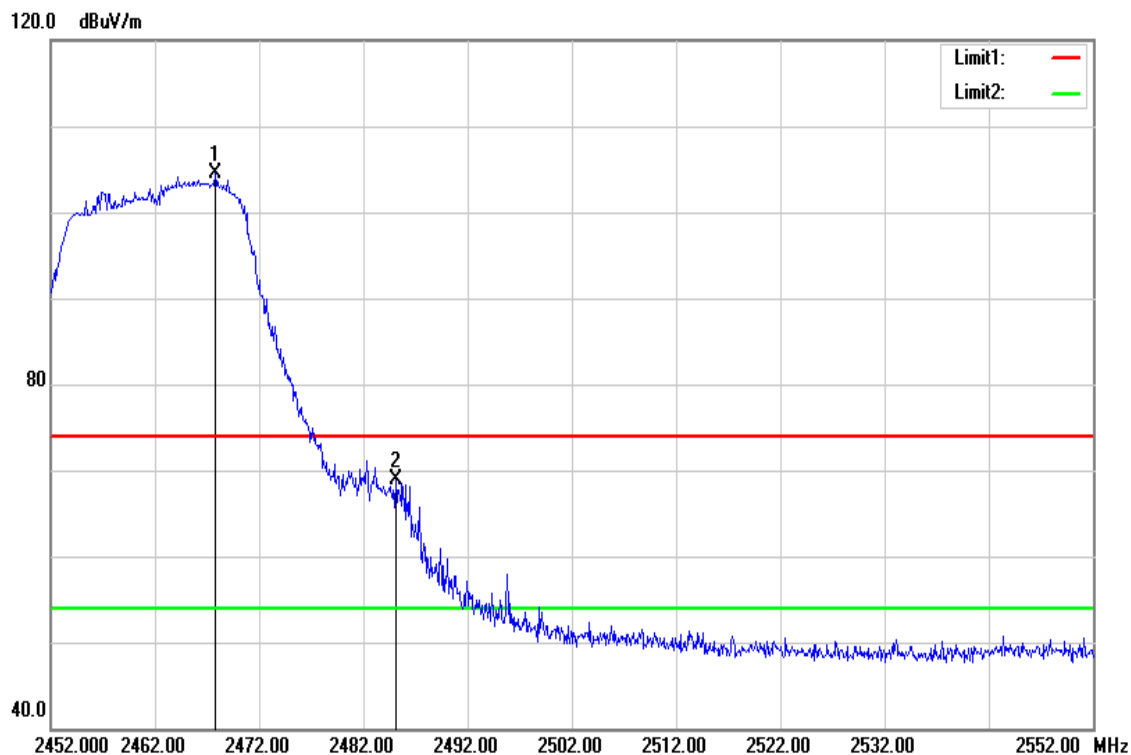
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.856	73.28	-2.98	70.30	74.00	-3.70	peak
2409.624	105.50	-2.92	102.58	-	-	peak

Test Mode	IEEE 802.11n 20MHz Low CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



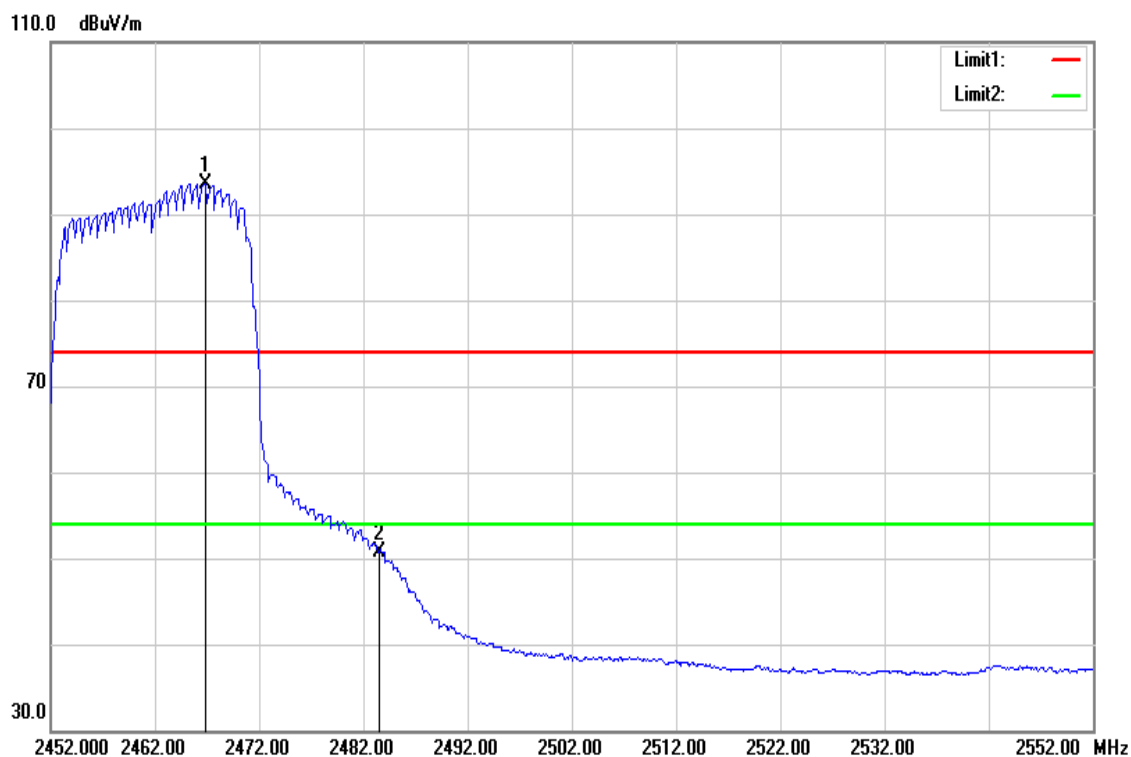
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	53.50	-2.98	50.52	54.00	-3.48	AVG
2416.176	96.07	-2.90	93.17	-	-	AVG

Test Mode	IEEE 802.11n 20MHz High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



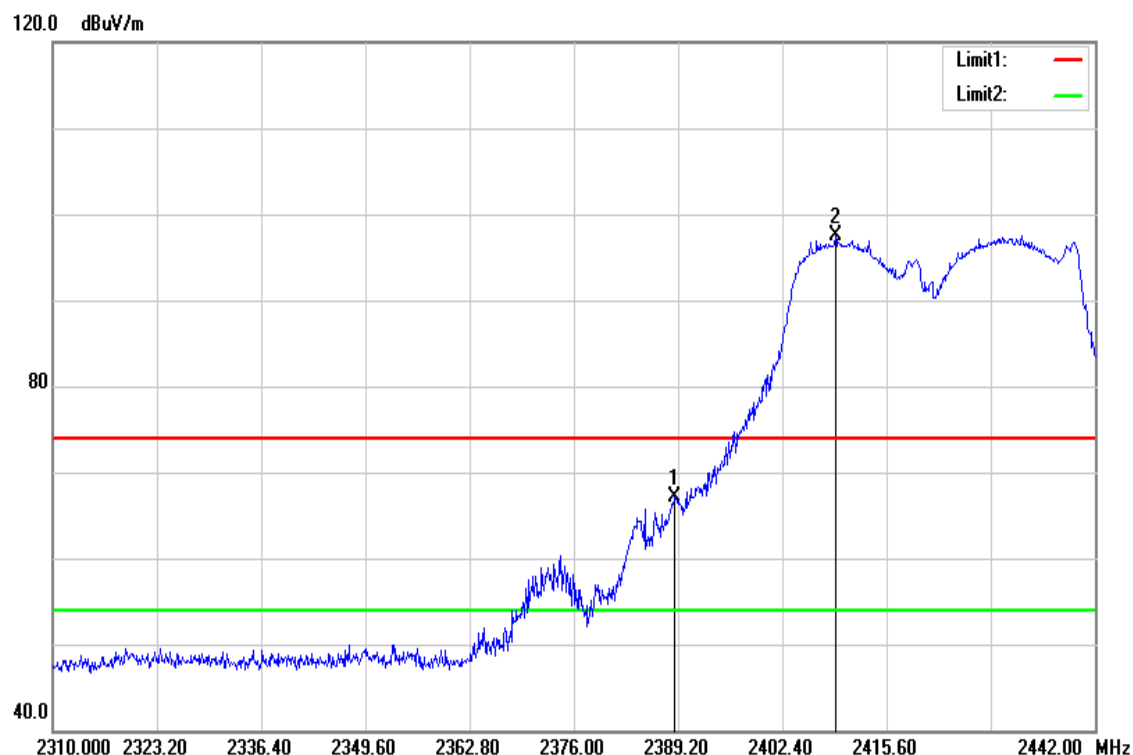
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2467.850	107.17	-2.73	104.44	-	-	peak
2485.100	71.68	-2.69	68.99	74.00	-5.01	peak

Test Mode	IEEE 802.11n 20MHz High CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



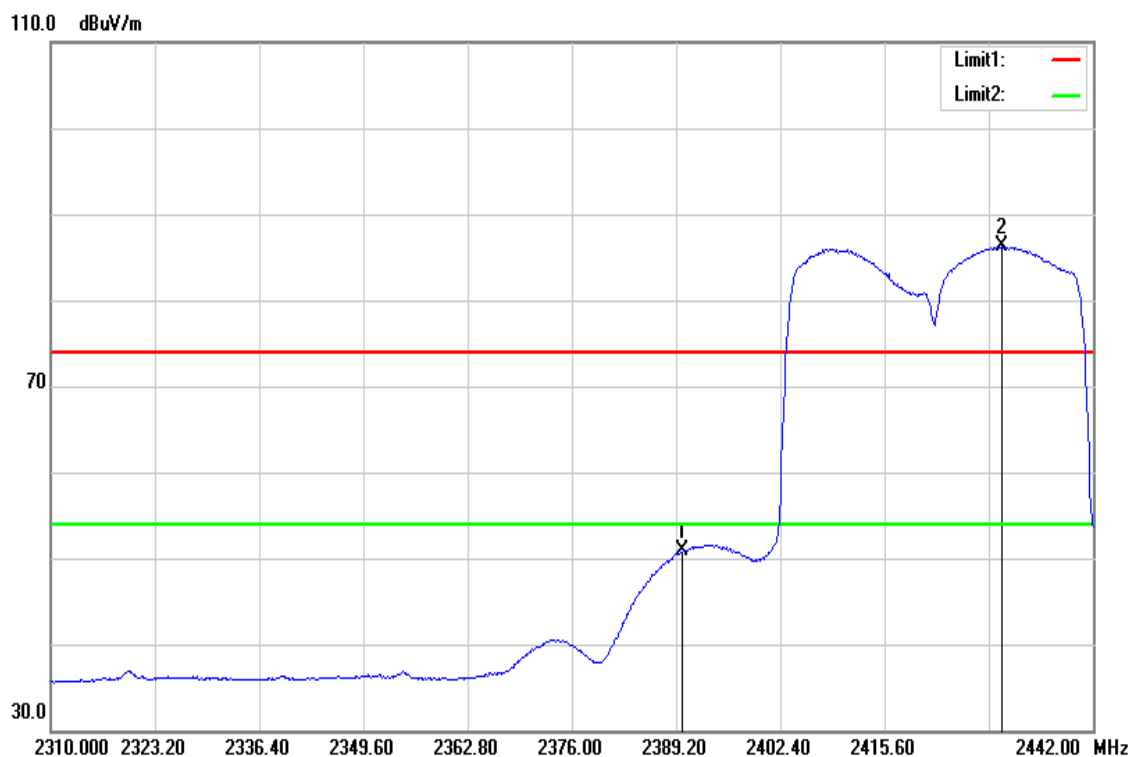
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2466.900	96.29	-2.75	93.54	-	-	AVG
2483.500	53.44	-2.69	50.75	54.00	-3.25	AVG

Test Mode	IEEE 802.11n 40MHz Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



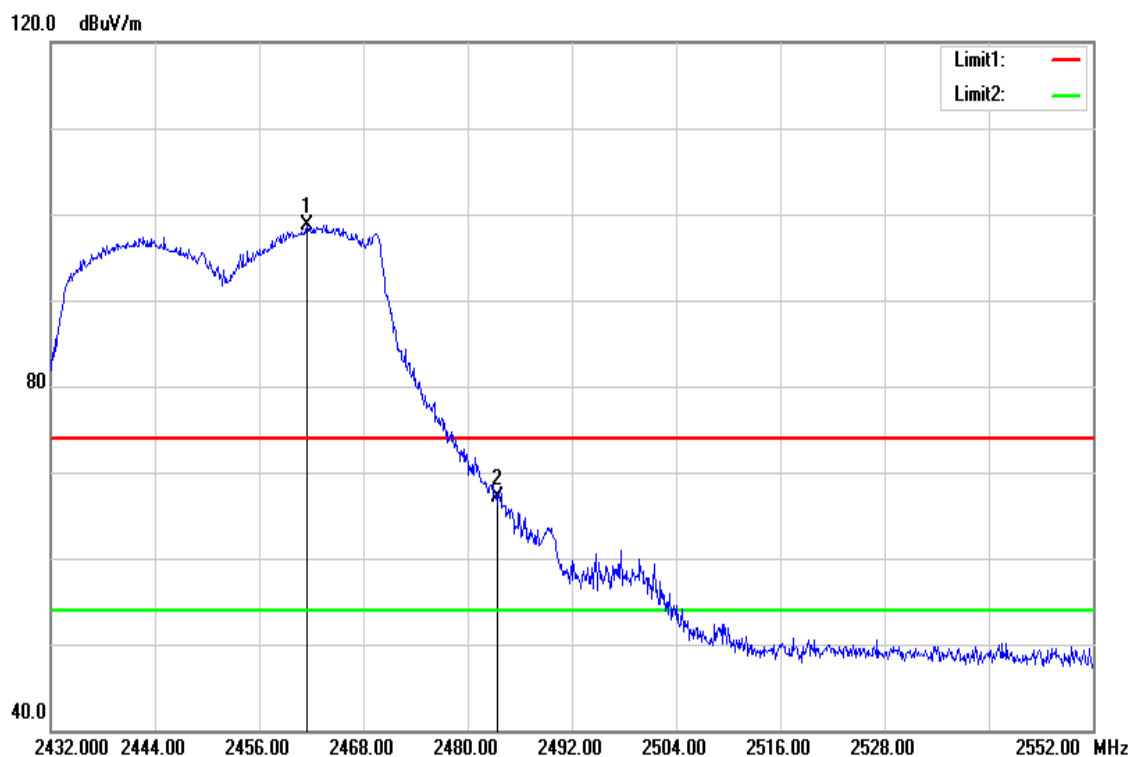
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2388.804	70.07	-2.98	67.09	74.00	-6.91	peak
2409.132	100.49	-2.92	97.57	-	-	peak

Test Mode	IEEE 802.11n 40MHz Low CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



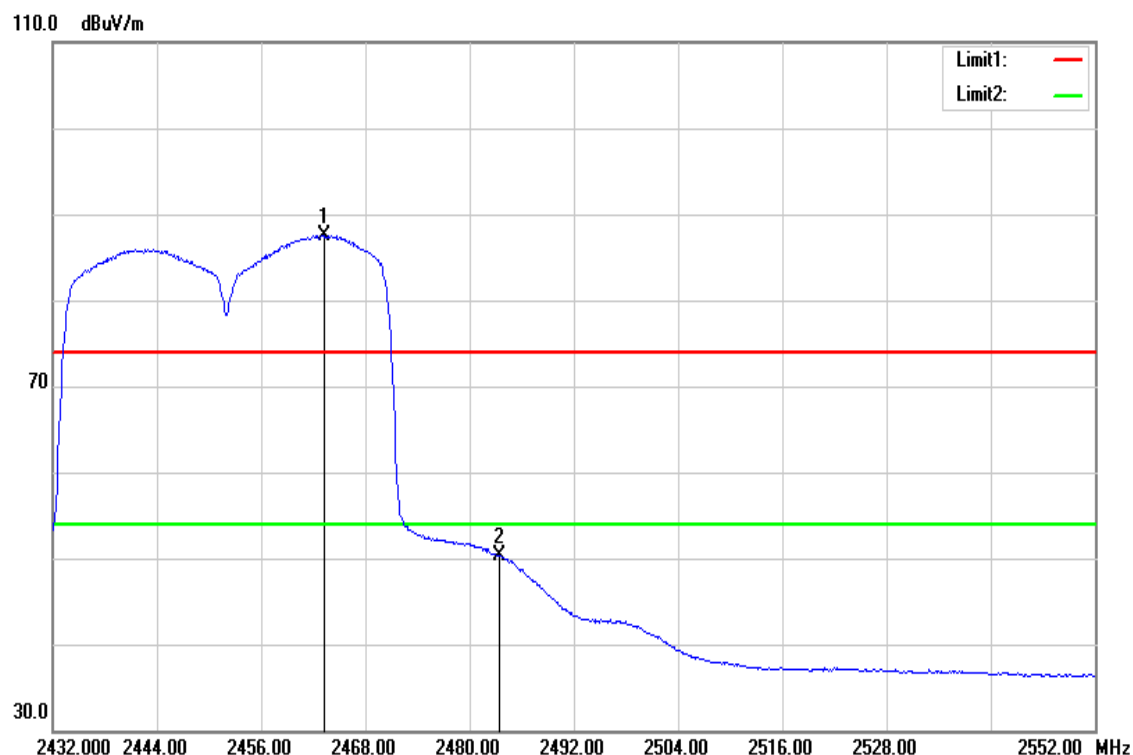
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	53.89	-2.98	50.91	54.00	-3.09	AVG
2430.384	89.09	-2.86	86.23	-	-	AVG

Test Mode	IEEE 802.11n 40MHz High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2461.520	101.48	-2.76	98.72	-	-	peak
2483.500	69.78	-2.69	67.09	74.00	-6.91	peak

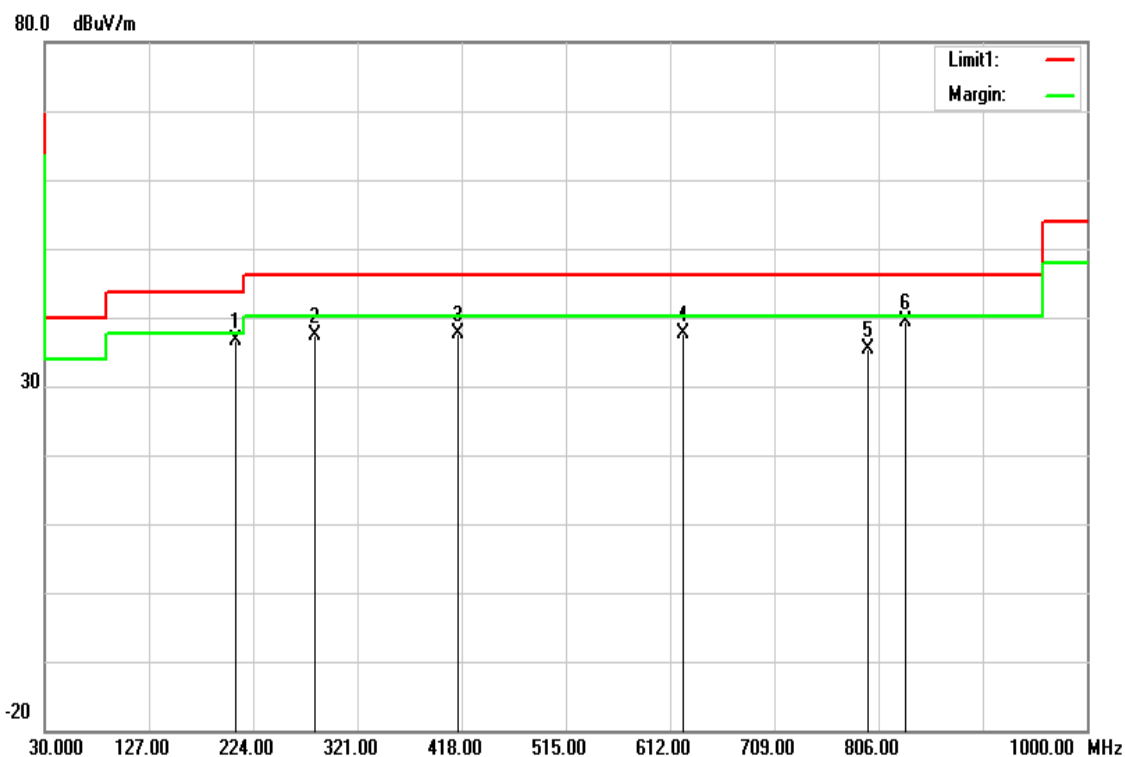
Test Mode	IEEE 802.11n 40MHz High CH	Temperature:	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac/60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2463.200	90.34	-2.75	87.59	-	-	AVG
2483.500	52.91	-2.69	50.22	54.00	-3.78	AVG

Below 1G Test Data

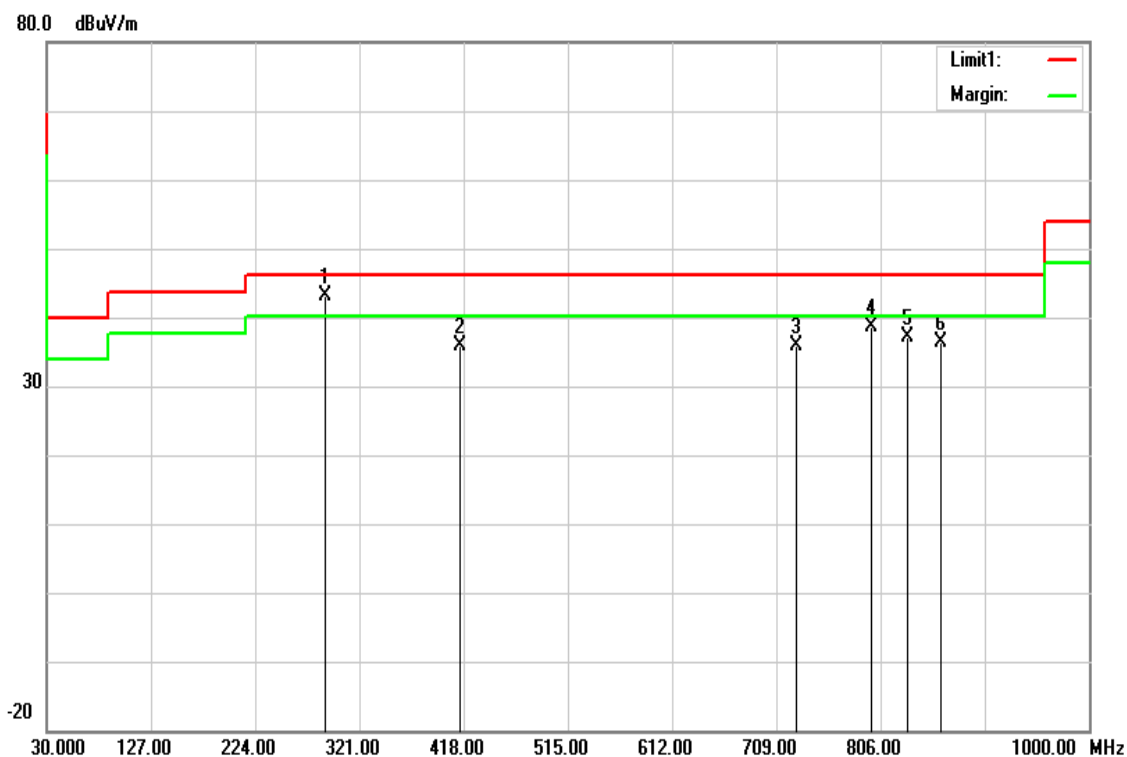
Test Mode	Mode 1	Temp/Hum	24(°C)/ 33%RH
Test Item	30MHz-1GHz	Test Date	January 24, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
207.5100	52.80	-16.06	36.74	43.52	-6.78	peak
281.2300	51.73	-14.25	37.48	46.02	-8.54	peak
415.0900	48.49	-10.85	37.64	46.02	-8.38	peak
623.6400	43.88	-6.27	37.61	46.02	-8.41	QP
796.3000	38.92	-3.44	35.48	46.02	-10.54	QP
831.2200	42.35	-3.06	39.29	46.02	-6.73	peak

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

Test Mode	Mode 1	Temp/Hum	24(°C)/ 33%RH
Test Item	30MHz-1GHz	Test Date	January 24, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac/60Hz

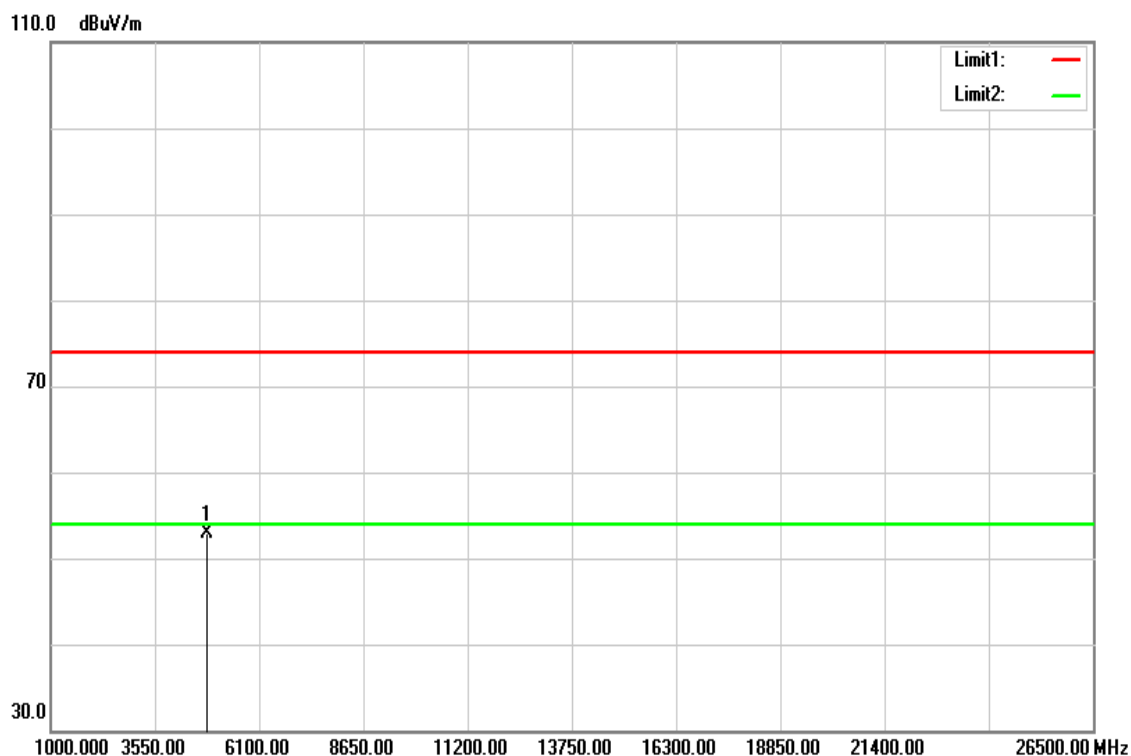


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
288.9900	57.34	-14.19	43.15	46.02	-2.87	QP
415.0900	46.66	-10.85	35.81	46.02	-10.21	peak
727.4300	40.37	-4.56	35.81	46.02	-10.21	QP
797.2700	42.17	-3.43	38.74	46.02	-7.28	QP
831.2200	40.13	-3.06	37.07	46.02	-8.95	QP
862.2600	38.99	-2.65	36.34	46.02	-9.68	QP

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

Above 1G Test Data

Test Mode	IEEE 802.11b Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

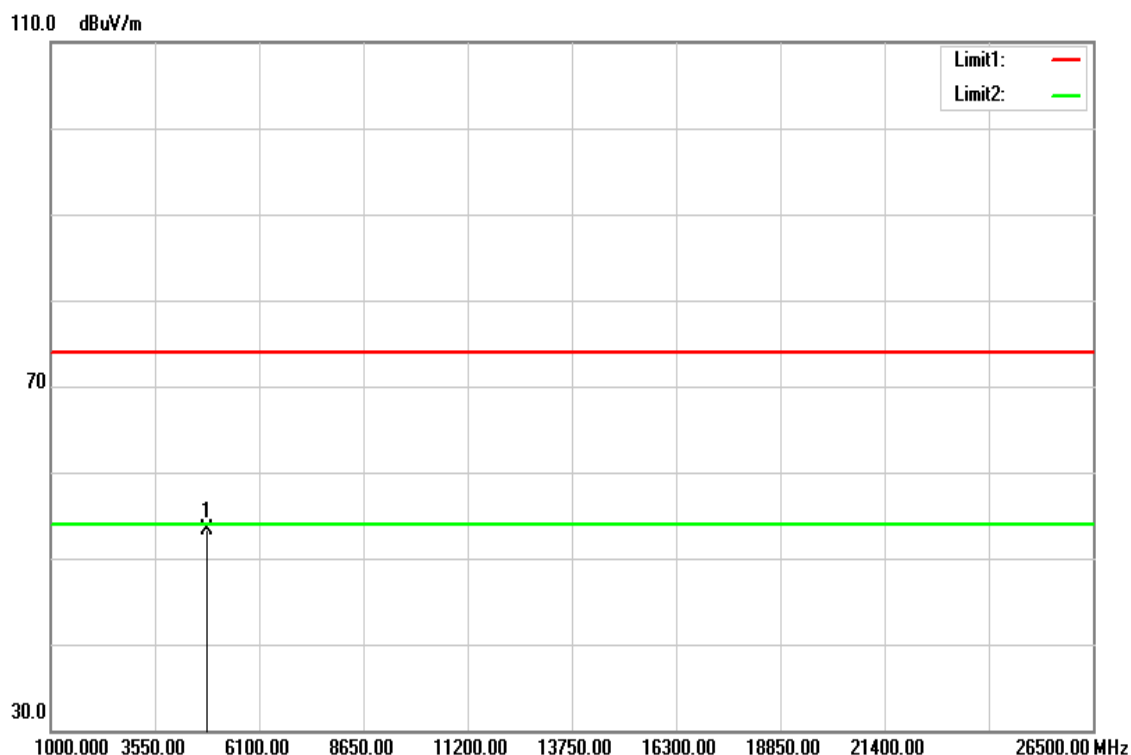


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4827.000	48.62	4.38	53.00	74.00	-21.00	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11b Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

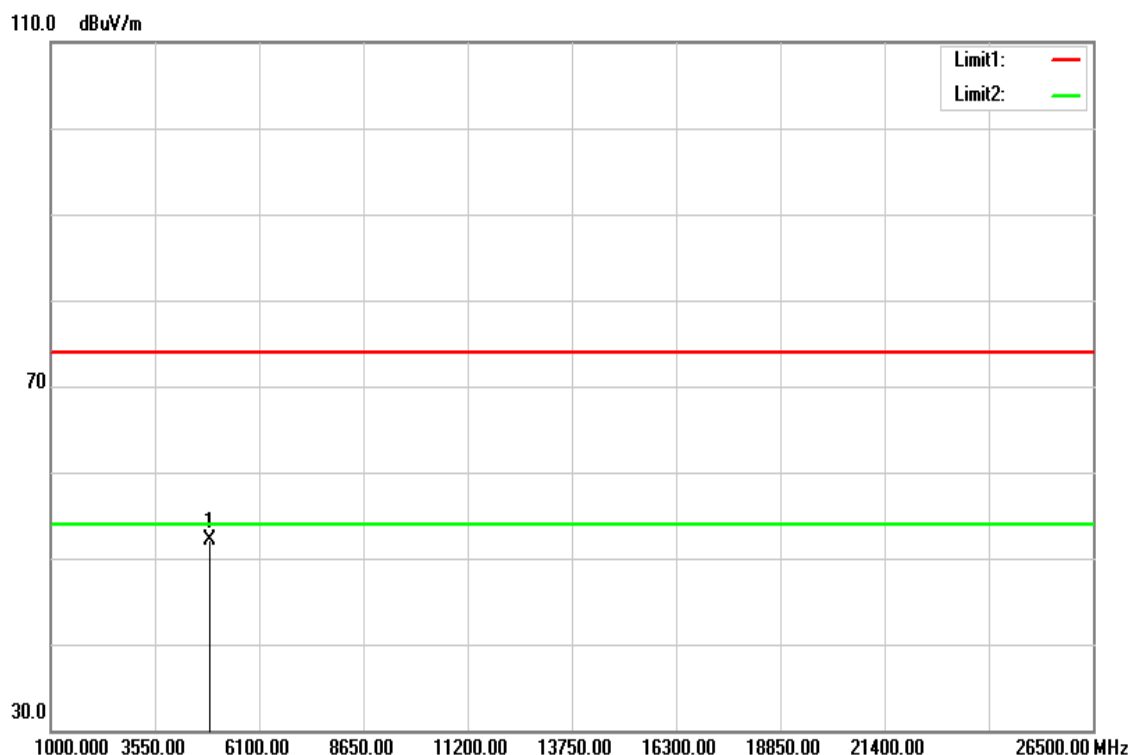


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4827.000	48.84	4.38	53.22	74.00	-20.78	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11b Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

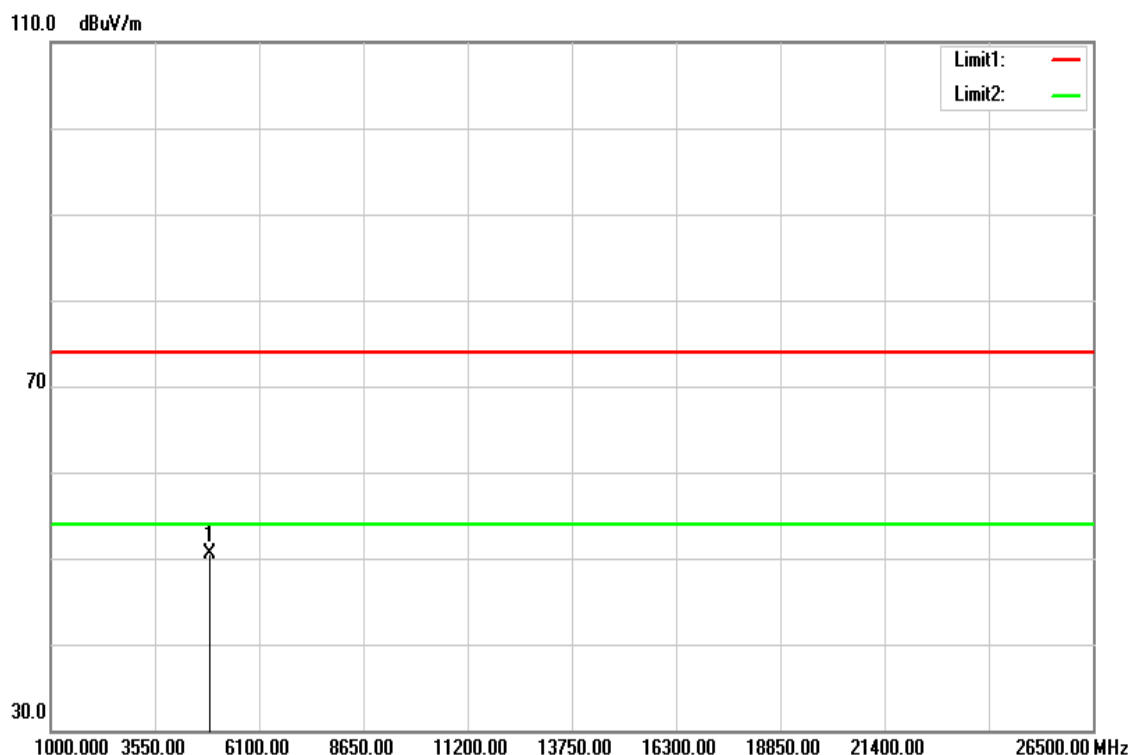


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	47.72	4.47	52.19	74.00	-21.81	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11b Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

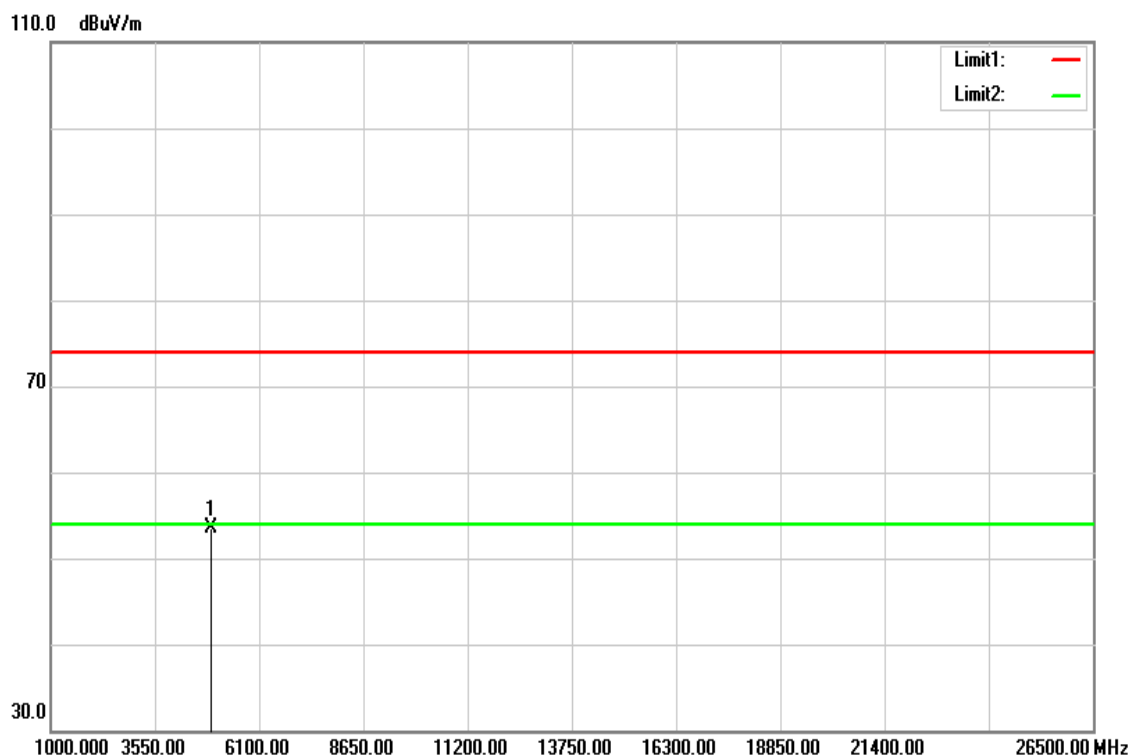


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	46.06	4.47	50.53	74.00	-23.47	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11b High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

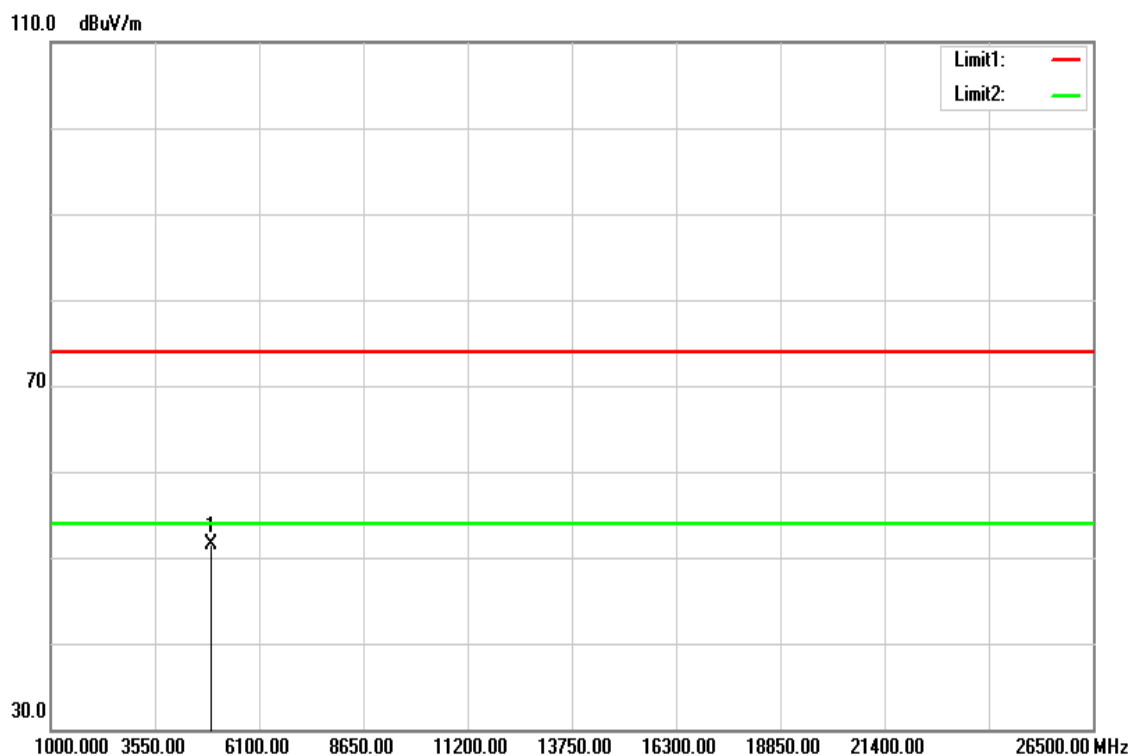


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4925.000	48.95	4.55	53.50	74.00	-20.50	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11b High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

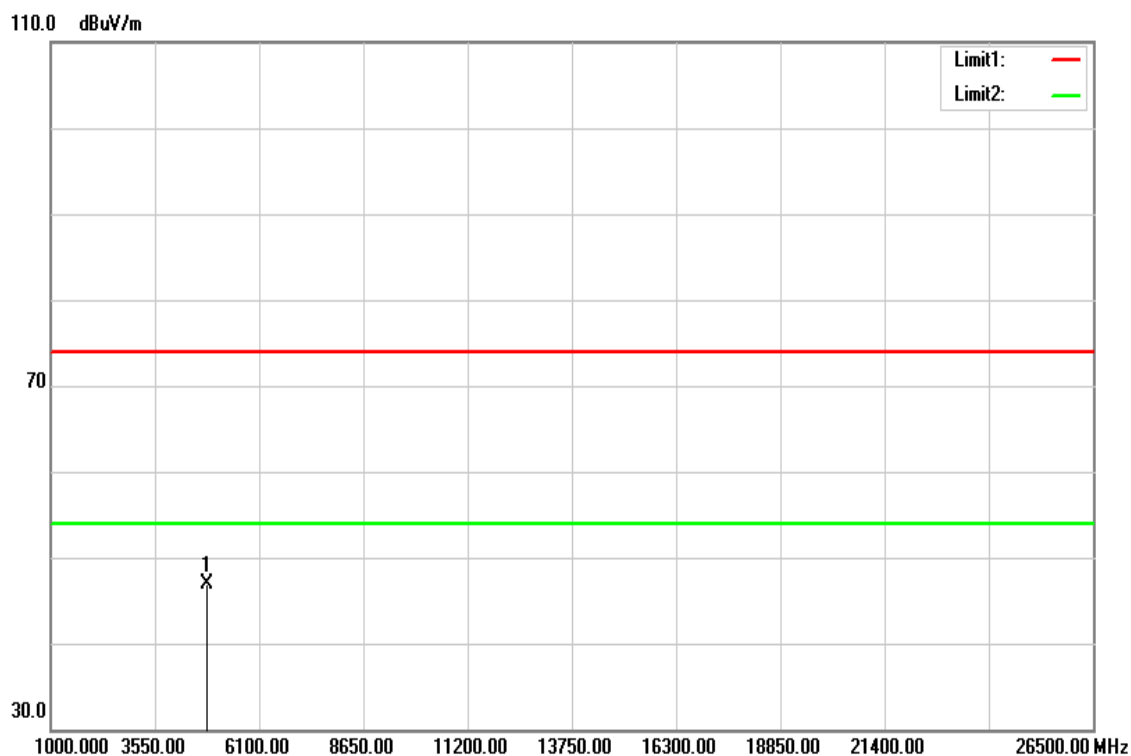


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4925.000	46.89	4.55	51.44	74.00	-22.56	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11g Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

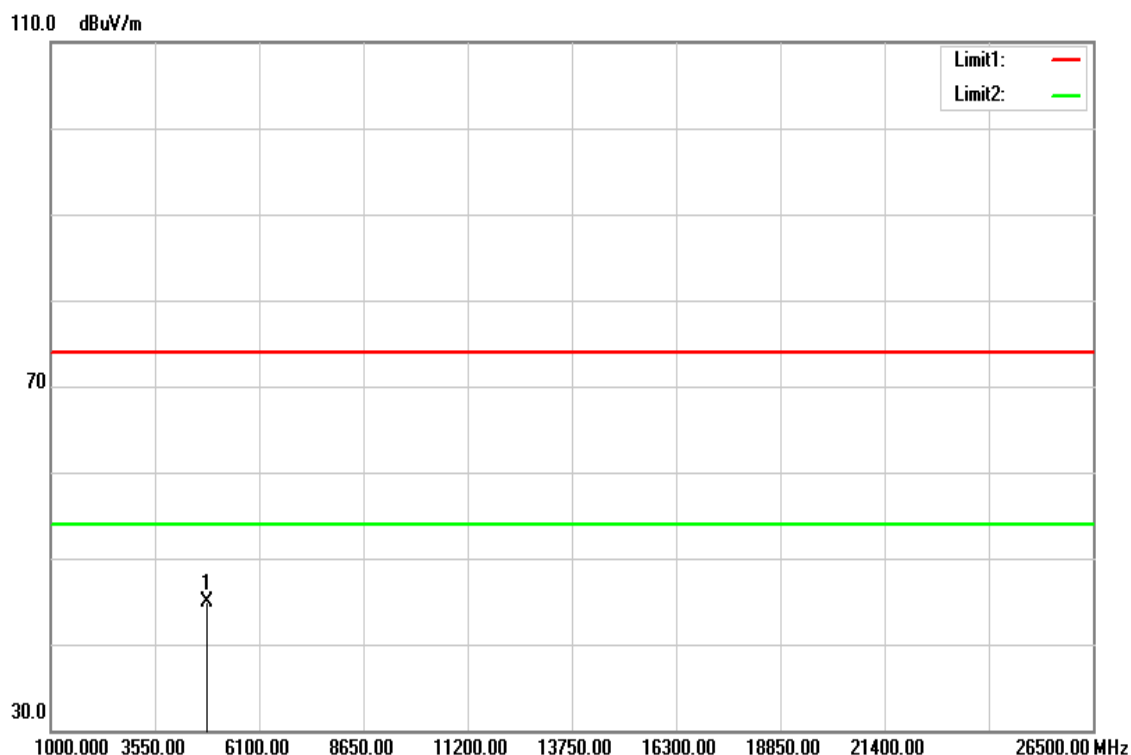


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4827.000	42.61	4.38	46.99	74.00	-27.01	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11g Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

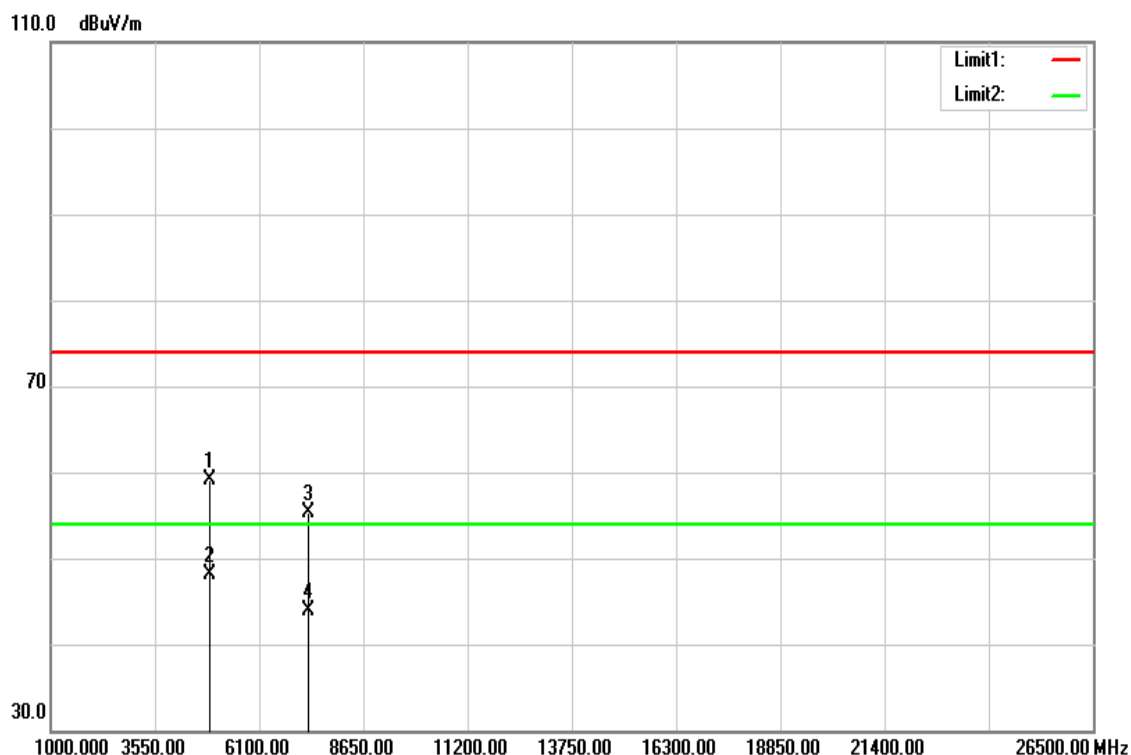


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824.000	40.59	4.38	44.97	74.00	-29.03	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11g Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

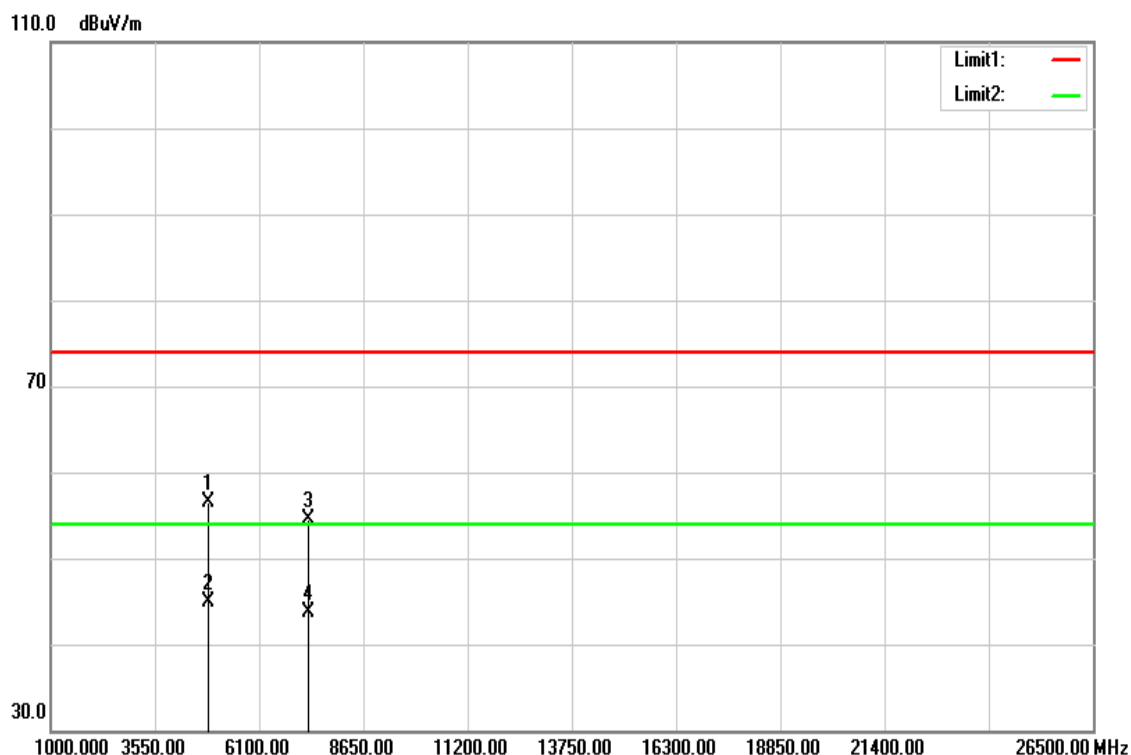


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	54.61	4.47	59.08	74.00	-14.92	peak
4876.000	43.66	4.47	48.13	54.00	-5.87	AVG
7312.000	44.76	10.44	55.20	74.00	-18.80	peak
7312.000	33.45	10.44	43.89	54.00	-10.11	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11g Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

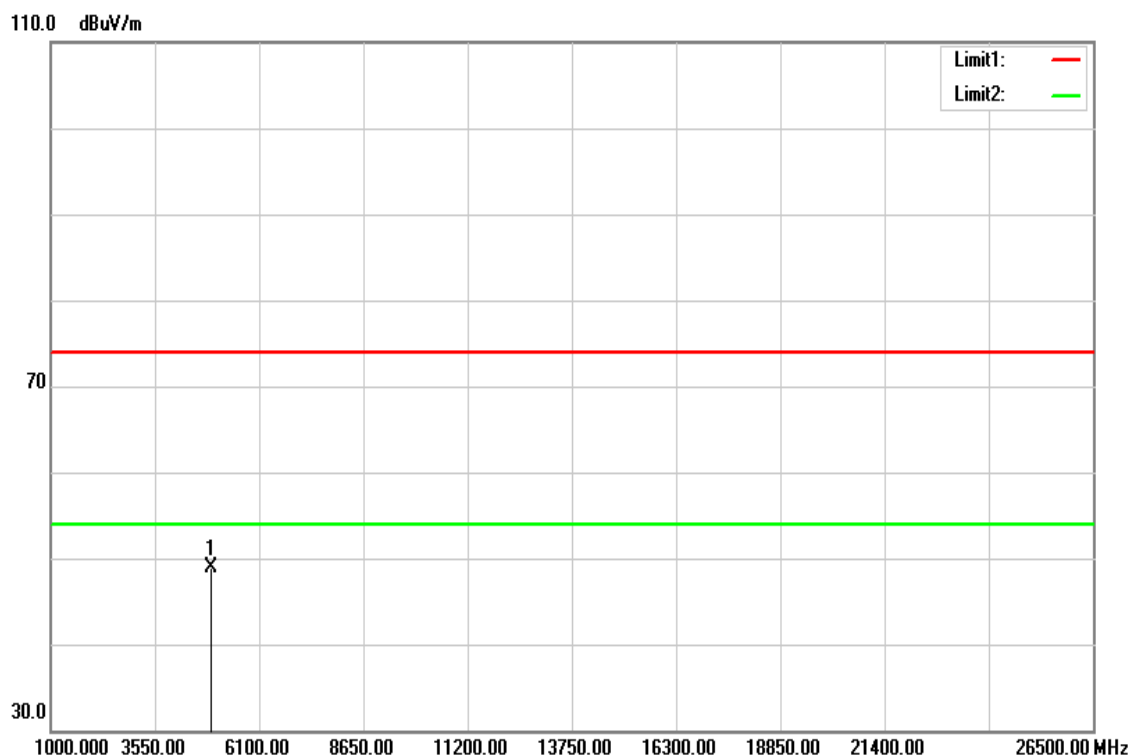


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4869.000	52.06	4.45	56.51	74.00	-17.49	peak
4869.000	40.36	4.45	44.81	54.00	-9.19	AVG
7305.000	44.11	10.44	54.55	74.00	-19.45	peak
7305.000	33.31	10.44	43.75	54.00	-10.25	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11g High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

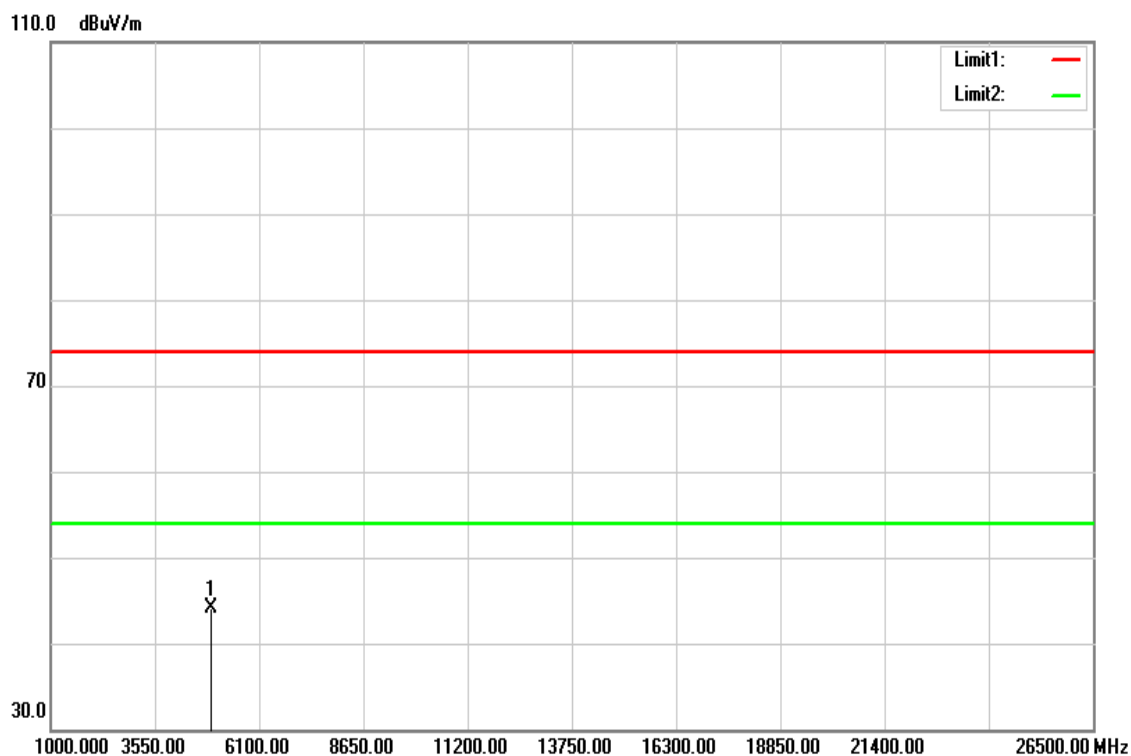


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4932.000	44.42	4.57	48.99	74.00	-25.01	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11g High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

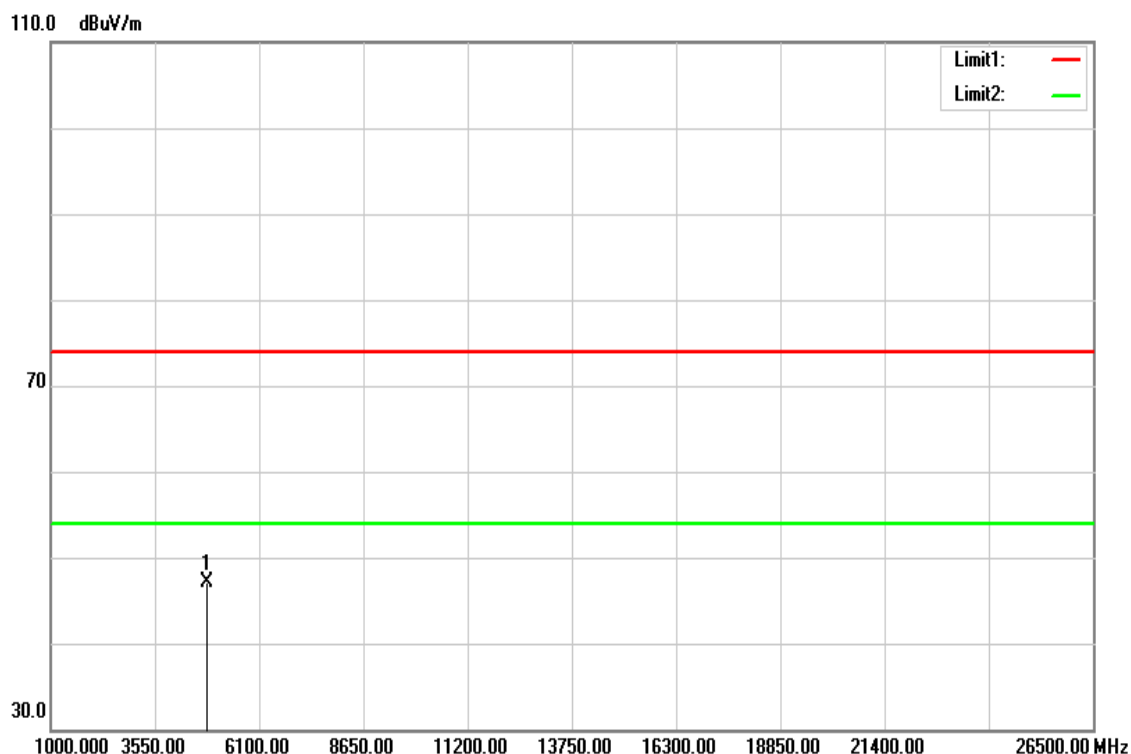


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4925.000	39.61	4.55	44.16	74.00	-29.84	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 20MHz Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

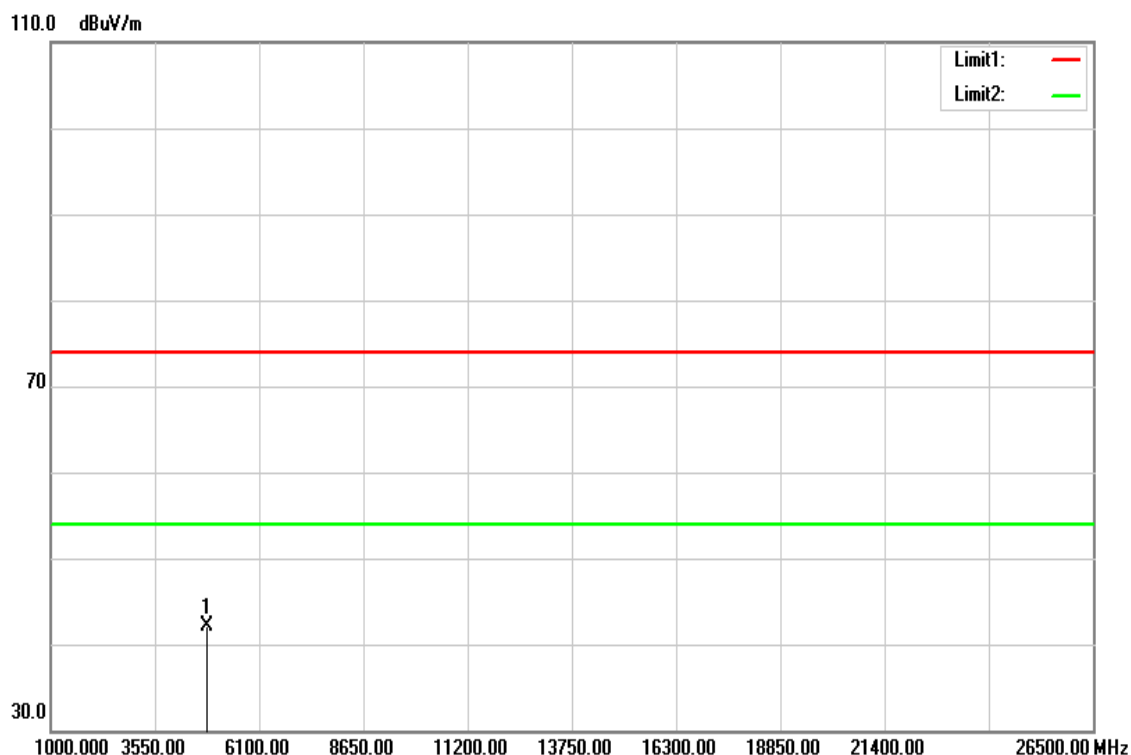


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4827.000	42.65	4.38	47.03	74.00	-26.97	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 20MHz Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

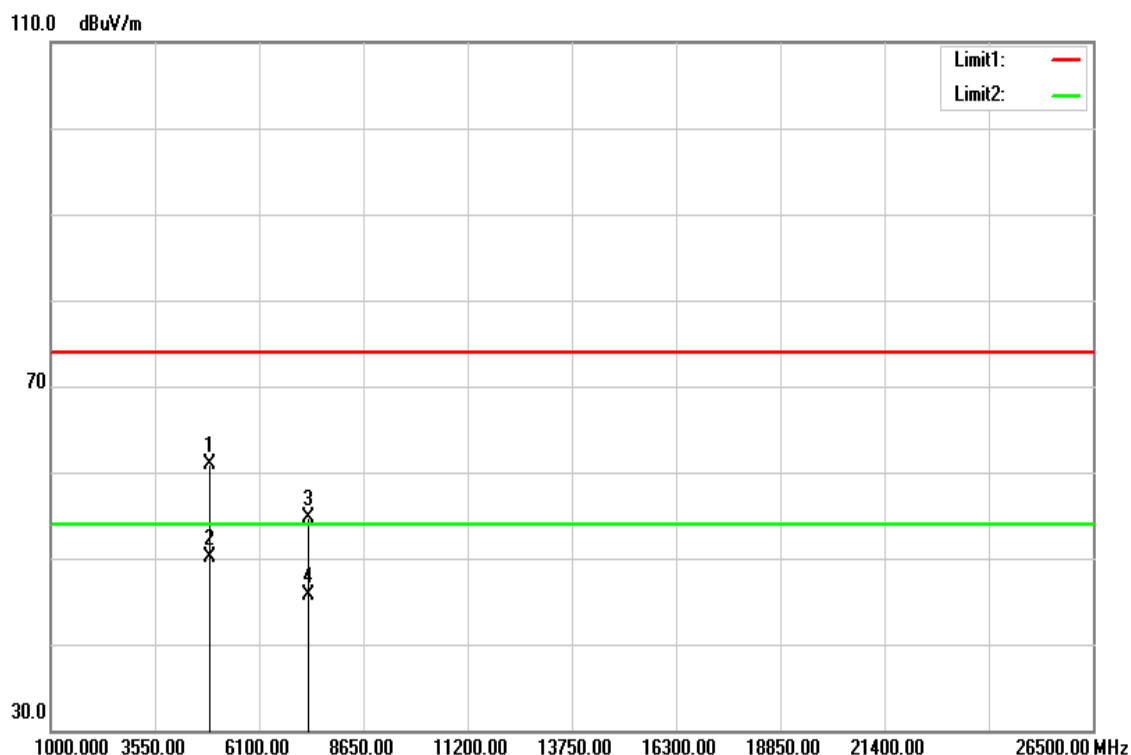


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824.000	37.69	4.38	42.07	74.00	-31.93	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 20MHz Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

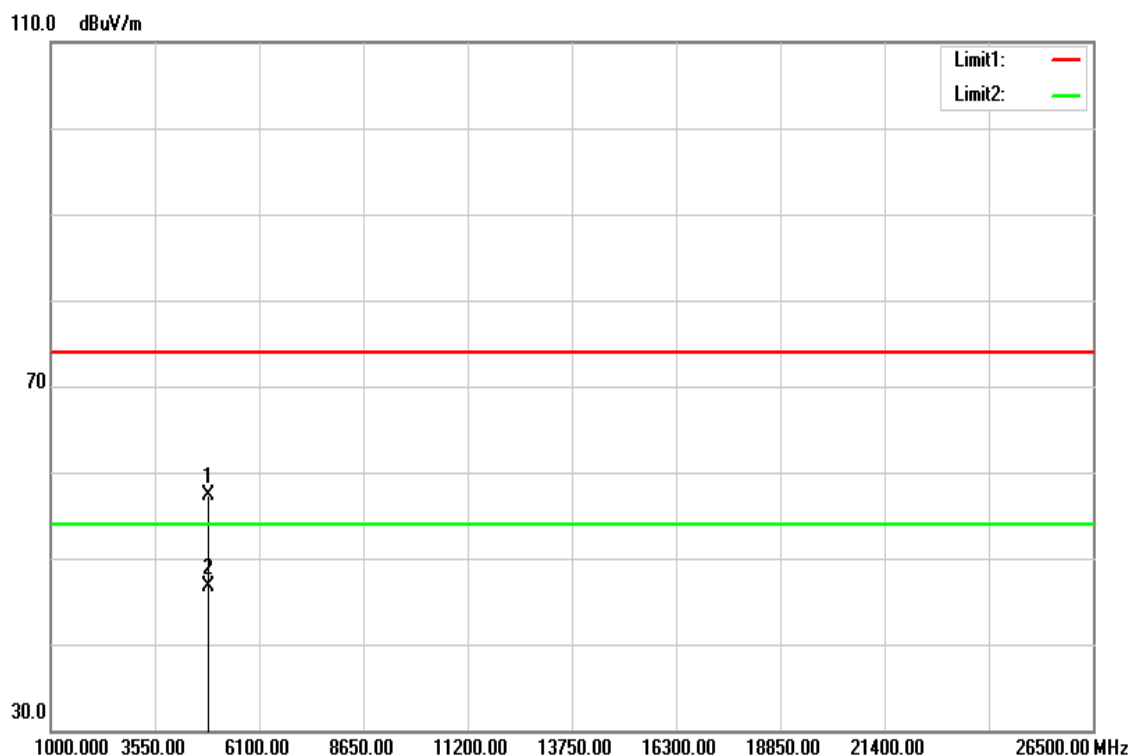


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	56.47	4.47	60.94	74.00	-13.06	peak
4876.000	45.57	4.47	50.04	54.00	-3.96	AVG
7305.000	44.27	10.44	54.71	74.00	-19.29	peak
7305.000	35.34	10.44	45.78	54.00	-8.22	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 20MHz Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

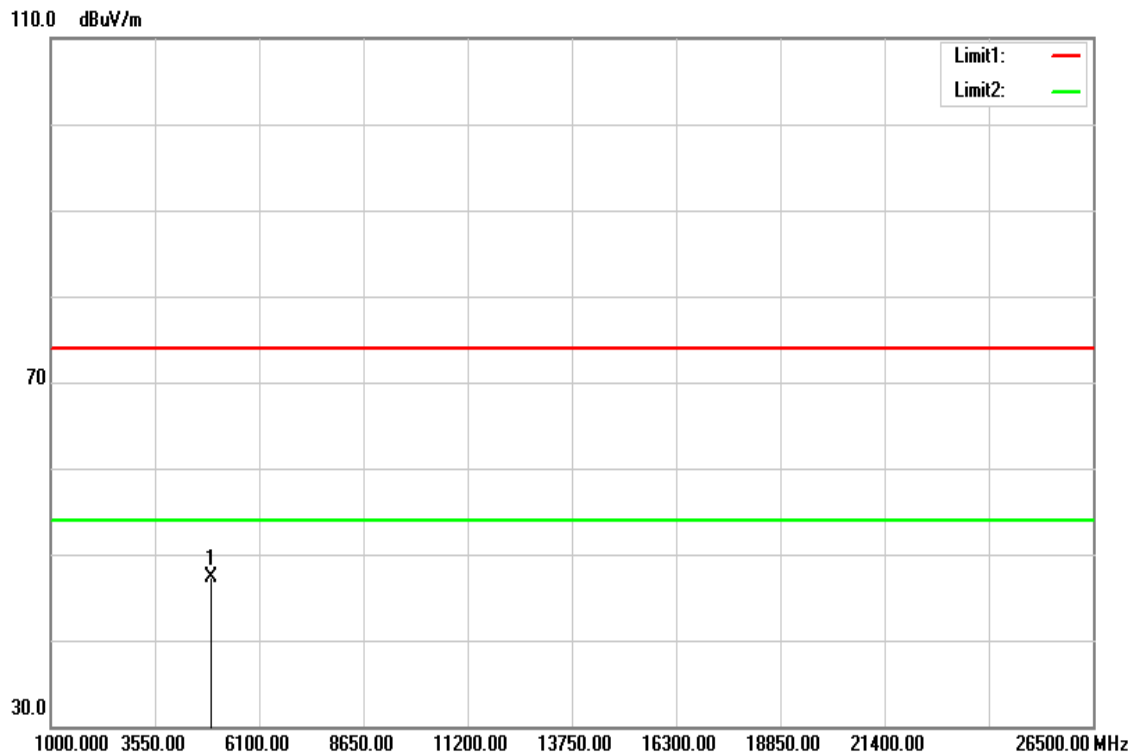


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4862.000	52.88	4.44	57.32	74.00	-16.68	peak
4862.000	42.24	4.44	46.68	54.00	-7.32	AVG
N/A						

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 20MHz High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

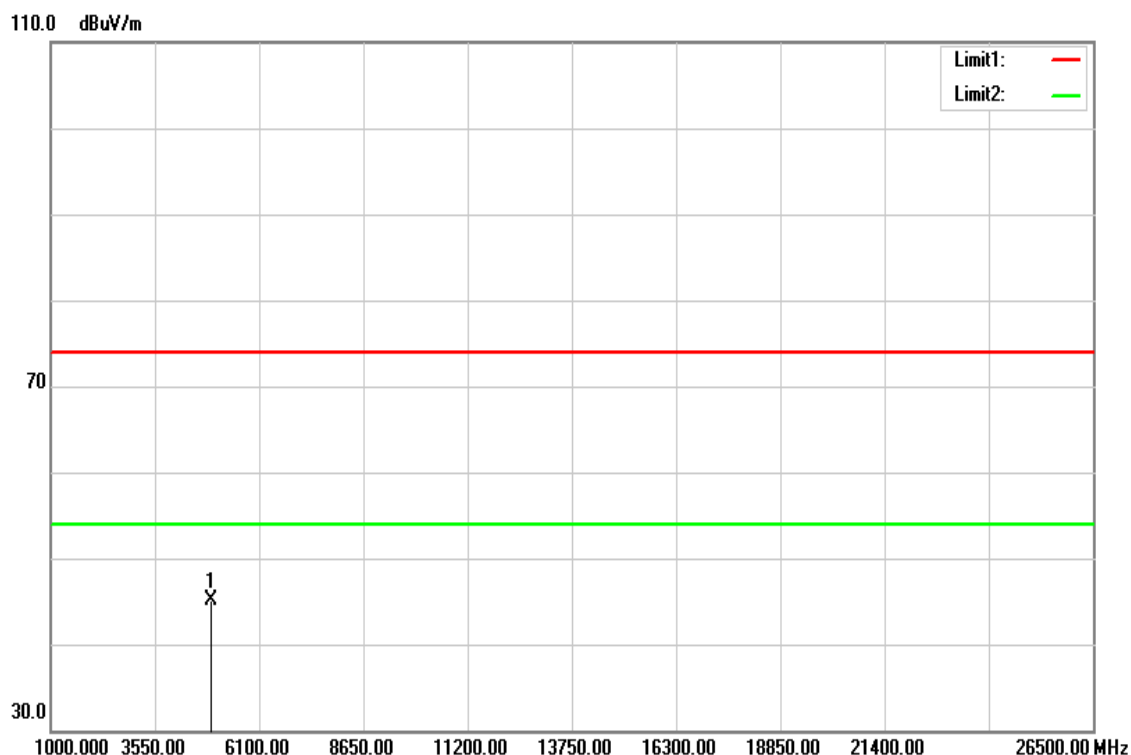


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4925.000	42.78	4.55	47.33	74.00	-26.67	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 20MHz High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

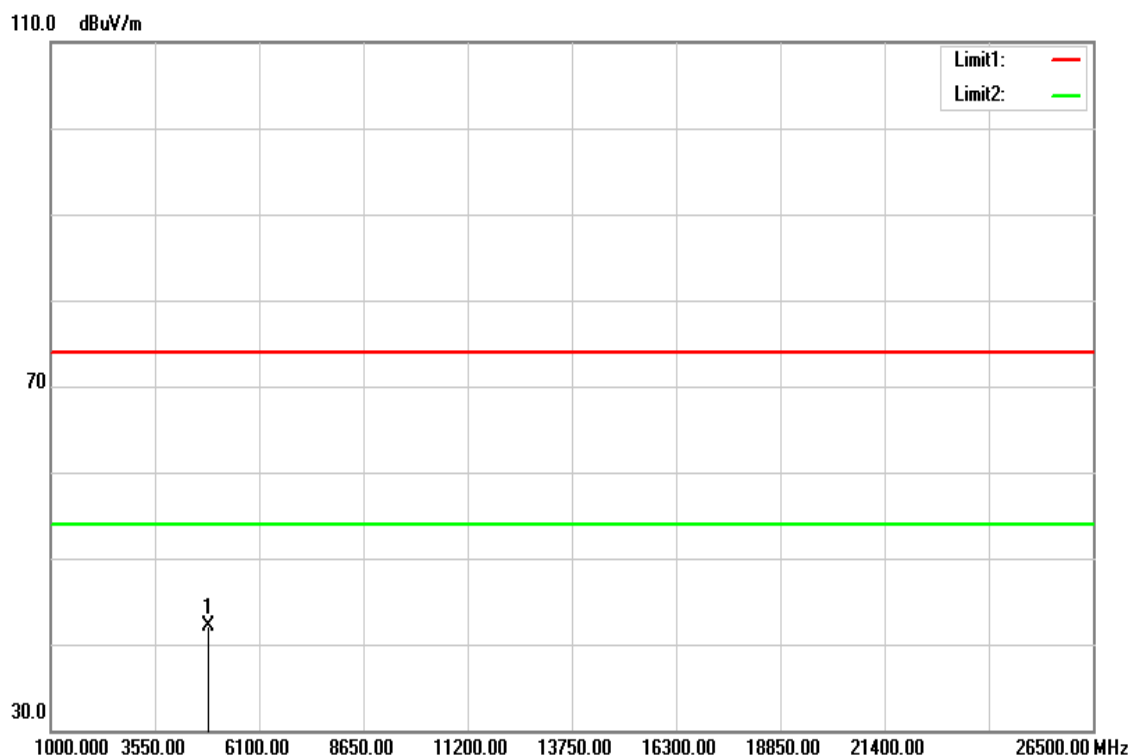


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4925.000	40.53	4.55	45.08	74.00	-28.92	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 40MHz Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

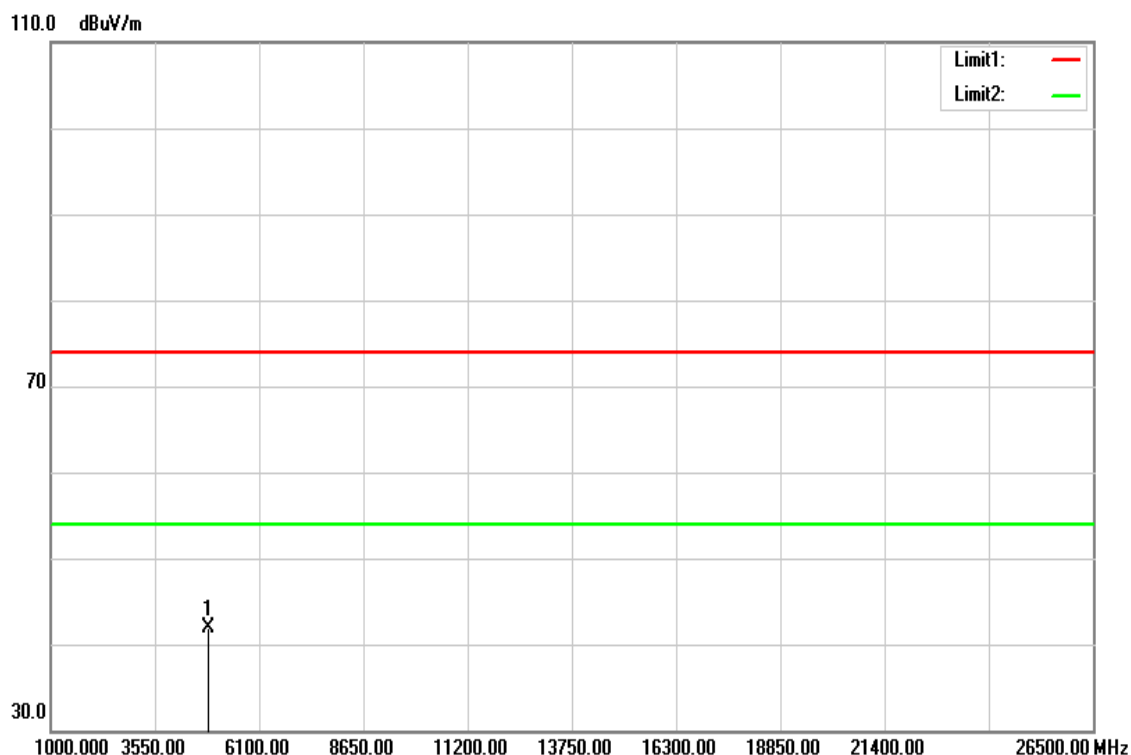


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4844.000	37.69	4.41	42.10	74.00	-31.90	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 40MHz Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

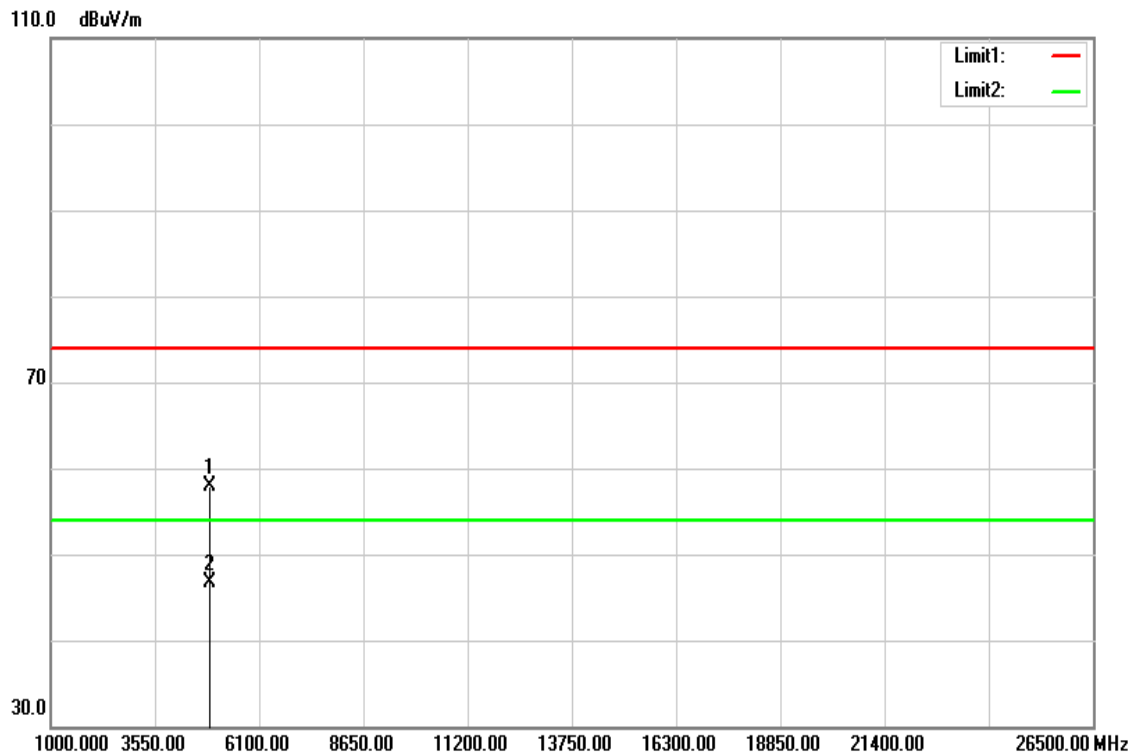


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4844.000	37.46	4.41	41.87	74.00	-32.13	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 40MHz Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 24, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

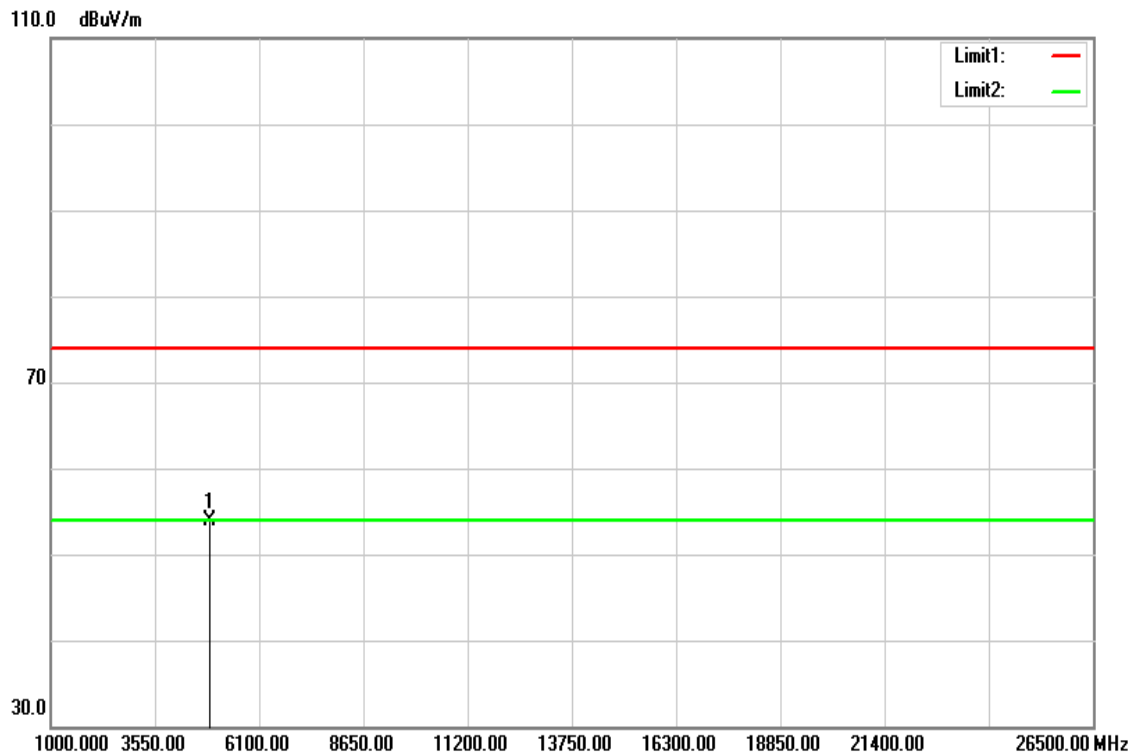


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4890.000	53.33	4.49	57.82	74.00	-16.18	peak
4890.000	42.12	4.49	46.61	54.00	-7.39	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 40MHz Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

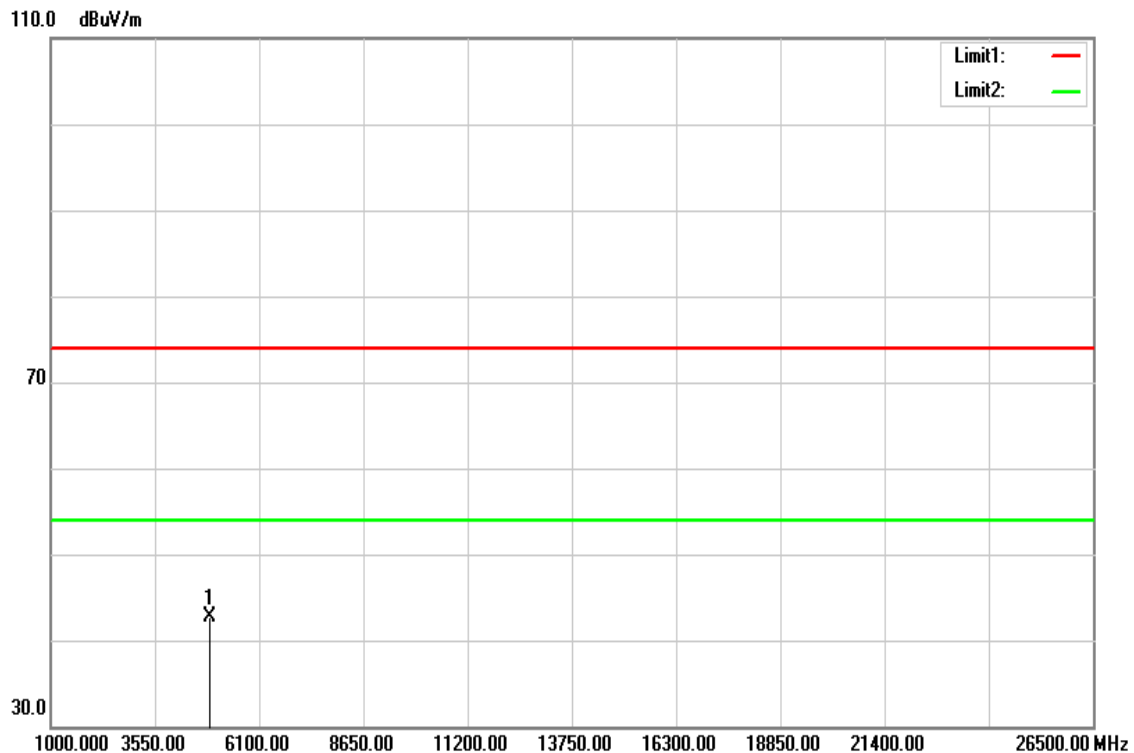


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4883.000	49.36	4.49	53.85	74.00	-20.15	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 40MHz High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz

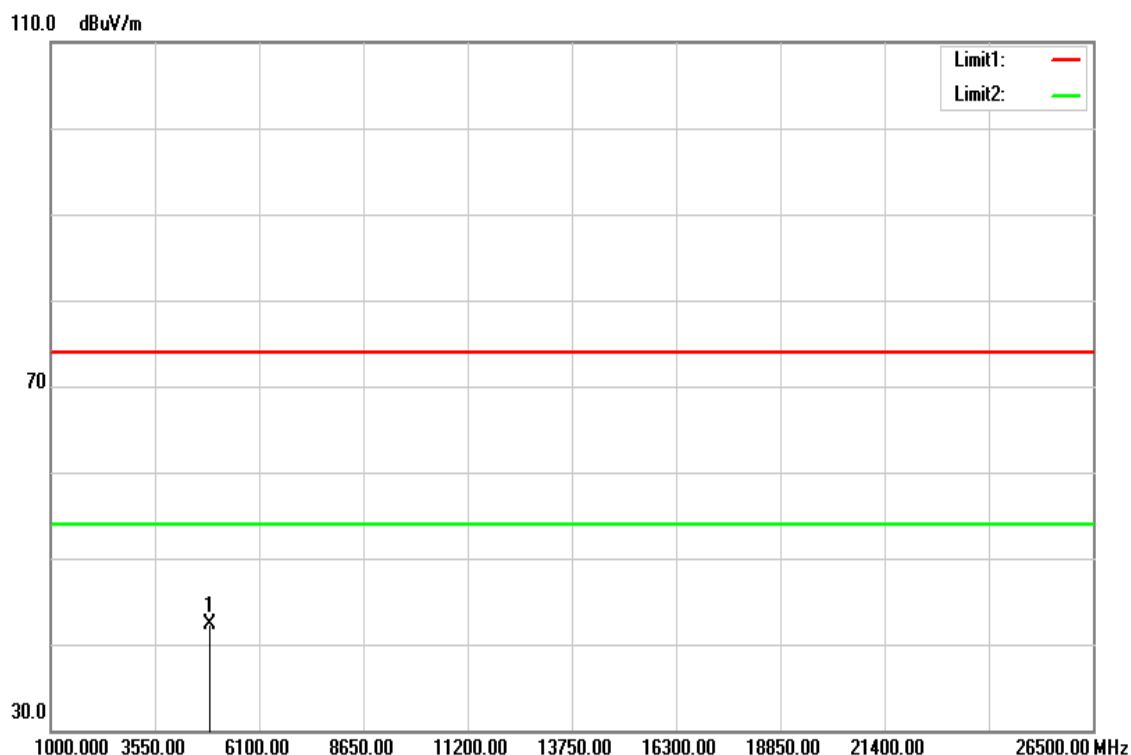


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4904.000	38.27	4.51	42.78	74.00	-31.22	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11n 40MHz High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 25, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac/60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4904.000	37.82	4.51	42.33	74.00	-31.67	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit