FCC RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART E

Test Standard	**FCC Part 15.407**
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:

Sam Chuang
Manager

Tested by:

Jerry Chuang
Engineer

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 the test result.	137, 138	Angel Cheng

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

<table>
<tr><td>Applicant</td><td>AAEON Technology Inc.
5F, No.135, Lane 235, Pao Chiao Rd, Hsin-Tien Dist., New Taipei City, Taiwan, R.O.C</td></tr>
<tr><td>Manufacturer</td><td>AAEON Technology Inc.
5F, No.135, Lane 235, Pao Chiao Rd, Hsin-Tien Dist., New Taipei City, Taiwan, R.O.C</td></tr>
<tr><td>Equipment</td><td>UP core Plus</td></tr>
<tr><td>Model Name</td><td>xUPC-PLUSx (x – where x may be any combination of alphanumeric characters or “-“ or blank)</td></tr>
<tr><td>Model Discrepancy</td><td>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.</td></tr>
<tr><td>Trade Name</td><td>AAEON</td></tr>
<tr><td>Received Date</td><td>August 2, 2018</td></tr>
<tr><td>Date of Test</td><td>August 27 ~ September 6, 2018</td></tr>
<tr><td>Power Supply</td><td>VDC from Power Adapter
Powertron Electronics Corp. / PS1065-120IB500
I/P:100-240V~ 50-60Hz 1.8A
O/P:12V 5.0A 60W Max</td></tr>
<tr><td>Output Power(W)</td><td>For Chain 0:
<table>
<tr><th>Band</th><th>Mode</th><th>Frequency Range (MHz)</th><th>Output Power (W)</th></tr>
<tr><td rowspan="4">U-NII-1</td><td>IEEE 802.11a</td><td>5180 ~ 5240</td><td>0.0275</td></tr>
<tr><td>IEEE 802.11n HT 20</td><td>5180 ~ 5240</td><td>0.0191</td></tr>
<tr><td>IEEE 802.11n HT 40</td><td>5190 ~ 5230</td><td>0.0115</td></tr>
<tr><td>IEEE 802.11ac VHT 80</td><td>5210</td><td>0.0201</td></tr>
<tr><td rowspan="4">U-NII-3</td><td>IEEE 802.11a</td><td>5745 ~ 5825</td><td>0.0341</td></tr>
<tr><td>IEEE 802.11n HT 20</td><td>5745 ~ 5825</td><td>0.0324</td></tr>
<tr><td>IEEE 802.11n HT 40</td><td>5755 ~ 5795</td><td>0.0282</td></tr>
<tr><td>IEEE 802.11ac VHT 80</td><td>5775</td><td>0.0185</td></tr>
</table>
For Chain 1:
<table>
<tr><th>Band</th><th>Mode</th><th>Frequency Range (MHz)</th><th>Output Power (W)</th></tr>
<tr><td rowspan="4">U-NII-1</td><td>IEEE 802.11a</td><td>5180 ~ 5240</td><td>0.0246</td></tr>
<tr><td>IEEE 802.11n HT 20</td><td>5180 ~ 5240</td><td>0.0191</td></tr>
<tr><td>IEEE 802.11n HT 40</td><td>5190 ~ 5230</td><td>0.0113</td></tr>
<tr><td>IEEE 802.11ac VHT 80</td><td>5210</td><td>0.0212</td></tr>
<tr><td rowspan="4">U-NII-3</td><td>IEEE 802.11a</td><td>5745 ~ 5825</td><td>0.0354</td></tr>
<tr><td>IEEE 802.11n HT 20</td><td>5745 ~ 5825</td><td>0.0335</td></tr>
<tr><td>IEEE 802.11n HT 40</td><td>5755 ~ 5795</td><td>0.0286</td></tr>
<tr><td>IEEE 802.11ac VHT 80</td><td>5775</td><td>0.0230</td></tr>
</table></td></tr>
</table>

1.2 EUT CHANNEL INFORMATION

Frequency Range	**UNII-1**
	IEEE 802.11a: 5180 ~ 5240 MHz
	IEEE 802.11n HT 20: 5180 ~ 5240 MHz
	IEEE 802.11n HT 40: 5190 ~ 5230 MHz
	IEEE 802.11ac VHT 80: 5210 MHz
	UNII-3
	IEEE 802.11a: 5745 ~ 5825 MHz
	IEEE 802.11n HT 20: 5745 ~ 5825 MHz
	IEEE 802.11n HT 40: 5755 ~ 5795 MHz
	IEEE 802.11ac VHT 80: 5775 MHz
Modulation Type	1. IEEE 802.11a mode: OFDM 2. IEEE 802.11n HT 20 mode: OFDM 3. IEEE 802.11n HT 40 mode: OFDM 4. IEEE 802.11ac VHT 80 mode: OFDM

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	

	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

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**
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
High Pass Filters	MICRO TRONICS	HPM13195	003	05/14/2018	05/13/2019
Horn Antenna	ETS LINDGREN	3116	00026370	01/04/2018	01/03/2019
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	MITEQ	AMF-6F-260400-40-8P	985646	06/21/2018	06/20/2019
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.*

AC Conducted Emissions Test Site					
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 15.407, KDB 789033 D02.

2. TEST SUMMERY

FCC Standard Sec.	Chapter	Test Item	Result
15.203	1.4	Antenna Requirement	Pass
15.207	4.1	AC Conducted Emission	Pass
15.403(i)	4.2	26dB Bandwidth	Pass
15.407(e)	4.2	6dB Bandwidth	Pass
2.1049	4.2	Occupied Bandwidth (99%)	Pass
15.407(a)	4.3	Output Power Measurement	Pass
15.407(a)	4.4	Power Spectral Density	Pass
15.407(b)	4.5	Radiation Band Edge	Pass
15.407(b)	4.5	Radiation Spurious Emission	Pass
15.407(g)	4.6	Frequency Stability	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

<table>
<tr><td>Operation mode</td><td>1. IEEE 802.11a mode: 6Mbps
2. IEEE 802.11n HT 20 mode: MCS0
3. IEEE 802.11n HT 40 mode: MCS0
4. IEEE 802.11ac VHT 80 mode: MCS0</td></tr>
<tr><td>Operating Frequency Range &
Number of Channels</td><td>
<table>
<tr><th></th><th>Mode</th><th>Frequency Range (MHz)</th><th>Number of Channels</th></tr>
<tr><td rowspan="4">U-NII-1</td><td>IEEE 802.11a</td><td>5180 ~ 5240</td><td>4 Channels</td></tr>
<tr><td>IEEE 802.11n HT 20</td><td>5180 ~ 5240</td><td>4 Channels</td></tr>
<tr><td>IEEE 802.11n HT 40</td><td>5190 ~ 5230</td><td>2 Channels</td></tr>
<tr><td>IEEE 802.11ac VHT 80</td><td>5210</td><td>1 Channels</td></tr>
<tr><td rowspan="4">U-NII-3</td><td>IEEE 802.11a</td><td>5745 ~ 5825</td><td>5 Channels</td></tr>
<tr><td>IEEE 802.11n HT 20</td><td>5745 ~ 5825</td><td>5 Channels</td></tr>
<tr><td>IEEE 802.11n HT 40</td><td>5755 ~ 5795</td><td>2 Channels</td></tr>
<tr><td>IEEE 802.11ac VHT 80</td><td>5775</td><td>1 Channels</td></tr>
</table>
</td></tr>
</table>

Remark:
1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.
2. Covered modes are test reduction modes. The output powers on the covered modes are equal to or less than the mode referenced and use the same module

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

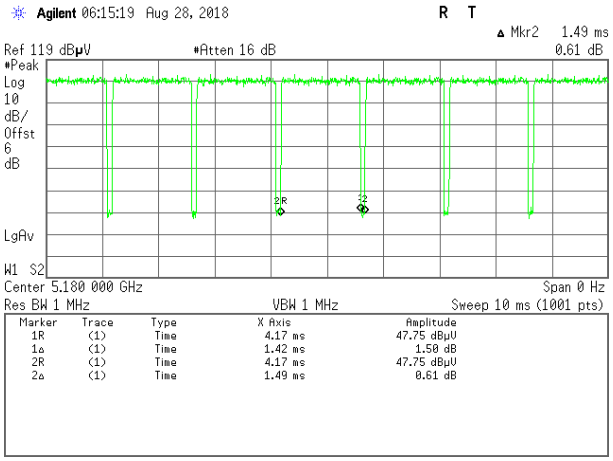
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT power by adapter via power cable
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

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 (X-Plane and Horizontal) 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.

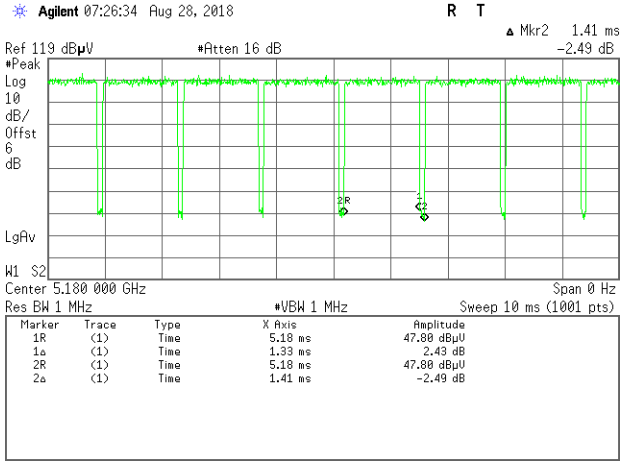
3.3 EUT DUTY CYCLE

Duty Cycle			
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)
802.11a	1.4200	1.4900	95.30%
802.11n HT20	1.3300	1.4100	94.33%
802.11n HT40	0.6700	0.7500	89.33%
802.11ac VHT80	0.4800	0.4900	97.96%

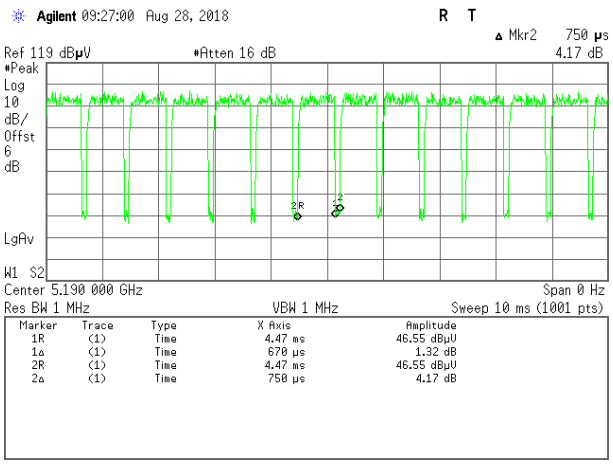
802.11a



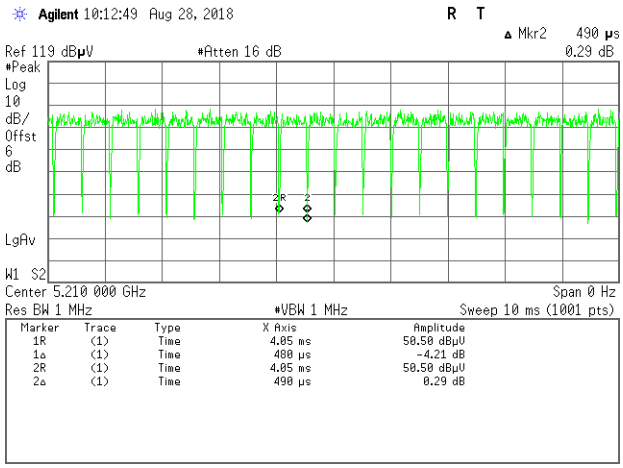
802.11n HT20



802.11n HT40



802.11ac VHT80



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

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

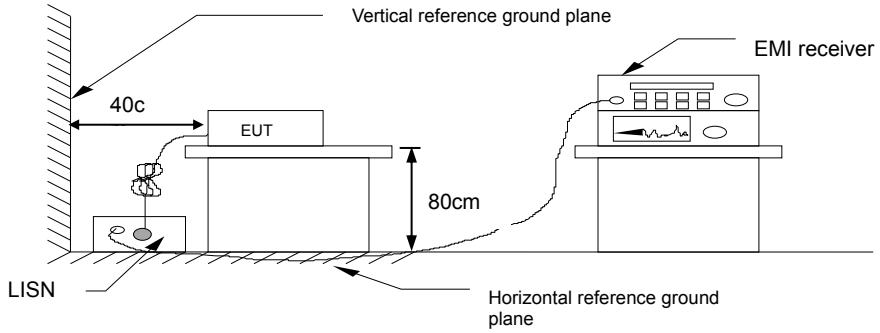
* Decreases with the logarithm of the frequency.

4.1.2 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.

4.1.3 Test Setup

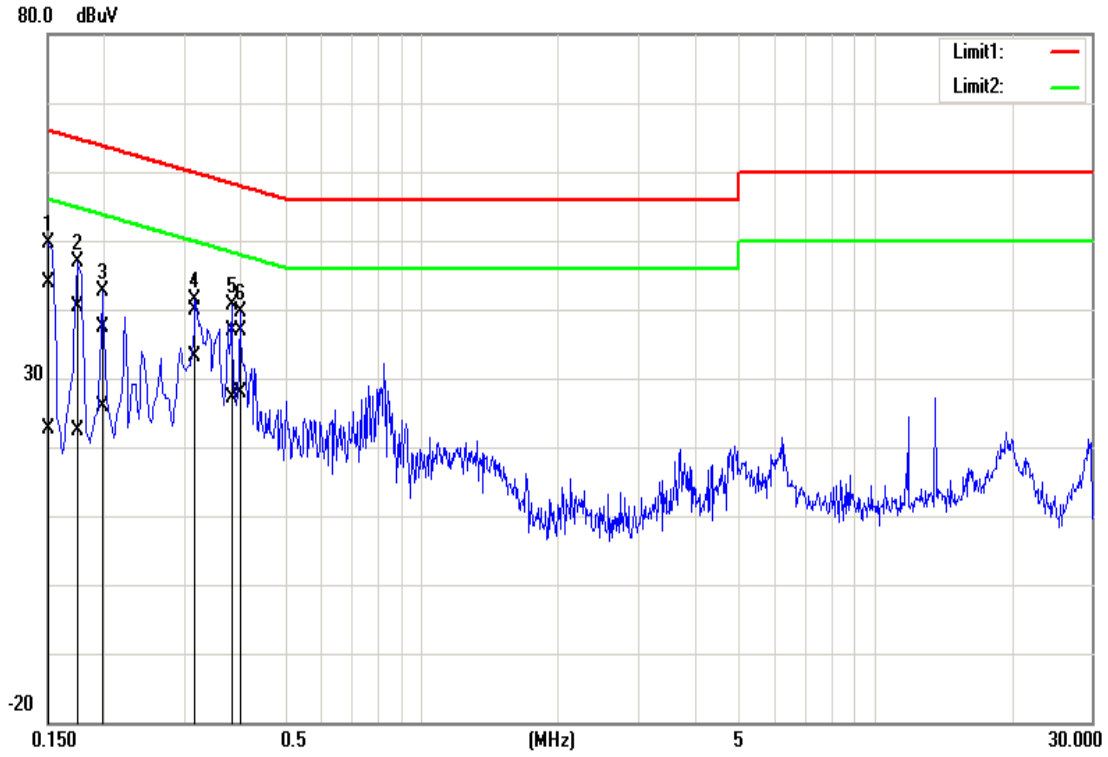


4.1.4 Test Result

Pass.

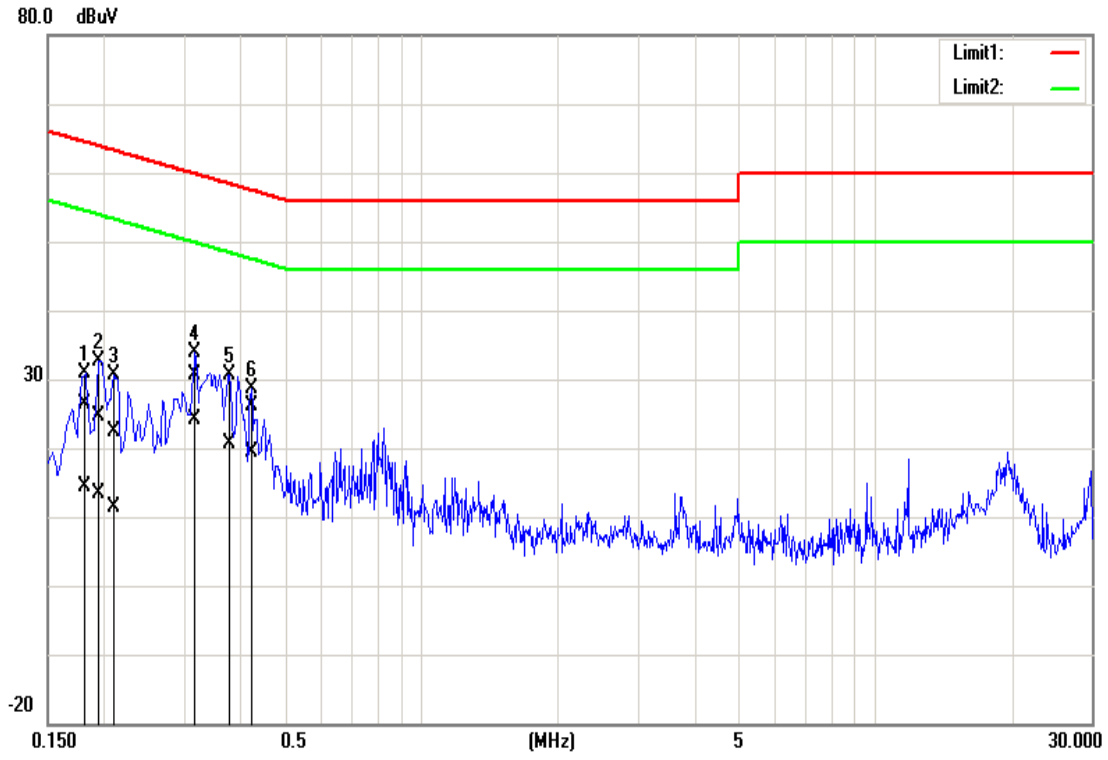
Test Data

Test Mode	Mode 1	Temp/Hum	24(℃)/ 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

Test Mode	Mode 1	Temp/Hum	24(℃)/ 50%RH
Phase	Neutral	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

4.2 26dB BANDWIDTH, 6dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

4.2.1 Test Limit

26 dB Bandwidth ：For reporting purposes only.

6 dB Bandwidth ：Least 500kHz.

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

4.2.2 Test Procedure

Test method Refer as KDB 789033 D02 and ANSI 63.10:2013 clause 6.9.2,

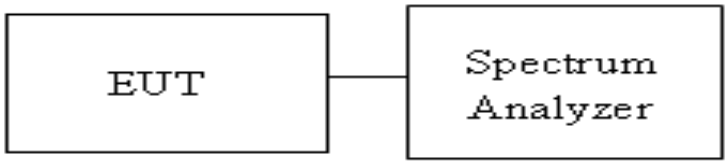
1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. UNII-1,

   (1) BW=20MHz : SA set RBW = 300kHz, VBW = 1MHz and Detector = Peak, to measurement 26 dB Bandwidth

   (2) BW=40MHz : SA set RBW = 1MHz, VBW = 3MHz and Detector = Peak, to measurement 26 dB Bandwidth

   (3) BW=80MHz : SA set RBW = 1MHz, VBW = 3MHz and Detector = Peak, to measurement 26 dB Bandwidth
4. UNII-3, SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth
5. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
6. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup



4.2.4 Test Result

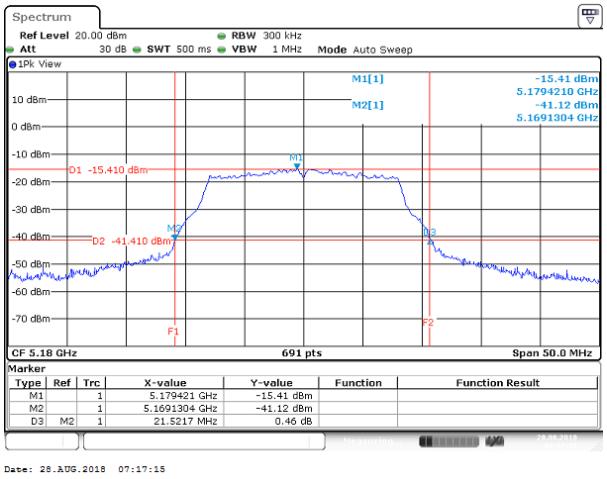
UNII-1					
Test mode: IEEE 802.11a mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 26dB BW (MHz)**	**Chain 1 26dB BW (MHz)**
Low	5180	16.7149	16.7149	21.5217	21.5942
Mid	5220	16.7149	16.7149	21.6667	21.6667
High	5240	16.7149	16.7872	21.5942	21.5942
Test mode: IEEE 802.11n HT20 mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 26dB BW (MHz)**	**Chain 1 26dB BW (MHz)**
Low	5180	17.8002	17.8726	21.8116	21.9565
Mid	5220	17.8002	17.8002	21.6667	21.8116
High	5240	17.8726	17.8726	21.8116	21.6667
Test mode: IEEE 802.11n HT40 mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 26dB BW (MHz)**	**Chain 1 26dB BW (MHz)**
Low	5190	36.3531	36.4688	41.043	41.043
High	5230	36.3531	36.4688	40.812	41.043
Test mode: IEEE 802.11ac VHT80 mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 26dB BW (MHz)**	**Chain 1 26dB BW (MHz)**
Mid	5210	75.9479	75.7163	83.014	81.855

UNII-3					
Test mode: IEEE 802.11a mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 6dB BW (MHz)**	**Chain 1 6dB BW (MHz)**
Low	5745	17.0043	17.0043	16.2609	16.3043
Mid	5785	17.0043	16.9319	15.7391	15.7391
High	5825	17.0043	17.1490	16.3043	16.3043
Test mode: IEEE 802.11n HT20 mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 6dB BW (MHz)**	**Chain 1 6dB BW (MHz)**
Low	5745	18.0173	18.0173	17.5217	17.5217
Mid	5785	17.9450	17.8726	16.3478	16.3478
High	5825	18.0897	18.2344	17.5217	17.5217
Test mode: IEEE 802.11n HT40 mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 6dB BW (MHz)**	**Chain 1 6dB BW (MHz)**
Low	5755	36.8162	36.8162	36.058	35.362
High	5795	36.7004	36.7004	35.826	35.71
Test mode: IEEE 802.11ac VHT80 mode					
Channel	**Frequency (MHz)**	**Chain 0 OBW(99%) (MHz)**	**Chain 1 OBW(99%) (MHz)**	**Chain 0 6dB BW (MHz)**	**Chain 1 6dB BW (MHz)**
Mid	5775	75.9479	75.4848	75.13	75.13

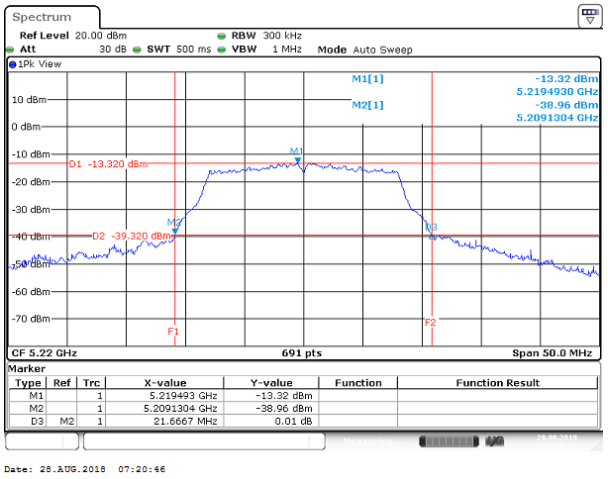
Test Data (26dB BANDWIDTH)

UNII-1 IEEE 802.11a mode- chain 0

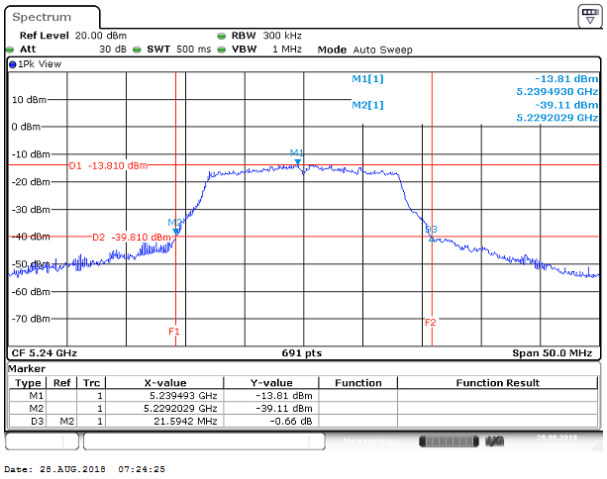
Low CH

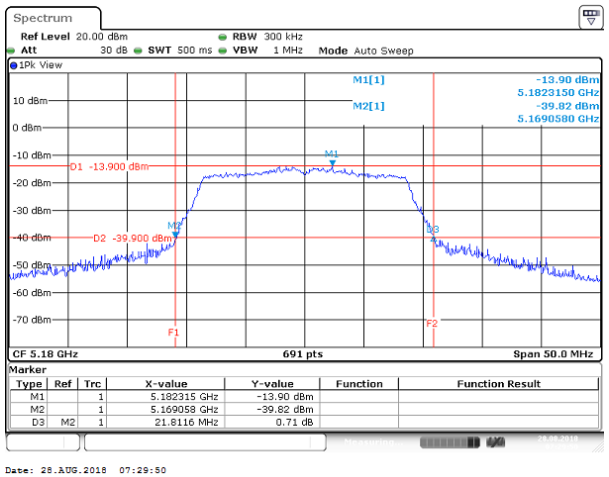
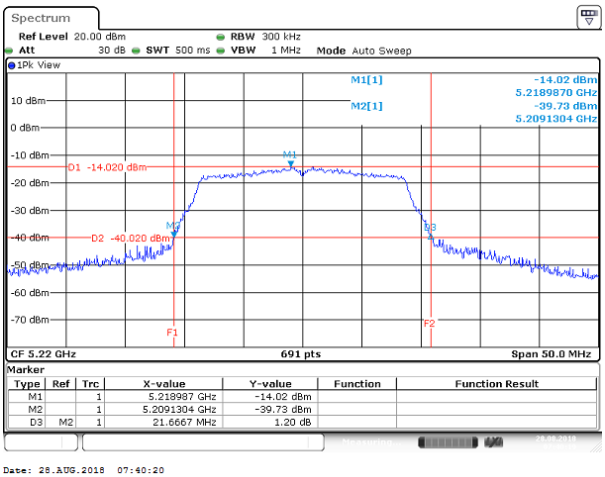
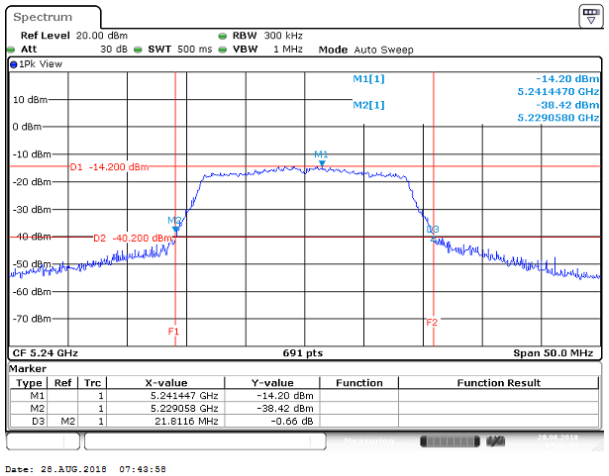


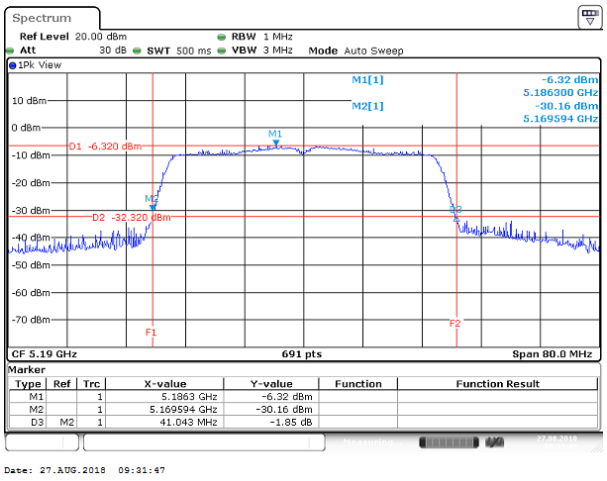
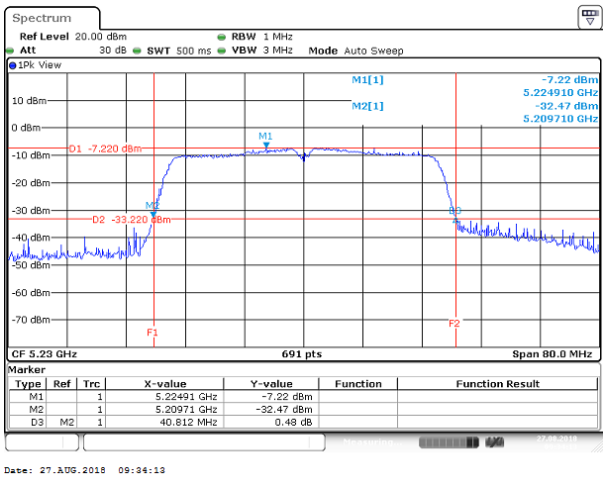
Mid CH

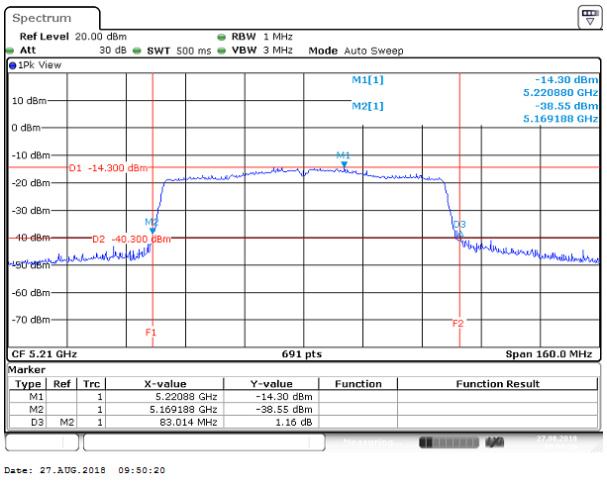


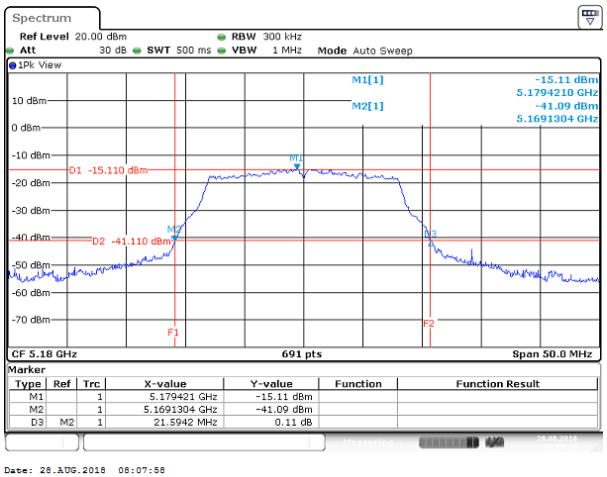
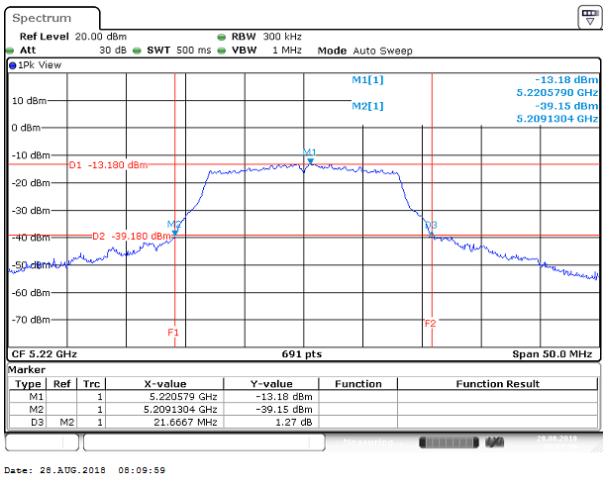
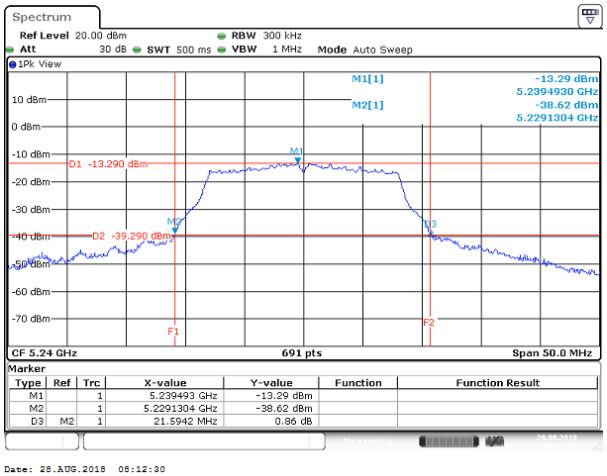
High CH

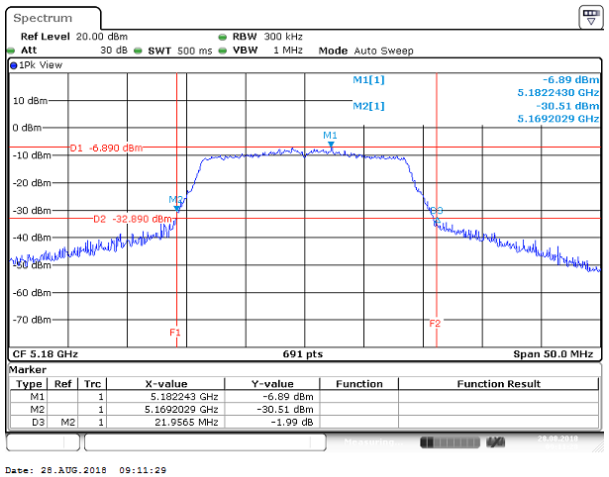
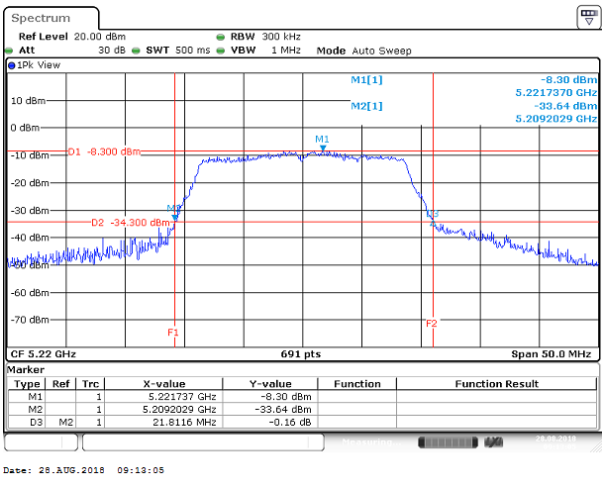
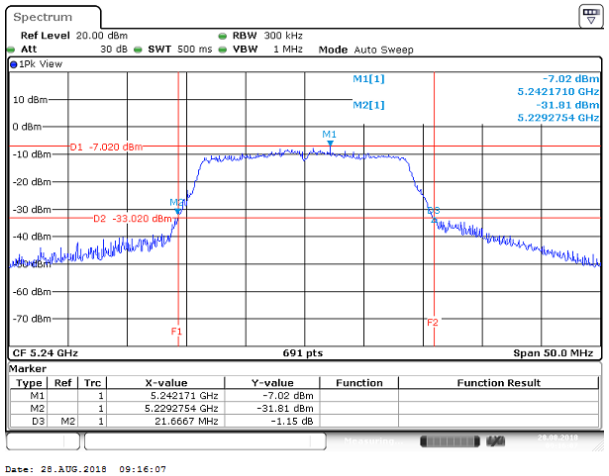


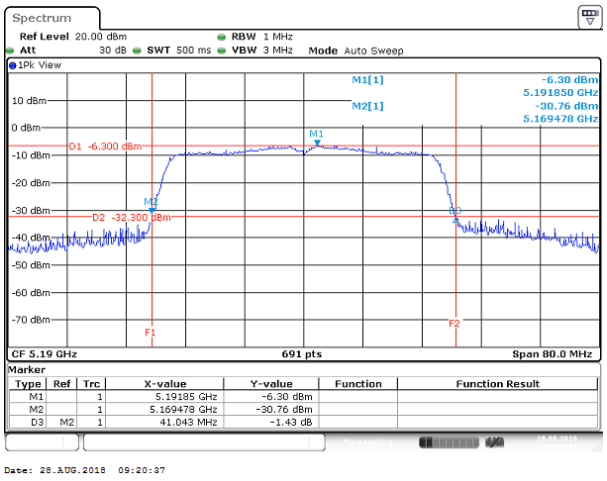
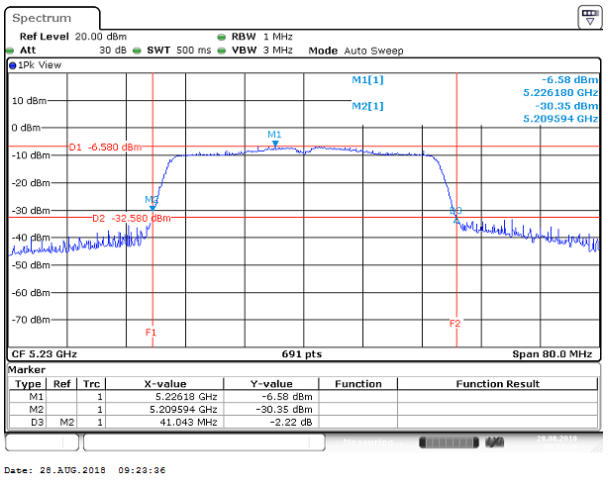
UNII-1 IEEE 802.11n HT20 mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

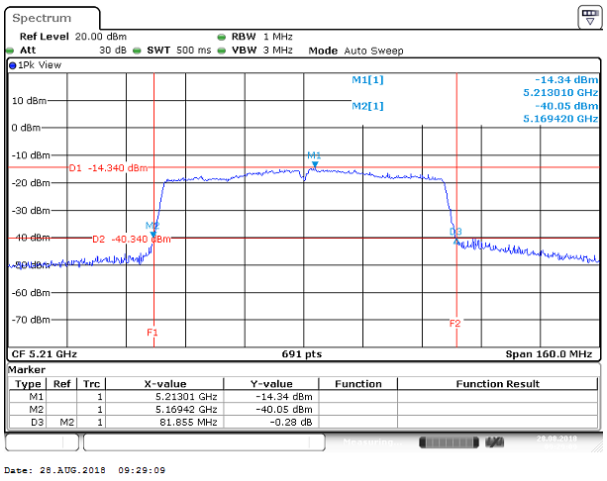
UNII-1 IEEE 802.11n HT40 mode- chain 0	
Low CH	**High CH**
	

UNII-1 IEEE 802.11ac VHT80 mode- chain 0
Mid CH


UNII-1 IEEE 802.11a mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

UNII-1 IEEE 802.11n HT20 mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

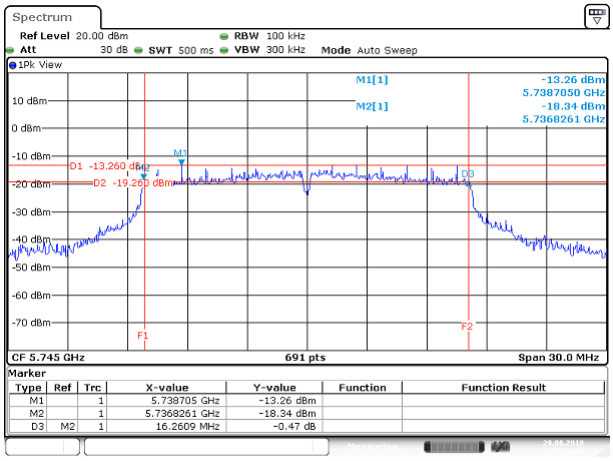
UNII-1 IEEE 802.11n HT40 mode- chain 1	
Low CH	**High CH**
	

UNII-1 IEEE 802.11ac VHT80 mode- chain 1
Mid CH


Test Data (6dB BANDWIDTH)

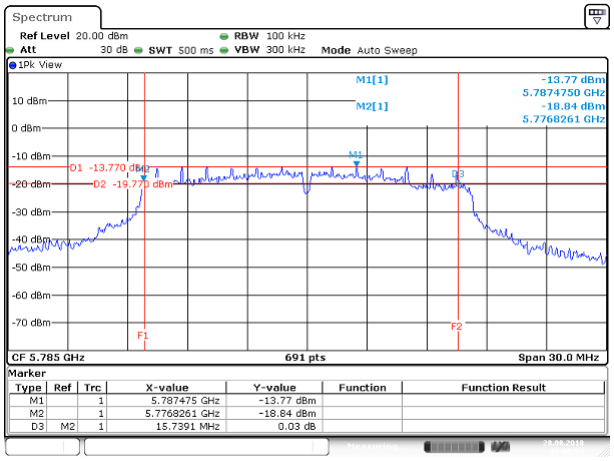
UNII-3 IEEE 802.11a mode- chain 0

Low CH



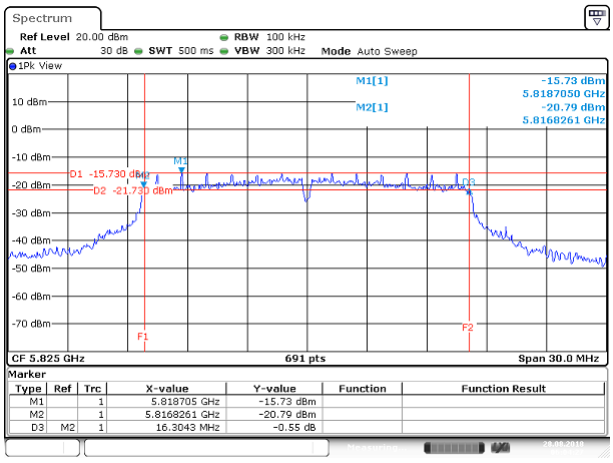
Date: 28.AUG.2018 05:58:29

Mid CH

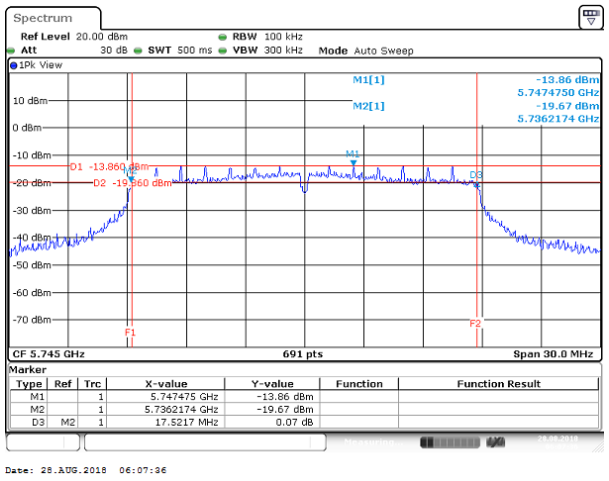
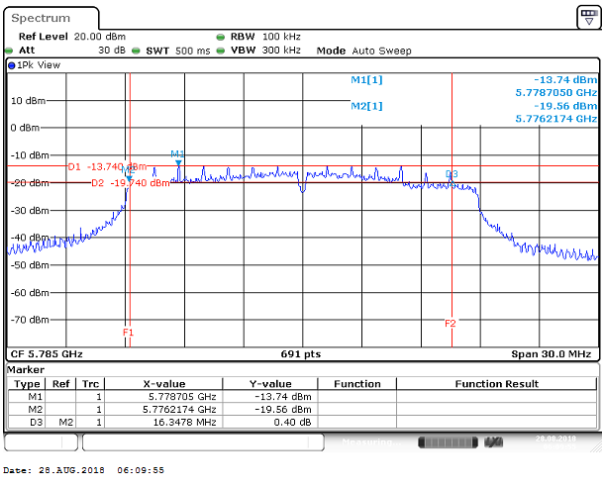
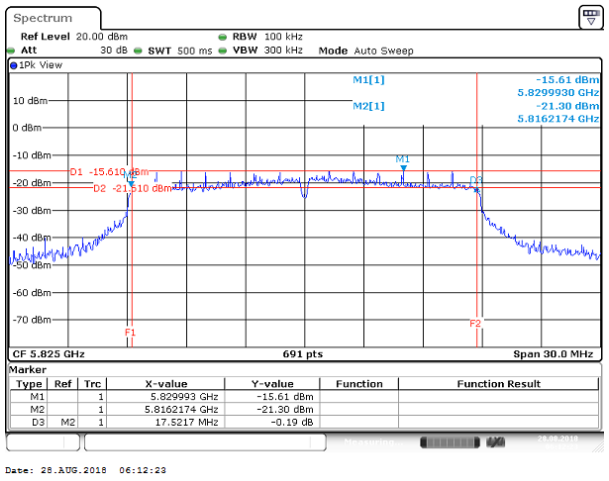


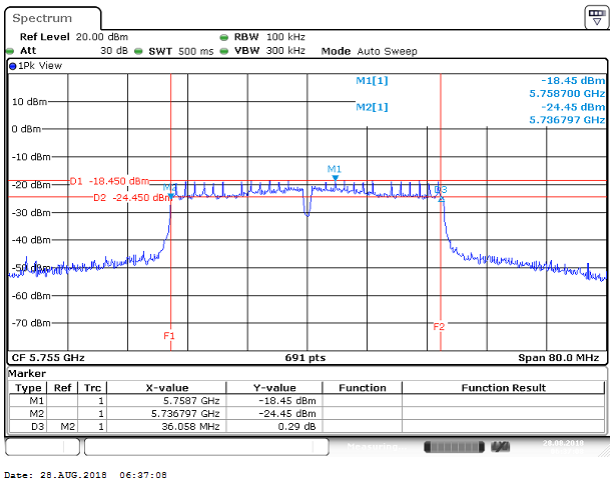
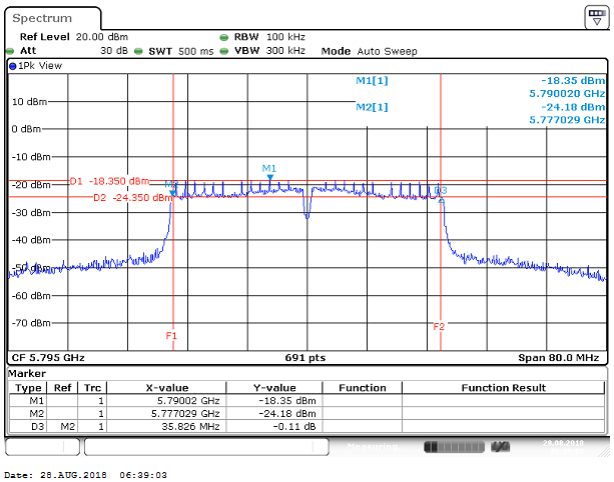
Date: 28.AUG.2018 06:00:53

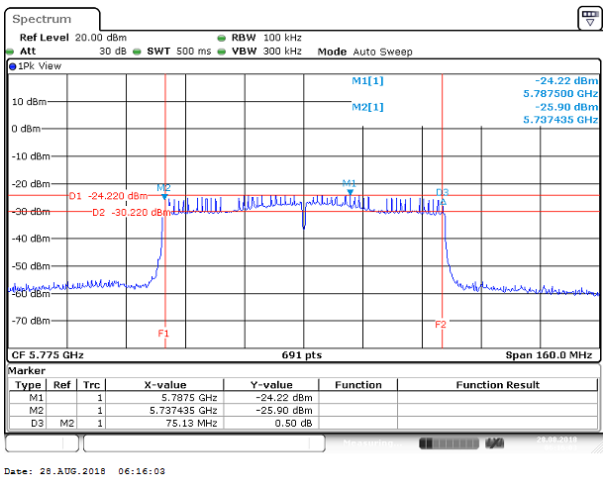
High CH



Date: 28.AUG.2018 06:04:27

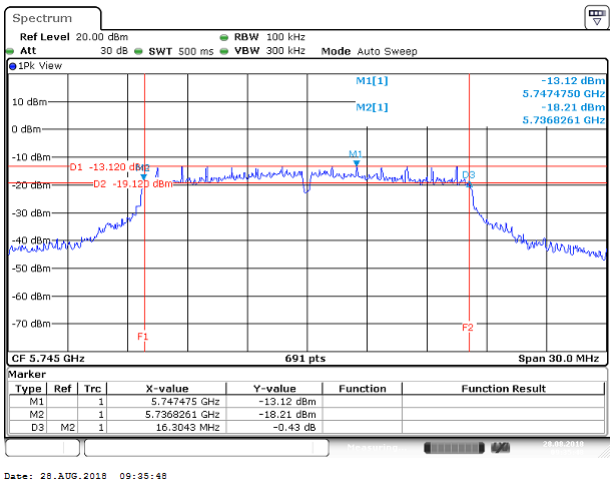
UNII-3 IEEE 802.11n HT20 mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

UNII-3 IEEE 802.11n HT40 mode- chain 0	
Low CH	**High CH**
	

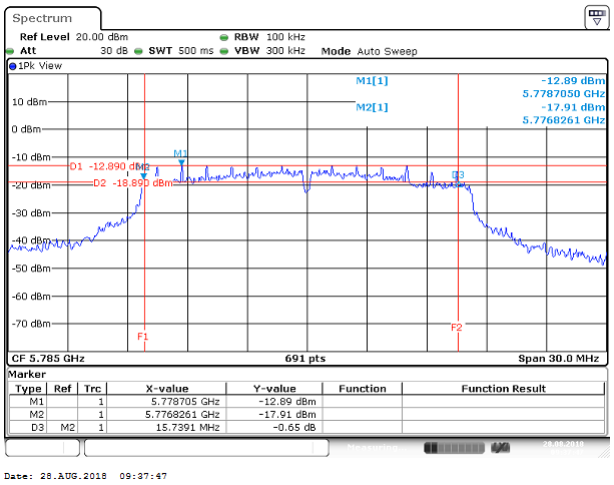
UNII-3 IEEE 802.11ac VHT80 mode- chain 0	
Mid CH	
	

UNII-3 IEEE 802.11a mode- chain 1

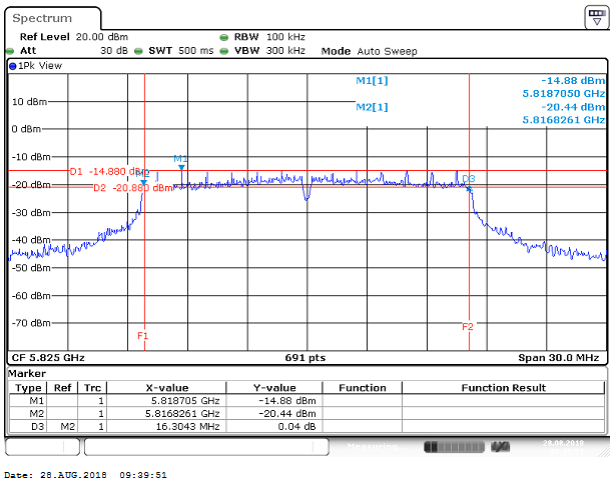
Low CH

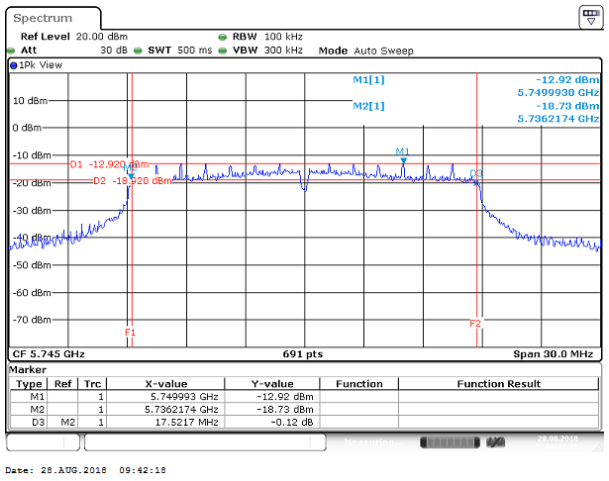
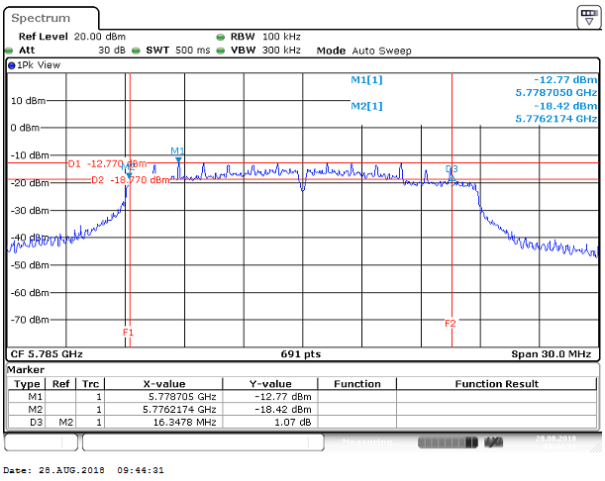
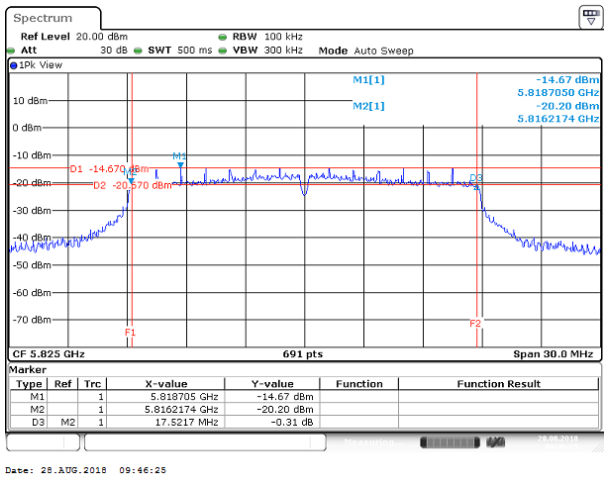


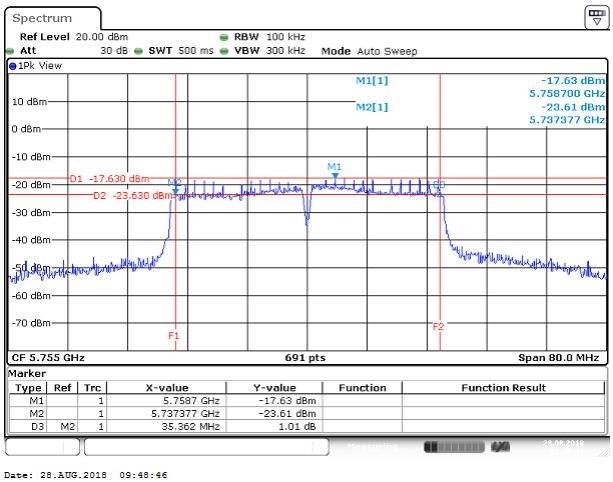
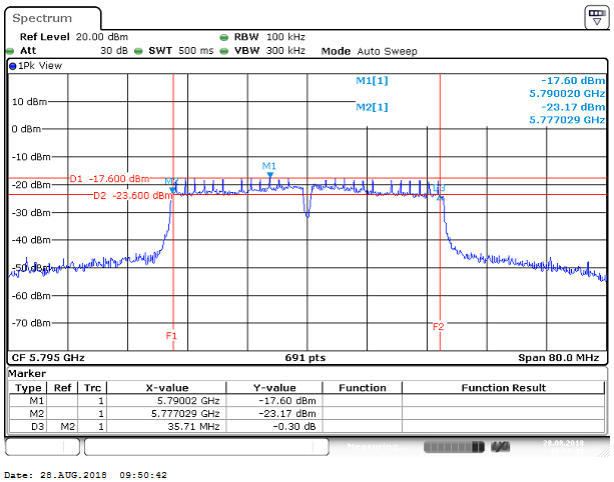
Mid CH

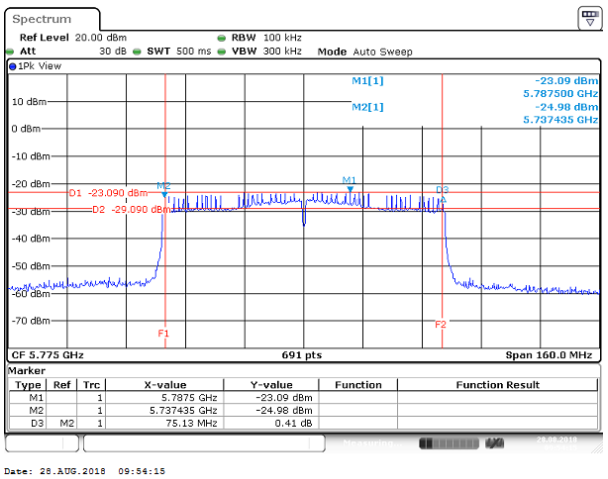


High CH

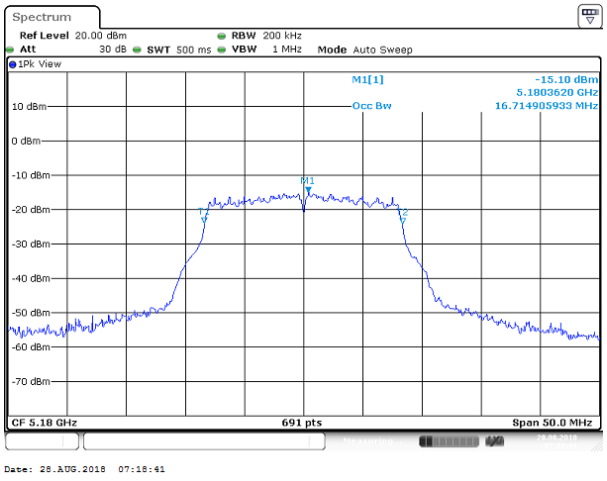
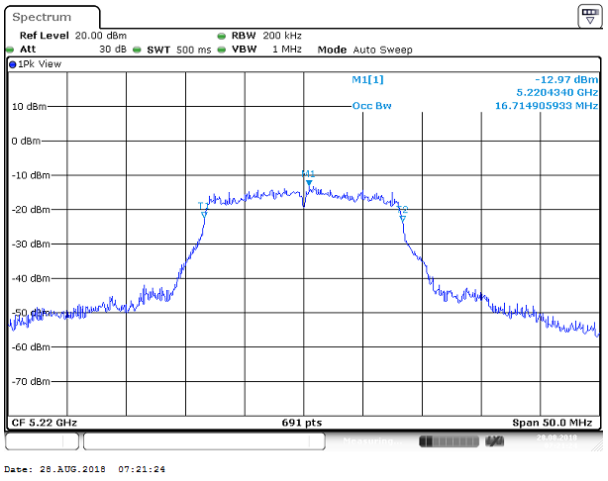
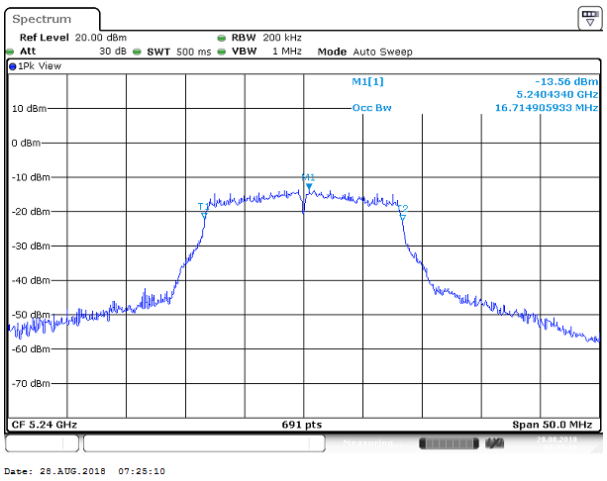


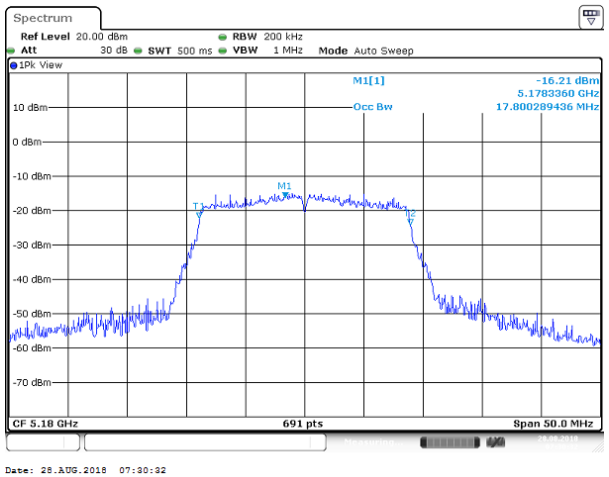
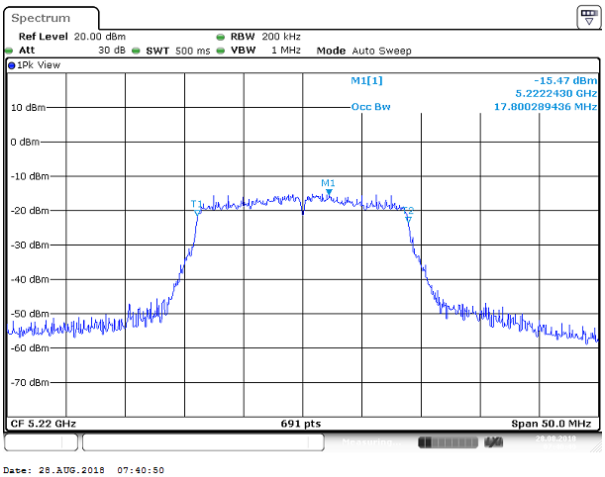
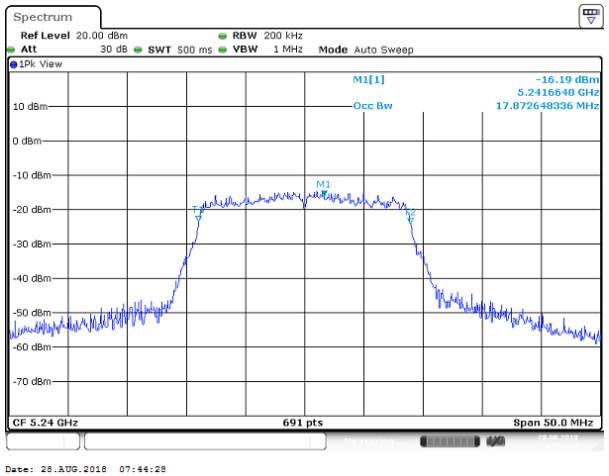
UNII-3 IEEE 802.11n HT20 mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

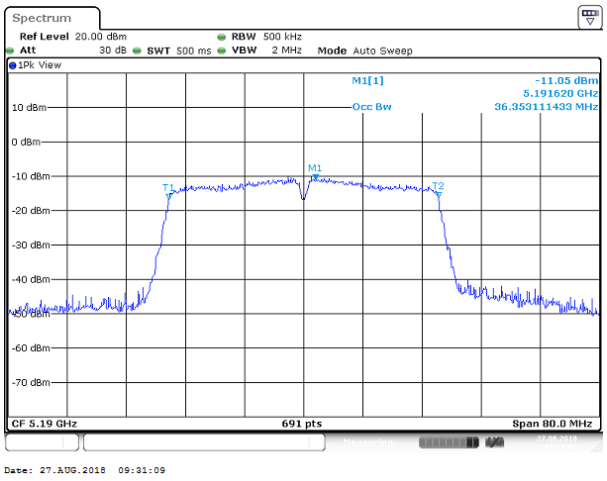
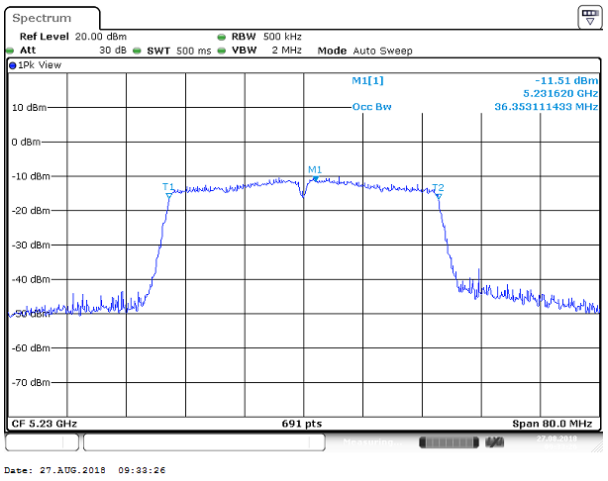
UNII-3 IEEE 802.11n HT40 mode- chain 1	
Low CH	**High CH**
	

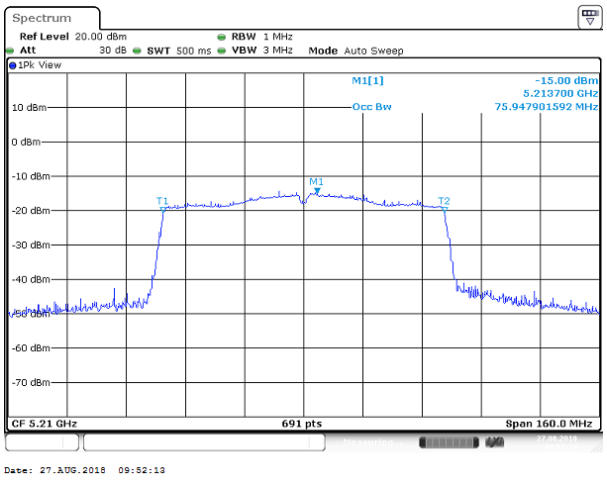
UNII-3 IEEE 802.11ac VHT80 mode- chain 1	
Mid CH	
	

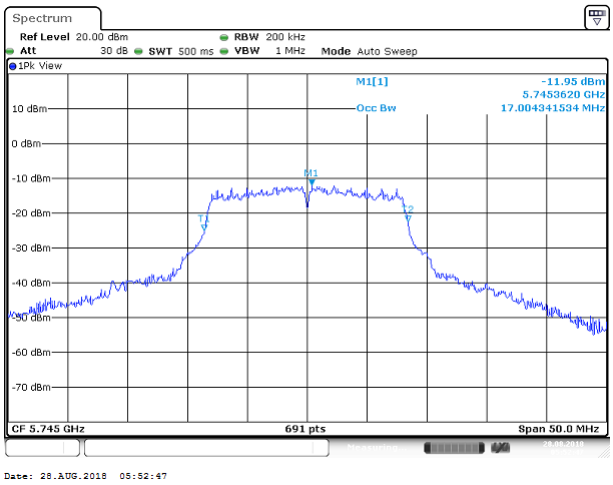
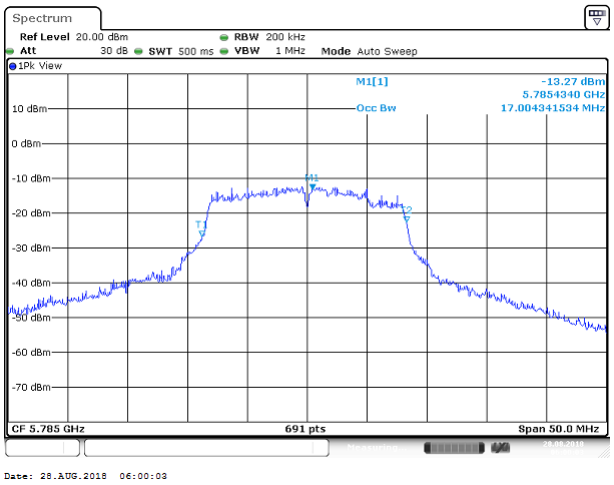
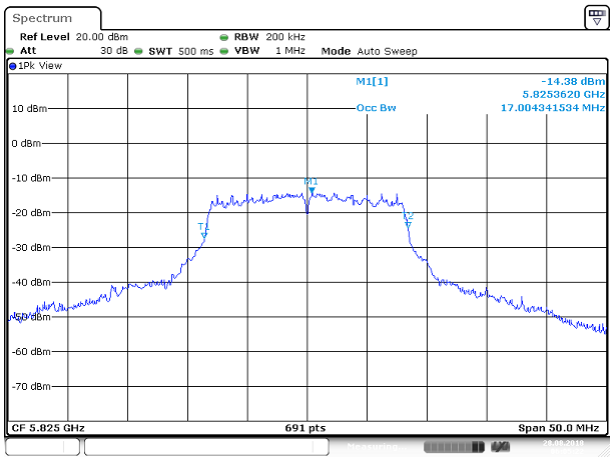
Test Data (BANDWIDTH 99%)

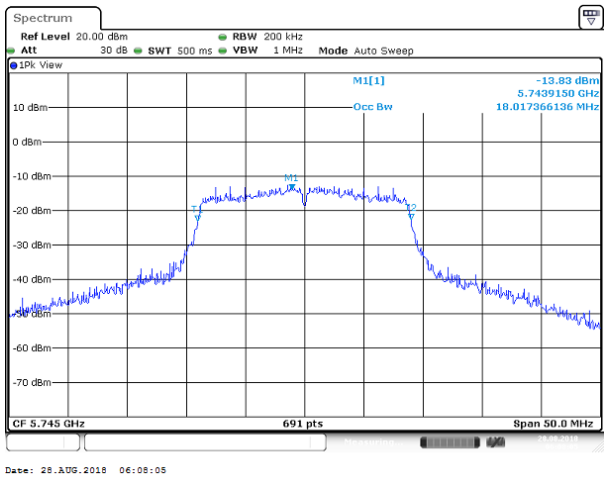
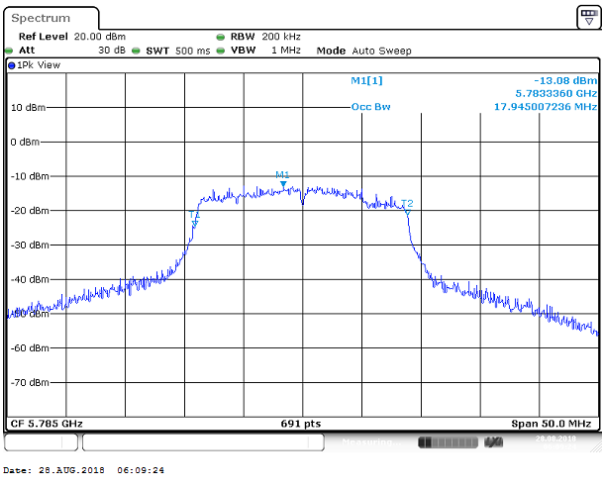
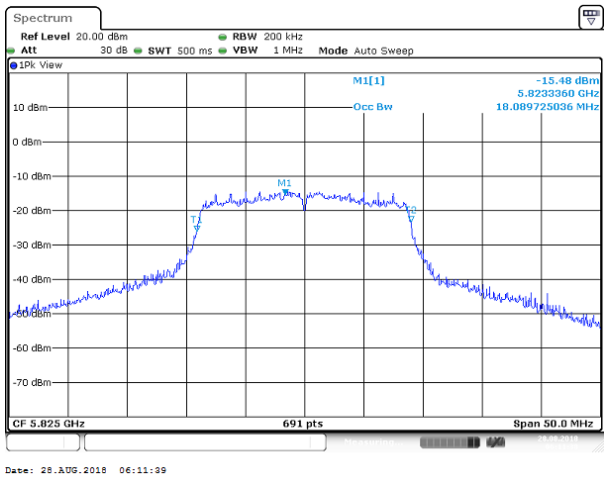
UNII-1 IEEE 802.11a mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

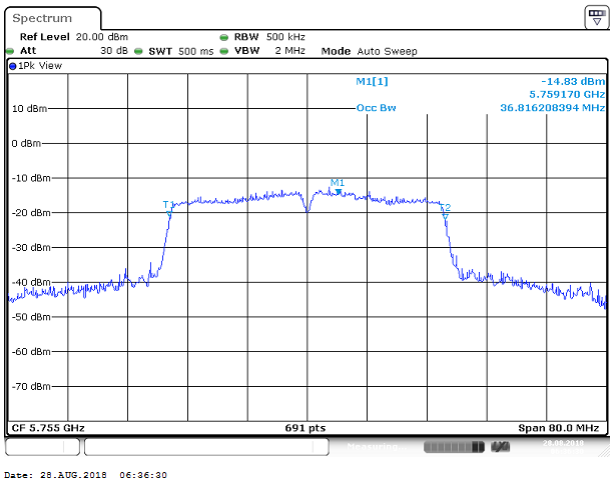
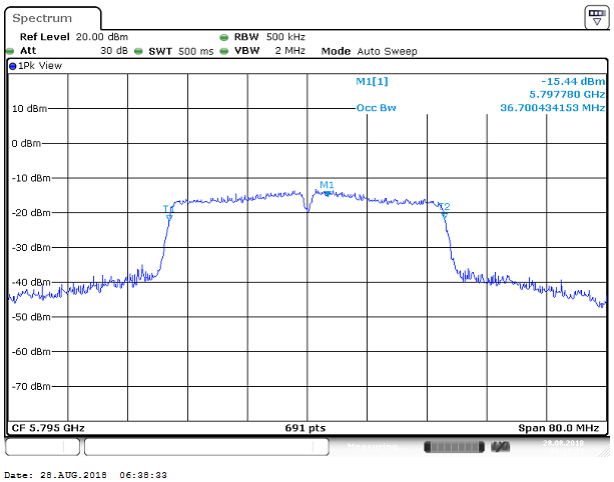
UNII-1 IEEE 802.11n HT20 mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

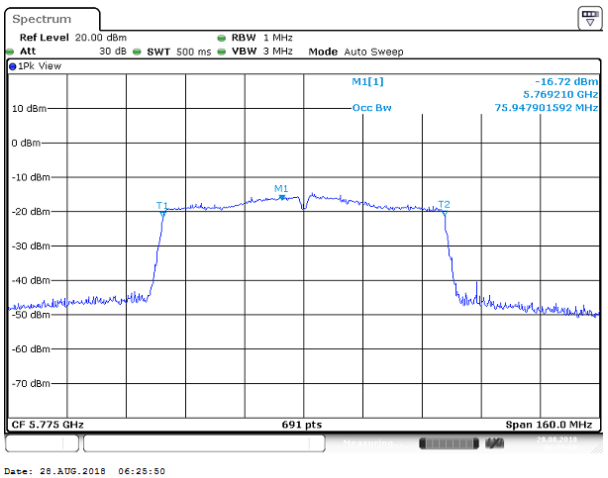
UNII-1 IEEE 802.11n HT40 mode- chain 0	
Low CH	**High CH**
	

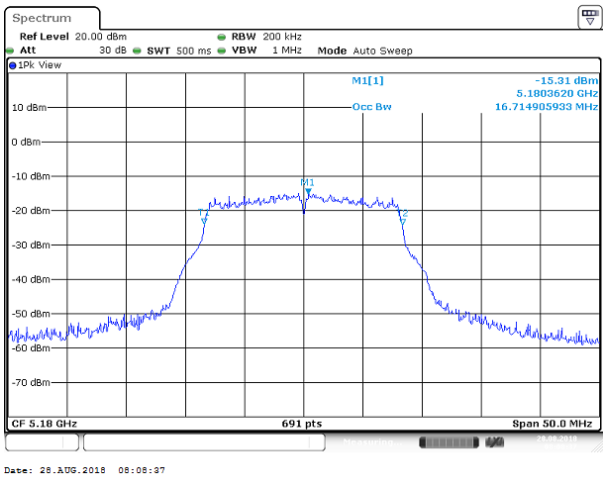
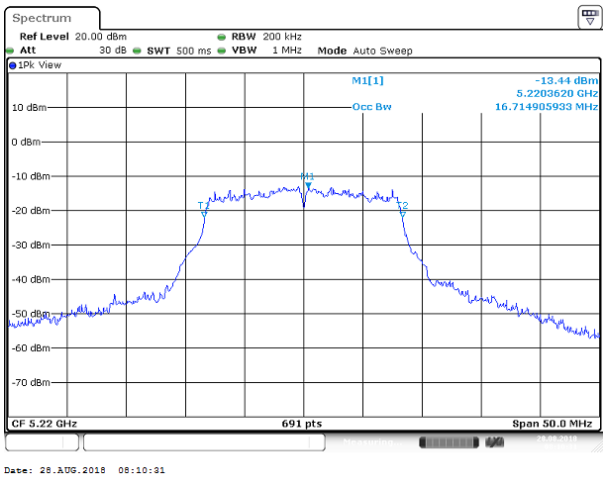
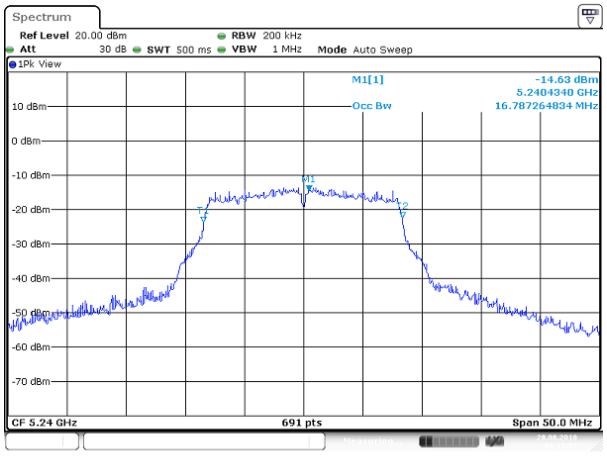
UNII-1 IEEE 802.11ac VHT80 mode- chain 0
Mid CH


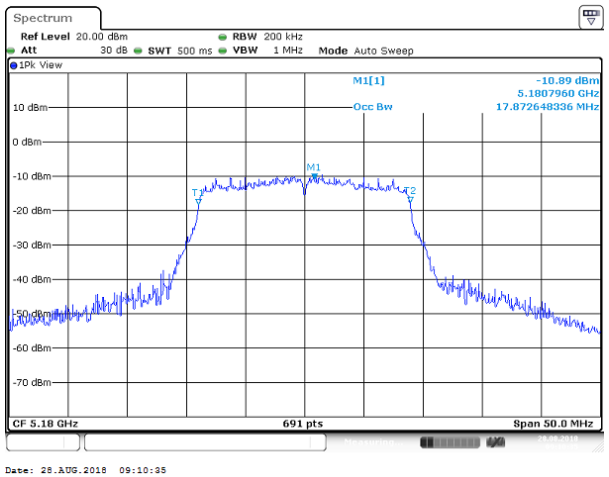
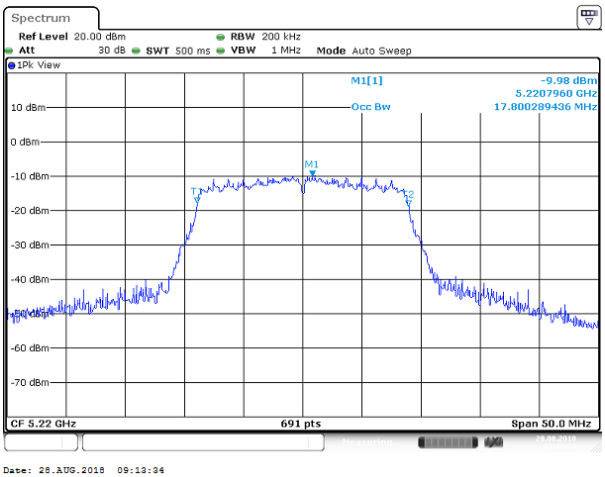
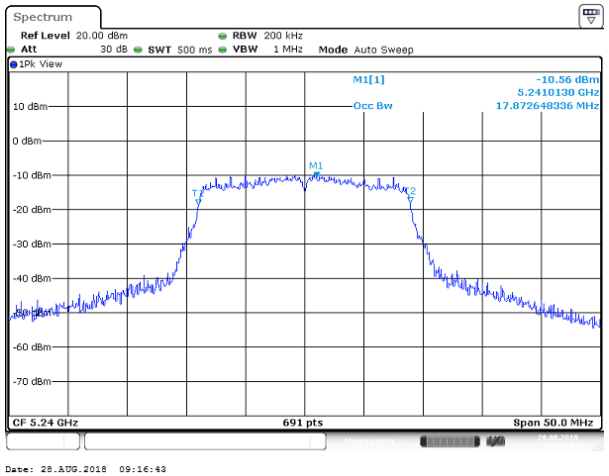
UNII-3 IEEE 802.11a mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

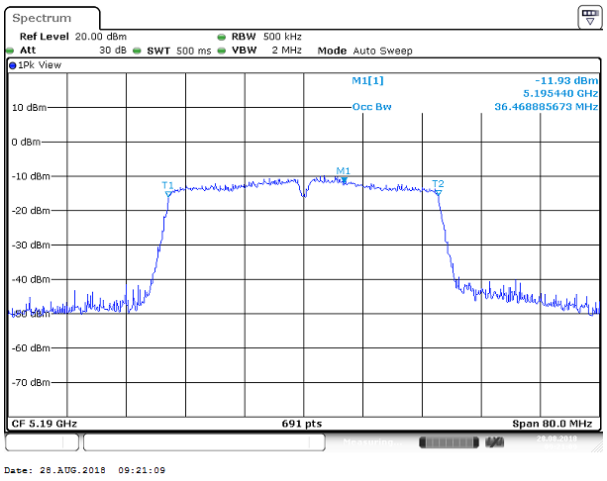
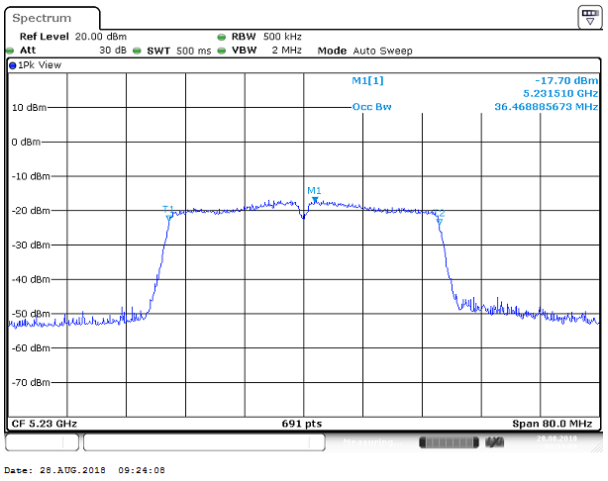
UNII-3 IEEE 802.11n HT20 mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

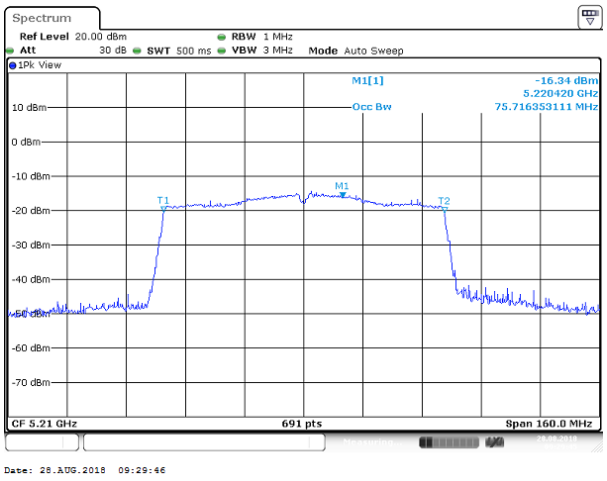
UNII-3 IEEE 802.11n HT40 mode- chain 0	
Low CH	**High CH**
	

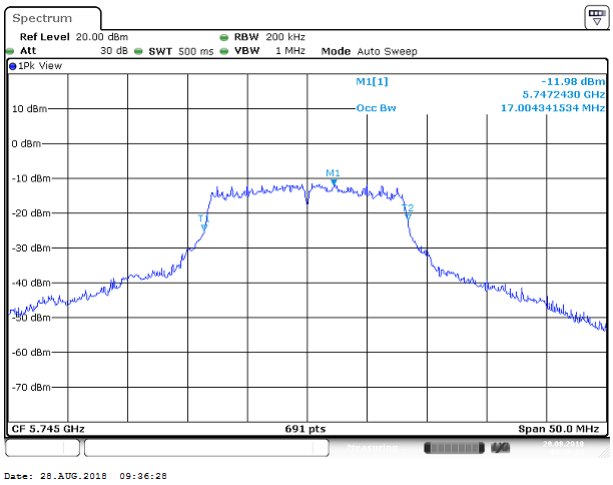
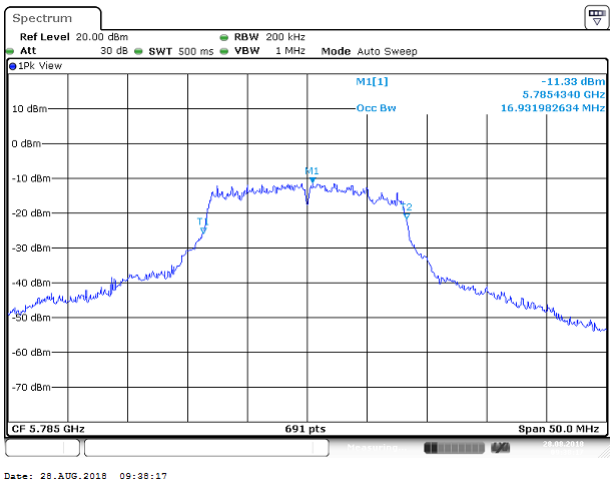
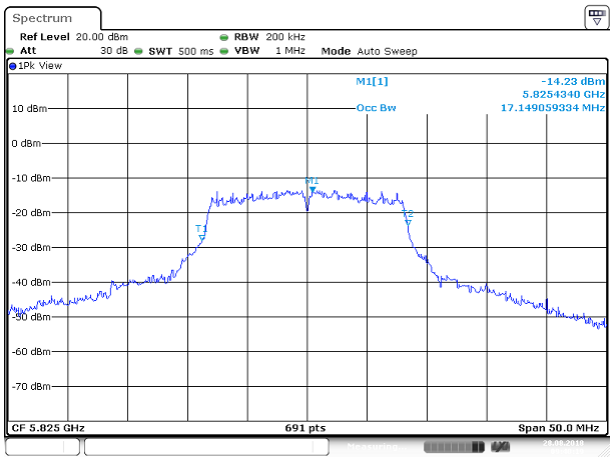
UNII-3 IEEE 802.11ac VHT80 mode- chain 0	
Mid CH	
	

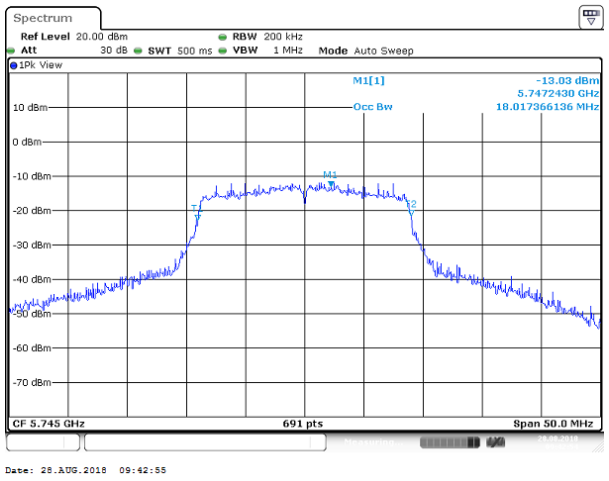
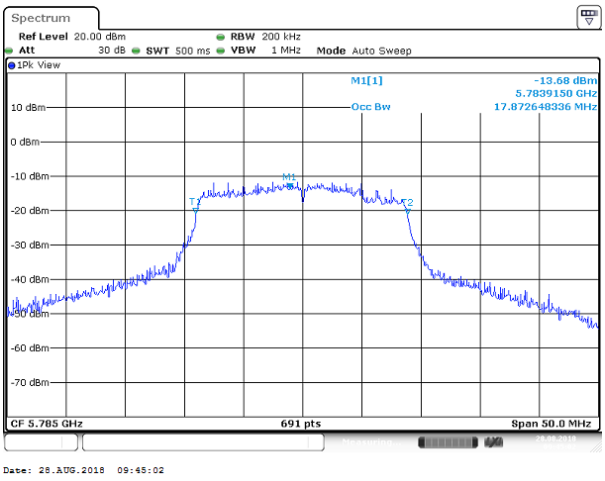
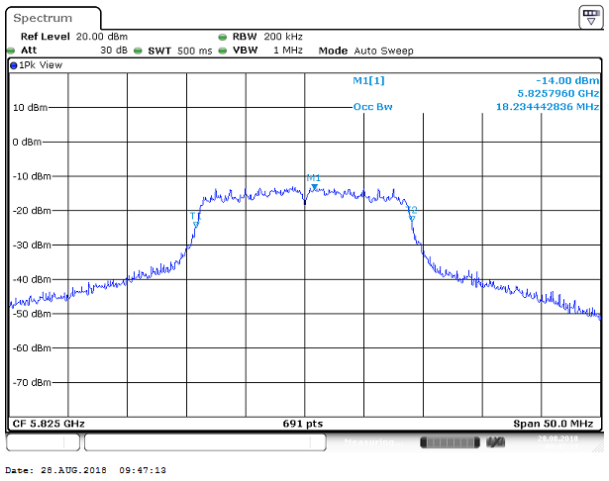
UNII-1 IEEE 802.11a mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

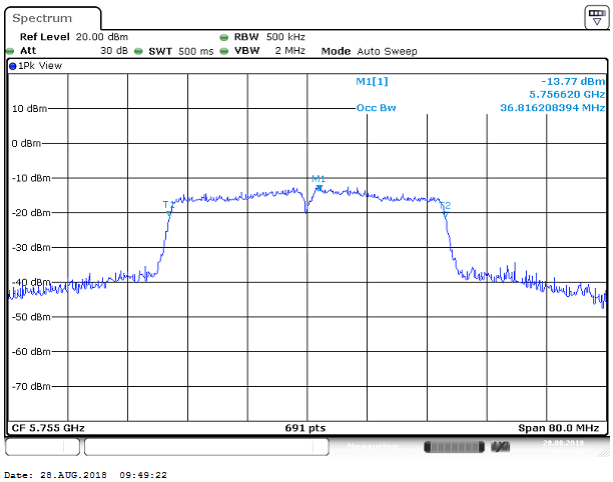
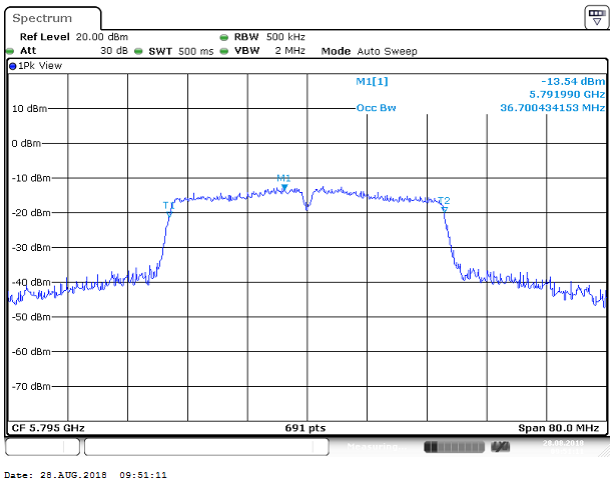
UNII-1 IEEE 802.11n HT20 mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

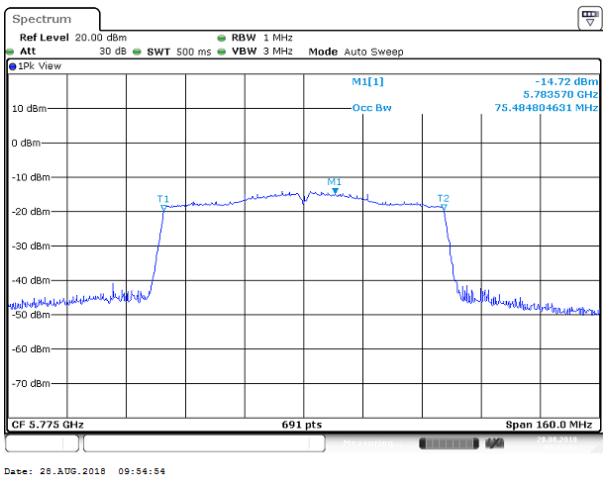
UNII-1 IEEE 802.11n HT40 mode- chain 1	
Low CH	**High CH**
	

UNII-1 IEEE 802.11ac VHT80 mode- chain 1
Mid CH


UNII-3 IEEE 802.11a mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

UNII-3 IEEE 802.11n HT20 mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

UNII-3 IEEE 802.11n HT40 mode- chain 1	
Low CH	**High CH**
	

UNII-3 IEEE 802.11ac VHT80 mode- chain 1	
Mid CH	
	

4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.407 (a)(1), 15.407(a)(3)

UNII-1 :

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

UNII-3:

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

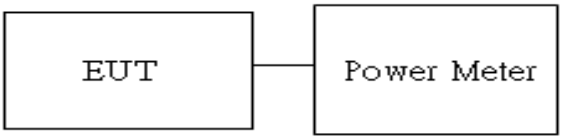
UNII-1 Limit	☒ Antenna not exceed 6 dBi：24dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 24 – (DG – 6)]
UNII-3 Limit	☒ Antenna not exceed 6 dBi：30dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 24 – (DG – 6)]

4.3.2 Test Procedure

Test method Refer as KDB 789033 D02.

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 Average output power. in the test report.

4.3.3 Test Setup



4.3.4 Test Result

Conducted output power：

For Chain 0

UNII-1									
Config	CH	Freq. (MHz)	Power Set		AV Power(dBm)		AV Total Power (dBm)	AV Total Power (W)	Limit (dBm)
			chain0	chain1	chain0	chain1			
IEEE 802.11a	36	5180	12	-	12.42	-	12.42	0.0175	24
	44	5220	14	-	14.40	-	14.40	0.0275	
	48	5240	14	-	13.80	-	13.80	0.0240	
IEEE 802.11n HT20	36	5180	13	-	12.82	-	12.82	0.0191	
	44	5220	13	-	12.68	-	12.68	0.0185	
	48	5240	13	-	12.26	-	12.26	0.0168	
IEEE 802.11n HT40	38	5190	12	-	10.61	-	10.61	0.0115	
	46	5230	12	-	10.43	-	10.43	0.0110	
IEEE 802.11ac VHT80	42	5210	-1	-	13.03	-	13.03	0.0201	

UNII-3									
Config	CH	Freq. (MHz)	Power Set		AV Power(dBm)		AV Total Power (dBm)	AV Total Power (W)	Limit (dBm)
			chain0	chain1	chain0	chain1			
IEEE 802.11a	149	5745	-1	-	15.23	-	15.23	0.0333	30
	157	5785	-1	-	15.33	-	15.33	0.0341	
	165	5825	-1	-	15.33	-	15.33	0.0341	
IEEE 802.11n HT20	149	5745	-1	-	14.96	-	14.96	0.0313	
	157	5785	-1	-	15.04	-	15.04	0.0319	
	165	5825	-1	-	15.10	-	15.10	0.0324	
IEEE 802.11n HT40	151	5755	-1	-	14.50	-	14.50	0.0282	
	159	5795	-1	-	14.43	-	14.43	0.0277	
IEEE 802.11ac VHT80	155	5775	-1	-	12.68	-	12.68	0.0185	

For Chain 1

UNII-1									
Config	CH	Freq. (MHz)	Power Set		AV Power(dBm)		AV Total Power (dBm)	AV Total Power (W)	Limit (dBm)
			chain0	chain1	chain0	chain1			
IEEE 802.11a	36	5180	-	12	-	12.32	12.32	0.0171	24
	44	5220	-	14	-	13.89	13.89	0.0245	
	48	5240	-	14	-	13.91	13.91	0.0246	
IEEE 802.11n HT20	36	5180	-	13	-	12.80	12.80	0.0191	
	44	5220	-	13	-	12.58	12.58	0.0181	
	48	5240	-	13	-	12.53	12.53	0.0179	
IEEE 802.11n HT40	38	5190	-	12	-	10.52	10.52	0.0113	
	46	5230	-	12	-	10.23	10.23	0.0105	
IEEE 802.11ac VHT80	42	5210	-	-1	-	13.27	13.27	0.0212	

UNII-3									
Config	CH	Freq. (MHz)	Power Set		AV Power(dBm)		AV Total Power (dBm)	AV Total Power (W)	Limit (dBm)
			chain0	chain1	chain0	chain1			
IEEE 802.11a	149	5745	-	-1	-	15.42	15.42	0.0348	30
	157	5785	-	-1	-	15.46	15.46	0.0352	
	165	5825	-	-1	-	15.49	15.49	0.0354	
IEEE 802.11n HT20	149	5745	-	-1	-	15.25	15.25	0.0335	
	157	5785	-	-1	-	15.18	15.18	0.0330	
	165	5825	-	-1	-	15.14	15.14	0.0327	
IEEE 802.11n HT40	151	5755	-	-1	-	14.57	14.57	0.0286	
	159	5795	-	-1	-	14.54	14.54	0.0284	
IEEE 802.11ac VHT80	155	5775	-	-1	-	13.62	13.62	0.0230	

4.4 POWER SPECTRAL DENSITY

4.4.1 Test Limit

According to §15.407 (a)(1), 15.407(a)(3)

UNII-1 :

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

UNII-3:

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

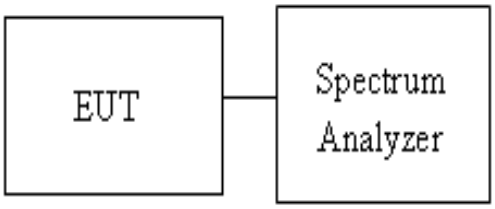
UNII-1 Limit	☒ Antenna not exceed 6 dBi：11 dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 11 – (DG – 6)]
UNII-3 Limit	☒ Antenna not exceed 6 dBi：30 dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 30 – (DG – 6)]

4.4.2 Test Procedure

Test method Refer as KDB 789033 D02.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. UNII-1, UNII-2a and UNII-2c, SA set RBW = 1MHz, VBW = 3MHz and Detector = RMS, to measurement Power Density.
4. UNII-3, SA set RBW = 500kHz, VBW = 2MHz and Detector = RMS, to measurement Power Density
5. The path loss and Duty Factor were compensated to the results for each measurement by SA.
6. Mark the maximum level.
7. Measure and record the result of power spectral density. in the test report.

4.4.3 Test Setup



4.4.4 Test Result

For Chain 0:

UNII-1			
Test mode: IEEE 802.11a mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5180	-5.99	11
Mid	5220	-3.88	
High	5240	-4.25	
Test mode: IEEE 802.11n HT20 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5180	-5.56	11
Mid	5220	-5.72	
High	5240	-5.70	
Test mode: IEEE 802.11n HT40 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5190	-4.27	11
High	5230	-4.51	
Test mode: IEEE 802.11ac VHT80 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Mid	5210	-12.08	11

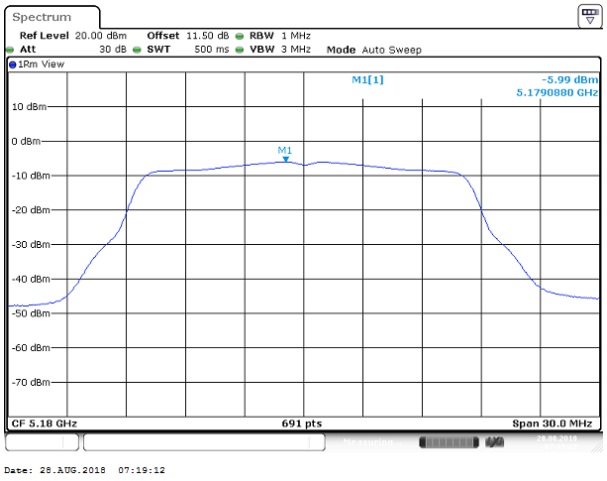
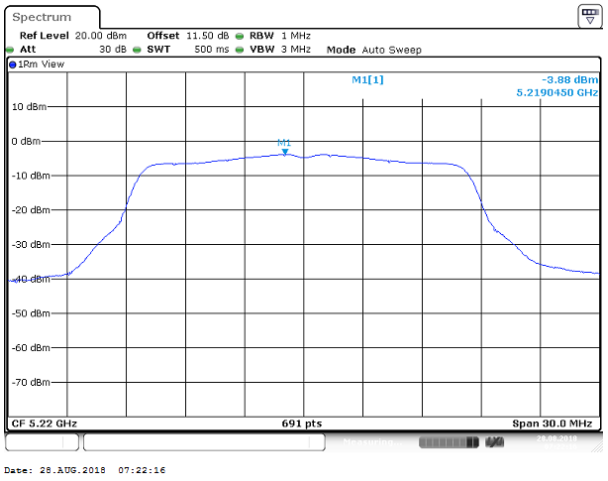
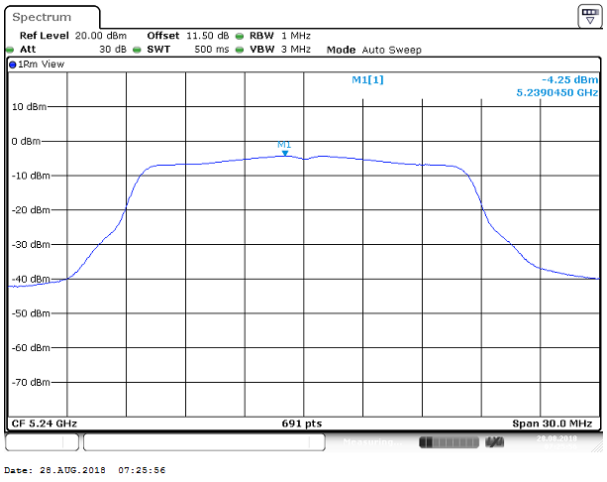
UNII-3			
Test mode: IEEE 802.11a mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5745	1.52	30
Mid	5785	1.56	
High	5825	1.43	
Test mode: IEEE 802.11n HT20 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5745	2.56	30
Mid	5785	1.95	
High	5825	2.15	
Test mode: IEEE 802.11n HT40 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5755	-0.96	30
High	5795	-1.14	
Test mode: IEEE 802.11ac VHT80 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Mid	5775	-7.17	30

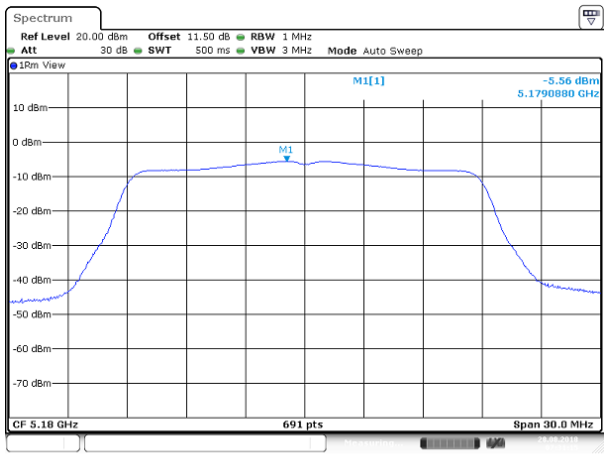
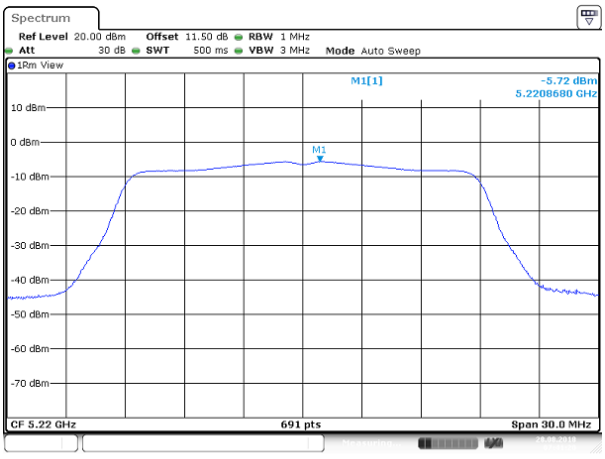
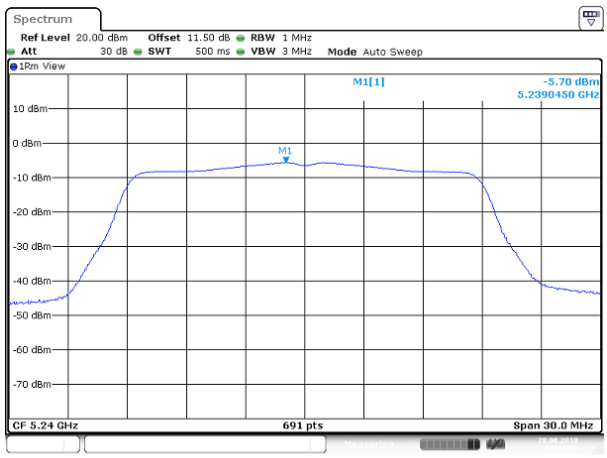
For Chain 1:

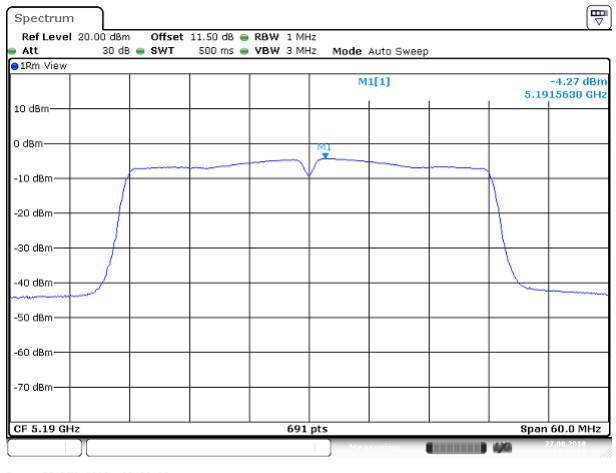
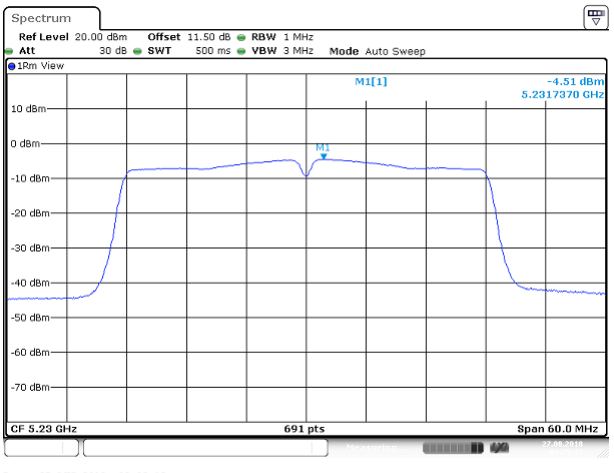
UNII-1			
Test mode: IEEE 802.11a mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5180	-5.68	11
Mid	5220	-3.72	
High	5240	-4.03	
Test mode: IEEE 802.11n HT20 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5180	1.05	11
Mid	5220	0.92	
High	5240	0.95	
Test mode: IEEE 802.11n HT40 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5190	-4.16	11
High	5230	-11.23	
Test mode: IEEE 802.11ac VHT80 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Mid	5210	-11.82	11

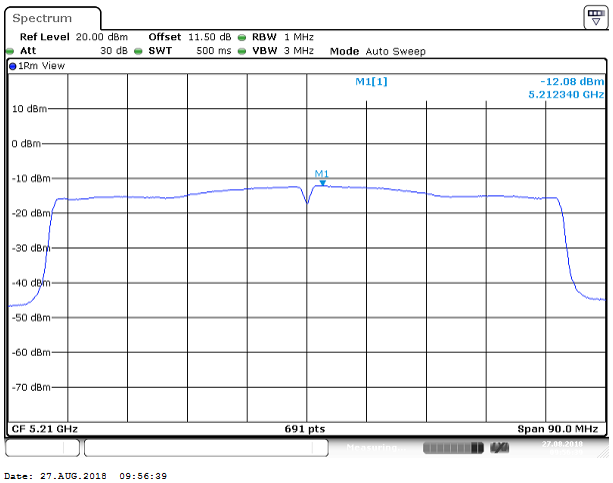
UNII-3			
Test mode: IEEE 802.11a mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5745	2.33	30
Mid	5785	2.43	
High	5825	2.31	
Test mode: IEEE 802.11n HT20 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5745	2.18	30
Mid	5785	3.31	
High	5825	3.19	
Test mode: IEEE 802.11n HT40 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Low	5755	-0.24	30
High	5795	-0.30	
Test mode: IEEE 802.11ac VHT80 mode			
Channel	**Frequency (MHz)**	**PPSD (dBm)**	**Limit (dBm)**
Mid	5775	-5.24	30

Test Data

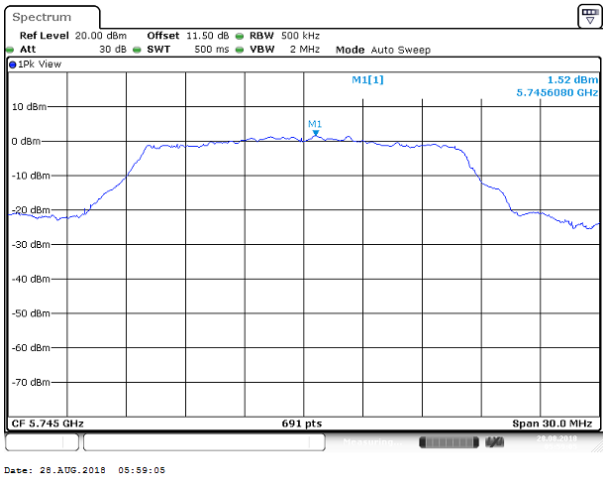
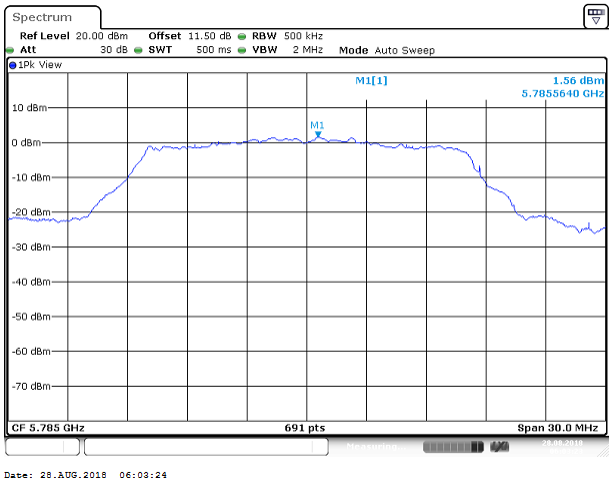
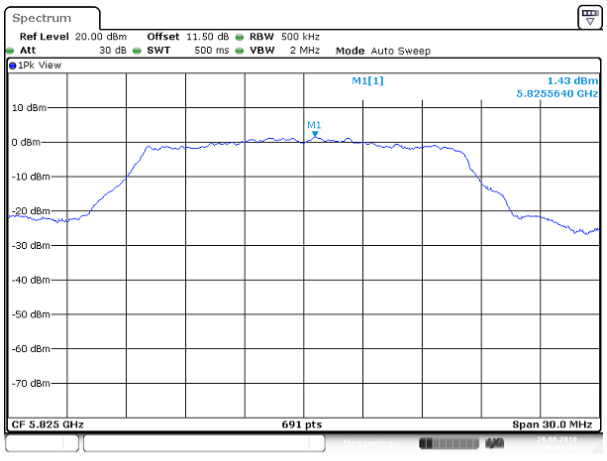
UNII-1 IEEE 802.11a mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

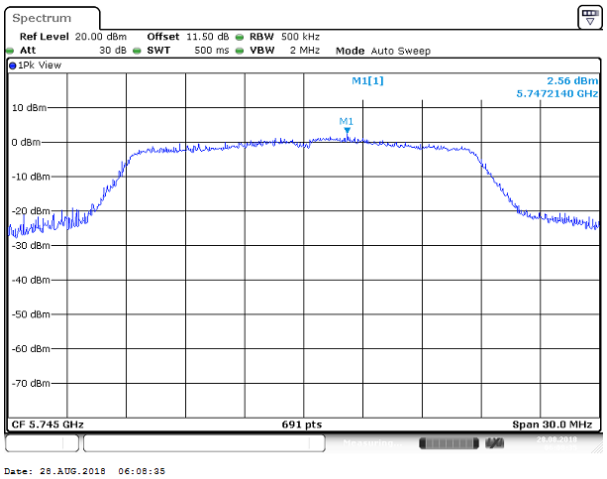
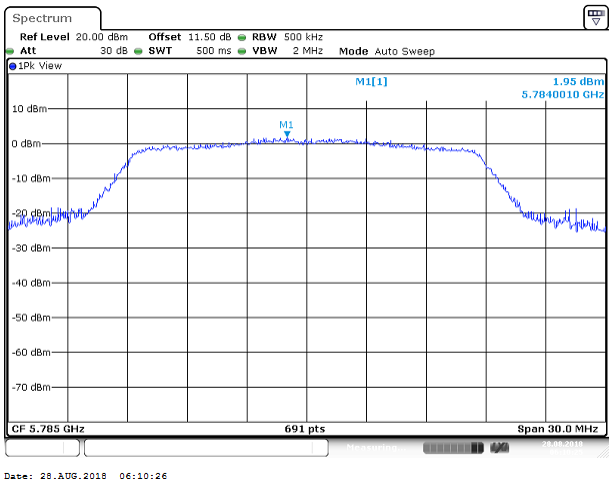
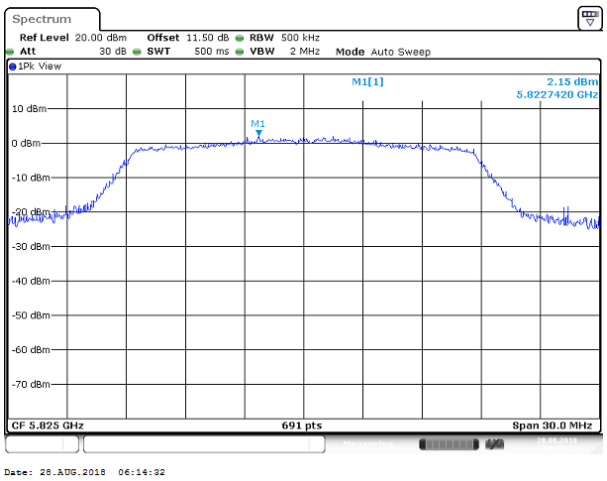
UNII-1 IEEE 802.11n HT20 mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

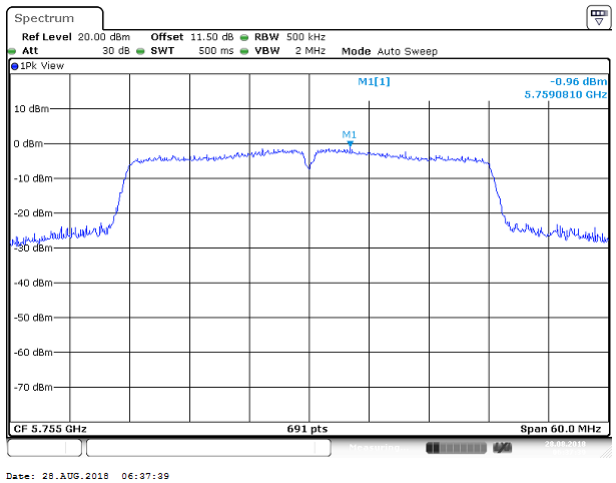
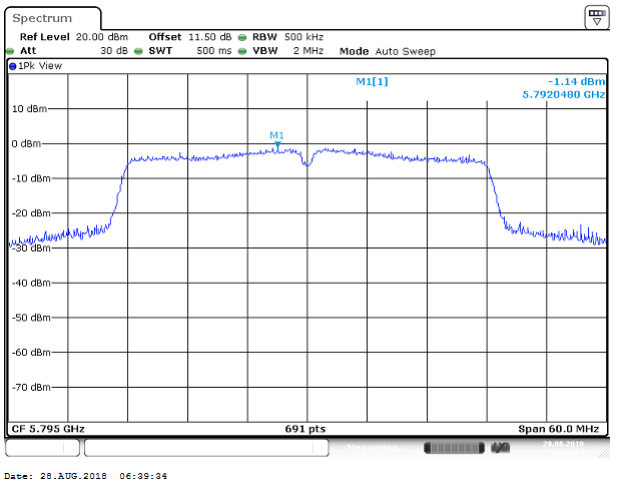
UNII-1 IEEE 802.11n HT40 mode- chain 0	
Low CH	**High CH**
	

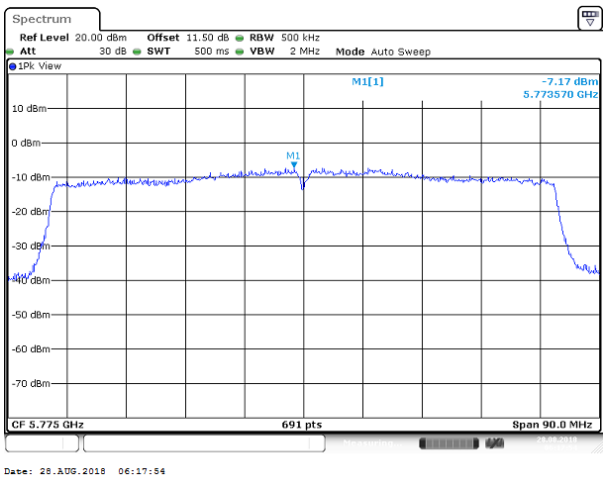
UNII-1 IEEE 802.11ac VHT80 mode- chain 0
Mid CH


Test Data

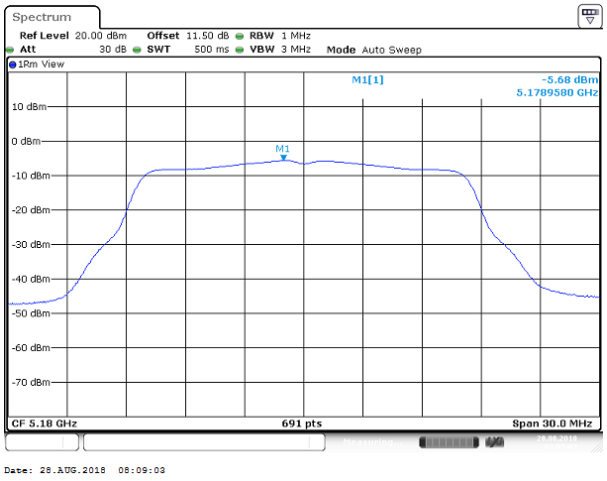
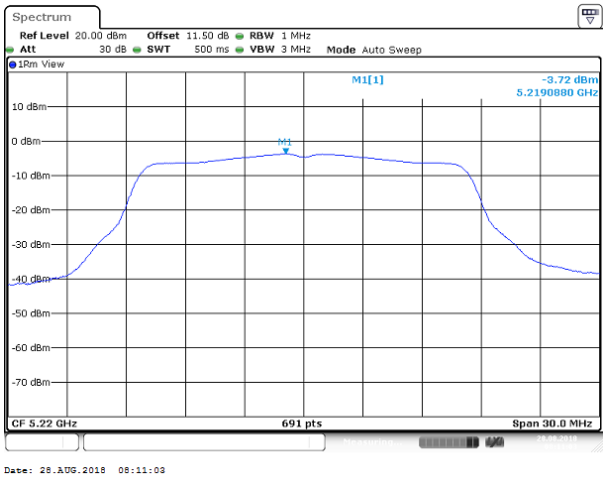
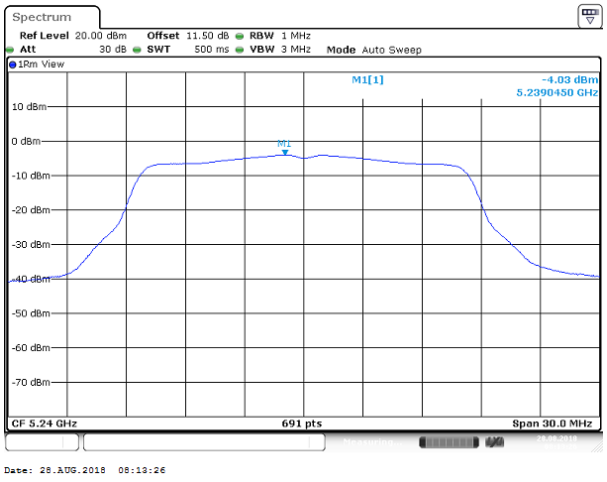
UNII-3 IEEE 802.11a mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

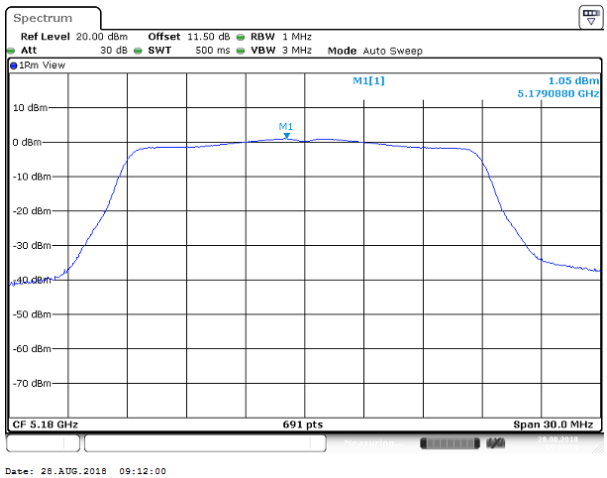
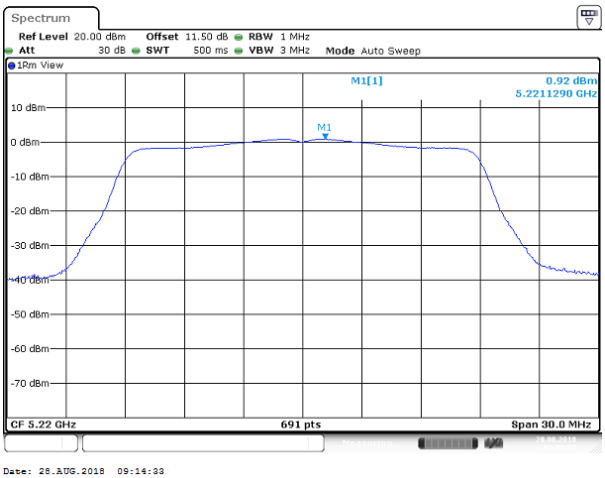
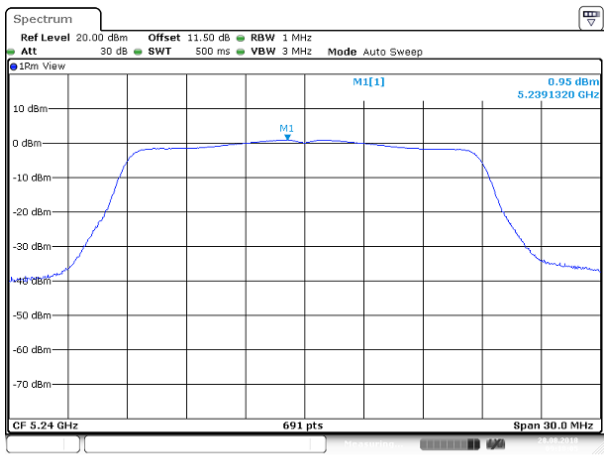
UNII-3 IEEE 802.11n HT20 mode- chain 0	
Low CH	**Mid CH**
	
High CH	
	

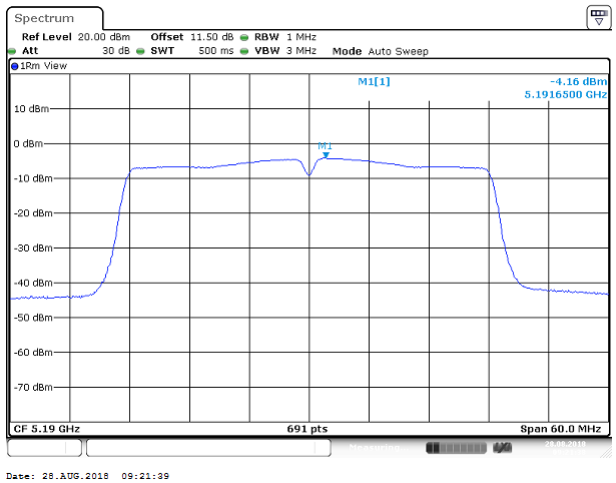
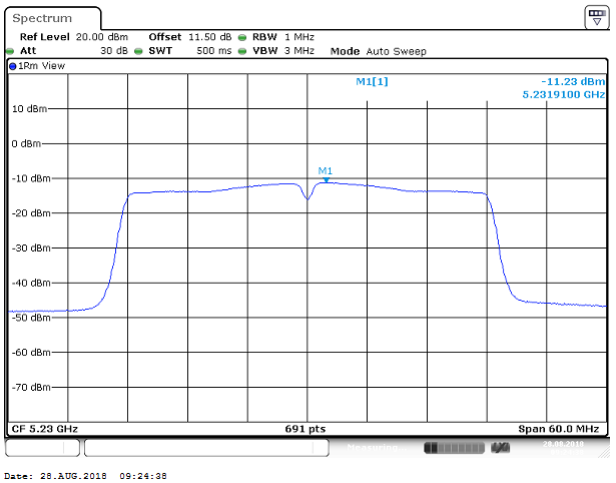
UNII-3 IEEE 802.11n HT40 mode- chain 0	
Low CH	**High CH**
	

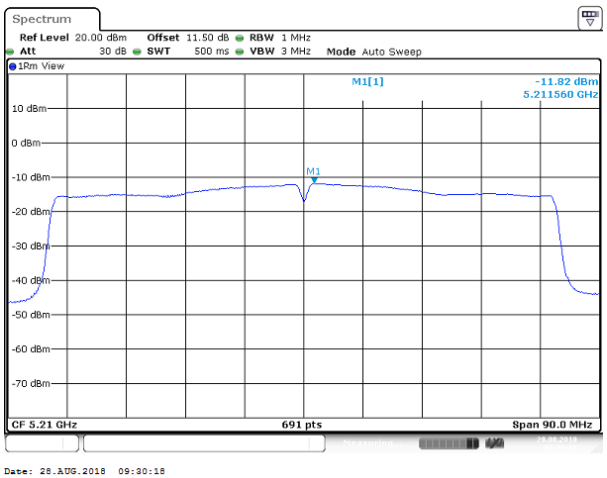
UNII-3 IEEE 802.11ac VHT80 mode- chain 0	
Mid CH	
	

Test Data

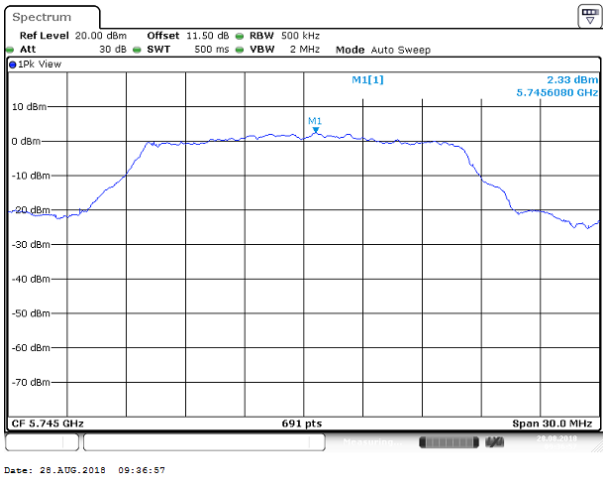
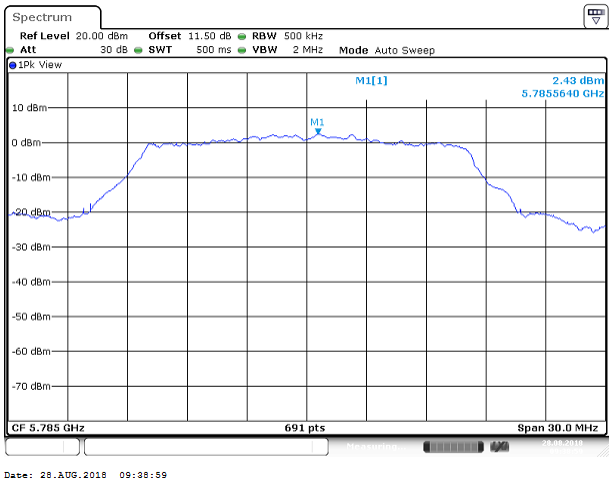
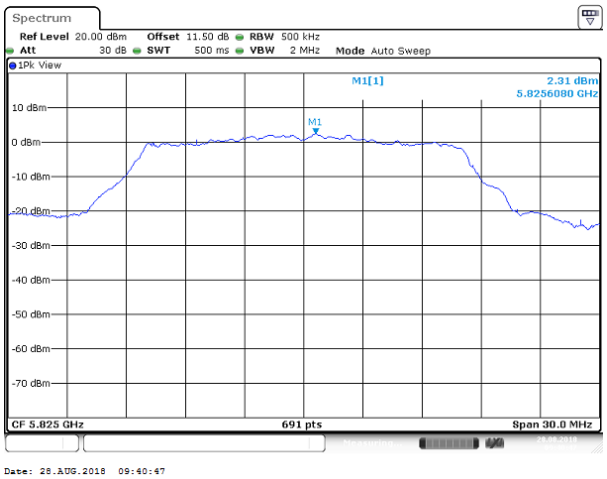
UNII-1 IEEE 802.11a mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

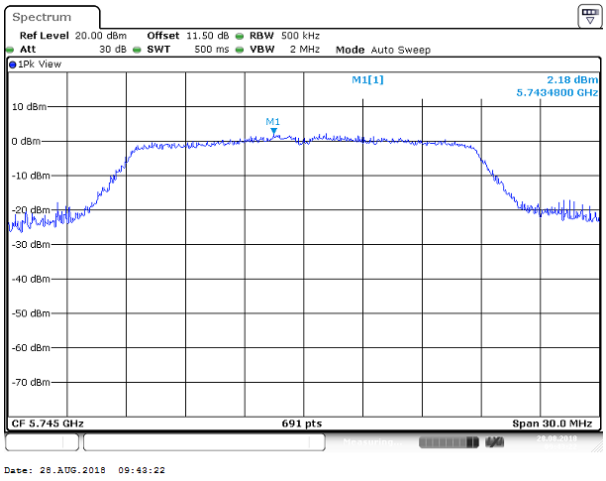
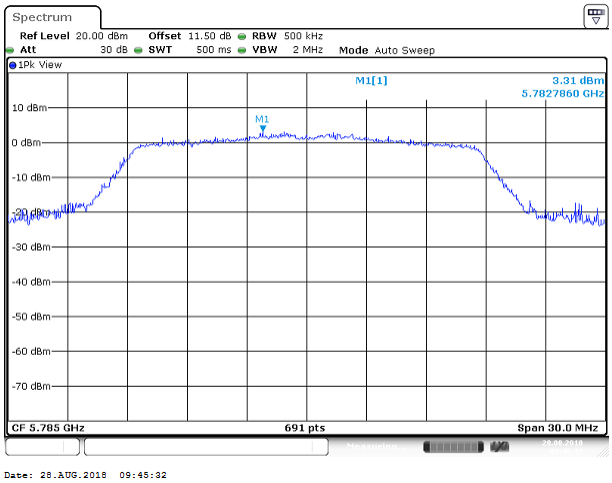
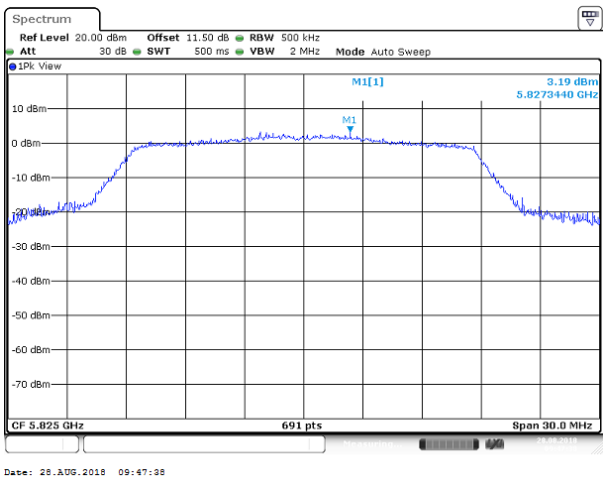
UNII-1 IEEE 802.11n HT20 mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

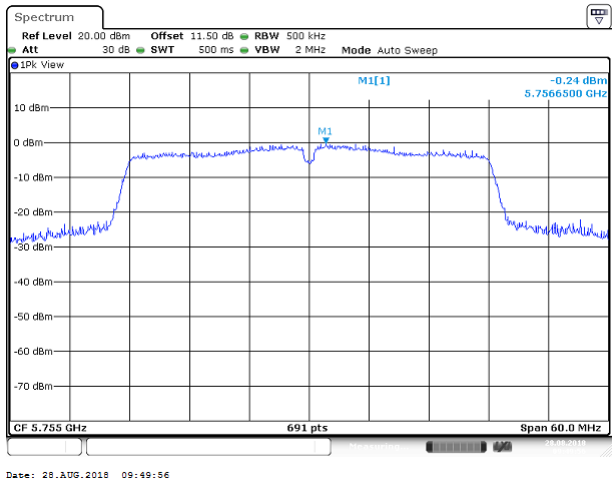
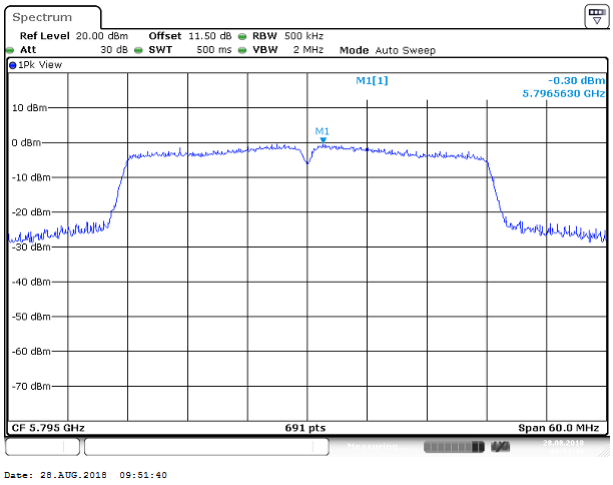
UNII-1 IEEE 802.11n HT40 mode- chain 1	
Low CH	**High CH**
	

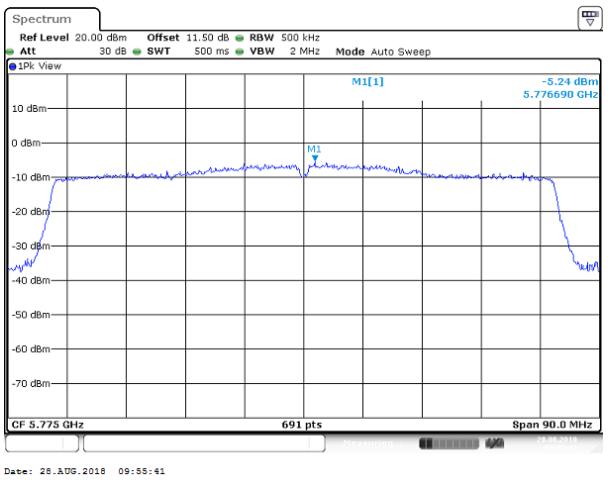
UNII-1 IEEE 802.11ac VHT80 mode- chain 1
Mid CH


Test Data

UNII-3 IEEE 802.11a mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

UNII-3 IEEE 802.11n HT20 mode- chain 1	
Low CH	**Mid CH**
	
High CH	
	

UNII-3 IEEE 802.11n HT40 mode- chain 1	
Low CH	**High CH**
	

UNII-3 IEEE 802.11ac VHT80 mode- chain 1	
Mid CH	
	

4.5 RADIATION BANDEDGE AND SPURIOUS EMISSION

4.5.1 Test Limit

FCC according to §15.407, §15.209 and §15.205,

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 (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

UNII-1 :

For transmitters operating in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250-5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz. Otherwise, the transmission is considered as intentional and the devices shall implement dynamic frequency selection (DFS) and transmitter power control (TPC) as per the requirements for the band 5250-5350 MHz

UNII-3:

All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

4.5.2 Test Procedure

Test method Refer as KDB 789033 D02.

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 30MHz 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 ≥ 3*RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G：

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

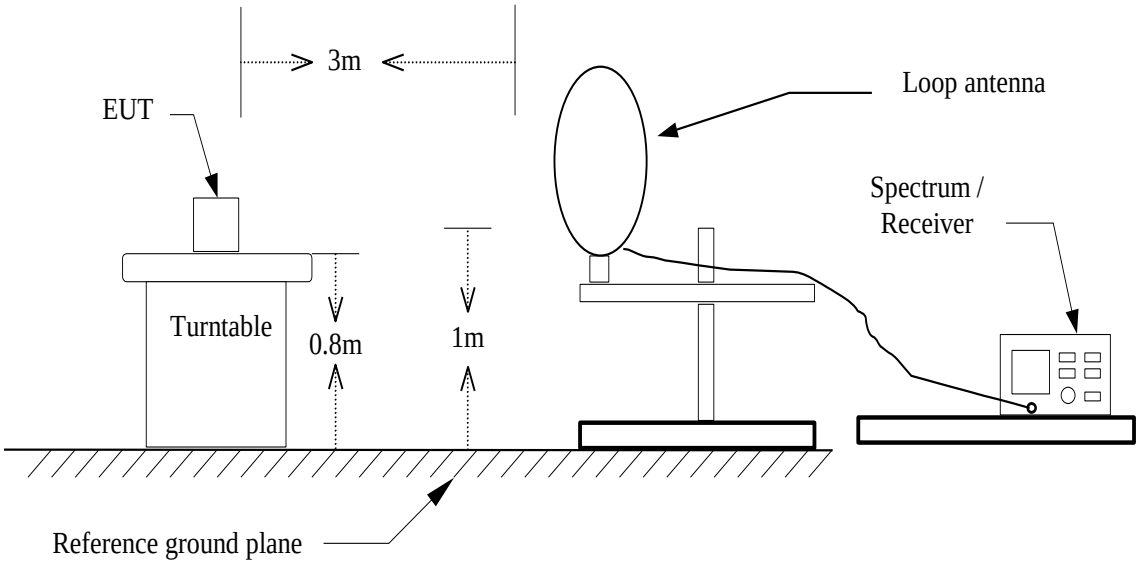
(2.2) For Average measurement：RBW = 1MHz, VBW

- If Duty Cycle ≥ 98%, VBW=10Hz.
- If Duty Cycle < 98%, VBW=1/T.

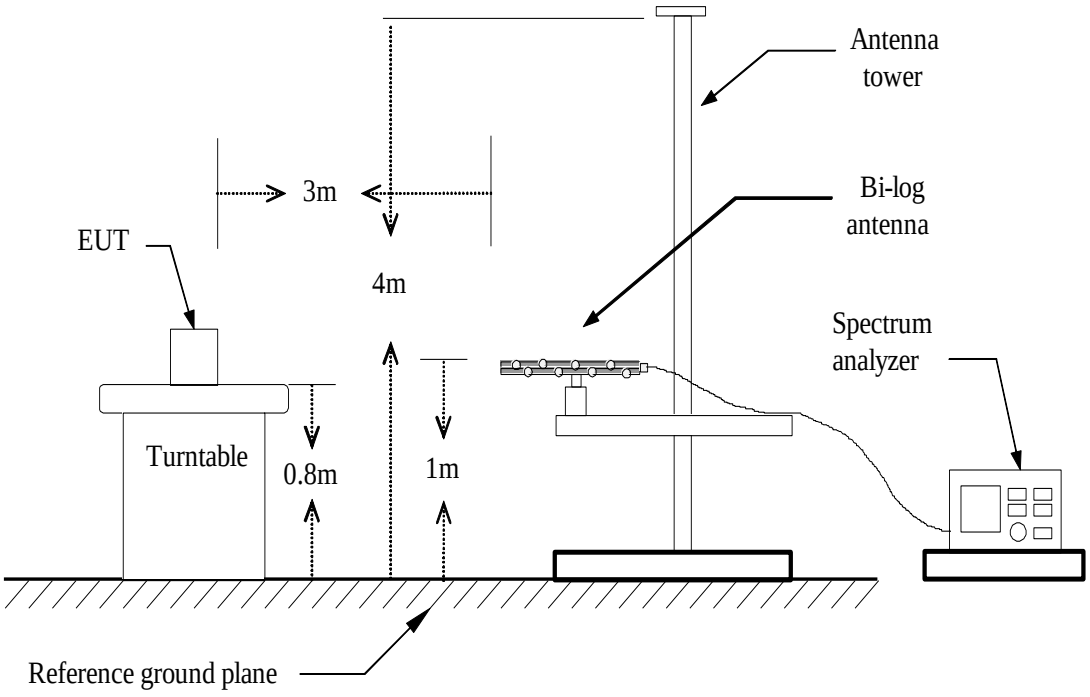
Configuration	Duty Cycle (%)	VBW
802.11a	95%	750Hz
802.11n HT20	94%	820Hz
802.11n HT40	89%	1.5KHz
802.11ac VHT80	98%	2.2KHz

4.5.3 Test Setup

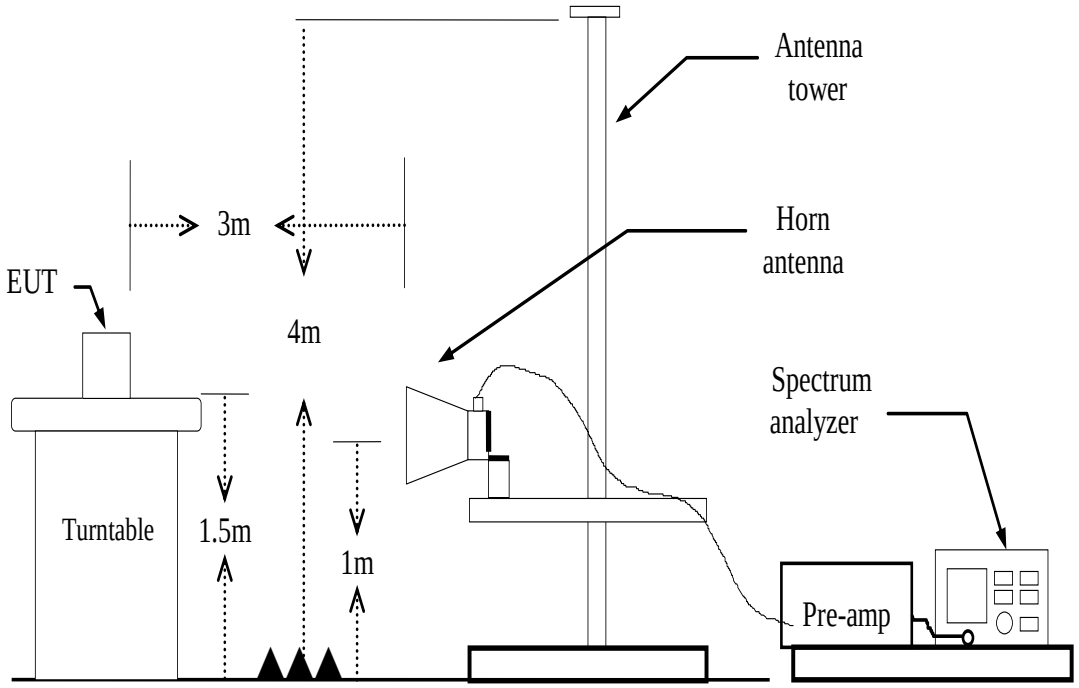
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz

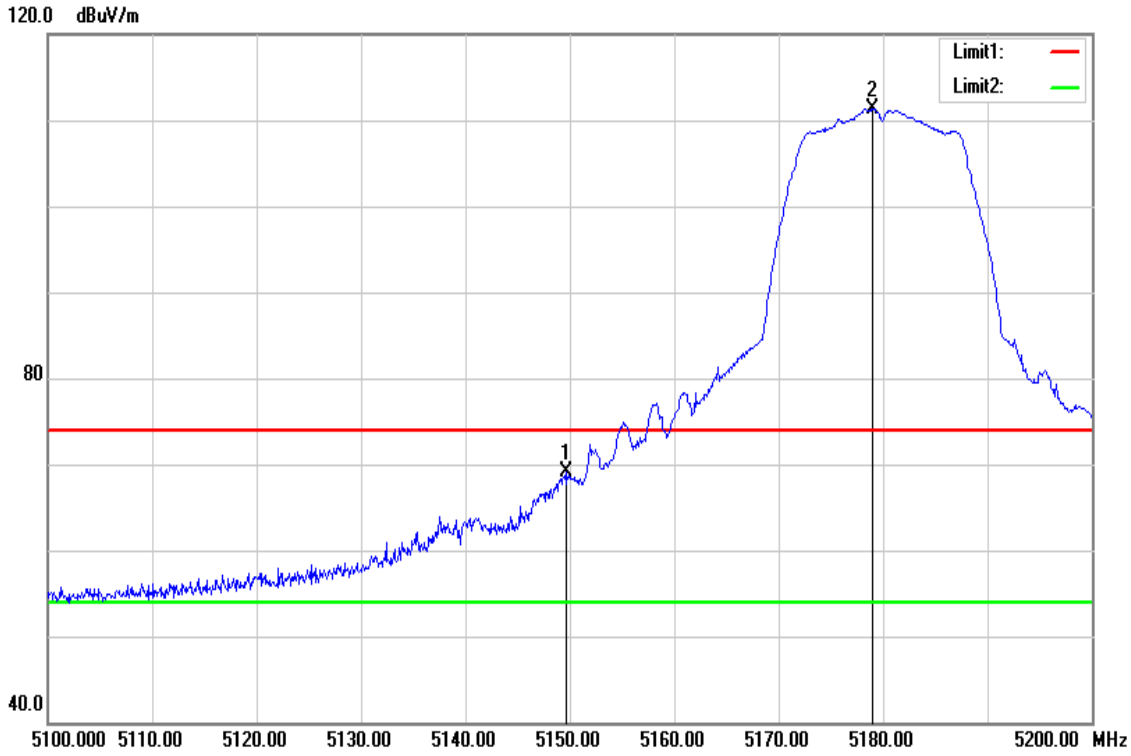


4.5.4 Test Result

Test Data

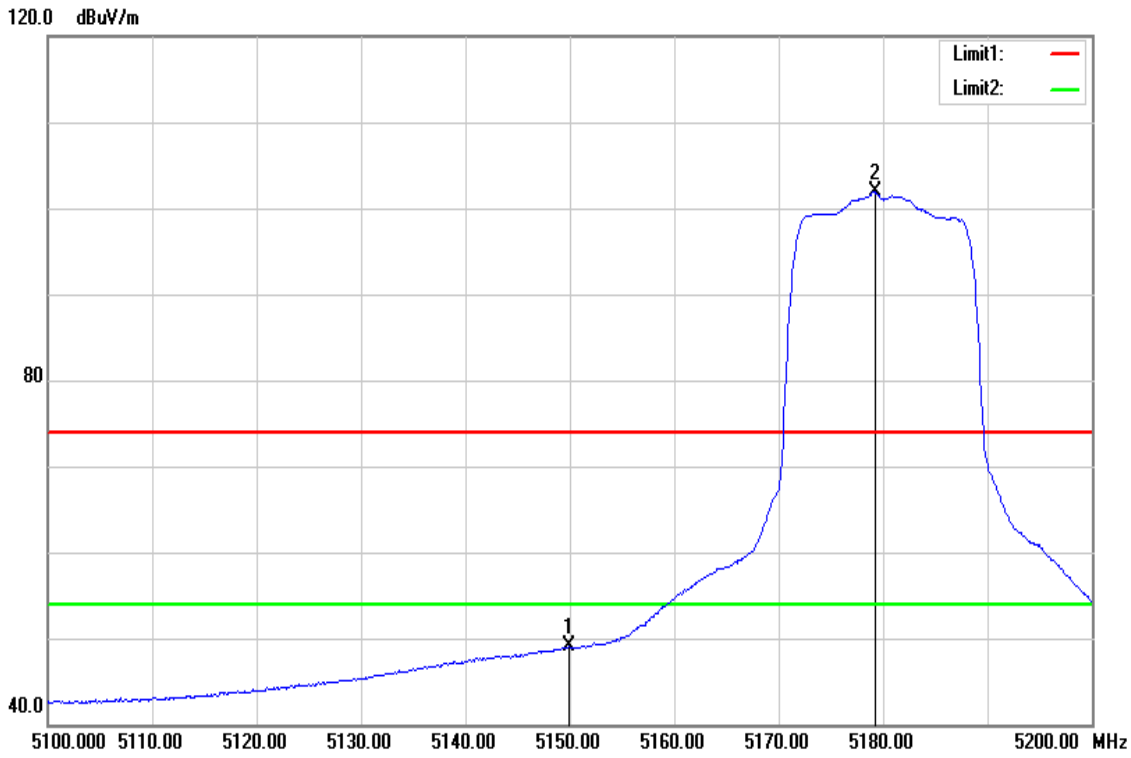
Band Edge Test Data for UNII-1

Test Mode	IEEE 802.11a Low CH	Temp/Hum	23.8(℃)/ 35%RH
Test Item	Band Edge	Test Date	August 29, 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
5149.600	64.06	5.00	69.06	74.00	-4.94	peak
5179.000	106.16	5.12	111.28	-	-	peak

Test Mode	IEEE 802.11a Low CH	Temperature	23.8(℃)/ 35%RH
Test Item	Band Edge	Test Date	August 29, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average		



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5149.900	44.02	5.00	49.02	54.00	-4.98	AVG
5179.200	96.79	5.12	101.91	-	-	AVG