

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
FCC ID	ACJ9TGWL17A
Brand name	Panasonic
Product name	WIFI module
Model No.	WL17A
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	Effect Page	Revised By
00	February 21, 2018	Initial Issue	ALL	May Lin
01	April 16, 2018	1. Revised the version of KDB 558074. 2. Add the procedure of 99% BW. 3. Add test data for 99%OBW. 4. Remove the EIRP limit.	P.17, P.20-23, P.28-31, P.36	May Lin

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Panasonic Corporation of North America Two Riverfront Plaza, 9th Floor Newark, NJ 07102-5490 United States
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	WIFI module
Model Name	WL17A
Model Discrepancy	N/A
Received Date	January 15, 2018
Date of Test	January 15 ~ February 9, 2018
Output Power(W)	IEEE 802.11b mode: 0.1954 (EIRP: 0.4375) IEEE 802.11g mode: 0.1865 (EIRP: 0.4169) IEEE 802.11n 20 MHz mode: 0.8035 (EIRP: 1.7989) IEEE 802.11n 40 MHz mode: 0.8531 (EIRP: 1.9099)
Power Supply	Powered from host device (DC 5V)
HW Version	V01
FW Version	V2

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 MHz mode : OFDM 4. IEEE 802.11n 40 MHz MHz mode : OFDM
Bandwidth	1. IEEE 802.11b mode: 11 Channels 2. IEEE 802.11g mode: 11 Channels 3. IEEE 802.11n 20 MHz MHz mode : 11 Channels 4. IEEE 802.11n 40 MHz 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	Brand	P/N	Type	Cable length	Peak Gain	Worst case
	LYNwave	ALA110-222050-300011	PIFA	300mm	3.5dBi	H
	1. Power Directional Gain: 3.5 2. Power Density Directional Gain: 3.5					

Notes:

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

1.4 MEASUREMENT UNCERTAINTY

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

Remark:

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

1.5 FACILITIES AND TEST LOCATION

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

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

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

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Power Meter	Anritsu	ML2495A	1033009	04/11/2017	04/10/2018
Power Sensor	Anritsu	MA2411B	917072	07/03/2017	07/02/2018
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018
Directional Coupler	Agilent	87301D	MY44350252	07/25/2017	07/24/2018
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Divider	Solvang Technology	2-18GHz 4Way	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
Pre-Amplifier	EMEC	EM330	60609	06/07/2017	06/06/2018
Spectrum Analyzer	Agilent	E4446A	US42510252	11/27/2017	11/26/2018
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Pre-Amplifier	HP	8449B	3008A00965	06/27/2017	06/26/2018
Filter	N/A	2400-2500	N/A	N/A	N/A
Filter	N/A	0-6000	N/A	N/A	N/A
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	07/31/2017	07/30/2018
Horn Antenna	EMCO	3117	55165	02/20/2017	02/19/2018
Loop Ant	COM-POWER	AL-130	121051	03/21/2018	03/20/2019
AC Conducted Emissions Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
LISN	R&S	ENV216	101054	05/18/2017	05/17/2018
LISN	SCHWARZBECK	NSLK 8127	8127-541	02/14/2017	02/13/2018
EMI Test Receiver	R&S	ESCI	100064	05/17/2017	05/16/2018

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	NB(G)	Lenovo	IBM 1951	R33B65	CJ6UPA3489WL

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

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

Remark:

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

3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Voltage/Hz	DC 5V
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	DC 5V
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	DC 5V
Test Mode	Mode 1: EUT power by Host System.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

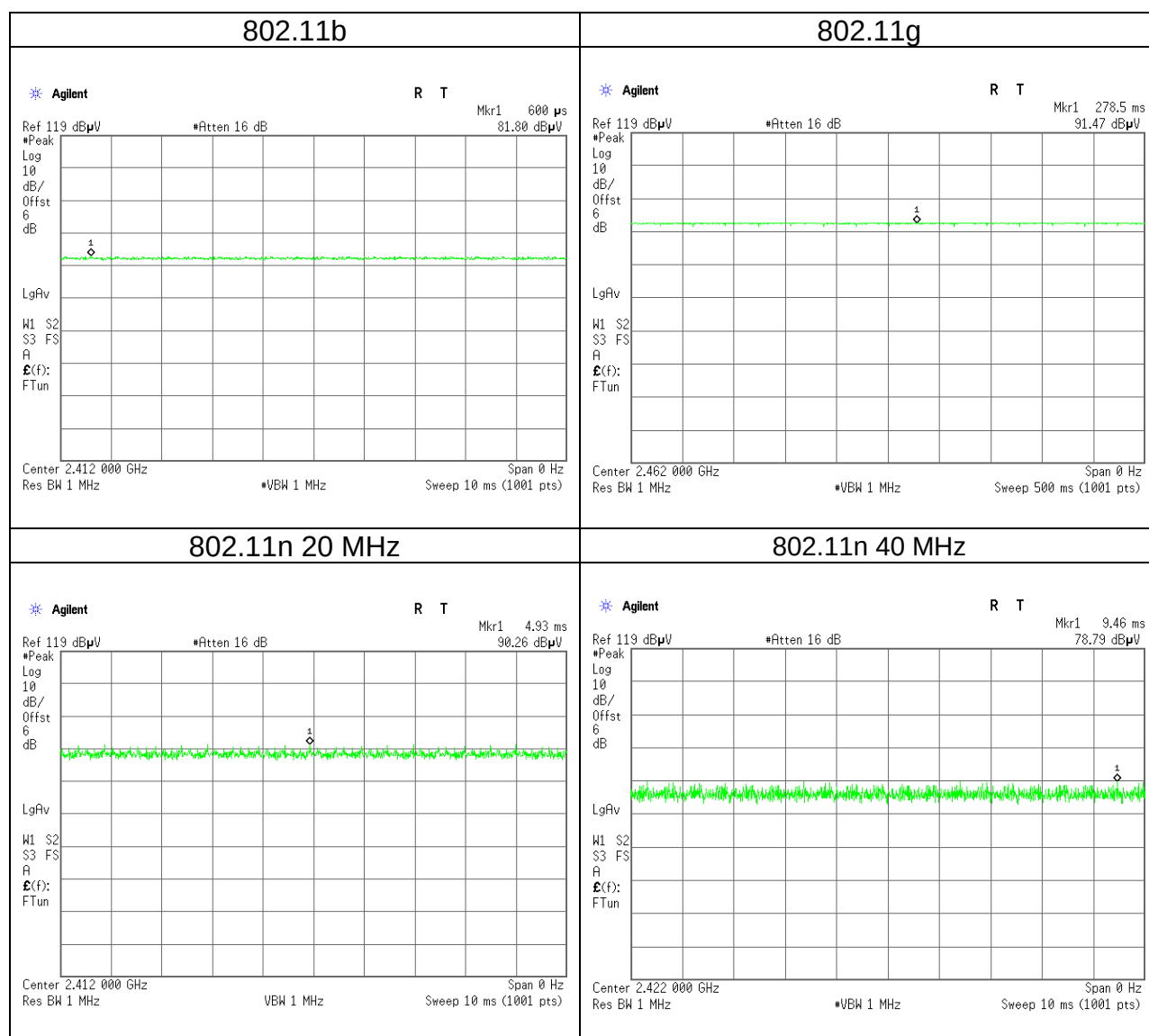
Remark:

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

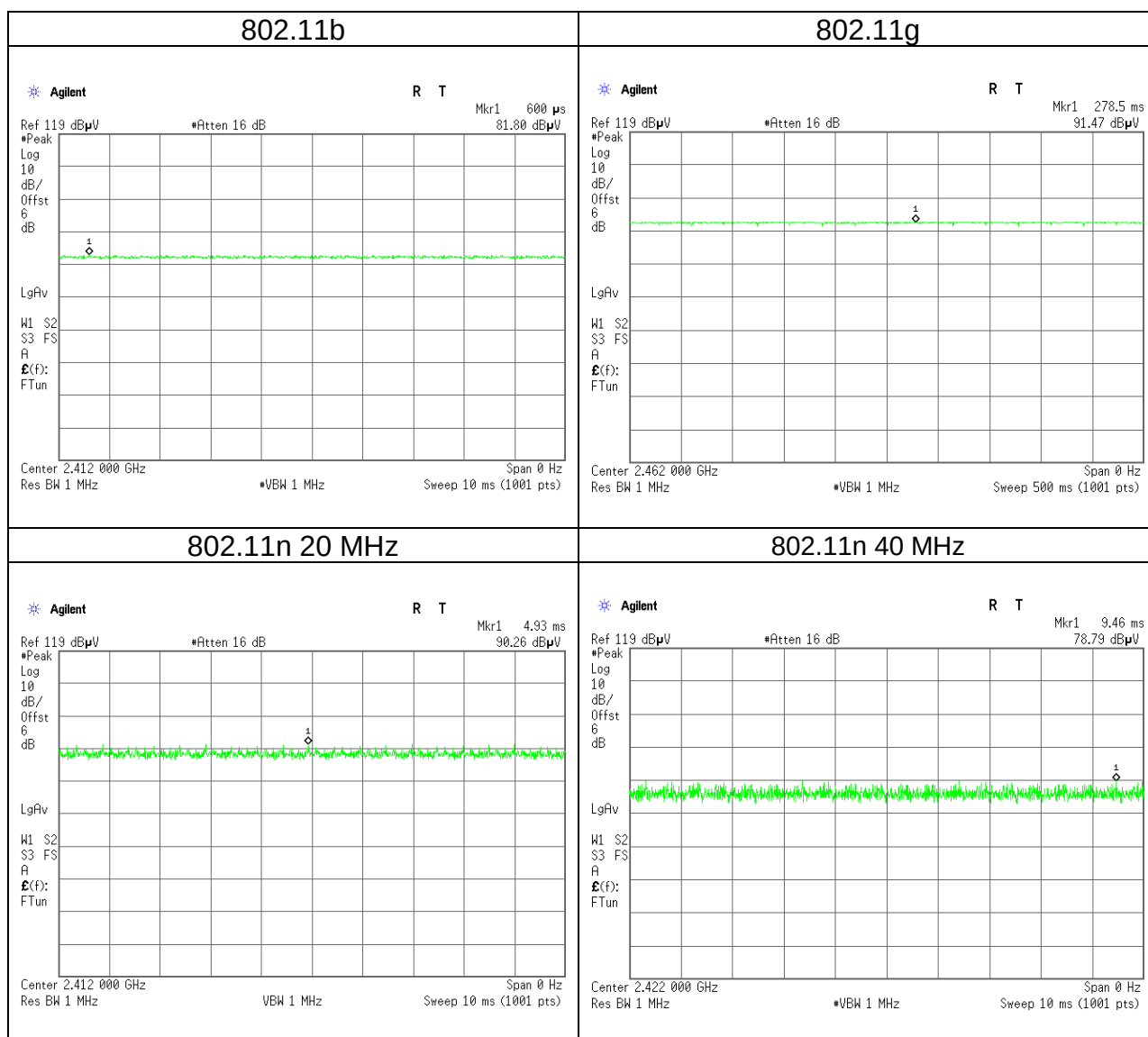
For 1TX

Duty Cycle				
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)
802.11b	-	-	100.00%	0.00
802.11g	-	-	100.00%	0.00
802.11n 20 MHz	-	-	100.00%	0.00
802.11n 40 MHz	-	-	100.00%	0.00



For 2TX

Duty Cycle				
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)
802.11b	-	-	100.00%	0.00
802.11g	-	-	100.00%	0.00
802.11n 20 MHz	-	-	100.00%	0.00
802.11n 40 MHz	-	-	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

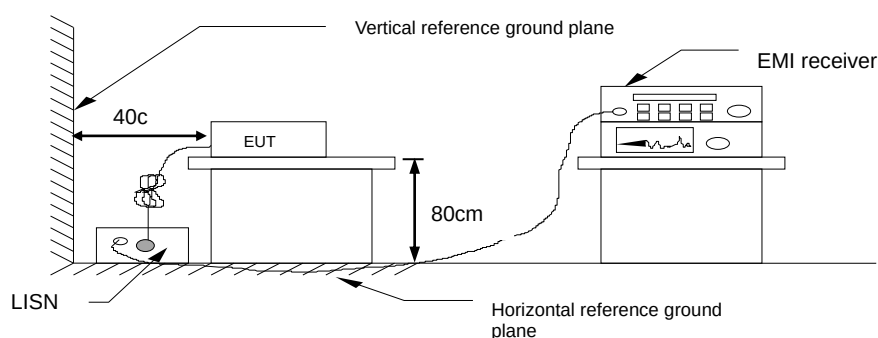
* Decreases with the logarithm of the frequency.

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

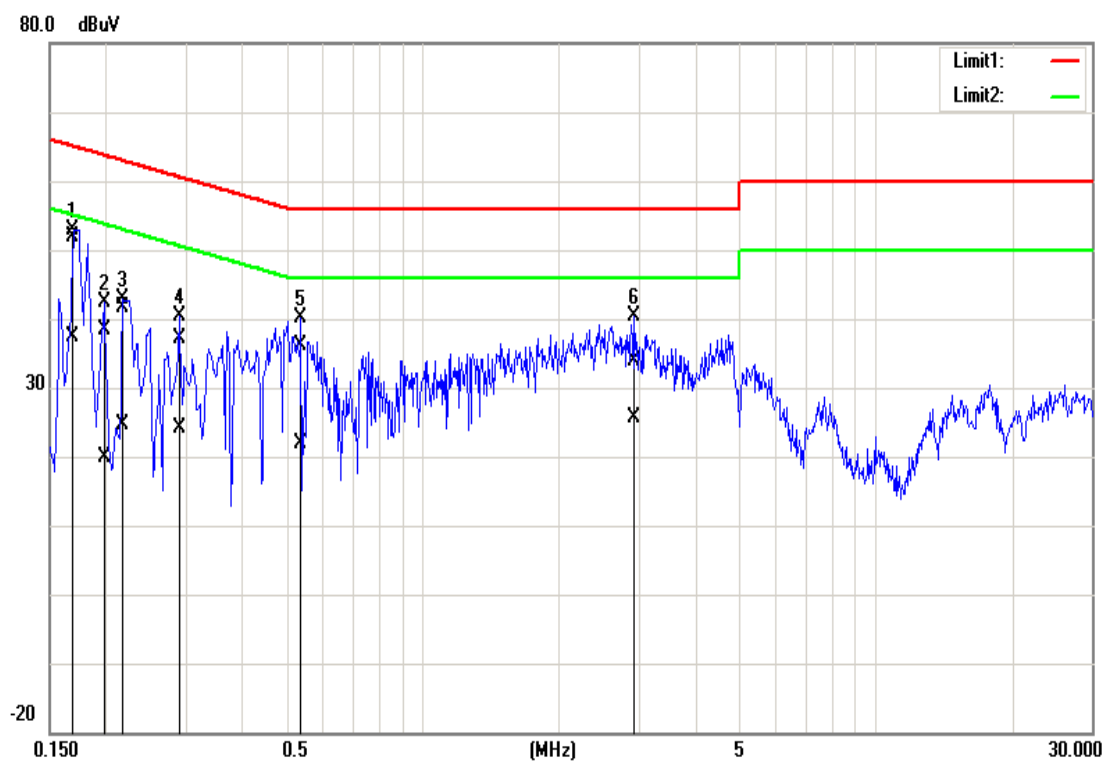


5.1.4 Test Result

Pass.

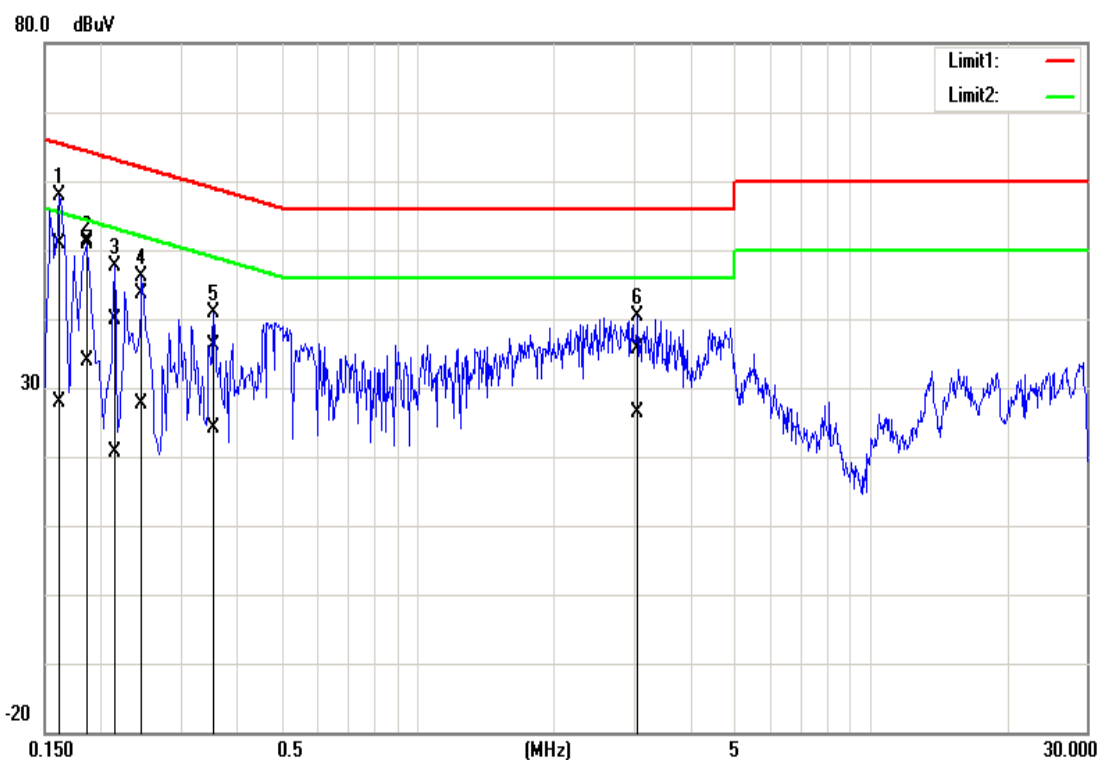
Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	2018/01/18
Phase:	Line	Test Engineer	Eric Lee



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1700	51.89	37.45	0.05	51.94	37.50	64.96	54.96	-13.02	-17.46	Pass
2	0.1980	38.29	19.71	0.05	38.34	19.76	63.69	53.69	-25.35	-33.93	Pass
3	0.2180	41.67	24.53	0.05	41.72	24.58	62.89	52.89	-21.17	-28.31	Pass
4	0.2900	37.11	24.16	0.05	37.16	24.21	60.52	50.52	-23.36	-26.31	Pass
5	0.5380	36.09	21.78	0.05	36.14	21.83	56.00	46.00	-19.86	-24.17	Pass
6	2.9460	33.89	25.43	0.11	34.00	25.54	56.00	46.00	-22.00	-20.46	Pass

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	2018/01/18
Phase:	Neutral	Test Engineer	Eric Lee



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1620	50.79	27.79	0.12	50.91	27.91	65.36	55.36	-14.45	-27.45	Pass
2	0.1860	51.32	33.78	0.12	51.44	33.90	64.21	54.21	-12.77	-20.31	Pass
3	0.2140	39.83	20.49	0.12	39.95	20.61	63.05	53.05	-23.10	-32.44	Pass
4	0.2460	43.63	27.39	0.12	43.75	27.51	61.89	51.89	-18.14	-24.38	Pass
5	0.3540	35.93	23.93	0.13	36.06	24.06	58.87	48.87	-22.81	-24.81	Pass
6	3.0580	35.41	26.08	0.19	35.60	26.27	56.00	46.00	-20.40	-19.73	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

For 1TX

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	-	13.6758	-	9.1304	≥500
Mid	2437	-	13.8929	-	10.0	
High	2462	-	13.8494	-	10.0	

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	-	16.5412	-	16.4783	≥500
Mid	2437	-	16.6714	-	16.4783	
High	2462	-	16.6280	-	16.4783	

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	-	17.5832	-	17.6087	≥500
Mid	2437	-	17.8437	-	17.6522	
High	2462	-	17.6700	-	17.6087	

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	-	36.7004	-	36.522	>500
Mid	2437	-	37.8581	-	36.406	
High	2452	-	36.7004	-	36.406	

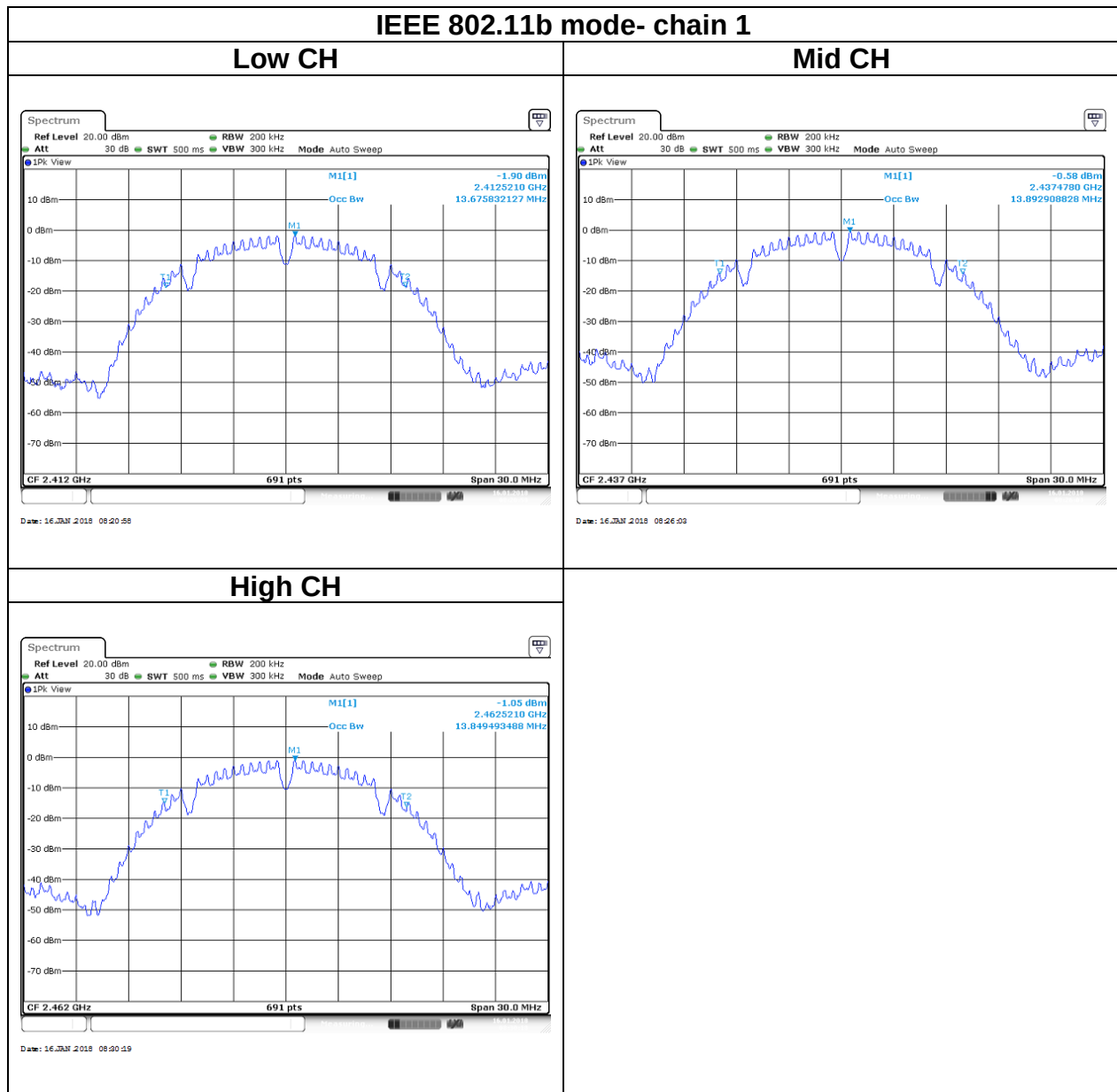
For 2TX

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	17.6087	17.6087	≥500
Mid	2437	17.7568	18.1910	17.6522	17.6522	
High	2462	17.6266	17.6266	17.6522	17.6087	

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	36.7004	36.7004	36.638	36.522	>500
Mid	2437	36.8162	36.9319	36.638	36.406	
High	2452	36.7004	36.5846	36.638	36.406	

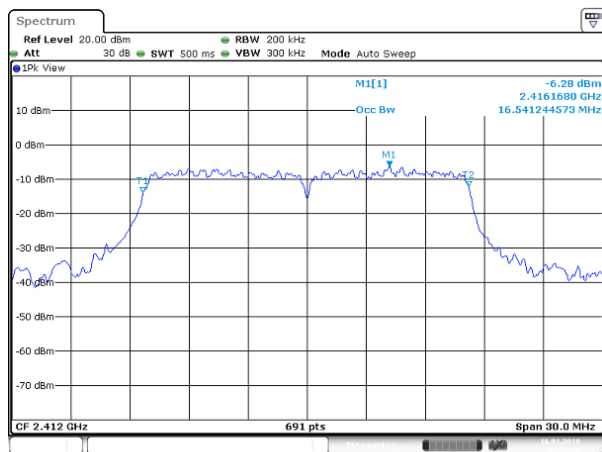
Test Data

For 1TX (99%)

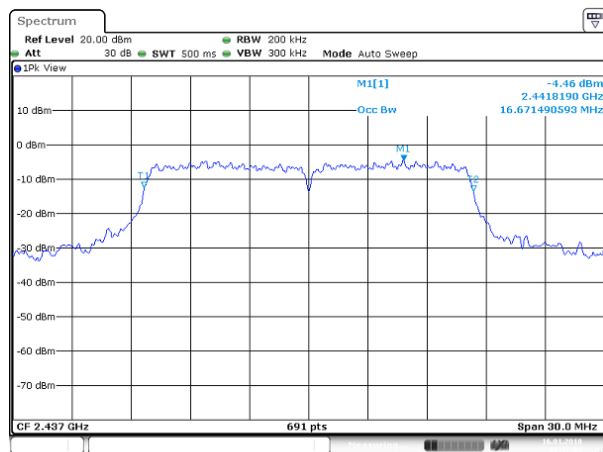


IEEE 802.11g mode- chain 1

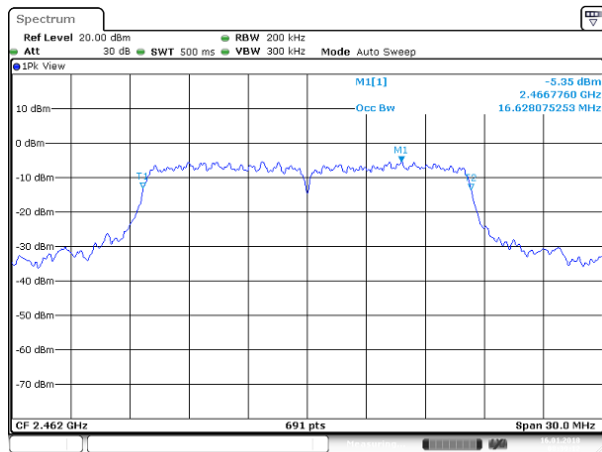
Low CH



Mid CH

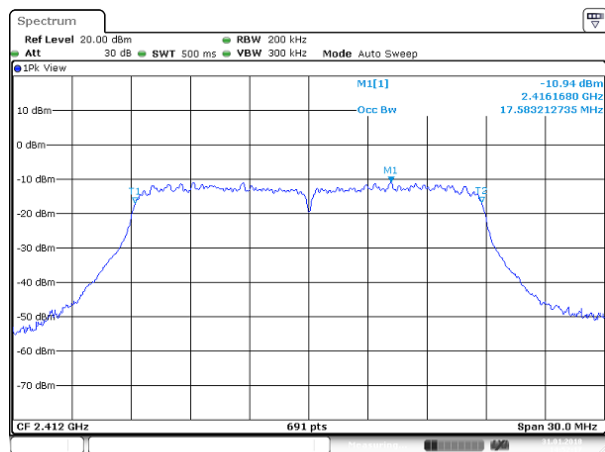


High CH



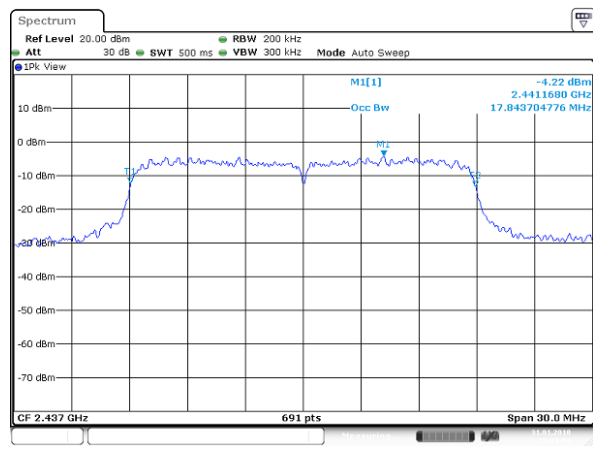
IEEE 802.11n 20 MHz mode- chain 1

Low CH



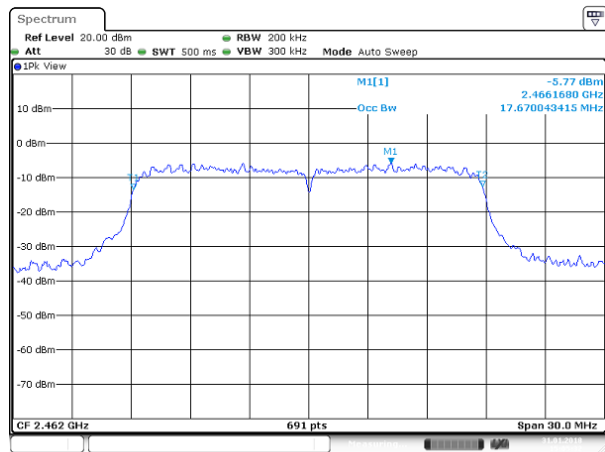
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Mid CH



Date: 31.JAN.2018 15:01:54

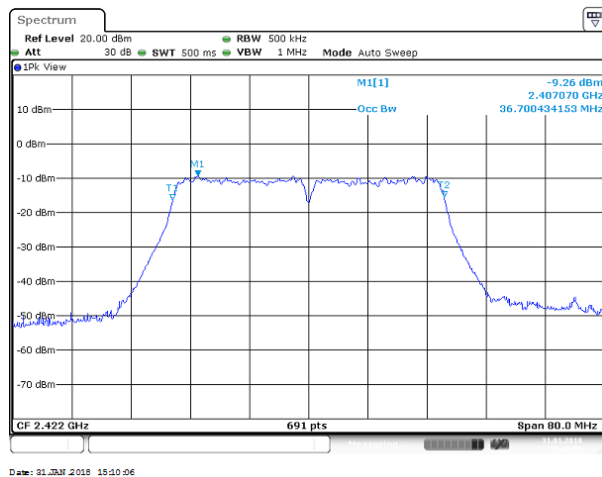
High CH



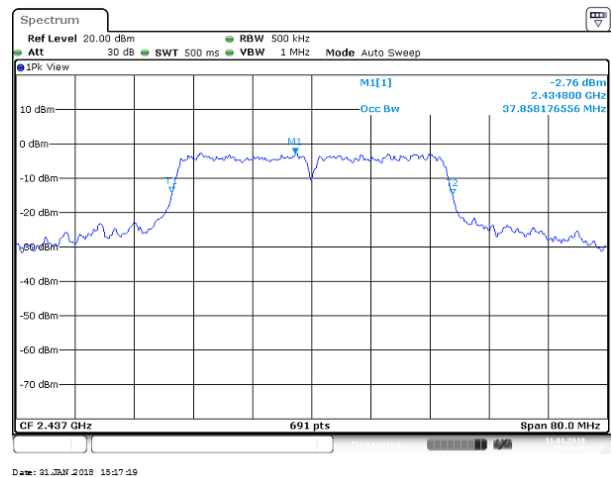
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IEEE 802.11n 40 MHz mode- chain 1

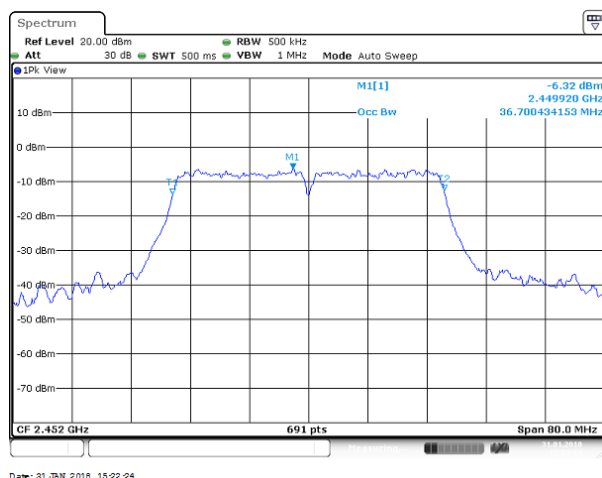
Low CH



Mid CH



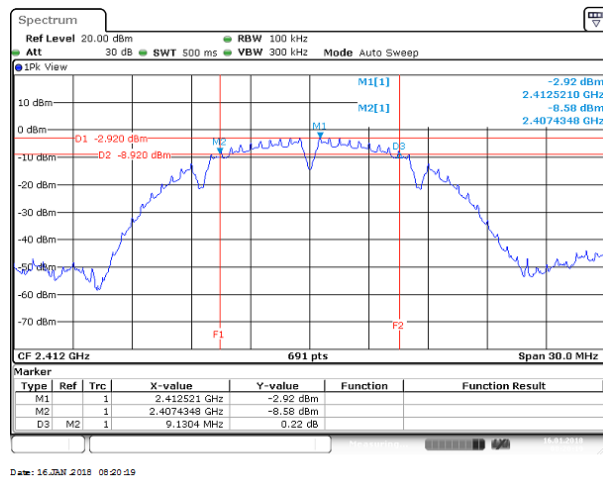
High CH



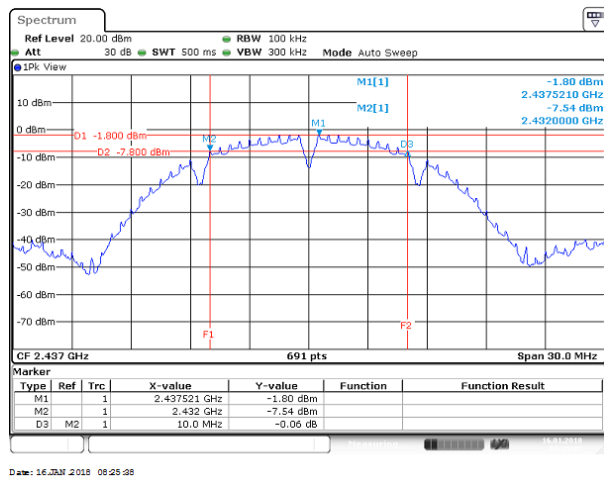
For 1TX (6dB)

IEEE 802.11b mode- chain 1

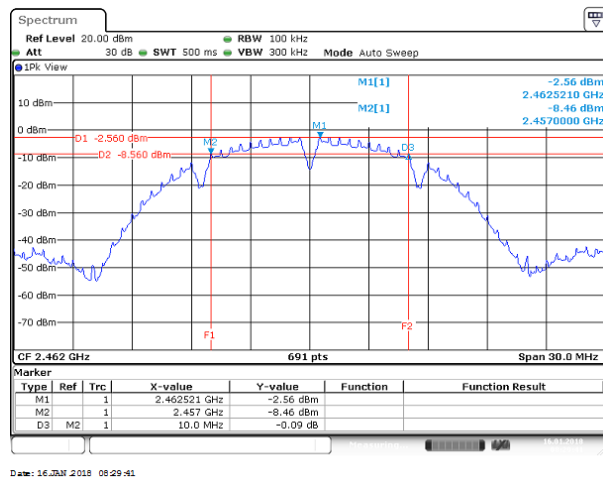
Low CH



Mid CH

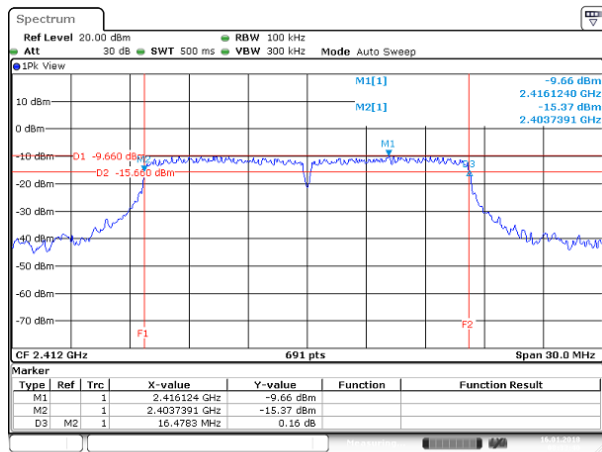


High CH

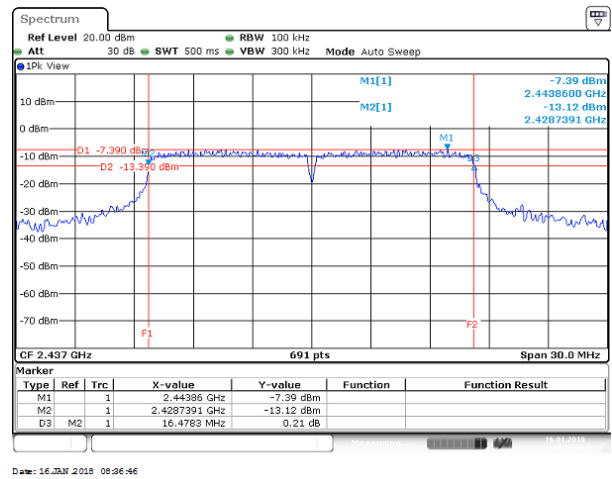


IEEE 802.11g mode- chain 1

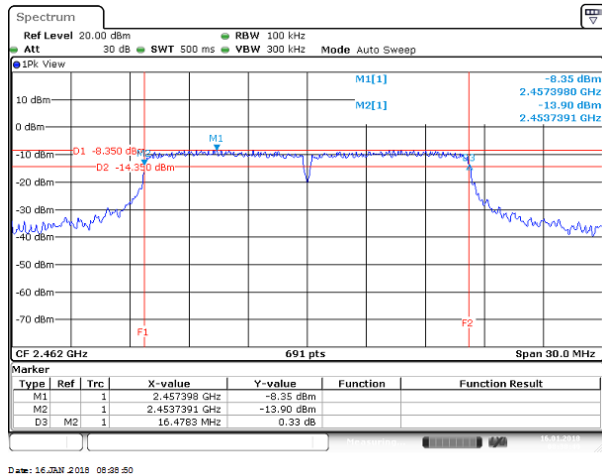
Low CH



Mid CH

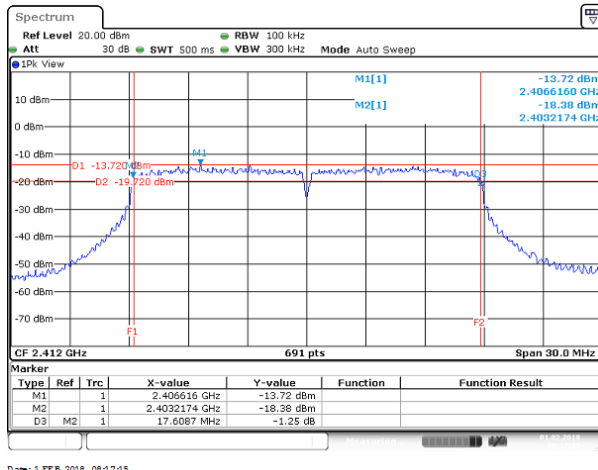


High CH

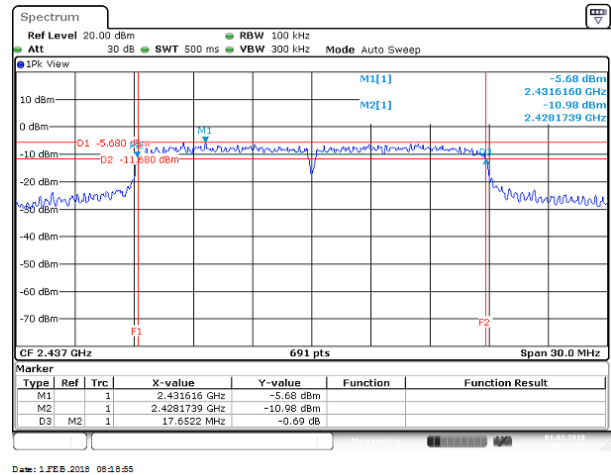


IEEE 802.11n 20 MHz mode- chain 1

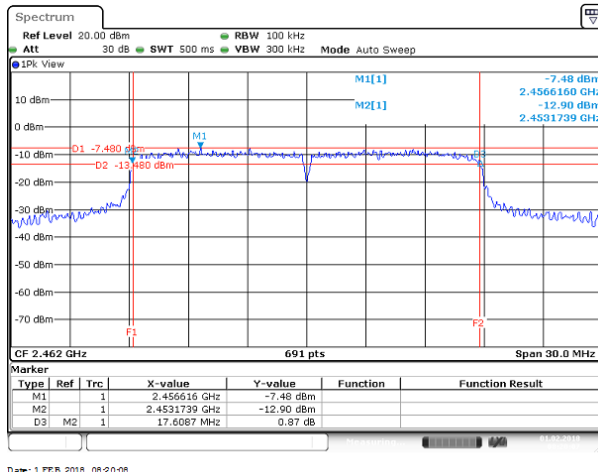
Low CH



Mid CH

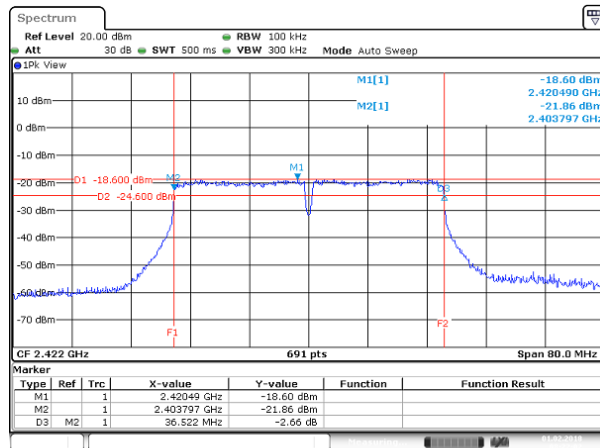


High CH

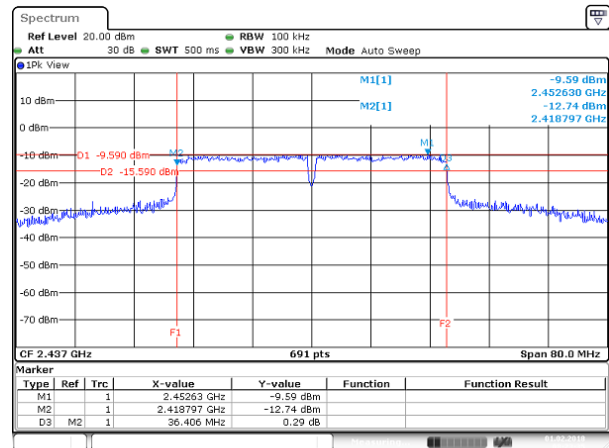


IEEE 802.11n 40 MHz mode- chain 1

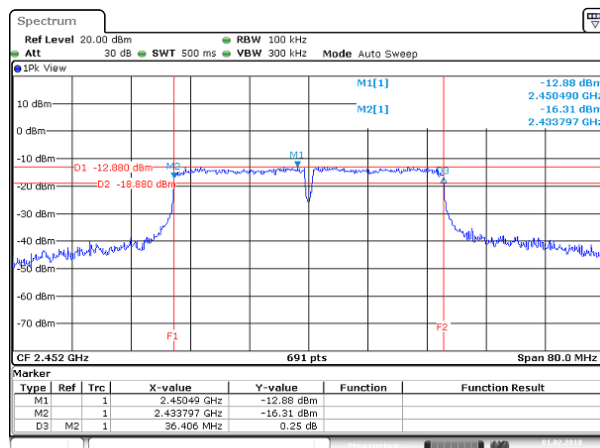
Low CH



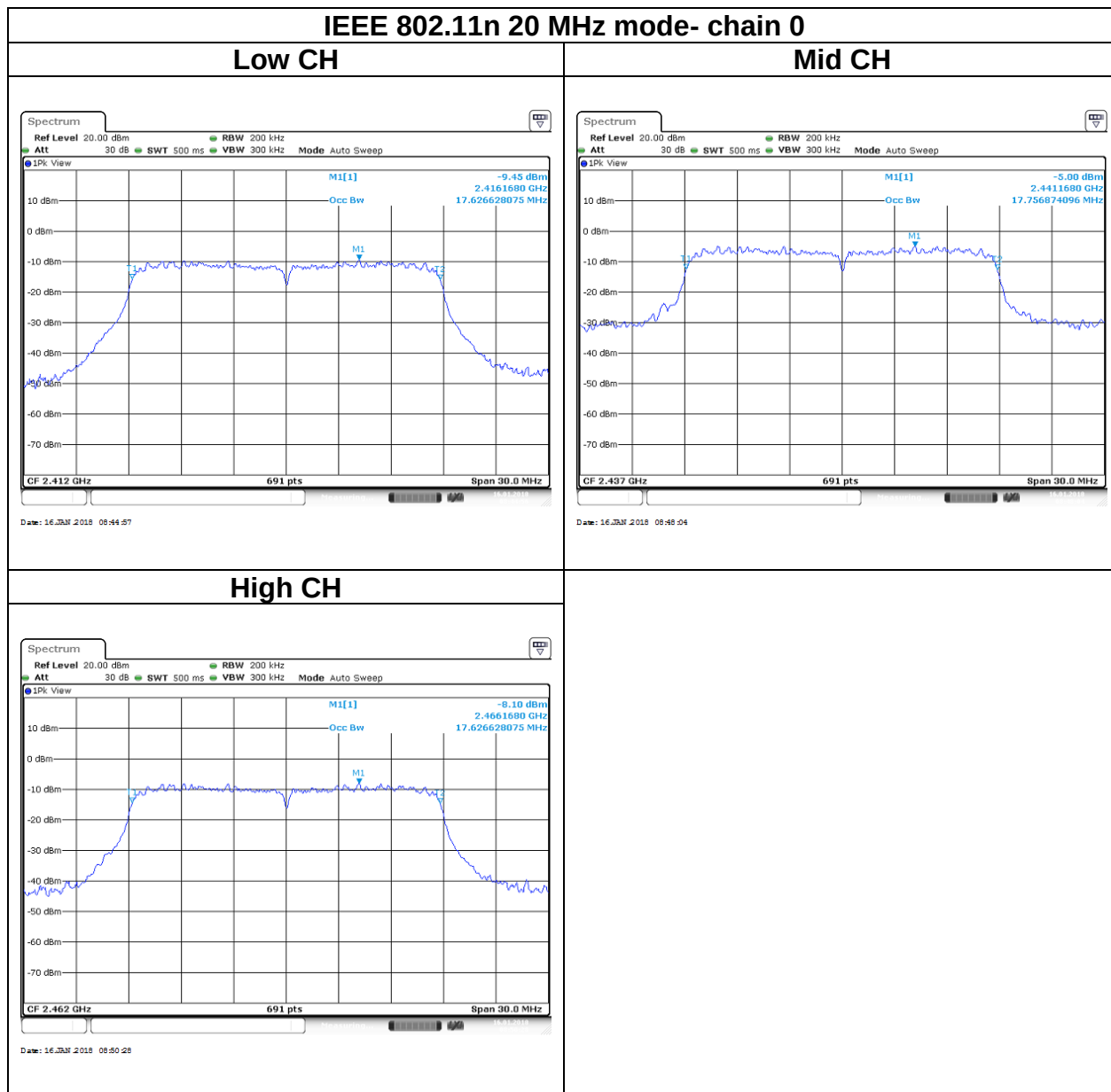
Mid CH



High CH

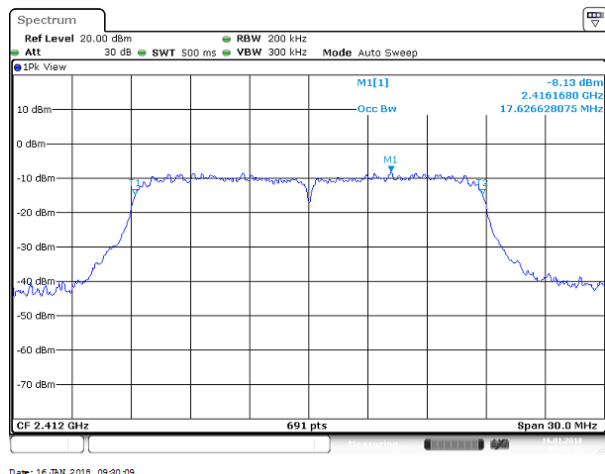


For 2TX (99%)

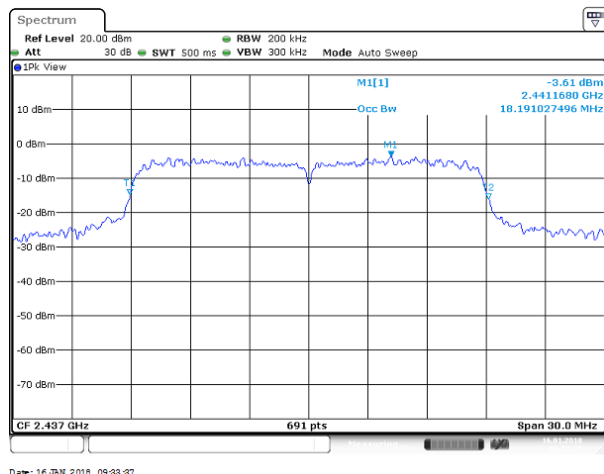


IEEE 802.11n 20 MHz mode- chain 1

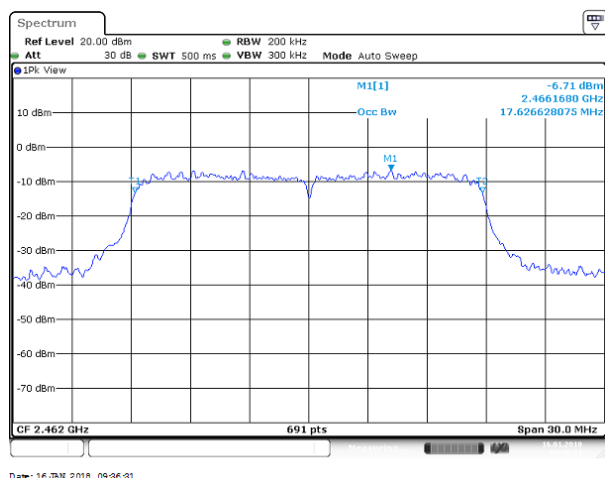
Low CH



Mid CH

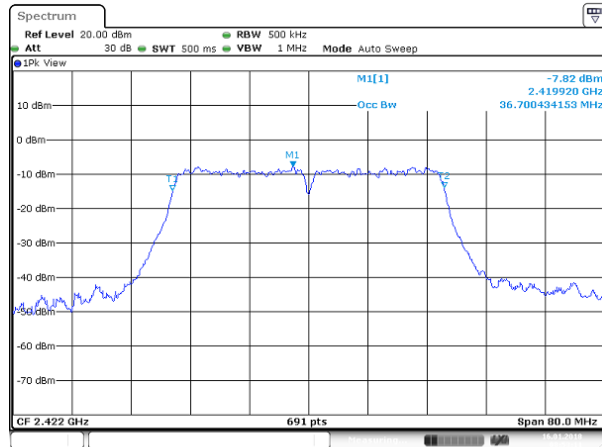


High CH

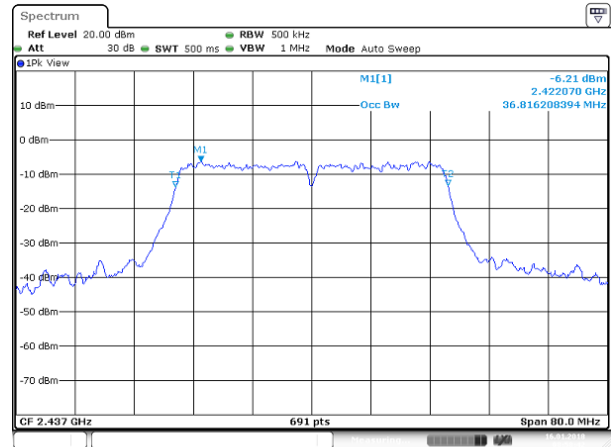


IEEE 802.11n 40 MHz mode- chain 0

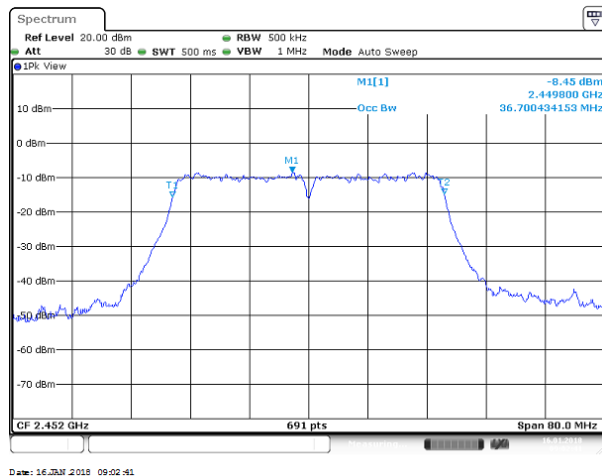
Low CH



Mid CH

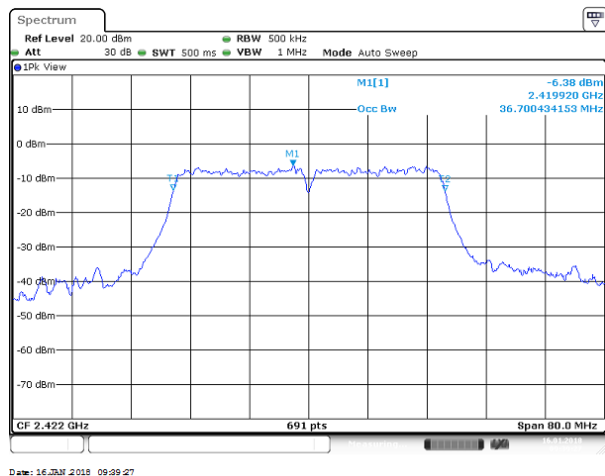


High CH

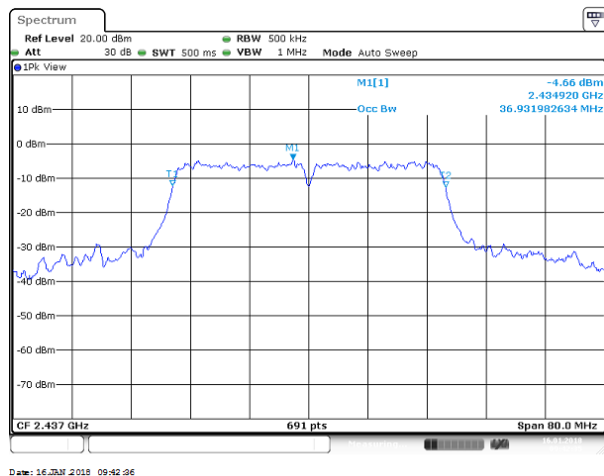


IEEE 802.11n 40 MHz mode- chain 1

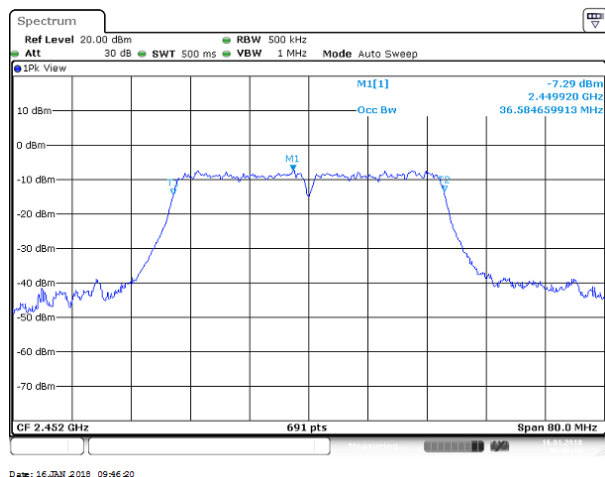
Low CH



Mid CH



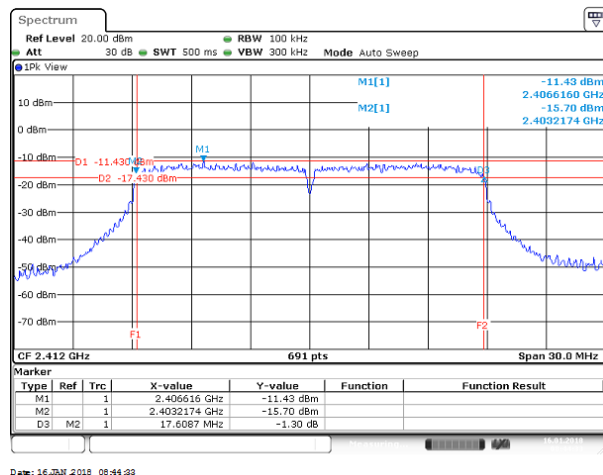
High CH



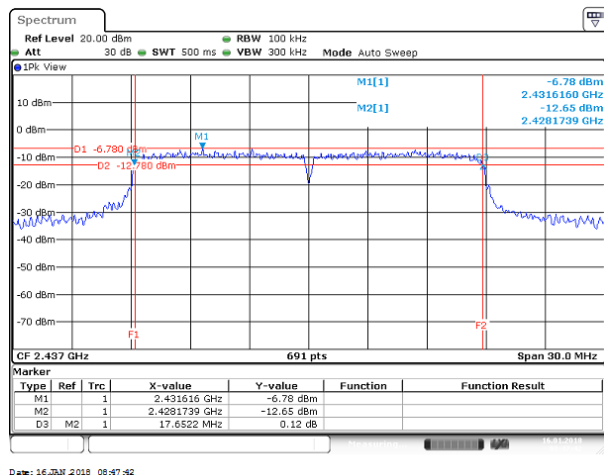
For 2TX (6dB)

IEEE 802.11n 20 MHz mode- chain 0

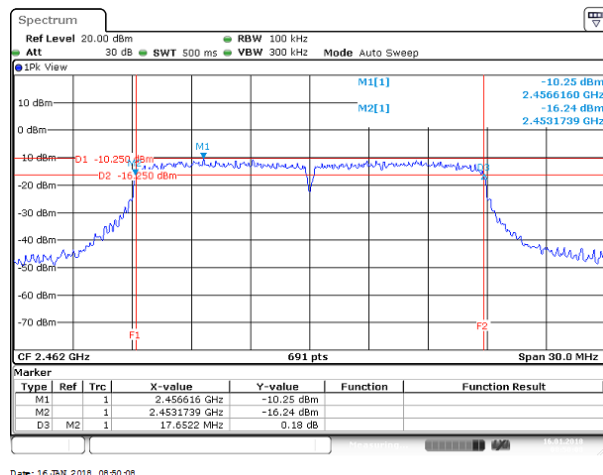
Low CH



Mid CH

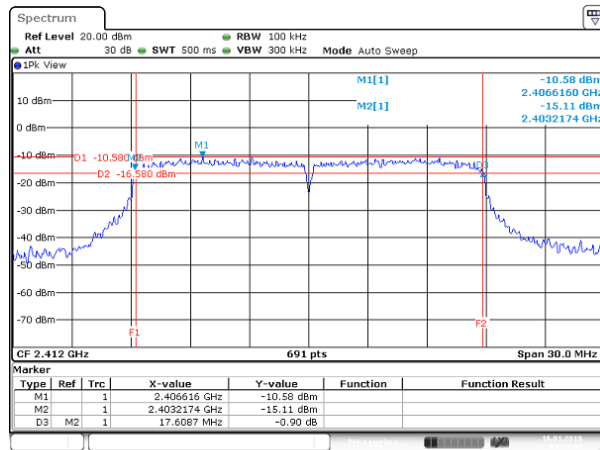


High CH

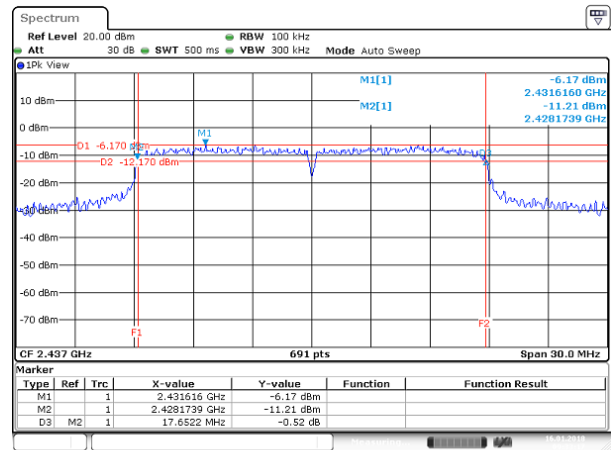


IEEE 802.11n 20 MHz mode- chain 1

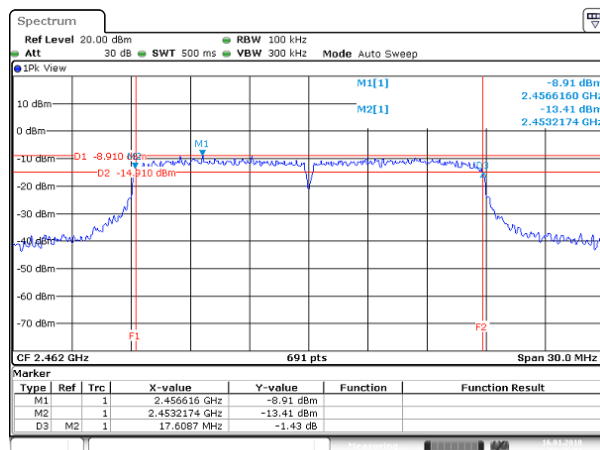
Low CH



Mid CH

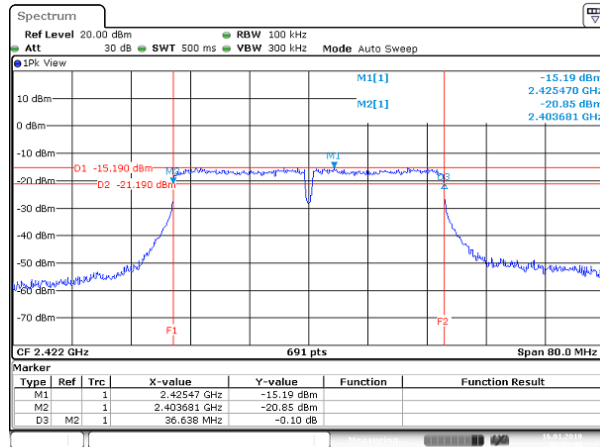


High CH

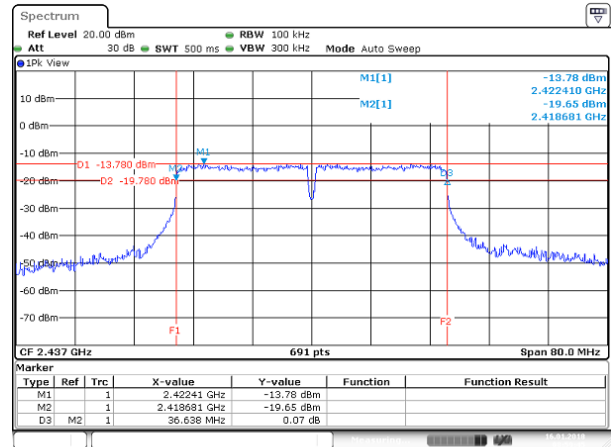


IEEE 802.11n 40 MHz mode- chain 0

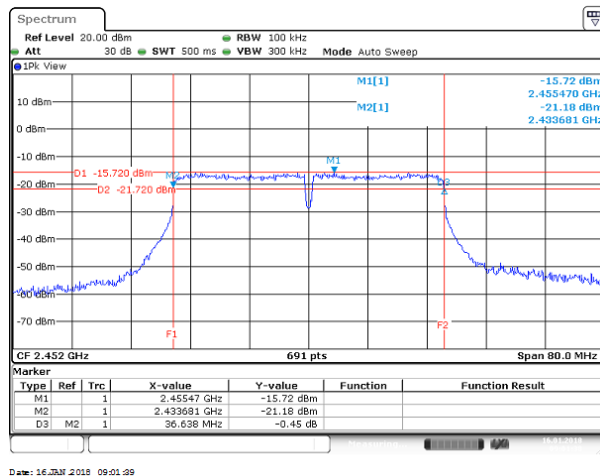
Low CH



Mid CH

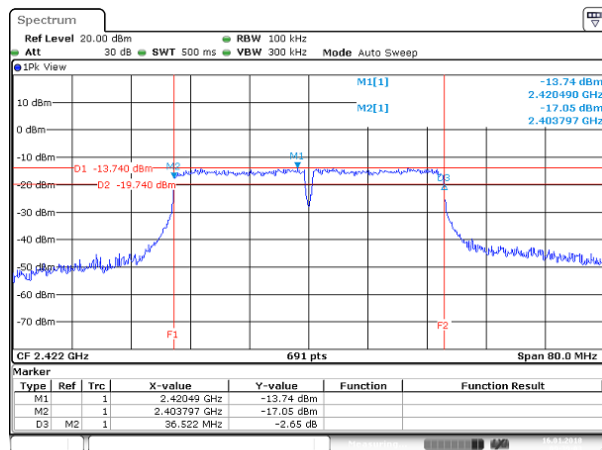


High CH

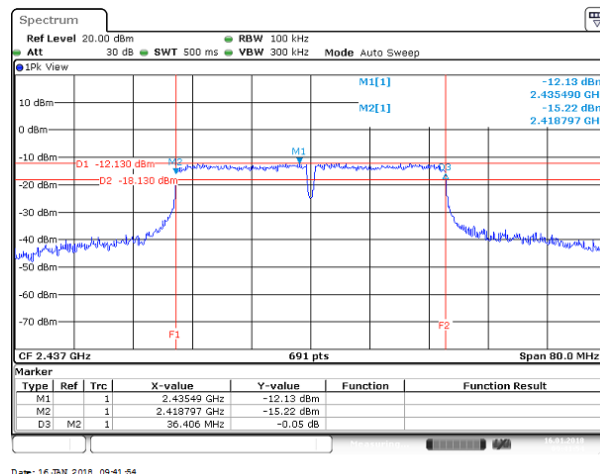


IEEE 802.11n 40 MHz mode- chain 1

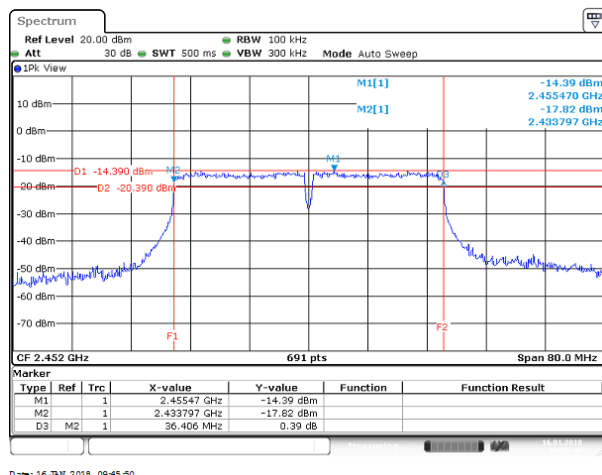
Low CH



Mid CH



High CH



5.3 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 :
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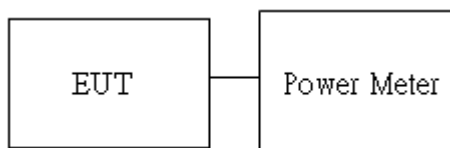
Average output power : For reporting purposes only.

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 :

For 1TX

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	-	58	-	21.76	21.76	0.1500	30
	Mid	2437	-	63	-	22.91	22.91	0.1954	
	High	2462	-	61	-	22.53	22.53	0.1791	
IEEE 802.11g Data rate: 6Mbps	Low	2412	-	57	-	21.02	21.02	0.1265	
	Mid	2437	-	63	-	22.70	22.70	0.1862	
	High	2462	-	60	-	21.95	21.95	0.1567	
IEEE 802.11n HT20 Data rate: MCS0	Low	2412	-	50	-	24.23	24.23	0.2649	
	Mid	2437	-	63	-	25.07	25.07	0.3214	
	High	2462	-	52	-	24.47	24.47	0.2799	
IEEE 802.11n HT40 Data rate: MCS0	Low	2422	-	49	-	24.32	24.32	0.2704	
	Mid	2437	-	63	-	25.24	25.24	0.3342	
	High	2452	-	49	-	24.32	24.32	0.2704	

For 2TX

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 802.11n HT20 Data rate: MCS0	Low	2412	52	52	23.76	24.26	27.03	0.5047	30
	Mid	2437	63	63	25.77	26.3	29.05	0.8035	
	High	2462	57	57	24.62	25.81	28.27	0.6714	
IEEE 802.11n HT40 Data rate: MCS0	Low	2422	53	53	25.80	25.96	28.89	0.7745	
	Mid	2437	57	57	25.63	26.88	29.31	0.8531	
	High	2452	52	52	24.07	25.89	28.08	0.6427	

Average output power :**For 1TX**

Wifi 2.4G					
Config	CH	Freq. (MHz)	AV Power(dBm)		AV Total Power (dBm)
			chain0	chain1	
IEEE 802.11b Data rate: 1Mbps	Low	2412	-	21.06	21.06
	Mid	2437	-	22.27	22.27
	High	2462	-	21.87	21.87
IEEE 802.11g Data rate: 6Mbps	Low	2412	-	18.40	18.40
	Mid	2437	-	20.29	20.29
	High	2462	-	19.35	19.35
IEEE 802.11n HT20 Data rate: MCS0	Low	2412	-	16.86	16.86
	Mid	2437	-	20.94	20.94
	High	2462	-	17.92	17.92
IEEE 802.11n HT40 Data rate: MCS0	Low	2422	-	16.84	16.84
	Mid	2437	-	20.97	20.97
	High	2452	-	16.78	16.78

For 2TX

Wifi 2.4G					
Config	CH	Freq. (MHz)	AV Power(dBm)		AV Total Power (dBm)
			chain0	chain1	
IEEE 802.11n HT20 Data rate: MCS0	Low	2412	14.83	16.15	18.55
	Mid	2437	18.75	19.97	22.41
	High	2462	16.60	18.53	20.68
IEEE 802.11n HT40 Data rate: MCS0	Low	2422	15.12	16.93	19.13
	Mid	2437	17.33	18.13	20.76
	High	2452	15.49	16.56	19.07

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.

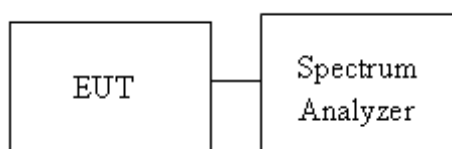
Limit	☒ Antenna not exceed 6 dBi : 8dBm ☐ Antenna with DG greater than 6 dBi : [Limit = 8 – (DG – 6)] ☐ Point-to-point operation :
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5.4.2 Test Procedure

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

For 1TX

Test mode: IEEE 802.11b mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSS (dBm)	Chain 1 PPSS (dBm)	Total PPSS (dBm)	Limit (dBm)
Low	2412	-	-11.28	-11.28	8
Mid	2437	-	-9.99	-9.99	
High	2462	-	-10.38	-10.38	

Test mode: IEEE 802.11g mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSS (dBm)	Chain 1 PPSS (dBm)	Total PPSS (dBm)	Limit (dBm)
Low	2412	-	-12.26	-12.26	8
Mid	2437	-	-10.11	-10.11	
High	2462	-	-10.87	-10.87	

Test mode: IEEE 802.11n 20 MHz mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain 0 PPSS (dBm)	Chain 1 PPSS (dBm)	Total PPSS (dBm)	Limit (dBm)
Low	2412	-	-16.63	-16.63	8
Mid	2437	-	-7.74	-7.74	
High	2462	-	-10.12	-10.12	

Test mode: IEEE 802.11n 40 MHz mode / 2422-2452 MHz					
Channel	Frequency (MHz)	Chain 0 PPSS (dBm)	Chain 1 PPSS (dBm)	Total PPSS (dBm)	Limit (dBm)
Low	2422	-	-17.81	-17.81	8
Mid	2437	-	-9.09	-9.09	
High	2452	-	-12.13	-12.13	

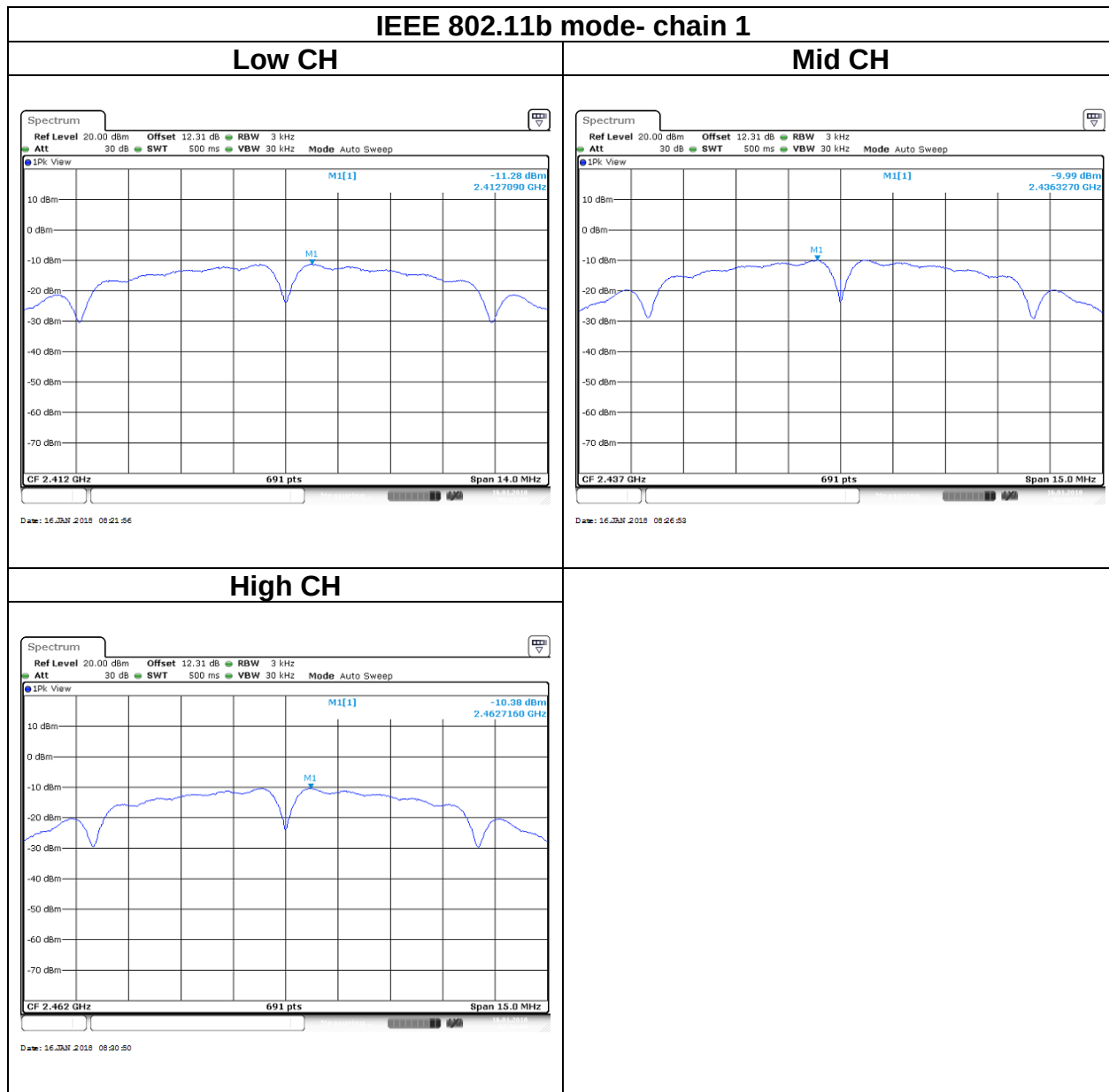
For 2TX

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	-13.24	-12.29	-9.73	8
Mid	2437	-9.70	-8.75	-6.19	
High	2462	-11.94	-11.04	-8.46	

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	-15.48	-13.67	-11.47	8
Mid	2437	-13.62	-11.97	-9.71	
High	2452	-16.06	-15.42	-12.72	

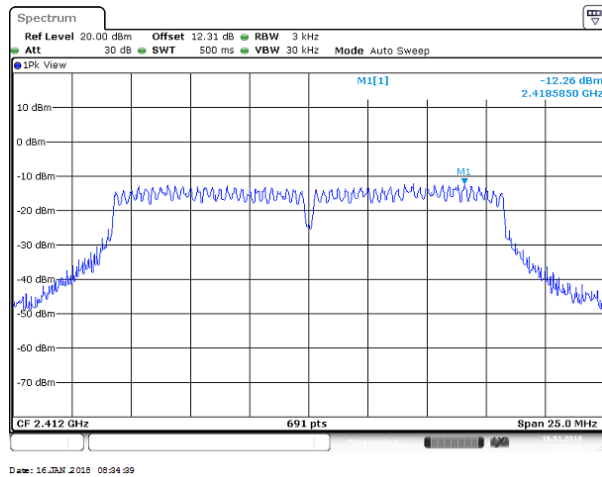
Test Data

For 1TX

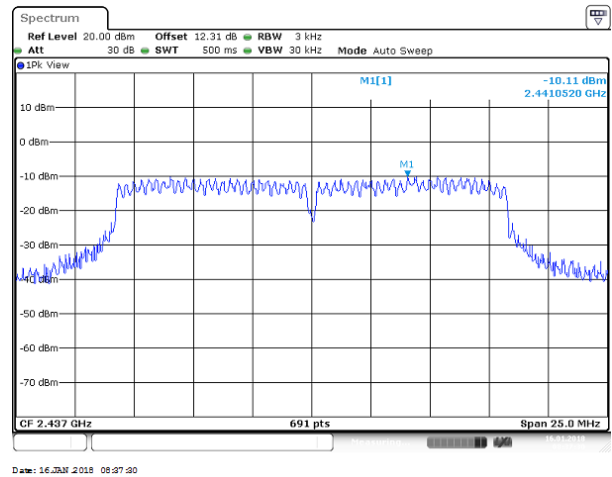


IEEE 802.11g mode- chain 1

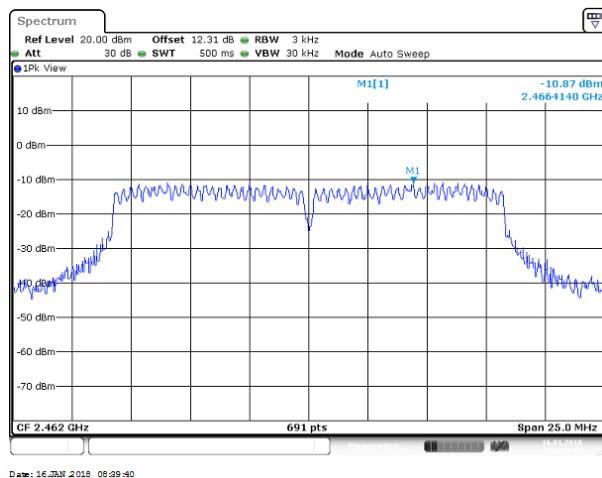
Low CH



Mid CH

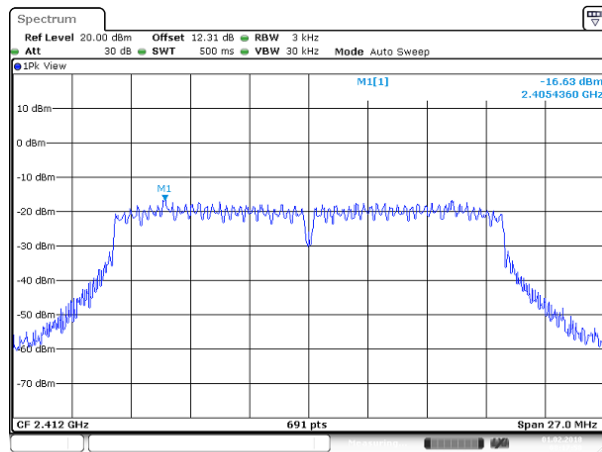


High CH



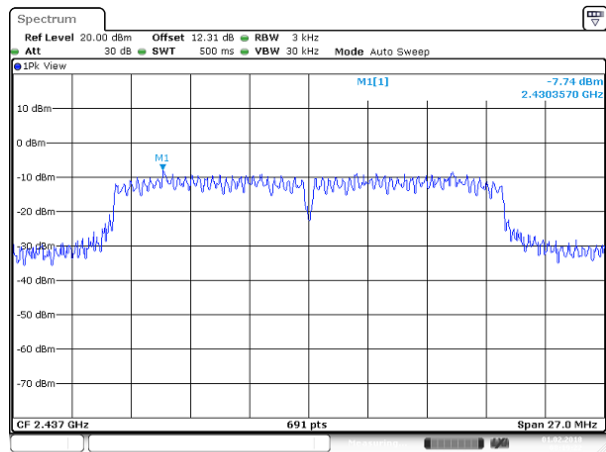
IEEE 802.11n 20 MHz mode- chain 1

Low CH



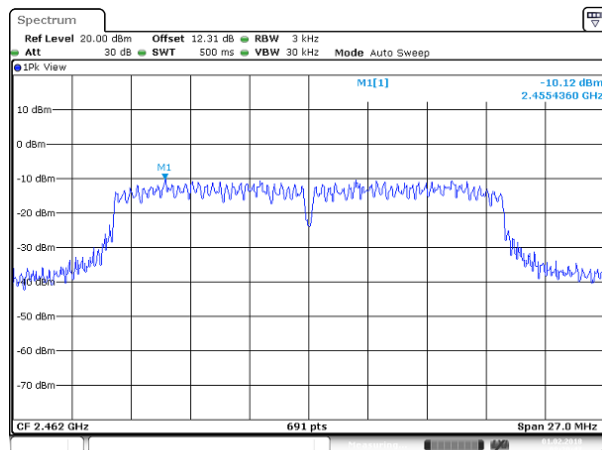
Date: 1.FEB.2015 08:17:59

Mid CH



Date: 1.FEB.2015 08:19:23

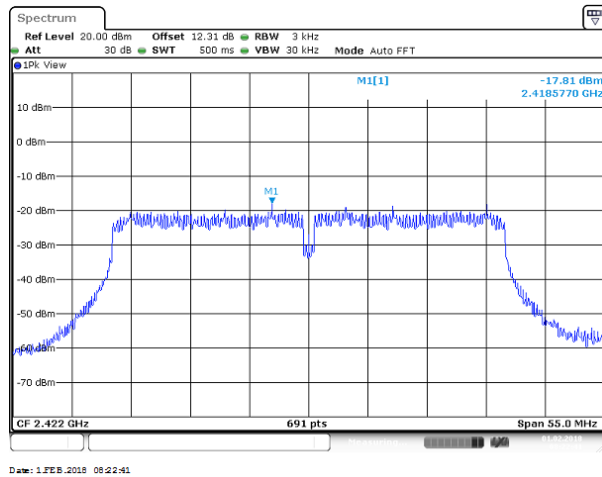
High CH



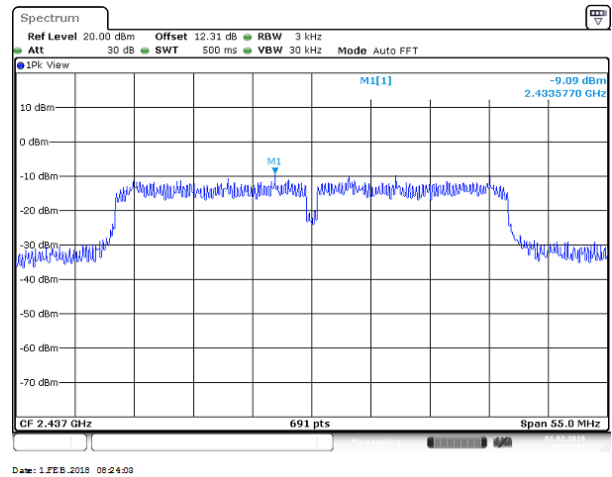
Date: 1.FEB.2015 08:20:48

IEEE 802.11n 40 MHz mode- chain 1

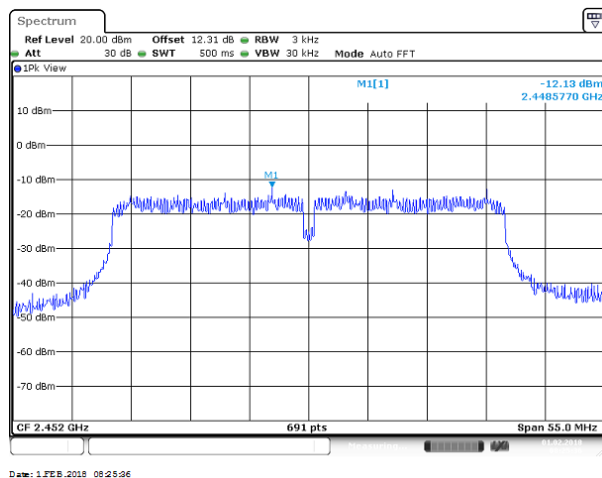
Low CH



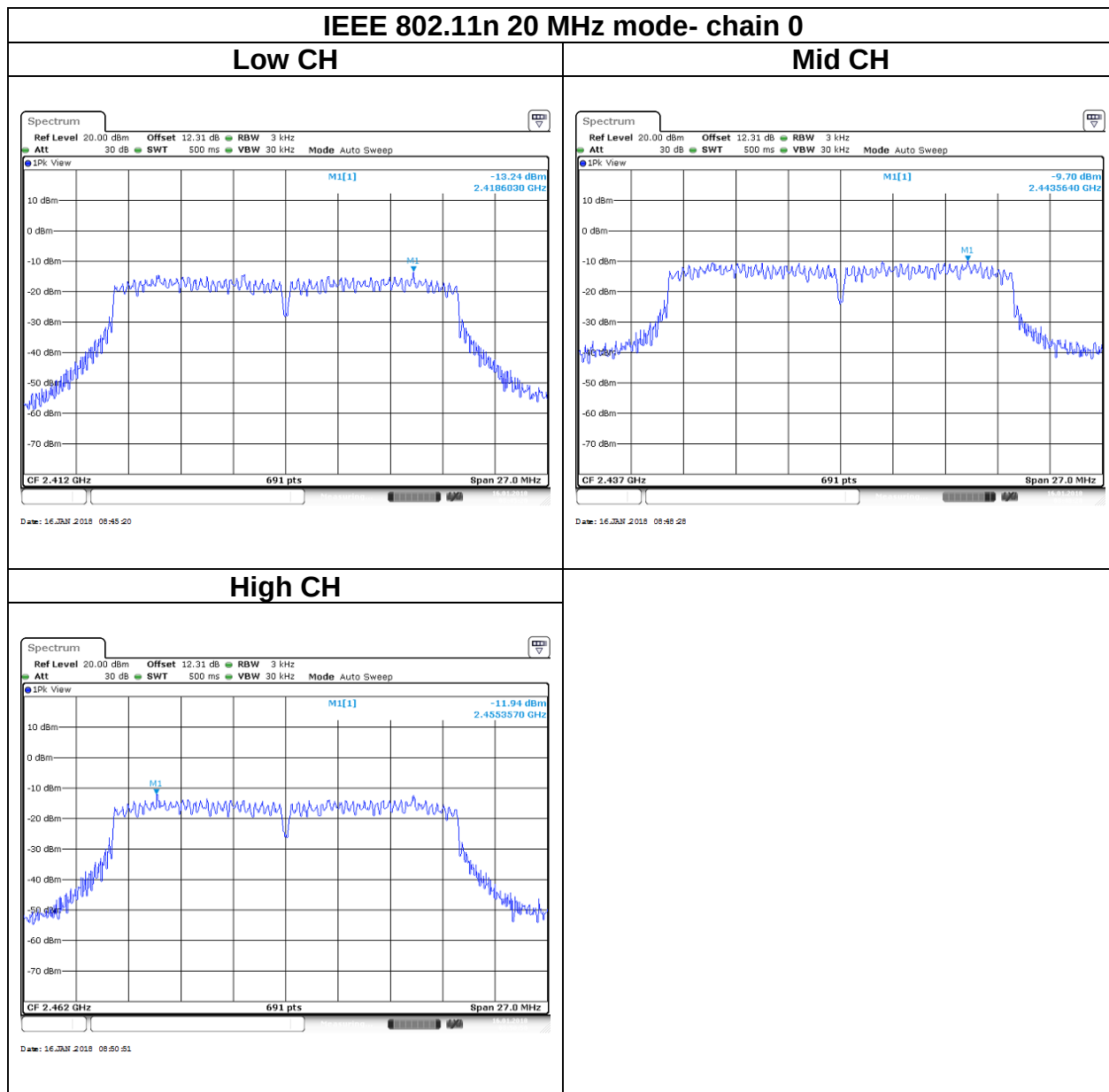
Mid CH



High CH

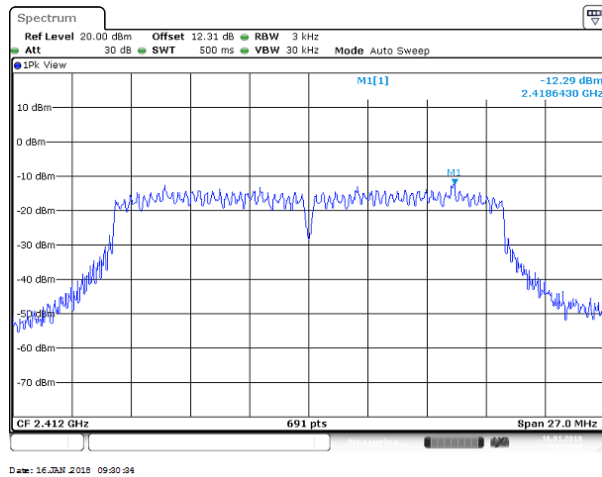


For 2TX

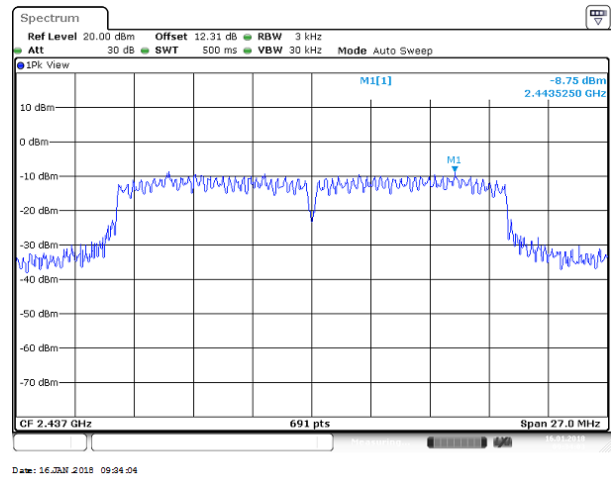


IEEE 802.11n 20 MHz mode- chain 1

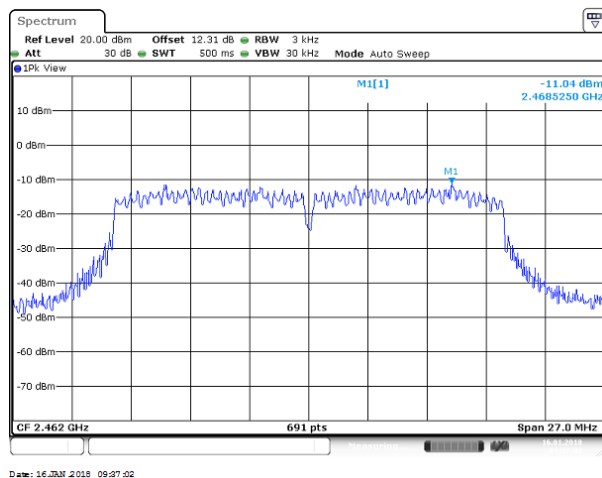
Low CH



Mid CH

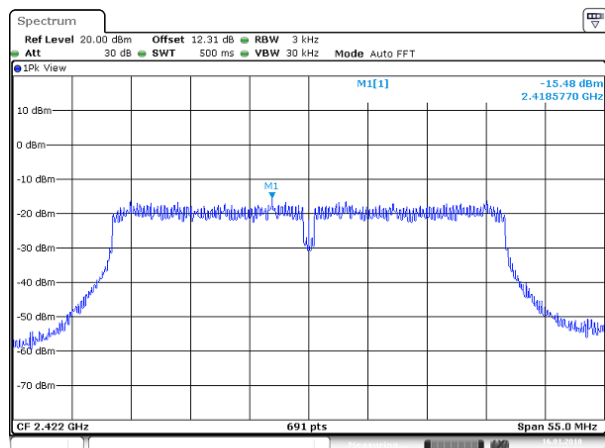


High CH

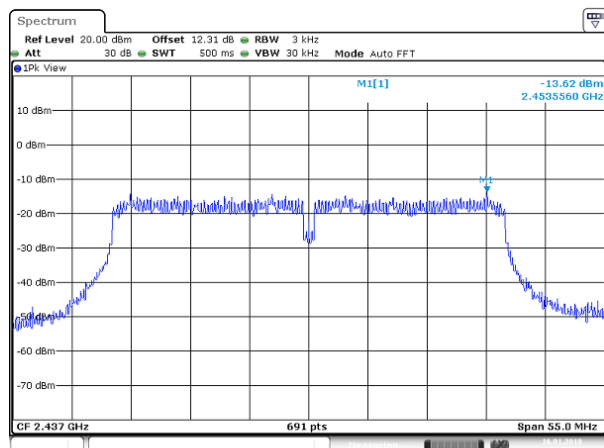


IEEE 802.11n 40 MHz mode- chain 0

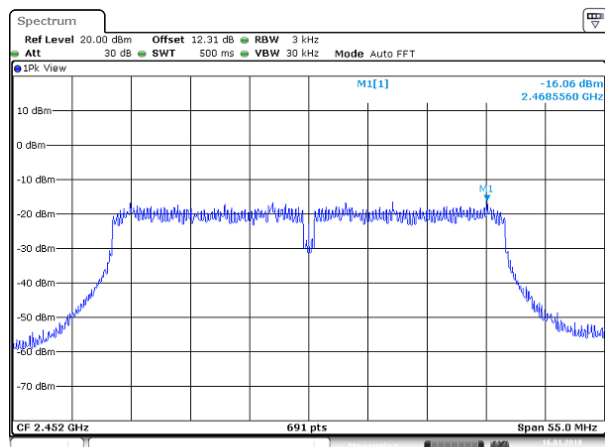
Low CH



Mid CH

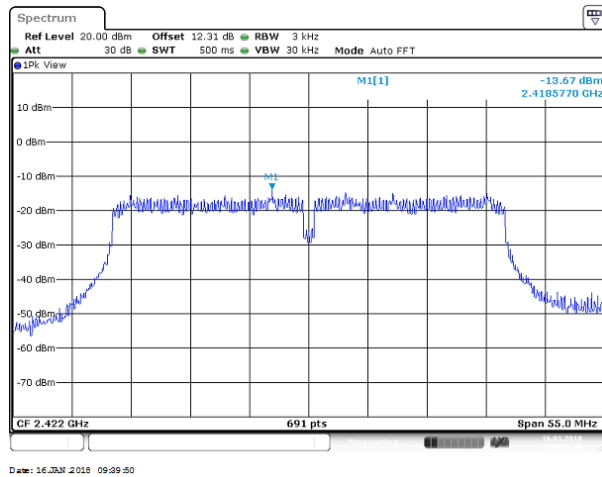


High CH

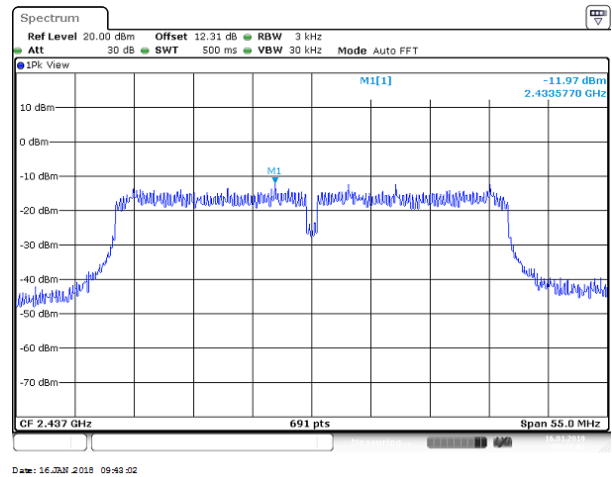


IEEE 802.11n 40 MHz mode- chain 1

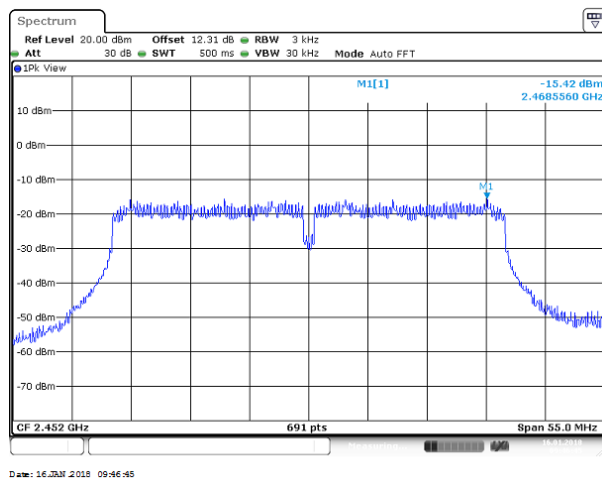
Low CH



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,

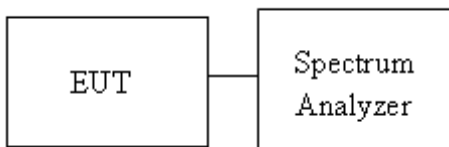
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

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.

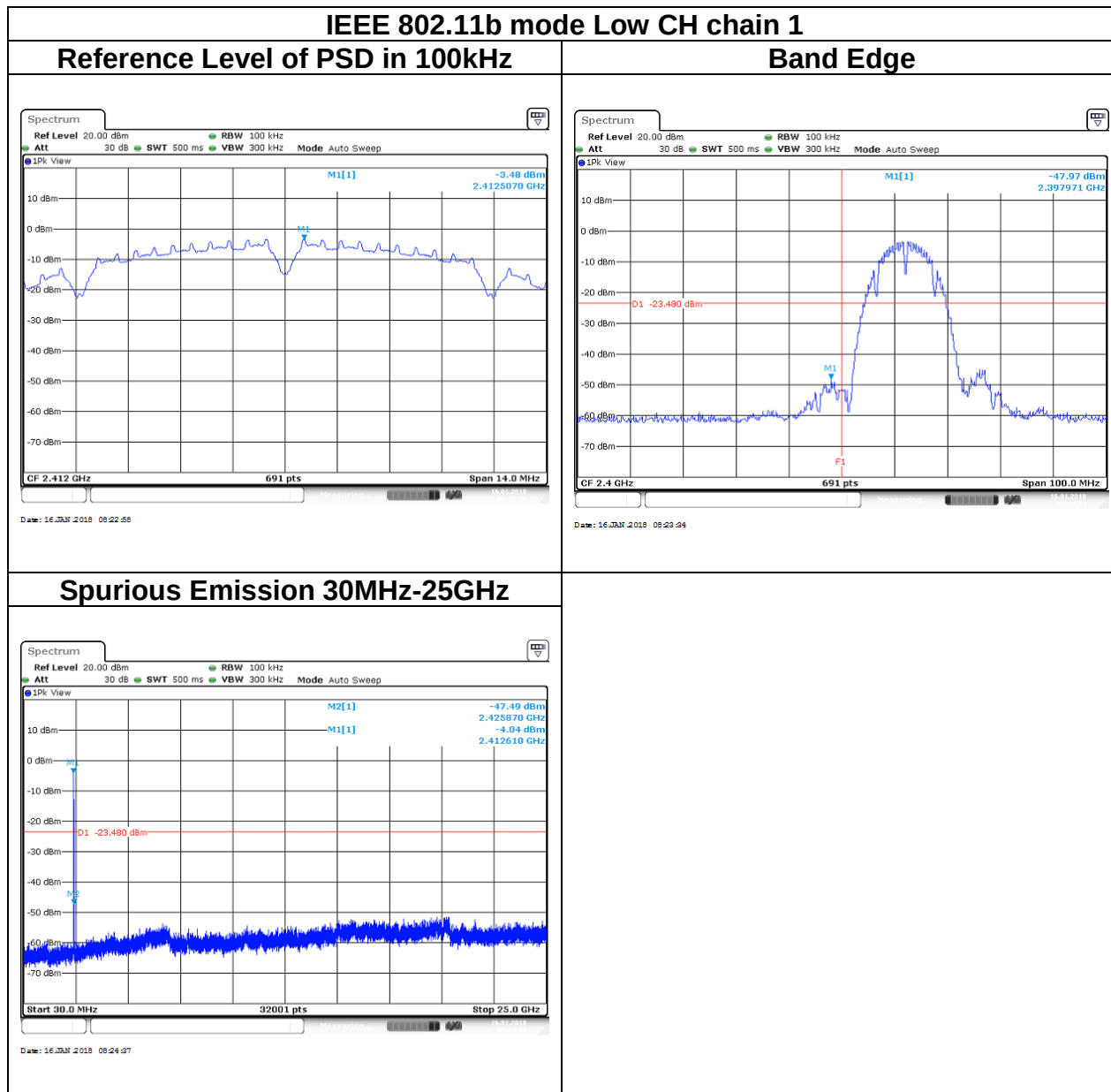
5.5.3 Test Setup



5.5.4 Test Result

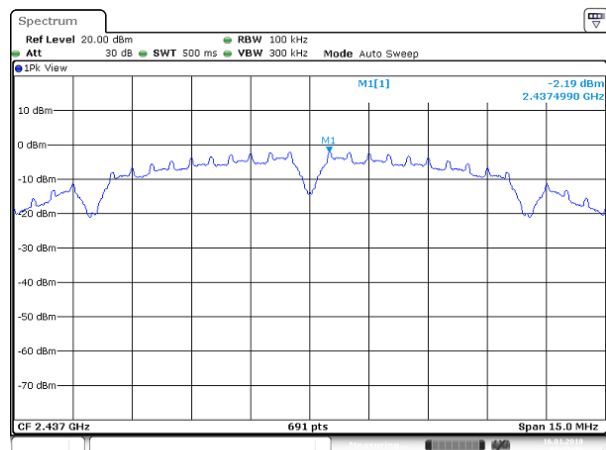
Test Data

For 1TX



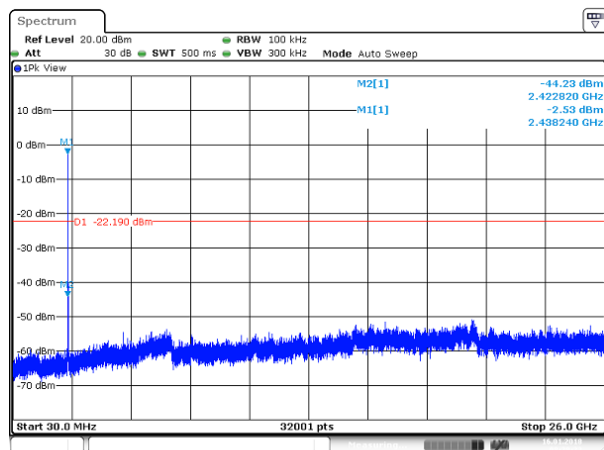
IEEE 802.11b mode Mid CH chain 1

Reference Level of PSD in 100kHz



Date: 16 JUN 2018 08:27:29

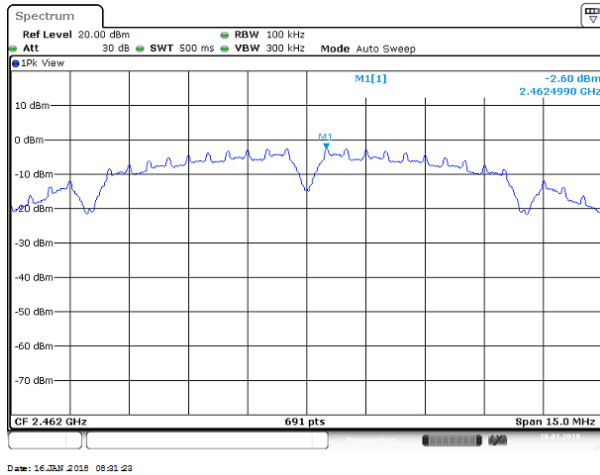
Spurious Emission 30MHz-25GHz



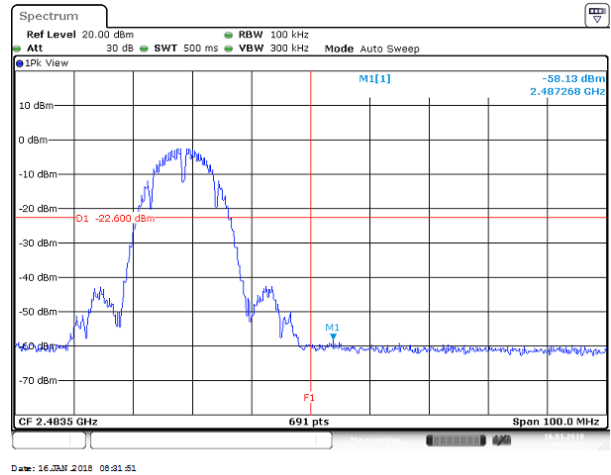
Date: 16 JUN 2018 08:28:22

IEEE 802.11b mode High CH chain 1

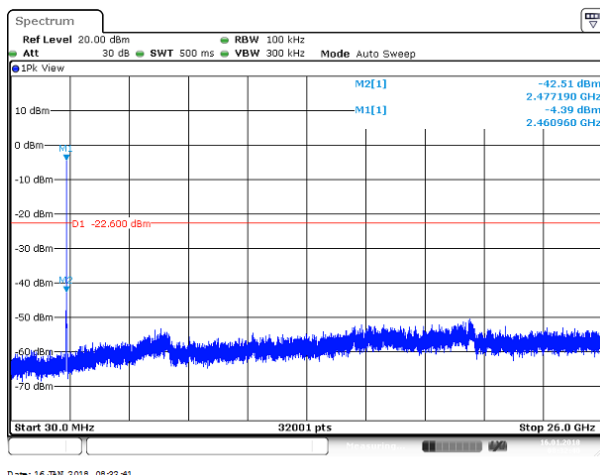
Reference Level of PSD in 100kHz



Band Edge

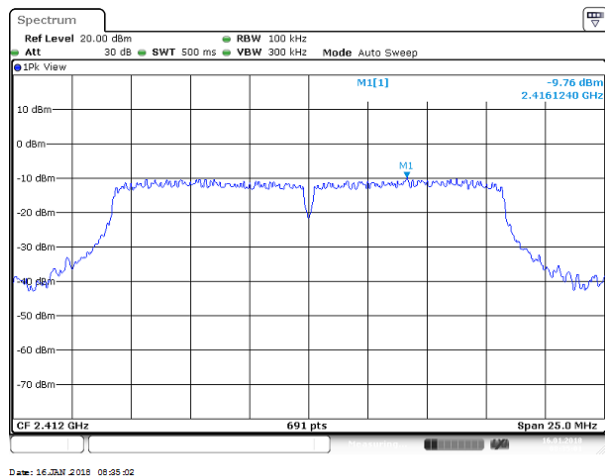


Spurious Emission 30MHz-25GHz

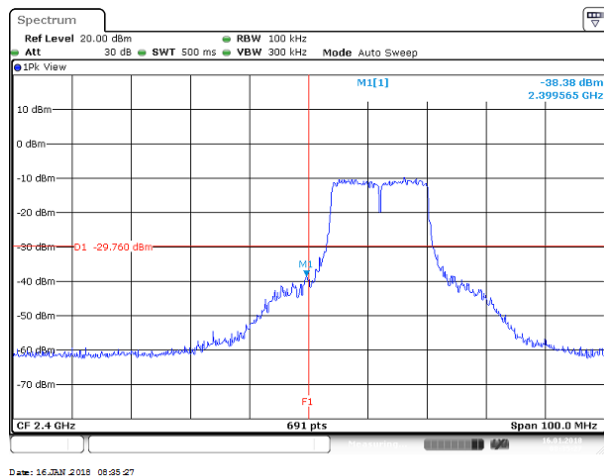


IEEE 802.11g mode Low CH chain 1

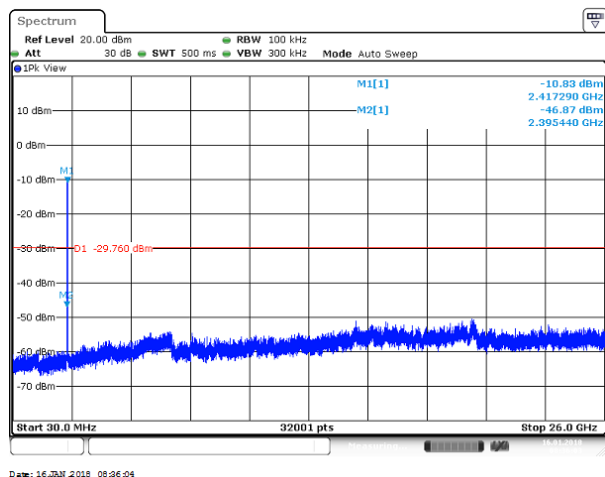
Reference Level of PSD in 100kHz



Band Edge

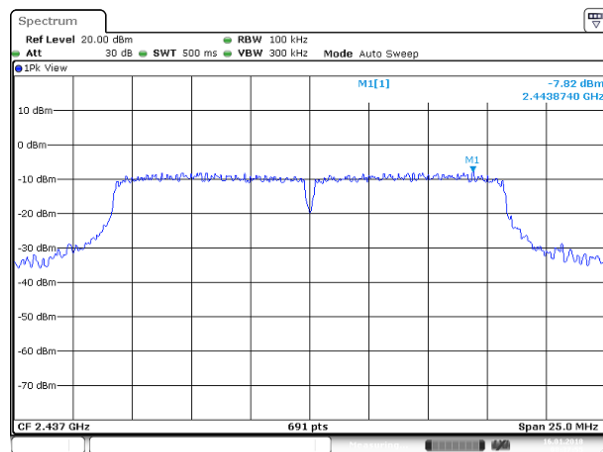


Spurious Emission 30MHz-25GHz

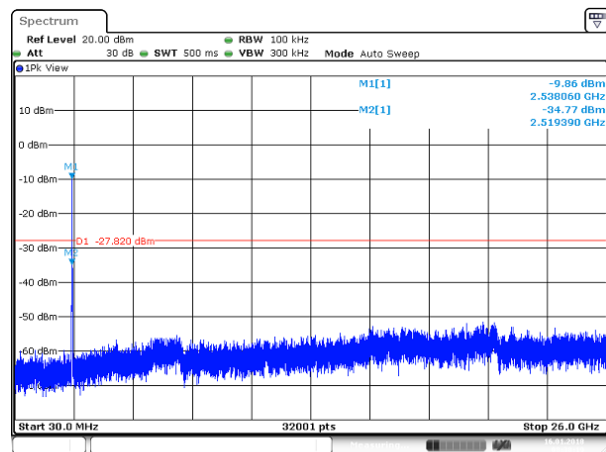


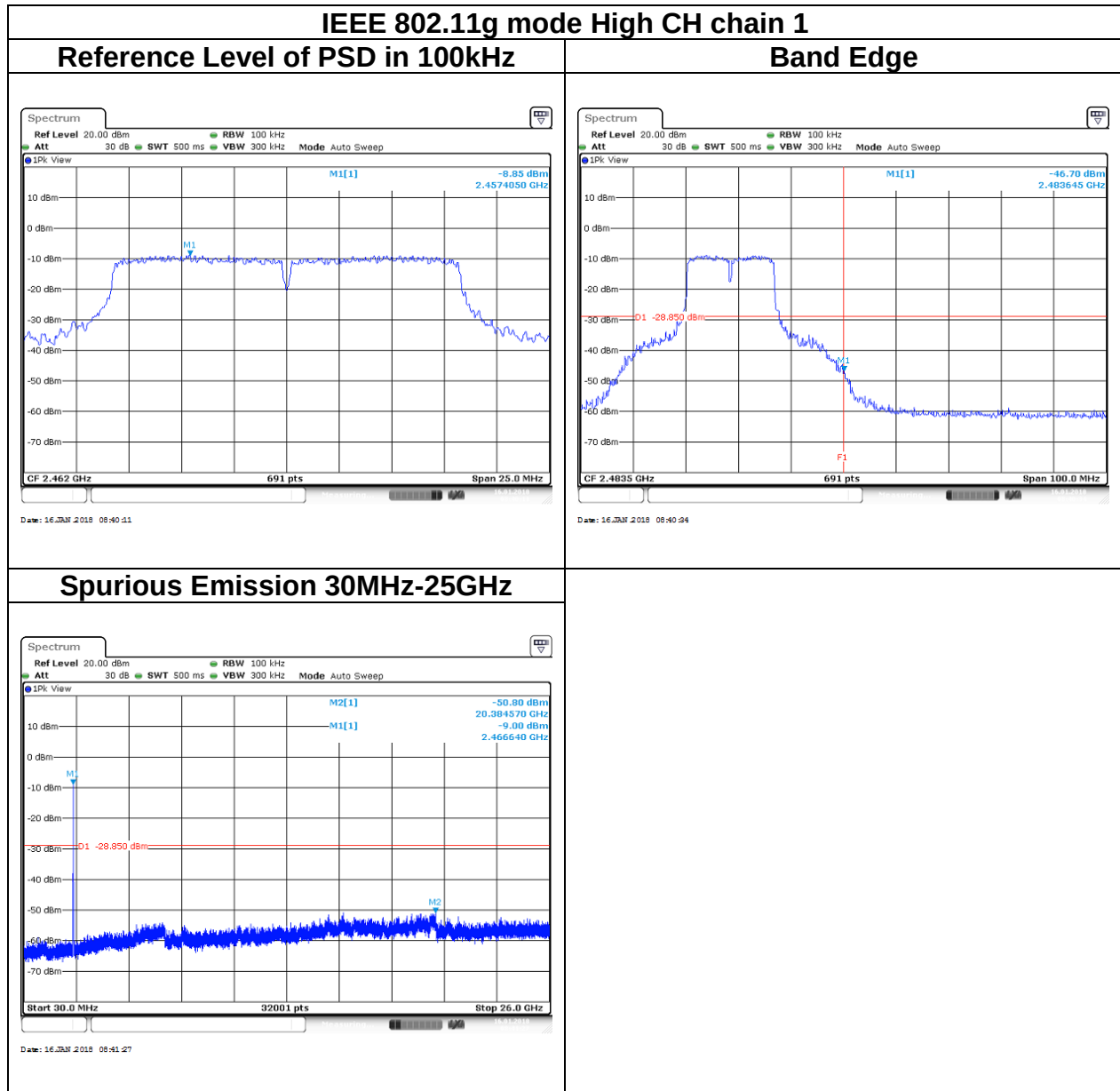
IEEE 802.11g mode Mid CH chain 1

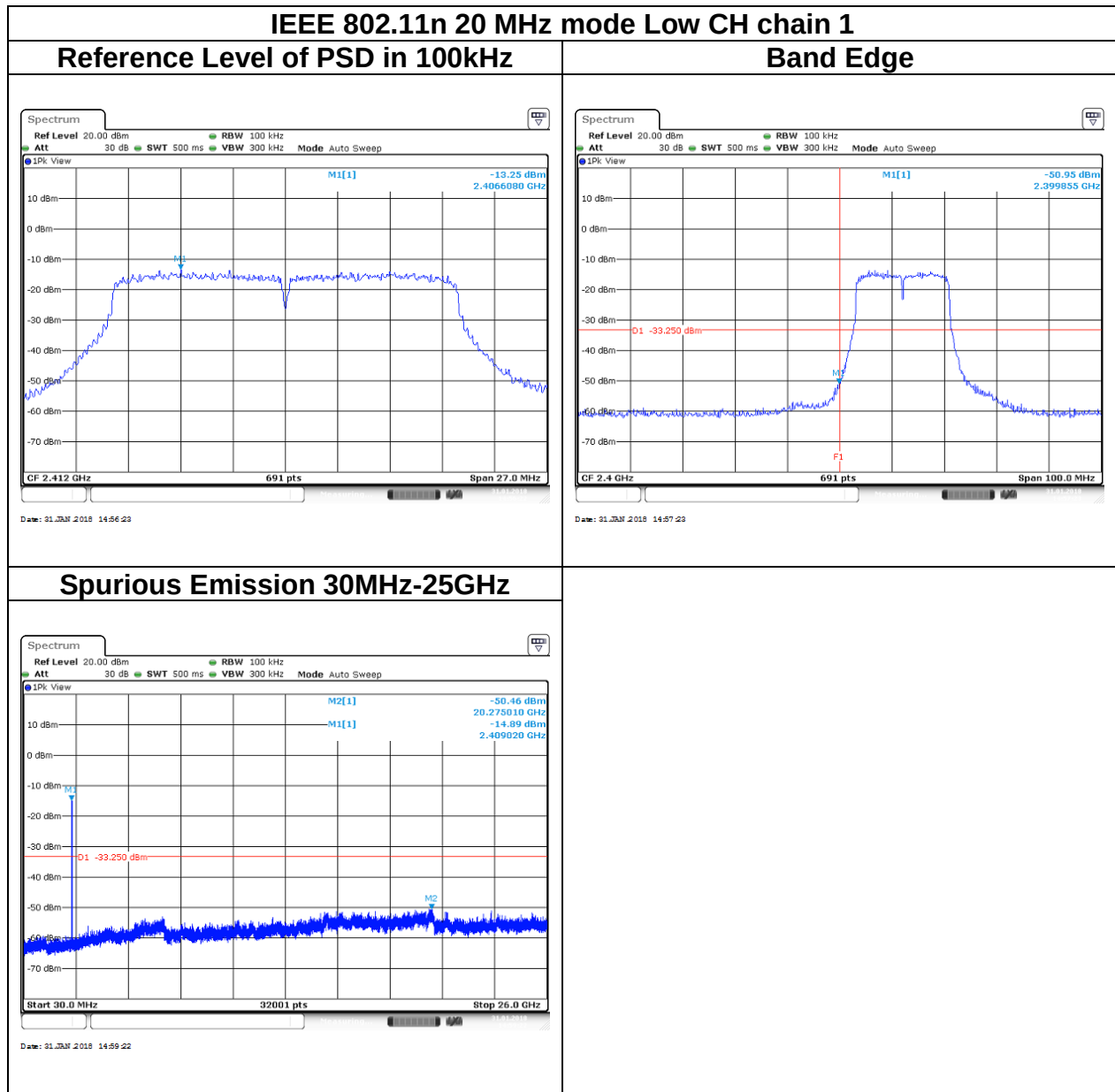
Reference Level of PSD in 100kHz

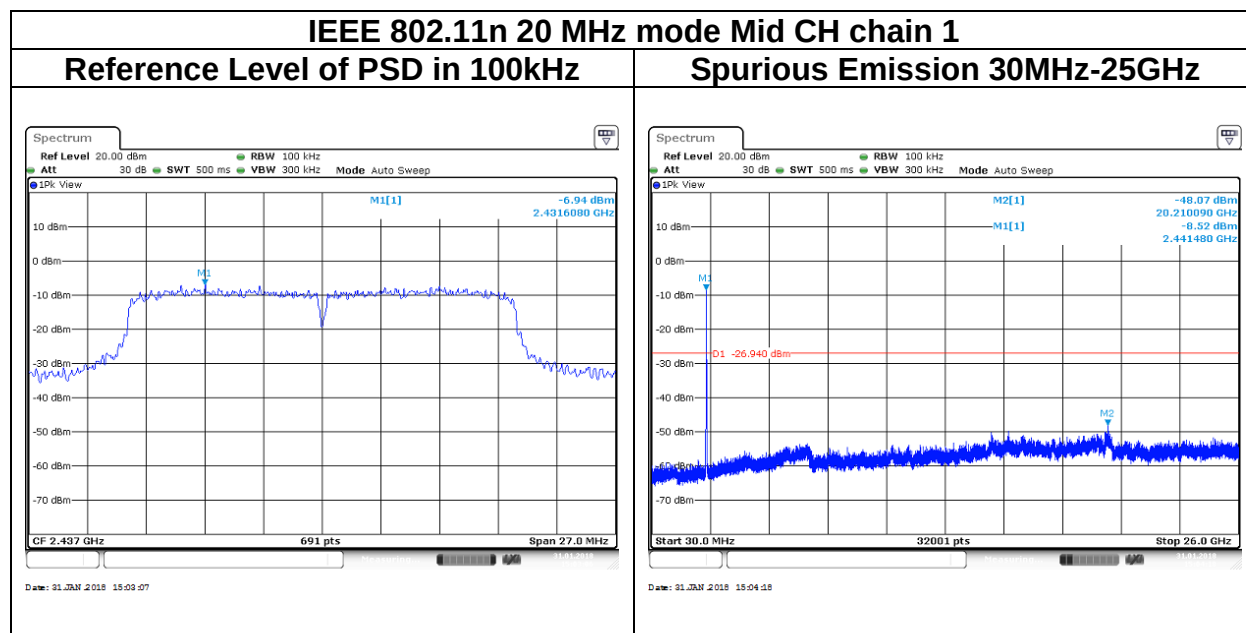


Spurious Emission 30MHz-25GHz



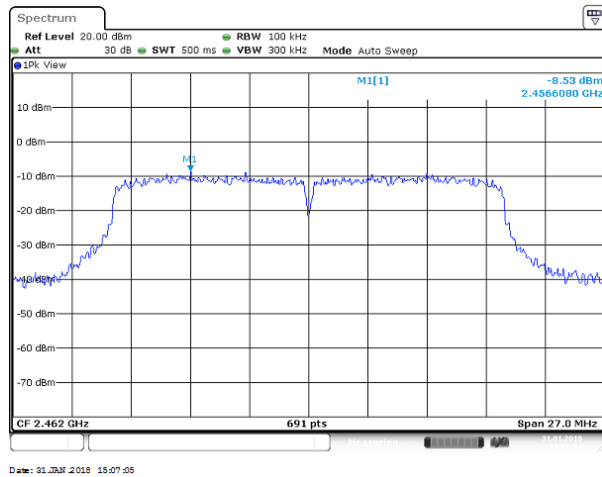




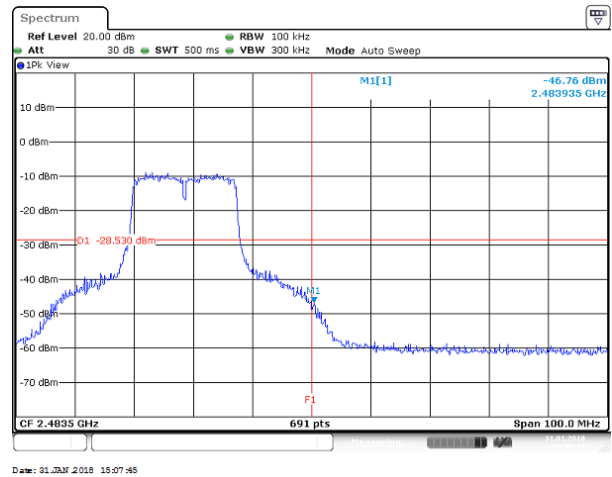


IEEE 802.11n 20 MHz mode High CH chain 1

Reference Level of PSD in 100kHz



Band Edge



Spurious Emission 30MHz-25GHz

