



FCC ID: OHB-UPC-PLUS
Report No.: T180802D07-A-RP2

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RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
Product name	UP core Plus
Brand name	AAEON
Model No.	xUPC-PLUSx (x – where x may be any combination of alphanumeric characters or “-“ 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:

Tested by:

Sam Chuang
Manager

Jerry Chuang
Engineer

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部分複製。

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	November 08, 2018	Initial Issue	ALL	May Lin
01	November 14, 2018	1. Revised modulation type	P.5	Angel Cheng



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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	AAEON Technology Inc. 5F, No.135, Lane 235, Pao Chiao Rd, Hsin-Tien Dist., New Taipei City, Taiwan, R.O.C																
Manufacturer	AAEON Technology Inc. 5F, No.135, Lane 235, Pao Chiao Rd, Hsin-Tien Dist., New Taipei City, Taiwan, R.O.C																
Equipment	UP core Plus																
Model Name	xUPC-PLUSx (x – where x may be any combination of alphanumeric characters or “-“ or blank)																
Model Discrepancy	All the above models are identical except for the designation of model numbers. The suffix of (x – where x may be any combination of alphanumeric characters or “-“ or blank) on model number is just for marketing purpose only.																
Trade Name	AAEON																
Received Date	August 2, 2018																
Date of Test	August 27 ~ September 6, 2018																
Output Power(W)	For Chain 0: <table> <tr> <th>Mode</th><th>Output Power (W)</th></tr> <tr> <td>IEEE 802.11b mode</td><td>0.0843</td></tr> <tr> <td>IEEE 802.11g mode</td><td>0.2518</td></tr> <tr> <td>IEEE 802.11n 20 mode</td><td>0.2553</td></tr> </table> For Chain 1: <table> <tr> <th>Mode</th><th>Output Power (W)</th></tr> <tr> <td>IEEE 802.11b mode</td><td>0.0875</td></tr> <tr> <td>IEEE 802.11g mode</td><td>0.2559</td></tr> <tr> <td>IEEE 802.11n 20 mode</td><td>0.2673</td></tr> </table>	Mode	Output Power (W)	IEEE 802.11b mode	0.0843	IEEE 802.11g mode	0.2518	IEEE 802.11n 20 mode	0.2553	Mode	Output Power (W)	IEEE 802.11b mode	0.0875	IEEE 802.11g mode	0.2559	IEEE 802.11n 20 mode	0.2673
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IEEE 802.11g mode	0.2559																
IEEE 802.11n 20 mode	0.2673																
Power Supply	VDC from Power Adapter Powertron Electronics Corp. / PS1065-120IB500 I/P:100-240V~ 50-60Hz 1.8A O/P:12V 5.0A 60W Max																

1.2 EUT CHANNEL INFORMATION

Frequency Range	802.11b/g/n 20 mode: 2412MHz ~ 2462MHz
Modulation Type	1. IEEE 802.11b Mode: DSSS(DBPSK/DQPSK/CCK) 2. IEEE 802.11g Mode: OFDM (BPSK/QPSK/16QAM/64QAM) 3. IEEE 802.11n HT20 Mode : OFDM (BPSK/QPSK/16QAM/64QAM)
Number of channels	1. IEEE 802.11b mode: 11 Channels 2. IEEE 802.11g mode: 11 Channels 3. IEEE 802.11n 20 mode : 11 Channels

Remark:

Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 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>Model name</th><th>Type</th><th>Peak Gain</th></tr> <tr> <td>Ant 1</td><td>RFA-25-C2M2-M10-1</td><td>Dipole</td><td>2dBi</td></tr> <tr> <td>Ant 2</td><td>RFA-25-C2M2-M10-1</td><td>Dipole</td><td>2dBi</td></tr> </table>				Model name	Type	Peak Gain	Ant 1	RFA-25-C2M2-M10-1	Dipole	2dBi	Ant 2	RFA-25-C2M2-M10-1	Dipole	2dBi
	Model name	Type	Peak Gain												
Ant 1	RFA-25-C2M2-M10-1	Dipole	2dBi												
Ant 2	RFA-25-C2M2-M10-1	Dipole	2dBi												
Antenna Connector	RP SMA PLUG														



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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

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	Dally Hong	-

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
Coaxial Cable	Woken	WC12	CC002	06/29/2018	06/28/2019
Power Meter	Anritsu	ML2495A	1149001	02/06/2018	02/05/2019
Power Seneor	Anritsu	MA2491A	030982	02/07/2018	02/06/2019
Signal Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018
Thermostatic/ Hrgrosatic Chamber	TAICHY	MHG-150LF	930619	10/11/2017	10/10/2018

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Band Reject Filters	MICRO TRONICS	BRM 50702	120	05/14/2018	05/13/2019
Bilog Antenna	Sunol Sciences	JB3	A030105	07/13/2018	07/12/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	06/29/2018	06/28/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	06/29/2018	06/28/2019
Digital Thermo- Hygro Meter	WISEWIND	1206	D07	02/08/2018	02/07/2019
Double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	08/20/2018	08/19/2019
Loop Ant	COM-POWER	AL-130	121051	03/21/2018	03/20/2019
Pre-Amplifier	EMEC	EM330	060609	06/29/2018	06/28/2019
Pre-Amplifier	HP	8449B	3008A00965	06/29/2018	06/28/2019
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/31/2018	05/30/2019
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

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



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AC line Conduction Test Room					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
CABLE	EMCI	CFD300-NL	CERF	06/29/2018	06/28/2019
EMI Test Receiver	R&S	ESCI	100064	07/24/2018	07/23/2019
LISN	SCHWARZBECK	NSLK 8127	8127-541	02/09/2018	02/08/2019
LISN	SCHAFFNER	NNB41	03/10013	02/06/2018	02/05/2019

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	Keyboard	DELL	SK-8115	N/A	FCC DoC
2	Mouse	DELL	M-UAL-96	N/A	FCC DoC
3	Monitor	DELL	U2410F	N/A	FCC DoC

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.



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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 Spurious 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 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 mode: 1. Lowest Channel: 2412MHz 2. Middle Channel: 2437MHz 3. Highest Channel: 2462MHz
Operation Transmitter	IEEE 802.11b mode: 1T1R IEEE 802.11g mode: 1T1R IEEE 802.11n 20 mode: 1T1R

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
Power supply Mode	Mode 1: EUT power by 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
Power supply Mode	Mode 1: EUT power by 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
Power supply Mode	Mode 1: EUT power by adapter via power cable
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

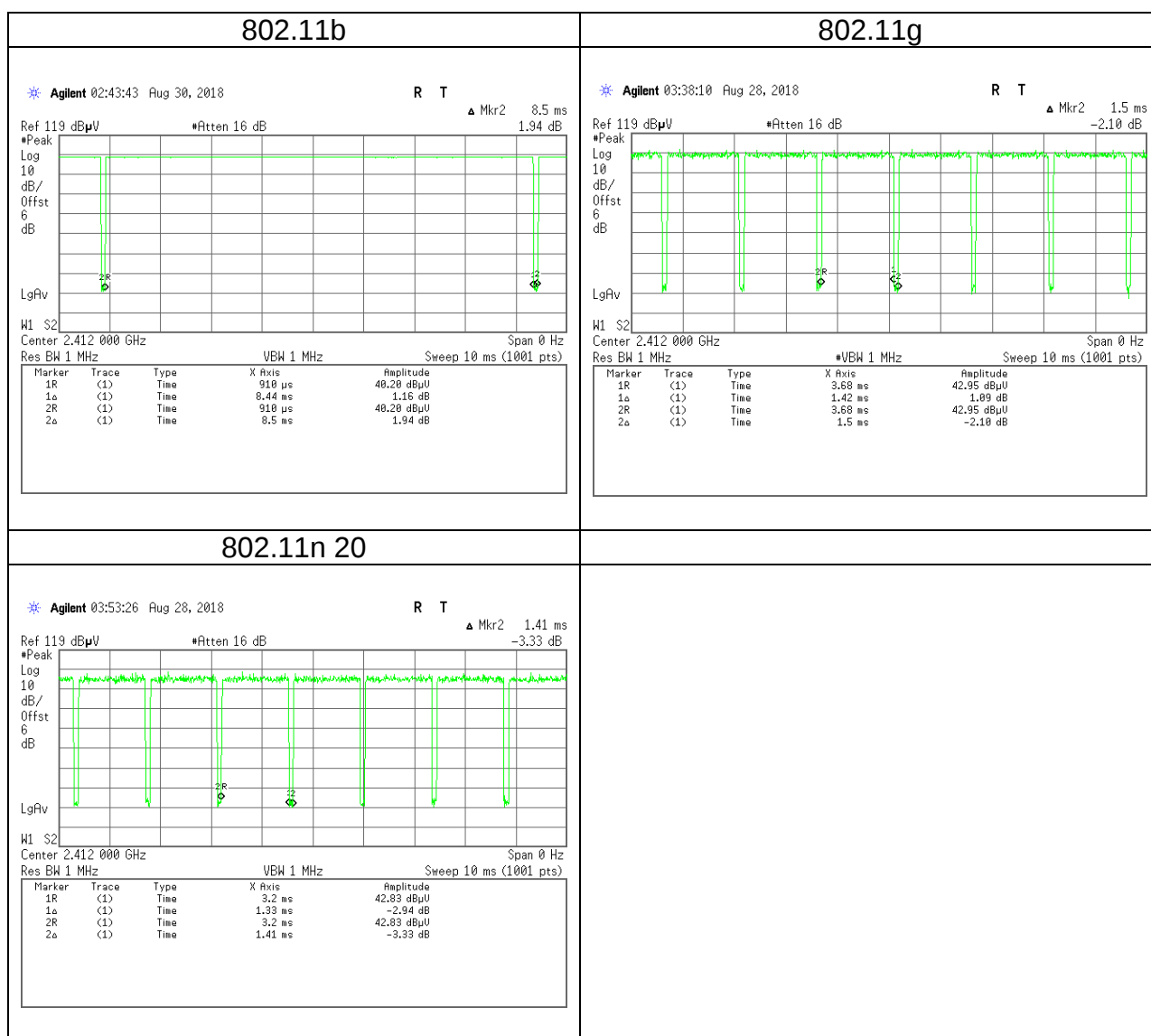
Remark:

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 Vertical) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

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4. EUT DUTY CYCLE

Duty Cycle			
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)
802.11b	8.4400	8.5000	99.29%
802.11g	1.4200	1.5000	94.67%
802.11n 20	1.3300	1.4100	94.33%



5. TEST RESULT

5.1 AC POWER LINE CONDUCTED EMISSION

5.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dB μ V)	
	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

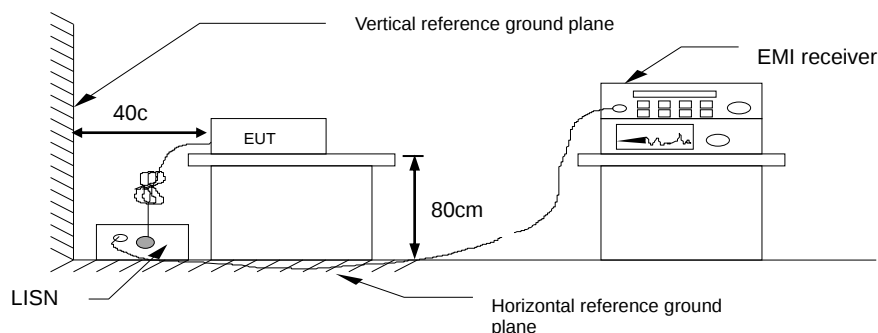
* Decreases with the logarithm of the frequency.

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

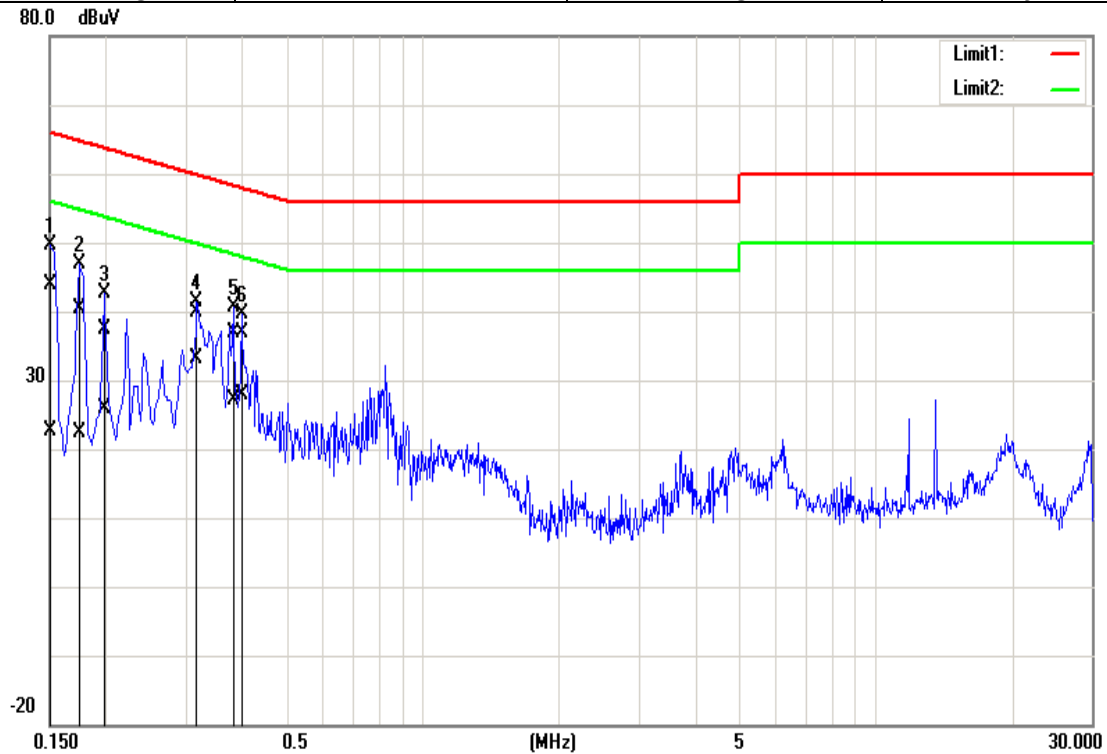


5.1.4 Test Result

Pass.

Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Phase:	Line	Test Date	September 6, 2018
Test Voltage:	120Vac	Test Engineer	Dally Hong

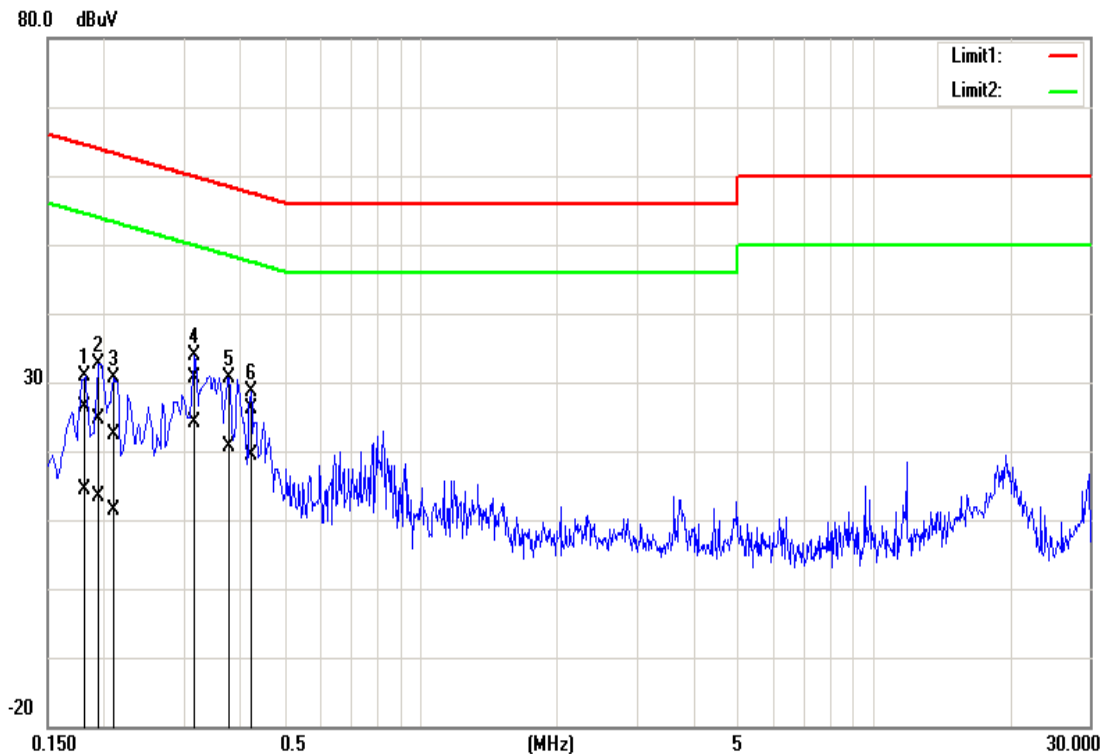


Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1500	43.88	22.59	0.11	43.99	22.70	65.99	56.00	-22.00	-33.30	Pass
0.1740	40.25	22.29	0.11	40.36	22.40	64.76	54.77	-24.40	-32.37	Pass
0.1980	37.38	25.66	0.11	37.49	25.77	63.69	53.69	-26.20	-27.92	Pass
0.3180	39.81	33.06	0.12	39.93	33.18	59.76	49.76	-19.83	-16.58	Pass
0.3820	36.64	26.95	0.12	36.76	27.07	58.23	48.24	-21.47	-21.17	Pass
0.3980	36.86	27.87	0.12	36.98	27.99	57.89	47.90	-20.91	-19.91	Pass

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Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Phase:	Line	Test Date	September 6, 2018
Test Voltage:	120Vac	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
0.1820	26.16	14.32	0.13	26.29	14.45	64.39	54.39	-38.10	-39.94	Pass
0.1945	24.48	13.37	0.13	24.61	13.50	63.84	53.84	-39.23	-40.34	Pass
0.2117	22.20	11.32	0.13	22.33	11.45	63.14	53.14	-40.81	-41.69	Pass
0.3180	30.38	23.91	0.13	30.51	24.04	59.76	49.76	-29.25	-25.72	Pass
0.3780	30.47	20.43	0.13	30.60	20.56	58.32	48.32	-27.72	-27.76	Pass
0.4220	25.96	19.13	0.13	26.09	19.26	57.41	47.41	-31.32	-28.15	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
-------	--------------------------

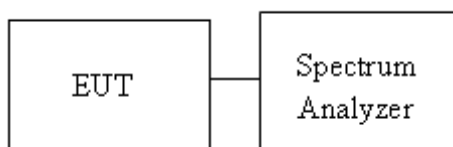
Occupied Bandwidth(99%) : For reporting purposes only.

5.2.2 Test Procedure

Test method Refer as KDB 558074 D01 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

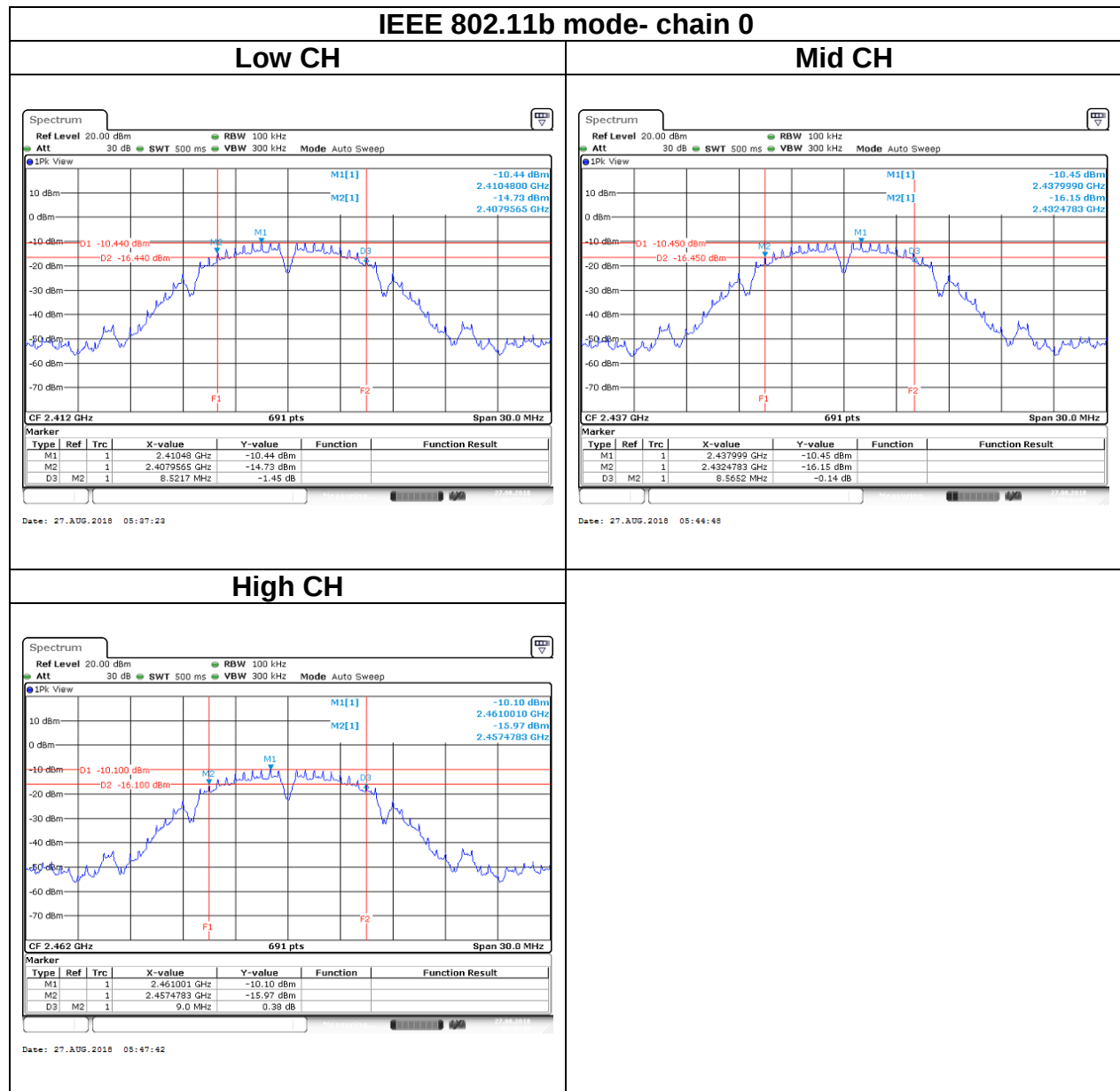
Test mode: IEEE 802.11b mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain 0 OBW(99%) (MHz)	Chain 1 OBW(99%) (MHz)	Chain 0 6dB BW (MHz)	Chain 1 6dB BW (MHz)	6dB limit (kHz)
Low	2412	12.0694	11.9826	8.5217	8.087	≥500
Mid	2437	12.0260	12.0260	8.5652	9.0	
High	2462	12.1128	12.0694	9.0	9.0	

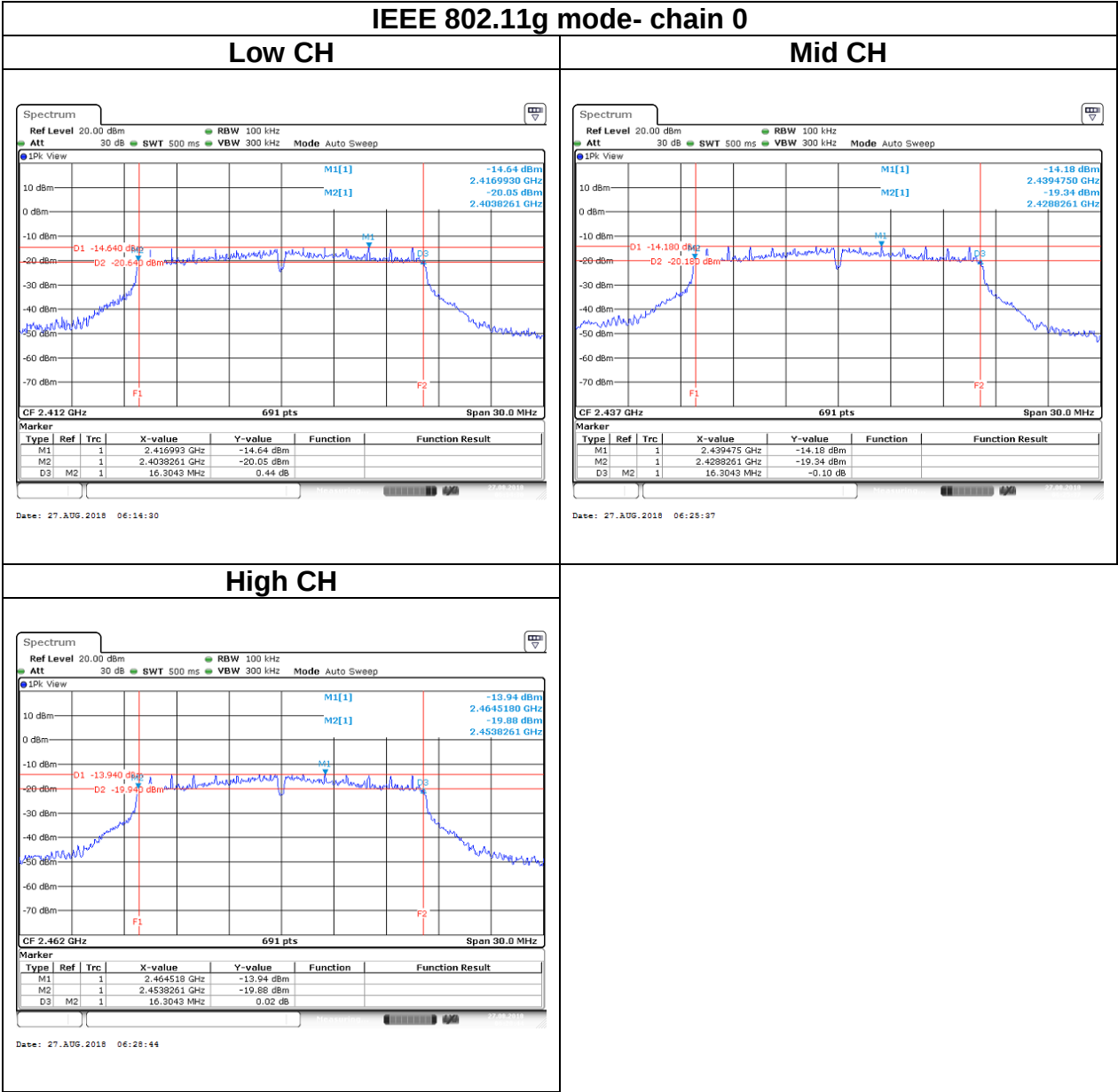
Test mode: IEEE 802.11g mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain 0 OBW(99%) (MHz)	Chain 1 OBW(99%) (MHz)	Chain 0 6dB BW (MHz)	Chain 1 6dB BW (MHz)	6dB limit (kHz)
Low	2412	16.6714	16.6280	16.3043	16.3043	≥500
Mid	2437	16.6714	16.6714	16.3043	16.3043	
High	2462	16.5412	16.5412	16.3043	16.0435	

Test mode: IEEE 802.11n 20 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	17.8871	17.9739	17.5217	17.5217	≥500
Mid	2437	17.9305	17.8437	17.5217	17.1304	
High	2462	17.8002	17.7568	16.4348	16.4783	

Test Data

6dB BANDWIDTH





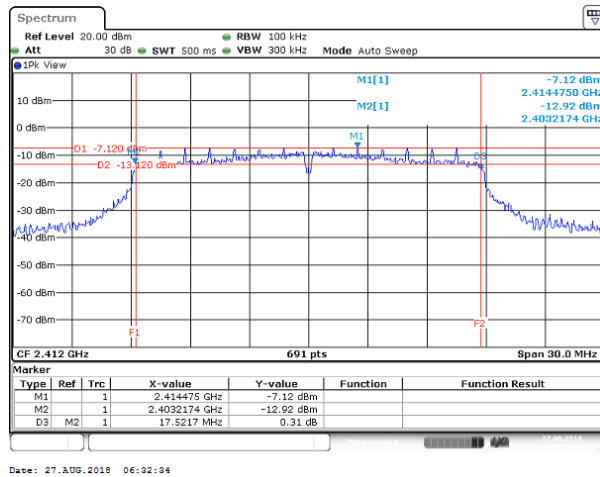


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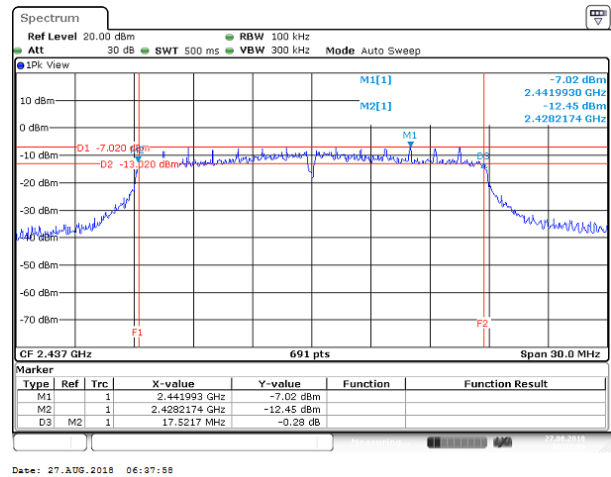
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IEEE 802.11n 20 mode- chain 0

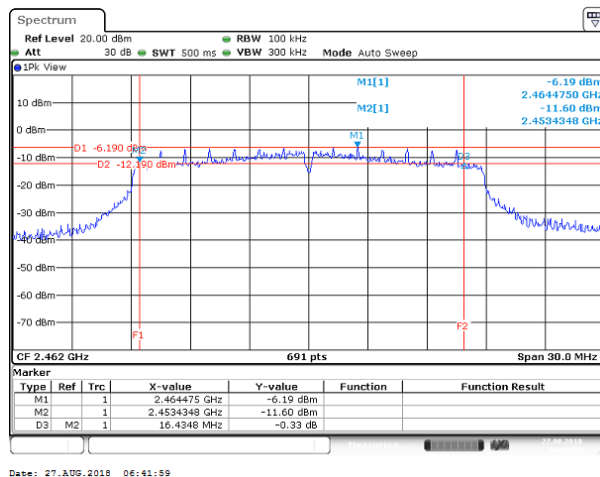
Low CH



Mid CH

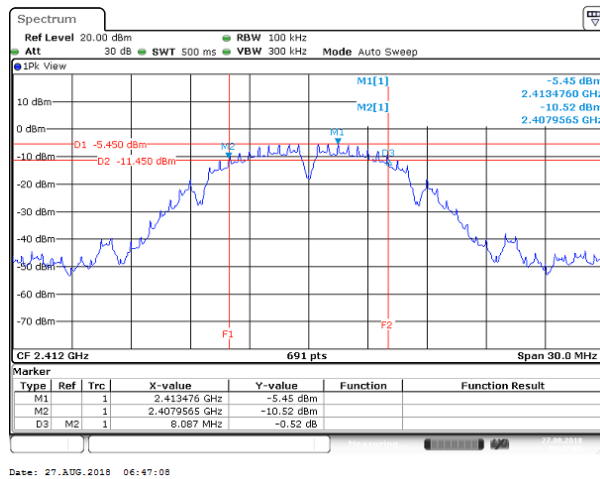


High CH

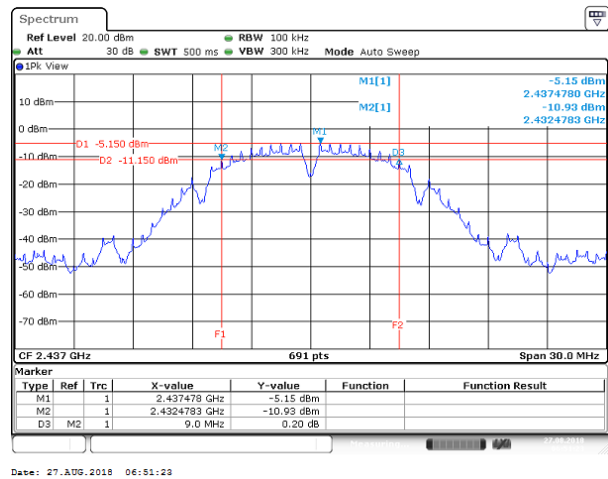


IEEE 802.11b mode- chain 1

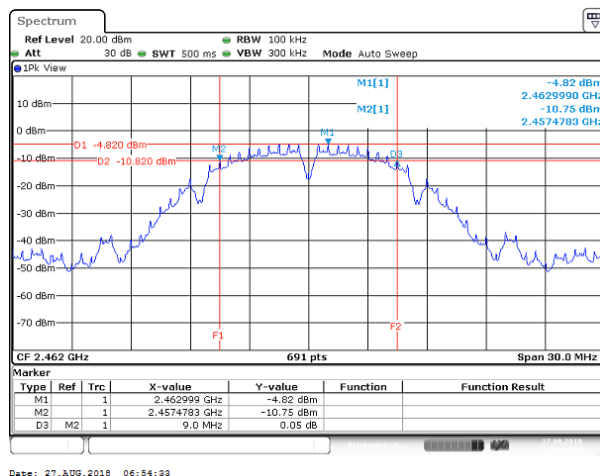
Low CH

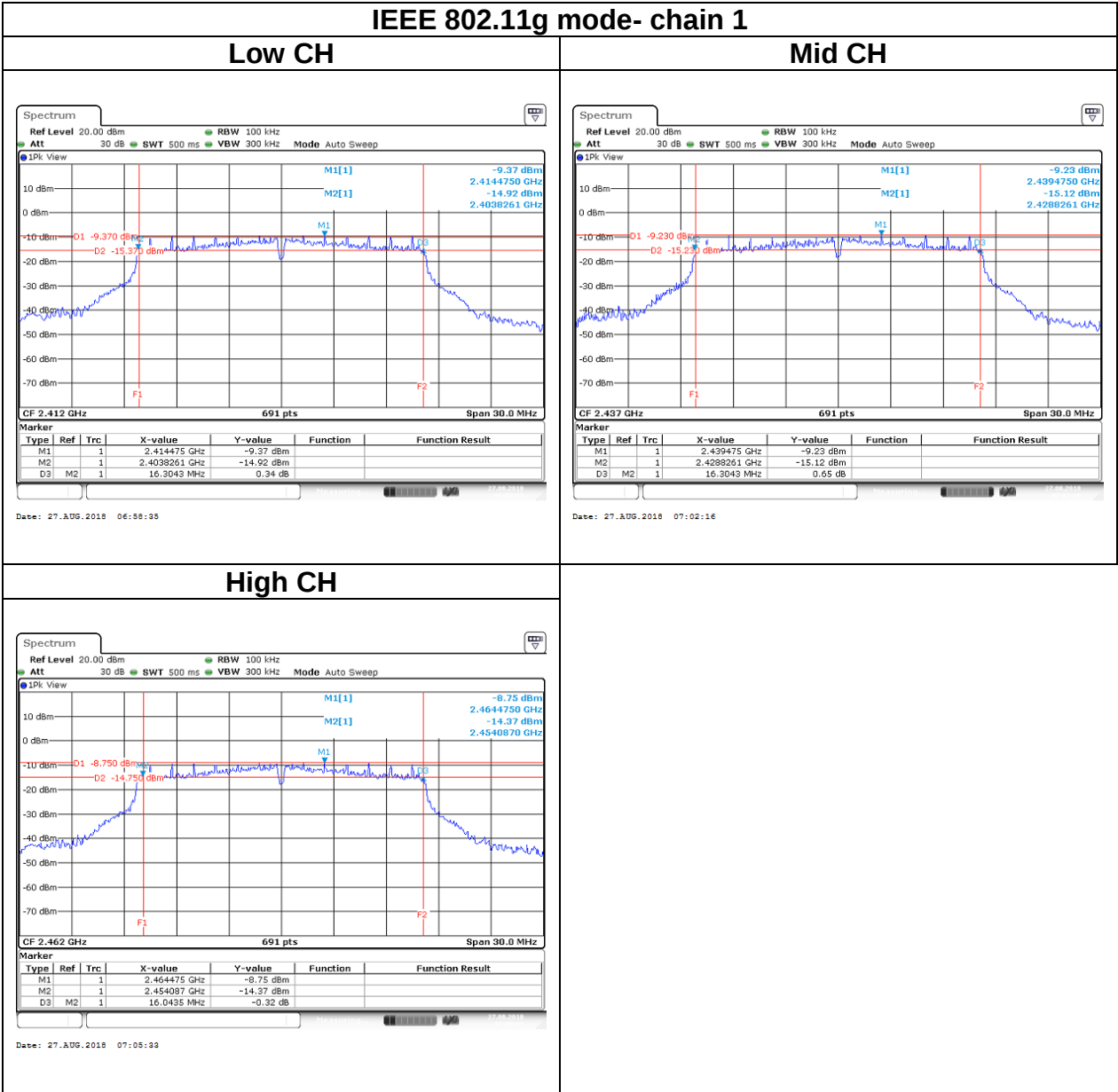


Mid CH

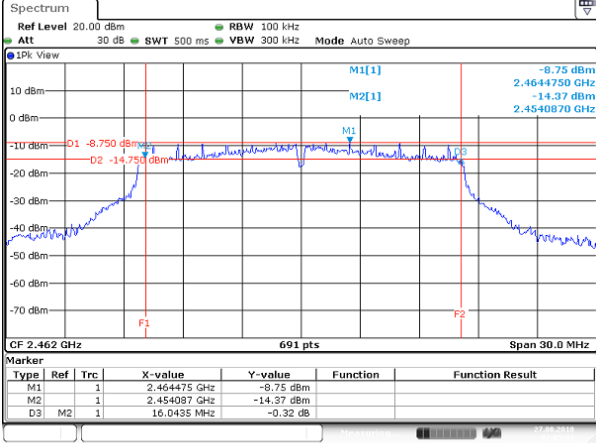


High CH





High CH



Spectrum

Ref Level 20.00 dBm

Att 30 dB

RBW 100 kHz

SWT 500 ms

VBW 300 kHz

Mode Auto Sweep

1Pk View

M1[1]

-8.75 dBm

2.4644750 GHz

M2[1]

-14.37 dBm

2.4540870 GHz

D1

-8.750 dBm

D2

-14.750 dBm

CF 2.462 GHz

691 pts

Span 30.0 MHz

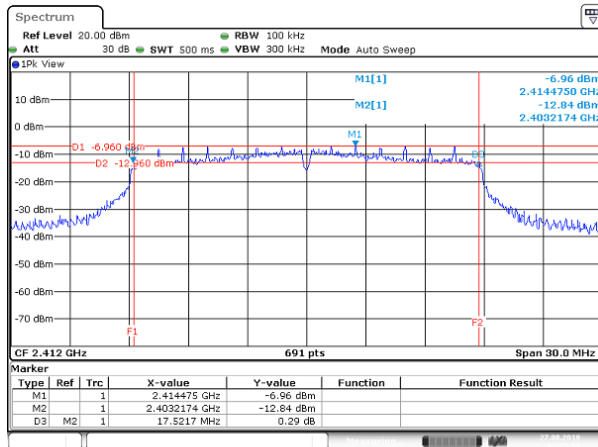
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.464475 GHz	-8.75 dBm		
M2		1	2.454087 GHz	-14.37 dBm		
D3	M2	1	16.0435 MHz	-0.32 dB		

Date: 27.AUG.2018 07:05:33

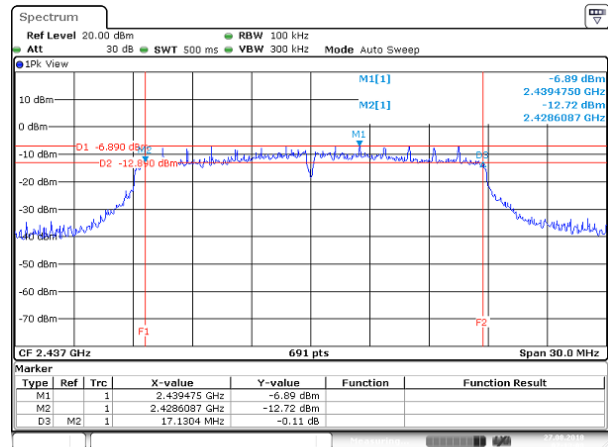
IEEE 802.11n 20 mode- chain 1

Low CH



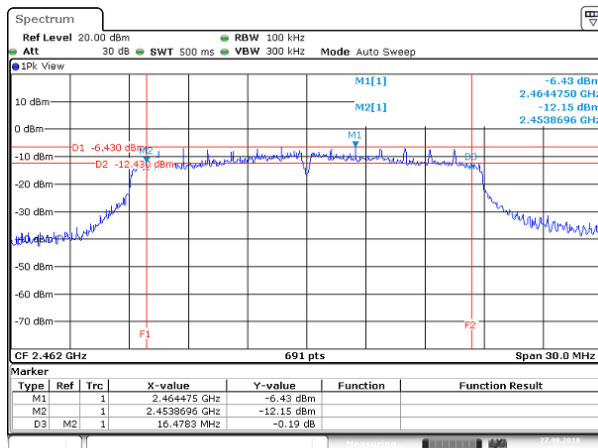
Date: 27.AUG.2018 07:09:58

Mid CH



Date: 27.AUG.2018 07:13:08

High CH



Date: 27.AUG.2018 07:15:54

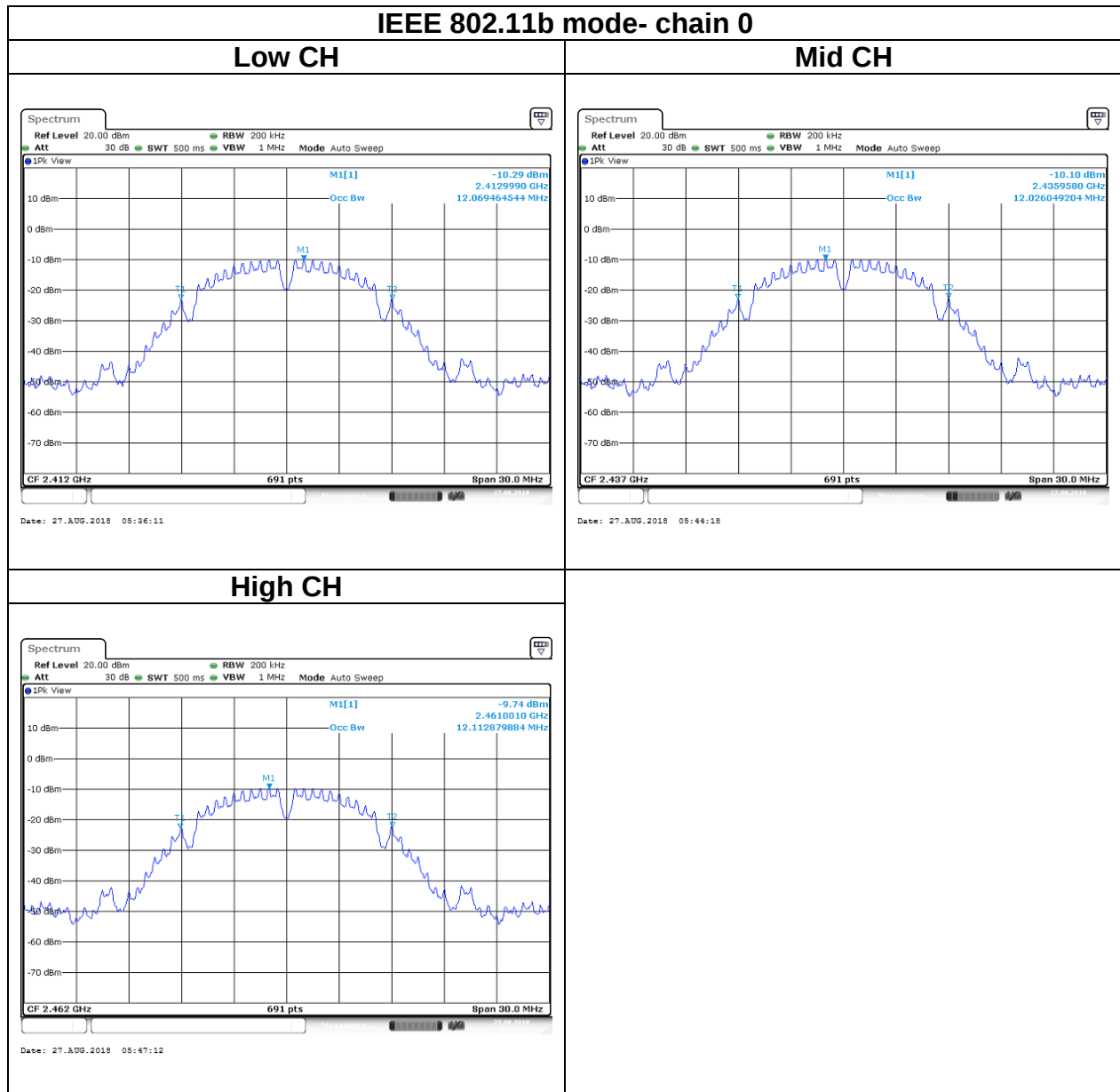


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Test Data

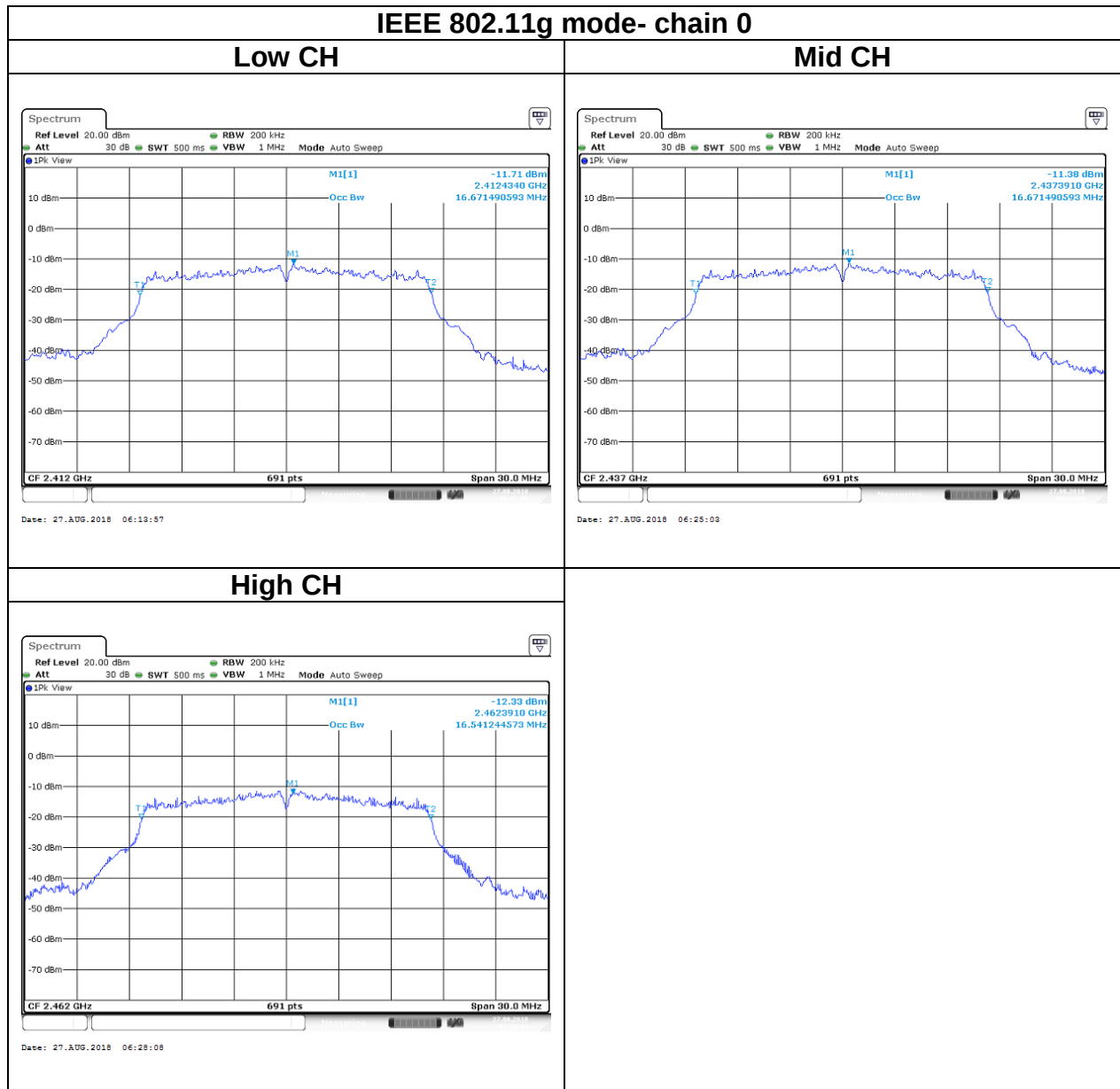
BANDWIDTH (99%)





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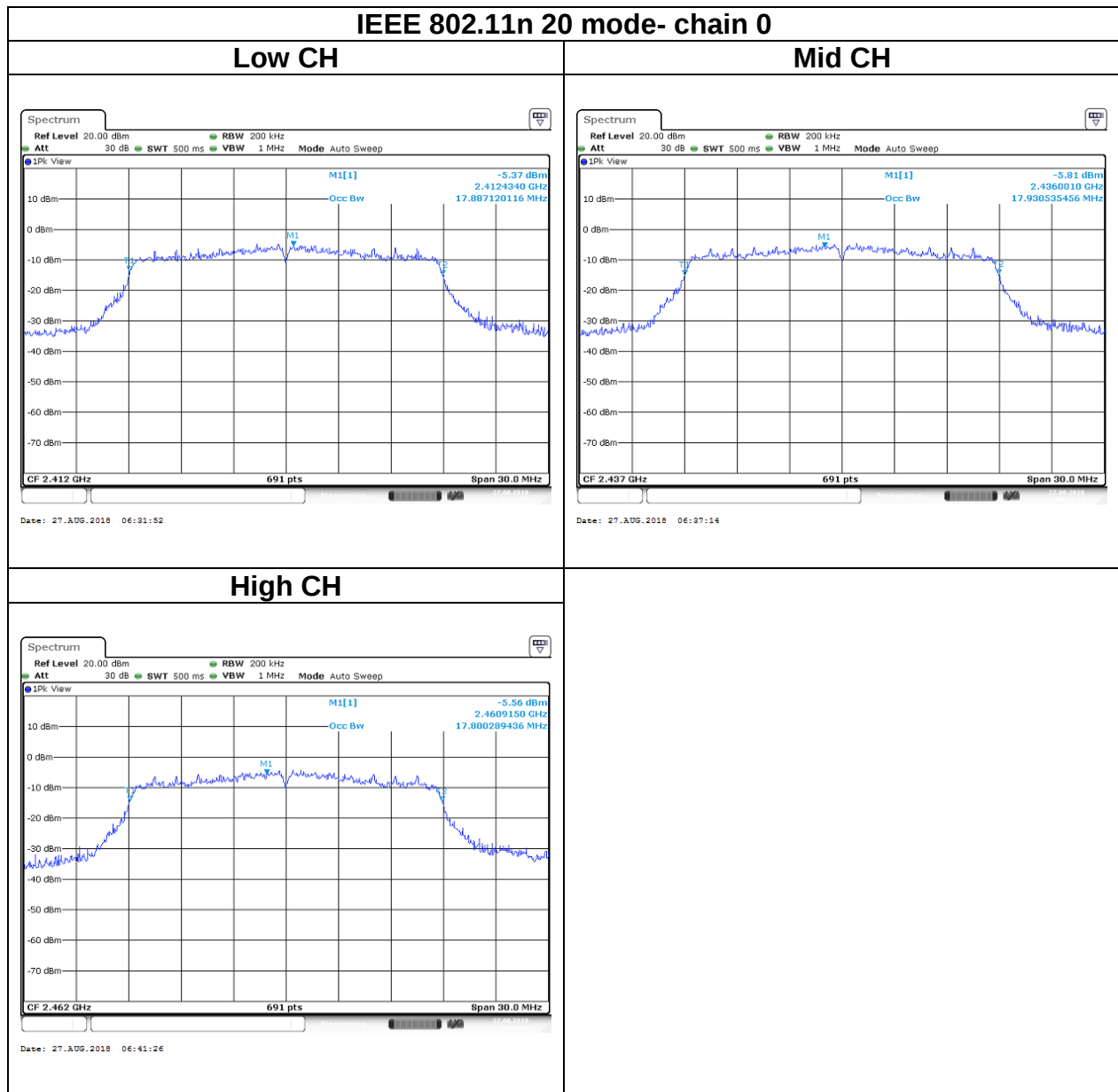
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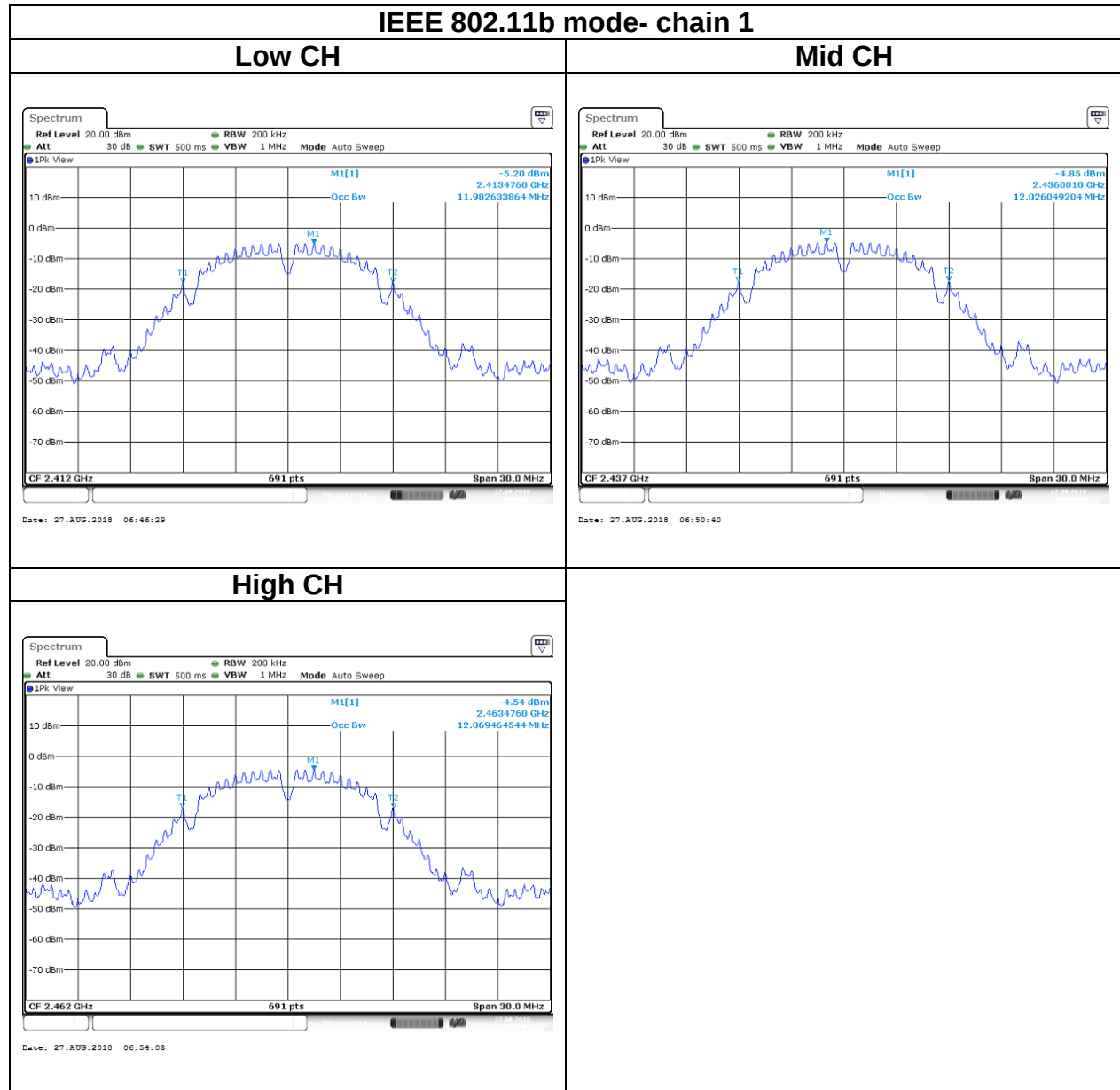




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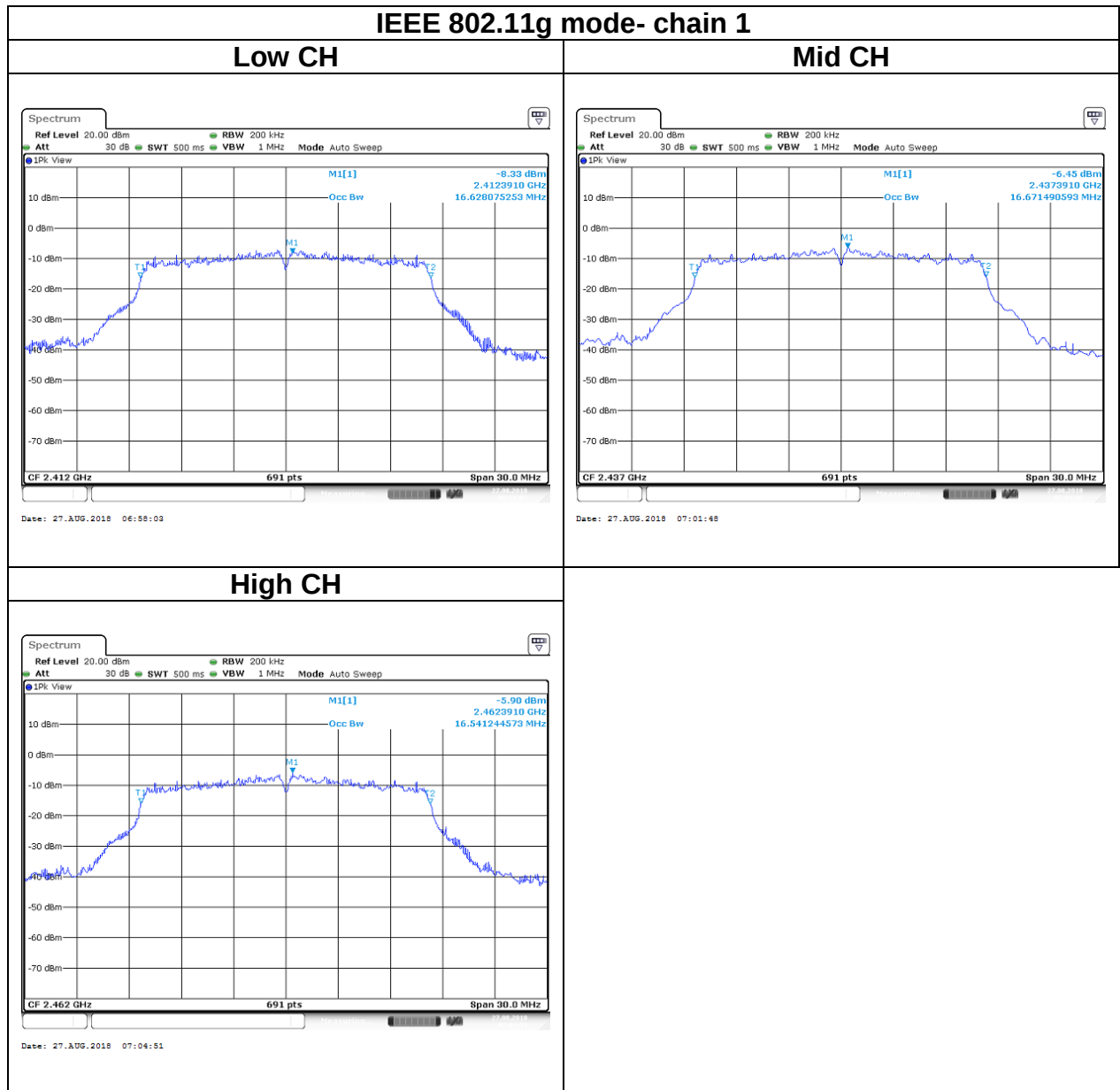






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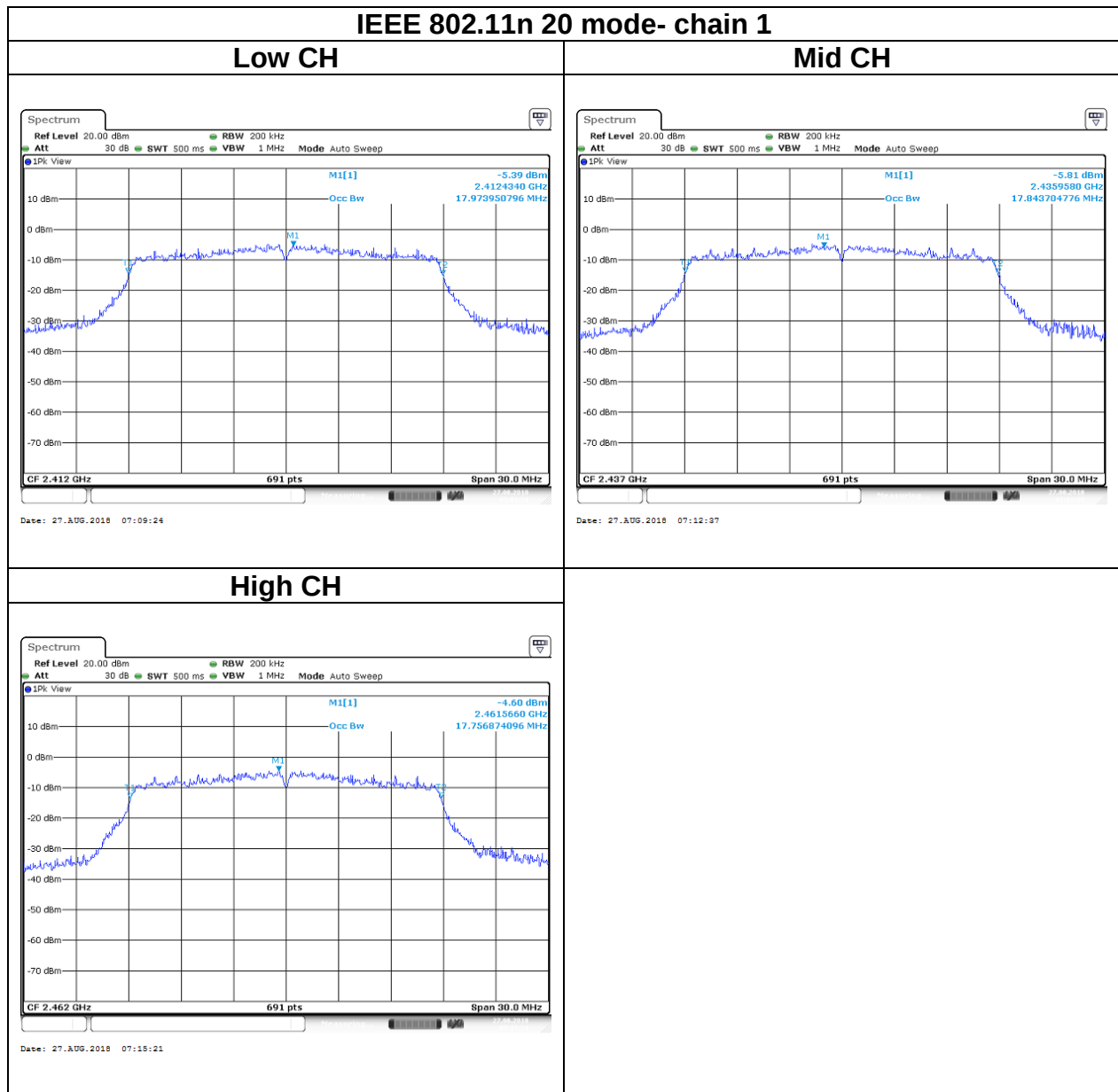
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5.3 OUTPUT POWER MEASUREMENT

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 :
-------	---

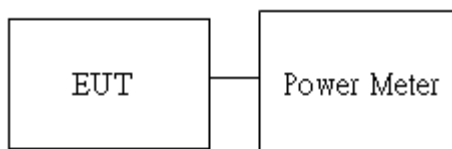
Average output power : For reporting purposes only.

5.3.2 Test Procedure

Test method Refer as KDB 558074 D01.

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 Power (dBm)	PK Power (W)	Limit (dBm)
				Chain 0	Chain 1		
IEEE 802.11b mode Data rate: 1Mbps	Low	2412	-1	18.78	-	0.0755	30
	Mid	2437	-1	19.18	-	0.0828	
	High	2462	-1	19.26	-	0.0843	
IEEE 802.11g mode Data rate: 6Mbps	Low	2412	-1	23.59	-	0.2286	
	Mid	2437	-1	23.95	-	0.2483	
	High	2462	-1	24.01	-	0.2518	
IEEE 802.11n 20 mode Data rate: MCS0	Low	2412	-1	23.92	-	0.2466	
	Mid	2437	-1	24.02	-	0.2523	
	High	2462	-1	24.07	-	0.2553	

Average output power :

Wifi 2.4G					
Config	CH	Freq. (MHz)	AV Power(dBm)		AV Total Power (dBm)
			chain0	chain1	
IEEE 802.11b mode Data rate: 1Mbps	Low	2412	15.91	-	15.91
	Mid	2437	16.25	-	16.25
	High	2462	16.35	-	16.35
IEEE 802.11g mode Data rate: 6Mbps	Low	2412	14.67	-	14.67
	Mid	2437	14.98	-	14.98
	High	2462	15.22	-	15.22
IEEE 802.11n 20 mode Data rate: MCS0	Low	2412	16.68	-	16.68
	Mid	2437	16.81	-	16.81
	High	2462	17.15	-	17.15



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Peak output power :

Wifi 2.4G							
Config	CH	Freq. (MHz)	power set	PK Power (dBm)	PK Power (dBm)	PK Power (W)	Limit (dBm)
				Chain 0	Chain 1		
IEEE 802.11b mode Data rate: 1Mbps	Low	2412	-1	-	19.05	0.0804	30
	Mid	2437	-1	-	19.11	0.0815	
	High	2462	-1	-	19.42	0.0875	
IEEE 802.11g mode Data rate: 6Mbps	Low	2412	-1	-	23.69	0.2339	
	Mid	2437	-1	-	23.98	0.2500	
	High	2462	-1	-	24.08	0.2559	
IEEE 802.11n 20 mode Data rate: MCS0	Low	2412	-1	-	24.14	0.2594	
	Mid	2437	-1	-	24.22	0.2642	
	High	2462	-1	-	24.27	0.2673	

Average output power :

Wifi 2.4G					
Config	CH	Freq. (MHz)	AV Power(dBm)		AV Total Power (dBm)
			chain0	chain1	
IEEE 802.11b mode Data rate: 1Mbps	Low	2412	-	16.13	16.13
	Mid	2437	-	16.24	16.24
	High	2462	-	16.54	16.54
IEEE 802.11g mode Data rate: 6Mbps	Low	2412	-	14.71	14.71
	Mid	2437	-	14.95	14.95
	High	2462	-	15.16	15.16
IEEE 802.11n 20 mode Data rate: MCS0	Low	2412	-	16.63	16.63
	Mid	2437	-	16.91	16.91
	High	2462	-	17.02	17.02

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.

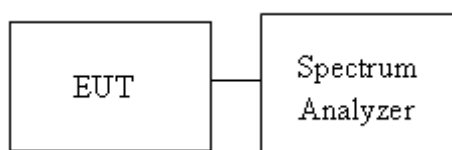
Limit	☒ Antenna not exceed 6 dBi : 8dBm ☐ Antenna with DG greater than 6 dBi : [Limit = 8 – (DG – 6)] ☐ Point-to-point operation :
-------	---

5.4.2 Test Procedure

Test method Refer as KDB 558074 D01,.

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 PPSD (dBm)	Chain 1 PPSD (dBm)	Limit (dBm)
Low	2412	-15.52	-7.52	8
Mid	2437	-15.49	-8.29	
High	2462	-13.58	-7.29	

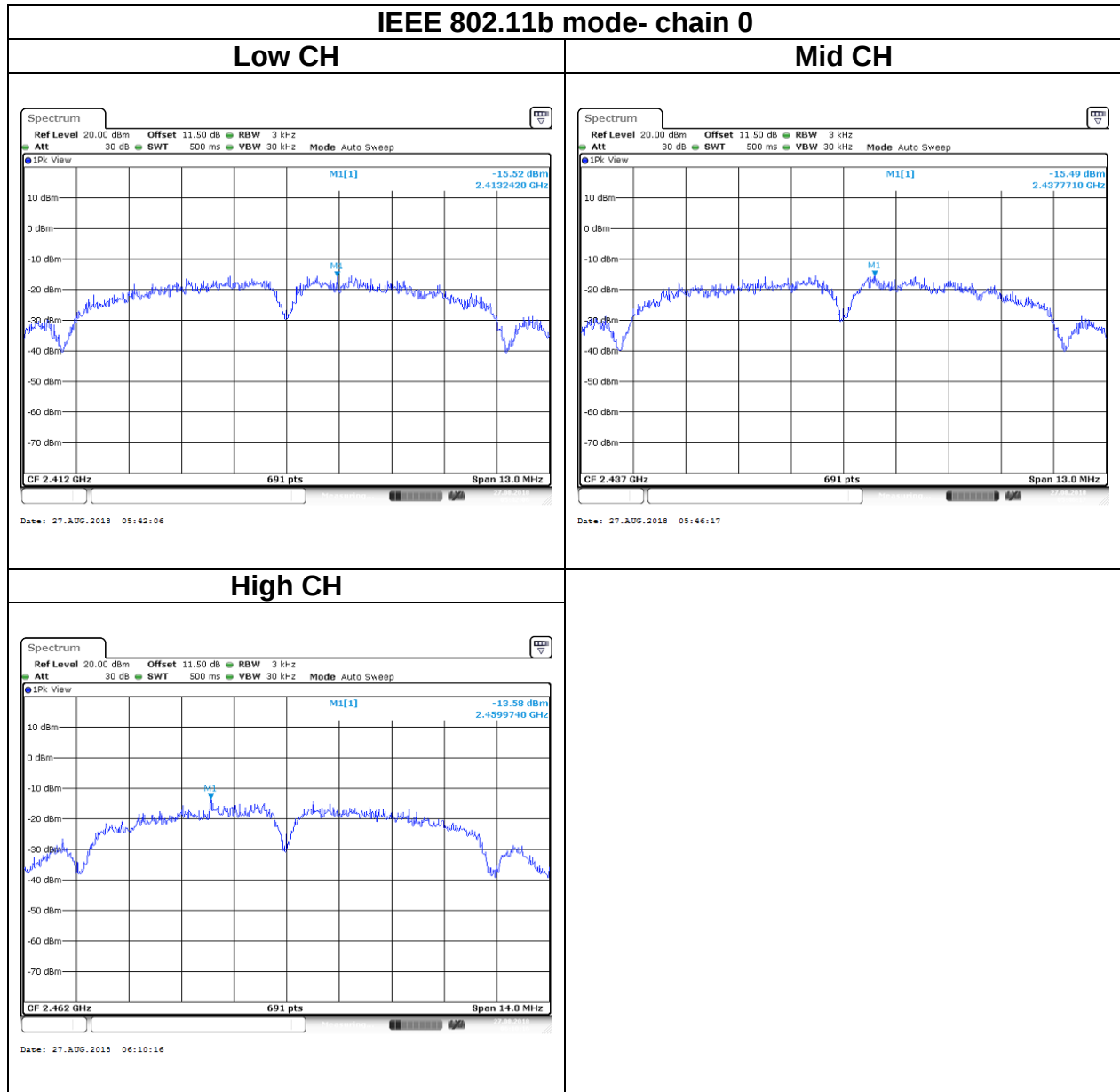
Test mode: IEEE 802.11g mode / 2412-2462 MHz				
Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	Limit (dBm)
Low	2412	-16.78	-9.35	8
Mid	2437	-16.49	-10.47	
High	2462	-9.67	-9.89	

Test mode: IEEE 802.11n 20 mode / 2412-2462 MHz				
Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	Limit (dBm)
Low	2412	-8.66	-8.57	8
Mid	2437	-8.03	-8.48	
High	2462	-8.34	-7.02	



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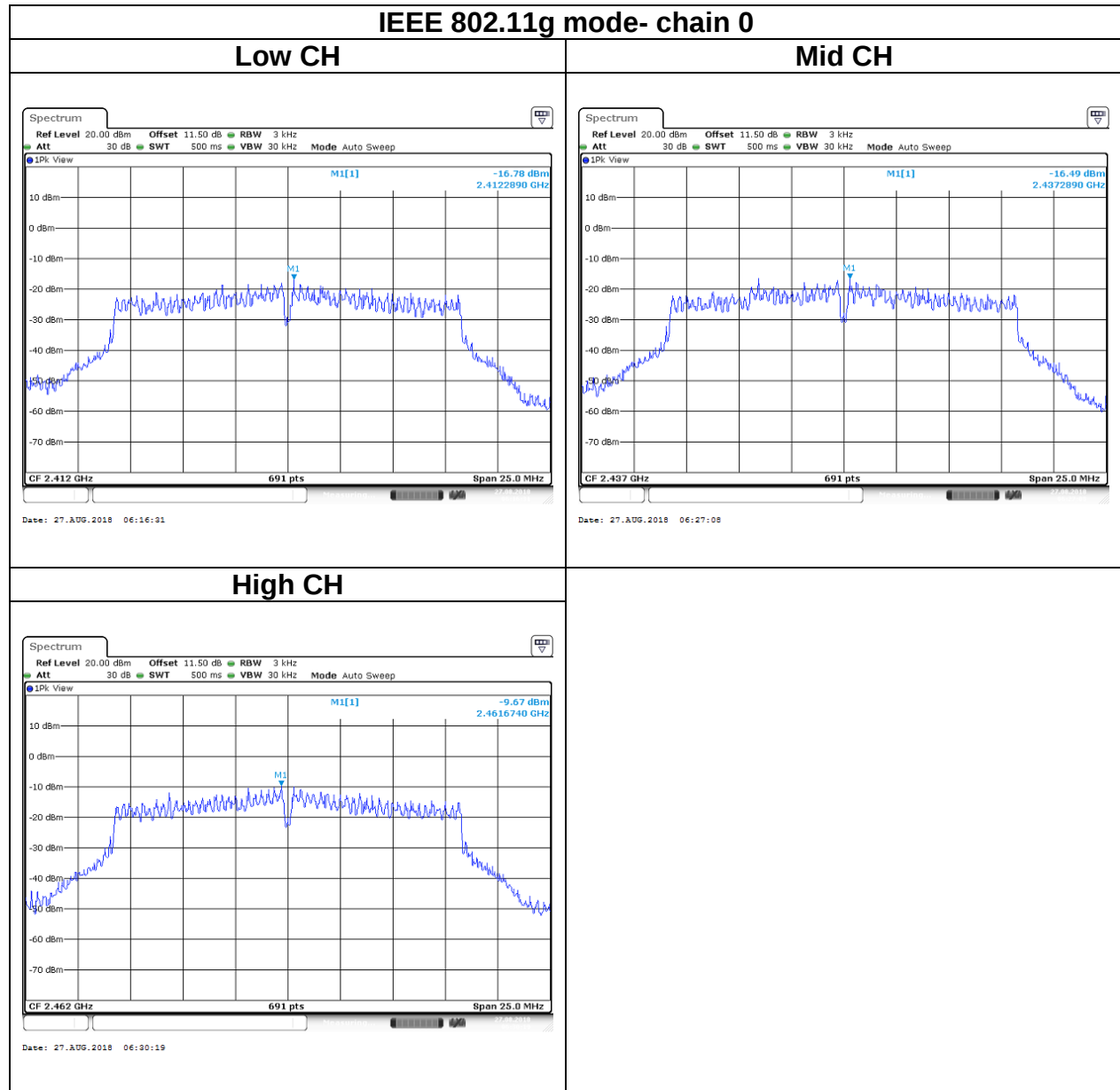
Test Data

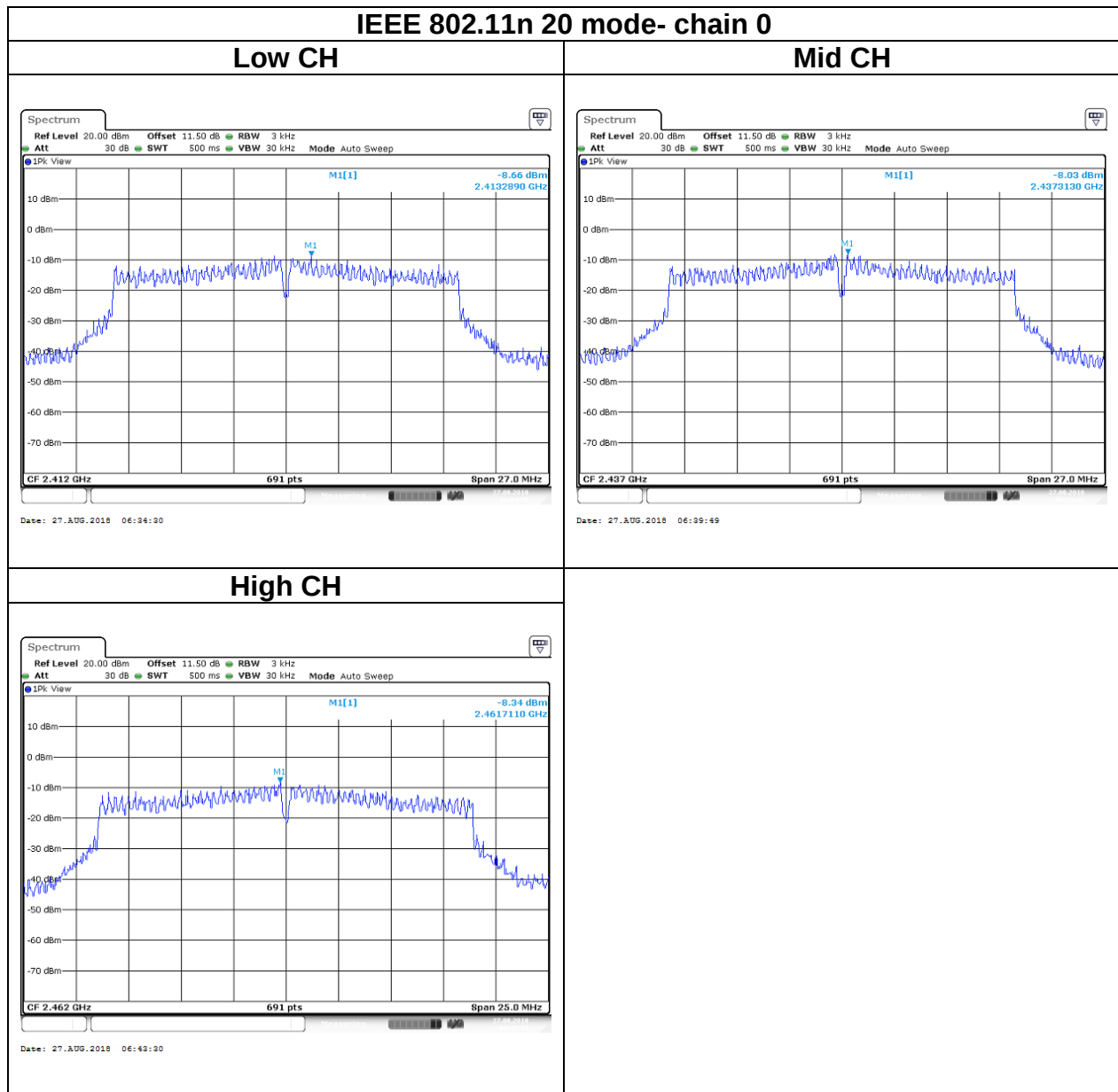




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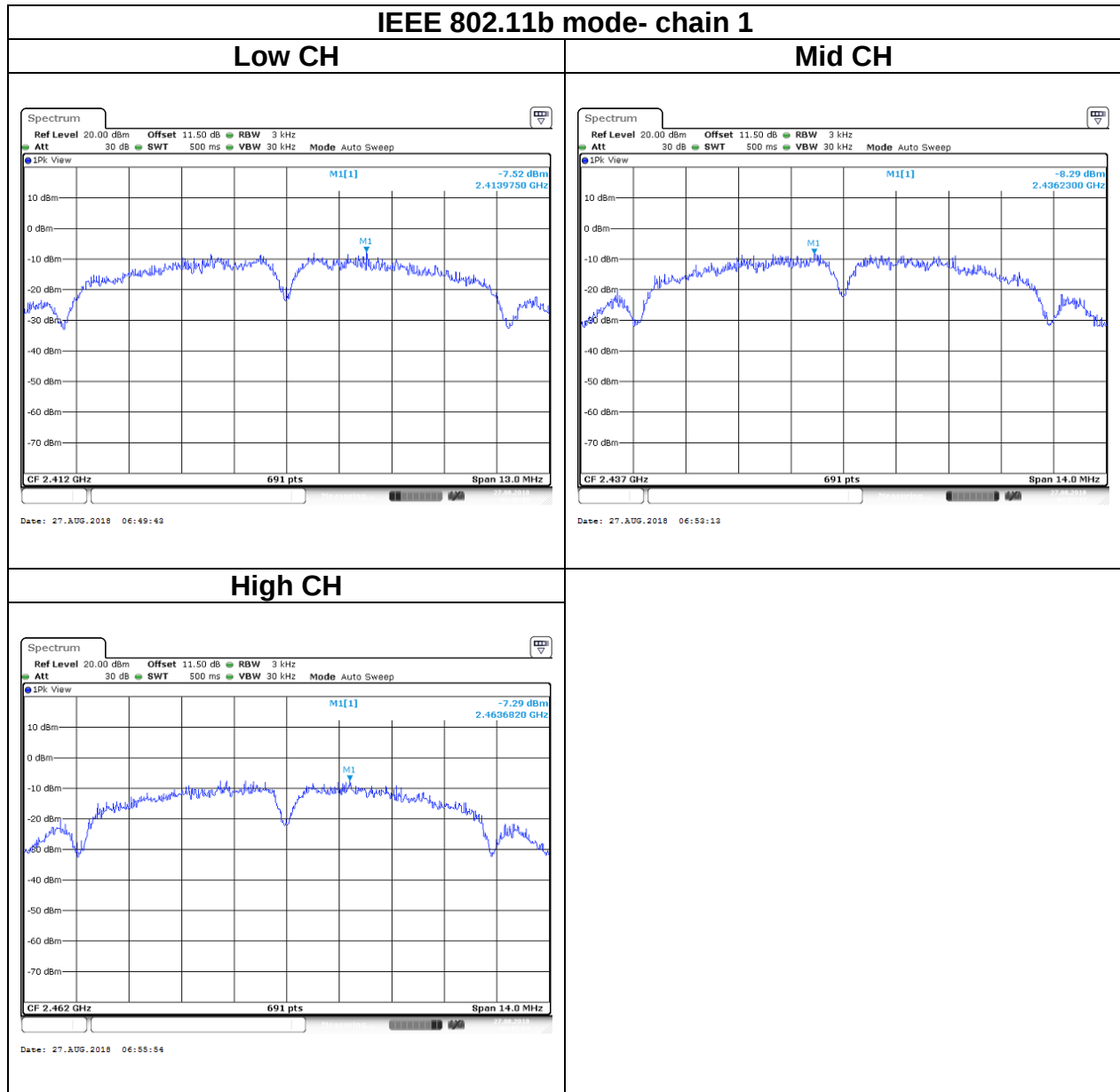






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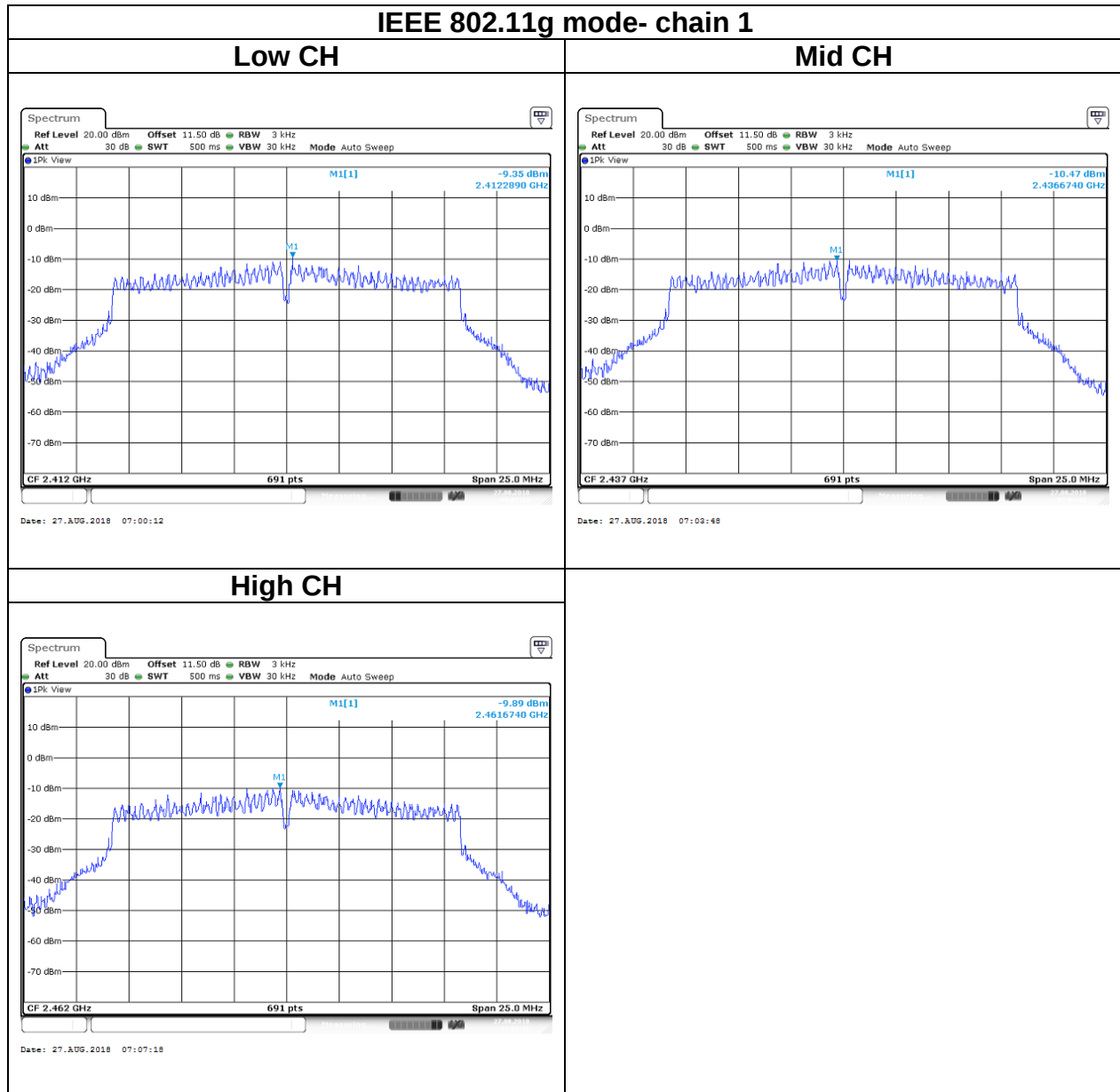
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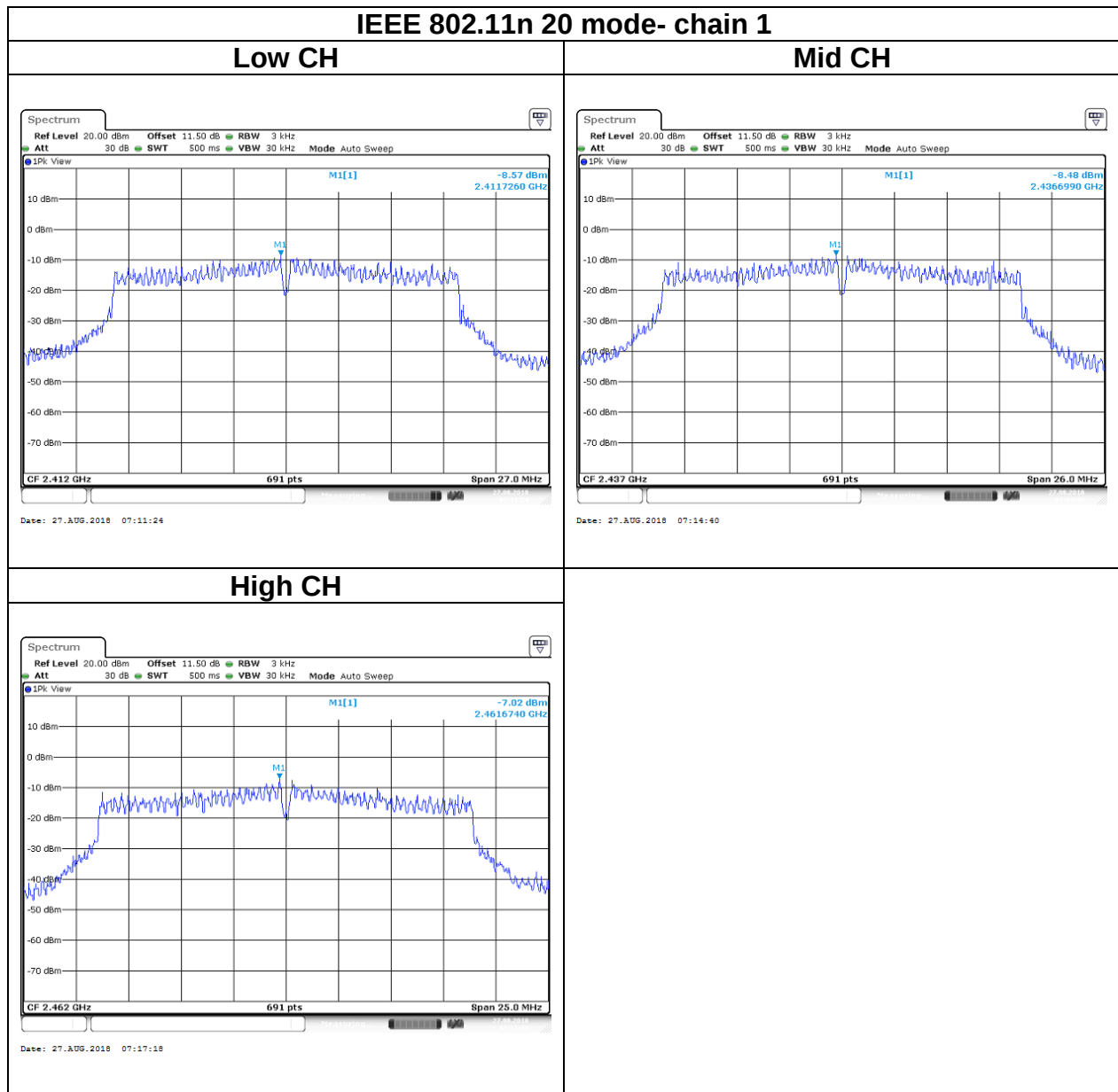
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5.5 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

5.5.1 Test Limit

According to §15.247(d),

In any 100 kHz bandwidth outside the authorized frequency band,

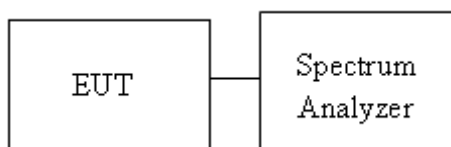
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

5.5.2 Test Procedure

Test method Refer as KDB 558074 D01.

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.

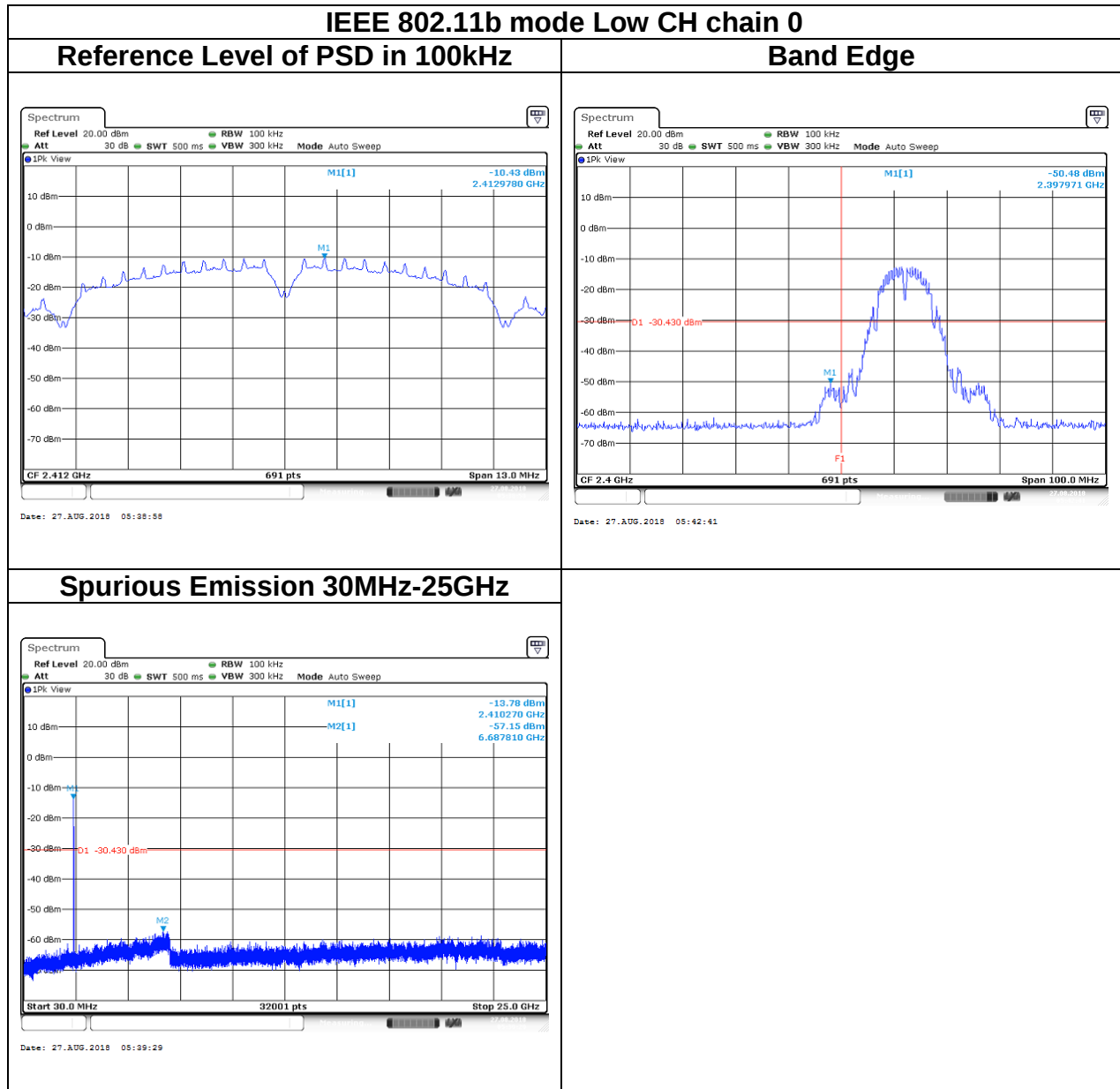
5.5.3 Test Setup



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5.5.4 Test Result

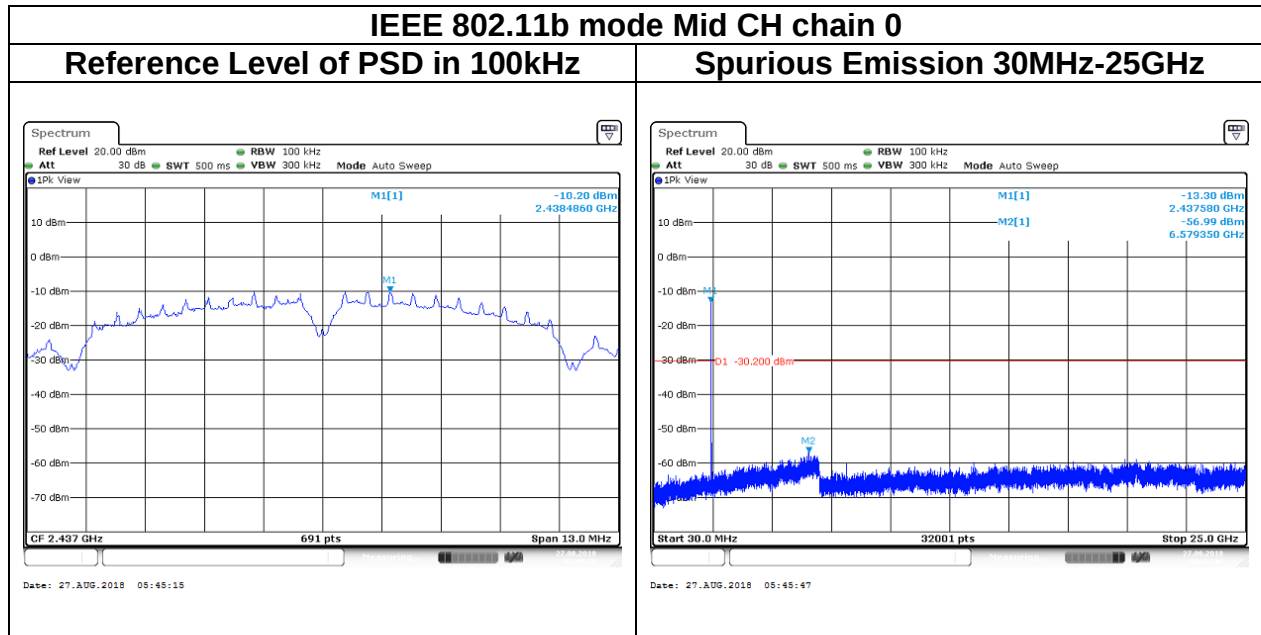
Test Data

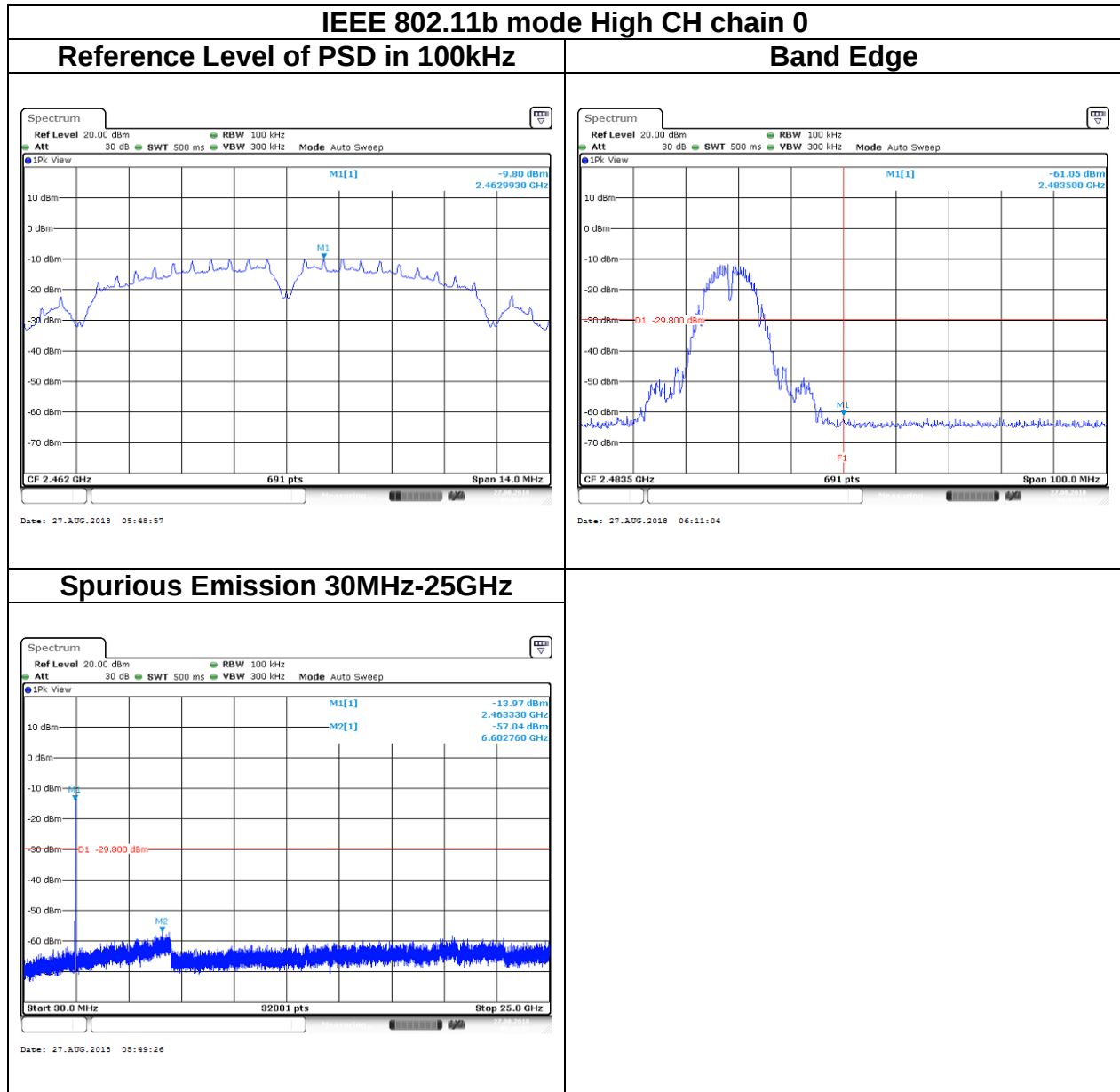


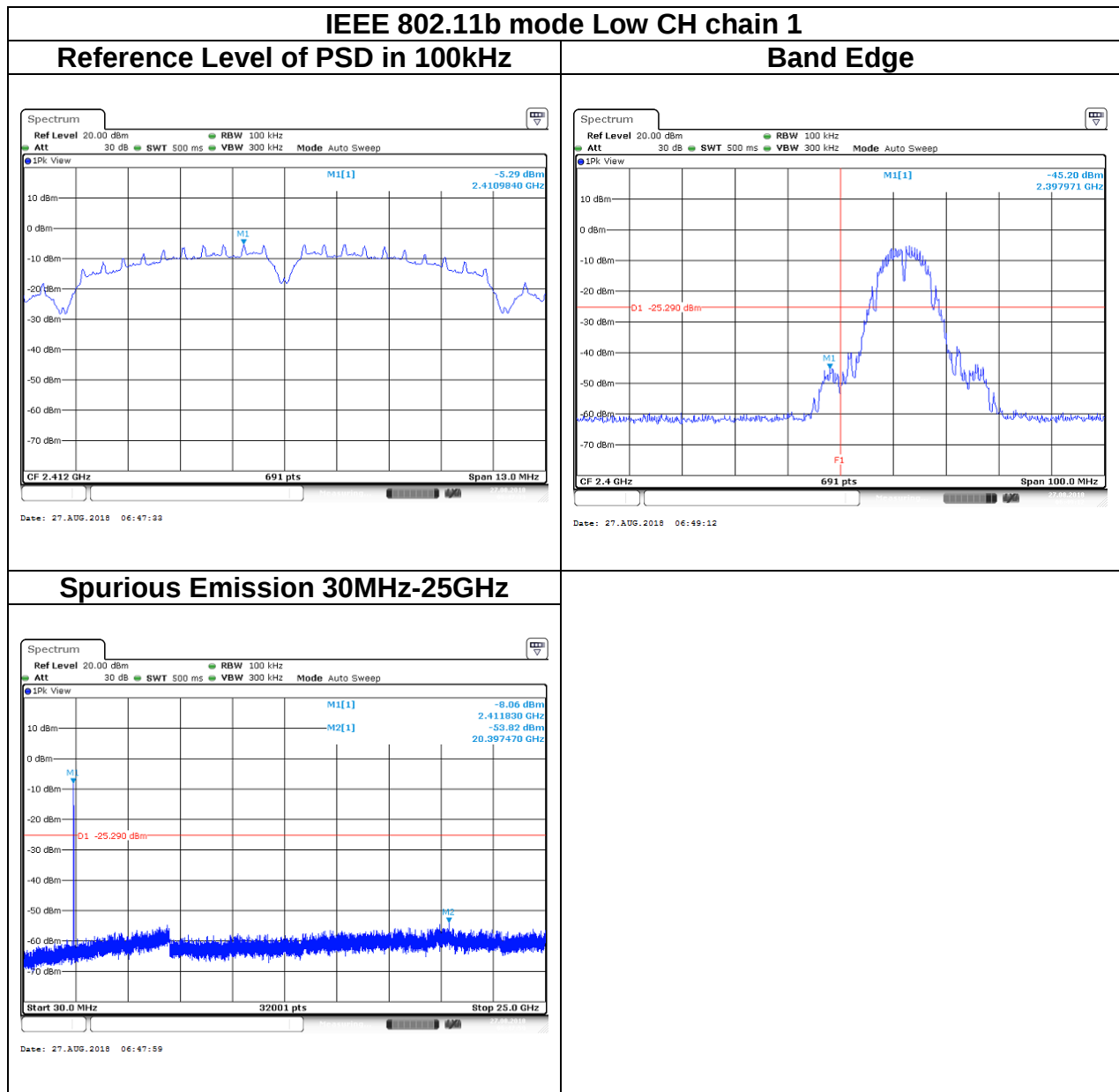


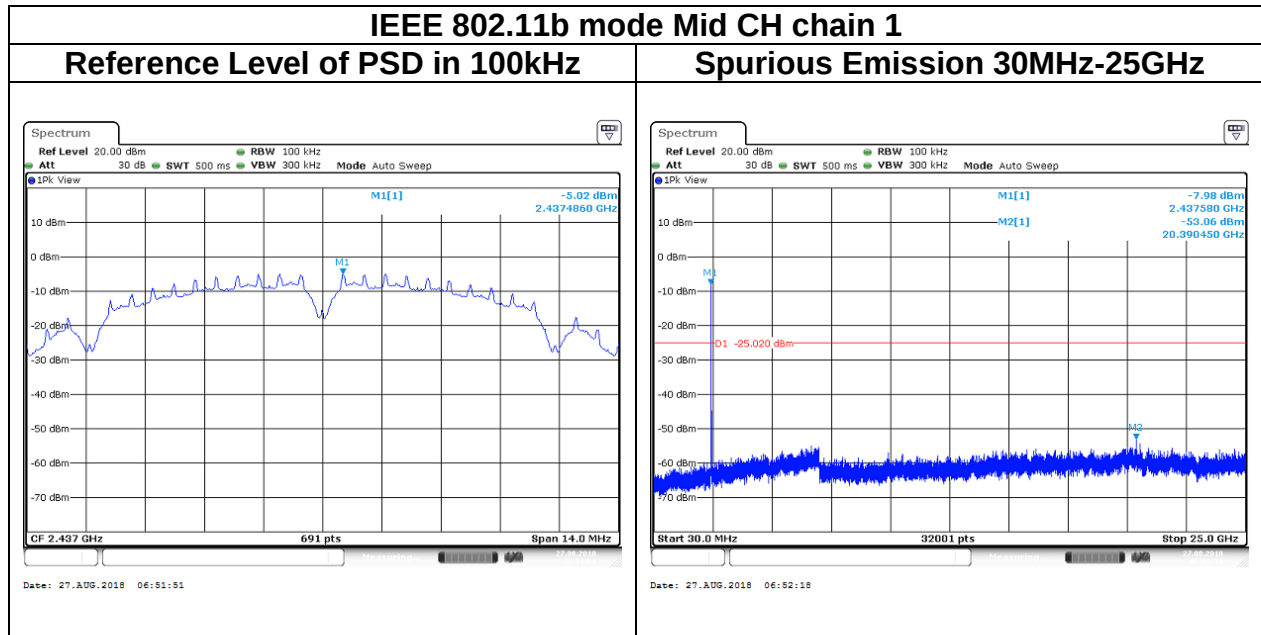
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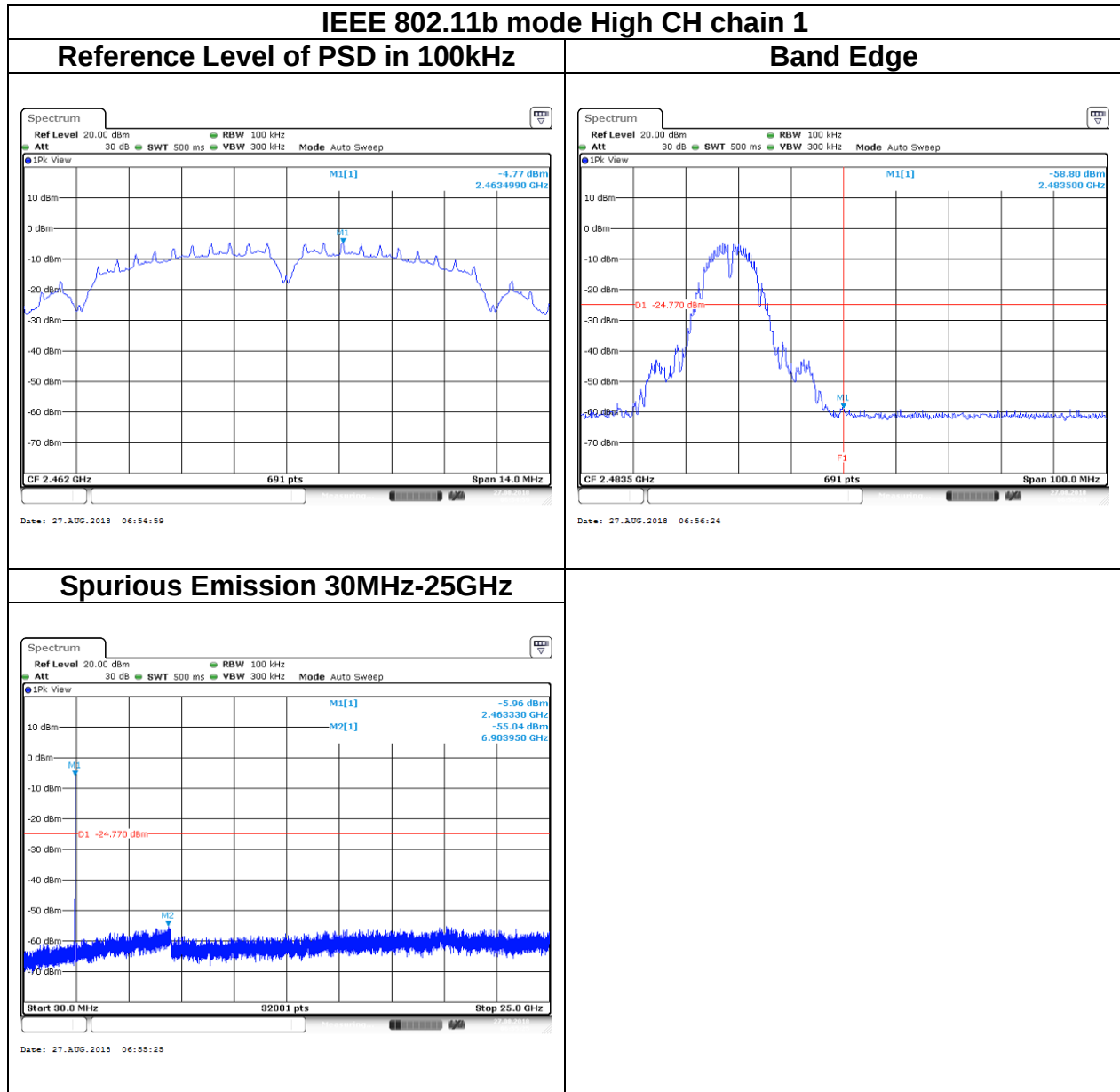
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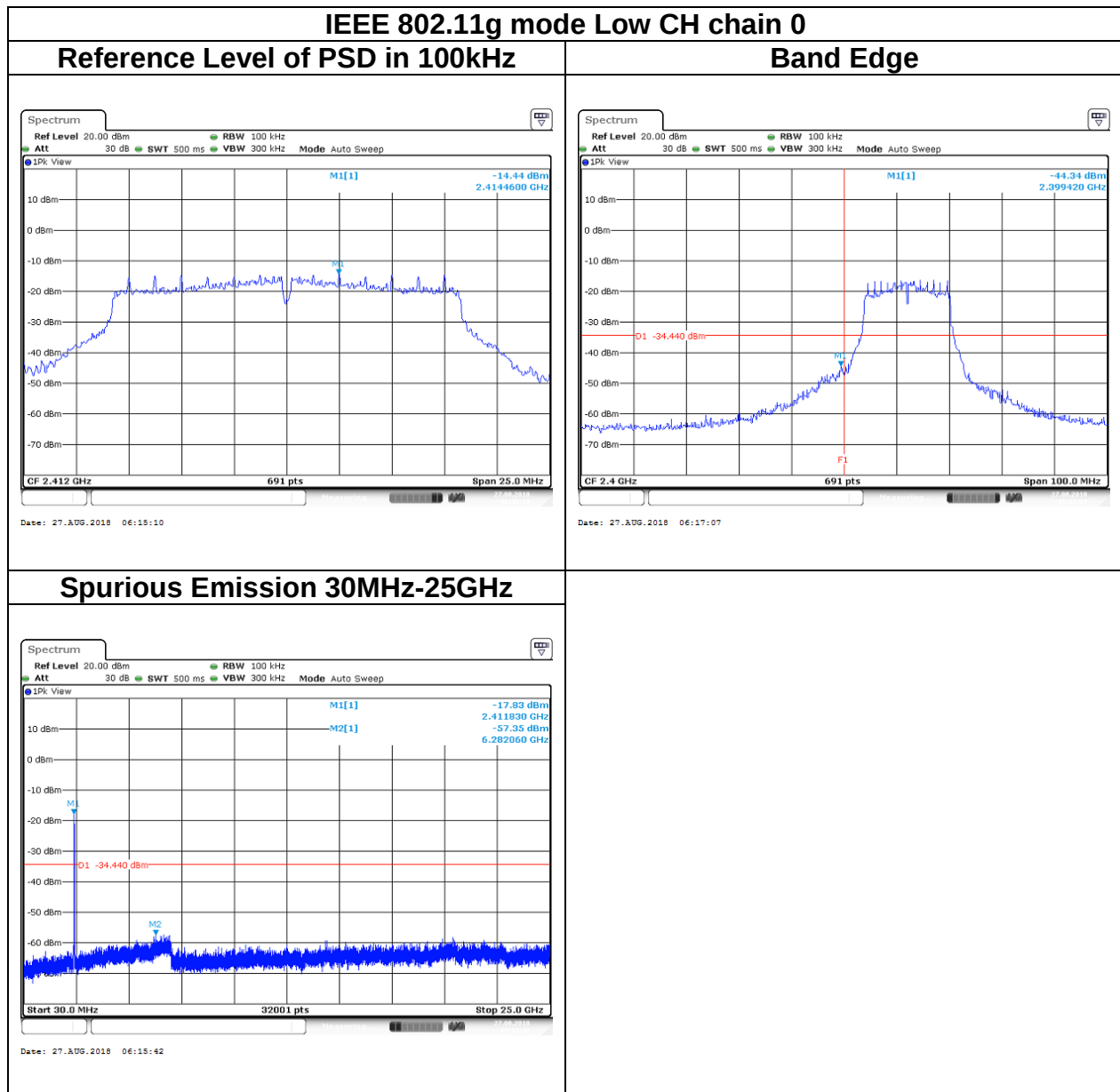


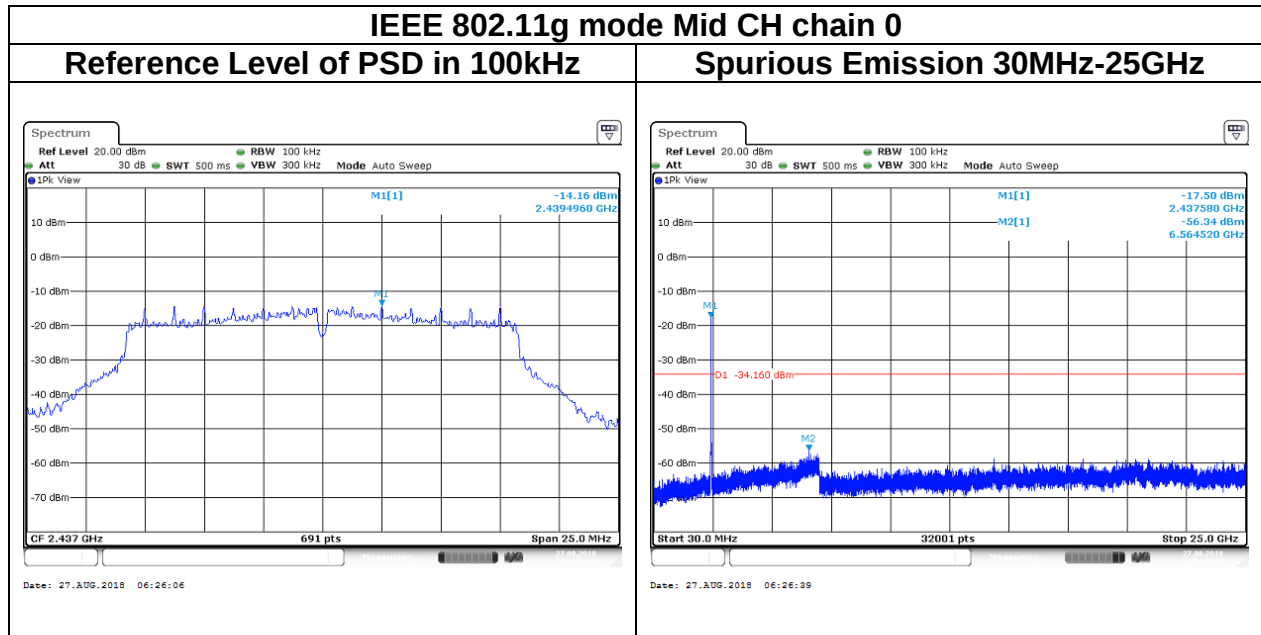


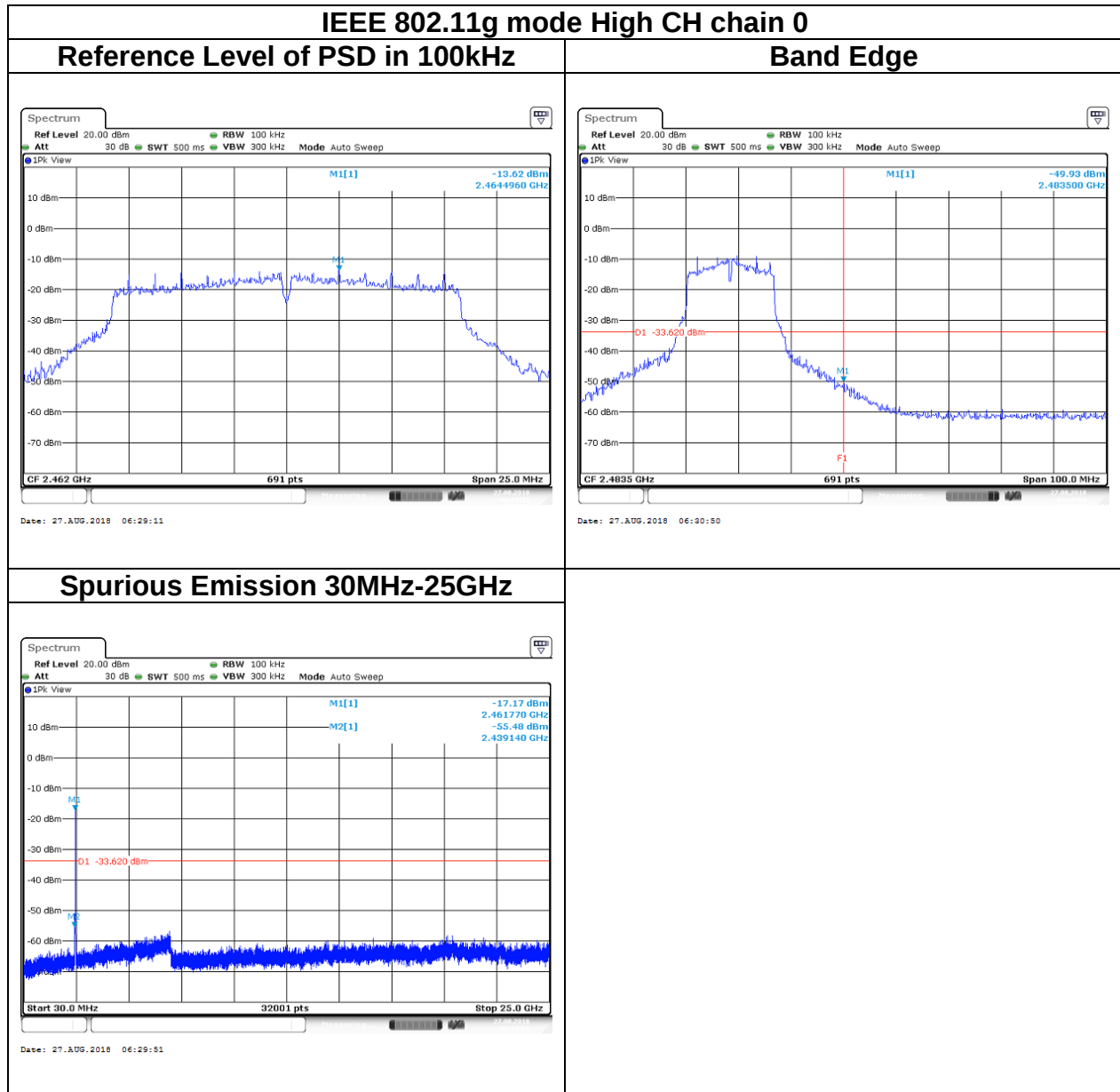


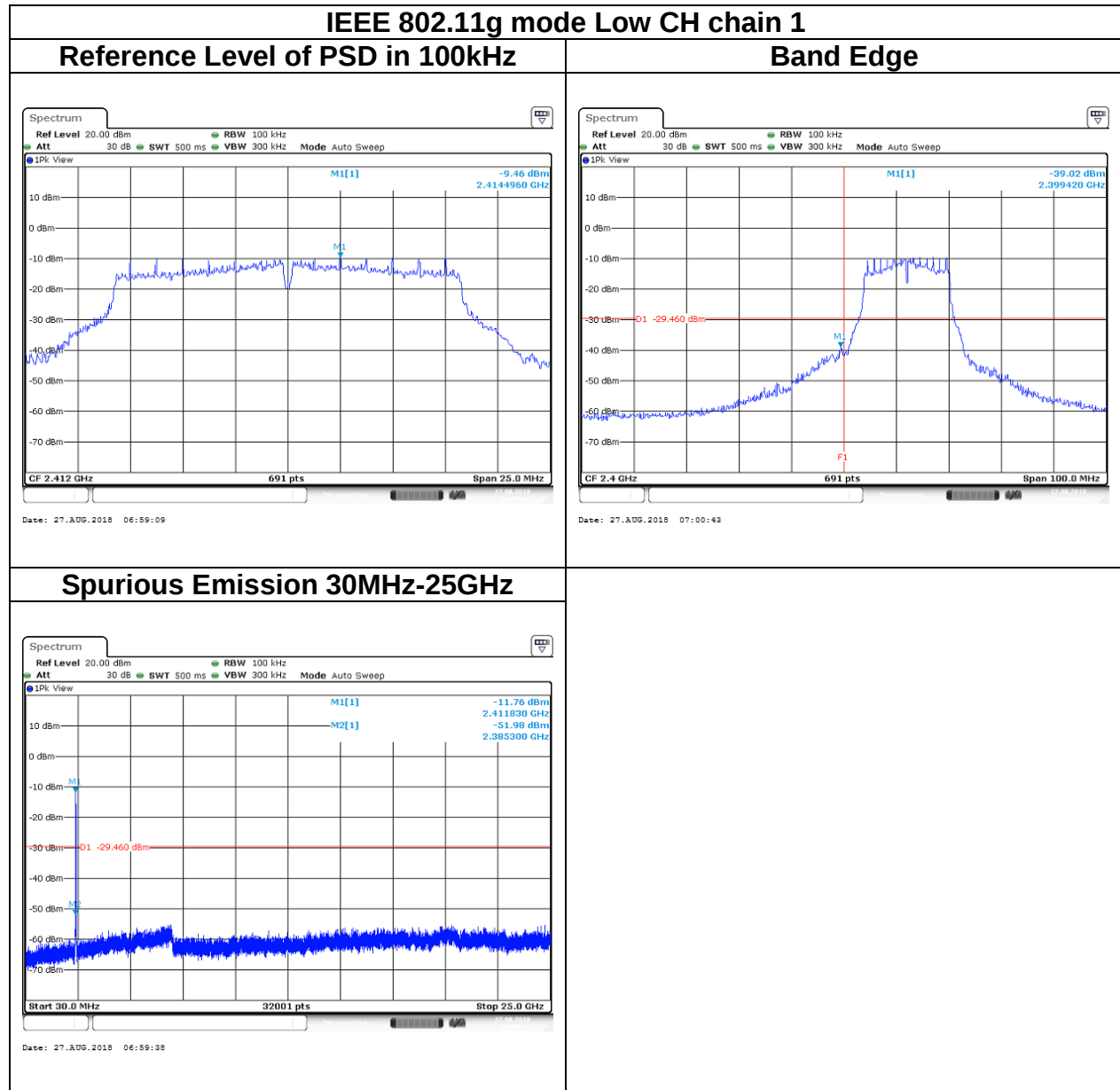








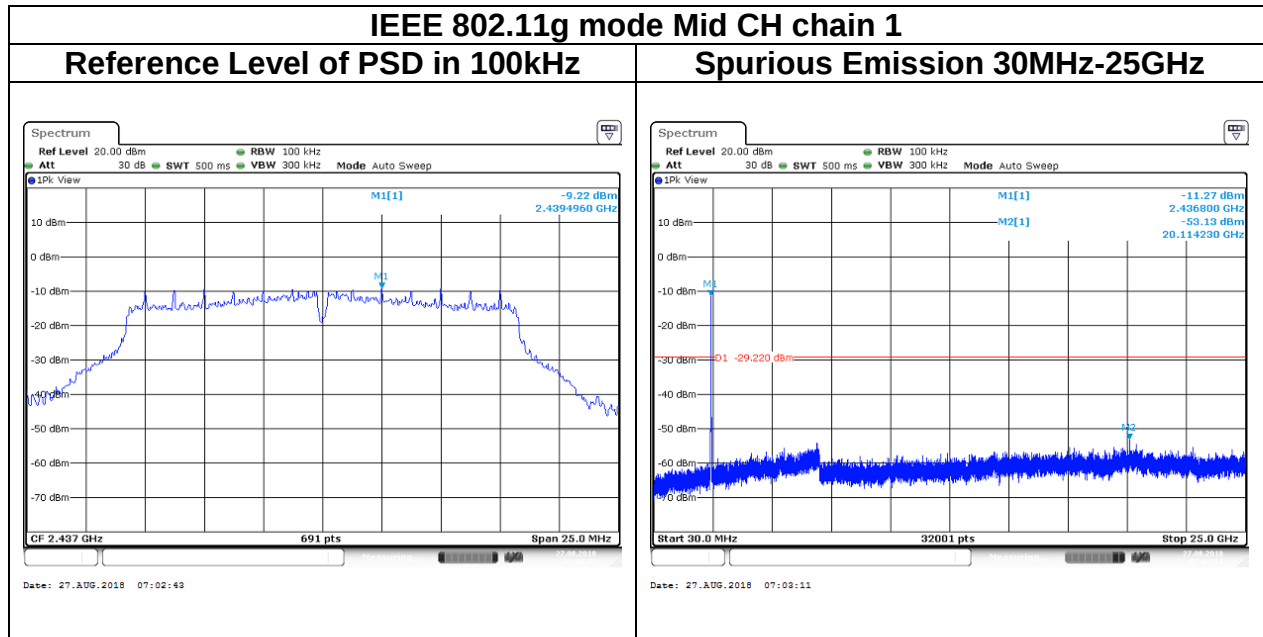


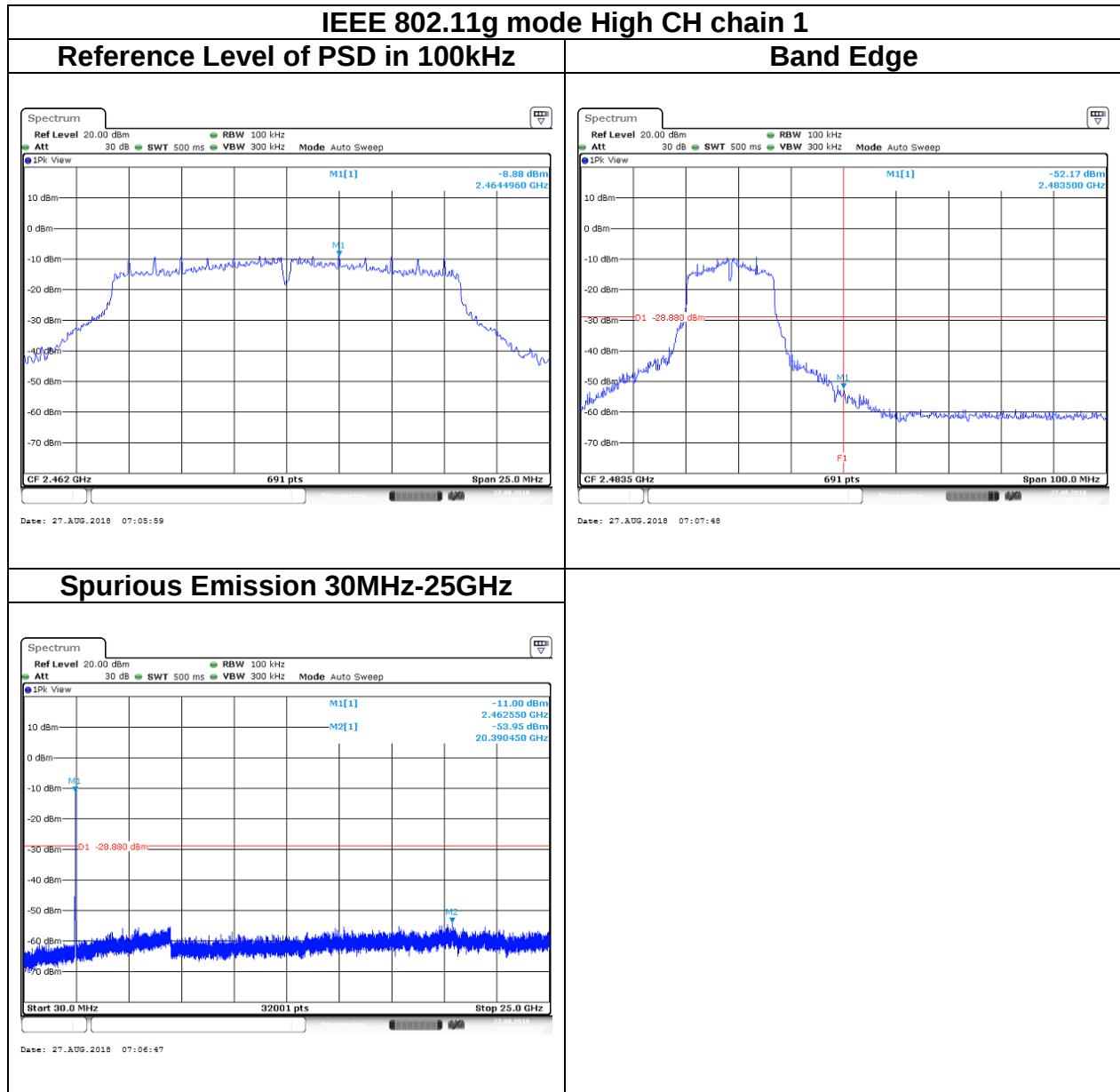


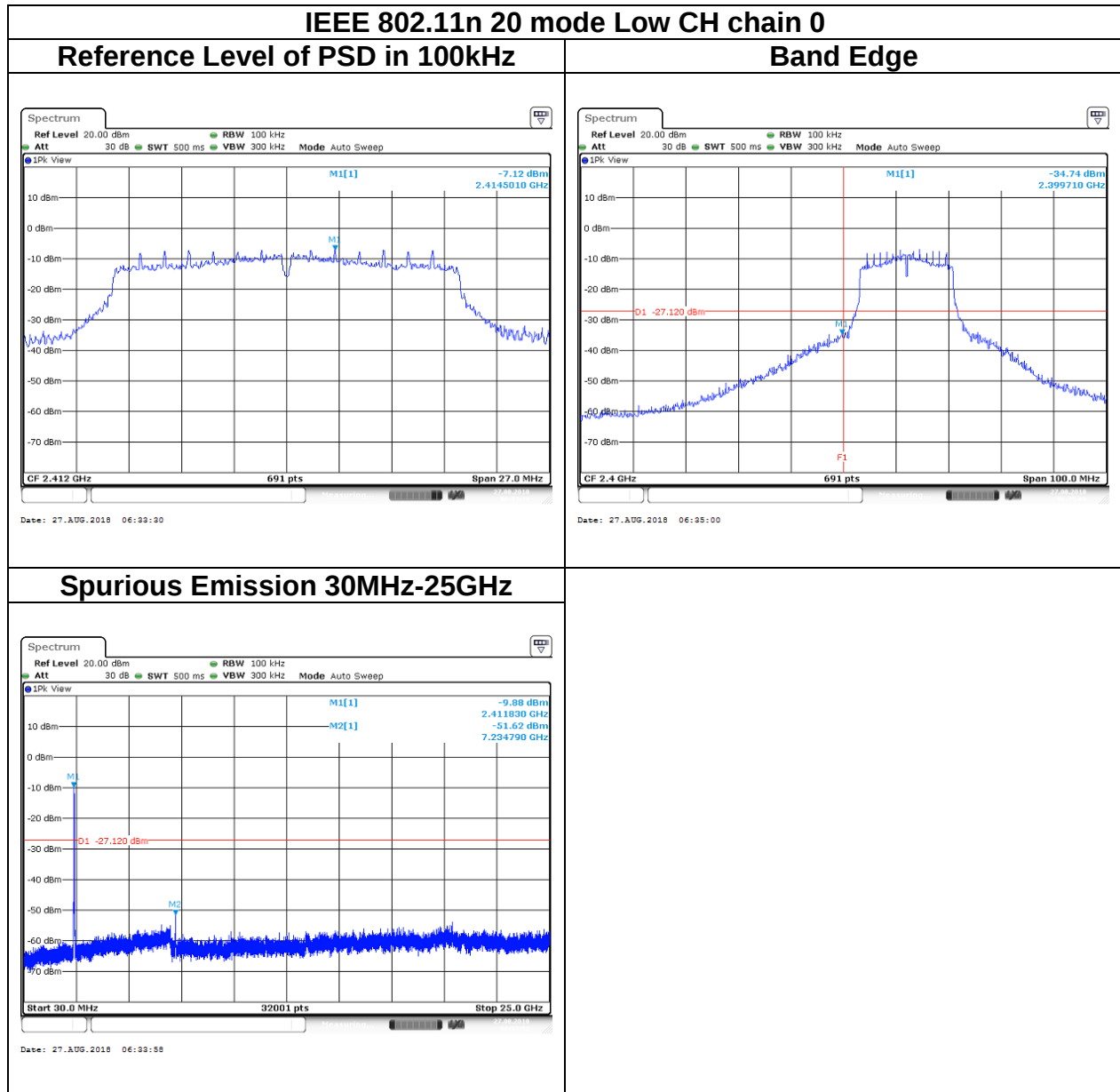


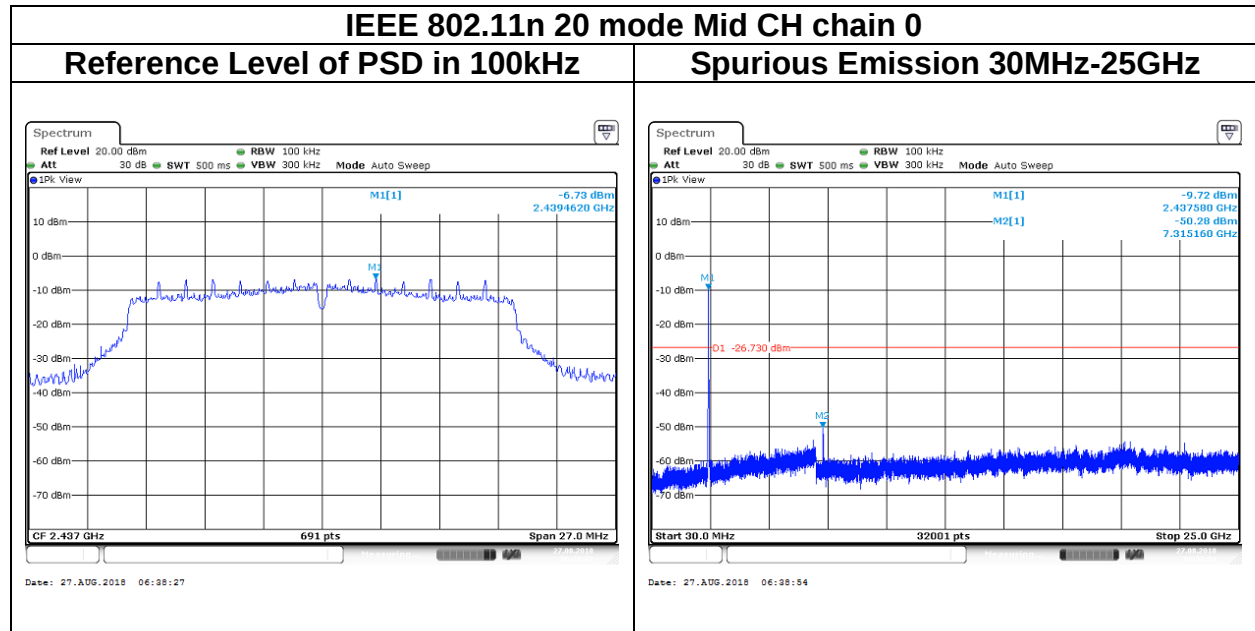
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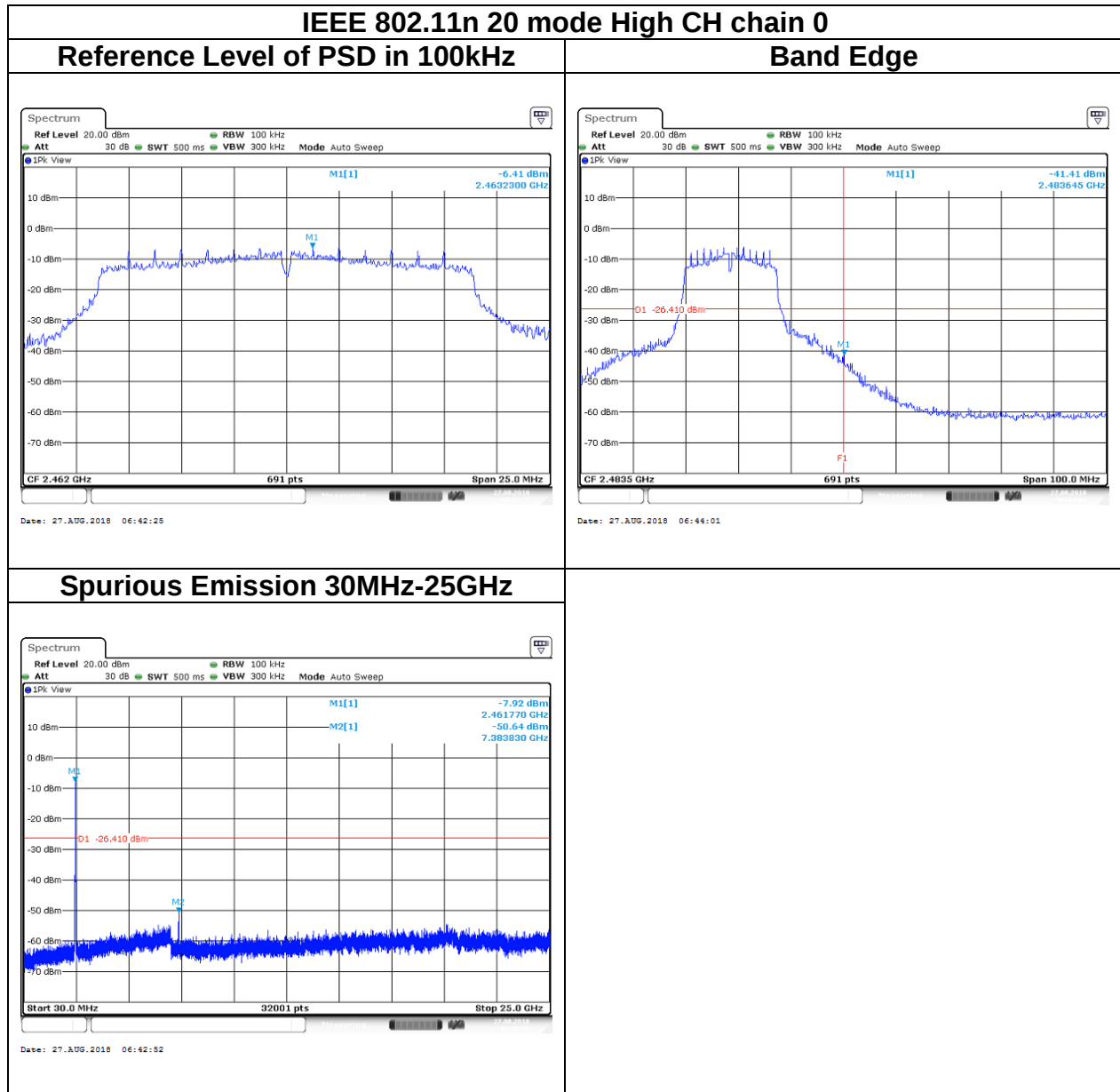
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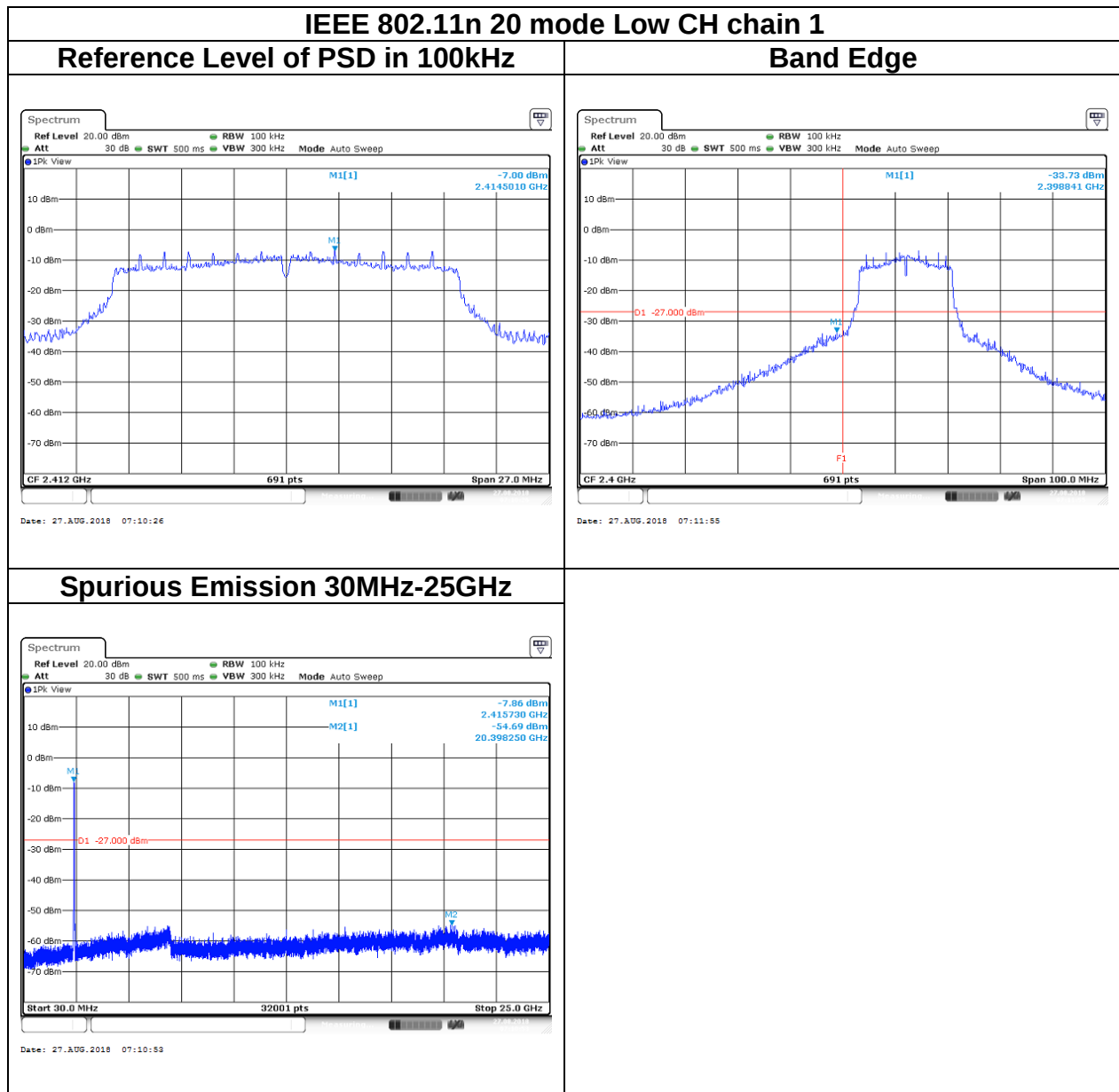








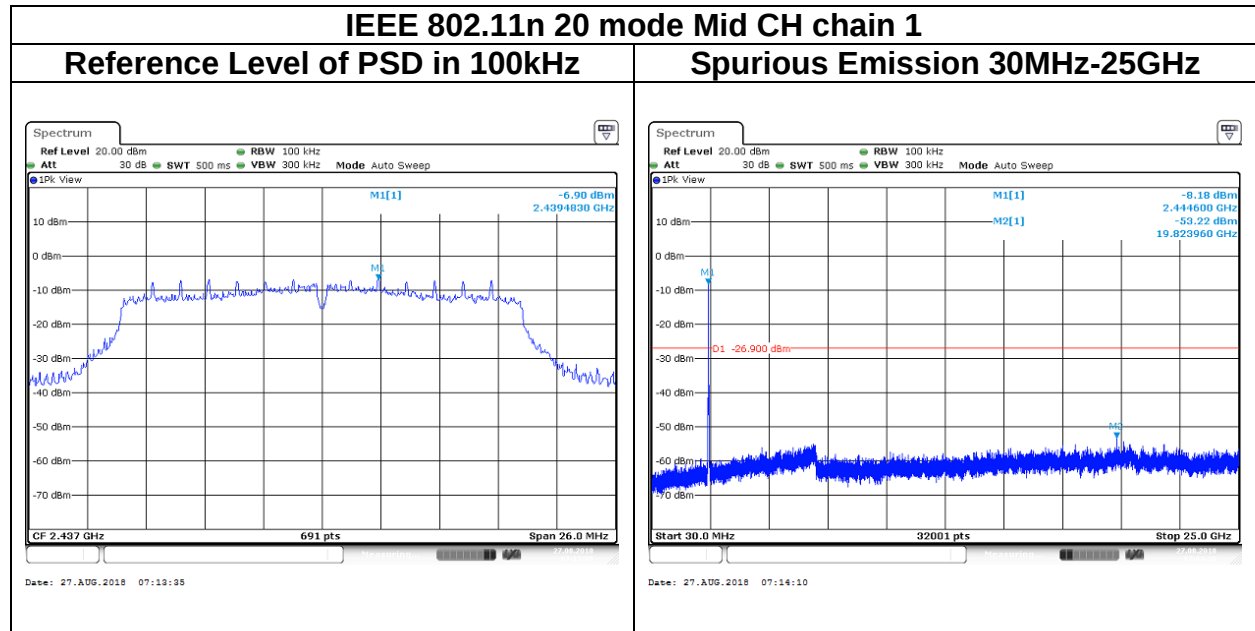


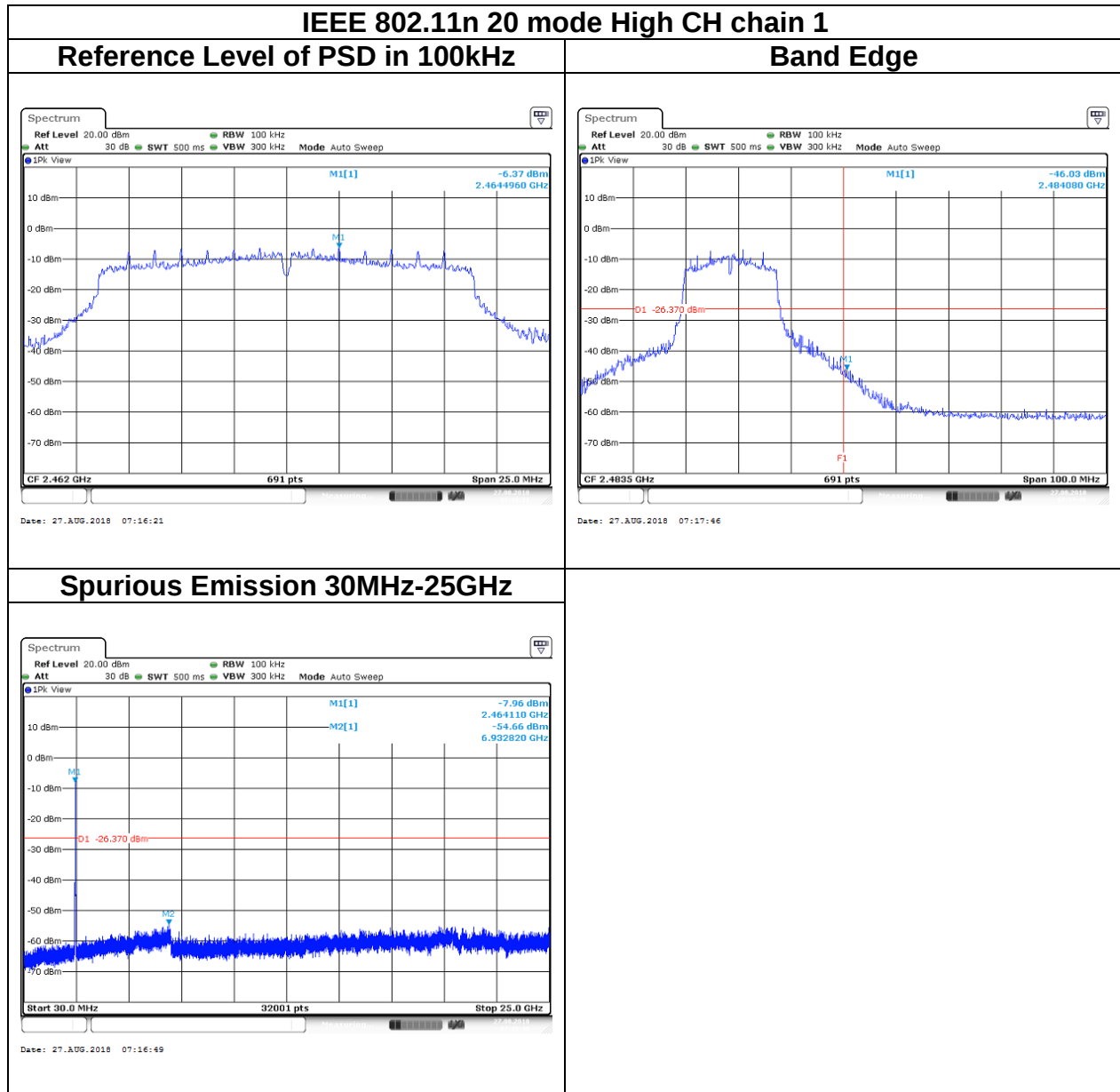




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5.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

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

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.

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 414788.
2. Note: No emission found between lowest internal used/generated frequency to 30MHz (9KHz~30MHz)

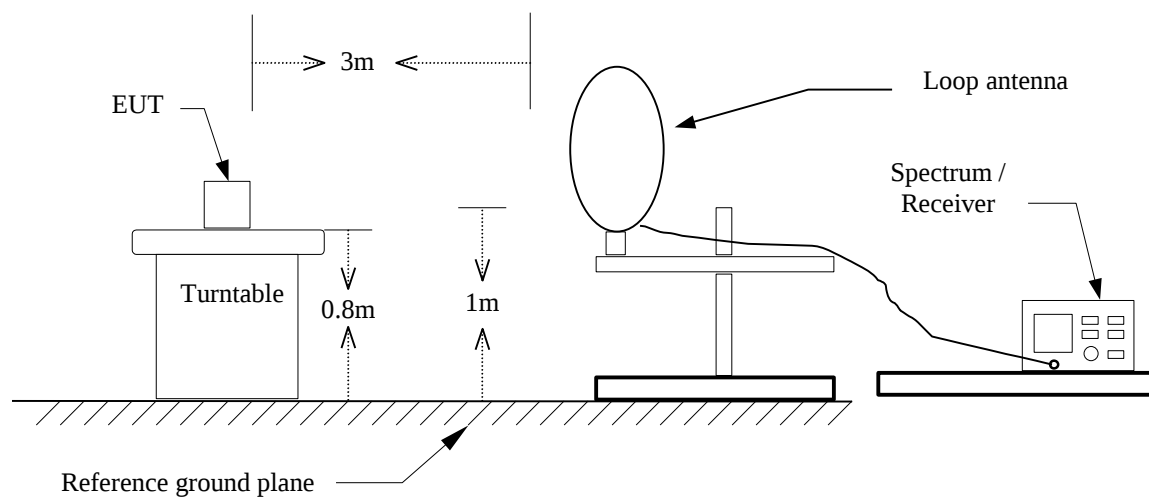
4. The SA setting following :

- (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.

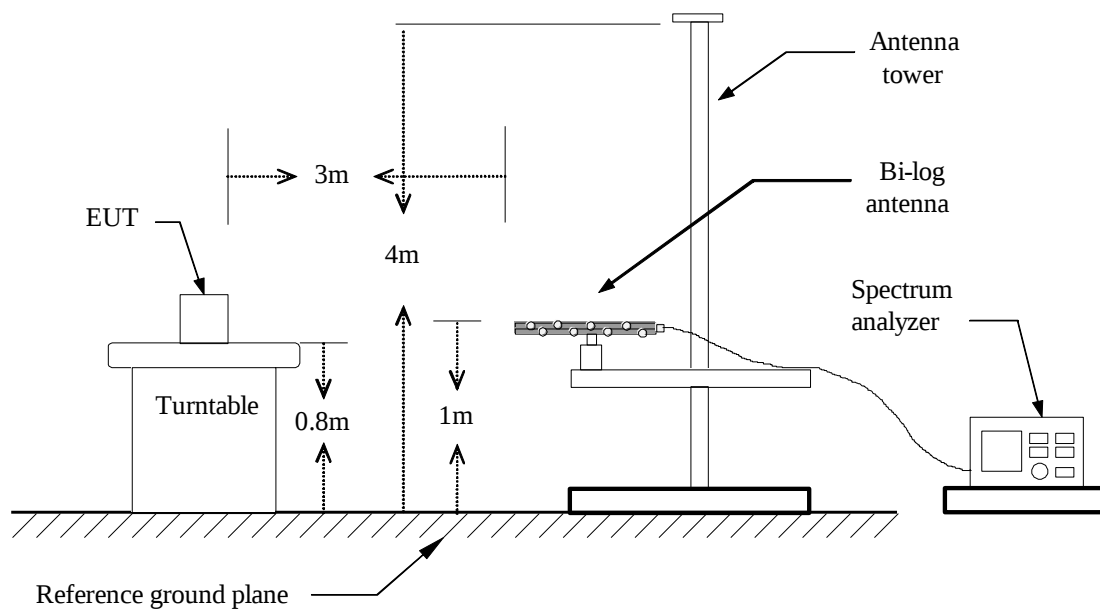
Configuration	Duty Cycle (%)	T(ms)	1/T (kHz)	VBW Setting
802.11b	99%	8.4400	-	10Hz
802.11g	95%	1.4200	0.704	750Hz
802.11n 20	94%	1.3300	0.752	820Hz

5.6.3 Test Setup

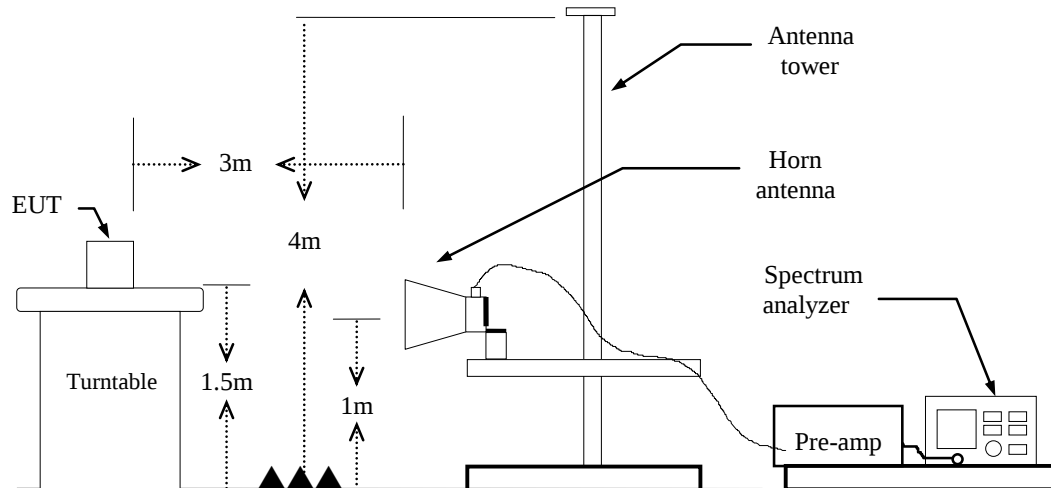
9kHz ~ 30MHz



30MHz ~ 1GHz



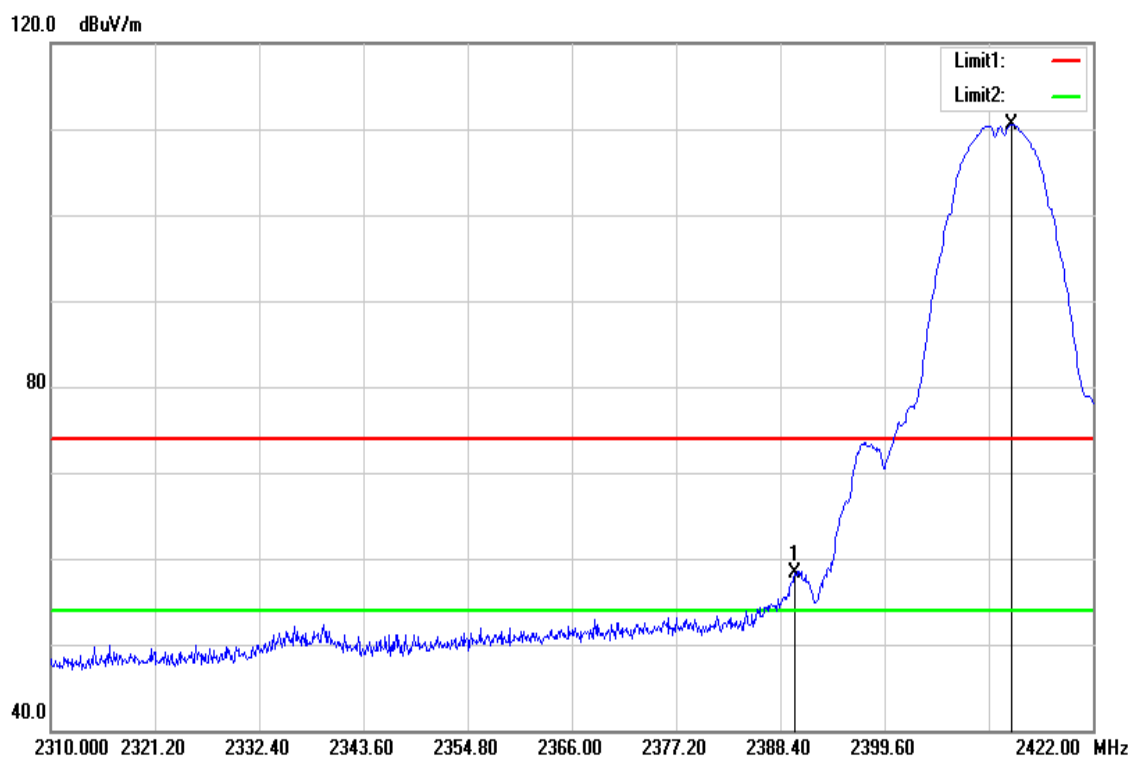
Above 1 GHz



5.6.4 Test Result

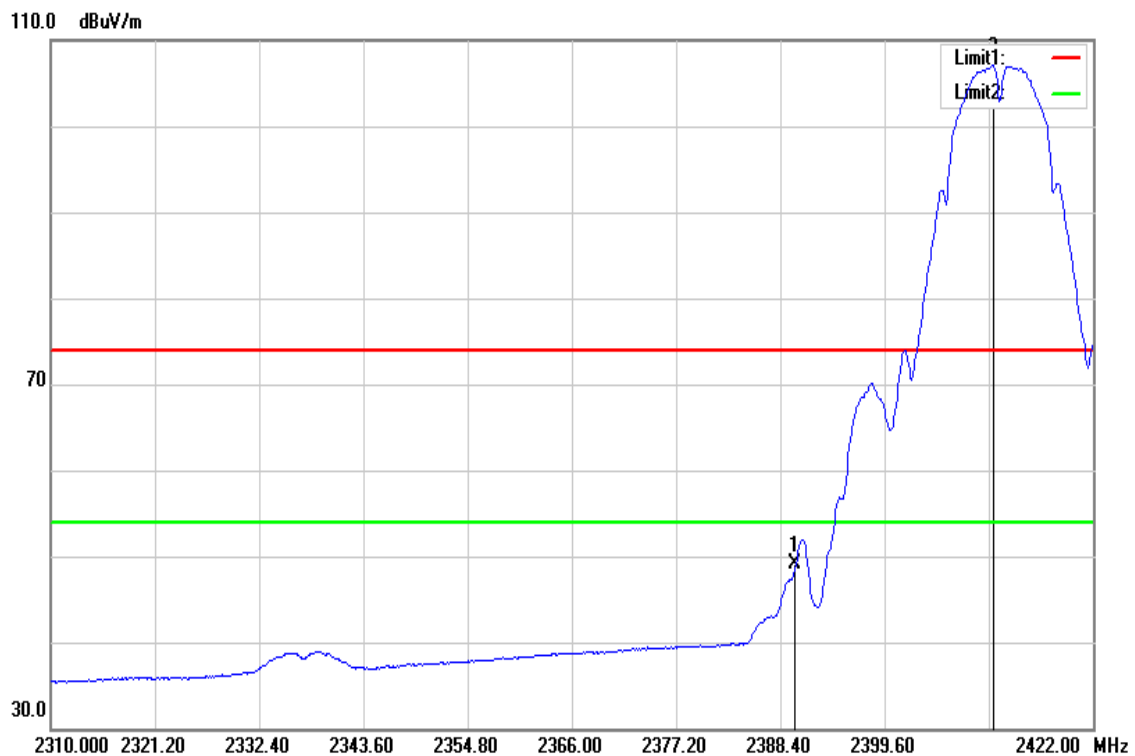
Band Edge Test Data

Test Mode	IEEE 802.11b Low CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.968	61.39	-3.13	58.26	74.00	-15.74	peak
2413.264	113.56	-3.06	110.50	-	-	peak

Test Mode	IEEE 802.11b Low CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Average		

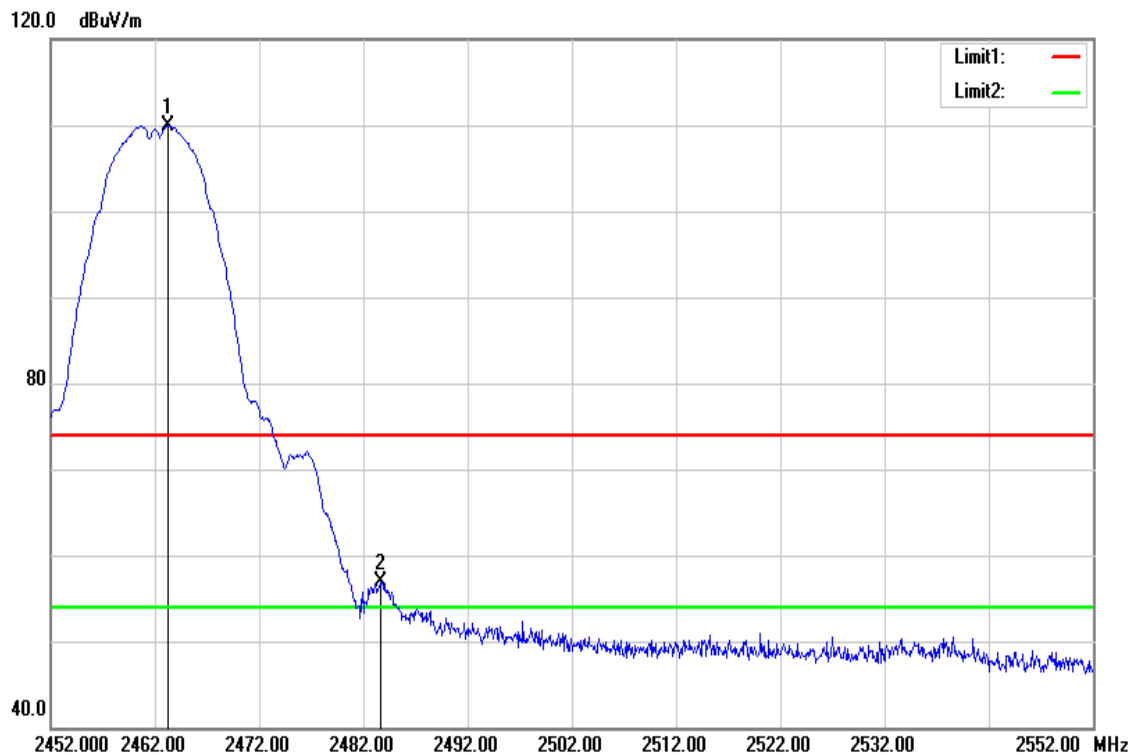


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	52.23	-3.13	49.10	54.00	-4.90	AVG
2411.248	110.16	-3.08	107.08	-	-	AVG

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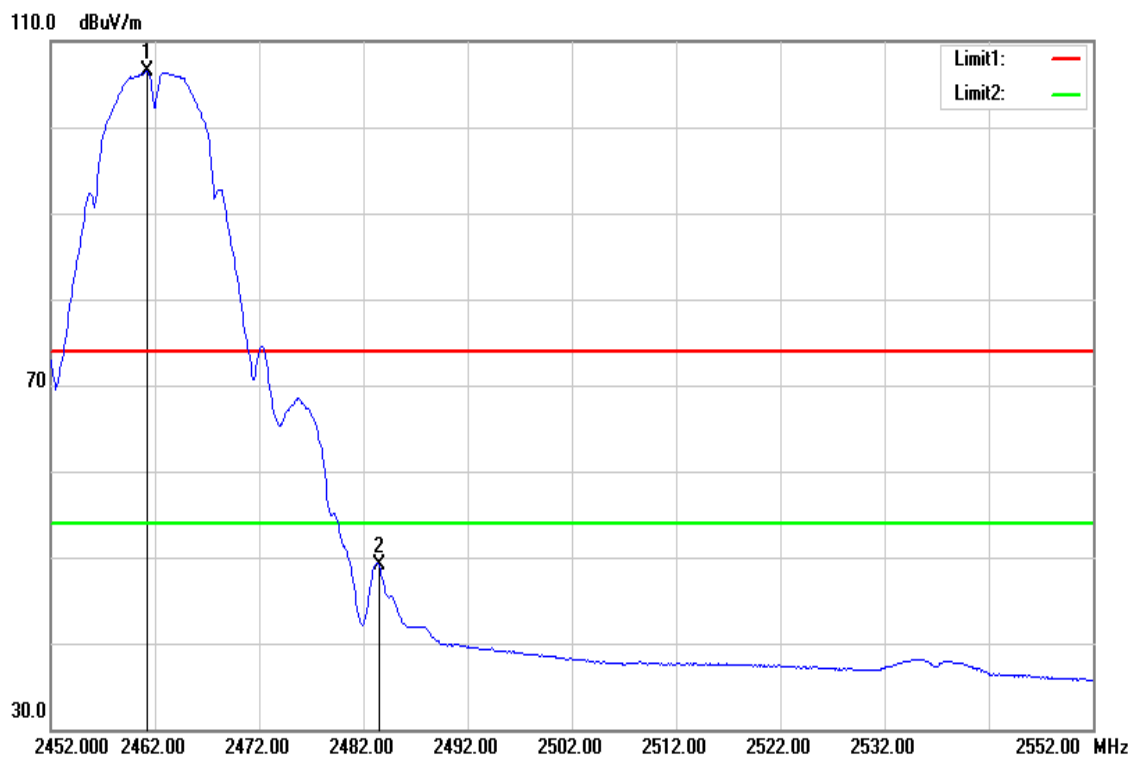
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Test Mode	IEEE 802.11b High CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak		



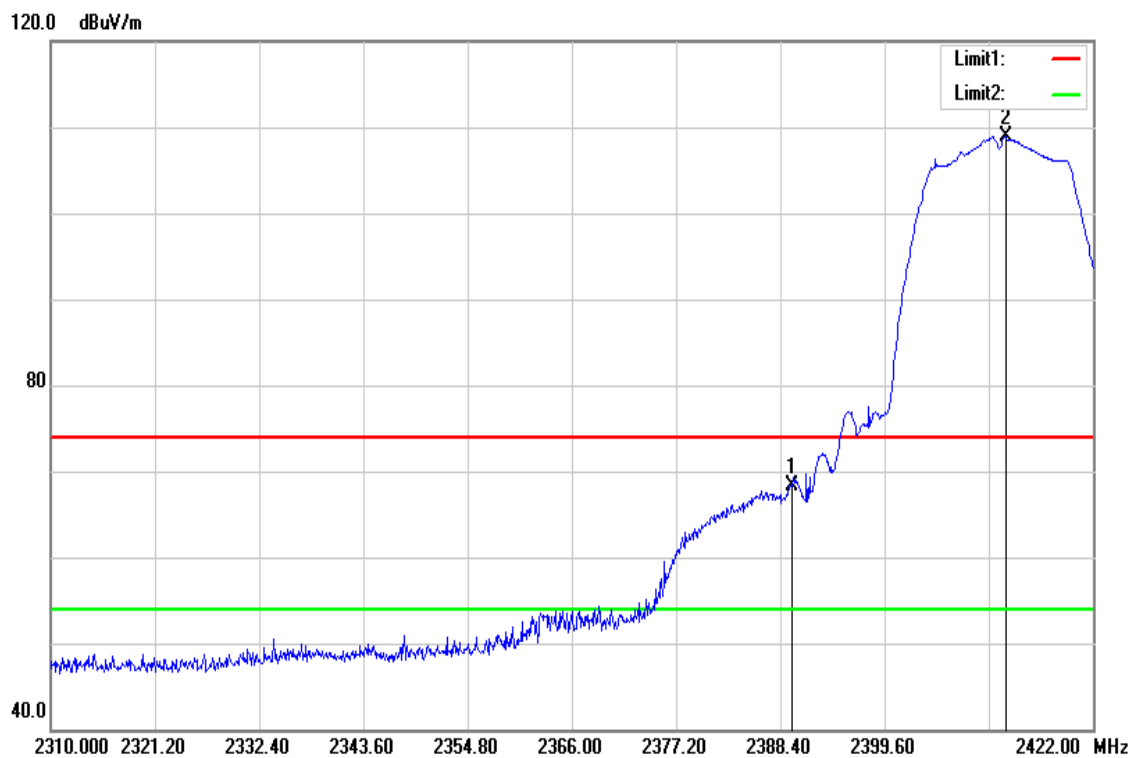
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2463.300	112.71	-2.82	109.89	-	-	peak
2483.700	59.59	-2.71	56.88	74.00	-17.12	peak

Test Mode	IEEE 802.11b High CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Average		



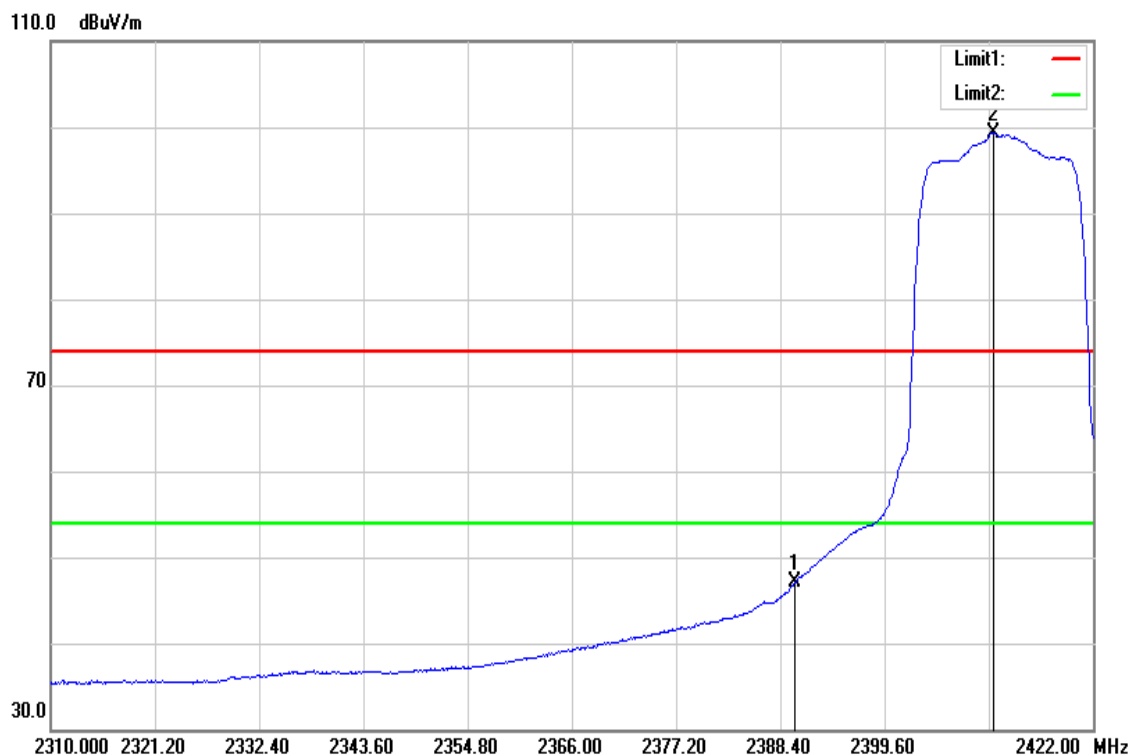
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2461.200	109.34	-2.84	106.50	-	-	AVG
2483.500	51.73	-2.71	49.02	54.00	-4.98	AVG

Test Mode	IEEE 802.11g Low CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak		



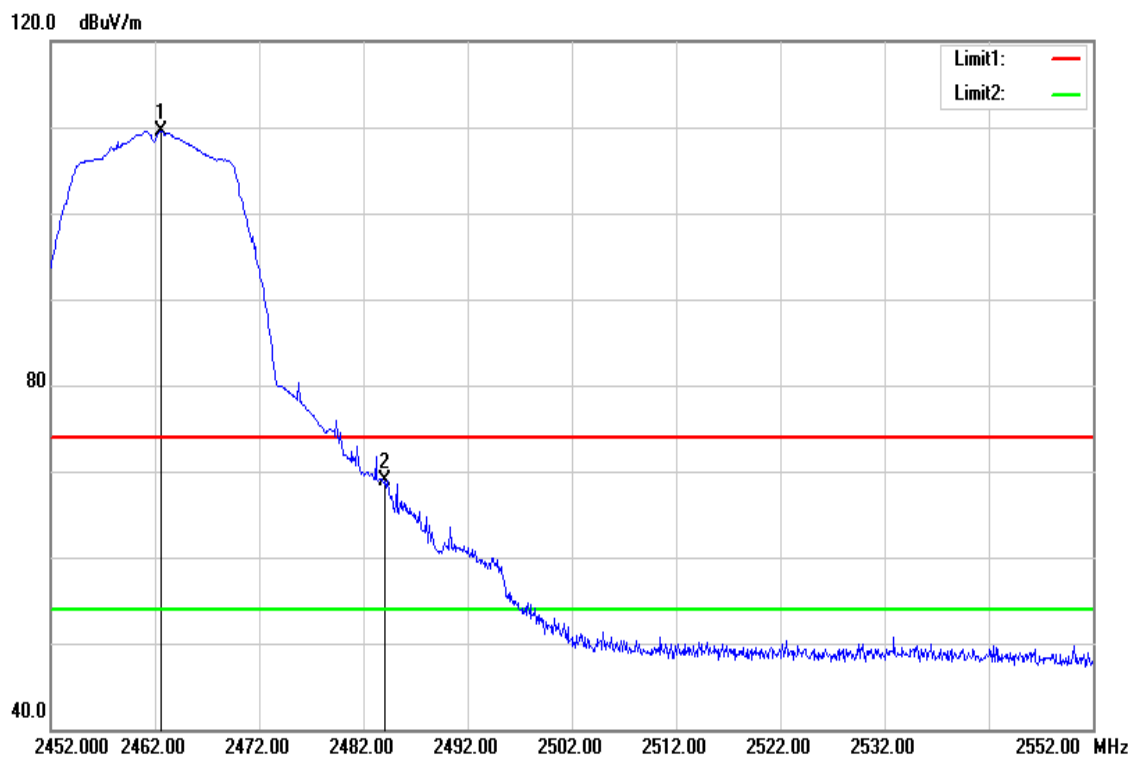
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.632	71.52	-3.13	68.39	74.00	-5.61	peak
2412.592	111.95	-3.08	108.87	-	-	peak

Test Mode	IEEE 802.11g Low CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Average		



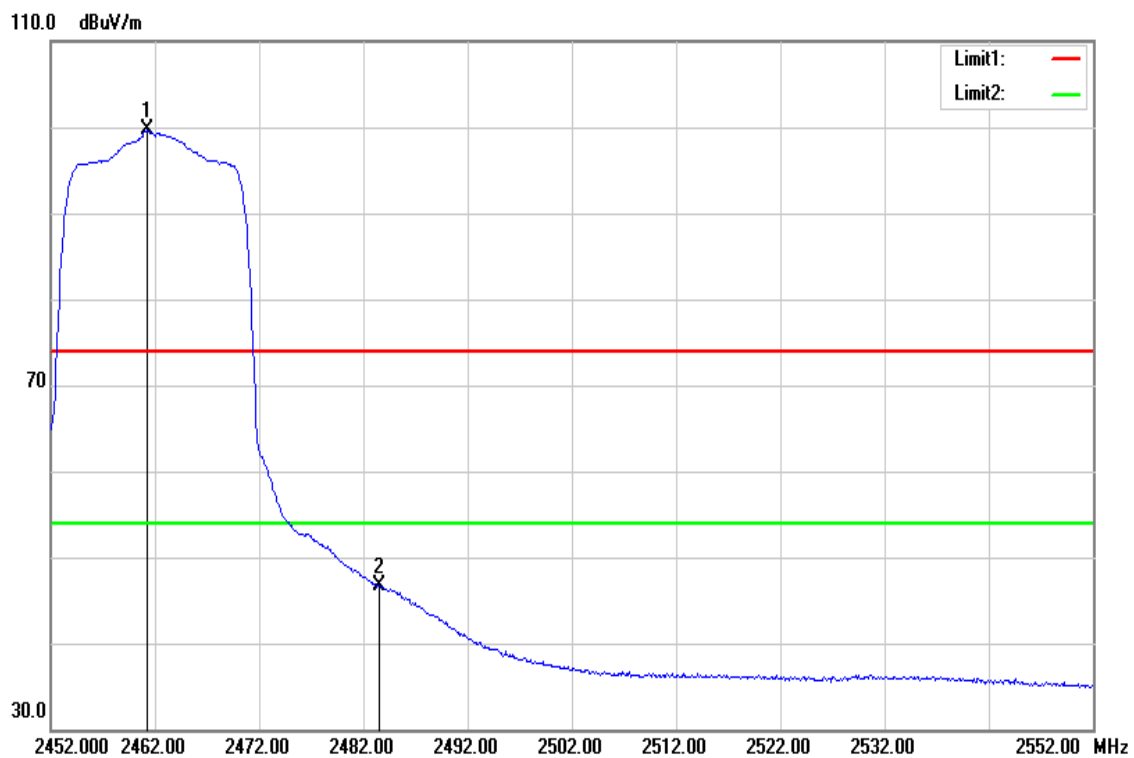
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	50.29	-3.13	47.16	54.00	-6.84	AVG
2411.248	102.47	-3.08	99.39	-	-	AVG

Test Mode	IEEE 802.11g High CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak		



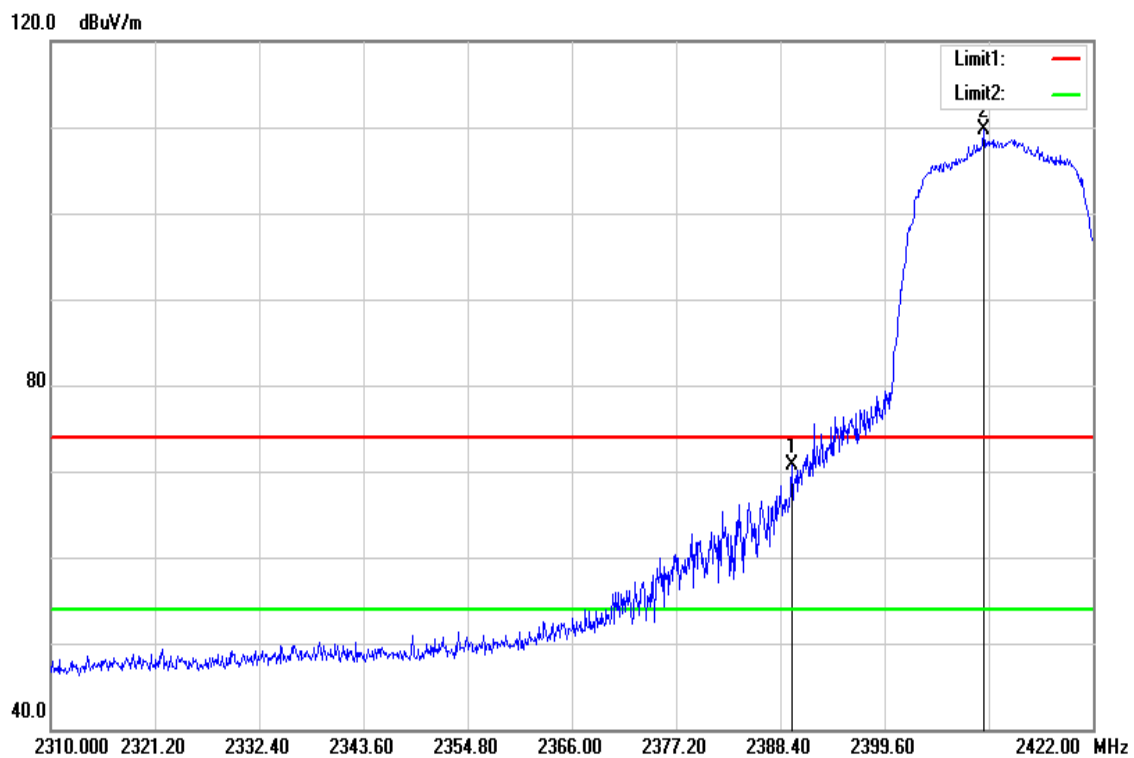
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2462.600	112.42	-2.82	109.60	-	-	peak
2484.000	71.60	-2.71	68.89	74.00	-5.11	peak

Test Mode	IEEE 802.11g High CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Average		



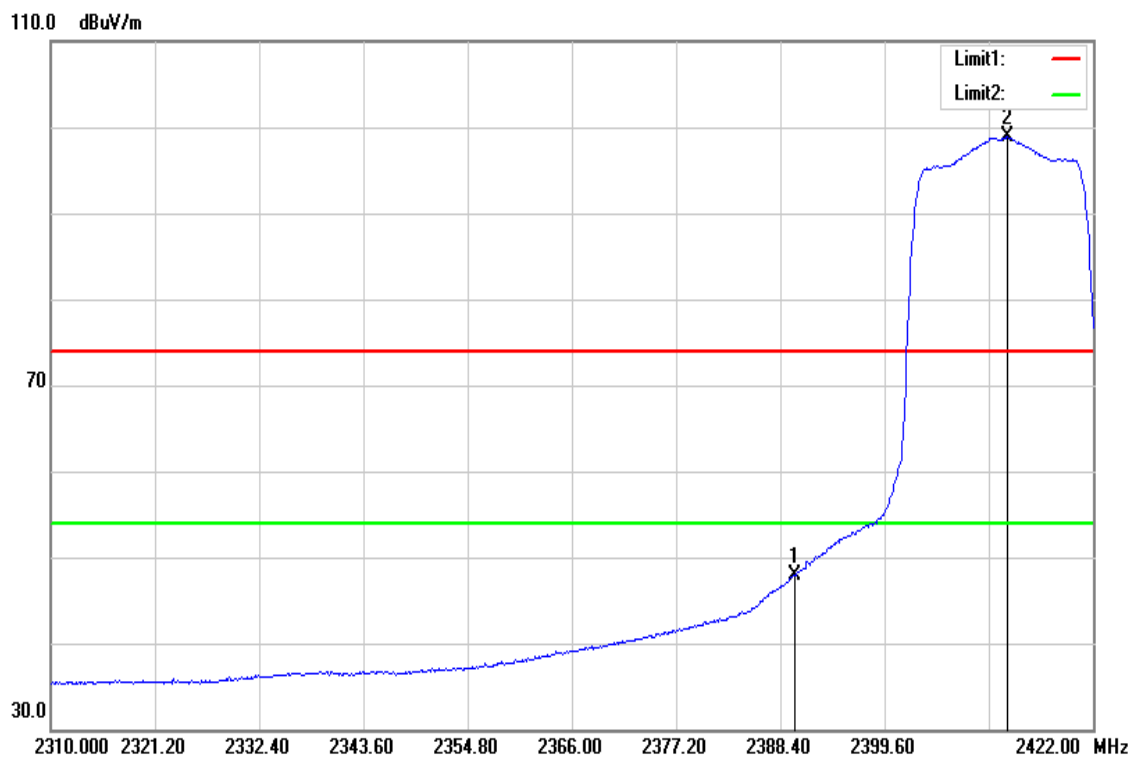
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2461.200	102.48	-2.84	99.64	-	-	AVG
2483.500	49.33	-2.71	46.62	54.00	-7.38	AVG

Test Mode	IEEE 802.11n 20 Low CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak		



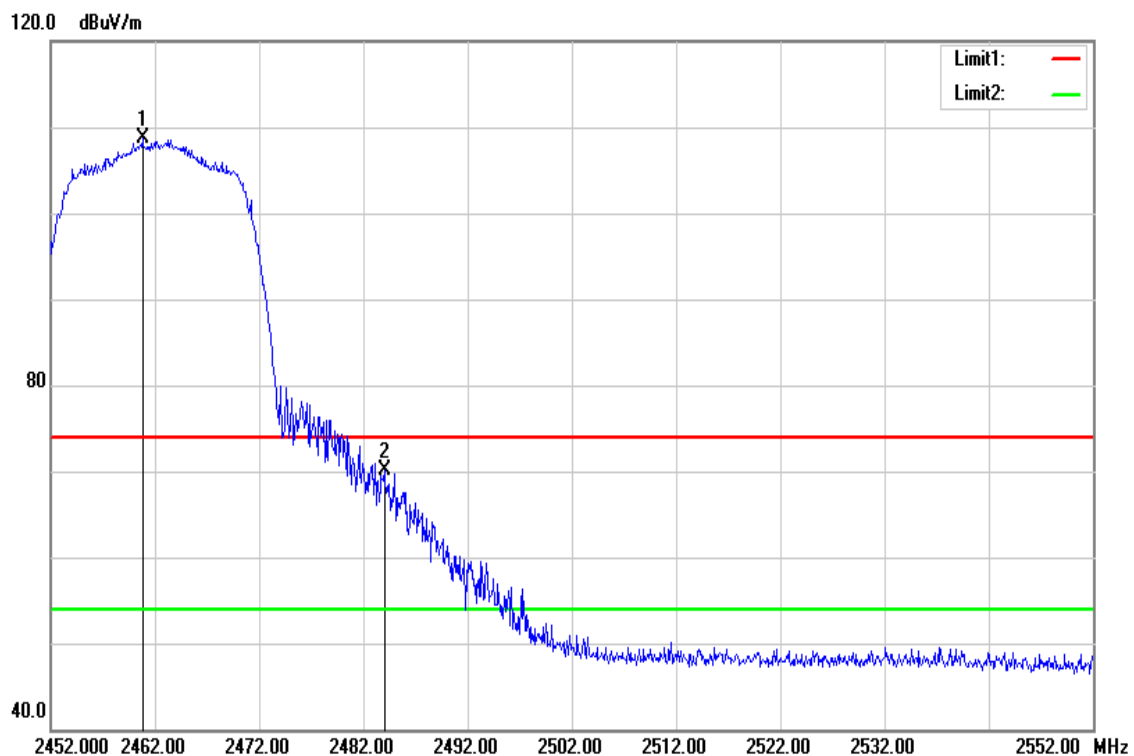
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.632	73.88	-3.13	70.75	74.00	-3.25	peak
2410.240	112.83	-3.08	109.75	-	-	peak

Test Mode	IEEE 802.11n 20 Low CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Average		



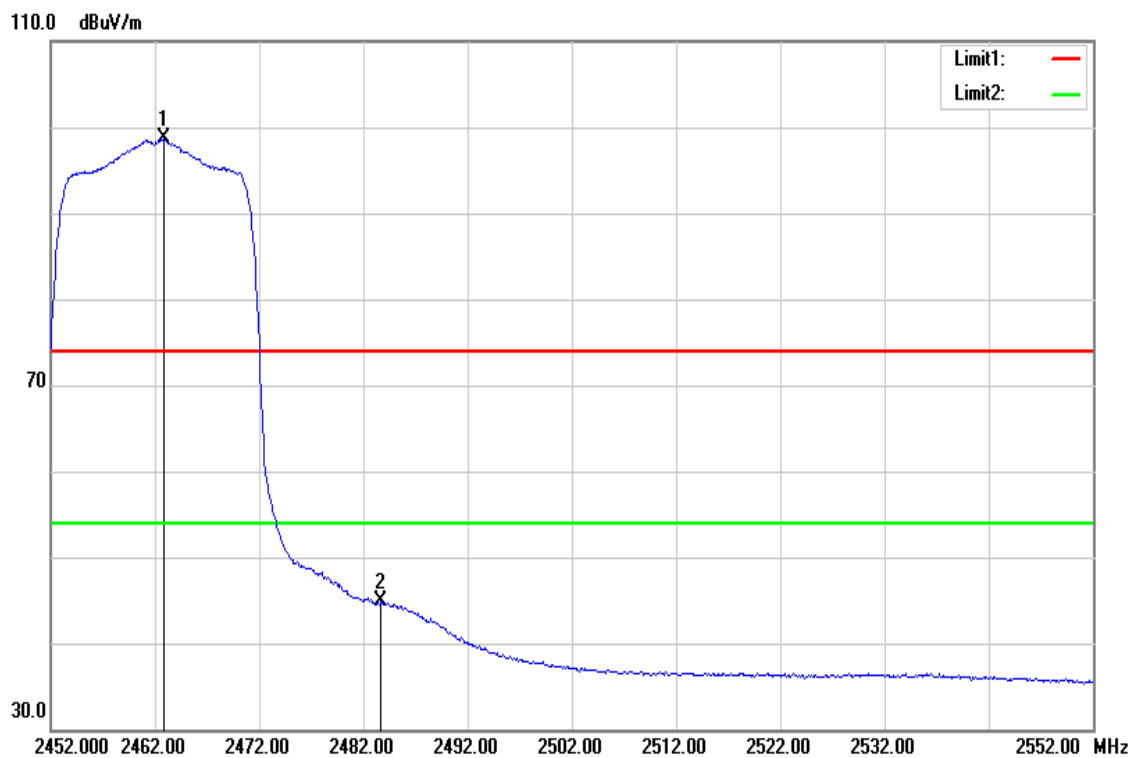
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	51.11	-3.13	47.98	74.00	-26.02	AVG
2412.816	101.99	-3.08	98.91	-	-	AVG

Test Mode	IEEE 802.11n 20 High CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2460.800	111.62	-2.84	108.78	-	-	peak
2484.000	72.72	-2.71	70.01	74.00	-3.99	peak

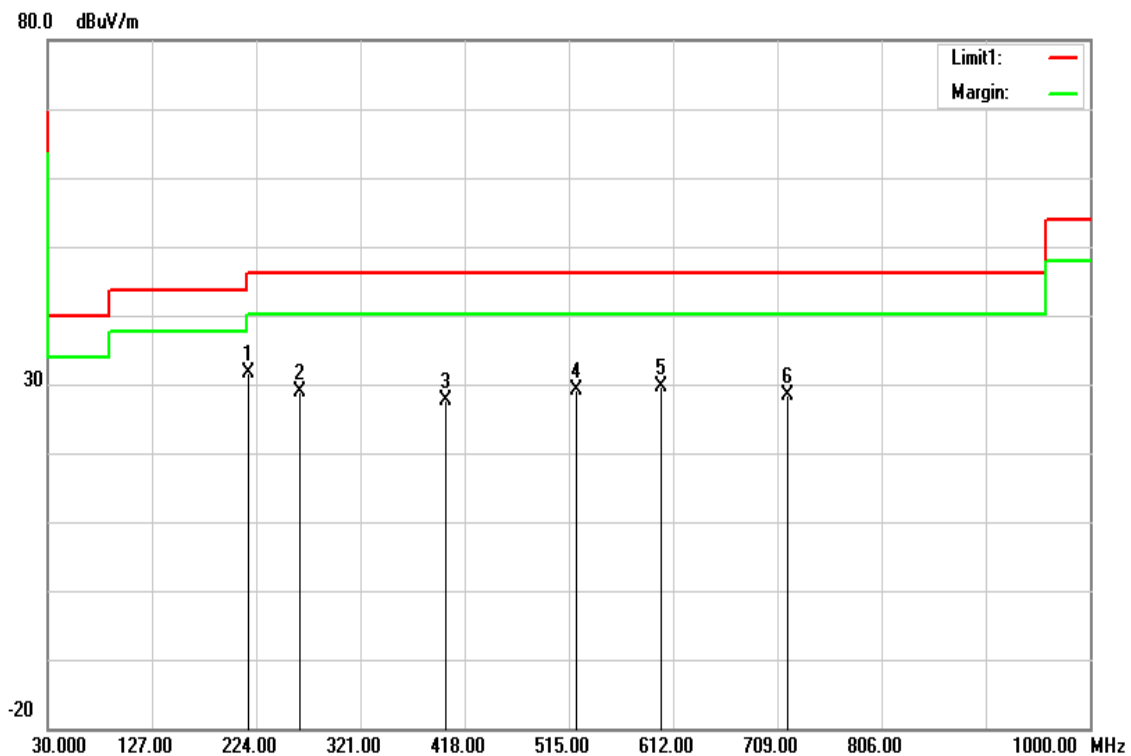
Test Mode	IEEE 802.11n 20 High CH	Temp/Hum	22.9(°C)/ 38%RH
Test Item	Band Edge	Test Date	August 28, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2462.800	101.45	-2.82	98.63	-	-	AVG
2483.700	47.62	-2.71	44.91	54.00	-9.09	AVG

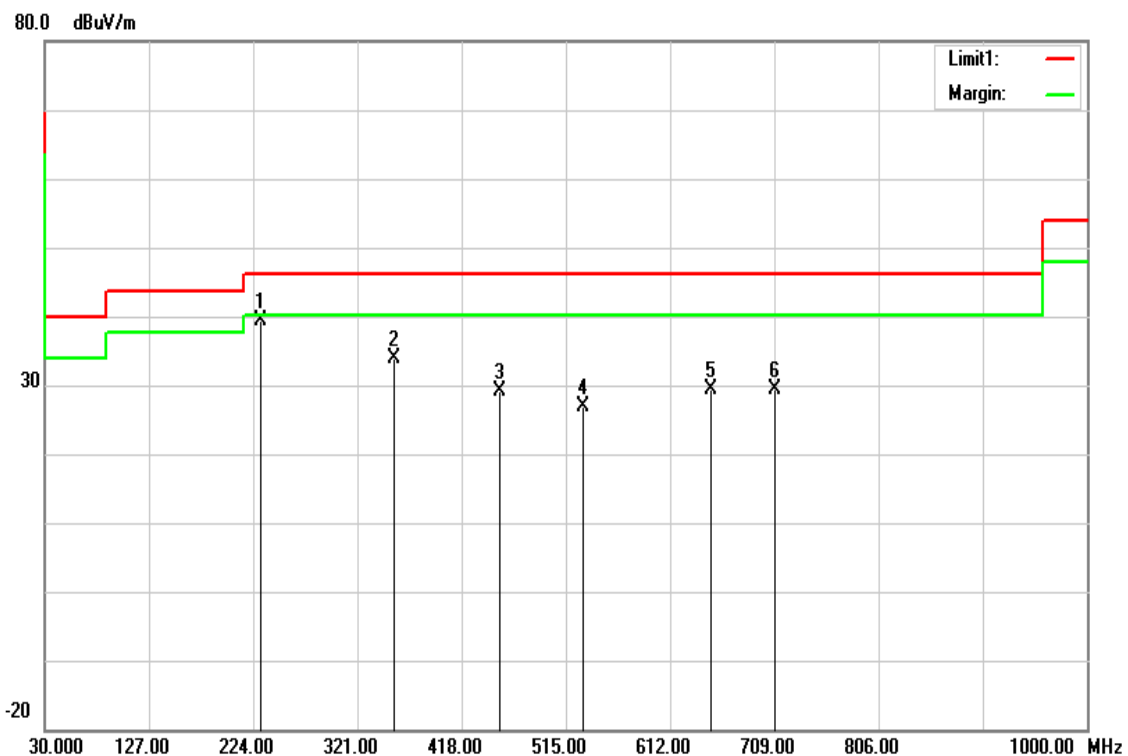
Below 1G Test Data

Test Mode	Mode 1	Temp/Hum	24(°C)/ 39%RH
Test Item	30MHz-1GHz	Test Date	August 30, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
216.2400	42.08	-10.40	31.68	46.02	-14.34	peak
264.7400	37.62	-8.71	28.91	46.02	-17.11	peak
400.5400	32.46	-4.78	27.68	46.02	-18.34	peak
521.7900	31.01	-1.94	29.07	46.02	-16.95	peak
600.3600	30.49	-0.79	29.70	46.02	-16.32	peak
718.7000	26.77	1.69	28.46	46.02	-17.56	peak

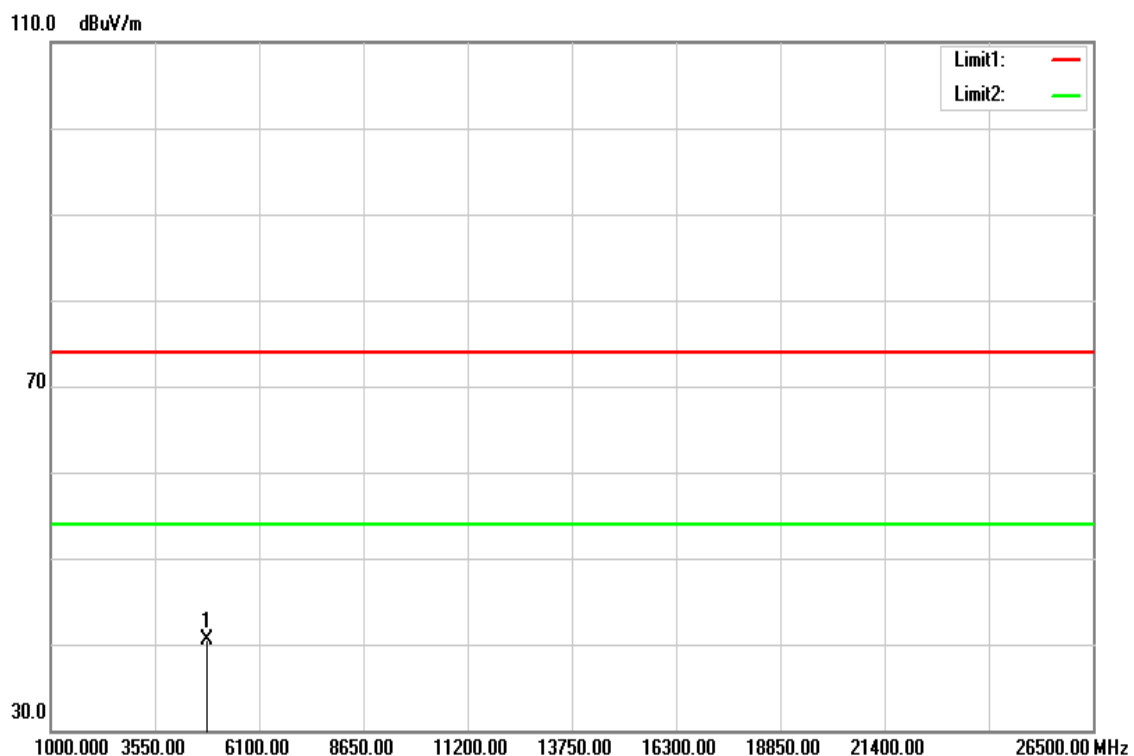
Test Mode	Mode 1	Temp/Hum	24(°C)/ 39%RH
Test Item	30MHz-1GHz	Test Date	August 30, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
230.7900	49.61	-10.18	39.43	46.02	-6.59	peak
354.9500	39.91	-5.99	33.92	46.02	-12.10	peak
453.8900	32.21	-3.16	29.05	46.02	-16.97	peak
531.4900	28.72	-1.74	26.98	46.02	-19.04	peak
649.8300	28.77	0.60	29.37	46.02	-16.65	peak
709.9700	27.82	1.51	29.33	46.02	-16.69	peak

Above 1G Test Data

Test Mode	IEEE 802.11b Low CH	Temp/Hum	24(°C)/ 39%RH
Test Item	Harmonic	Test Date	August 30, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average		

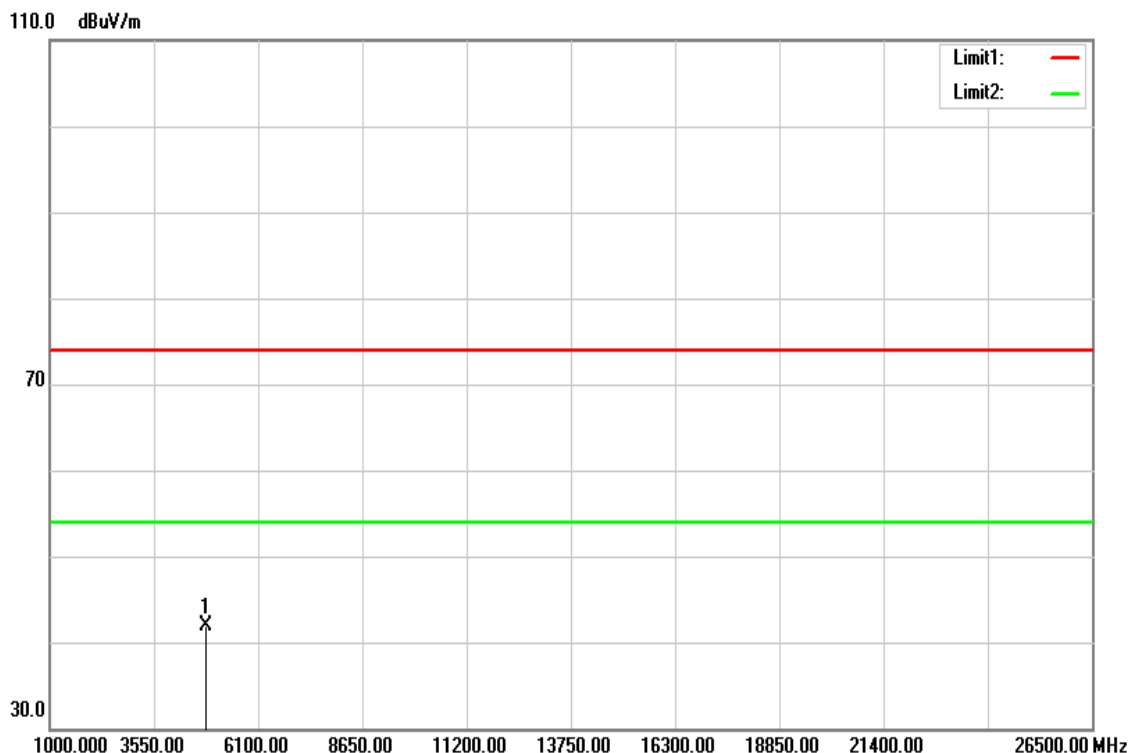


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824.000	37.25	3.23	40.48	74.00	-33.52	peak
N/A						

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 802.11b Low CH	Temp/Hum	24(°C)/ 39%RH
Test Item	Harmonic	Test Date	August 30, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824.000	38.75	3.23	41.98	74.00	-32.02	peak
N/A						

Remark:

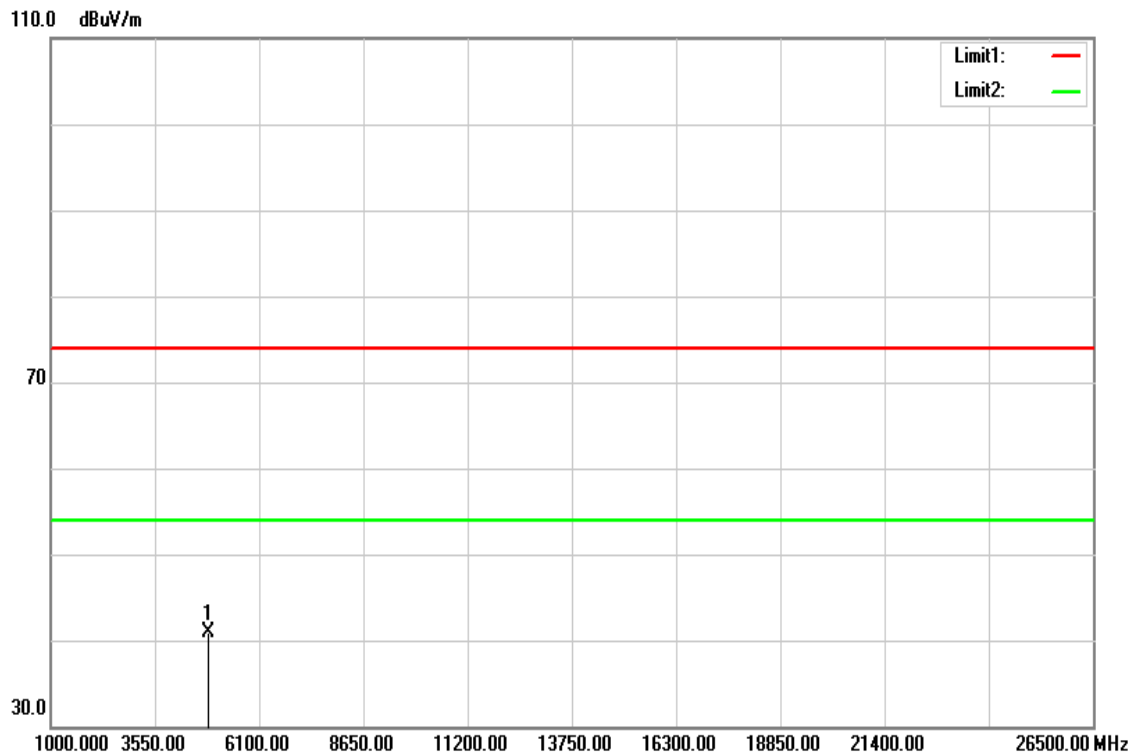
- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

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Test Mode	IEEE 802.11b Mid CH	Temp/Hum	24(°C)/ 39%RH
Test Item	Harmonic	Test Date	August 30, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4874.000	37.39	3.56	40.95	74.00	-33.05	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