

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
FCC ID	PPQ-WCBN4508M
Product name	802.11a/b/g/n/ac 2Tx2R + BT V4.2 LE USB Combo Module
Brand name	LITE-ON
Model No.	WCBN4508M
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".

Sam Chuang
Manager

Tested by:

A handwritten signature in black ink, appearing to read "Jerry Chuang".

Jerry Chuang
Engineer

Revision History

Rev.	Issue Date	Revisions	Revised By
00	June 7, 2018	Initial Issue	Doris Chu

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	LITE-ON Technology Corp. Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan
Manufacturer	LITE-ON TECHNOLOGY (Changzhou) CO., LTD A9 Building, No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone, Changzhou City, Jiangsu Province 213100 China
Equipment	802.11a/b/g/n/ac 2Tx2R + BT V4.2 LE USB Combo Module
Model Name	WCBN4508M
Model Discrepancy	N/A
Brand name	LITE-ON
Received Date	February 1, 2018
Date of Test	February 26 ~ June 7, 2018
Output Power(W)	IEEE 802.11b mode: 0.2173 IEEE 802.11g mode: 0.4571 IEEE 802.11n 20 MHz mode: 0.7737 IEEE 802.11n 40 MHz mode: 0.7754
Power Supply	Power form host device.

1.2 EUT CHANNEL INFORMATION

Frequency Range	802.11b/g/n 20 MHz: 2412MHz ~ 2462MHz 802.11n 40 MHz: 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	Ant 0: Gain: 3 dBi Ant 1 Gain: 3.3 dBi
Antenna connector	N/A
Directional gain	3.15

Notes:

1. Power Directional Gain: $10\text{LOG}(((10^{(Ant1/10)}+10^{(Ant2/10)}))/2))=10\text{LOG}(((10^{(3/10)}+10^{(3.3/10)}))/2))=3.15$

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 1.4003
RF output power, conducted	+/- 1.1372
Power density, conducted	+/- 1.4003
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683
3M Semi Anechoic Chamber / 40G~60G	+/- 1.8509
3M Semi Anechoic Chamber / 60G~75G	+/- 1.9869
3M Semi Anechoic Chamber / 75G~110G	+/- 2.9651
3M Semi Anechoic Chamber / 110G~170G	+/- 2.7807
3M Semi Anechoic Chamber / 170G~220G	+/- 3.6437
3M Semi Anechoic Chamber / 220G~325G	+/- 4.2982

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	Dally Hong	-
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	1012009	09/18/2017	09/17/2018
Power Sensor	Anritsu	MA2411B	917072	09/18/2017	09/17/2018
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	STI08-0015	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	ETC	MCTD 1209	DRH13M02003	08/25/2017	08/24/2018
Pre-Amplifier	EMEC	EM330	60609	06/06/2018	06/05/2019
Spectrum Analyzer	Agilent	E4446A	US42510252	11/27/2017	11/26/2018
Loop Ant	COM-POWER	AL-130	121051	03/21/2018	03/20/2019
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
Wideband Radio Communication Tester	R&S	CMW 500	116875	04/20/2018	04/19/2019
Pre-Amplifier	HP	8449B	3008A00965	06/27/2017	06/26/2018
Filter	Micro Tronics	BRM 50702	120	05/14/2018	05/13/2019
Filter	Micro Tronics	HPM13195	3	05/14/2018	05/13/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	07/31/2017	07/30/2018

AC Conducted Emissions Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
LISN	R&S	ENV216	101054	02/06/2018	02/05/2019
LISN	SCHWARZBECK	NSLK 8127	8127-541	02/09/2018	02/08/2019
EMI Test Receiver	R&S	ESCI	101203	11/02/2017	11/01/2018

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
1	DC Power Source	Agilent	E3640A	N/A	N/A
2	NB(H)	Acer	Aspire 4320 series	N/A	QDS-BRCM1018

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 662911 D01 v02r01

2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	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 20 MHz mode :MCS0 IEEE 802.11n 40 MHz mode :MCS0
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 20 MHz mode : 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz IEEE 802.11n 40 MHz 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 20 MHz mode : 2T2R IEEE 802.11n 40 MHz mode : 2T2R

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 host system.
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 host system.
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

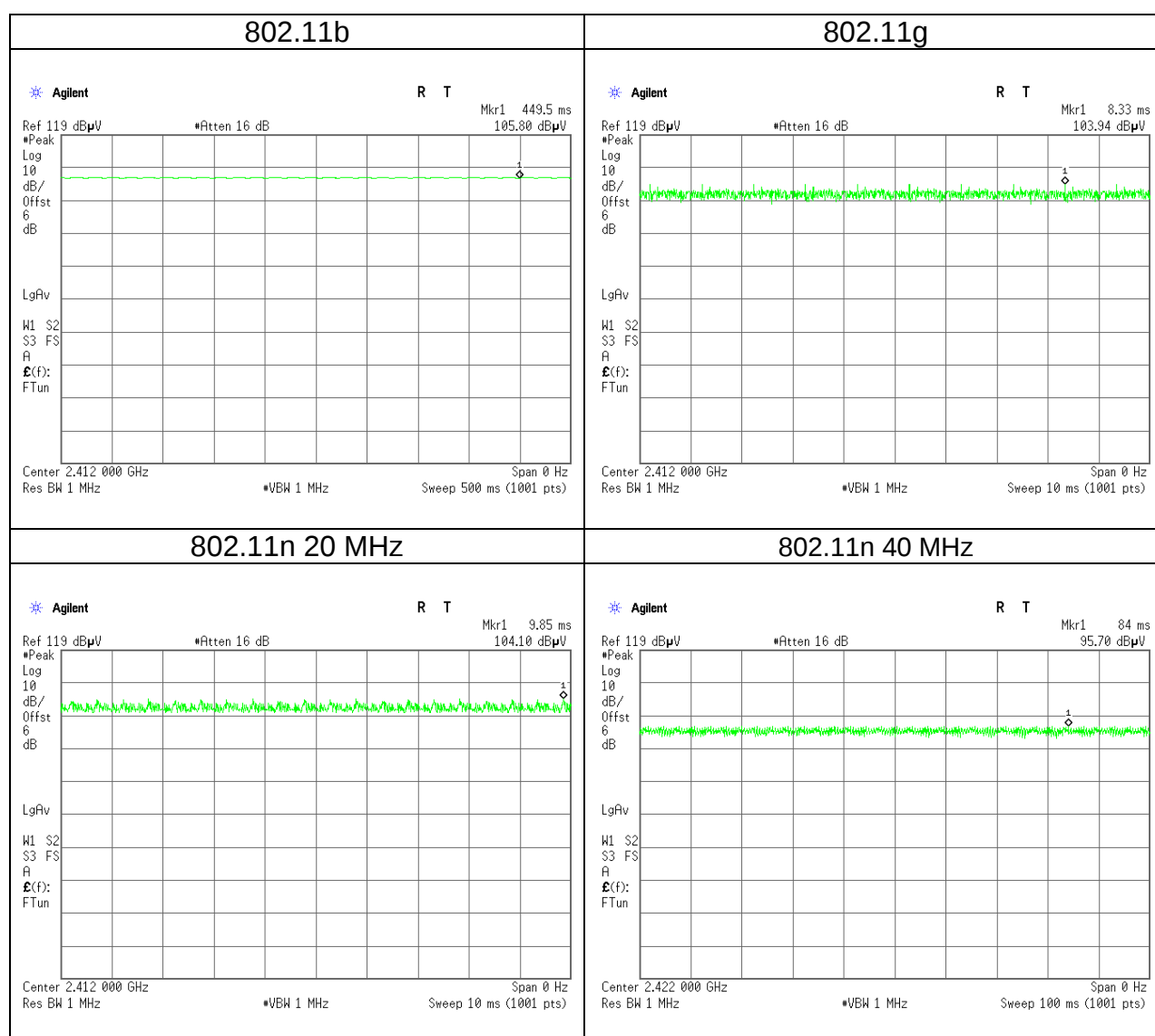
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Voltage/Hz	120V / 60Hz
Test Mode	Mode 1:EUT power by host system.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

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(X-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	1.0000	1.0000	100.00%	0.00
802.11g	1.0000	1.0000	100.00%	0.00
802.11n 20 MHz	1.0000	1.0000	100.00%	0.00
802.11n 40 MHz	1.0000	1.0000	100.00%	0.00



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

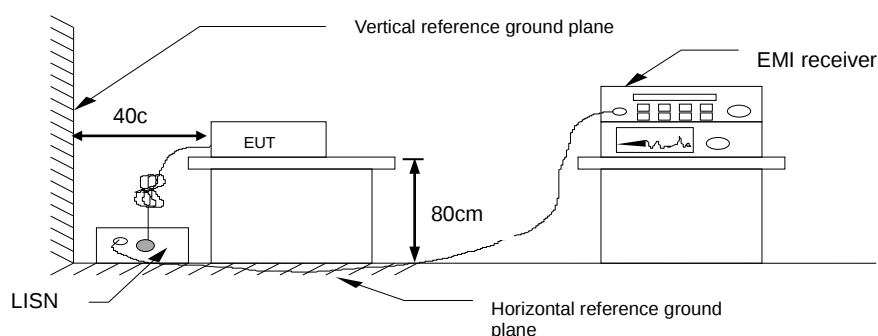
* Decreases with the logarithm of the frequency.

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

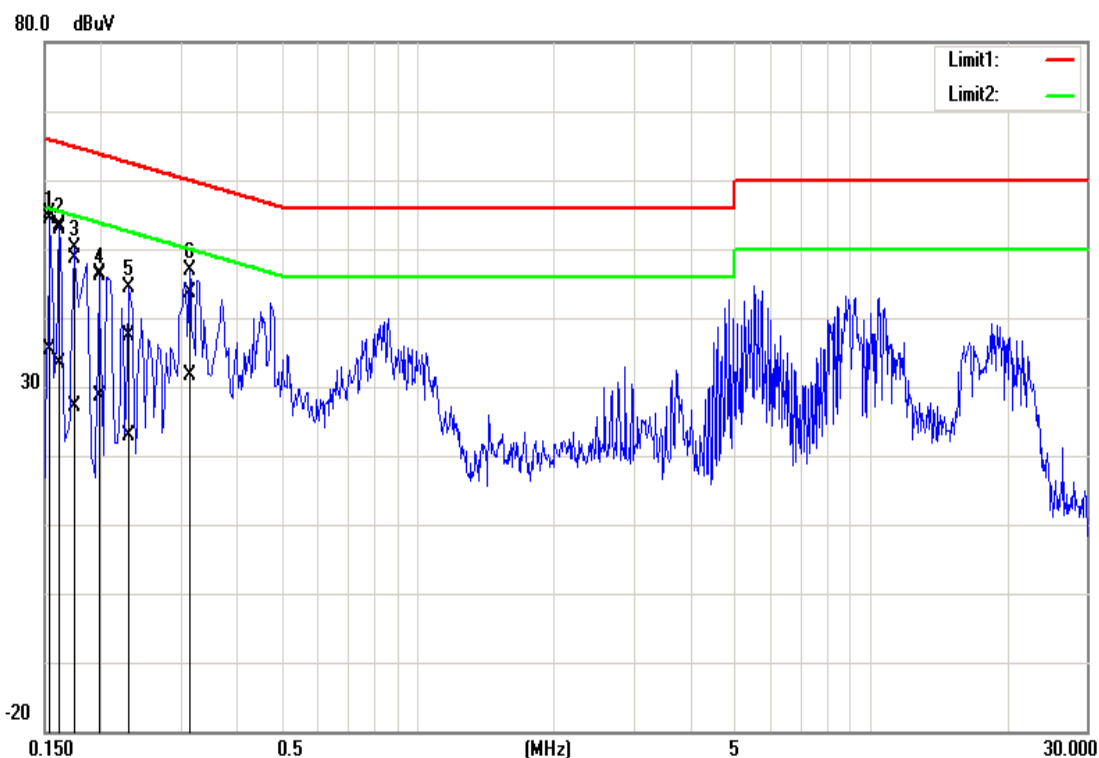


5.1.4 Test Result

Pass.

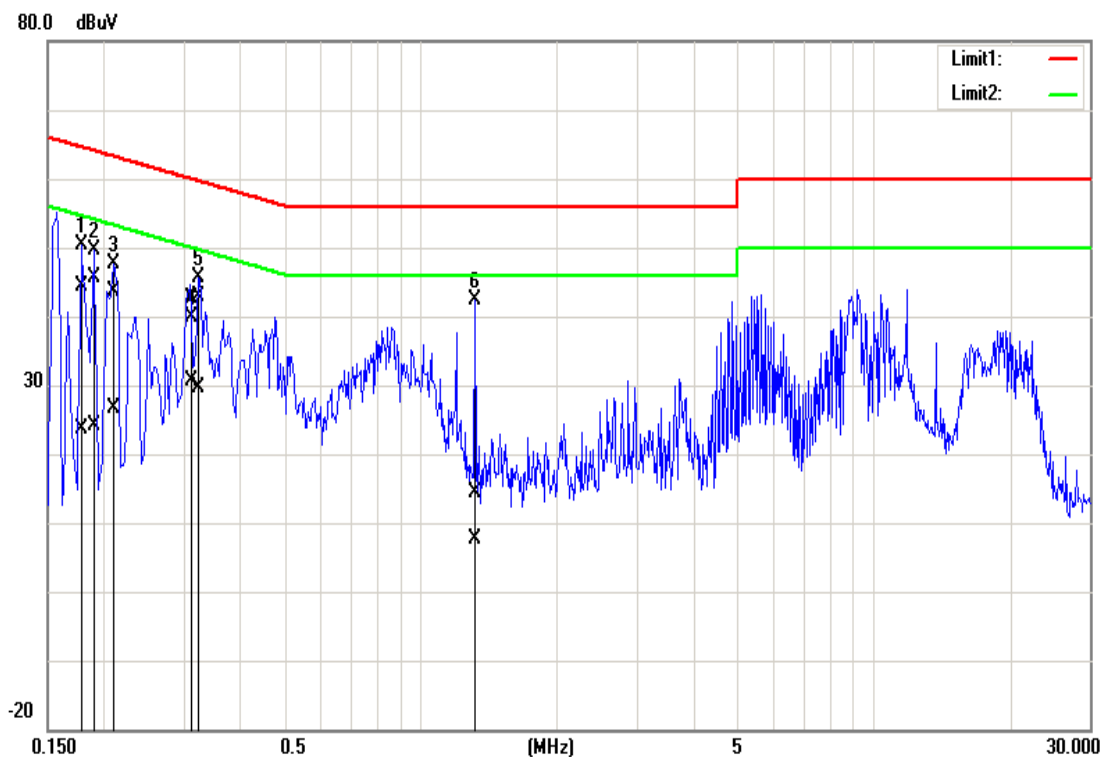
Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	June 7, 2018
Phase:	Line	Test Engineer	Dally Hong



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
0.1540	55.02	35.15	0.11	55.13	35.26	65.78	55.78	-10.65	-20.52	Pass
0.1620	52.65	33.30	0.11	52.76	33.41	65.36	55.36	-12.60	-21.95	Pass
0.1740	48.45	26.90	0.11	48.56	27.01	64.77	54.77	-16.21	-27.76	Pass
0.1980	46.24	28.45	0.11	46.35	28.56	63.69	53.69	-17.34	-25.13	Pass
0.2300	37.37	22.81	0.11	37.48	22.92	62.45	52.45	-24.97	-29.53	Pass
0.3140	43.63	31.58	0.12	43.75	31.70	59.86	49.86	-16.11	-18.16	Pass

Test Mode:	Mode 1	Temp/Hum	27(°C)/ 53%RH
Test Voltage:	120Vac / 60Hz	Test Date	June 7, 2018
Phase:	Neutral	Test Engineer	Dally Hong



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
0.1780	44.36	23.38	0.13	44.49	23.51	64.58	54.58	-20.09	-31.07	Pass
0.1900	45.44	23.91	0.13	45.57	24.04	64.04	54.04	-18.47	-30.00	Pass
0.2100	43.51	26.47	0.13	43.64	26.60	63.21	53.21	-19.57	-26.61	Pass
0.3140	42.55	30.45	0.13	42.68	30.58	59.86	49.86	-17.18	-19.28	Pass
0.3220	42.80	29.43	0.13	42.93	29.56	59.66	49.66	-16.73	-20.10	Pass
1.3180	14.20	7.41	0.15	14.35	7.56	56.00	46.00	-41.65	-38.44	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
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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	-	13.4153	-	10.0870	≥500
Mid	2437	-	13.4587	-	10.0870	
High	2462	-	13.4153	-	10.0870	

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	-	17.6266	-	16.6087	≥500
Mid	2437	-	17.2358	-	16.5652	
High	2462	-	16.7149	-	16.6087	

Test mode: IEEE 802.11n 20 MHz 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	17.6266	17.6266	17.7391	17.6522	≥500
Mid	2437	17.6266	17.6700	17.6957	17.6522	
High	2462	17.6266	17.6700	17.6087	17.6522	

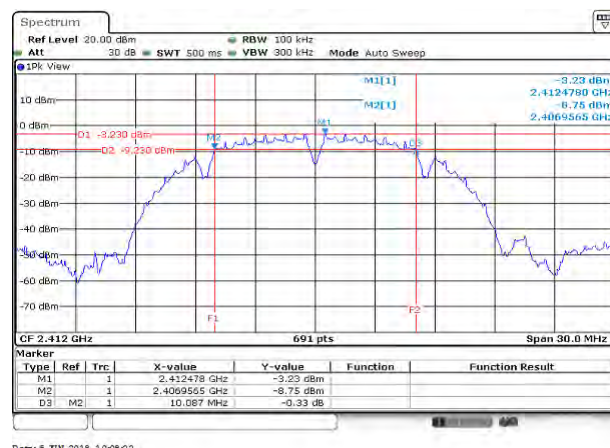
Test mode: IEEE 802.11n 40 MHz MHz mode / 2422-2452 MHz						
Channel	Frequency (MHz)	Chain 0 OBW(99%) (MHz)	Chain 1 OBW(99%) (MHz)	Chain 0 6dB BW (MHz)	Chain 1 6dB BW (MHz)	6dB limit (kHz)
Low	2422	36.2373	36.1215	36.4060	36.4060	>500
Mid	2437	36.3531	36.3531	36.4060	36.4060	
High	2452	36.3531	36.1215	36.4060	36.4060	

Test Data

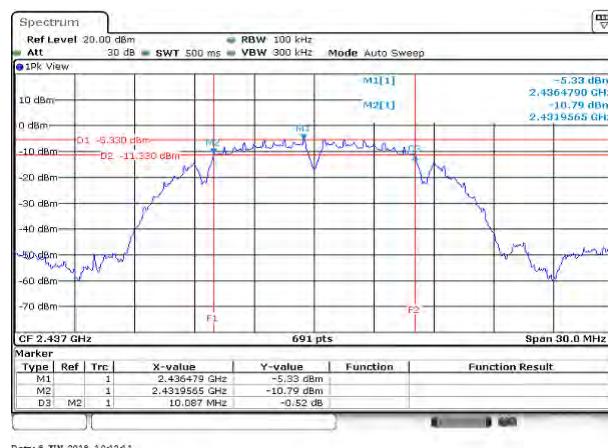
6 dB Bandwidth

IEEE 802.11b mode- Chain 1

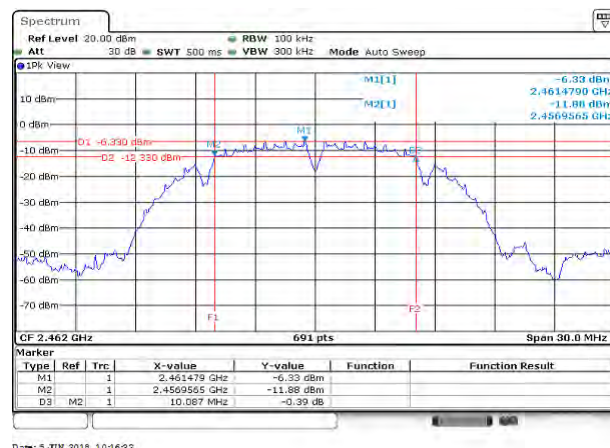
Low CH



Mid CH

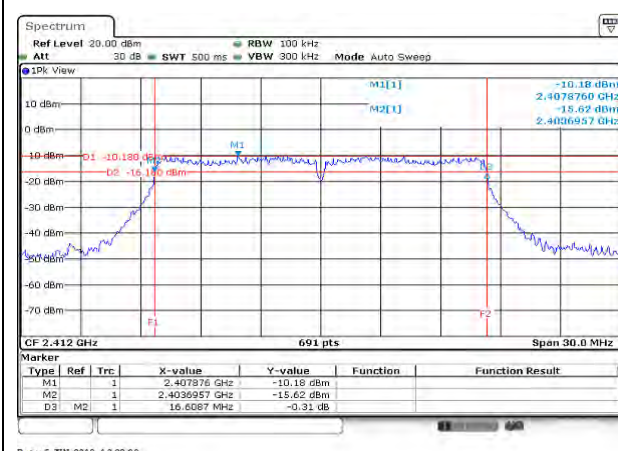


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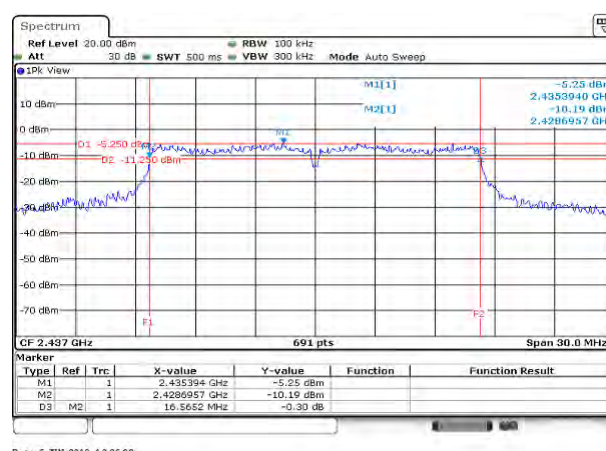


IEEE 802.11g mode- Chain 1

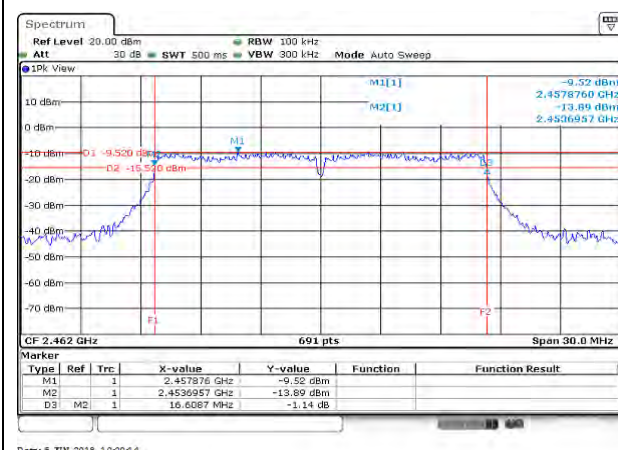
Low CH



Mid CH

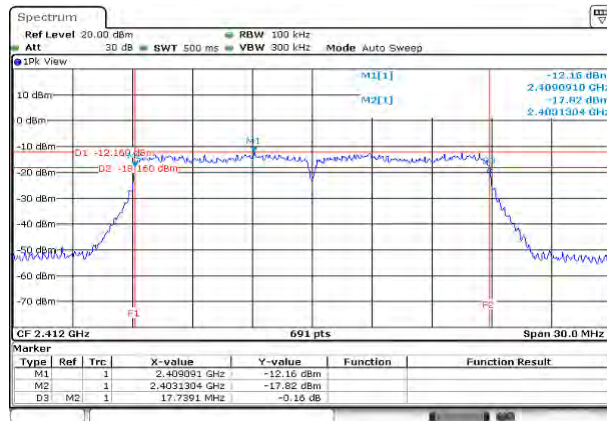


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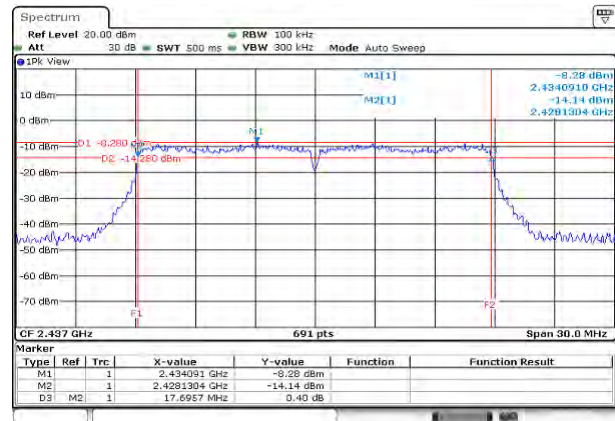


IEEE 802.11n 20 MHz mode- chain 0

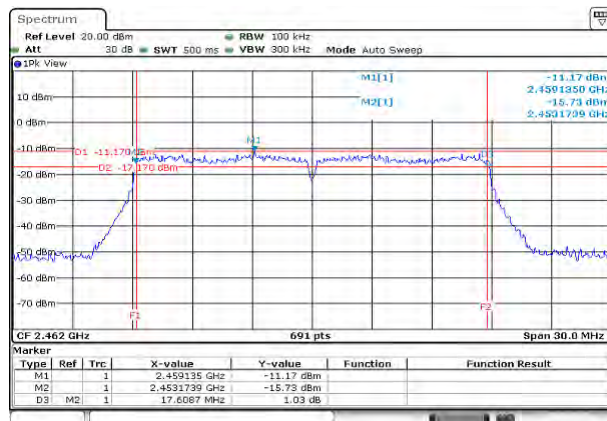
Low CH



Mid CH

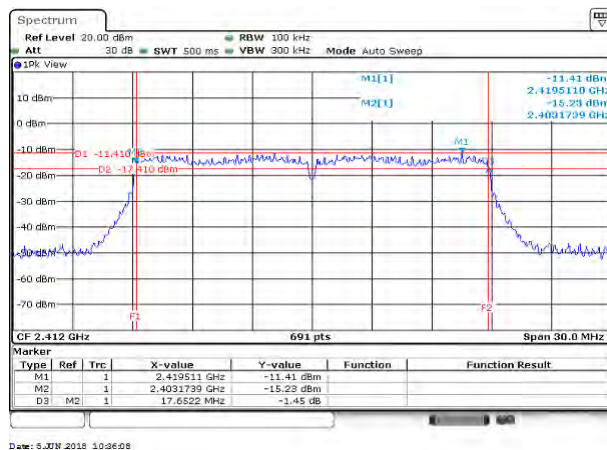


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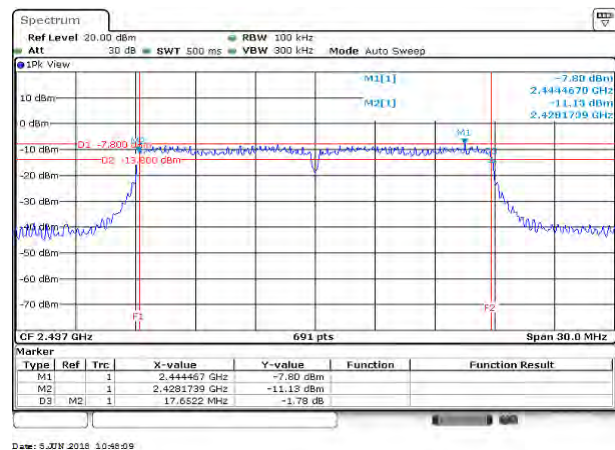


IEEE 802.11n 20 MHz mode- chain 1

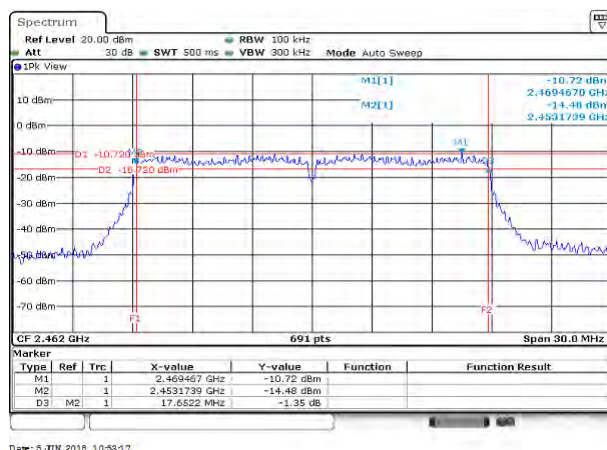
Low CH



Mid CH

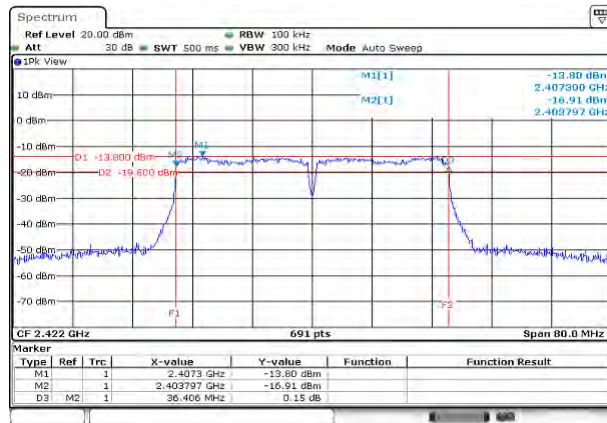


High CH

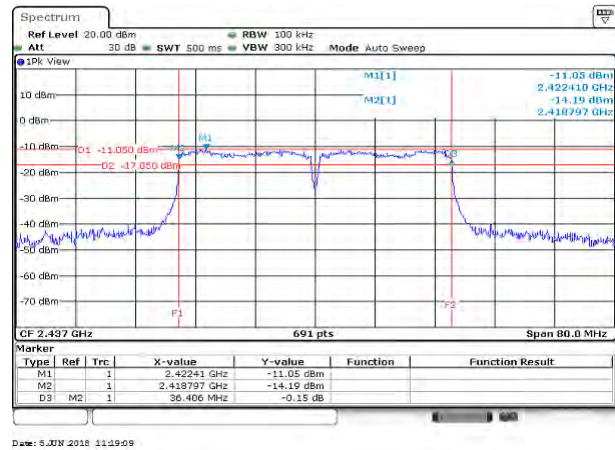


IEEE 802.11n 40 MHz mode- chain 0

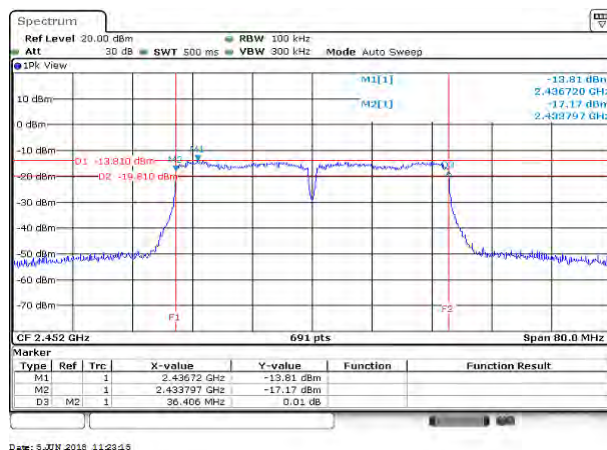
Low CH



Mid CH

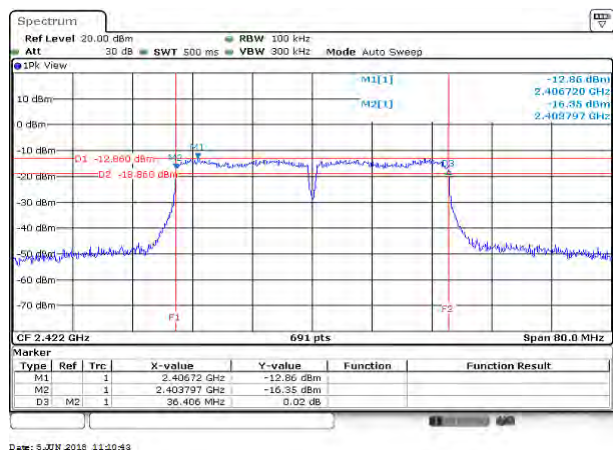


High CH

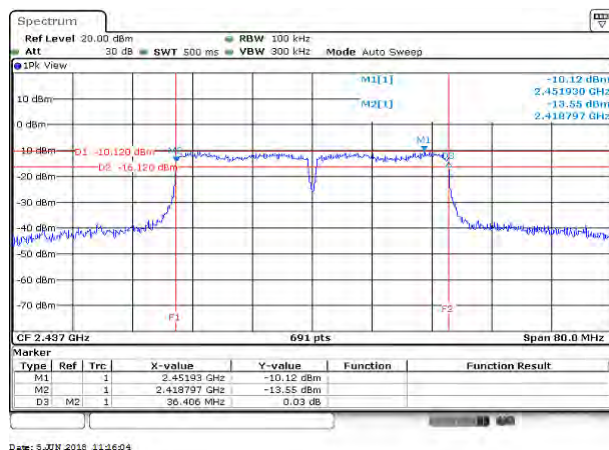


IEEE 802.11n 40 MHz mode- chain 1

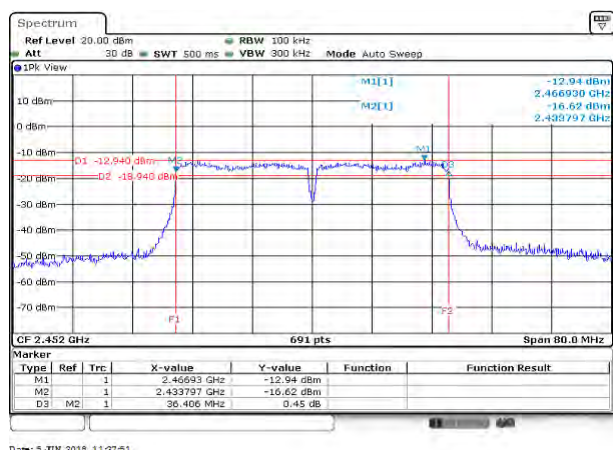
Low CH



Mid CH

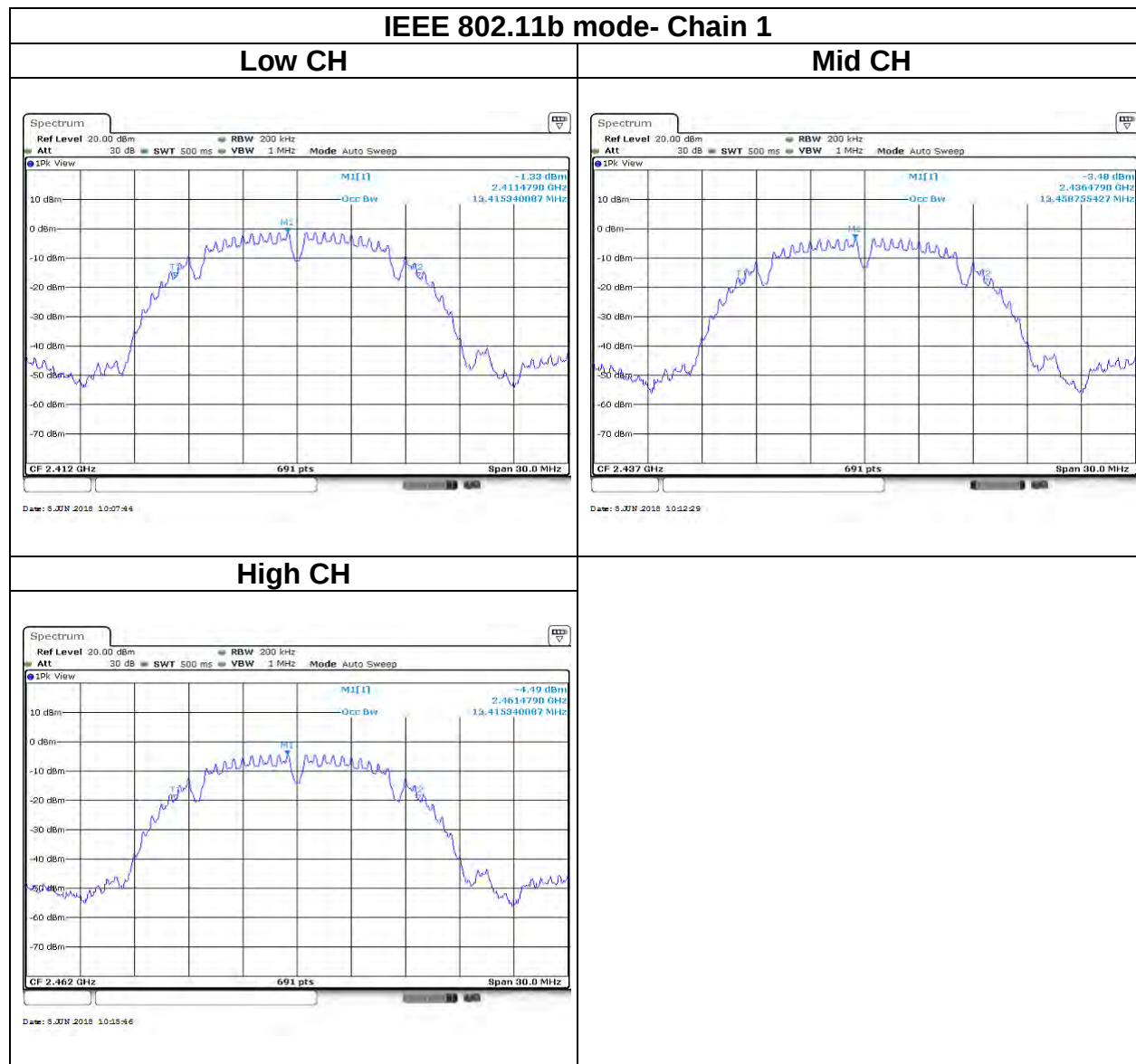


High CH



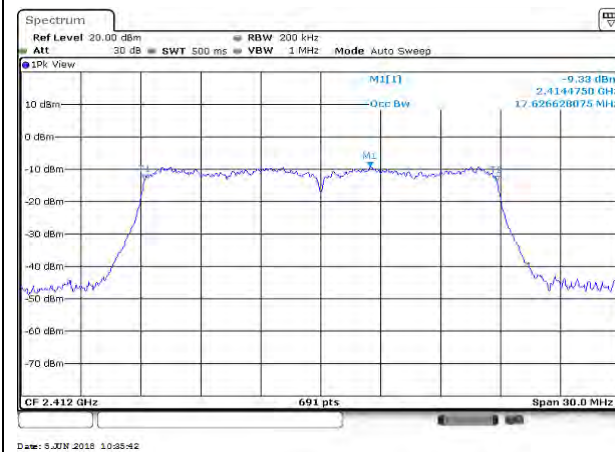
Test Data

99% Bandwidth



IEEE 802.11g mode- Chain 1

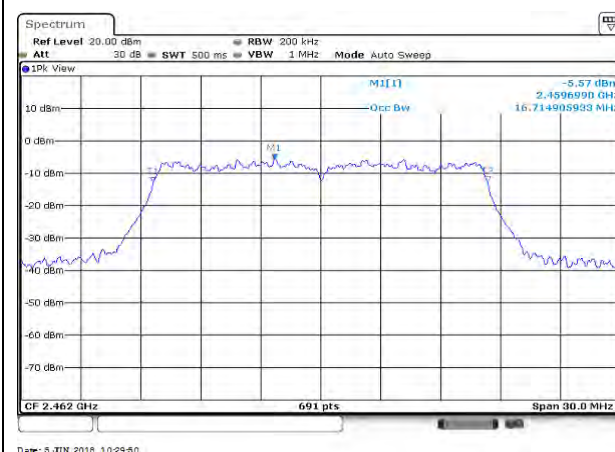
Low CH



Mid CH

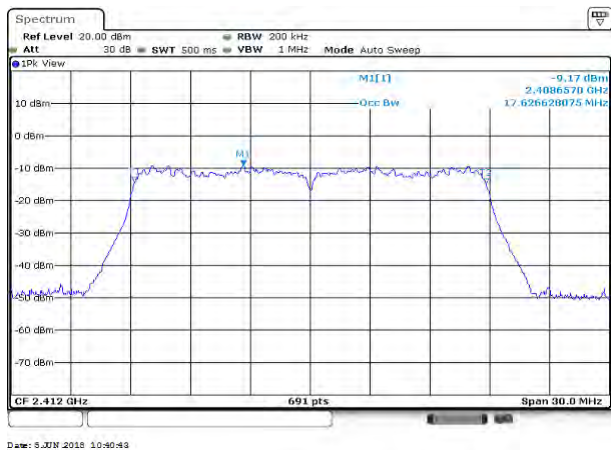


High CH

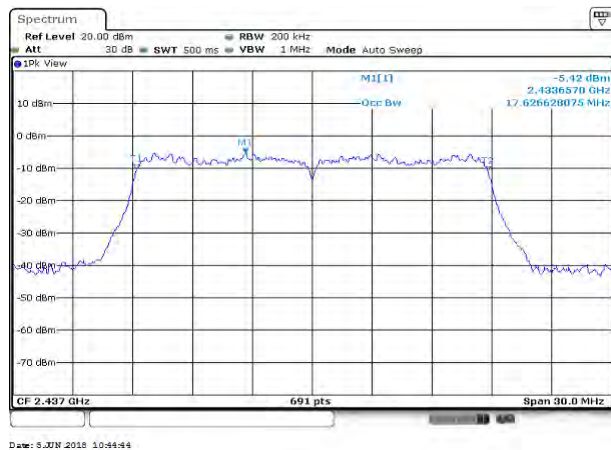


IEEE 802.11n 20 MHz mode- chain 0

Low CH



Mid CH

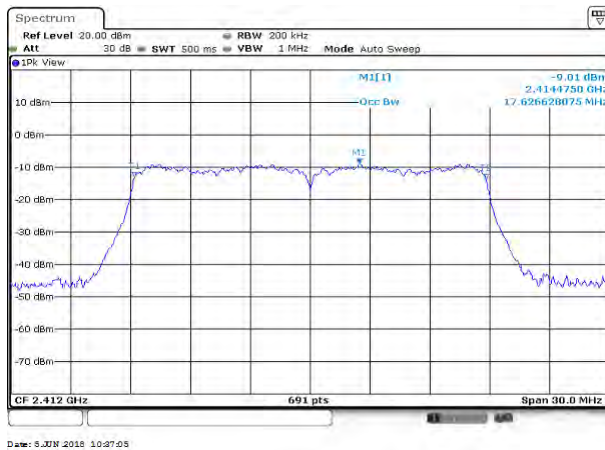


High CH

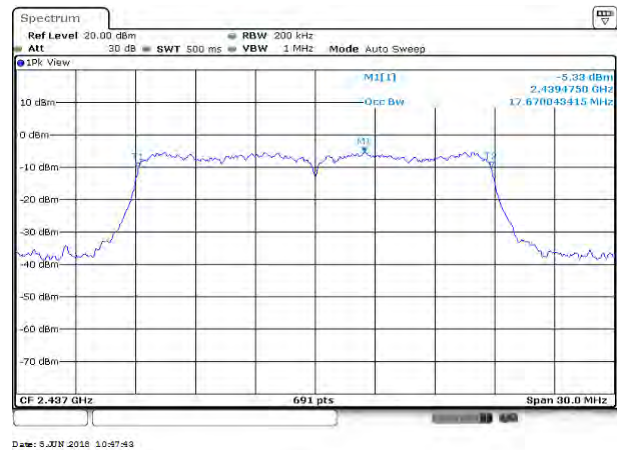


IEEE 802.11n 20 MHz mode- chain 1

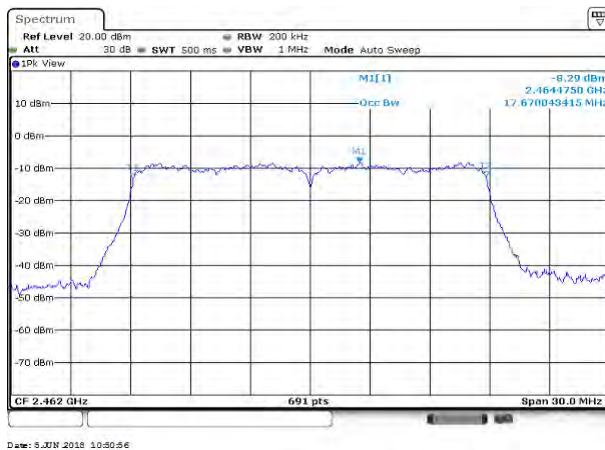
Low CH



Mid CH



High CH



IEEE 802.11n 40 MHz mode- chain 0

Low CH

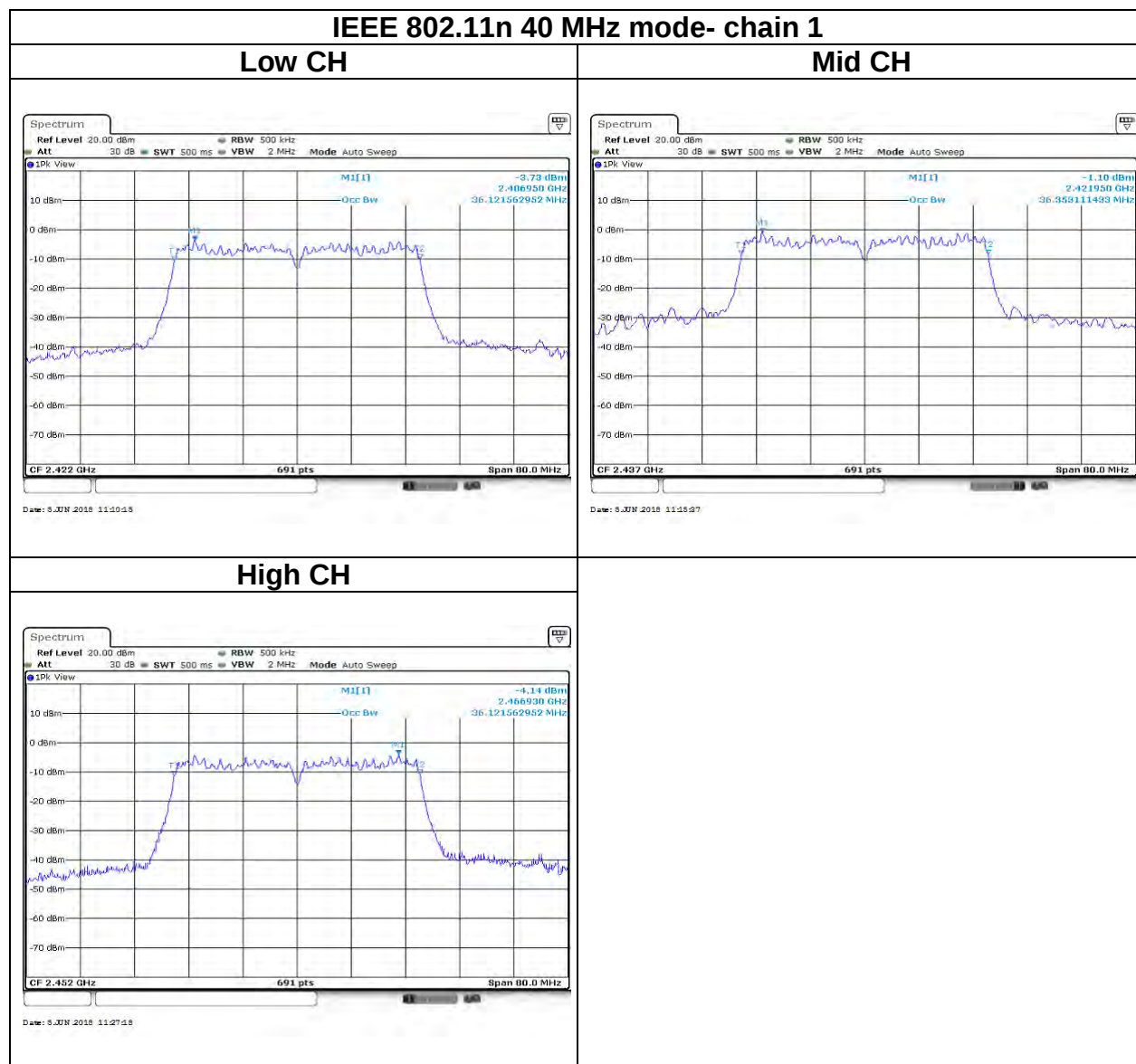


Mid CH



High CH





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 902-928 MHz, 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 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 :
-------	---

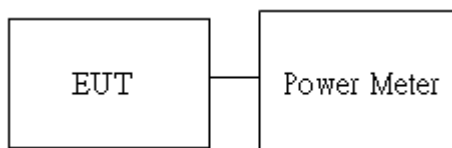
Average output power : For reporting purposes only.

5.3.2 Test Procedure

Test method Refer as KDB 558074 D01 V04, Section 9.1.2.

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	-	19	-	23.37	23.37	0.2173	30
	Mid	2437	-	17	-	21.30	21.30	0.1349	
	High	2462	-	16	-	20.34	20.34	0.1081	
IEEE 802.11g Data rate: 6Mbps	Low	2412	-	15	-	26.06	26.06	0.4036	
	Mid	2437	-	20	-	26.60	26.60	0.4571	
	High	2462	-	16	-	26.02	26.02	0.3999	
IEEE 802.11n HT20 Data rate: MCS0	Low	2412	13	13	23.58	23.97	26.79	0.4775	
	Mid	2437	17	17	25.95	25.80	28.89	0.7737	
	High	2462	14	14	24.16	24.83	27.52	0.5647	
IEEE 802.11n HT40 Data rate: MCS0	Low	2422	15	15	25.33	25.70	28.53	0.7127	
	Mid	2437	18	18	25.93	25.84	28.90	0.7754	
	High	2452	15	15	24.18	25.49	27.89	0.6158	

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	-	20.84	20.84
	Mid	2437	-	18.78	18.78
	High	2462	-	17.81	17.81
IEEE 802.11g Data rate: 6Mbps	Low	2412	-	16.88	16.88
	Mid	2437	-	21.23	21.23
	High	2462	-	17.61	17.61
IEEE 802.11n HT20 Data rate: MCS0	Low	2412	14.66	15.09	17.89
	Mid	2437	18.13	18.76	21.47
	High	2462	15.12	15.78	18.47
IEEE 802.11n HT40 Data rate: MCS0	Low	2422	16.25	16.86	19.58
	Mid	2437	18.89	19.44	22.18
	High	2452	16.02	16.52	19.29

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.

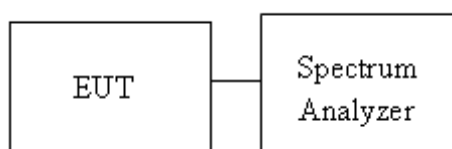
Limit	☒ Antenna not exceed 6 dBi : 8dBm ☐ Antenna with DG greater than 6 dBi : [Limit = 8 – (DG – 6)] ☐ Point-to-point operation :
-------	---

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

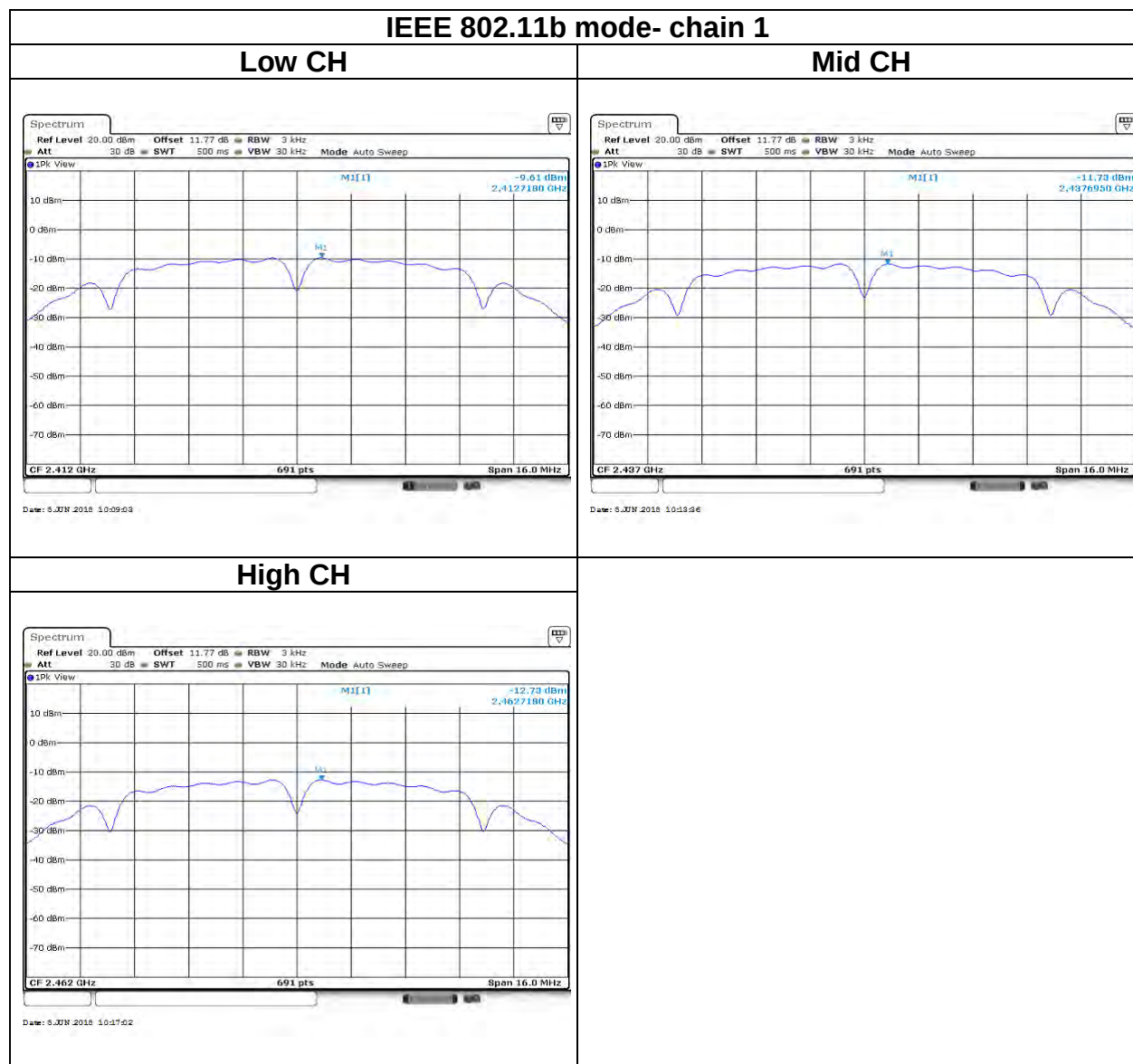
Test mode: IEEE 802.11b mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSSD (dBm)	Chain 1 PPSSD (dBm)	Total PPSSD (dBm)	Limit (dBm)
Low	2412	-	-9.61	-9.61	8
Mid	2437	-	-11.73	-11.73	
High	2462	-	-12.73	-12.73	

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	-	-12.00	-12.00	8
Mid	2437	-	-7.53	-7.53	
High	2462	-	-11.16	-11.16	

Test mode: IEEE 802.11n 20 MHz MHz mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSSD (dBm)	Chain 1 PPSSD (dBm)	Total PPSSD (dBm)	Limit (dBm)
Low	2412	-14.72	-14.22	-11.45	8
Mid	2437	-10.23	-10.31	-7.26	
High	2462	-13.95	-13.35	-10.63	

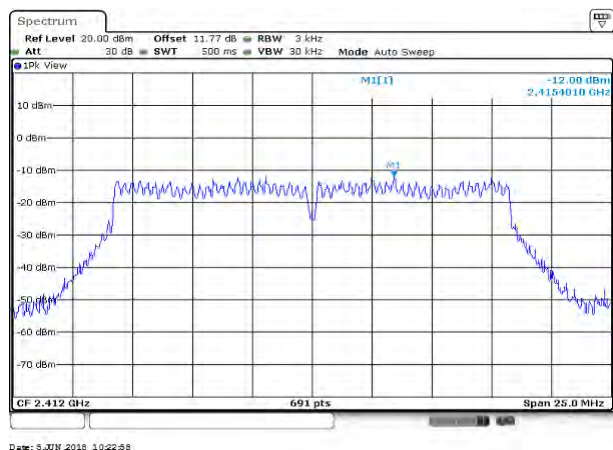
Test mode: IEEE 802.11n 40 MHz MHz mode / 2422-2452 MHz					
Channel	Frequency (MHz)	Chain 0 PPSSD (dBm)	Chain 1 PPSSD (dBm)	Total PPSSD (dBm)	Limit (dBm)
Low	2422	-13.91	-14.32	-11.10	8
Mid	2437	-10.72	-10.82	-7.76	
High	2452	-13.79	-14.45	-11.10	

Test Data

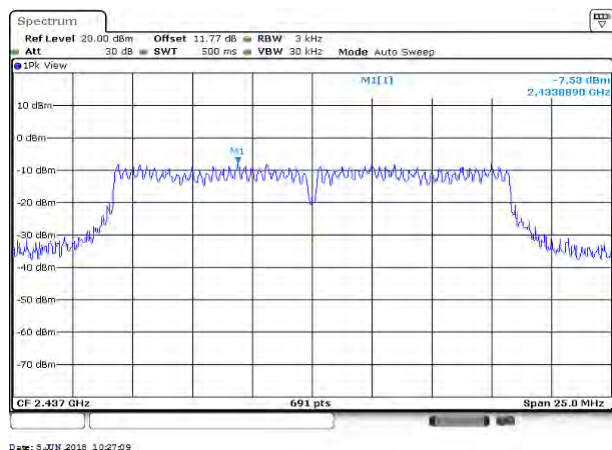


IEEE 802.11g mode- chain 1

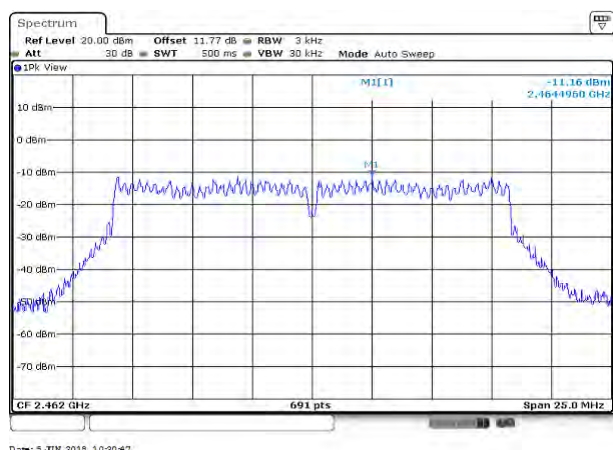
Low CH



Mid CH

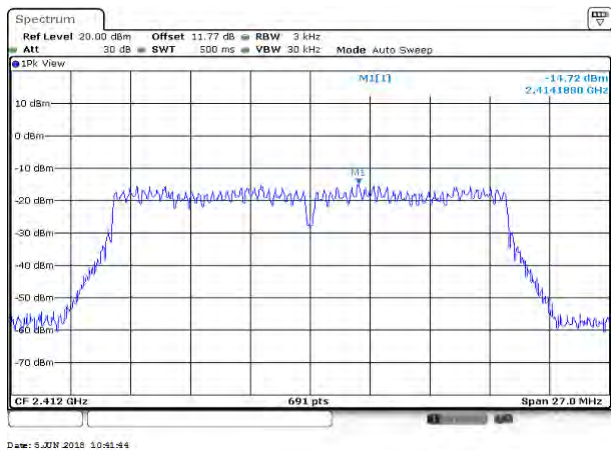


High CH

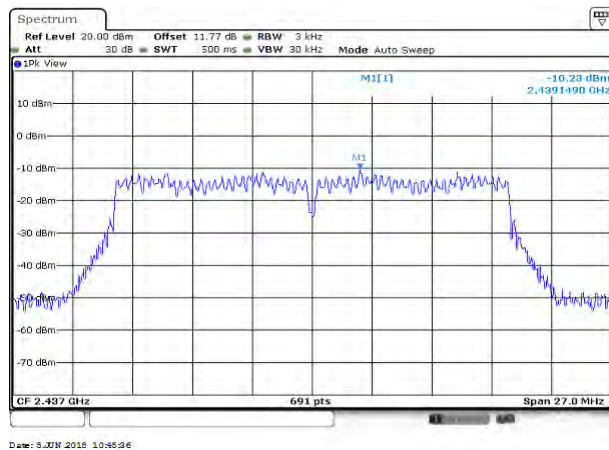


IEEE 802.11n 20 MHz mode- chain 0

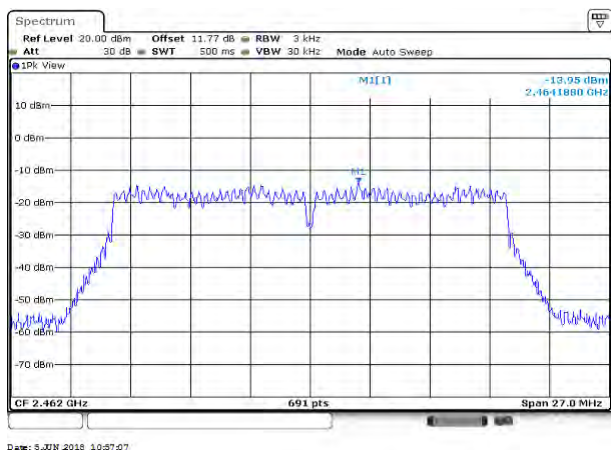
Low CH



Mid CH

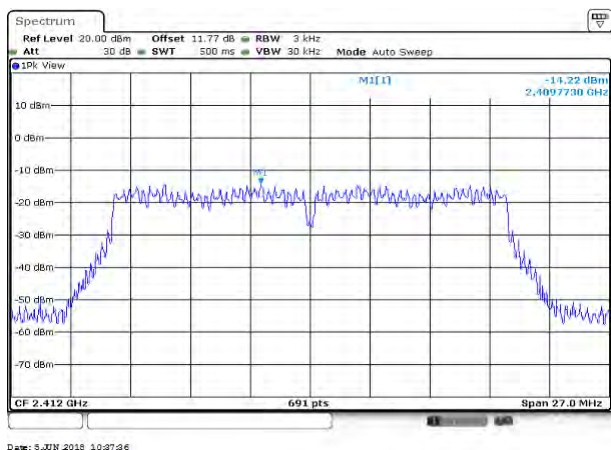


High CH

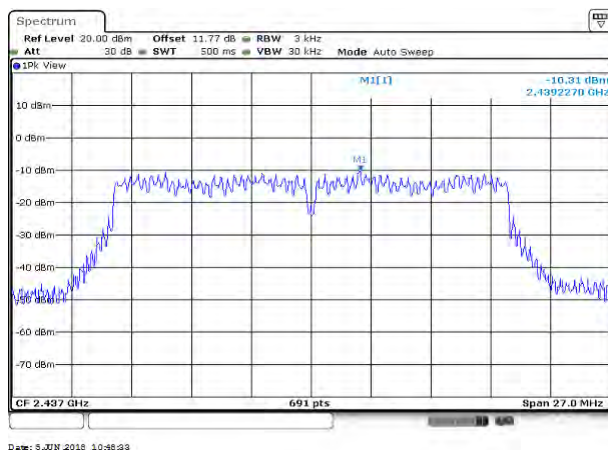


IEEE 802.11n 20 MHz mode- chain 1

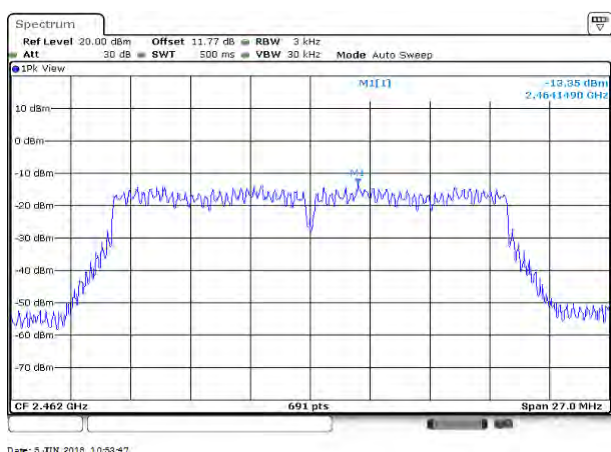
Low CH



Mid CH

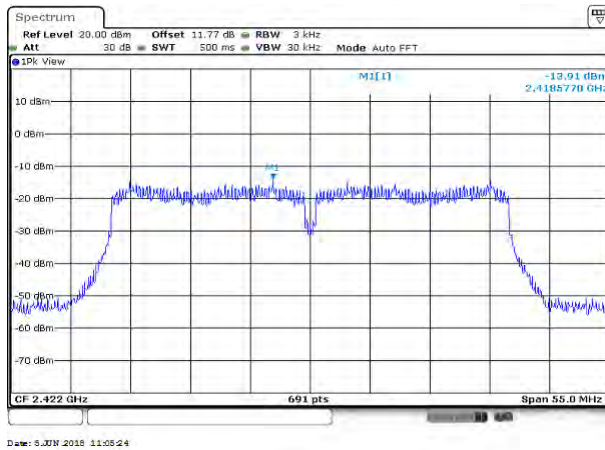


High CH

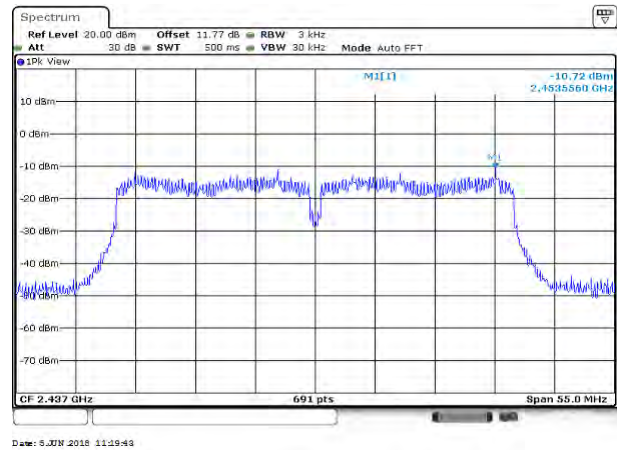


IEEE 802.11n 40 MHz mode- chain 0

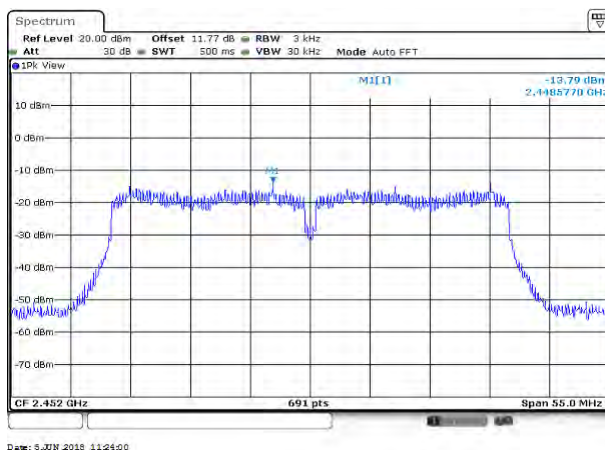
Low CH



Mid CH

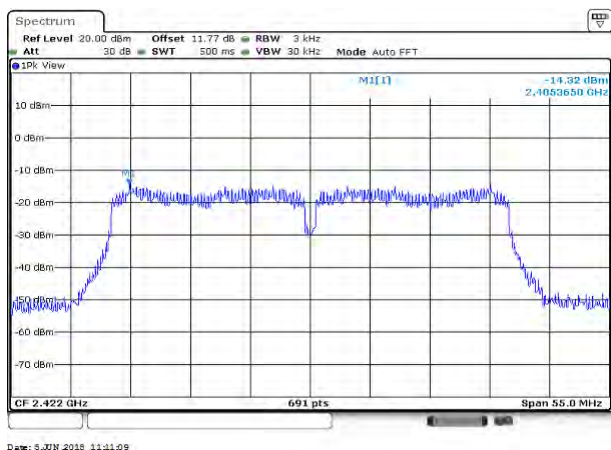


High CH

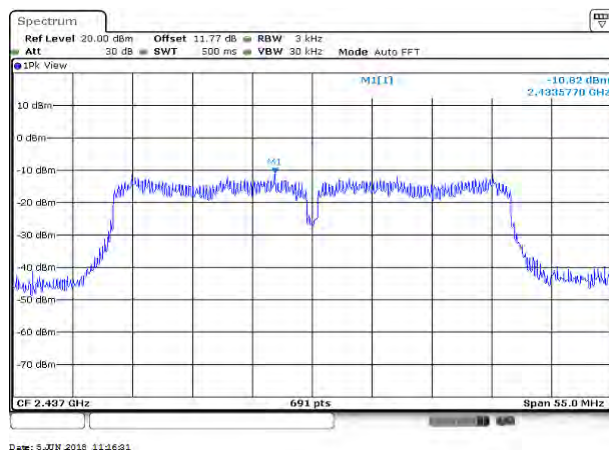


IEEE 802.11n 40 MHz mode- chain 1

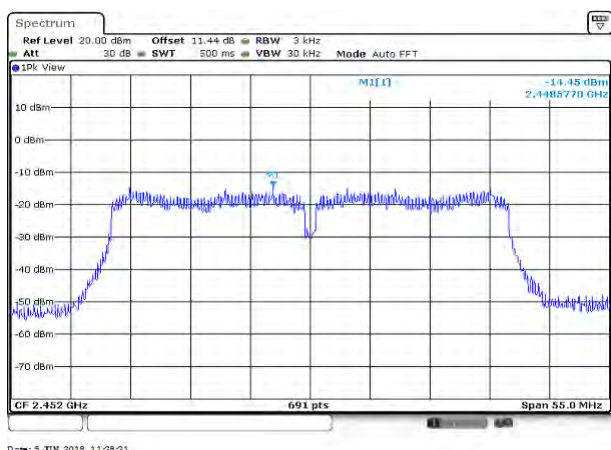
Low CH



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,

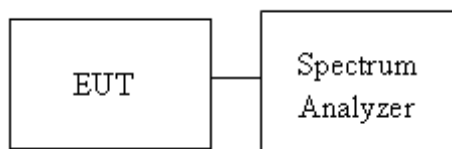
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

5.5.2 Test Procedure

Test method Refer as KDB 558074 D01 V04, Section 11.

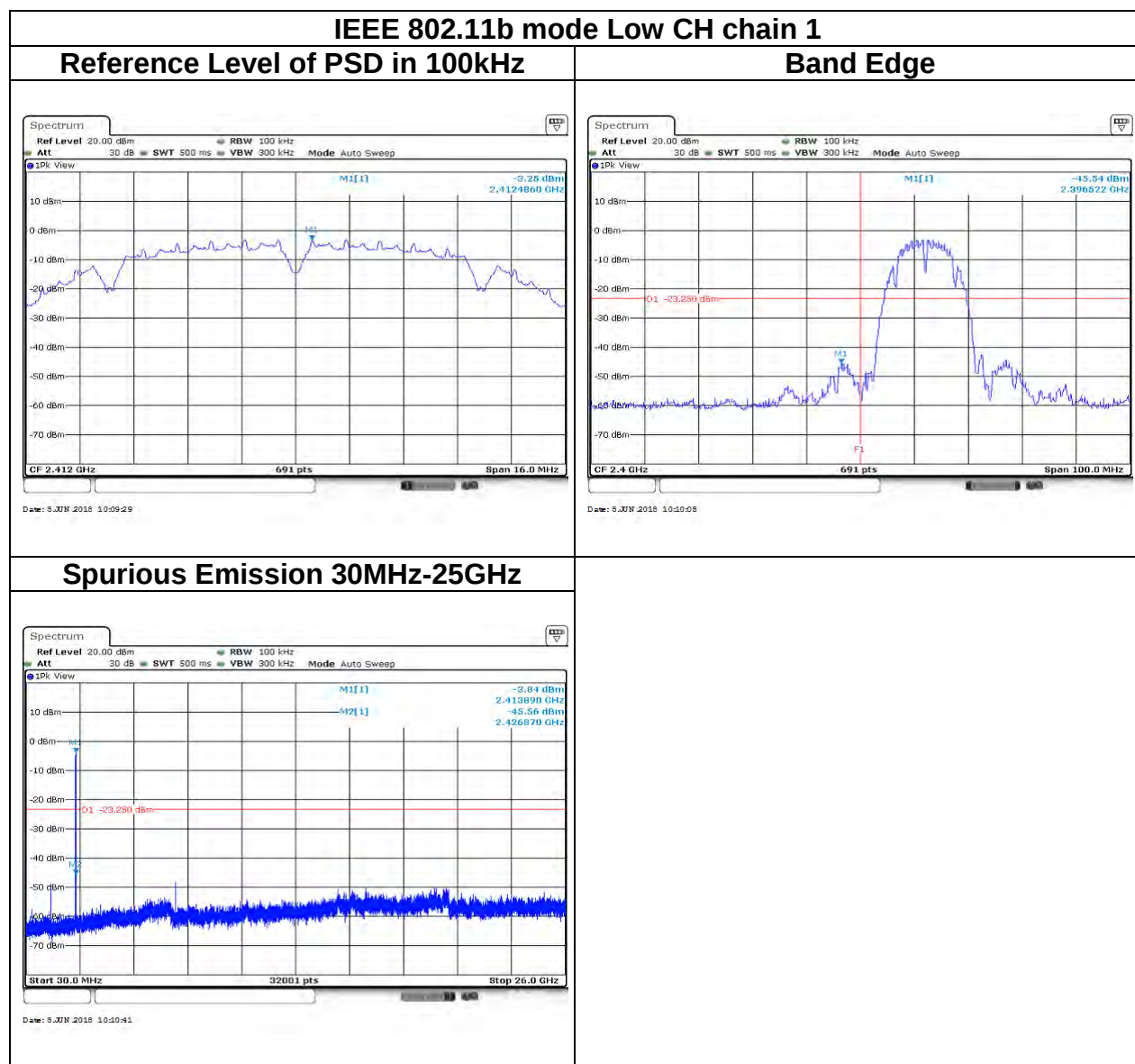
1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to 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.

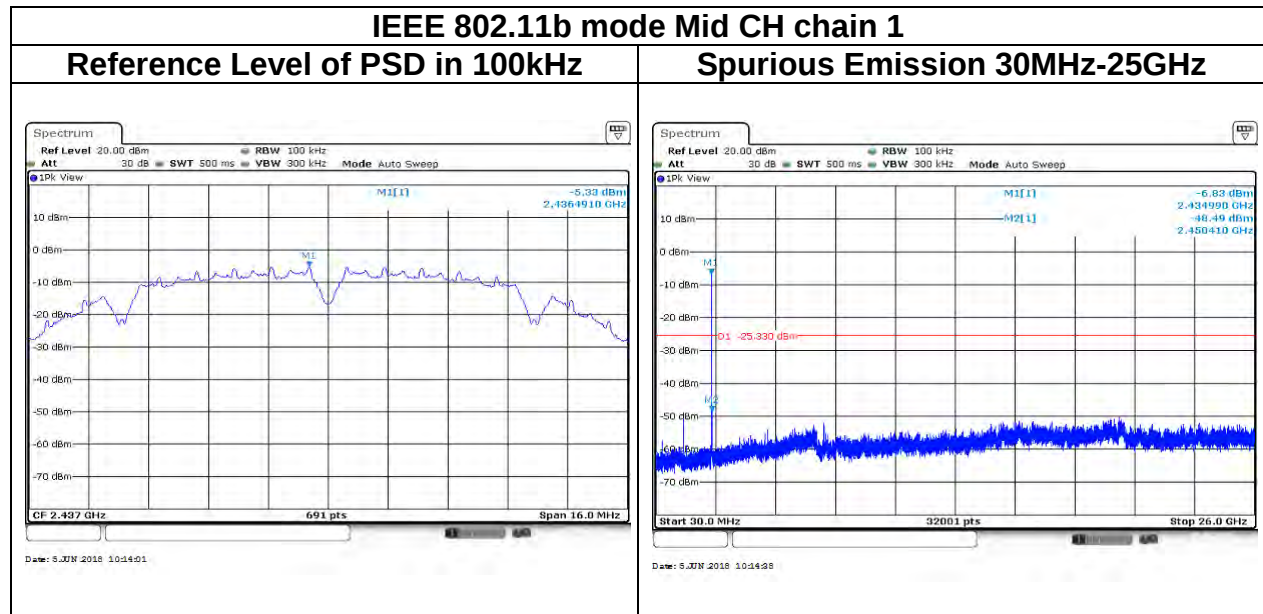
5.5.3 Test Setup



5.5.4 Test Result

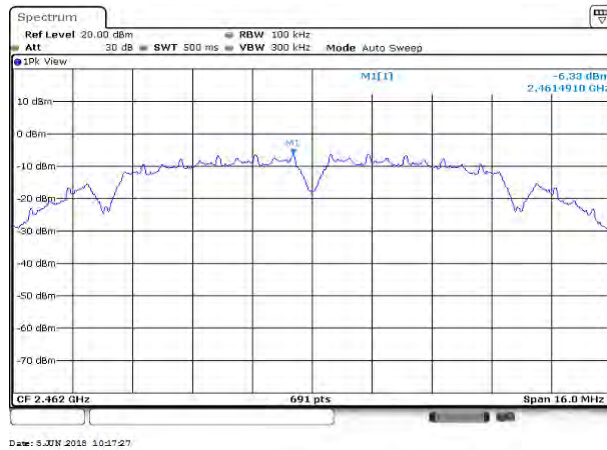
Test Data



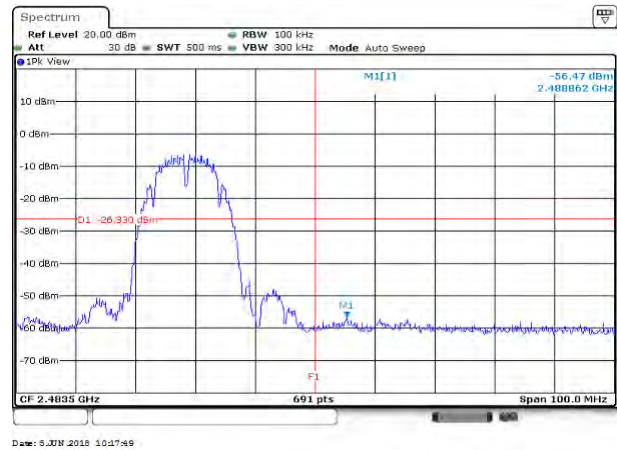


IEEE 802.11b mode High CH chain 1

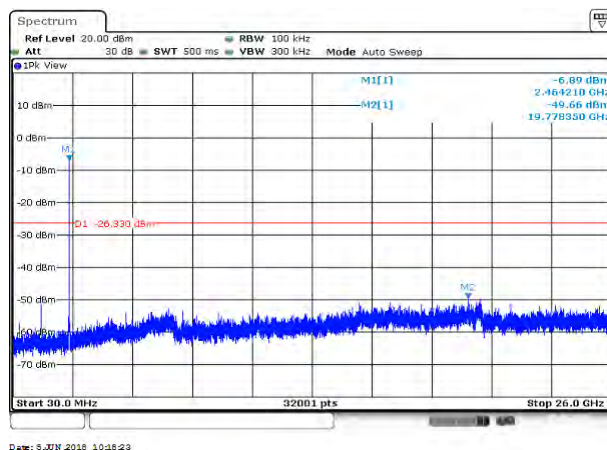
Reference Level of PSD in 100kHz



Band Edge



Spurious Emission 30MHz-25GHz

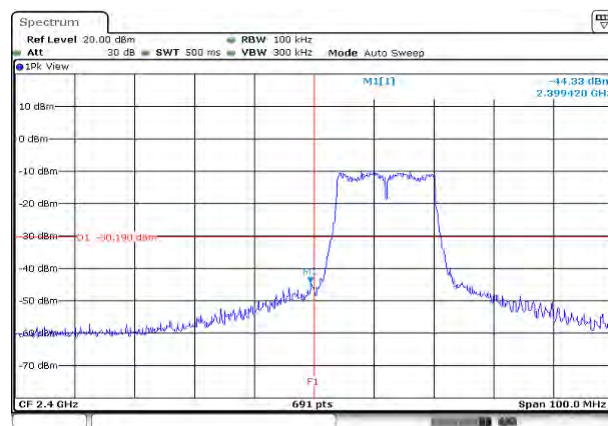


IEEE 802.11g mode Low CH chain 1

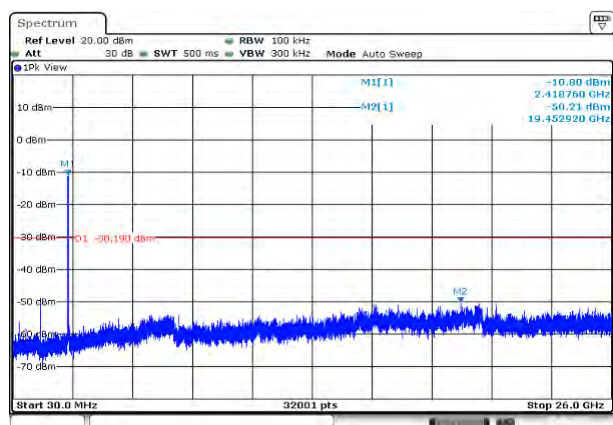
Reference Level of PSD in 100kHz

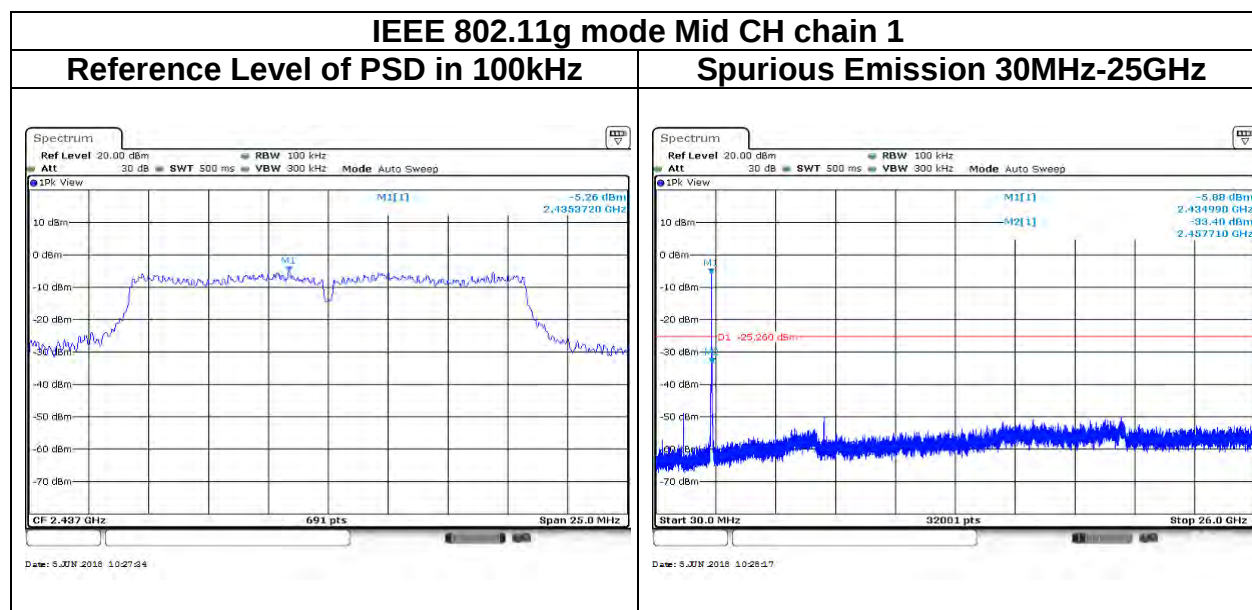


Band Edge



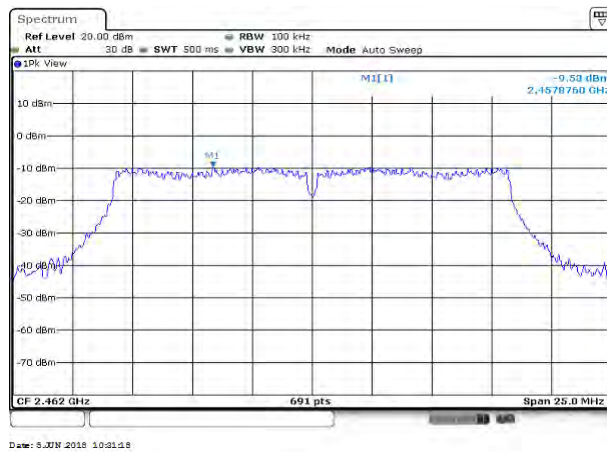
Spurious Emission 30MHz-25GHz



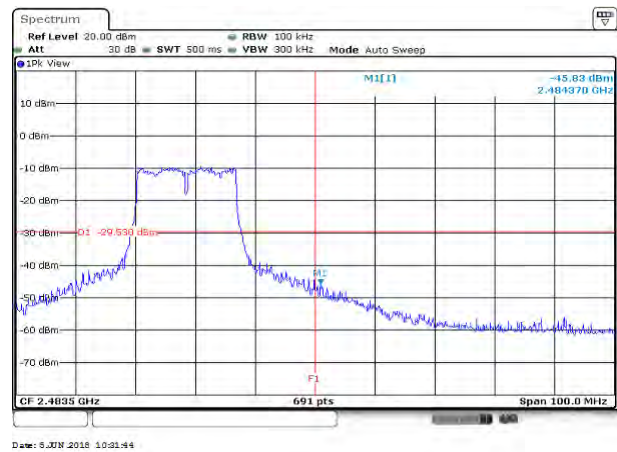


IEEE 802.11g mode High CH chain 1

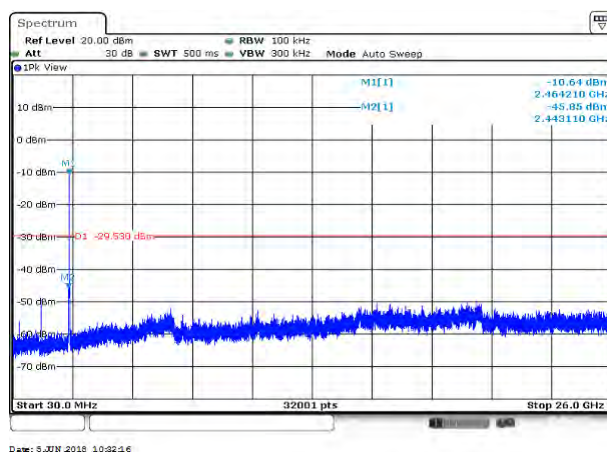
Reference Level of PSD in 100kHz

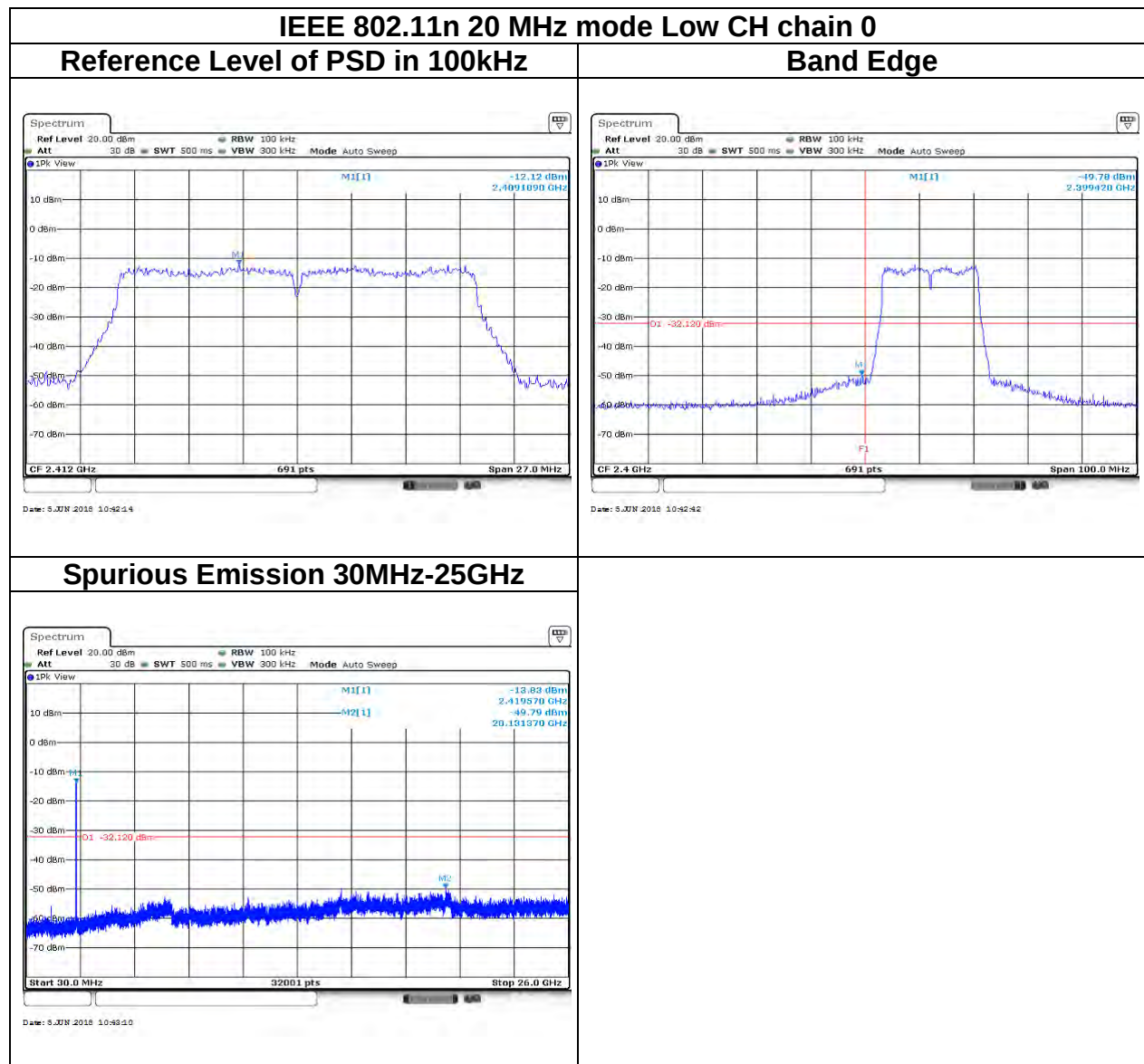


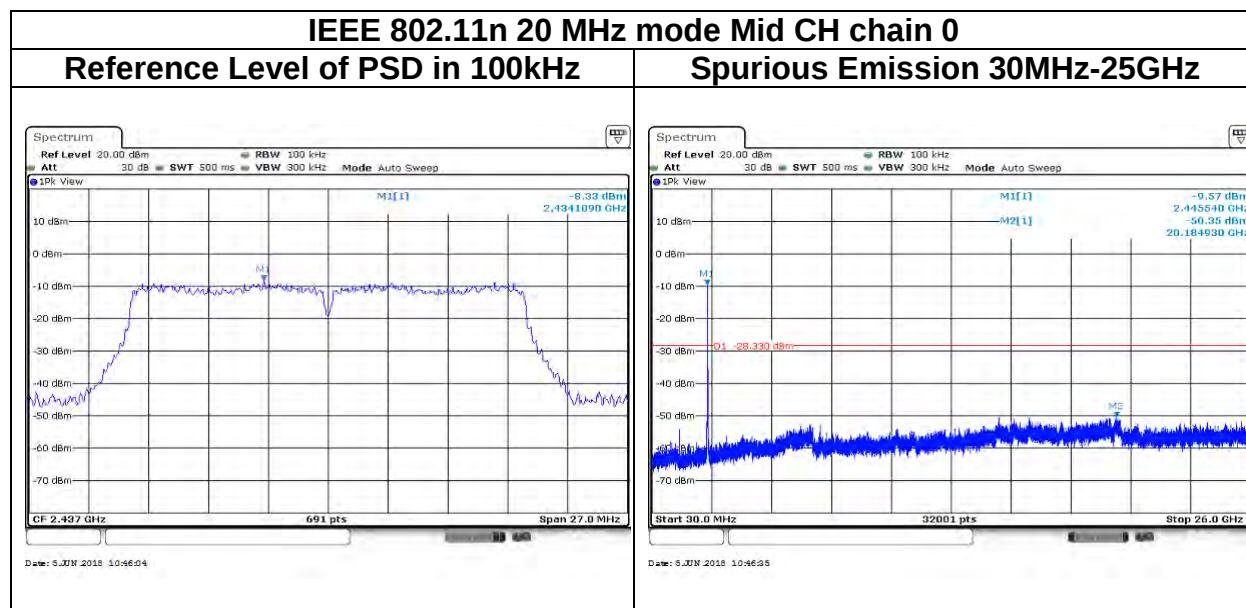
Band Edge



Spurious Emission 30MHz-25GHz

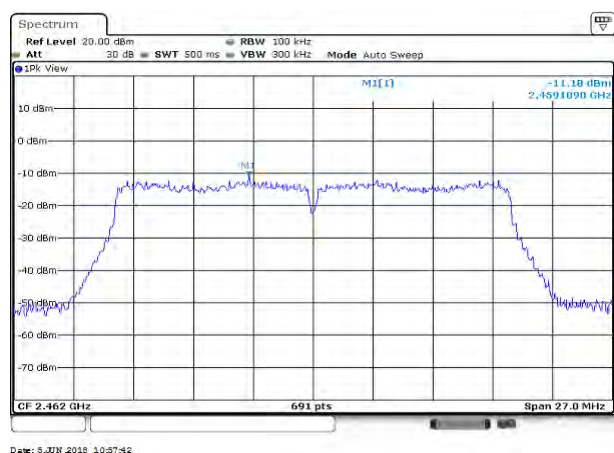




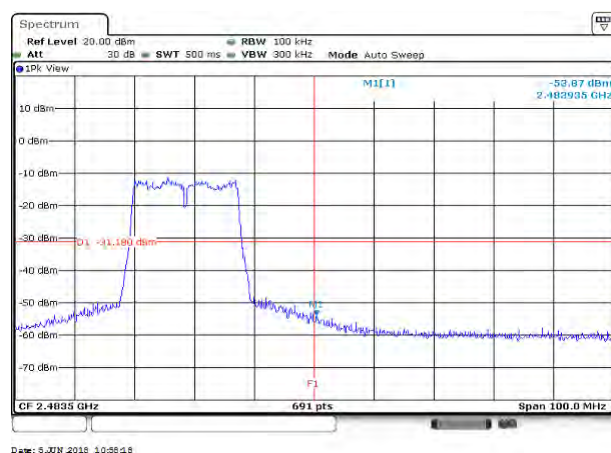


IEEE 802.11n 20 MHz mode High CH chain 0

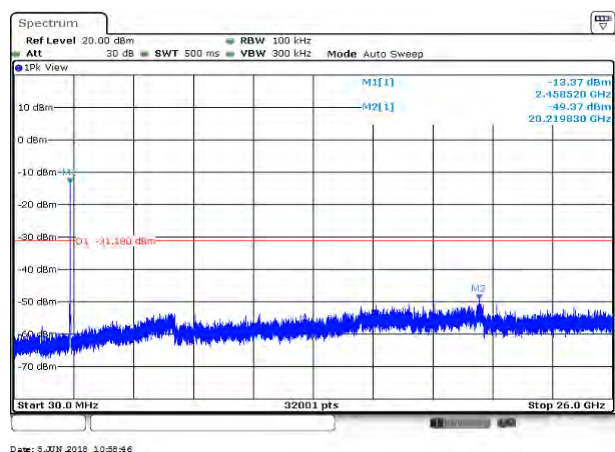
Reference Level of PSD in 100kHz

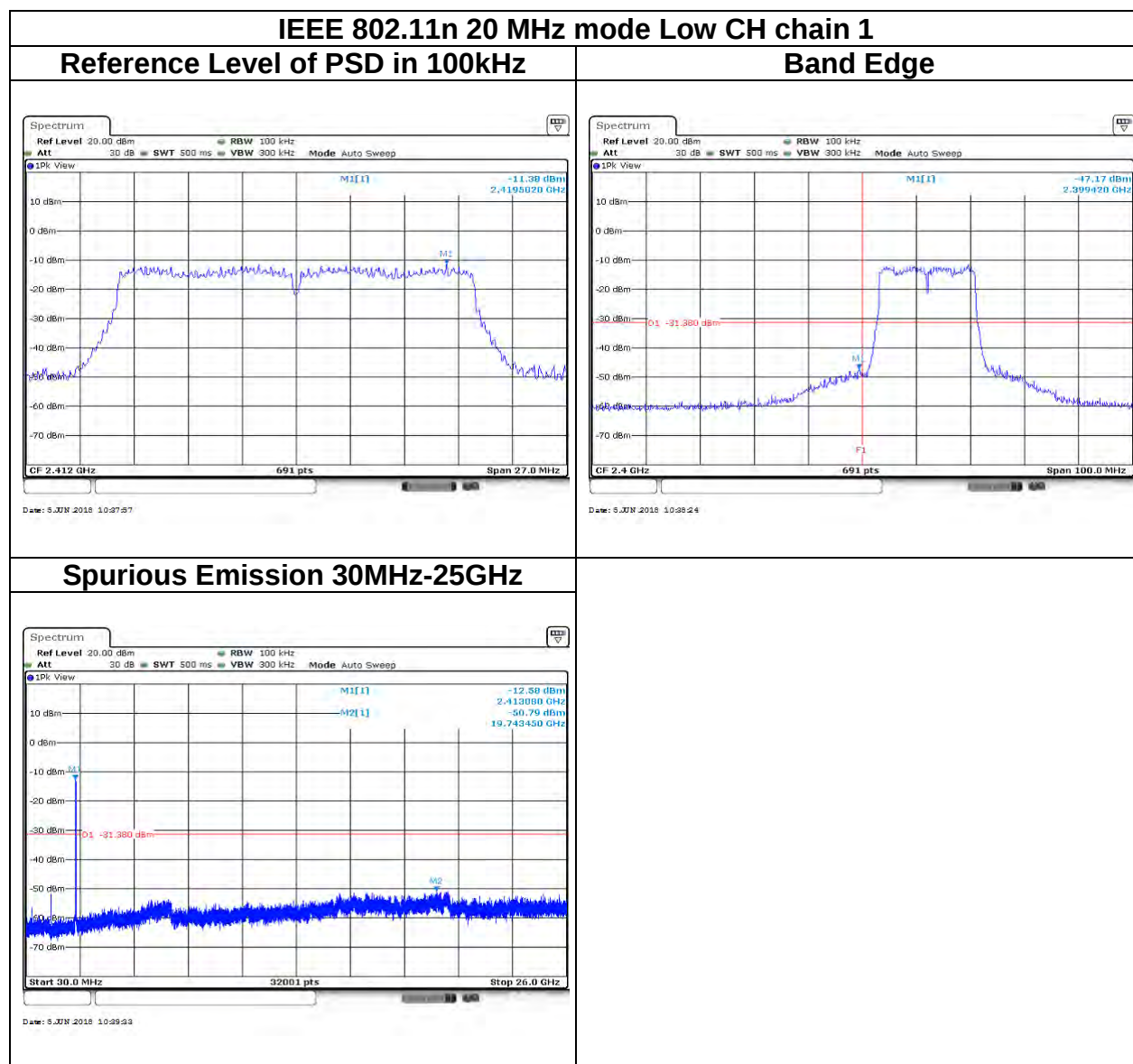


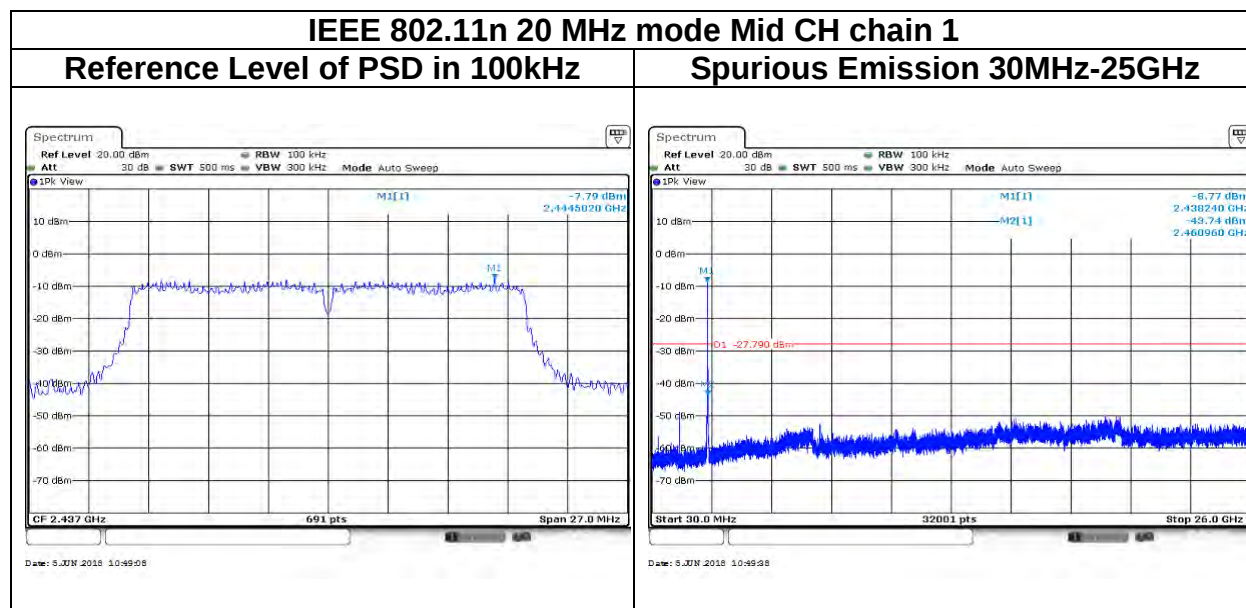
Band Edge



Spurious Emission 30MHz-25GHz

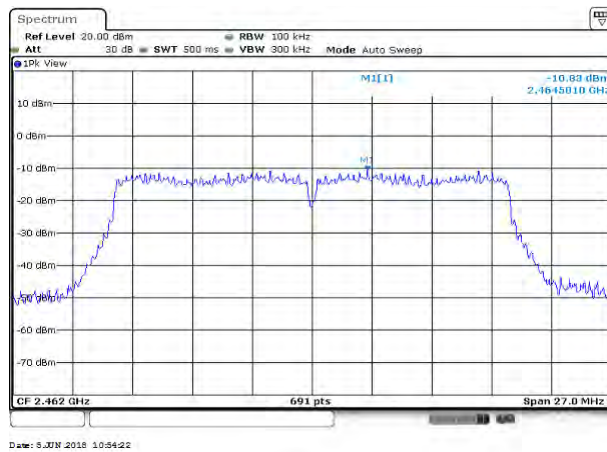




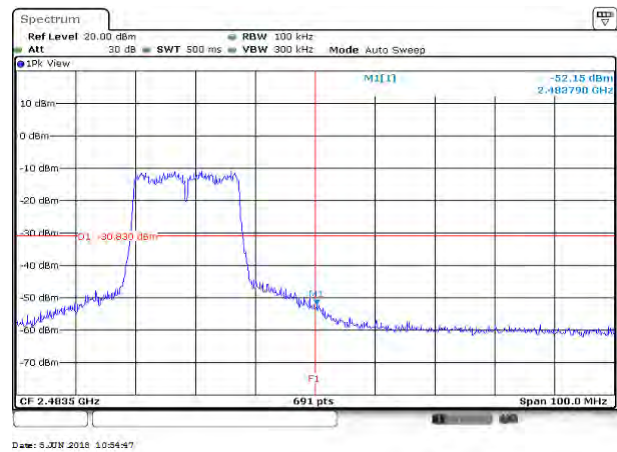


IEEE 802.11n 20 MHz mode High CH chain 1

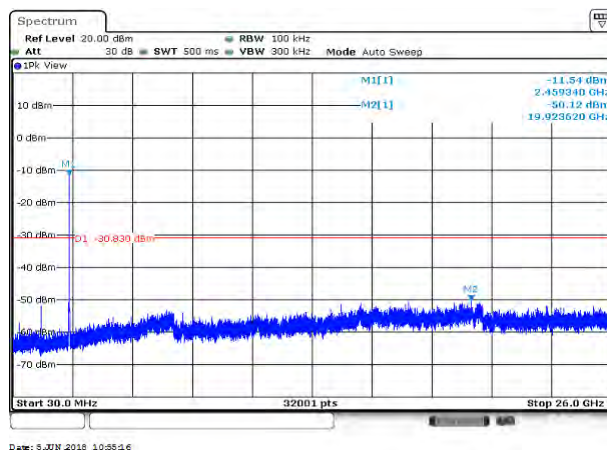
Reference Level of PSD in 100kHz

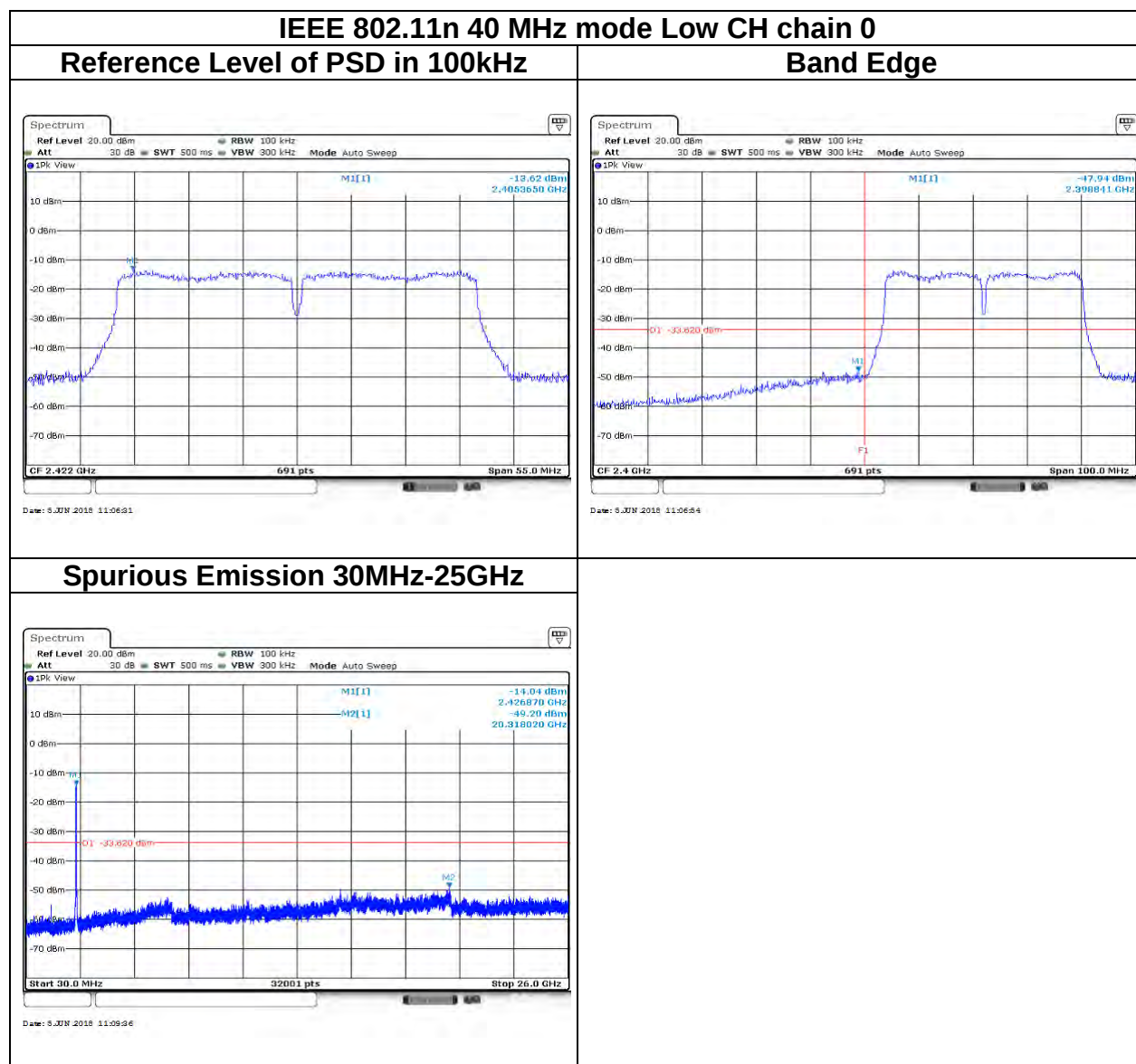


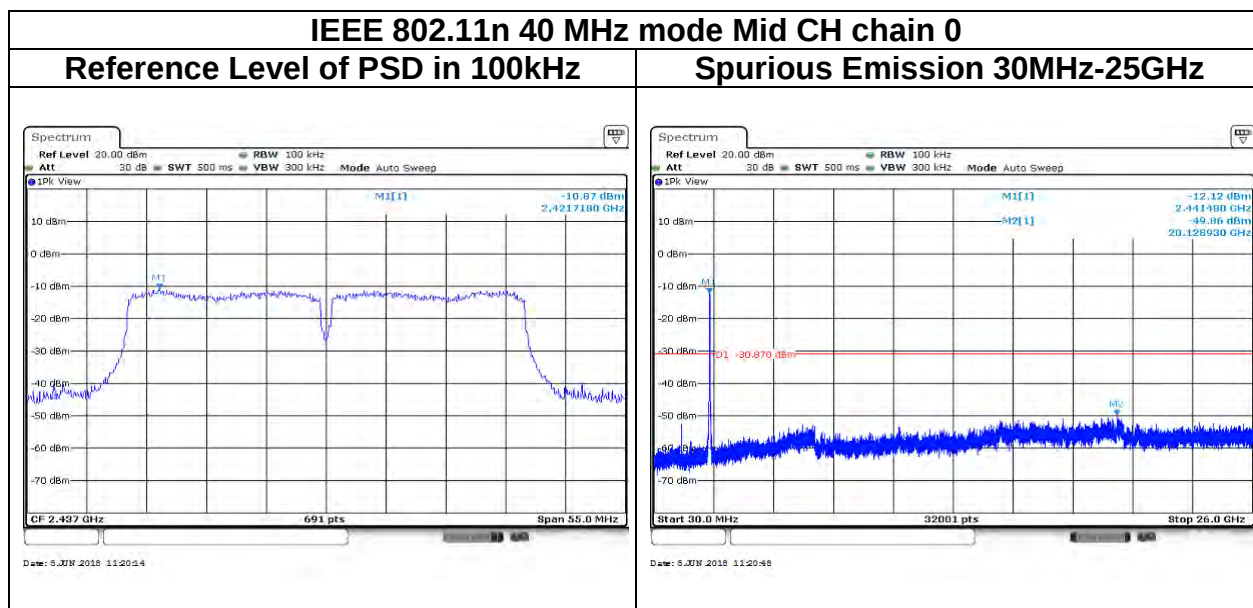
Band Edge

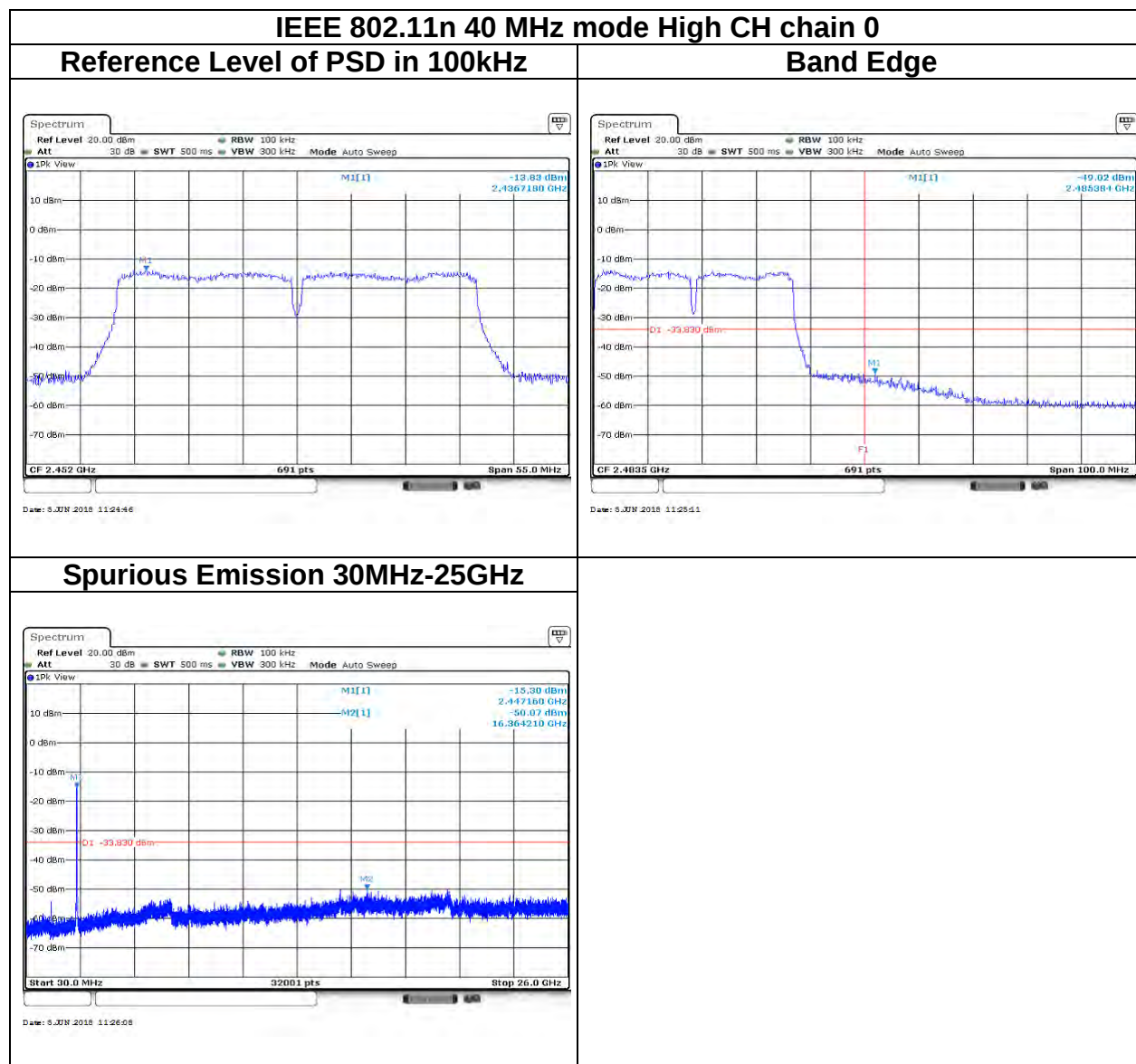


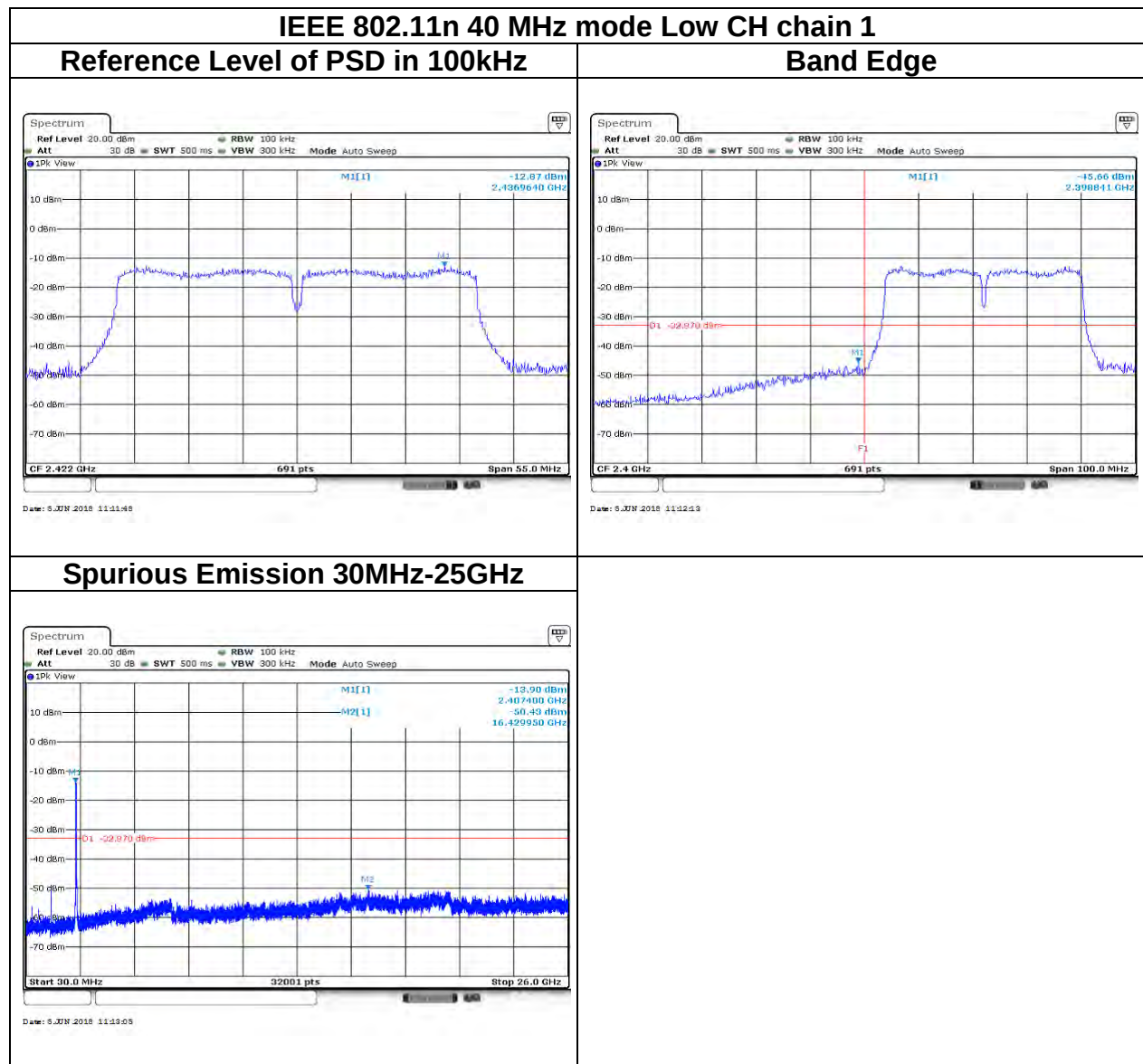
Spurious Emission 30MHz-25GHz

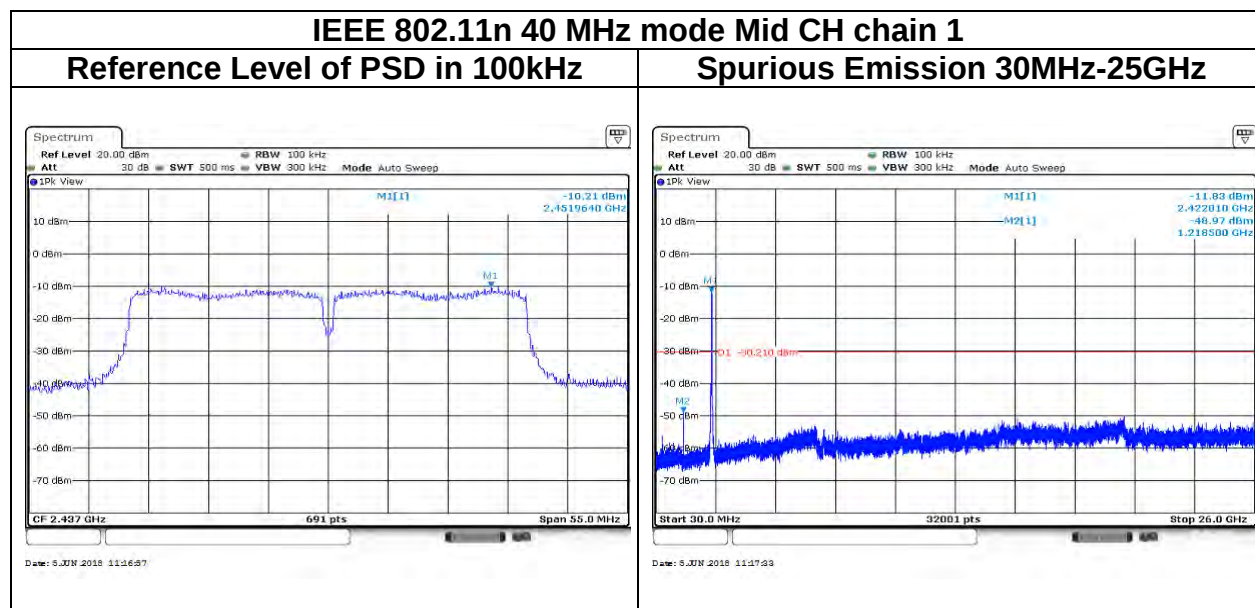










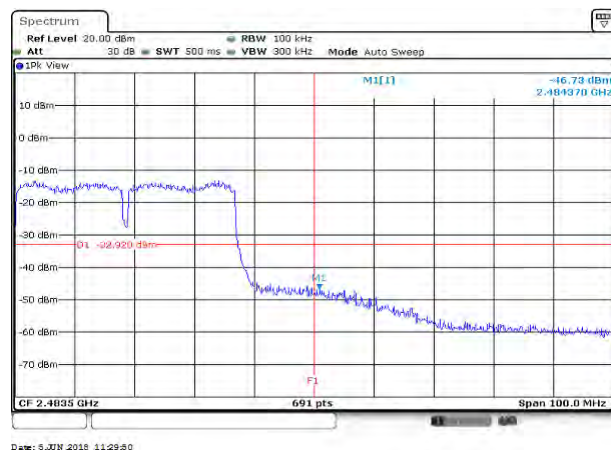


IEEE 802.11n 40 MHz mode High CH chain 1

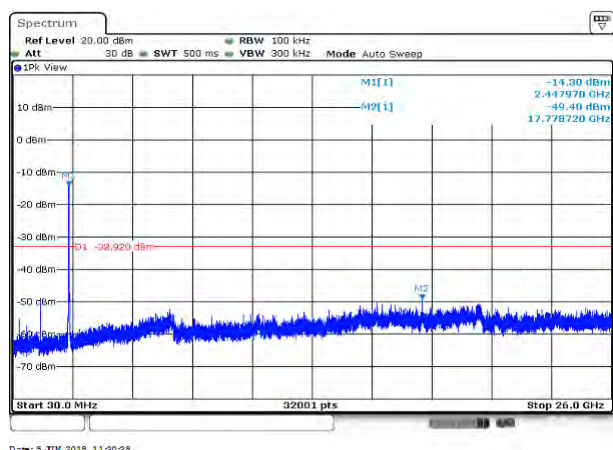
Reference Level of PSD in 100kHz



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.
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.

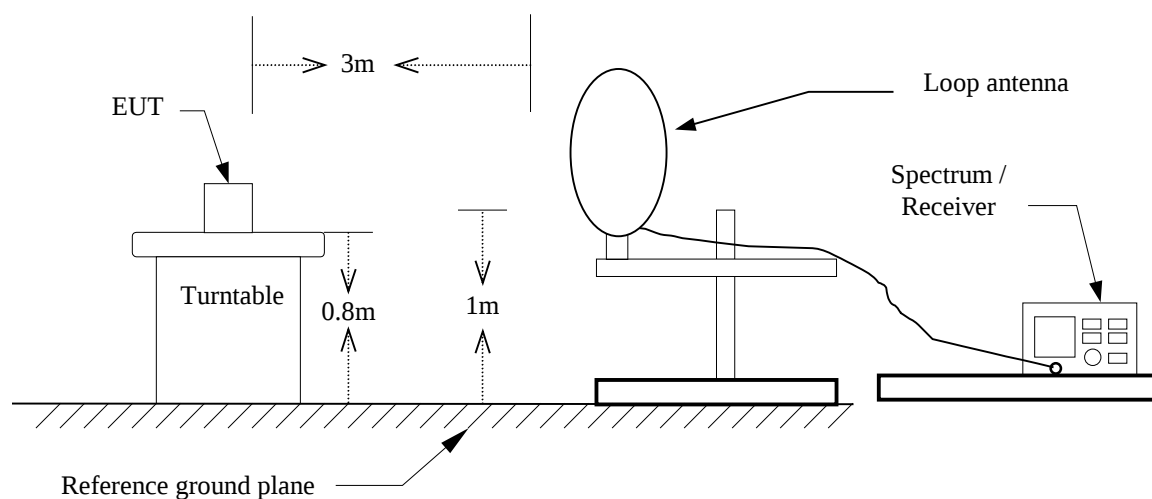
Configuration	Duty Cycle (%)	T(ms)	1/T (kHz)	VBW Setting
802.11b	100%	1.0000	-	10Hz
802.11g	100%	1.0000	-	10Hz
802.11n 20 MHz	100%	1.0000	-	10Hz
802.11n 40 MHz	100%	1.0000	-	10Hz

Remark:

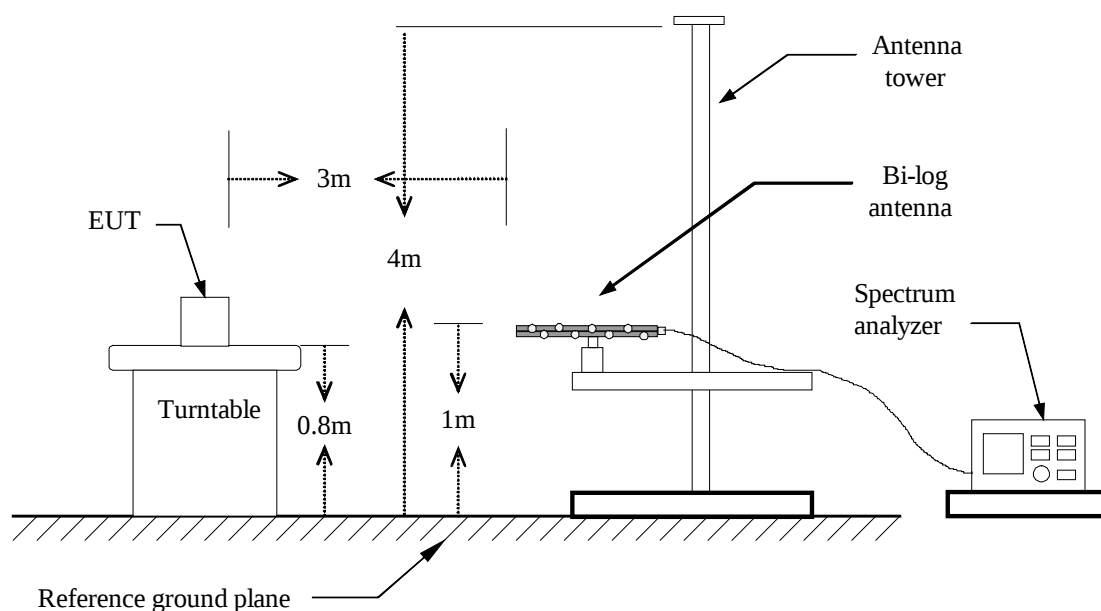
1. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.
2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

5.6.3 Test Setup

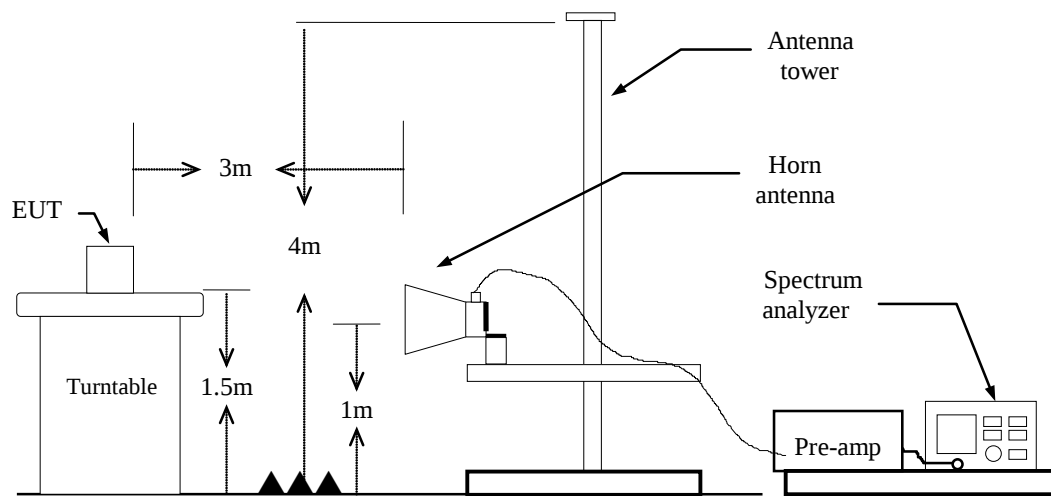
9kHz ~ 30MHz



30MHz ~ 1GHz



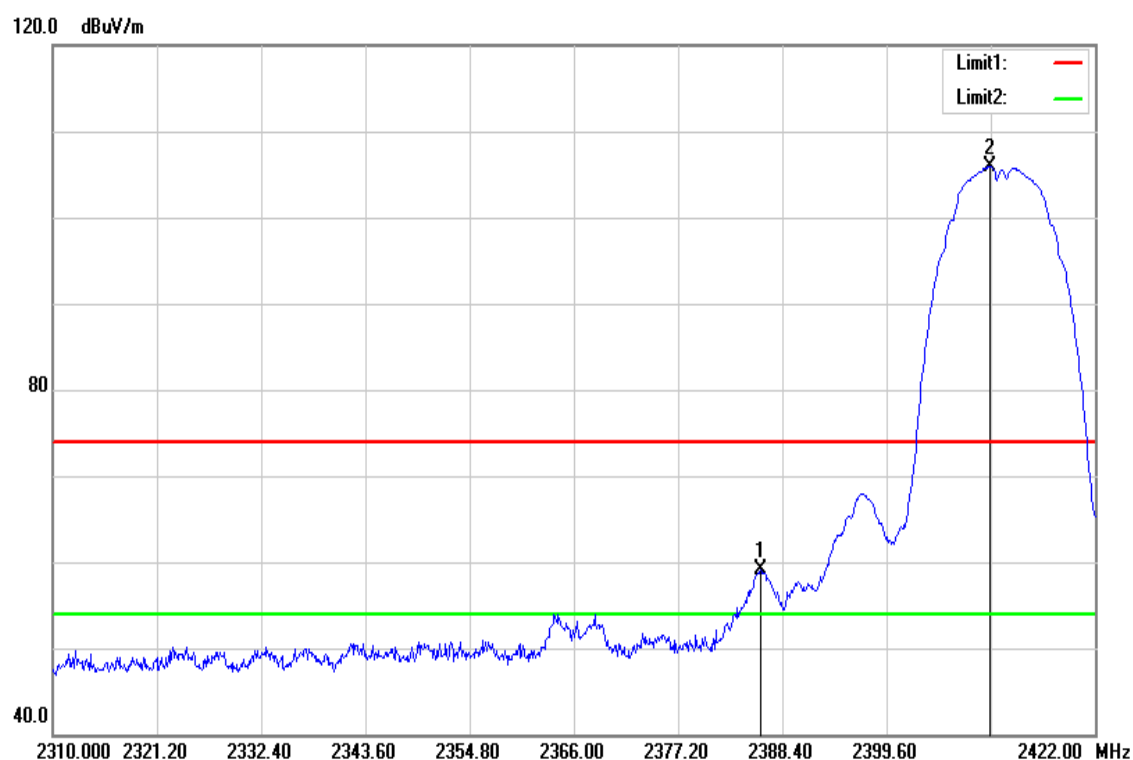
Above 1 GHz



5.6.4 Test Result

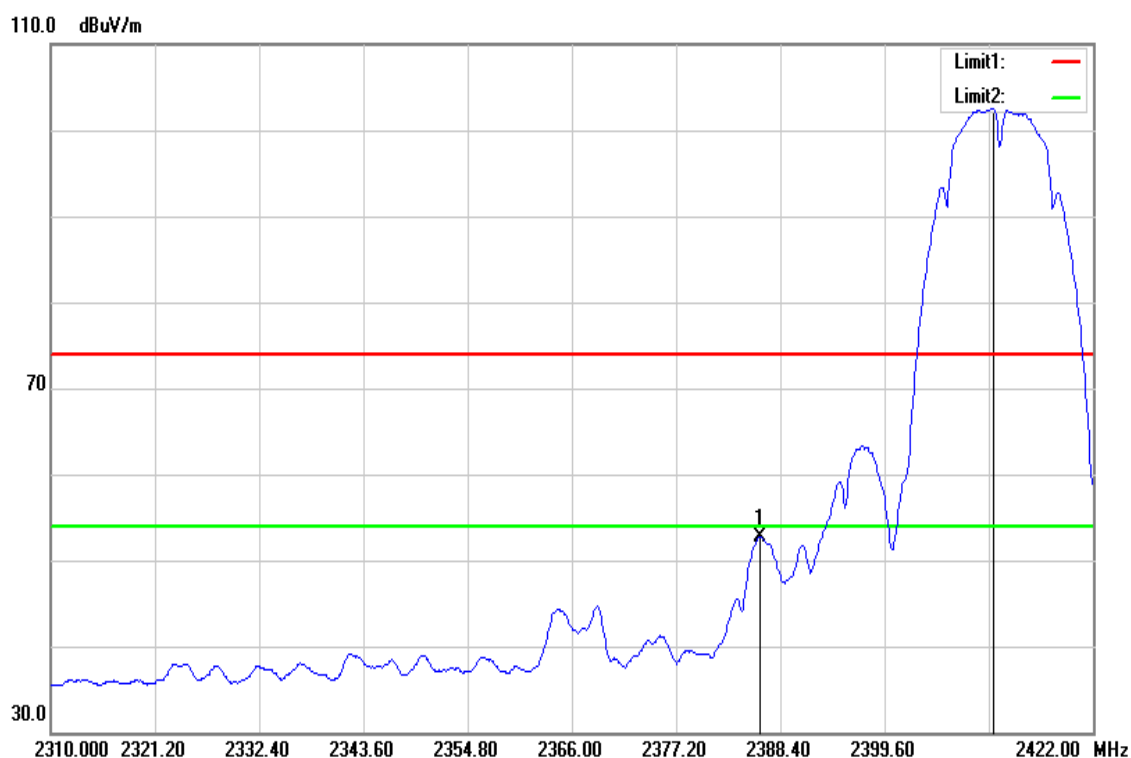
Band Edge Test Data

Test Mode	IEEE 802.11b Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



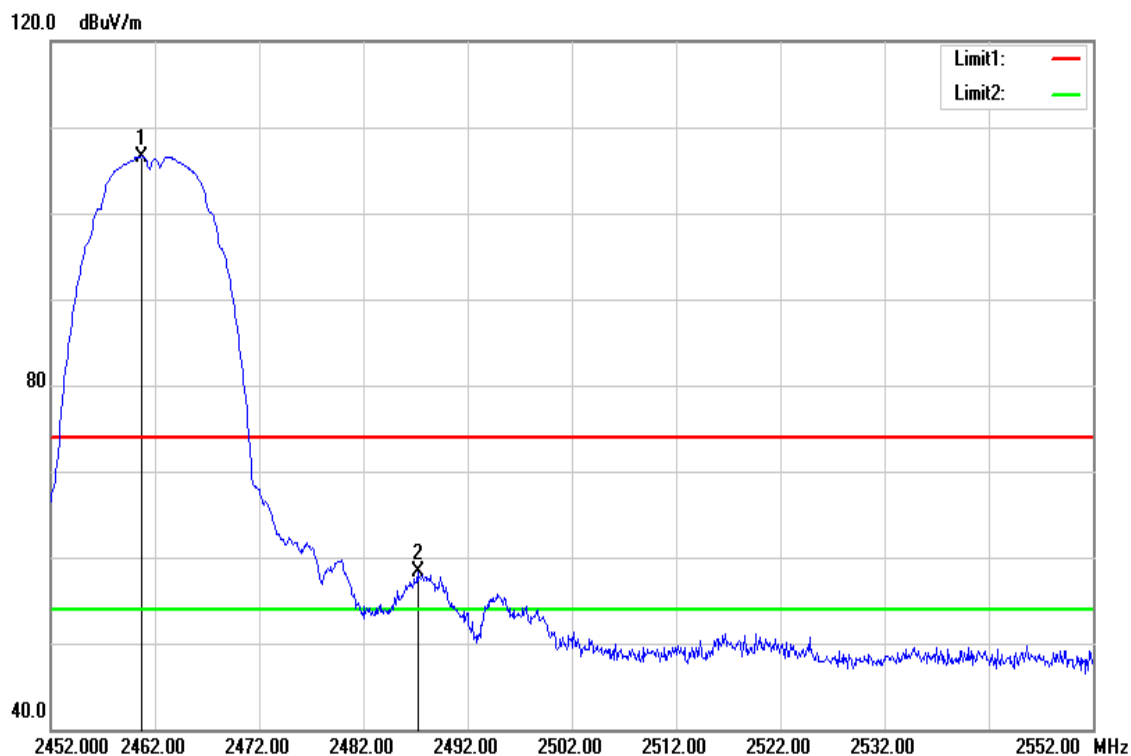
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2386.048	62.09	-2.99	59.10	74.00	-14.90	peak
2410.688	108.78	-2.92	105.86	-	-	peak

Test Mode	IEEE 802.11b Low CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



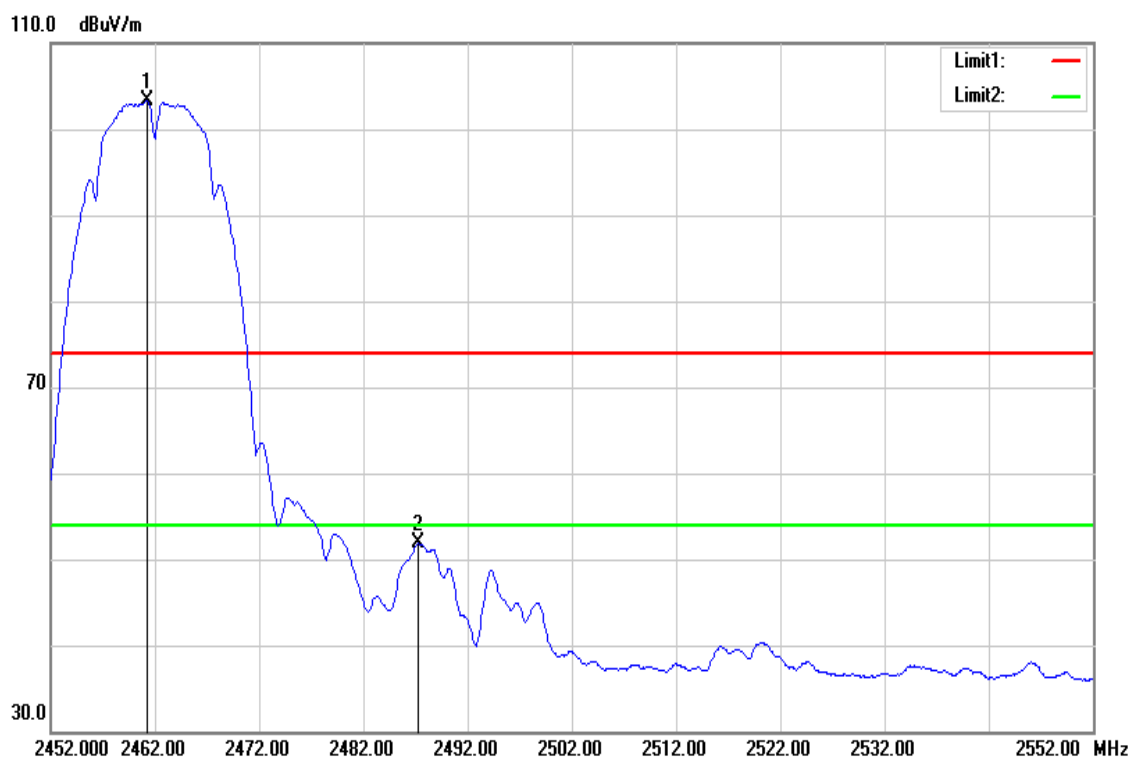
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2386.272	55.73	-2.99	52.74	54.00	-1.26	AVG
2411.248	105.51	-2.92	102.59	-	-	AVG

Test Mode	IEEE 802.11b High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



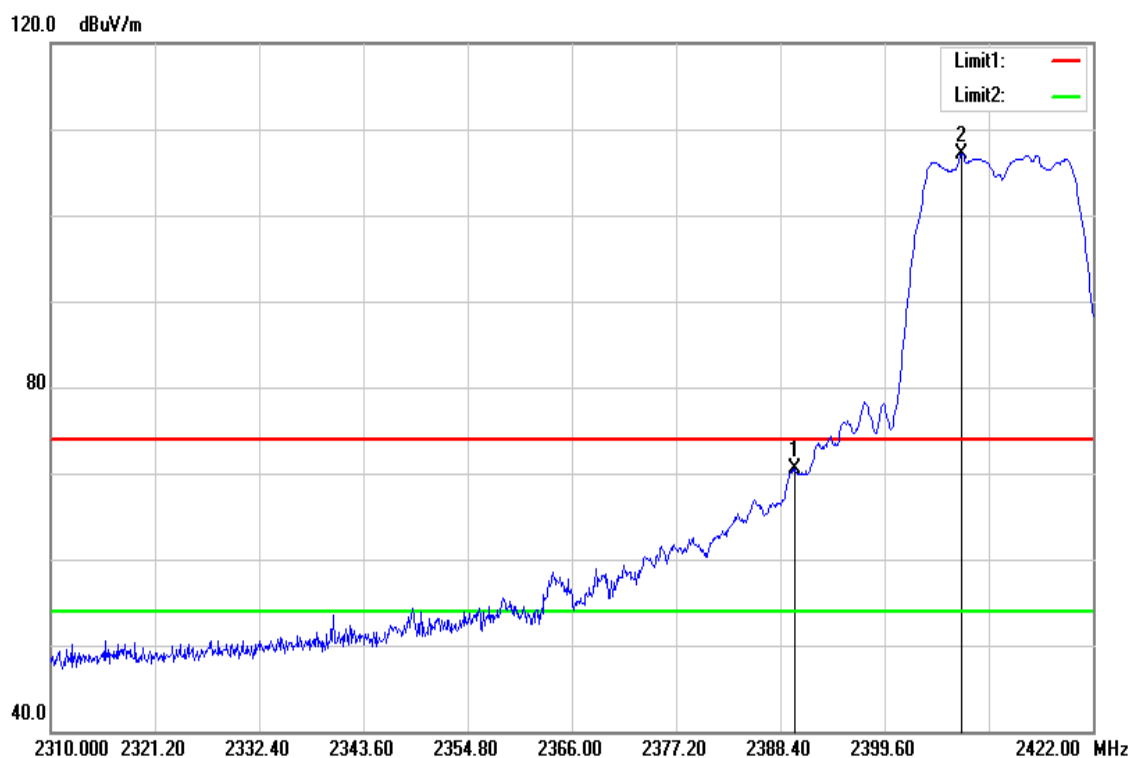
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2460.700	109.36	-2.76	106.60	-	-	peak
2487.200	60.99	-2.68	58.31	74.00	-15.69	peak

Test Mode	IEEE 802.11b High CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



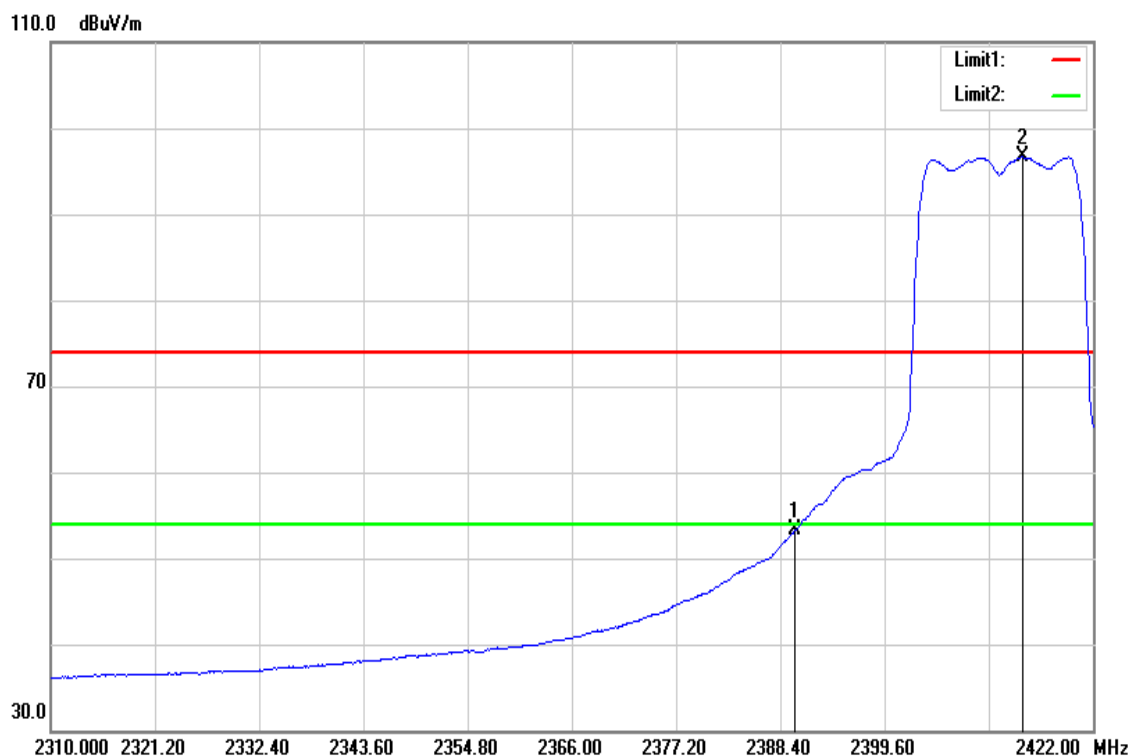
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2461.200	106.09	-2.76	103.33	-	-	AVG
2487.200	54.55	-2.68	51.87	54.00	-2.13	AVG

Test Mode	IEEE 802.11g Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



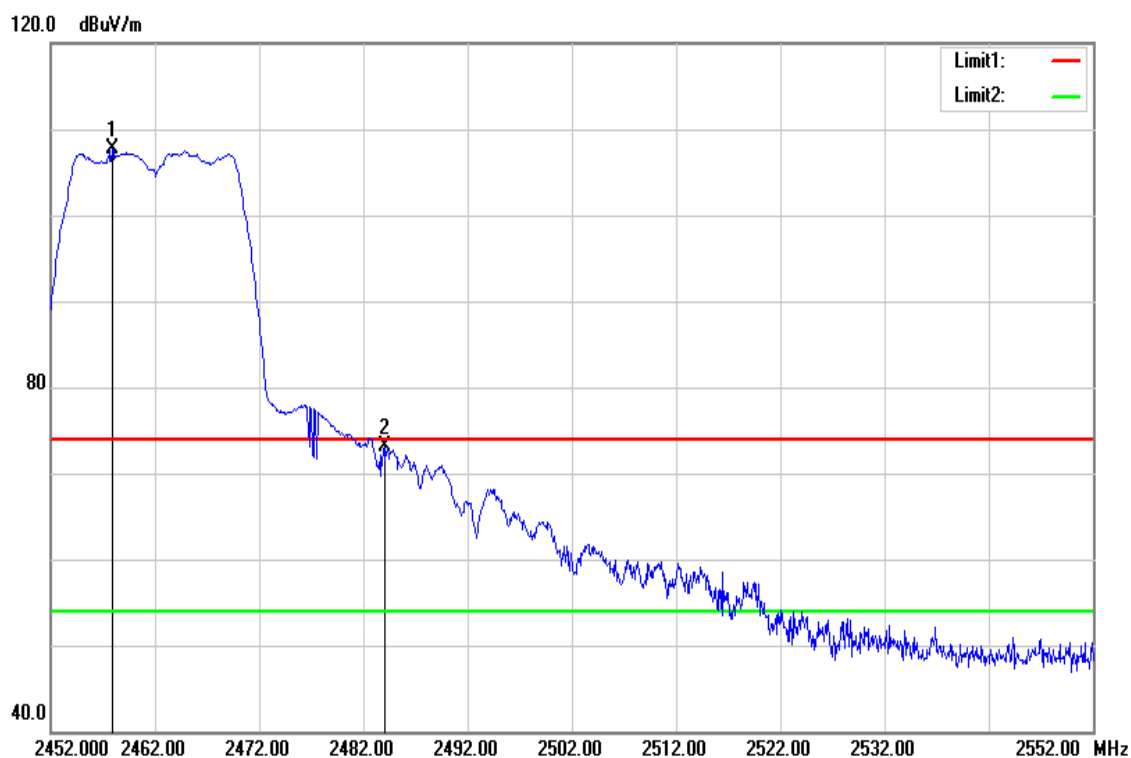
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.968	73.42	-2.98	70.44	74.00	-3.56	peak
2407.888	109.98	-2.92	107.06	-	-	peak

Test Mode	IEEE 802.11g Low CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



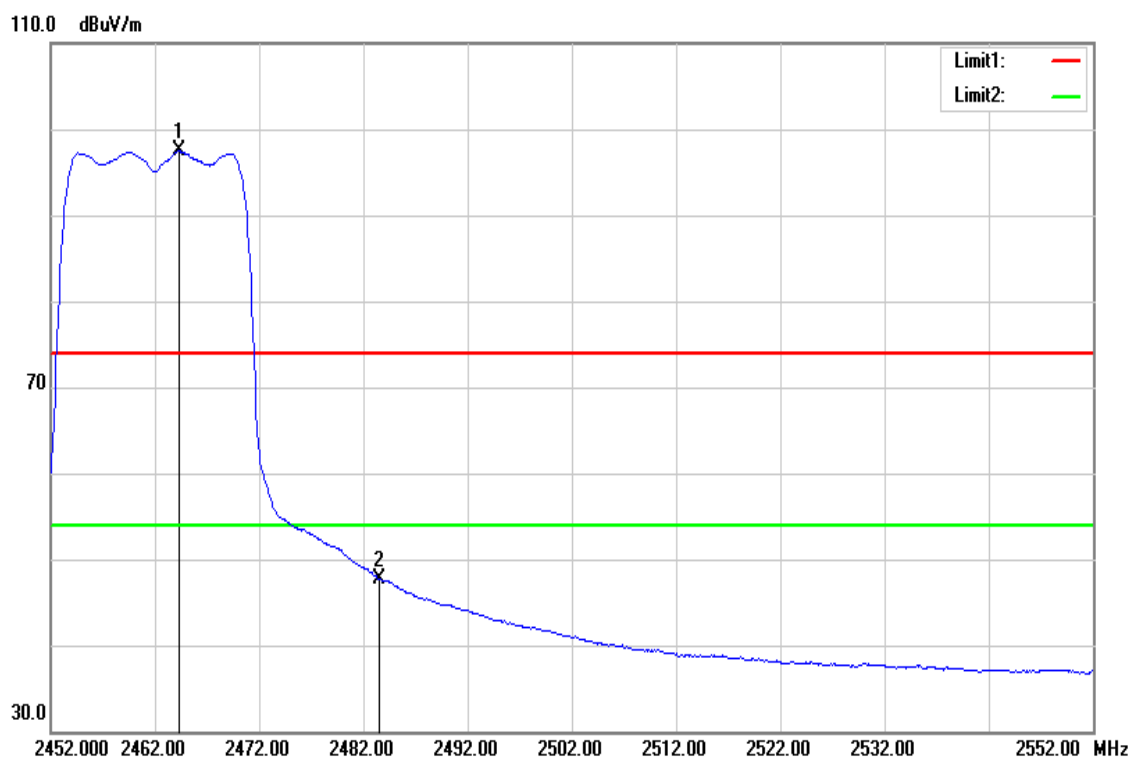
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	56.32	-2.98	53.34	54.00	-0.66	AVG
2414.496	99.52	-2.90	96.62	-	-	AVG

Test Mode	IEEE 802.11g High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



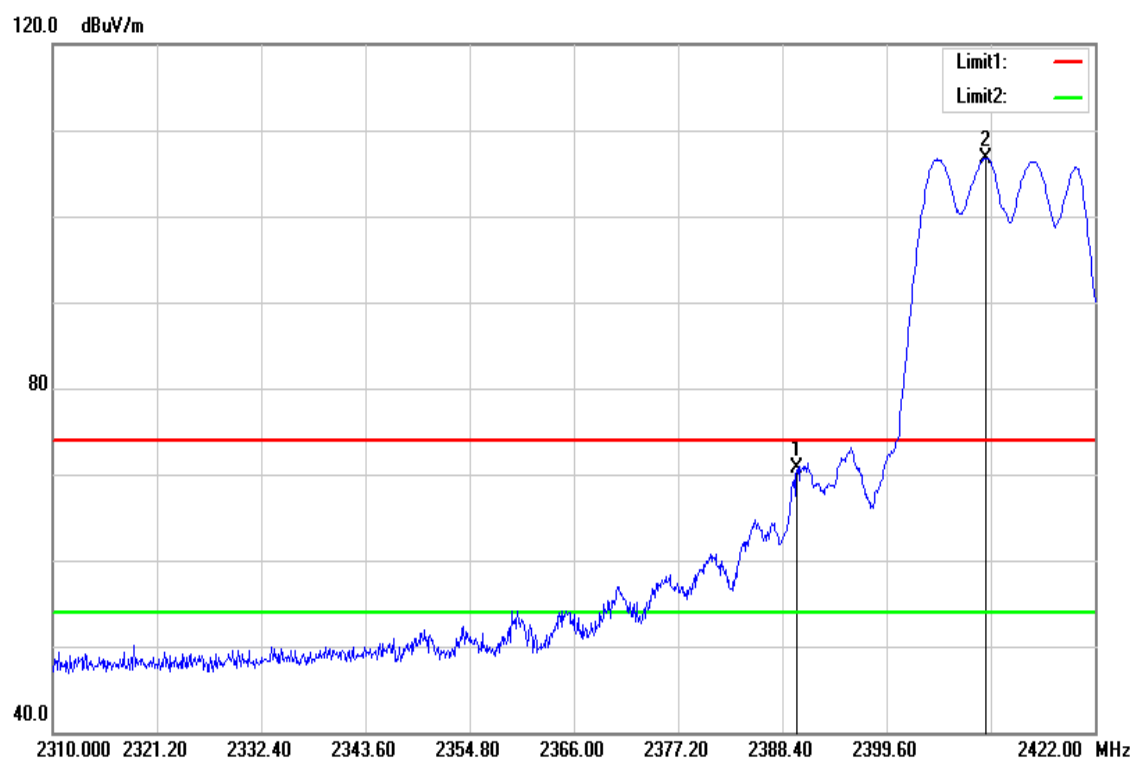
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2457.900	110.55	-2.77	107.78	-	-	peak
2484.100	75.80	-2.69	73.11	74.00	-0.89	peak

Test Mode	IEEE 802.11g High CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



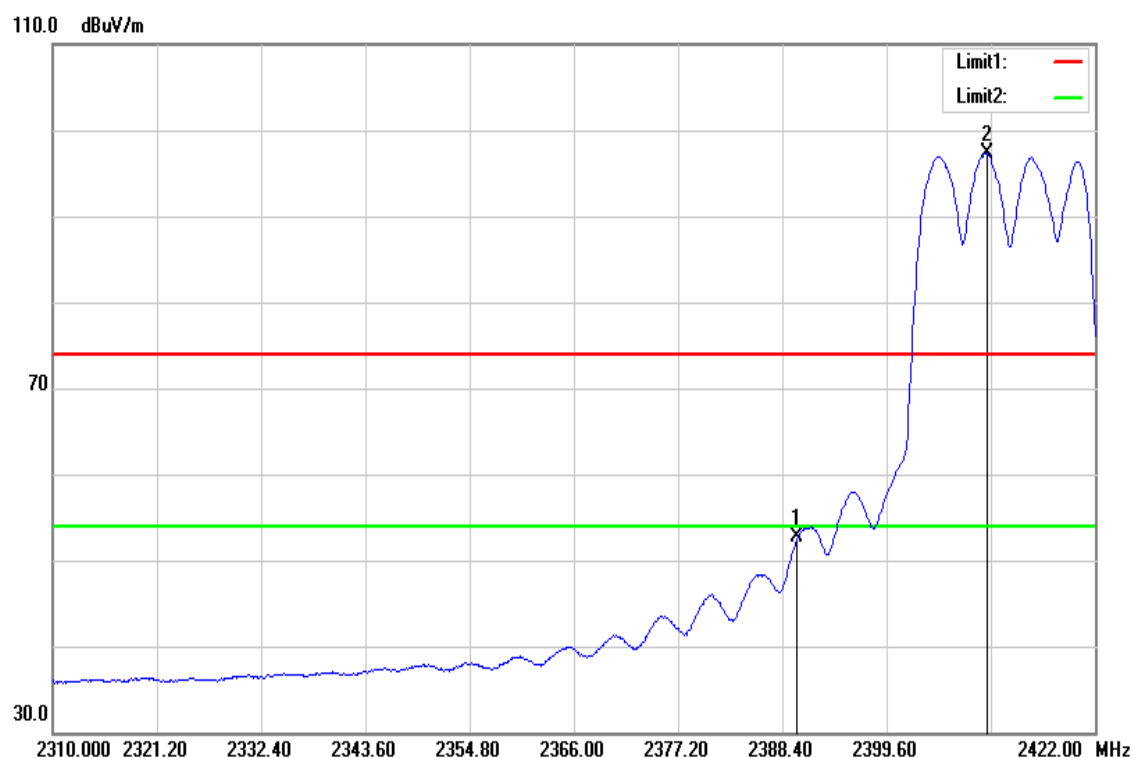
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2464.300	100.24	-2.75	97.49	-	-	AVG
2483.500	50.49	-2.69	47.80	54.00	-6.20	AVG

Test Mode	IEEE 802.11n 20 MHz Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



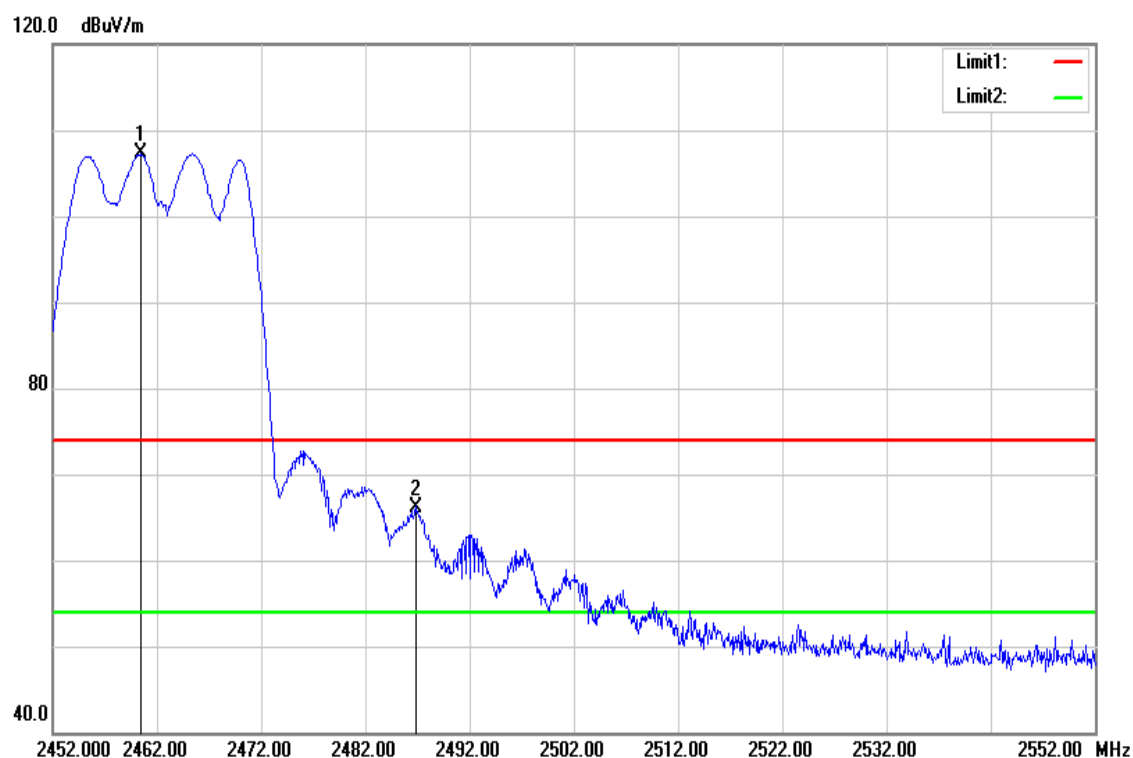
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	73.60	-2.98	70.62	74.00	-3.38	peak
2410.240	109.68	-2.92	106.76	-	-	peak

Test Mode	IEEE 802.11n 20 MHz Low CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



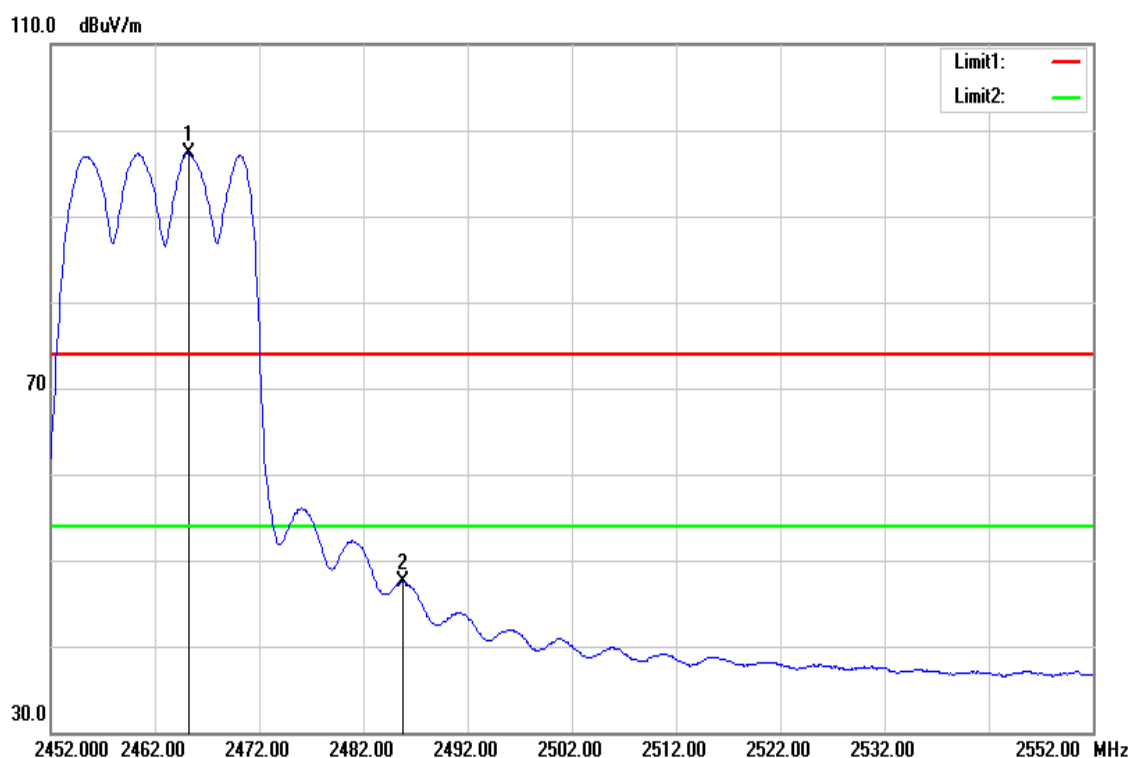
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	55.70	-2.98	52.72	54.00	-1.28	AVG
2410.352	100.17	-2.92	97.25	-	-	AVG

Test Mode	IEEE 802.11n 20 MHz High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



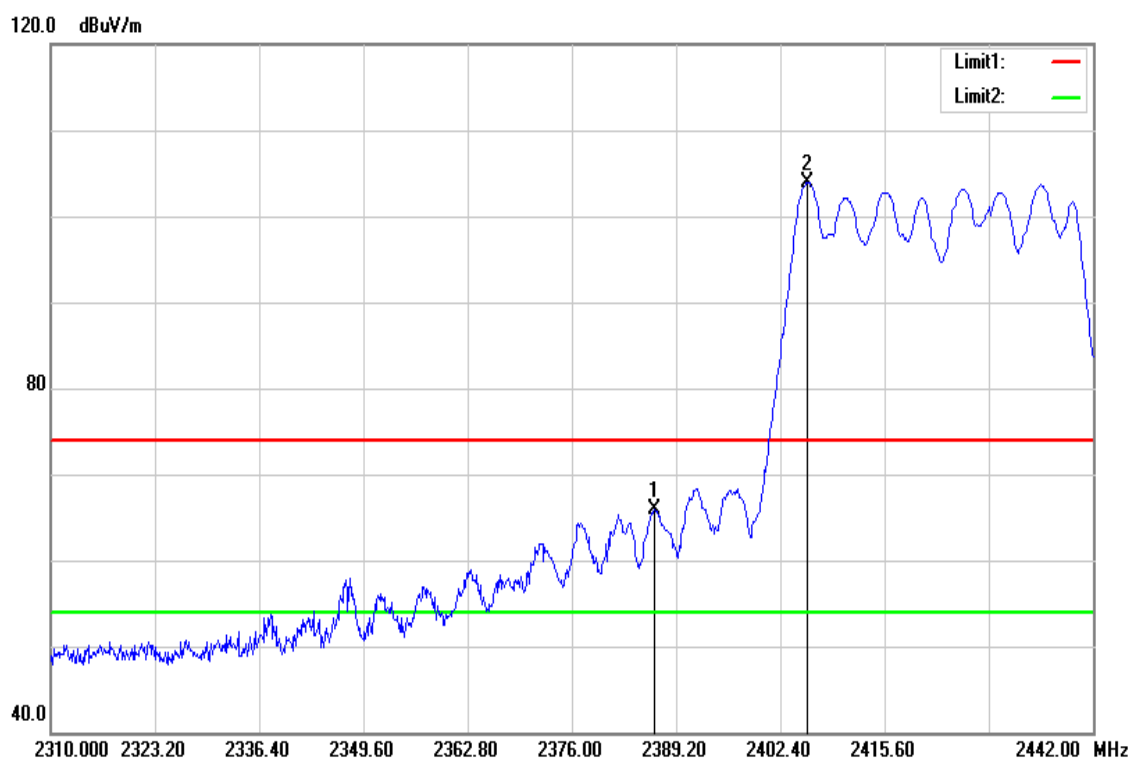
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2460.500	110.01	-2.76	107.25	-	-	peak
2486.800	68.88	-2.68	66.20	74.00	-7.80	peak

Test Mode	IEEE 802.11n 20 MHz High CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



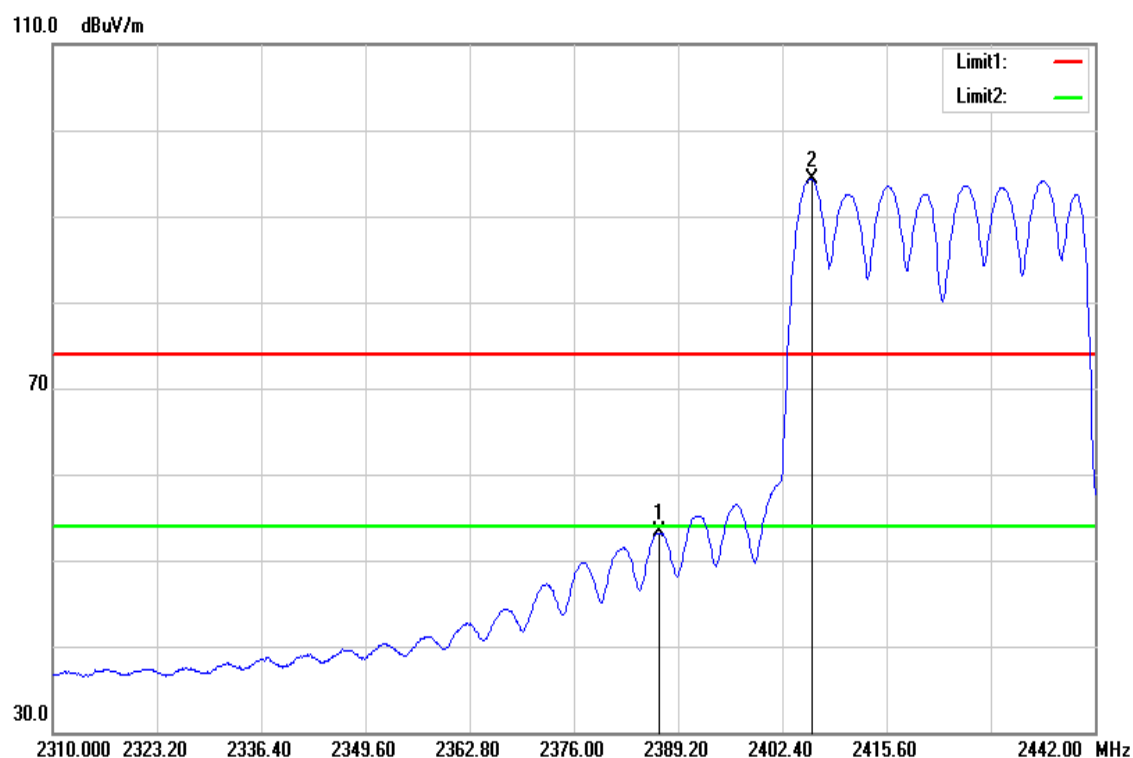
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2465.200	100.06	-2.75	97.31	-	-	AVG
2485.800	50.16	-2.69	47.47	54.00	-6.53	AVG

Test Mode	IEEE 802.11n 40 MHz Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



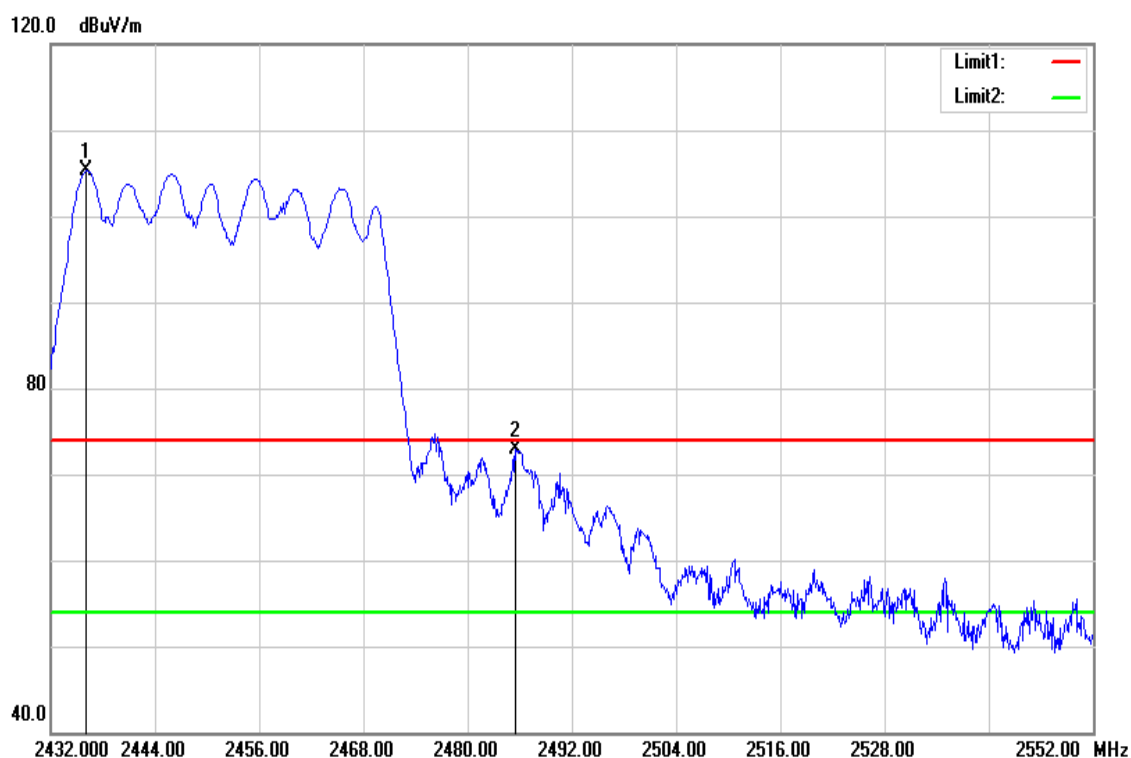
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2386.428	68.99	-2.99	66.00	74.00	-8.00	peak
2405.832	106.80	-2.93	103.87	-	-	peak

Test Mode	IEEE 802.11n 40 MHz Low CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



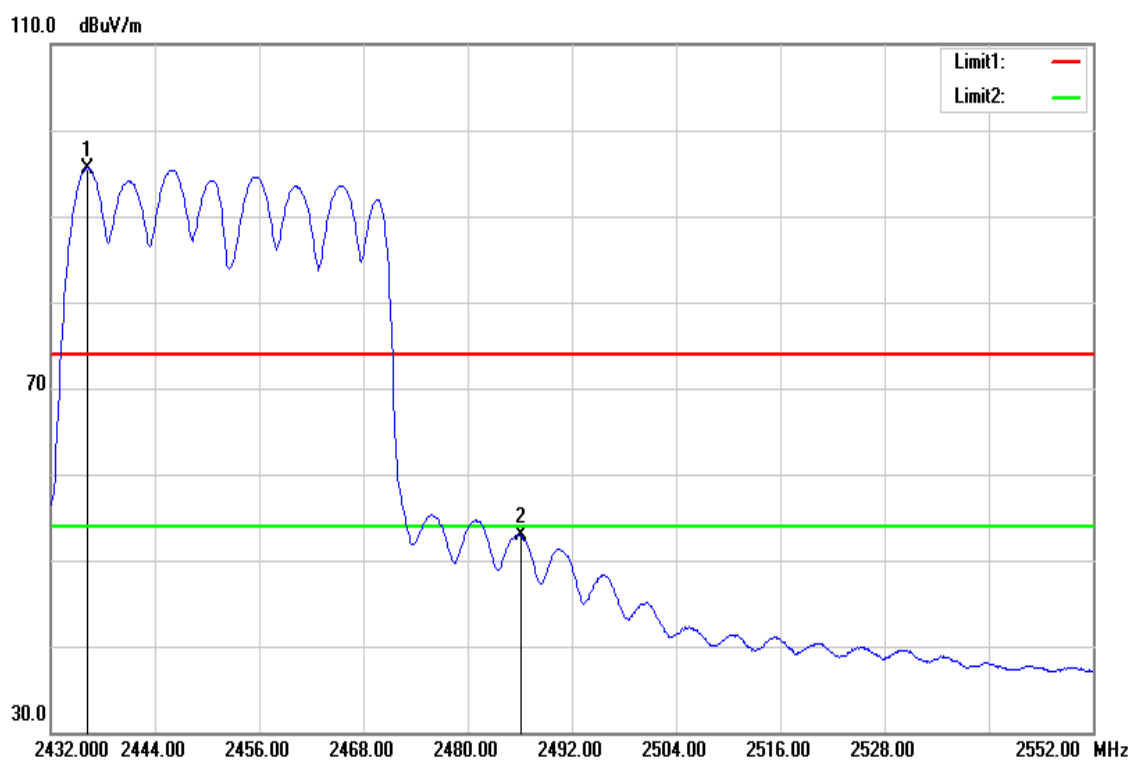
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2386.824	56.19	-2.99	53.20	54.00	-0.80	AVG
2406.096	97.28	-2.93	94.35	-	-	AVG

Test Mode	IEEE 802.11n 40 MHz High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 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
2436.080	108.07	-2.84	105.23	-	-	peak
2485.520	75.59	-2.69	72.90	74.00	-1.10	peak

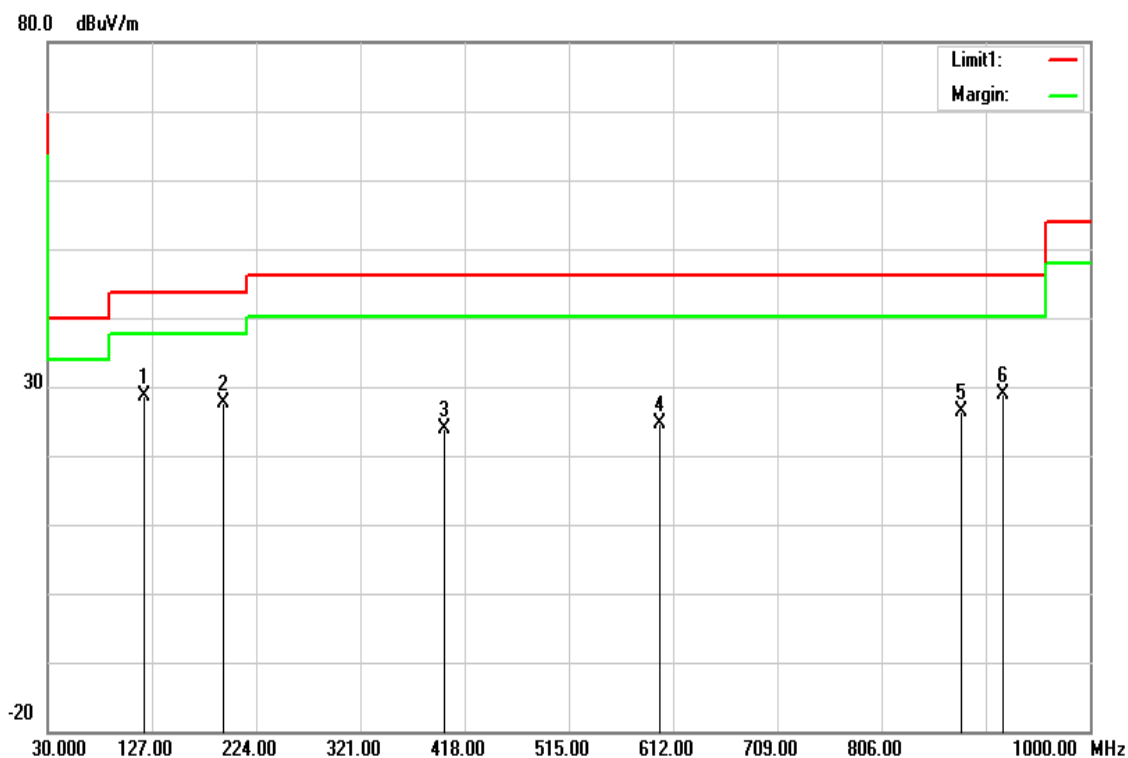
Test Mode	IEEE 802.11n 40 MHz High CH	Temperature:	22(°C)/ 34%RH
Test Item	Band Edge	Test Date	May 31, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2436.200	98.44	-2.84	95.60	-	-	AVG
2486.120	55.62	-2.68	52.94	54.00	-1.06	AVG

Below 1G Test Data

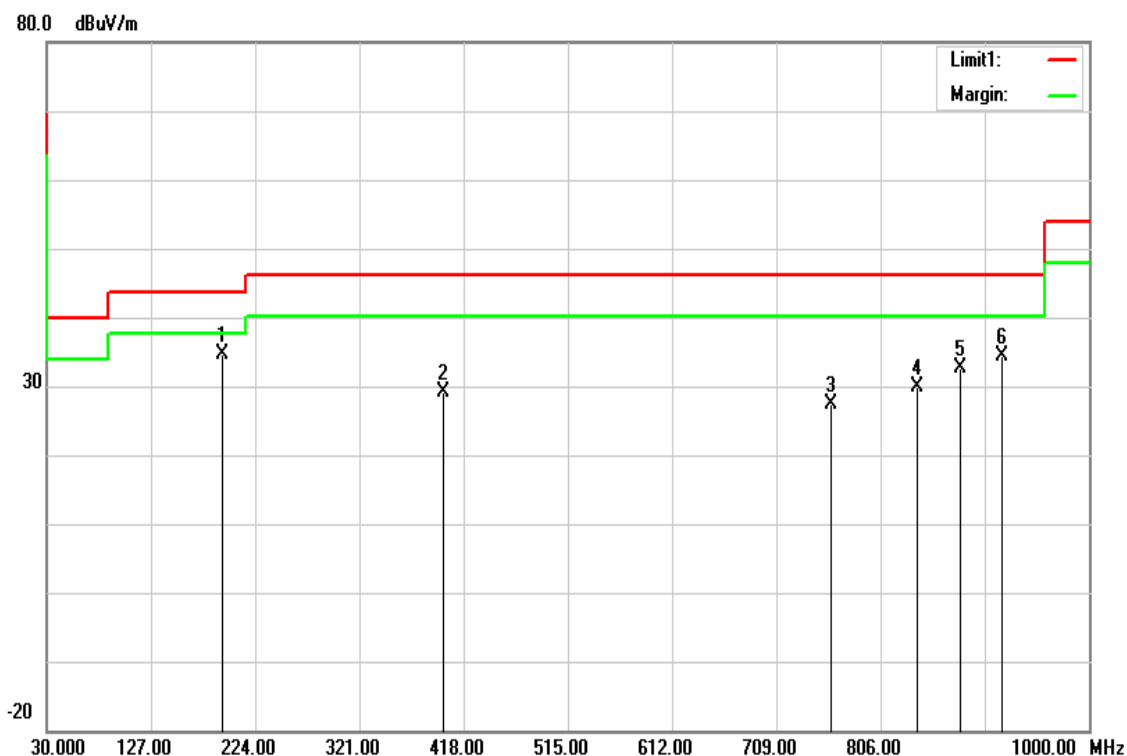
Test Mode	Mode 1	Temp/Hum	22(°C)/ 34%RH
Test Item	30MHz-1GHz	Test Date	February 26, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
119.2400	43.67	-15.14	28.53	43.52	-14.99	peak
193.4450	43.58	-15.91	27.67	43.52	-15.85	peak
400.0550	35.25	-11.39	23.86	46.02	-22.16	peak
599.8750	31.47	-6.93	24.54	46.02	-21.48	peak
880.2050	28.83	-2.35	26.48	46.02	-19.54	peak
919.9750	30.44	-1.68	28.76	46.02	-17.26	peak

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

Test Mode	Mode 1	Temp/Hum	22(°C)/ 34%RH
Test Item	30MHz-1GHz	Test Date	February 26, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage	120Vac / 60Hz

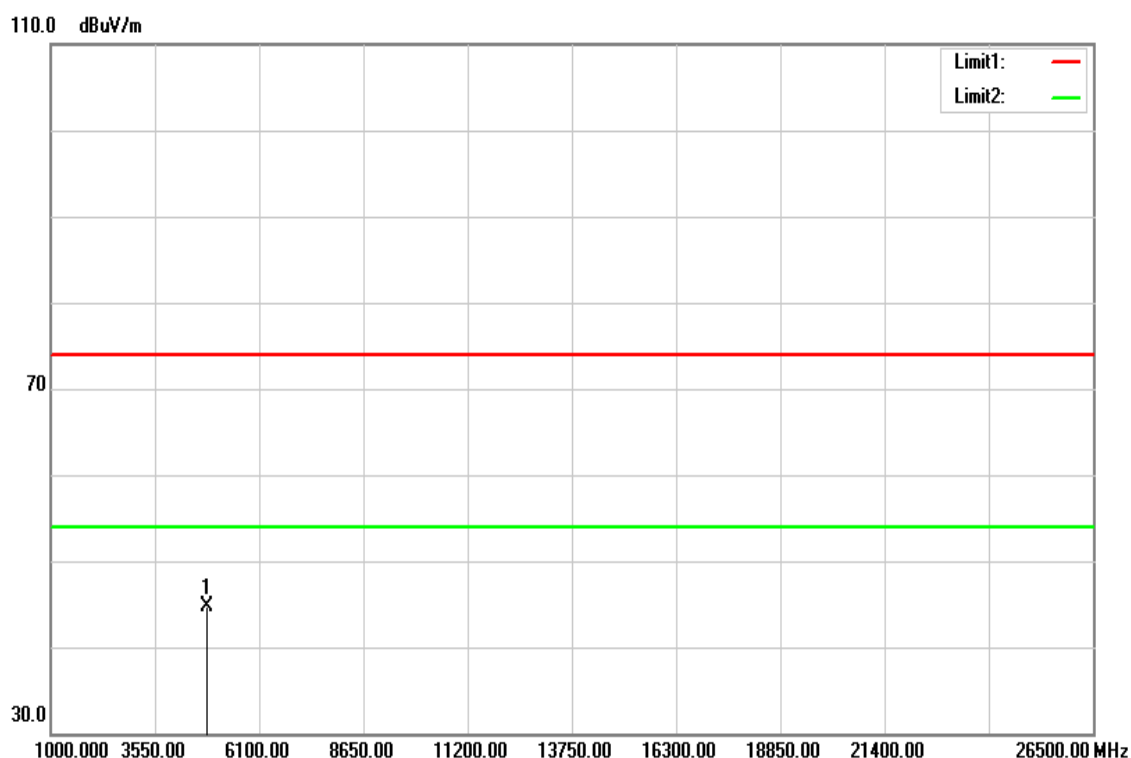


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
193.4450	50.55	-15.91	34.64	43.52	-8.88	QP
400.0550	40.47	-11.39	29.08	46.02	-16.94	peak
759.9250	31.47	-4.11	27.36	46.02	-18.66	peak
839.9500	32.87	-2.96	29.91	46.02	-16.11	peak
880.2050	34.93	-2.35	32.58	46.02	-13.44	peak
919.9750	36.07	-1.68	34.39	46.02	-11.63	peak

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	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

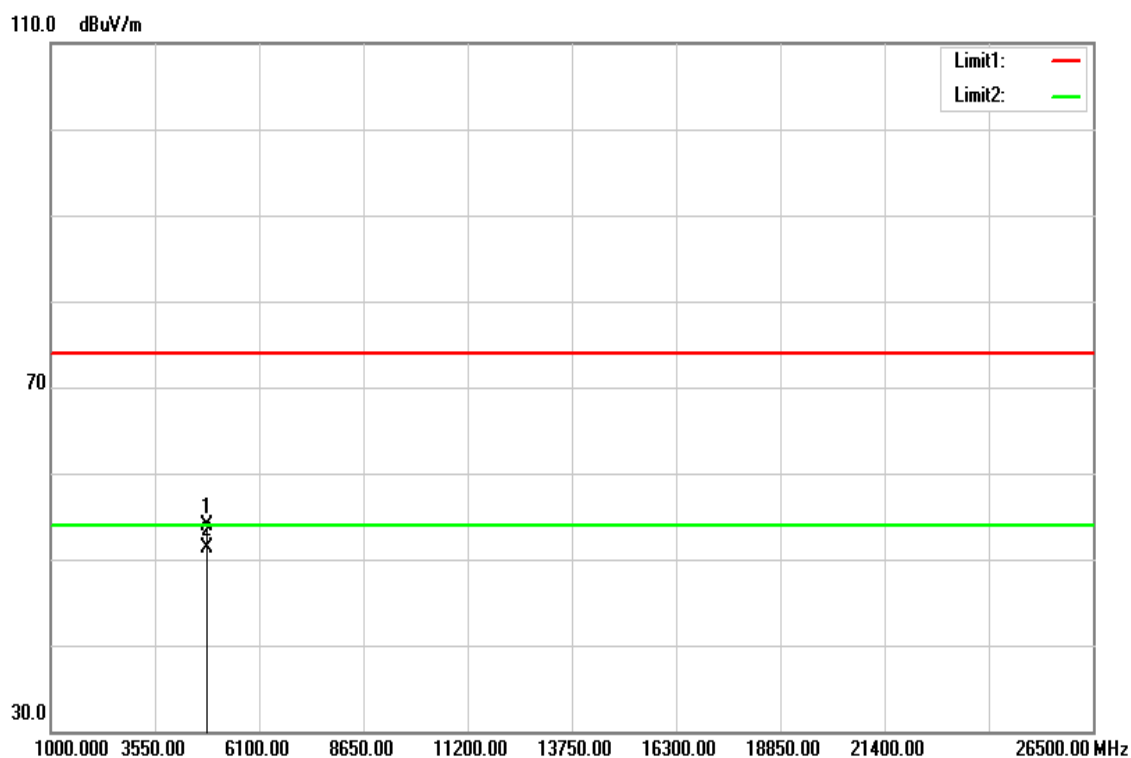


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4827.000	40.24	4.38	44.62	74.00	-29.38	peak
N/A						

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	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

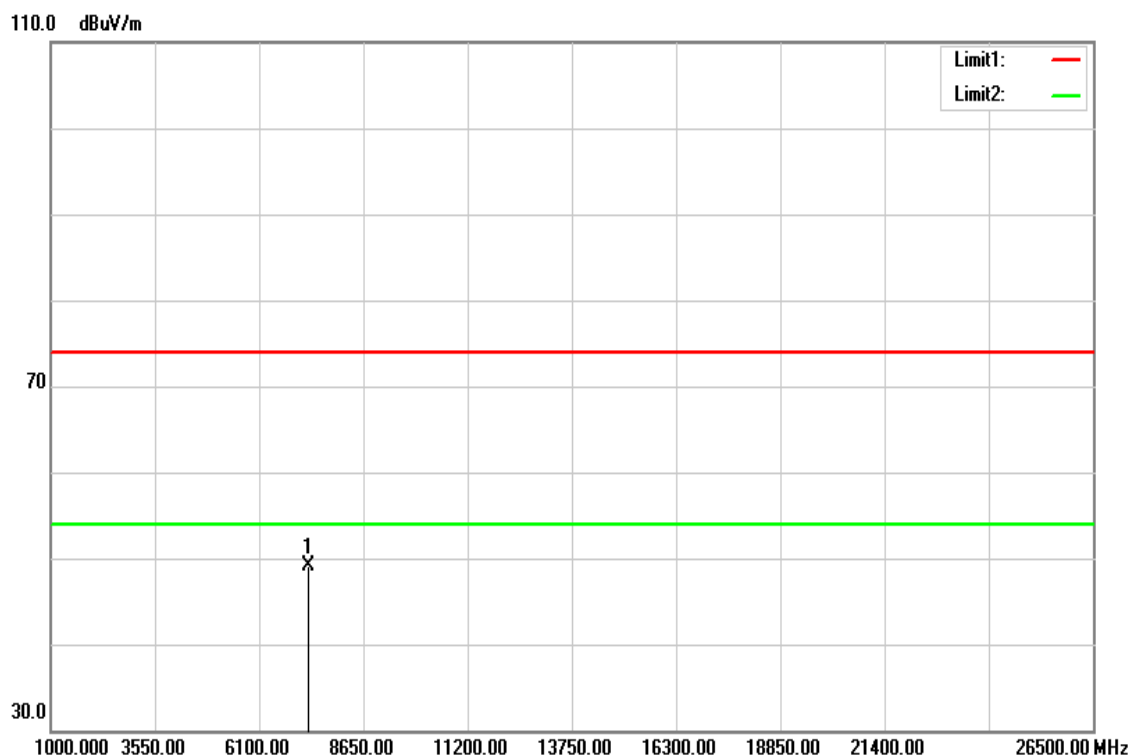


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4827.000	49.52	4.38	53.90	74.00	-20.10	peak
4827.000	47.00	4.38	51.38	54.00	-2.62	AVG
N/A						

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11b Mid CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

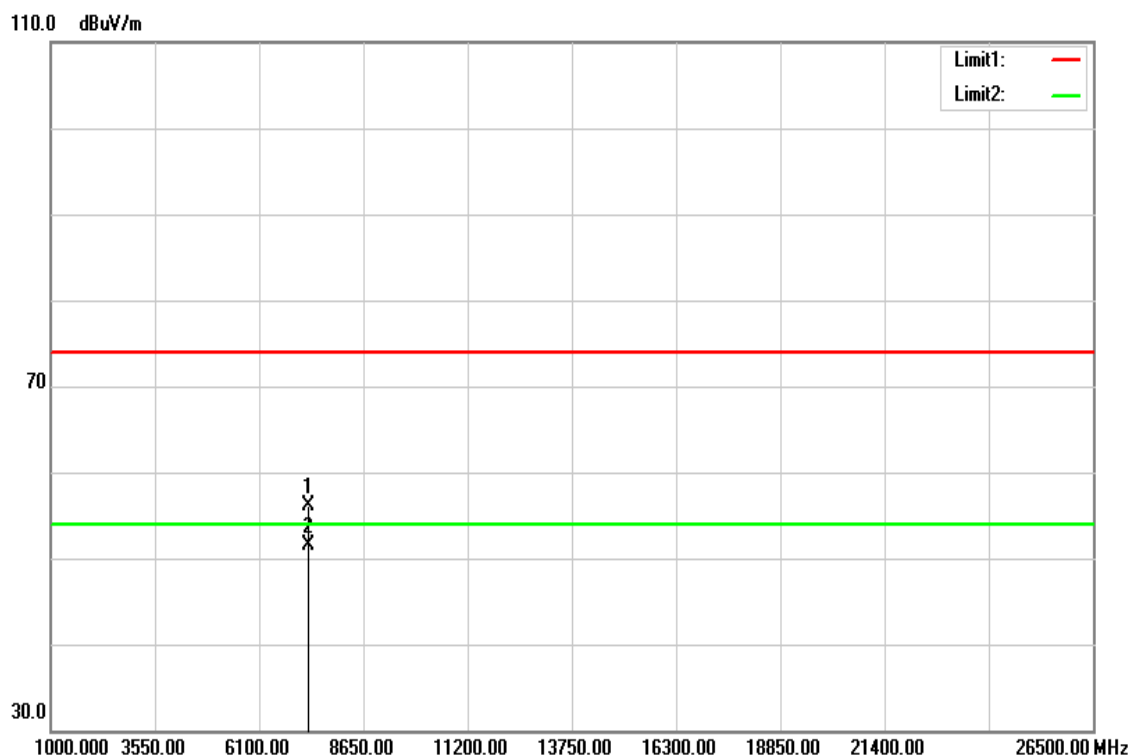


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7312.000	38.75	10.44	49.19	74.00	-24.81	peak
N/A						

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	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

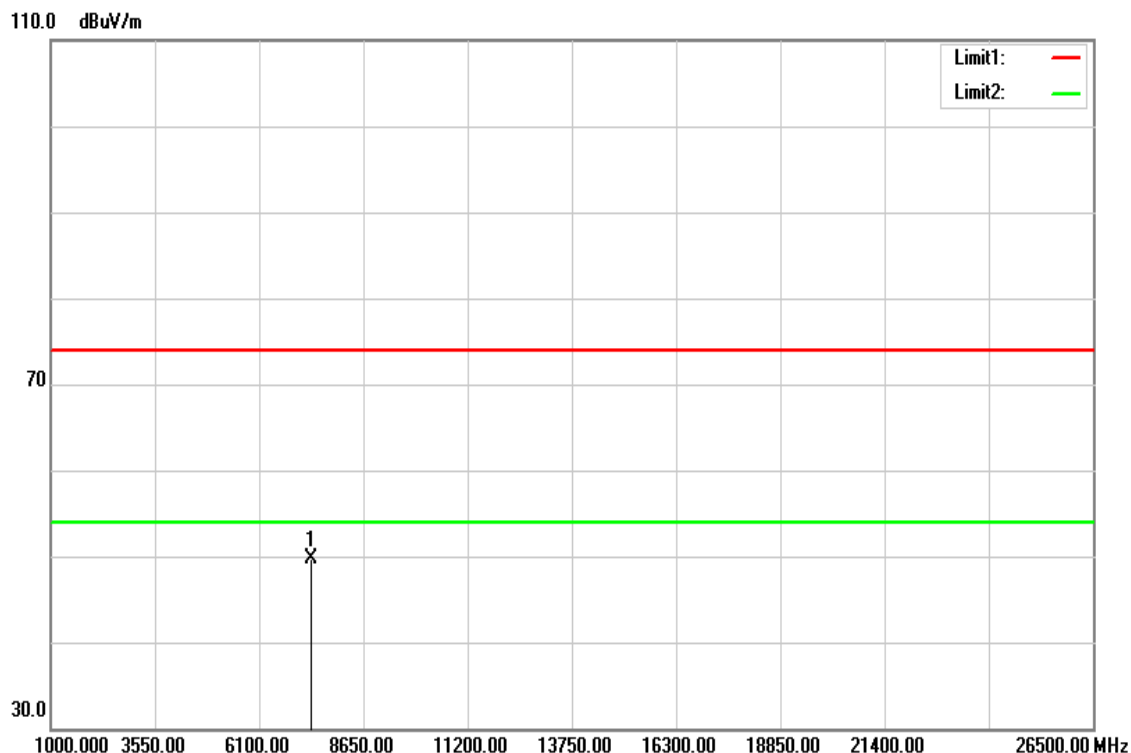


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7312.000	45.75	10.44	56.19	74.00	-17.81	peak
7312.000	40.99	10.44	51.43	54.00	-2.57	AVG
N/A						

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11b High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

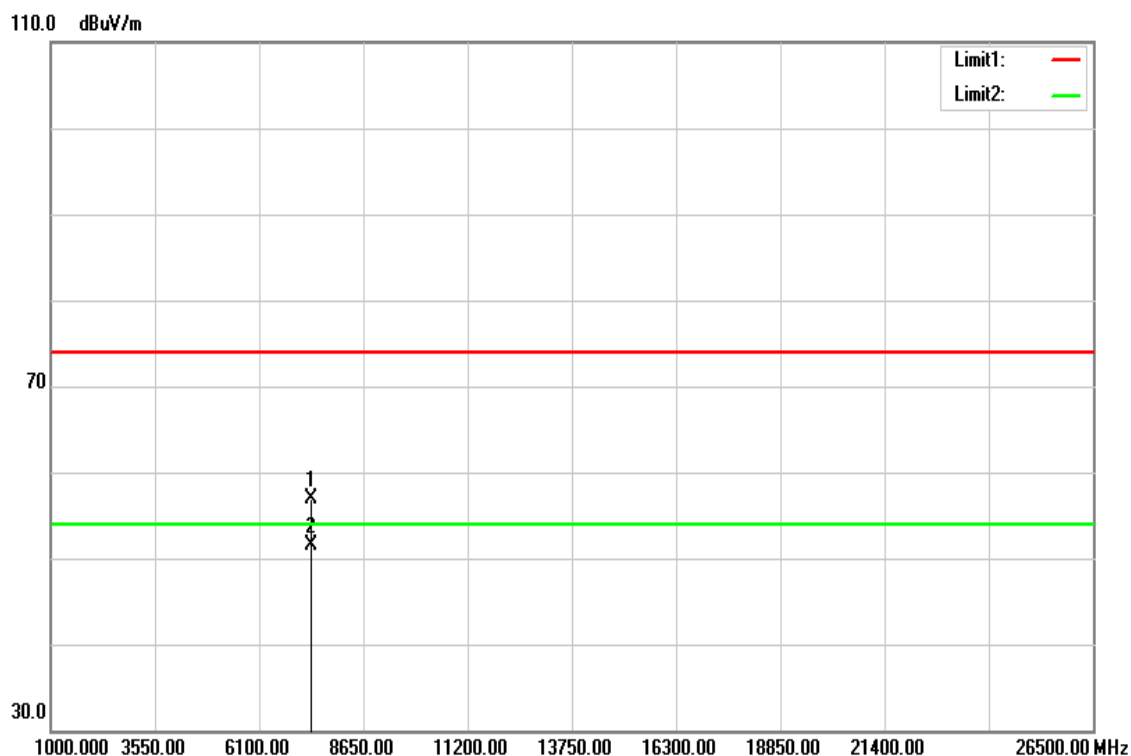


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7389.000	39.16	10.49	49.65	74.00	-24.35	peak
N/A						

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	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

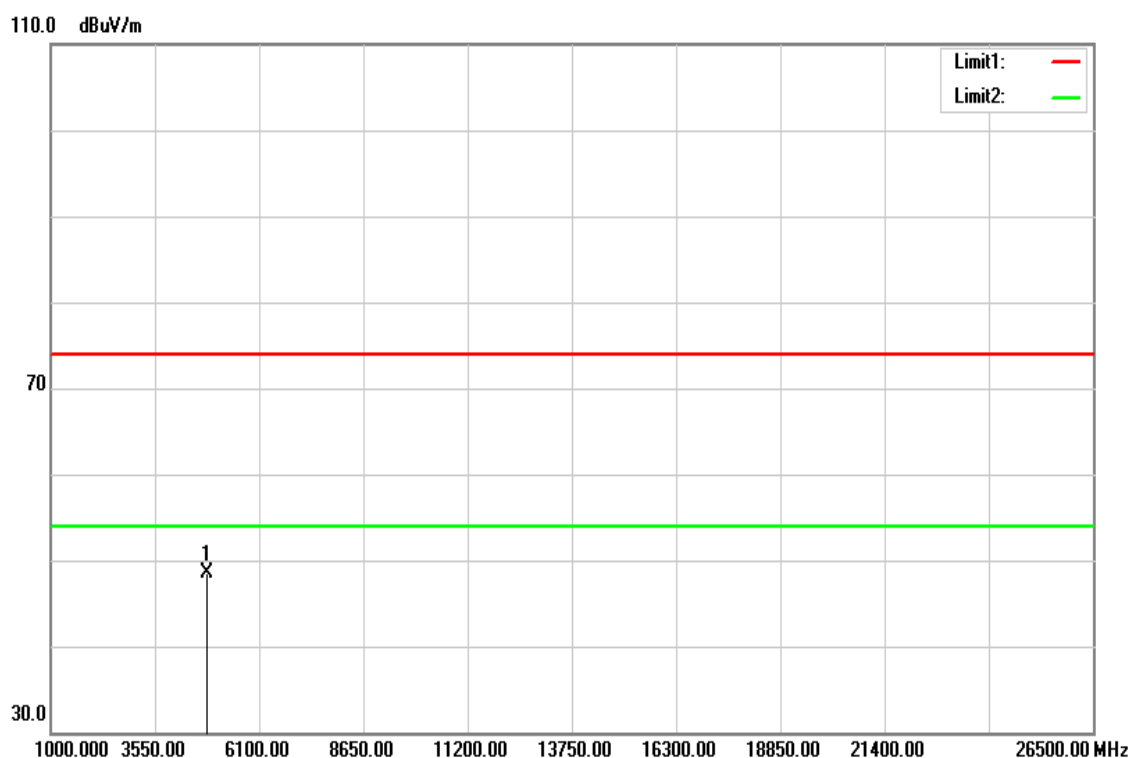


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7382.000	46.43	10.47	56.90	74.00	-17.10	peak
7382.000	41.09	10.47	51.56	54.00	-2.44	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11g Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

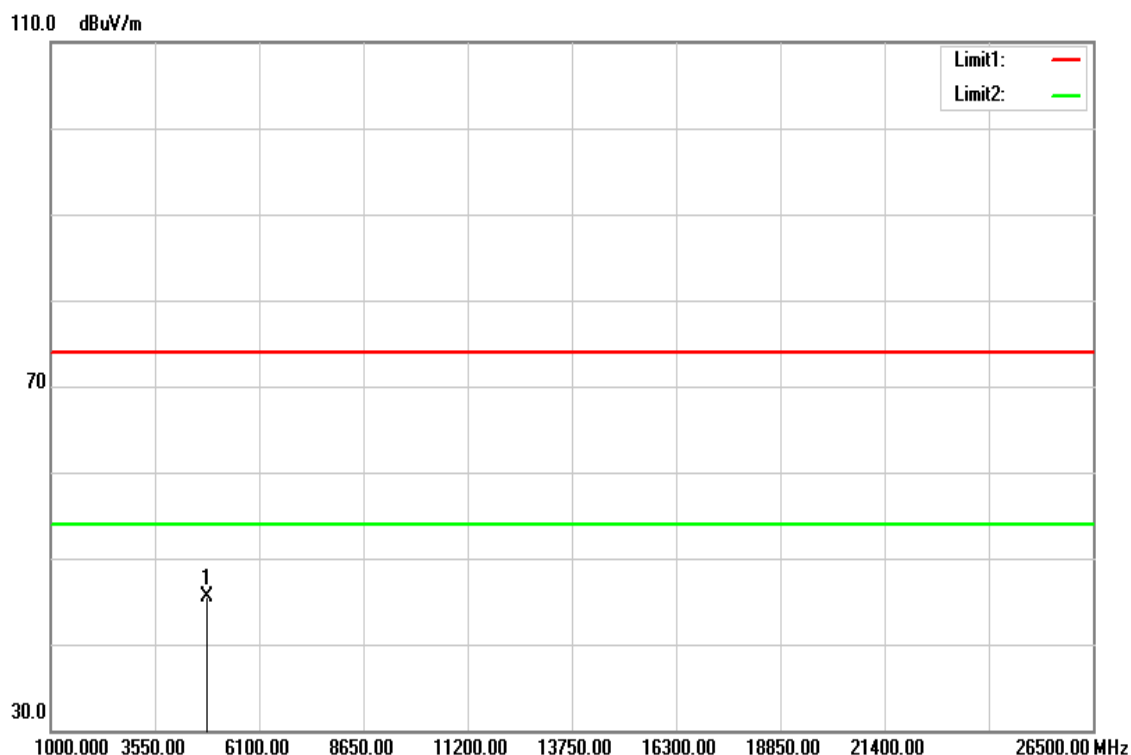


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824.000	44.06	4.38	48.44	74.00	-25.56	peak
N/A						

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	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

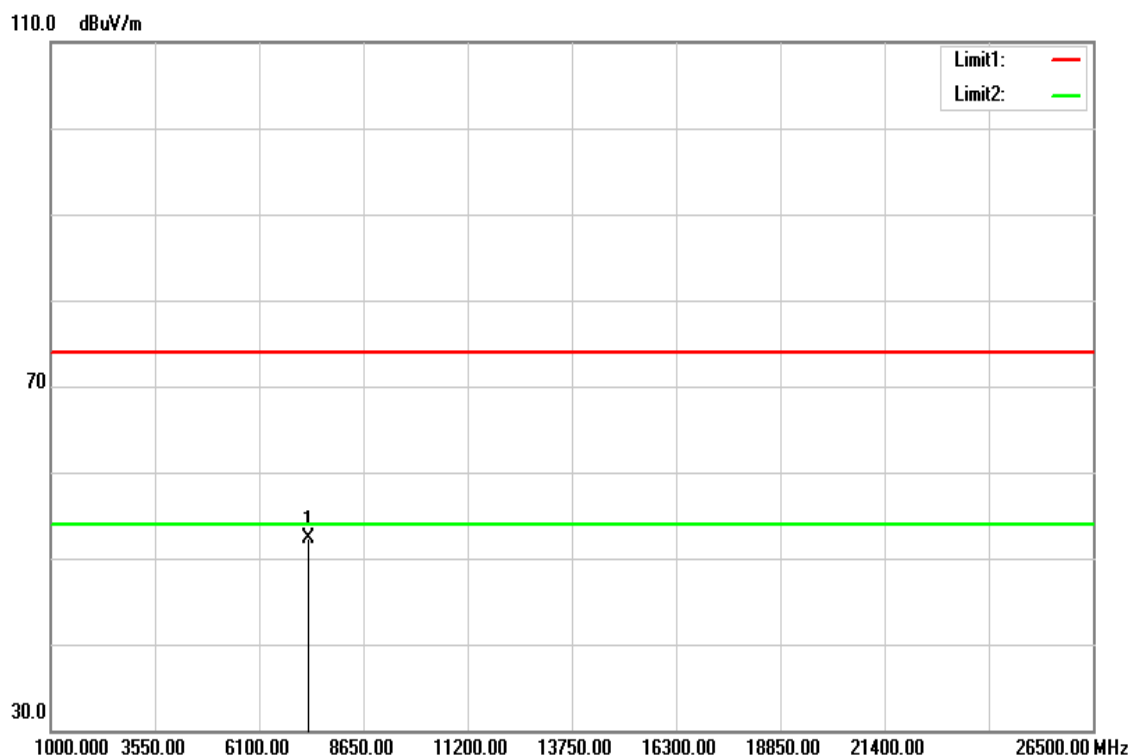


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4834.000	41.11	4.39	45.50	74.00	-28.50	peak
N/A						

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 802.11g Mid CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

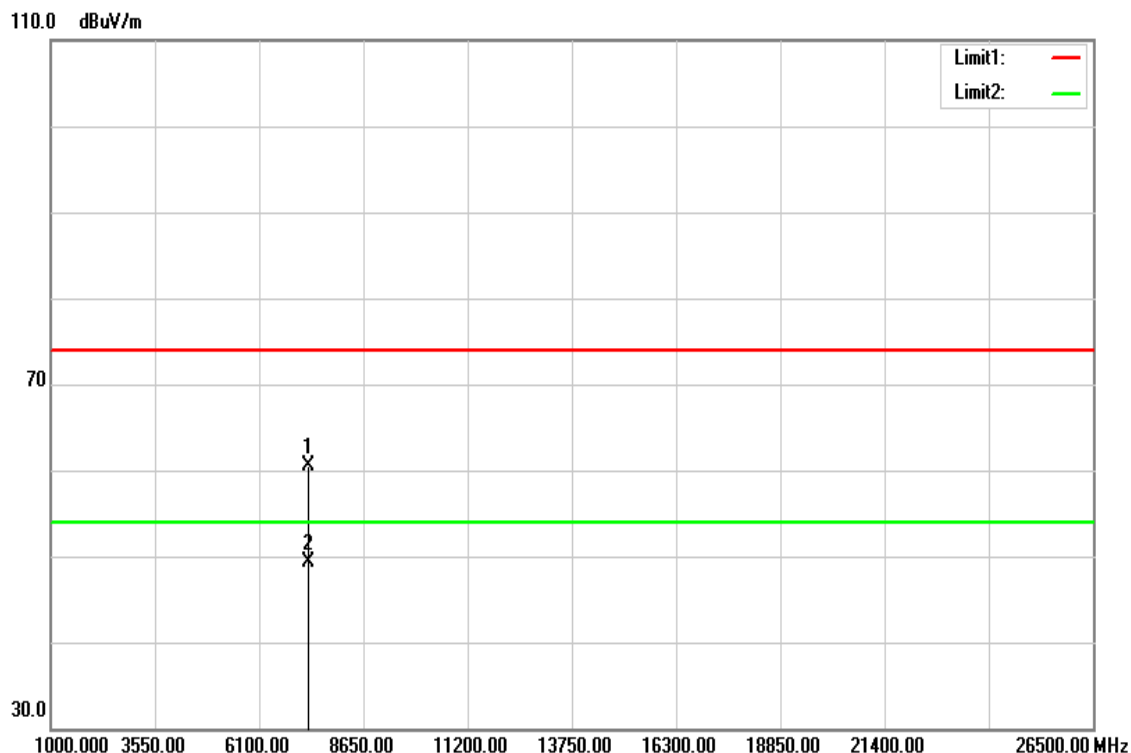


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7319.000	41.95	10.45	52.40	74.00	-21.60	peak
N/A						

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	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

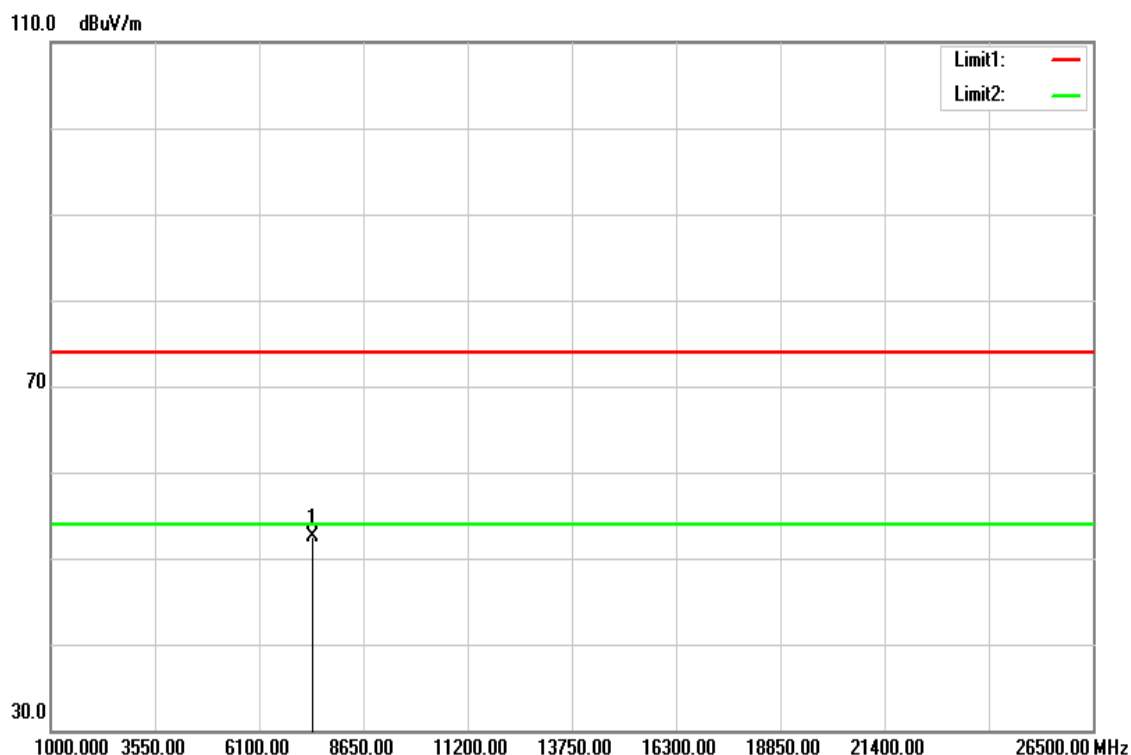


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7319.000	50.10	10.45	60.55	74.00	-13.45	peak
7319.000	38.85	10.45	49.30	54.00	-4.70	AVG
N/A						

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11g High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

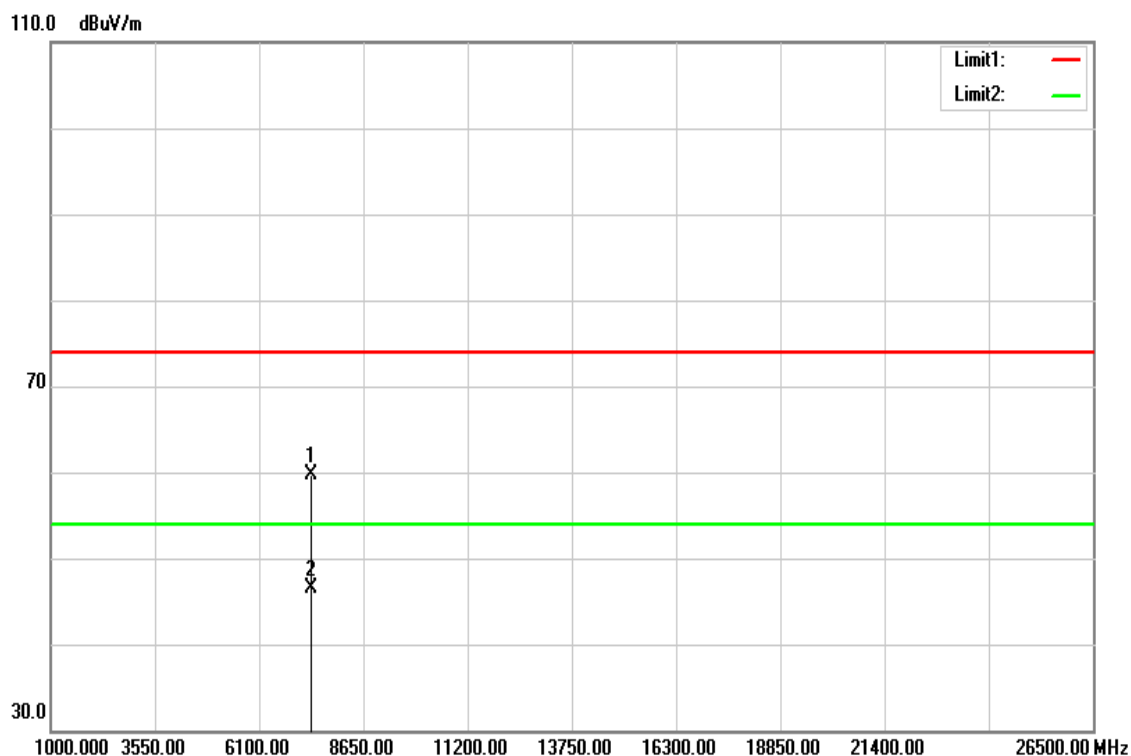


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7396.000	42.11	10.48	52.59	74.00	-21.41	peak
N/A						

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	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

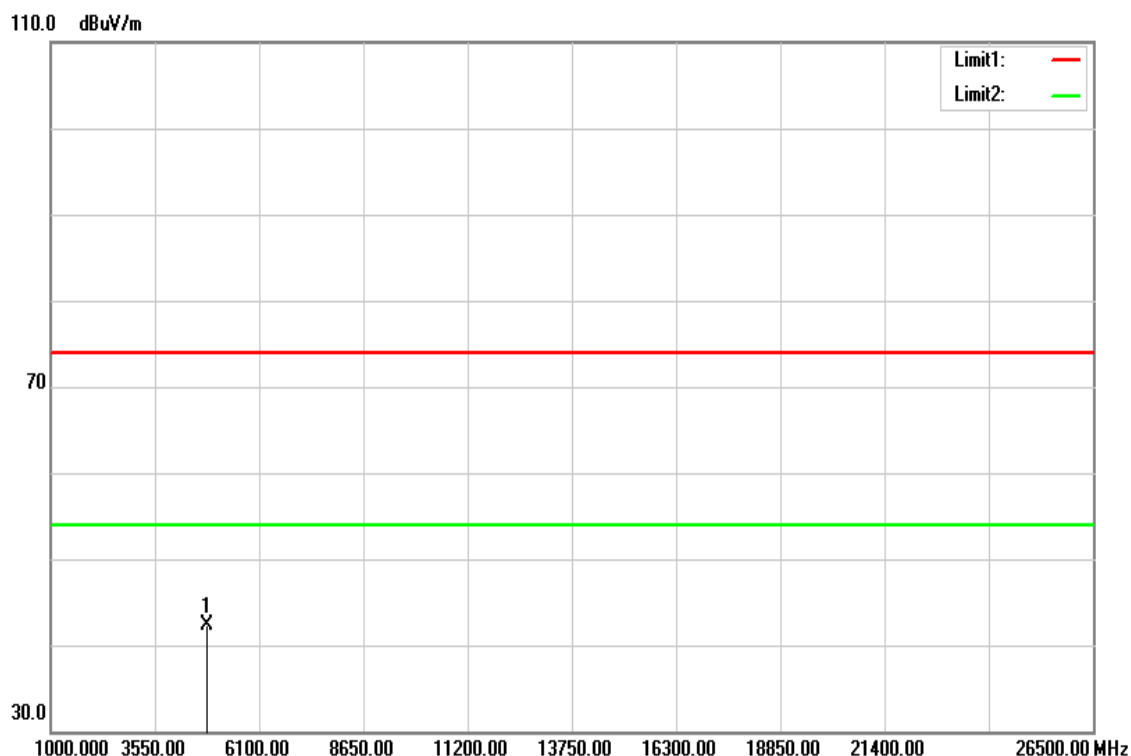


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7382.000	49.19	10.47	59.66	74.00	-14.34	peak
7382.000	35.96	10.47	46.43	54.00	-7.57	AVG
N/A						

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11n 20 MHz Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

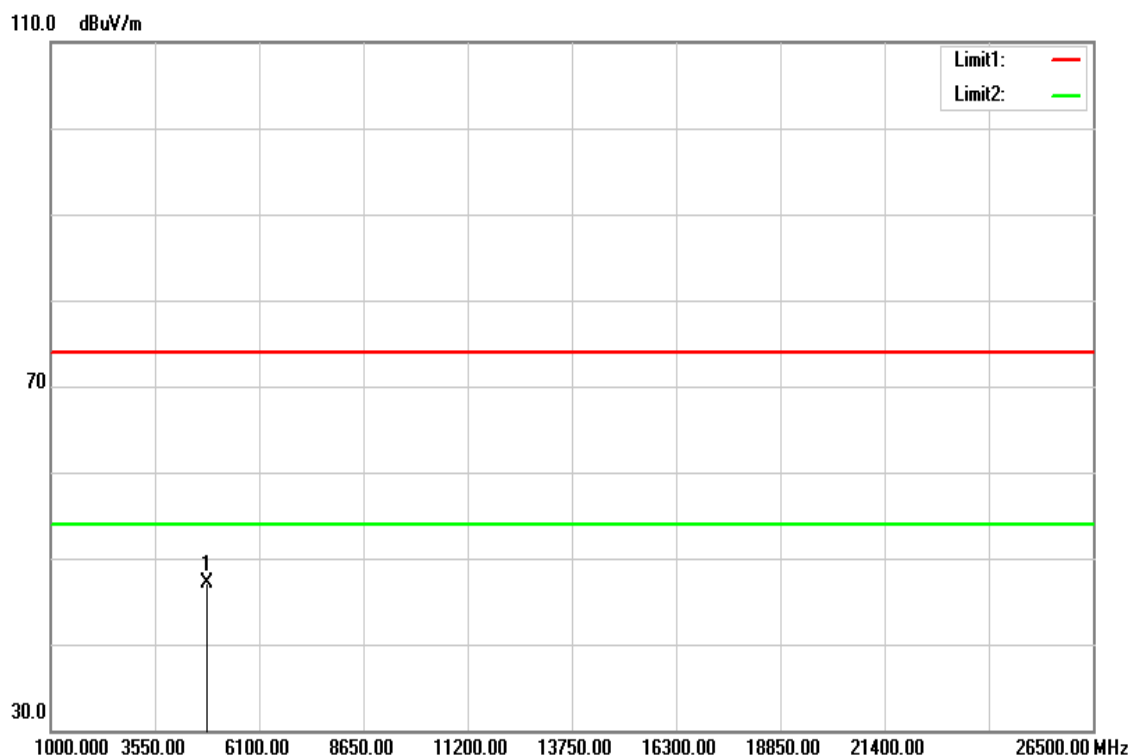


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824.000	37.89	4.38	42.27	74.00	-31.73	peak
N/A						

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 20 MHz Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

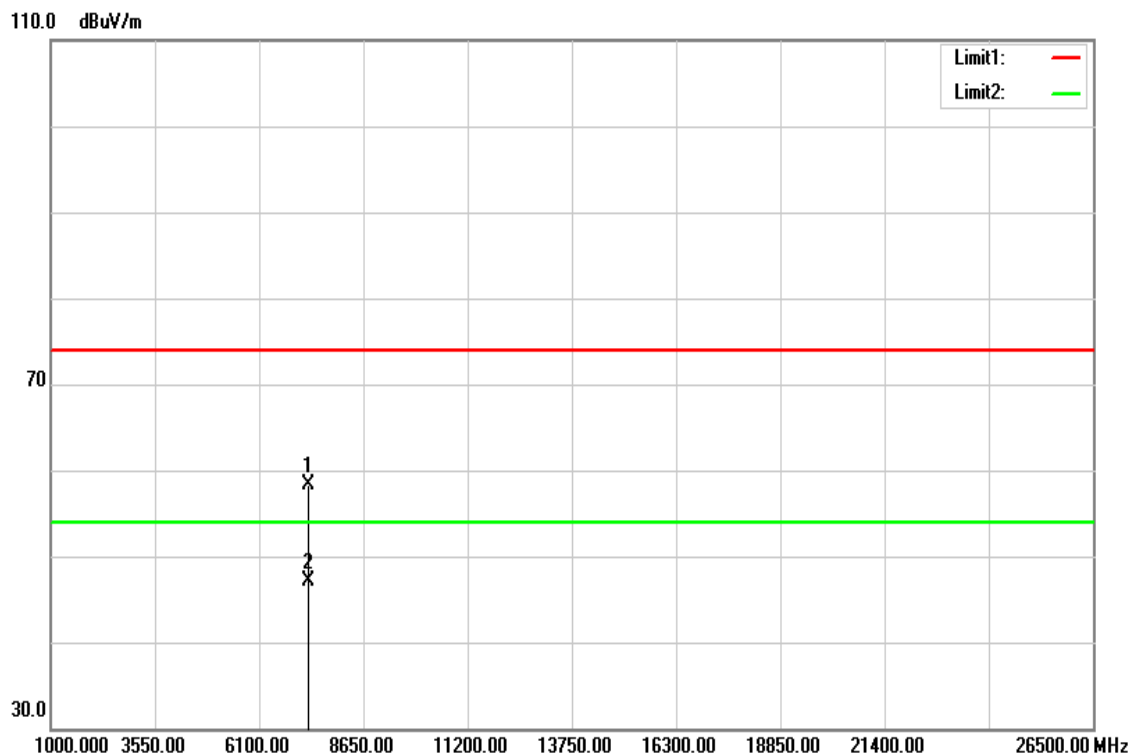


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4834.000	42.78	4.39	47.17	74.00	-26.83	peak
N/A						

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 20 MHz Mid CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

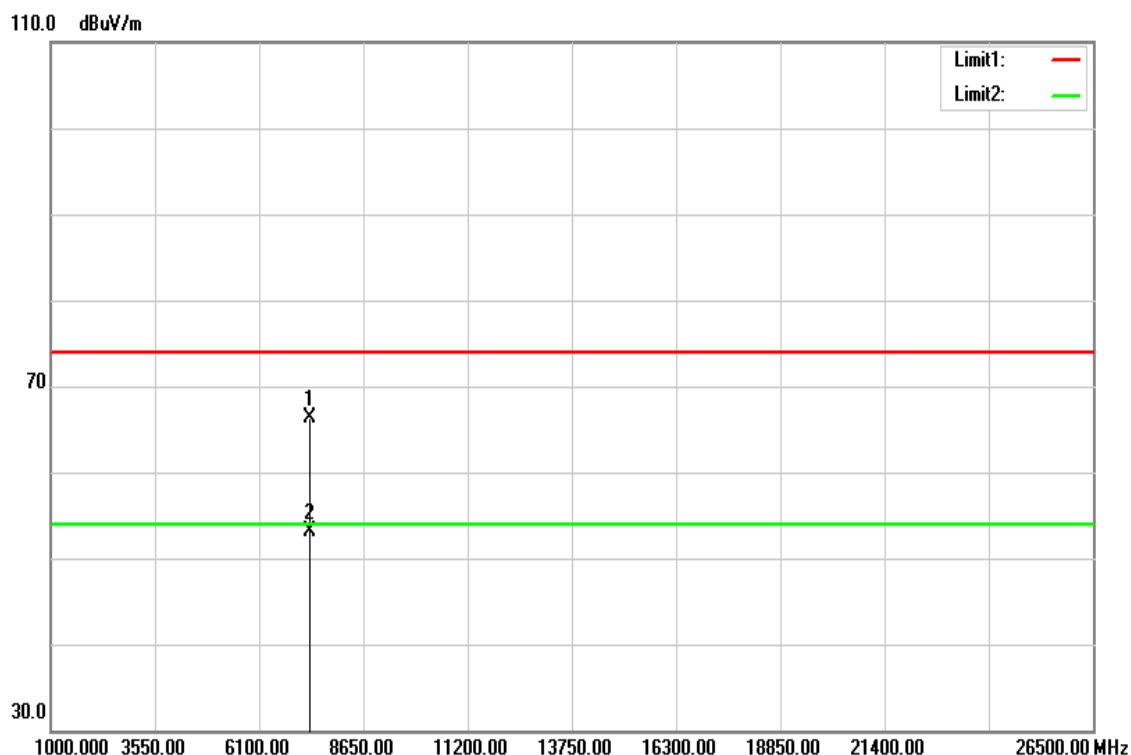


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7305.000	47.89	10.44	58.33	74.00	-15.67	peak
7305.000	36.74	10.44	47.18	54.00	-6.82	AVG
N/A						

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11n 20 MHz Mid CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

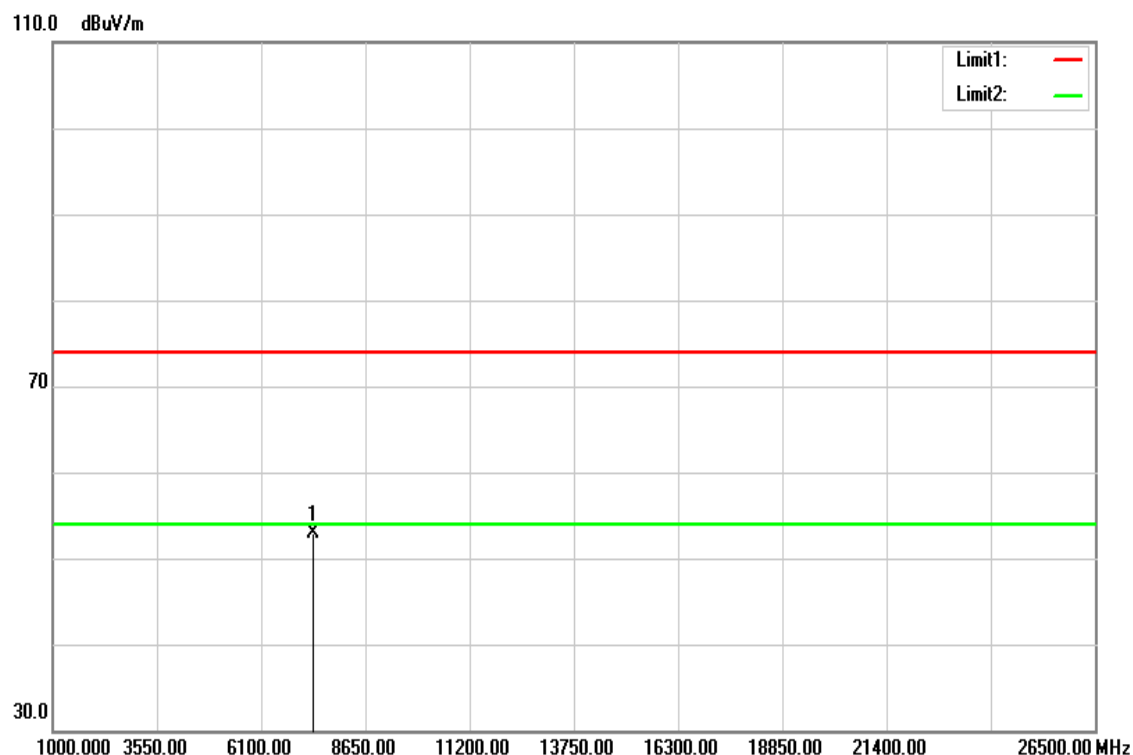


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7326.000	55.79	10.45	66.24	74.00	-7.76	peak
7326.000	42.56	10.45	53.01	54.00	-0.99	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11n 20 MHz High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

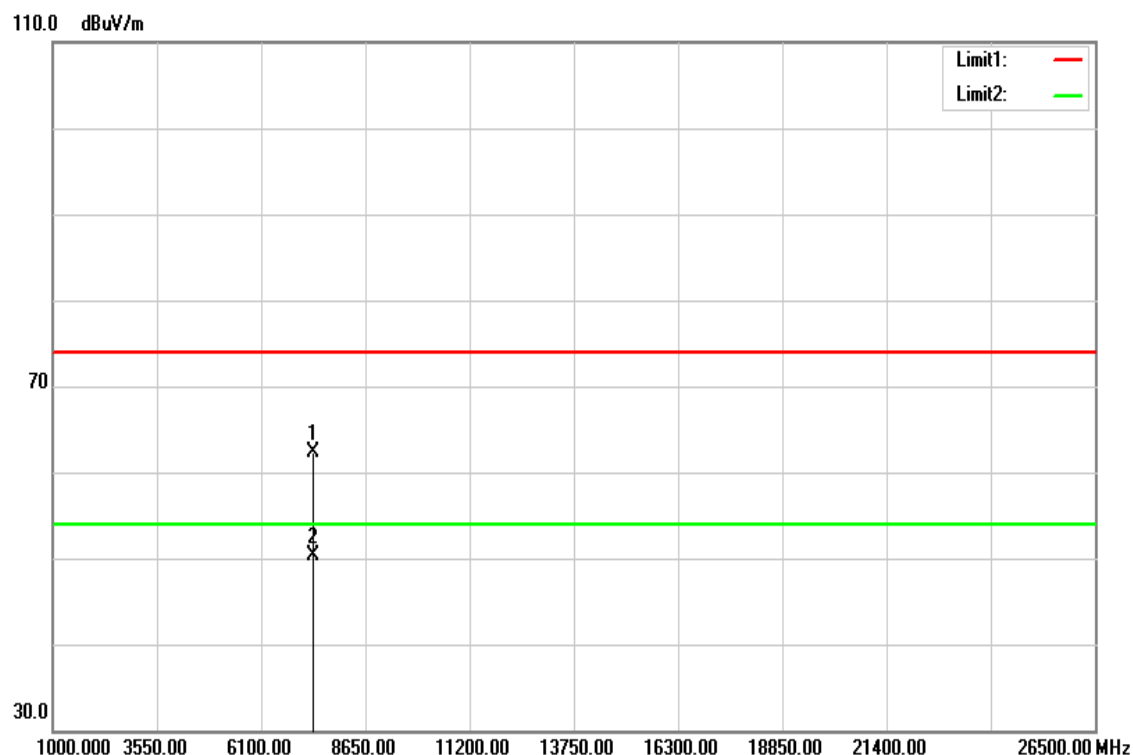


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7389.000	42.51	10.49	53.00	74.00	-21.00	peak
N/A						

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 802.11n 20 MHz High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

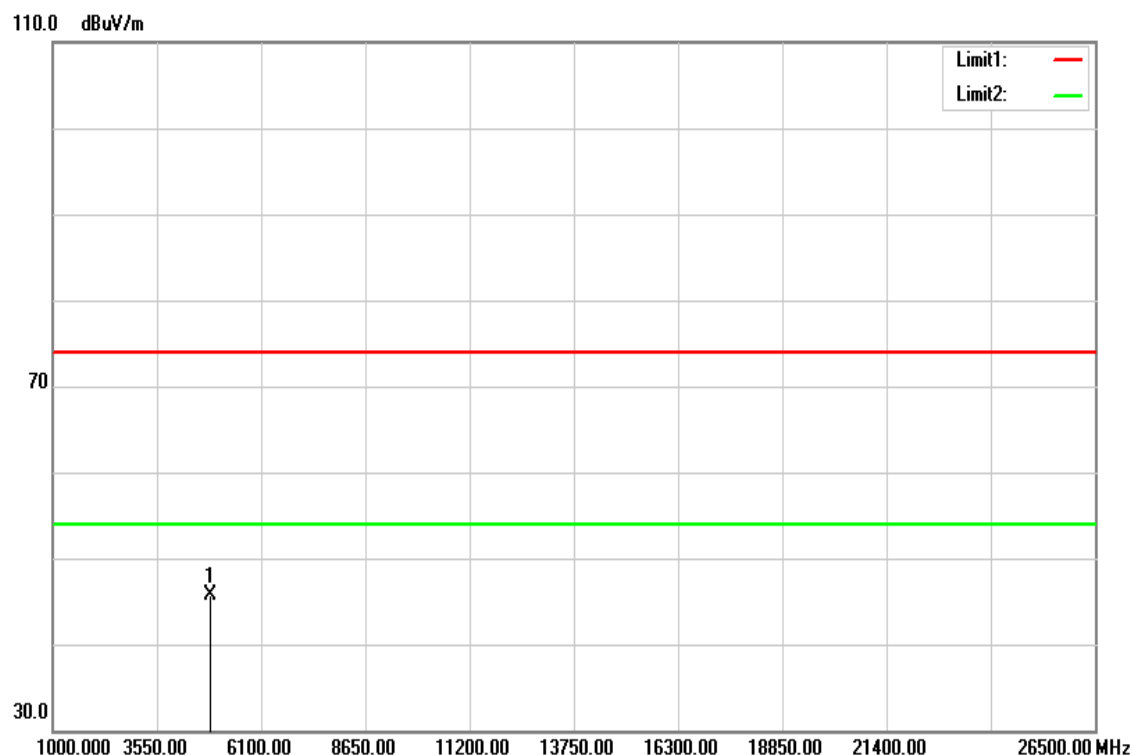


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7382.000	51.80	10.47	62.27	74.00	-11.73	peak
7382.000	39.88	10.47	50.35	54.00	-3.65	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11n 40 MHz Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

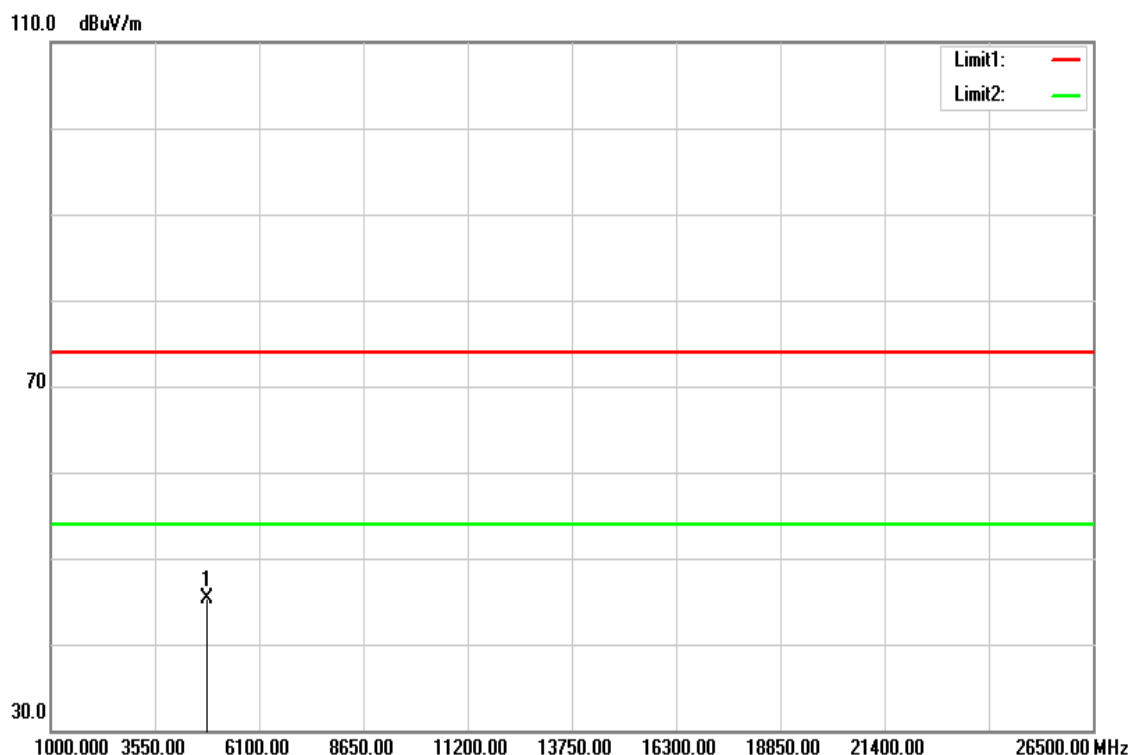


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4848.000	41.23	4.43	45.66	74.00	-28.34	peak
N/A						

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 40 MHz Low CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

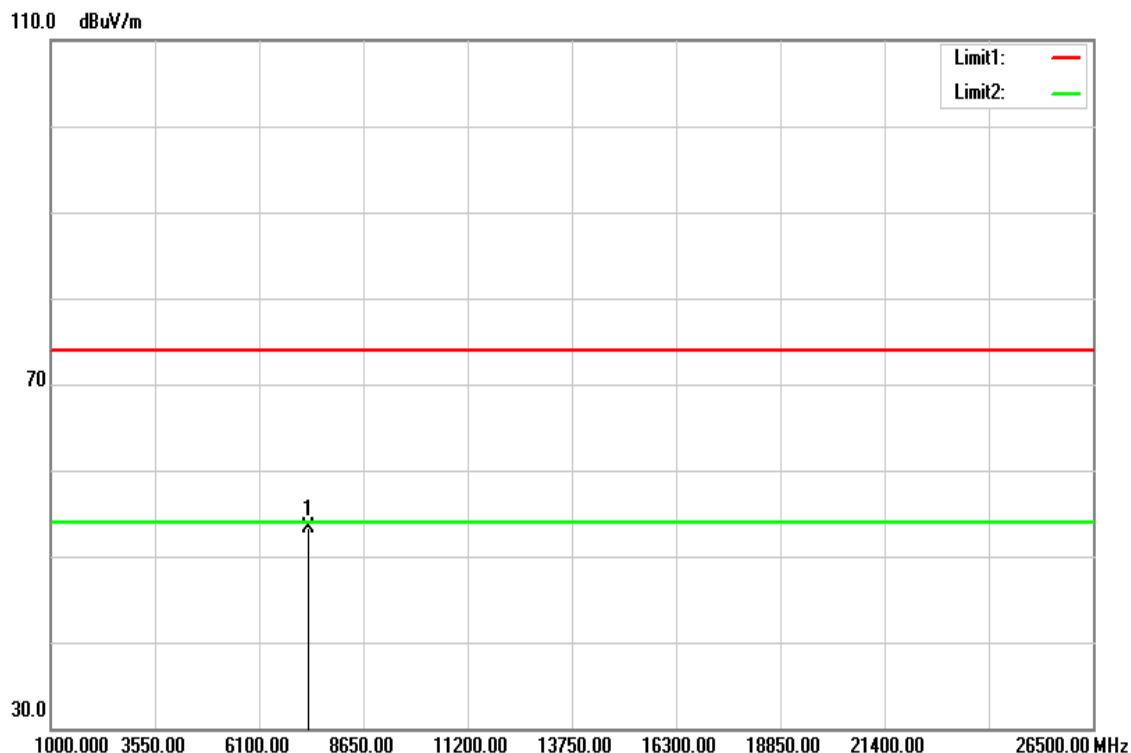


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4841.000	40.99	4.41	45.40	74.00	-28.60	peak
N/A						

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 40 MHz Mid CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

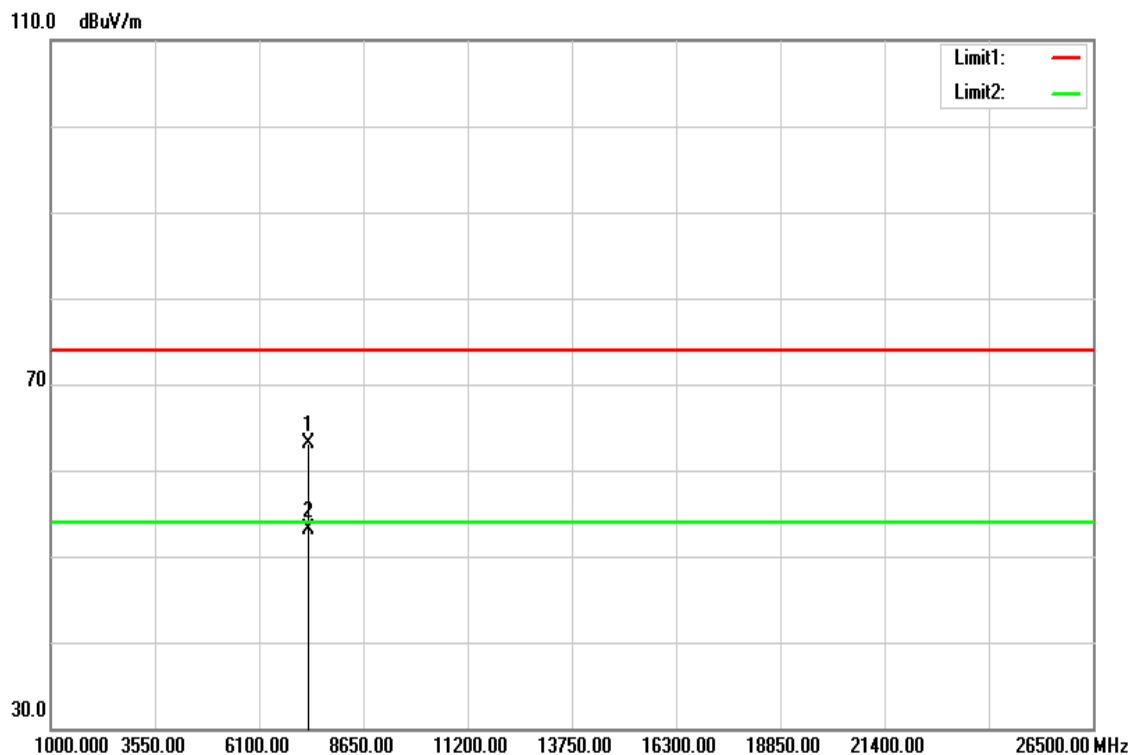


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7312.000	42.79	10.44	53.23	74.00	-20.77	peak
N/A						

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 40 MHz Mid CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

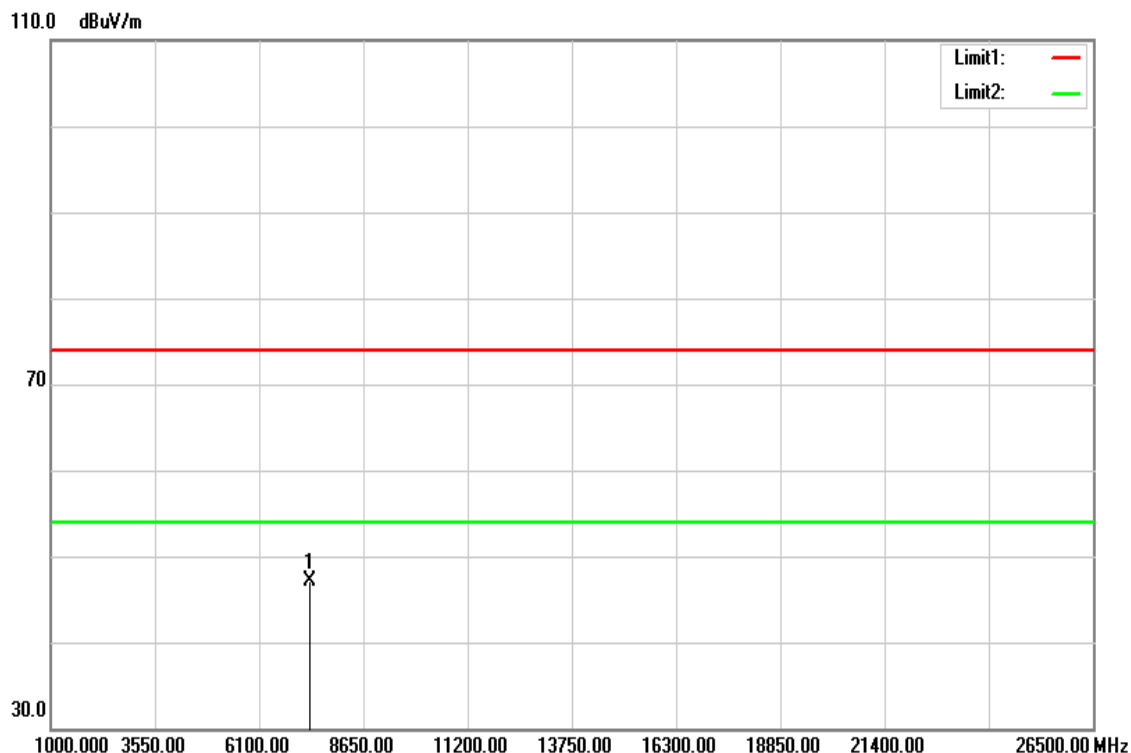


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7305.000	52.70	10.44	63.14	74.00	-10.86	peak
7305.000	42.60	10.44	53.04	54.00	-0.96	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	IEEE 802.11n 40 MHz High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

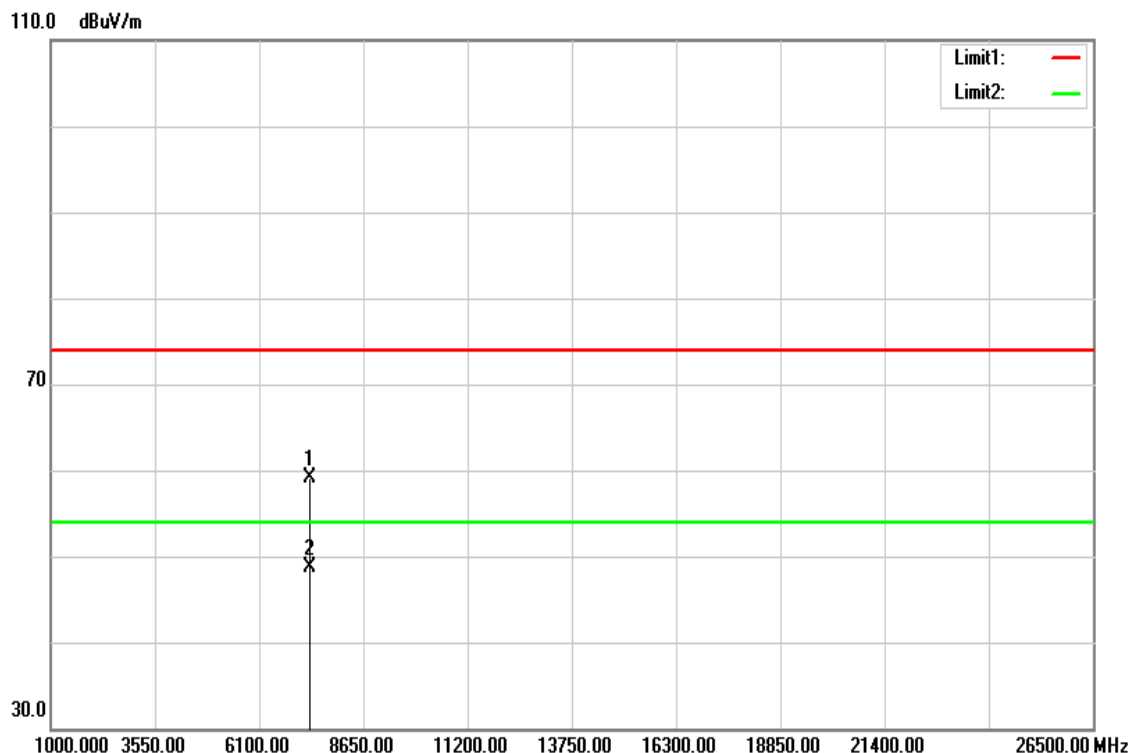


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7340.000	36.71	10.46	47.17	74.00	-26.83	peak
N/A						

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 40 MHz High CH	Temp/Hum	22(°C)/ 34%RH
Test Item	Harmonic	Test Date	June 4, 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
7340.000	48.56	10.46	59.02	74.00	-14.98	peak
7340.000	38.18	10.46	48.64	54.00	-5.36	AVG
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

--End of Test Report--