

FCC Radio Test Report

FCC ID: KA2WL8630APA1

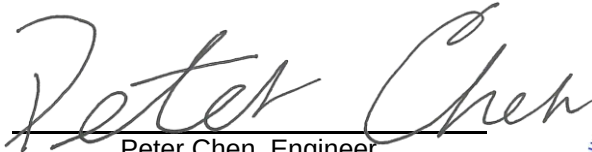
Report No. : BTL-FCCP-2-1909H044
Equipment : Unified AX Dual-Band PoE Access Point
Model Name : DWL-8630AP, DWL-8630APE, DWL-X8630AP, DWL-X8630APE
Brand Name : D-Link Corporation
Applicant : D-Link Corporation
Address : 17595 Mt. Herrmann, Fountain Valley, California United State 92708

Radio Function : RLAN 5 GHz (U-NII 1, U-NII 3)

FCC Rule Part(s) : FCC Part15, Subpart E (15.407)
Measurement Procedure(s) : ANSI C63.10-2013

Date of Receipt : 2019/9/30
Date of Test : 2019/9/30 ~ 2020/3/16
Issued Date : 2020/4/21

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	2020/4/21

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

FCC Part 15, Subpart E (15.407)				
Standard(s) Section	Description	Test Result	Judgement	Remark
15.207	AC power line conducted emissions	APPENDIX A	Pass	-----
15.205 15.209 15.407(b)	Radiated emissions	APPENDIX B APPENDIX C	Pass	-----
15.407(a)	Bandwidth	APPENDIX D	Pass	-----
15.407(a)	Output power	APPENDIX E	Pass	-----
15.407(a)	Power spectral density	APPENDIX F	Pass	-----
15.203	Antenna requirement	-----	Pass	-----
15.407(c)	Automatically Discontinue Transmission	-----	Pass	NOTE (2)

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report.
- (2) The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.
- (3) The report format version is TP.1.1.1.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

The test sites and facilities are covered under FCC RN: 355421 and DN: TW1099.

☒ C05 ☐ CB08 ☐ CB11 ☐ CB15 ☐ CB16
☒ SR06

No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan

The test sites and facilities are covered under FCC RN: 325517 and DN: TW1115.

☐ C03 ☒ CB18 ☐ CB19

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately **95 %**.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U (dB)
C05	CISPR	150 kHz ~ 30MHz	3.44

B. Radiated emissions test :

Test Site	Measurement Frequency Range	U,(dB)
CB18	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

C. Conducted test :

Test Item	U,(dB)
Bandwidth	1.13
Output power	1.06
Power Spectral Density	1.20
Conducted Spurious emissions	1.14
Conducted Band edges	1.13

NOTE:

Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Environment Condition	Tested by
AC Power Line Conducted Emissions	20 °C, 58 %	Eric Lee
Radiated emissions below 1 GHz	23 °C, 61 %	Hunter Chiang
Radiated emissions above 1 GHz	23 °C, 61~65 %	Hunter Chiang
Bandwidth	23.4 °C, 50 %	Tim Lee
Output Power	23.4 °C, 50 %	Tim Lee
Power Spectral Density	23.4 °C, 50 %	Tim Lee

1.4 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

Non-Beamforming mode				
UNII-1				
Test Software	QRCT v4.0.00123			
Mode	5180 MHz	5200 MHz	5240 MHz	Data Rate
IEEE 802.11a	17	17.5	18.5	6 Mbps
IEEE 802.11n (HT20)	18.5	18.5	18.5	MCS 0
IEEE 802.11ac (VHT20)	18.5	18.5	18.5	MCS 0
IEEE 802.11ax (HEW20)	18	18	18	MCS 0
Mode	5190 MHz	5230 MHz		Data Rate
IEEE 802.11n (HT40)	17	22		MCS 0
IEEE 802.11ac (VHT40)	17	22		MCS 0
IEEE 802.11ax (HEW40)	15.5	22		MCS 0
Mode	5210 MHz			Data Rate
IEEE 802.11ac (VHT80)	14			MCS 0
IEEE 802.11ax (HEW80)	12			MCS 0
Mode	5210 MHz + 5775 MHz			Data Rate
IEEE 802.11ac (VHT80+80)	14			MCS 0
IEEE 802.11ax (HEW80+80)	12			MCS 0

Non-Beamforming mode				
UNII-3				
Test Software	QRCT v4.0.00123			
Mode	5745 MHz	5785 MHz	5825 MHz	Data Rate
IEEE 802.11a	22	22	22	6 Mbps
IEEE 802.11n (HT20)	23	23	23	MCS 0
IEEE 802.11ac (VHT20)	23	23	23	MCS 0
IEEE 802.11ax (HEW20)	23	23	23	MCS 0
Mode	5755 MHz	5795 MHz		Data Rate
IEEE 802.11n (HT40)	23	23		MCS 0
IEEE 802.11ac (VHT40)	23	23		MCS 0
IEEE 802.11ax (HEW40)	23	23		MCS 0
Mode	5775 MHz			Data Rate
IEEE 802.11ac (VHT80)	23			MCS 0
IEEE 802.11ax (HEW80)	23			MCS 0
Mode	5775 MHz + 5210 MHz			Data Rate
IEEE 802.11ac (VHT80+80)	15			MCS 0
IEEE 802.11ax (HEW80+80)	13			MCS 0

Beamforming mode				
UNII-1				
Test Software	QRCT v4.0.00123			
Mode	5180 MHz	5200 MHz	5240 MHz	Data Rate
IEEE 802.11a	11	11.5	12.5	6 Mbps
IEEE 802.11n (HT20)	12.5	12.5	12.5	MCS 0
IEEE 802.11ac (VHT20)	12.5	12.5	12.5	MCS 0
IEEE 802.11ax (HEW20)	12	12	12	MCS 0
Mode	5190 MHz	5230 MHz		Data Rate
IEEE 802.11n (HT40)	11	16		MCS 0
IEEE 802.11ac (VHT40)	11	16		MCS 0
IEEE 802.11ax (HEW40)	9.5	16		MCS 0
Mode	5210 MHz			Data Rate
IEEE 802.11ac (VHT80)	8			MCS 0
IEEE 802.11ax (HEW80)	6			MCS 0
Mode	5210 MHz + 5775 MHz			Data Rate
IEEE 802.11ac (VHT80+80)	8			MCS 0
IEEE 802.11ax (HEW80+80)	6			MCS 0

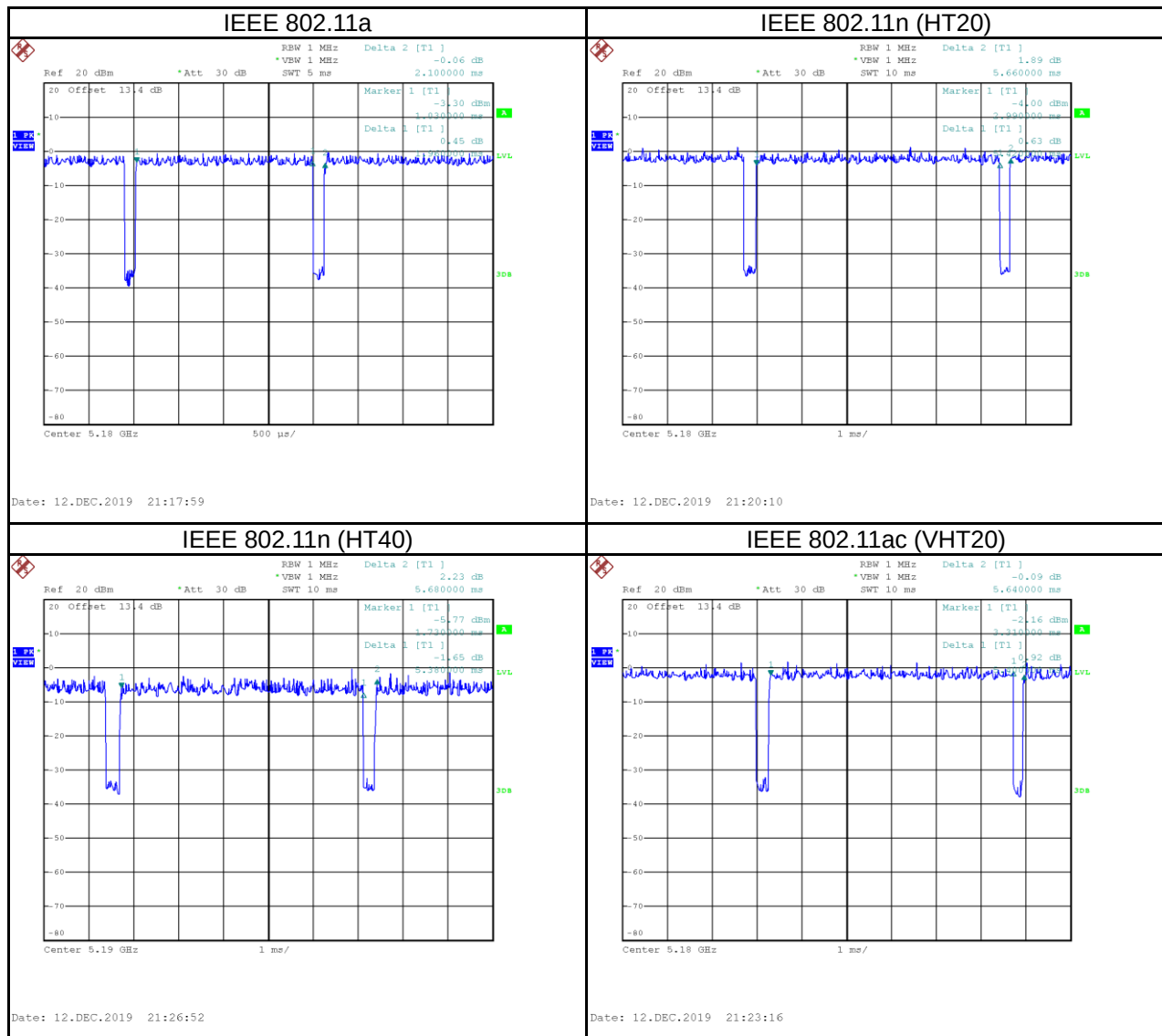
Beamforming mode				
UNII-3				
Test Software	QRCT v4.0.00123			
Mode	5745 MHz	5785 MHz	5825 MHz	Data Rate
IEEE 802.11a	16	16	16	6 Mbps
IEEE 802.11n (HT20)	17	17	17	MCS 0
IEEE 802.11ac (VHT20)	17	17	17	MCS 0
IEEE 802.11ax (HEW20)	17	17	17	MCS 0
Mode	5755 MHz	5795 MHz		Data Rate
IEEE 802.11n (HT40)	17	17		MCS 0
IEEE 802.11ac (VHT40)	17	17		MCS 0
IEEE 802.11ax (HEW40)	17	17		MCS 0
Mode	5775 MHz			Data Rate
IEEE 802.11ac (VHT80)	17			MCS 0
IEEE 802.11ax (HEW80)	17			MCS 0
Mode	5775 MHz + 5210 MHz			Data Rate
IEEE 802.11ac (VHT80+80)	9			MCS 0
IEEE 802.11ax (HEW80+80)	7			MCS 0

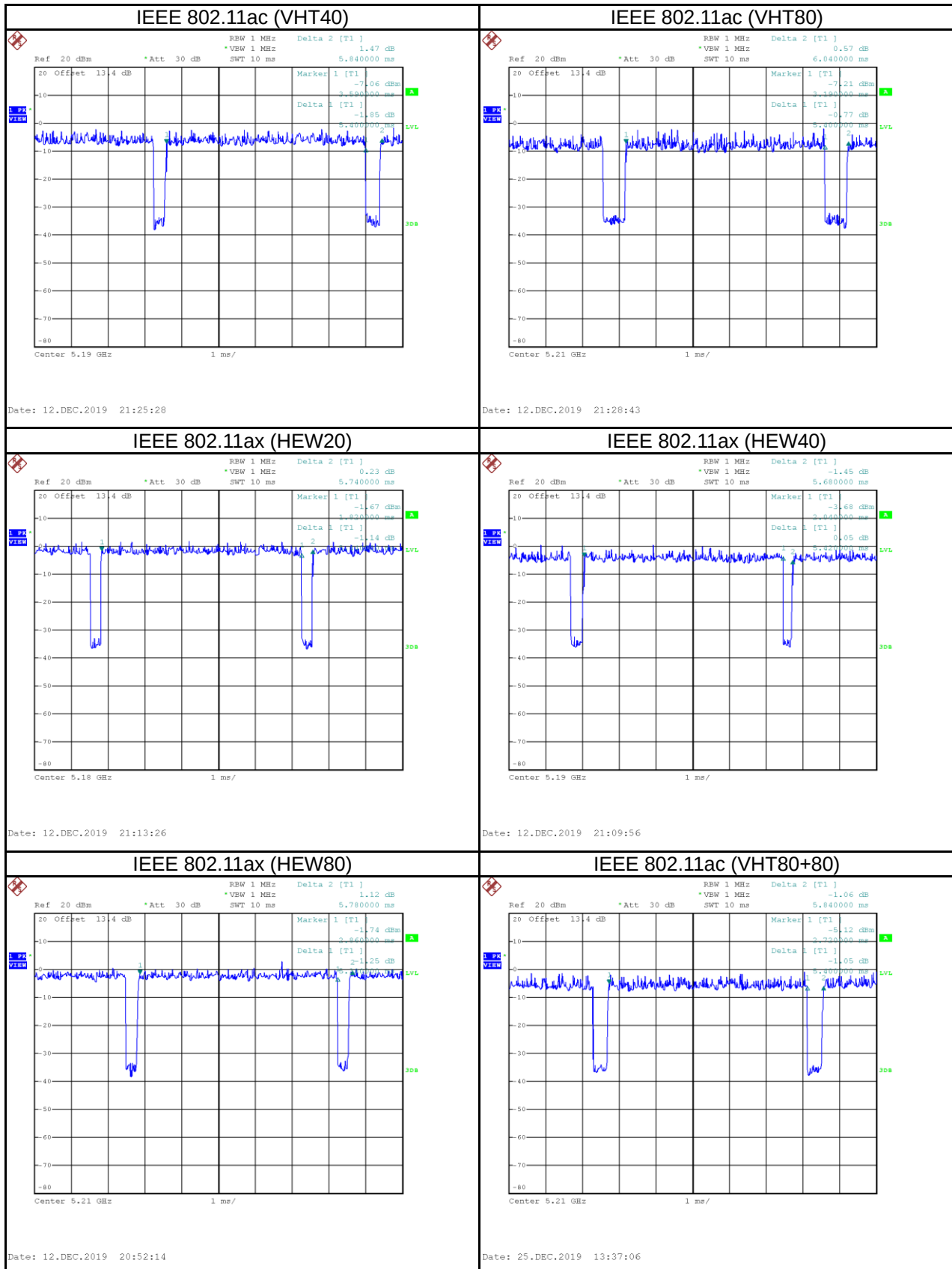
1.5 DUTY CYCLE

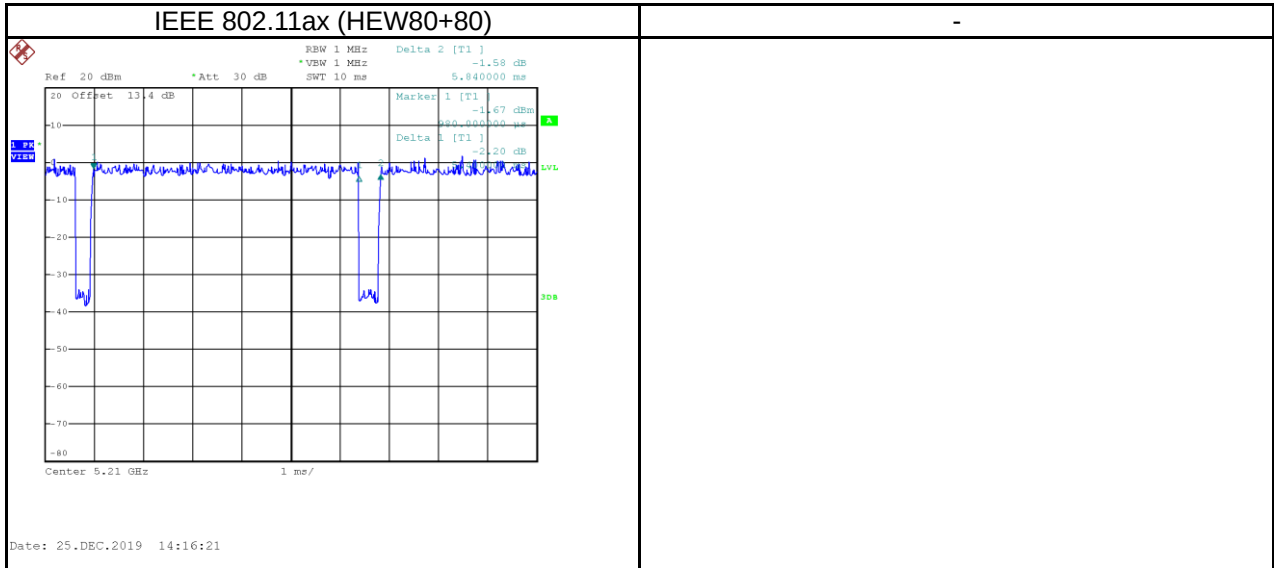
If duty cycle is $\geq 98\%$, duty factor is not required.

If duty cycle is $< 98\%$, duty factor shall be considered.

Remark	Delta 1			Delta 2	On Time/Period	10 log(1/Duty Cycle)	1/On Time (B)
Mode	ON (ms)	Numbers (ON)	On Time (B) (ms)	Period (ON+OFF) (ms)	Duty Cycle (%)	Duty Factor (dB)	1/B Minimum VBW (kHz)
IEEE 802.11a	1.960	1	1.960	2.100	93.33%	0.30	0.510
IEEE 802.11n (HT20)	5.420	1	5.420	5.660	95.76%	0.19	0.185
IEEE 802.11n (HT40)	5.380	1	5.380	5.680	94.72%	0.24	0.186
IEEE 802.11ac (VHT20)	5.400	1	5.400	5.640	95.74%	0.19	0.185
IEEE 802.11ac (VHT40)	5.400	1	5.400	5.840	92.47%	0.34	0.185
IEEE 802.11ac (VHT80)	5.400	1	5.400	6.040	89.40%	0.49	0.185
IEEE 802.11ax (HEW20)	5.440	1	5.440	5.740	94.77%	0.23	0.184
IEEE 802.11ax (HEW40)	5.420	1	5.420	5.680	95.42%	0.20	0.185
IEEE 802.11ax (HEW80)	5.380	1	5.380	5.780	93.08%	0.31	0.186
IEEE 802.11ac (VHT80+80)	5.400	1	5.400	5.840	92.47%	0.34	0.185
IEEE 802.11ax (HEW80+80)	5.400	1	5.400	5.840	92.47%	0.34	0.185







2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	Unified AX Dual-Band PoE Access Point		
Model Name	DWL-8630AP, DWL-8630APE, DWL-X8630AP, DWL-X8630APE		
Brand Name	D-Link Corporation		
Model Difference	Model Name	Antenna type	
	DWL-8630AP, DWL-X8630AP	Built-in antenna	
	DWL-8630APE, DWL-X8630APE	External antenna	
Power Source	DC voltage supplied from AC/DC Adapter or PoE (support unit).		
Power Rating	Adapter: 12V $\pm$ 2.5A PoE: 42.5-57V $\pm$ 0.6A		
Products Covered	2 * Aadapter: (1) CWT / 2ABL030F (2) APD / WA-30J12R		
Frequency Range	UNII-1: 5150 MHz to 5250 MHz UNII-3: 5725 MHz to 5850 MHz		
Operation Frequency	UNII-1: 5180 MHz to 5240 MHz UNII-3: 5745 MHz to 5825 MHz		
Modulation Technology	OFDM, OFDMA		
Transfer Rate	up to 2402 Mbps		
Output Power Max. for UNII-1	IEEE 802.11a: 25.05 dBm (0.3199 W) IEEE 802.11n (HT20): 25.60 dBm (0.3633 W) IEEE 802.11n (HT40): 26.55 dBm (0.4524 W) IEEE 802.11ac (VHT20): 24.16 dBm (0.2604 W) IEEE 802.11ac (VHT40): 26.59 dBm (0.4557 W) IEEE 802.11ac (VHT80): 19.24 dBm (0.0840 W) IEEE 802.11ax (HEW20): 23.82 dBm (0.2410 W) IEEE 802.11ax (HEW40): 26.48 dBm (0.4449 W) IEEE 802.11ax (HEW80): 17.61 dBm (0.0577 W) IEEE 802.11ac (VHT80+80): 19.42 dBm (0.0875 W) IEEE 802.11ax (HEW80+80): 17.97 dBm (0.0627 W)		
Output Power Max. With Beamforming for UNII-1	IEEE 802.11a: 19.03 dBm (0.0800 W) IEEE 802.11n (HT20): 19.58 dBm (0.0908 W) IEEE 802.11n (HT40): 20.53 dBm (0.1131 W) IEEE 802.11ac (VHT20): 18.14 dBm (0.0651 W) IEEE 802.11ac (VHT40): 20.57 dBm (0.1139 W) IEEE 802.11ac (VHT80): 13.22 dBm (0.0210 W) IEEE 802.11ax (HEW20): 17.80 dBm (0.0603 W) IEEE 802.11ax (HEW40): 20.46 dBm (0.1112 W) IEEE 802.11ax (HEW80): 11.59 dBm (0.0144 W) IEEE 802.11ac (VHT80+80): 13.40 dBm (0.0219 W) IEEE 802.11ax (HEW80+80): 11.95 dBm (0.0157 W)		

Output Power Max. for UNII-3	IEEE 802.11a: 27.68 dBm (0.5866 W) IEEE 802.11n (HT20): 28.19 dBm (0.6590 W) IEEE 802.11n (HT40): 28.55 dBm (0.7153 W) IEEE 802.11ac (VHT20): 28.17 dBm (0.6559 W) IEEE 802.11ac (VHT40): 28.53 dBm (0.7124 W) IEEE 802.11ac (VHT80): 27.95 dBm (0.6239 W) IEEE 802.11ax (HEW20): 28.57 dBm (0.7193 W) IEEE 802.11ax (HEW40): 28.46 dBm (0.7019 W) IEEE 802.11ax (HEW80): 28.10 dBm (0.6460 W) IEEE 802.11ac (VHT80+80): 20.67 dBm (0.1167 W) IEEE 802.11ax (HEW80+80): 18.83 dBm (0.0765 W)
Output Power Max. With Beamforming for UNII-3	IEEE 802.11a: 21.66 dBm (0.1467 W) IEEE 802.11n (HT20): 22.17 dBm (0.1648 W) IEEE 802.11n (HT40): 22.53 dBm (0.1789 W) IEEE 802.11ac (VHT20): 22.15 dBm (0.1640 W) IEEE 802.11ac (VHT40): 22.51 dBm (0.1781 W) IEEE 802.11ac (VHT80): 21.93 dBm (0.1560 W) IEEE 802.11ax (HEW20): 22.55 dBm (0.1798 W) IEEE 802.11ax (HEW40): 22.44 dBm (0.1755 W) IEEE 802.11ax (HEW80): 22.08 dBm (0.1615 W) IEEE 802.11ac (VHT80+80): 14.65 dBm (0.0292 W) IEEE 802.11ax (HEW80+80): 12.81 dBm (0.0191 W)
Test Model	DWL-8630AP (Built-in antenna), DWL-8630APE (External antenna)
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

(2) Channel List:

UNII-1					
IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

UNII-3					
IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

UNII-1+UNII-3			
IEEE 802.11ac (VHT80+80) IEEE 802.11ax (HEW80+80)			
1st Channel	2nd Channel	CH42: 5210 MHz	CH155: 5775 MHz
CH42: 5210 MHz		-	V
CH155: 5775 MHz		V	-

(3) Table for Filed Antenna:

Group I: Built-in antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	 www.whayu.com	DWL-8630AP	PIFA	I-PEX	4.41
2	 www.whayu.com	DWL-8630AP	PIFA	I-PEX	4.41
3	 www.whayu.com	DWL-8630AP	PIFA	I-PEX	4.34
4	 www.whayu.com	DWL-8630AP	PIFA	I-PEX	4.34

Group II: External antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	 www.whayu.com	DWL-8630APE	Dipole	RP-SMA	4.20
2	 www.whayu.com	DWL-8630APE	Dipole	RP-SMA	4.20
3	 www.whayu.com	DWL-8630APE	Dipole	RP-SMA	4.20
4	 www.whayu.com	DWL-8630APE	Dipole	RP-SMA	4.20

NOTE:

- (a) The EUT incorporates a MIMO function. Physically, the EUT provides two/four completed transmitters and receivers (2T2R/4T4R). 2.4 GHz and 5GHz can transmit simultaneously.
- (b) For Power Spectral Density
 $\text{Directional Gain} = 10\log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{Gn/20})^2 / N_{\text{ANT}}] = 10.40 \text{ dBi} > 6\text{dBi}$.
 To UNII-1, the reduced power spectral density limits (dBm/MHz) = $17 - (10.40 - 6) = 12.60$.
 To UNII-3, the reduced power spectral density limits (dBm/500 kHz) = $30 - (10.40 - 6) = 25.60$.
- (c) For Output Power
 For $N_{\text{ANT}} = 2 < 5$,
 $\text{Direction gain} = G_{\text{ANT}} + 0 = 4.41 + 0 = 4.41 \text{ dBi}$.
 The Direction gain is less than 6 dBi, so output power limits will not be reduced.
- (d) For Beamforming mode
 $\text{Directional Gain} = 10\log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{Gn/20})^2 / N_{\text{ANT}}] = 10.40 \text{ dBi} > 6\text{dBi}$.
 To UNII-1,
 the reduced power spectral density limits (dBm/MHz) = $17 - (10.40 - 6) = 12.60$;
 the reduced output power limits (dBm) = $30 - (10.40 - 6) = 25.60$.
 To UNII-3,
 the reduced power spectral density limits (dBm/500 kHz) = $30 - (10.40 - 6) = 25.60$;
 the reduced output power limits (dBm) = $30 - (10.40 - 6) = 25.60$.
 Beamforming gain is 5.10 dBi.

(4) Operating Mode and Antenna Configuration

Operating Mode \ TX Mode	2TX	4TX
IEEE 802.11a	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11n (HT20)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11n (HT40)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11ac (VHT20)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11ac (VHT40)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11ac (VHT80)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11ac (VHT80+80)	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)	-
IEEE 802.11ax (HEW20)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11ax (HEW40)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11ax (HEW80)	-	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)
IEEE 802.11ax (HEW80+80)	V (Ant. 1+Ant. 2+Ant. 3+Ant. 4)	-

2.2 TEST MODES

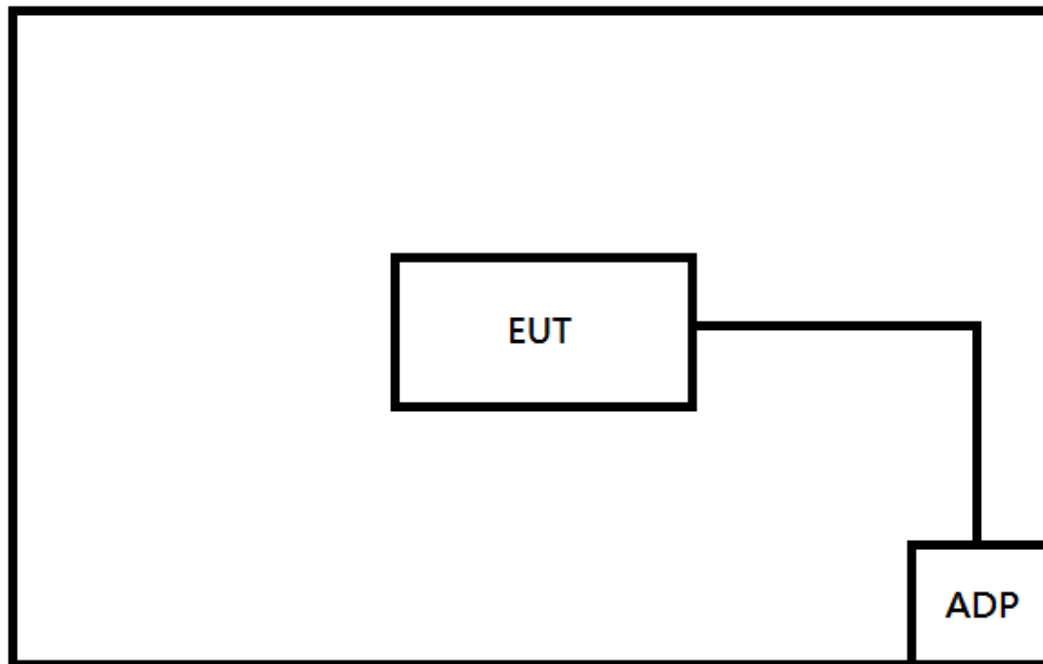
Test Items	Test mode	Channel	Note	
AC power line conducted emissions	Normal	-	-	
Transmitter Radiated Emissions (below 1 GHz)	IEEE 802.11ax (HEW20)	149/165	-	
Transmitter Radiated Emissions (above 1 GHz)	IEEE 802.11a	36/48/ 149/165	Bandedge	
	IEEE 802.11n (HT20)			
	IEEE 802.11ax (HEW20)			
	IEEE 802.11n (HT40)	38/46/ 151/159		
	IEEE 802.11ax (HEW40)			
	IEEE 802.11ac (VHT80)			
	IEEE 802.11ax (HEW80)	42/155		
	IEEE 802.11ac (VHT80+80)	42+155/ 155+42		
	IEEE 802.11ax (HEW80+80)	36/40/48/ 149/157/165	Harmonic	
	IEEE 802.11a			
	IEEE 802.11n (HT20)			
	IEEE 802.11ax (HEW20)			
	IEEE 802.11n (HT40)			38/46/ 151/159
	IEEE 802.11ax (HEW40)			
	IEEE 802.11ac (VHT80)			42/155
	IEEE 802.11ax (HEW80)			42+155/ 155+42
	IEEE 802.11ac (VHT80+80)	36/40/48/ 149/157/165	-	
	IEEE 802.11ax (HEW80+80)			
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IEEE 802.11n (HT40)	38/46/ 151/159			
IEEE 802.11ax (HEW40)	42/155			
IEEE 802.11ac (VHT80)	42+155/ 155+42			
IEEE 802.11ax (HEW80)	36/40/48/ 149/157/165	-		
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IEEE 802.11ac (VHT80+80)	42+155/ 155+42			
IEEE 802.11ax (HEW80+80)	36/40/48/ 149/157/165	-		
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IEEE 802.11ax (HEW80)			42+155/ 155+42	
IEEE 802.11ac (VHT80+80)	36/40/48/ 149/157/165	-		
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NOTE:

- (1) The EUT includes two adapters and both are evaluated. Only the worst case is used for final test.
- (2) For radiated emission band edge test, both Vertical and Horizontal are evaluated, but only the worst cases (Horizontal (Built-in antenna), Vertical (External antenna)) are recorded.
- (3) The EUT includes two groups of antenna assemblies and beamforming mode, all are evaluated. For Transmitter Radiated Emissions, only the worst cases are recorded.
- (4) All X, Y and Z axes are evaluated, but only the worst cases (Y, Z axis (Built-in antenna), Z axis (External antenna)) are recorded.
- (5) There were no emissions found below 30 MHz within 20 dB of the limit.

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
-	-	-	-	-	-

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
-	-	-	-	-	-

3 AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	56 - 46 *
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor (if use)
 Margin Level = Measurement Value – Limit Value
 Calculation example:

Reading Level		Correct Factor		Measurement Value
38.22	+	3.45	=	41.67

Measurement Value		Limit Value		Margin Level
41.67	-	60	=	-18.33

The following table is the setting of the receiver.

Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 m above the horizontal ground plane with the EUT being connected to the power mains through a line impedance stabilization network (LISN).
 All other support equipment were powered from an additional LISN(s).
 The LISN provides 50 Ohm/50uH of impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle to keep the cable above 40 cm.
- c. Excess I/O cables that are not connected to a peripheral shall be bundled in the center.
 The end of the cable will be terminated, using the correct terminating impedance.
 The overall length shall not exceed 1 m.
- d. The LISN is spaced at least 80 cm from the nearest part of the EUT chassis.
- e. For the actual test configuration, please refer to the related Item - EUT TEST PHOTO.

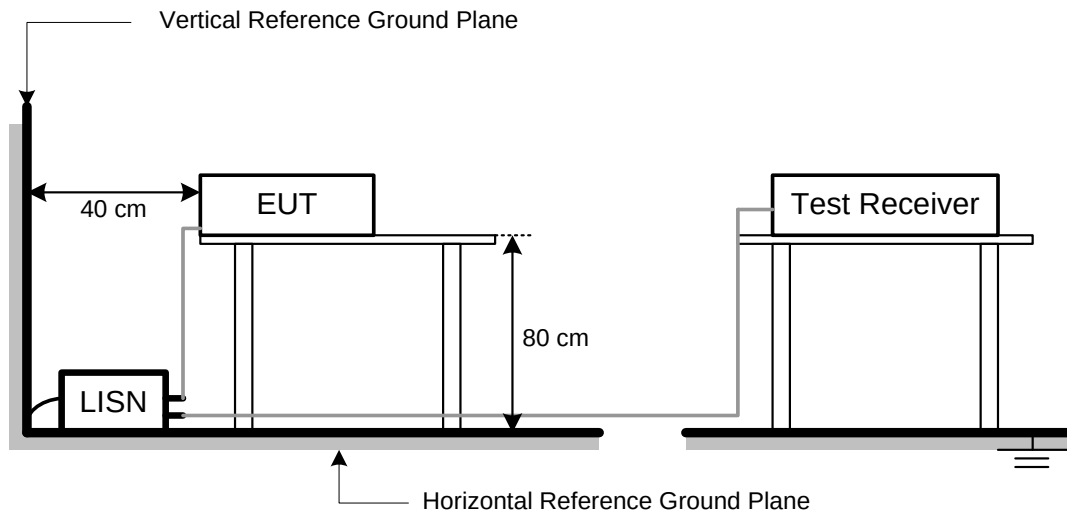
NOTE:

- (1) In the results, each reading is marked as Peak, QP or AVG per the detector used.
 BW=9 kHz (6 dB Bandwidth)
- (2) All readings are Peak unless otherwise stated QP or AVG in column of Note. Both the QP and the AVG readings must be less than the limit for compliance.

3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4 TEST SETUP



3.5 TEST RESULT

Please refer to the APPENDIX A.

4 RADIATED EMISSIONS TEST

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205, then the 15.209 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5150-5250	-27	68.3
5250-5350	-27	68.3
5470-5725	-27	68.3
5725-5850	-27 (NOTE 2)	68.3
	10 (NOTE 2)	105.3
	15.6 (NOTE 2)	110.9
	27 (NOTE 2)	122.3

NOTE:

- (1) The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$

- (2) According to FCC 16-24, 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.

- (3) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)

Margin Level = Measurement Value - Limit Value

Calculation example:

Reading Level		Correct Factor		Measurement Value
19.11	+	2.11	=	21.22

Measurement Value		Limit Value		Margin Level
21.22	-	68.3	=	-47.08

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

4.2 TEST PROCEDURE

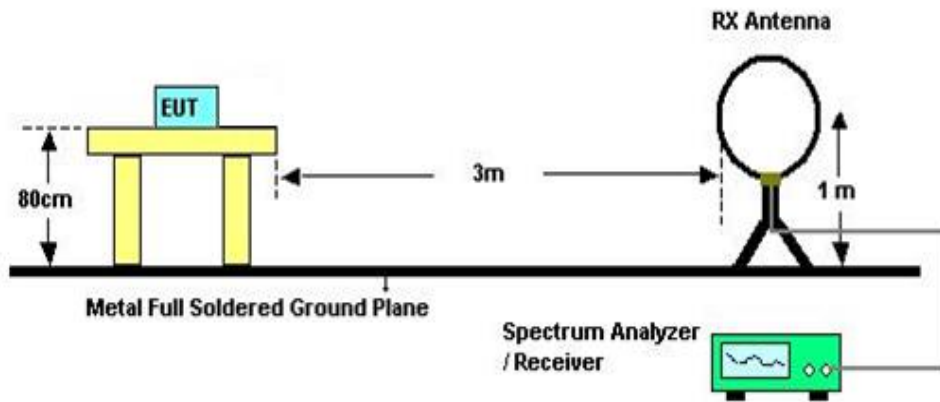
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

4.3 DEVIATION FROM TEST STANDARD

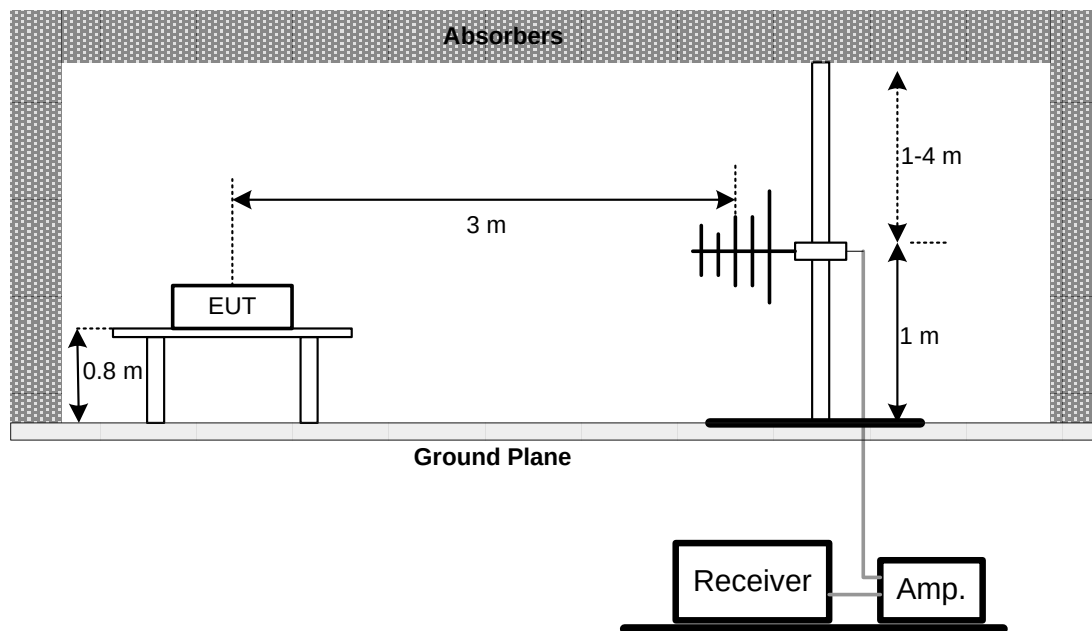
No deviation.

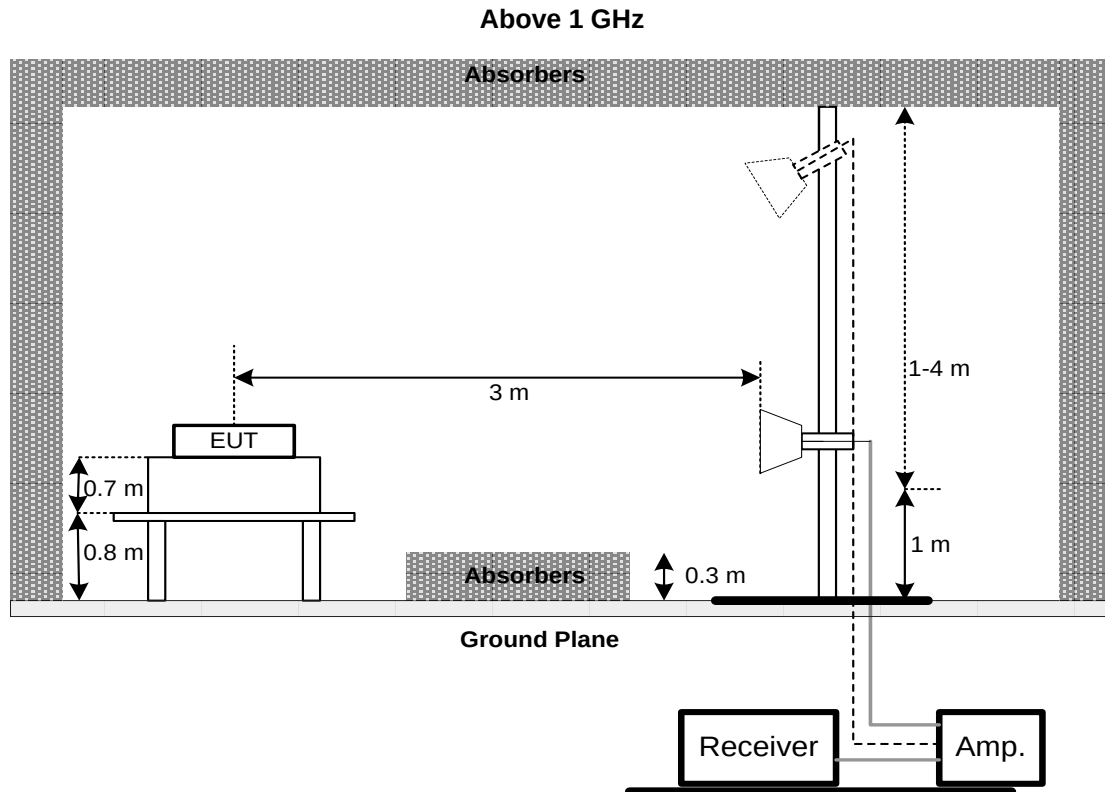
4.4 TEST SETUP

9 kHz to 30 MHz



30 MHz to 1 GHz





4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT – 9 KHZ TO 30 MHZ

There were no emissions found below 30 MHz within 20 dB of the limit.

4.7 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX B.

4.8 TEST RESULT – ABOVE 1 GHZ

Please refer to the APPENDIX C.

NOTE:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5 BANDWIDTH TEST

5.1 LIMIT

FCC Part15, Subpart E (15.407)		
Section	Test Item	Frequency Range (MHz)
15.407(a)	26 dB Bandwidth	5150-5250
		5250-5350
		5470-5725
	Minimum 500 kHz 6 dB Bandwidth	5725-5850

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 26 dB Bandwidth
RBW	300 kHz(Bandwidth 20 MHz) 1 MHz(Bandwidth 40 MHz and 80 MHz)
VBW	1 MHz(Bandwidth 20 MHz) 3 MHz(Bandwidth 40 MHz and 80 MHz)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.3 DEVIATION FROM TEST STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULT

Please refer to the APPENDIX D.

6 OUTPUT POWER TEST

6.1 LIMIT

FCC Part15, Subpart E (15.407)			
Section	Test Item	Limit	Frequency Range (MHz)
15.407(a)	Maximum Output Power	Other than client devices: 1 Watt (30 dBm)	5150-5250
		Client devices: 250 mW (24 dBm)	
		250 mW (24 dBm)	5250-5350
		1 Watt (30dBm)	5470-5725
			5725-5850

Note: The maximum e.i.r.p at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW(21 dBm).

6.2 TEST PROCEDURE

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.
- Spectrum Setting:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1 MHz
VBW	≥ 3 MHz
Detector	RMS
Trace	Max Hold
Sweep Time	auto

- The maximum peak conducted output power was performed in accordance with method of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

6.3 DEVIATION FROM TEST STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULT

Please refer to the APPENDIX E.

7 POWER SPECTRAL DENSITY

7.1 LIMIT

FCC Part15, Subpart E (15.407)			
Section	Test Item	Limit	Frequency Range (MHz)
15.407(a)	Power Spectral Density	Other than client devices: 17 dBm/MHz Client devices: 11 dBm/MHz	5150-5250
		11 dBm/MHz	5250-5350
			5470-5725
		30 dBm/500 kHz	5725-5850

7.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1 MHz
VBW	≥ 3 MHz
Detector	RMS
Trace	Max Hold
Sweep Time	Auto

7.3 DEVIATION FROM TEST STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULT

Please refer to the APPENDIX F.

8 LIST OF MEASURING EQUIPMENTS

AC power line conducted emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	2019/3/18	2020/3/17
2	Test Cable	EMCI	EMCCFD300-BM-BMR-6000	170715	2019/8/7	2020/8/6
3	EMI Test Receiver	R&S	ESR7	101433	2019/12/11	2020/12/9
4	Measurement Software	EZ	EZ EMC (Version NB-03A)	N/A	N/A	N/A

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC001340	980555	2019/4/12	2020/4/11
2	Preamplifier	EMCI	EMC02325B	980217	2019/4/12	2020/4/11
3	Preamplifier	EMCI	EMC012645B	980267	2019/4/12	2020/4/11
4	Preamplifier	EMCI	EMC2654045	980030	2020/1/31	2021/1/30
5	Test Cable	EMCI	EMC104-SM-SM-800	150207	2019/4/12	2020/4/11
6	Test Cable	EMCI	EMC104-SM-SM-3000	151205	2019/4/12	2020/4/11
7	Test Cable	EMCI	EMC-SM-SM-7000	180408	2019/4/12	2020/4/11
8	MXE EMI Receiver	Agilent	N9038A	MY55420127	2019/3/26	2020/3/25
9	Signal Analyzer	Agilent	N9010A	MY56480554	2019/6/6	2020/6/5
10	Loop Ant	EMCO	EMCI-LPA600	274	2019/5/31	2020/5/30
11	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	2019/6/10	2020/6/9
12	Horn Ant	Schwarzbeck	BBHA 9170	187	2019/12/21	2020/12/20
13	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	000992	2019/5/29	2020/5/28
14	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0508	2019/5/29	2020/5/28

Bandwidth						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP40	100129	2019/5/23	2020/5/22

Output Power						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Power Meter	Anritsu	ML2487A	6K00004714	2019/6/20	2020/6/19
2	Power Sensor	Anritsu	MA2491A	1725282	2019/6/20	2020/6/19

Power Spectral Density						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP40	100129	2019/5/23	2020/5/22

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

9 EUT TEST PHOTO

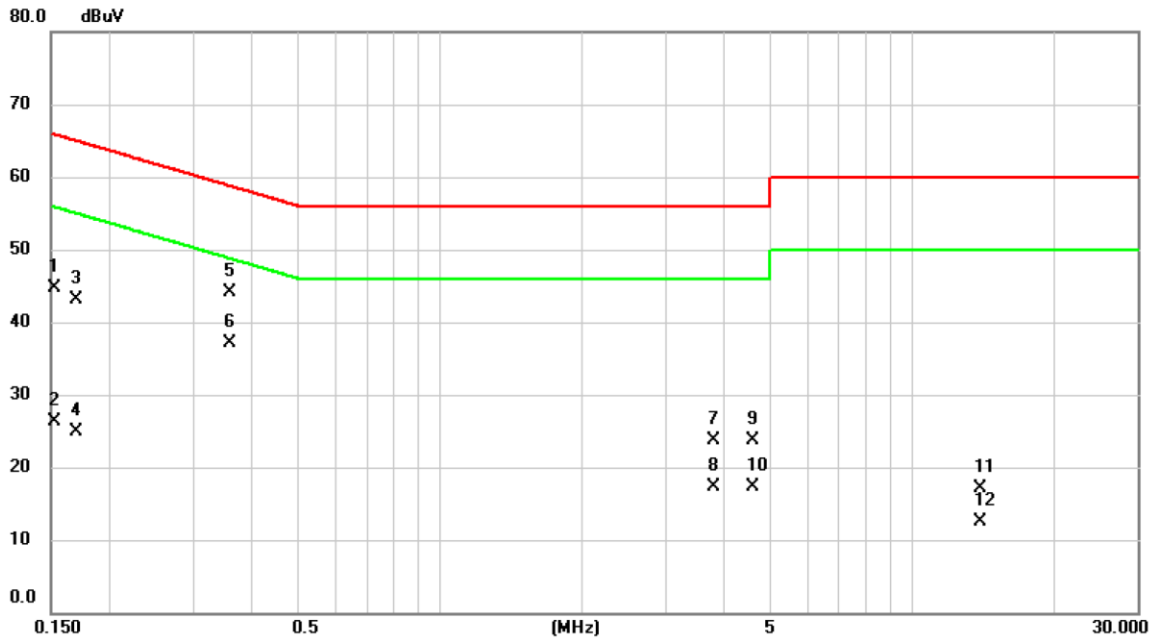
Please refer to document Appendix No.: TP-1909H044-FCCP-1 (APPENDIX-TEST PHOTOS).

10 EUT PHOTOS

Please refer to document Appendix No.: EP-1909H044-1 (APPENDIX-EUT PHOTOS).

APPENDIX A AC POWER LINE CONDUCTED EMISSIONS

Test Mode	Normal_Internal Antenna	Tested Date	2020/1/21
Test Voltage	AC 120V/60Hz	Phase	Line



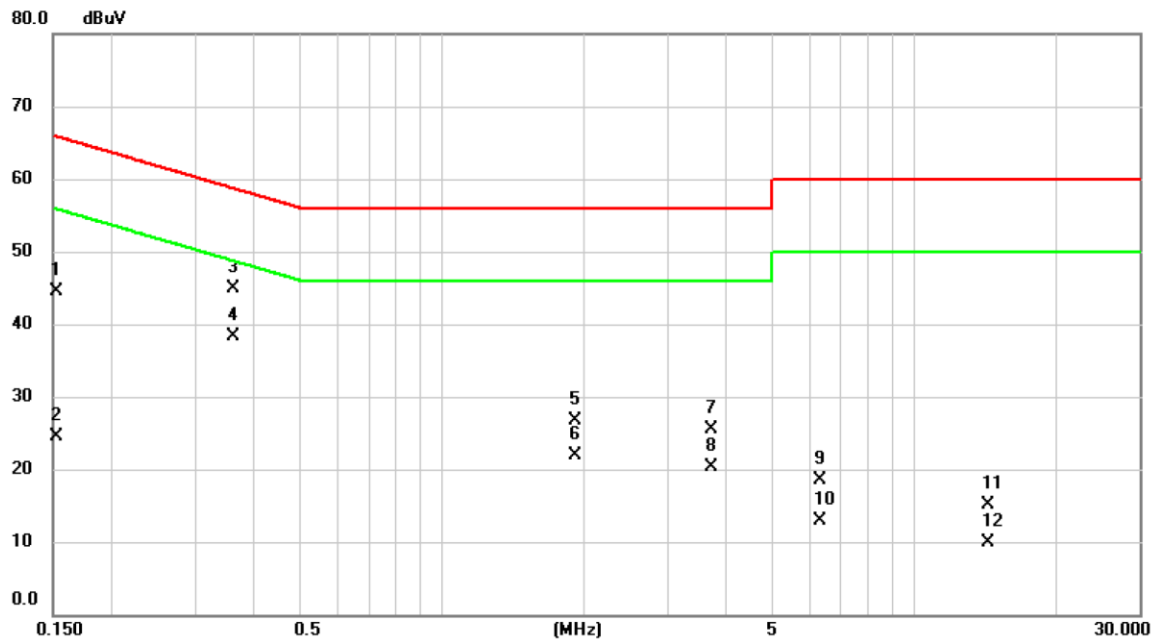
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1522	35.16	9.57	44.73	65.88	-21.15	QP	
2		0.1522	16.76	9.57	26.33	55.88	-29.55	AVG	
3		0.1703	33.53	9.57	43.10	64.95	-21.85	QP	
4		0.1703	15.25	9.57	24.82	54.95	-30.13	AVG	
5		0.3592	34.53	9.62	44.15	58.75	-14.60	QP	
6	*	0.3592	27.57	9.62	37.19	48.75	-11.56	AVG	
7		3.8063	13.92	9.72	23.64	56.00	-32.36	QP	
8		3.8063	7.63	9.72	17.35	46.00	-28.65	AVG	
9		4.6095	13.97	9.75	23.72	56.00	-32.28	QP	
10		4.6095	7.46	9.75	17.21	46.00	-28.79	AVG	
11		13.9740	7.27	9.91	17.18	60.00	-42.82	QP	
12		13.9740	2.60	9.91	12.51	50.00	-37.49	AVG	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	Normal_Internal Antenna	Tested Date	2020/1/21
Test Voltage	AC 120V/60Hz	Phase	Neutral



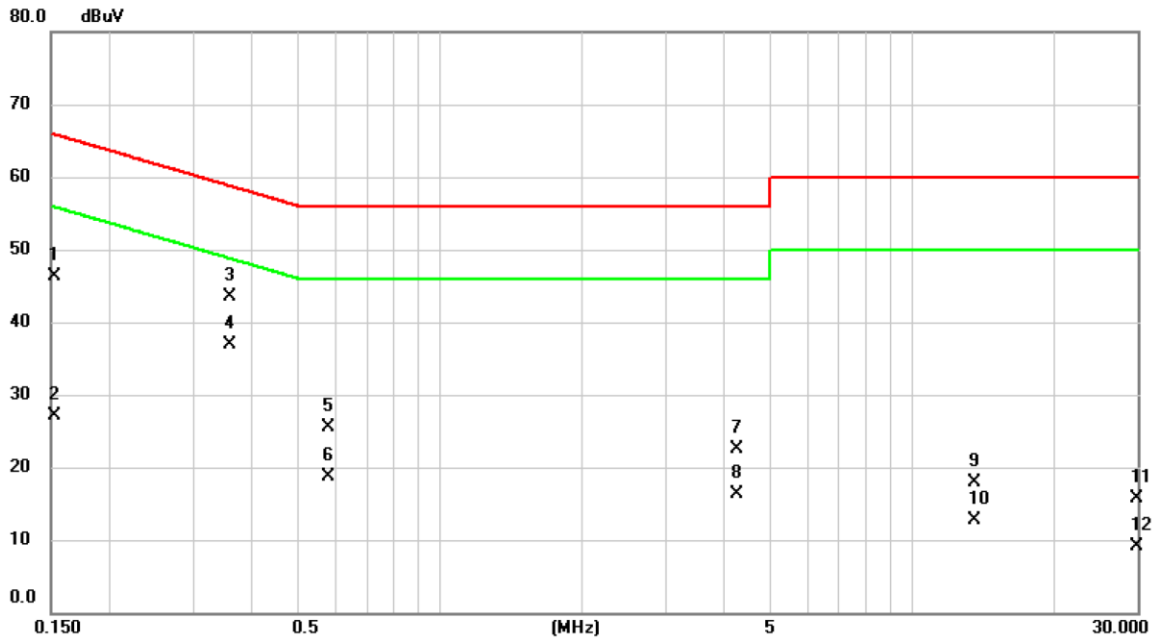
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.1522	34.99	9.61	44.60	65.88	-21.28	QP	
2	0.1522	14.85	9.61	24.46	55.88	-31.42	AVG	
3	0.3615	35.20	9.67	44.87	58.69	-13.82	QP	
4 *	0.3615	28.55	9.67	38.22	48.69	-10.47	AVG	
5	1.9208	17.08	9.71	26.79	56.00	-29.21	QP	
6	1.9208	12.15	9.71	21.86	46.00	-24.14	AVG	
7	3.7275	15.66	9.76	25.42	56.00	-30.58	QP	
8	3.7275	10.47	9.76	20.23	46.00	-25.77	AVG	
9	6.3353	8.74	9.84	18.58	60.00	-41.42	QP	
10	6.3353	3.02	9.84	12.86	50.00	-37.14	AVG	
11	14.3655	5.15	9.97	15.12	60.00	-44.88	QP	
12	14.3655	-0.02	9.97	9.95	50.00	-40.05	AVG	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	Normal_ External Antenna	Tested Date	2020/1/21
Test Voltage	AC 120V/60Hz	Phase	Line

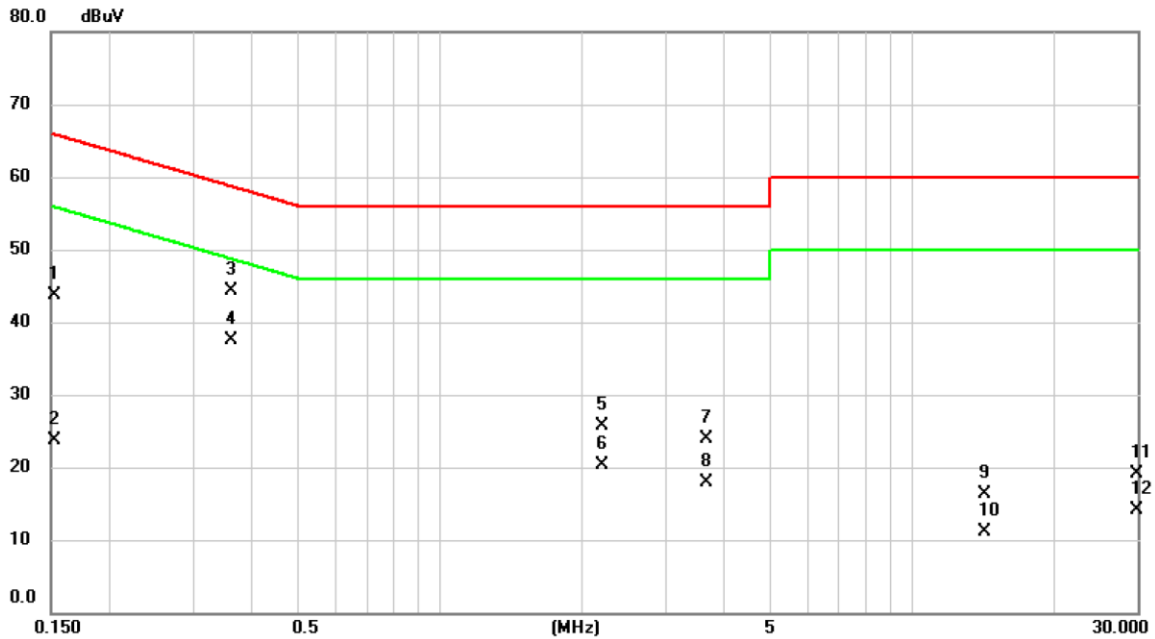


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1522	36.64	9.57	46.21	65.88	-19.67	QP	
2		0.1522	17.57	9.57	27.14	55.88	-28.74	AVG	
3		0.3592	33.95	9.62	43.57	58.75	-15.18	QP	
4	*	0.3592	27.30	9.62	36.92	48.75	-11.83	AVG	
5		0.5820	15.92	9.62	25.54	56.00	-30.46	QP	
6		0.5820	9.13	9.62	18.75	46.00	-27.25	AVG	
7		4.2608	12.73	9.73	22.46	56.00	-33.54	QP	
8		4.2608	6.62	9.73	16.35	46.00	-29.65	AVG	
9		13.5353	7.94	9.90	17.84	60.00	-42.16	QP	
10		13.5353	2.90	9.90	12.80	50.00	-37.20	AVG	
11		29.8523	5.68	10.00	15.68	60.00	-44.32	QP	
12		29.8523	-0.86	10.00	9.14	50.00	-40.86	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	Normal_ External Antenna	Tested Date	2020/1/21
Test Voltage	AC 120V/60Hz	Phase	Neutral



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.1522	34.05	9.57	43.62	65.88	-22.26	QP	
2	0.1522	14.21	9.57	23.78	55.88	-32.10	AVG	
3	0.3615	34.71	9.62	44.33	58.69	-14.36	QP	
4 *	0.3615	27.93	9.62	37.55	48.69	-11.14	AVG	
5	2.2110	15.98	9.68	25.66	56.00	-30.34	QP	
6	2.2110	10.60	9.68	20.28	46.00	-25.72	AVG	
7	3.6600	14.11	9.72	23.83	56.00	-32.17	QP	
8	3.6600	8.18	9.72	17.90	46.00	-28.10	AVG	
9	14.2148	6.41	9.91	16.32	60.00	-43.68	QP	
10	14.2148	1.17	9.91	11.08	50.00	-38.92	AVG	
11	29.9940	9.16	10.00	19.16	60.00	-40.84	QP	
12	29.9940	4.12	10.00	14.12	50.00	-35.88	AVG	

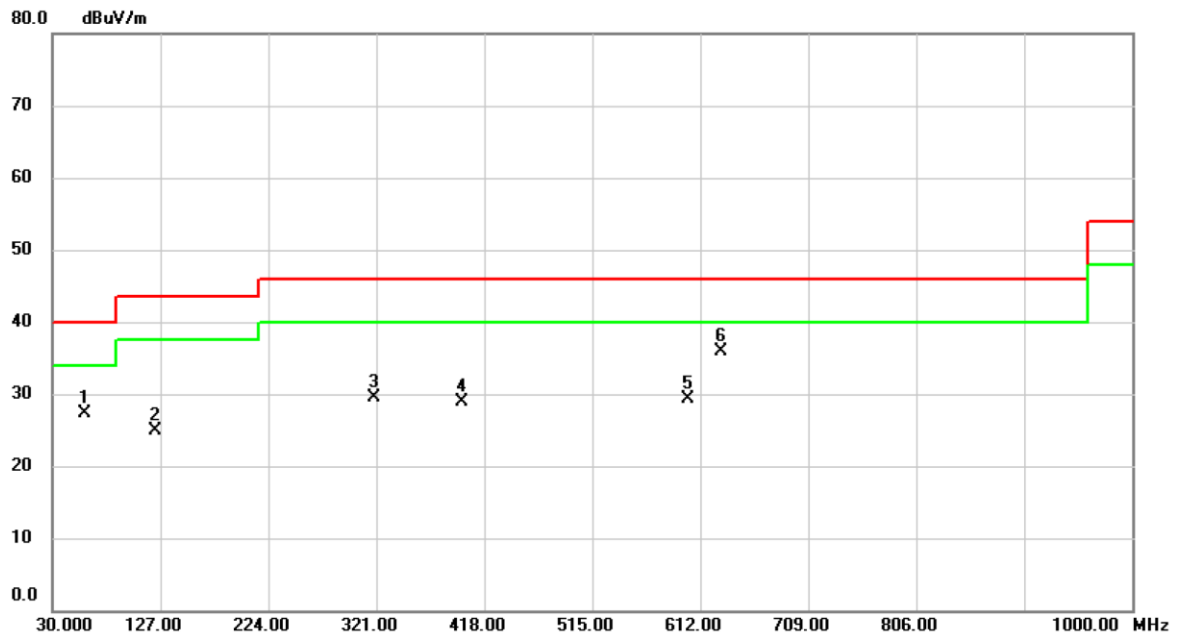
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

APPENDIX B RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

Test Mode	IEEE 802.11ax (HEW20)_Internal Antenna	Test Date	2019/12/3
Test Frequency	CH149: 5745 MHz	Polarization	Vertical



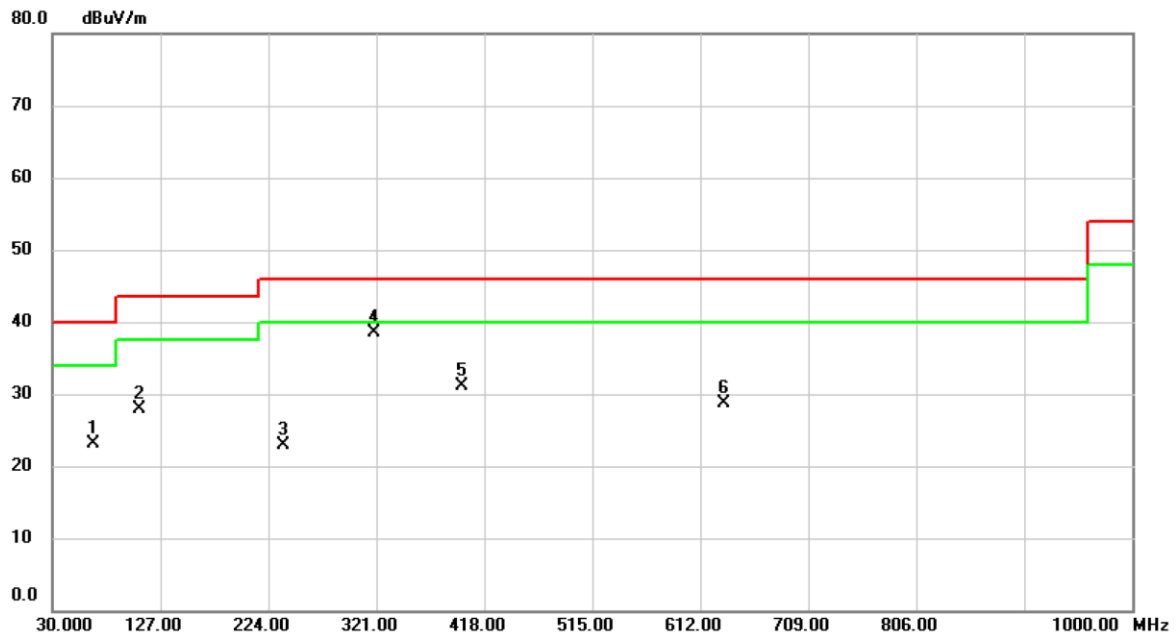
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		59.1000	44.99	-17.75	27.24	40.00	-12.76	peak	
2		122.1500	42.39	-17.58	24.81	43.50	-18.69	peak	
3		319.0600	45.02	-15.42	29.60	46.00	-16.40	peak	
4		397.6300	42.04	-13.22	28.82	46.00	-17.18	peak	
5		600.3600	38.93	-9.72	29.21	46.00	-16.79	peak	
6	*	630.4300	45.23	-9.33	35.90	46.00	-10.10	peak	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW20)_Internal Antenna	Test Date	2019/12/3
Test Frequency	CH149: 5745 MHz	Polarization	Horizontal

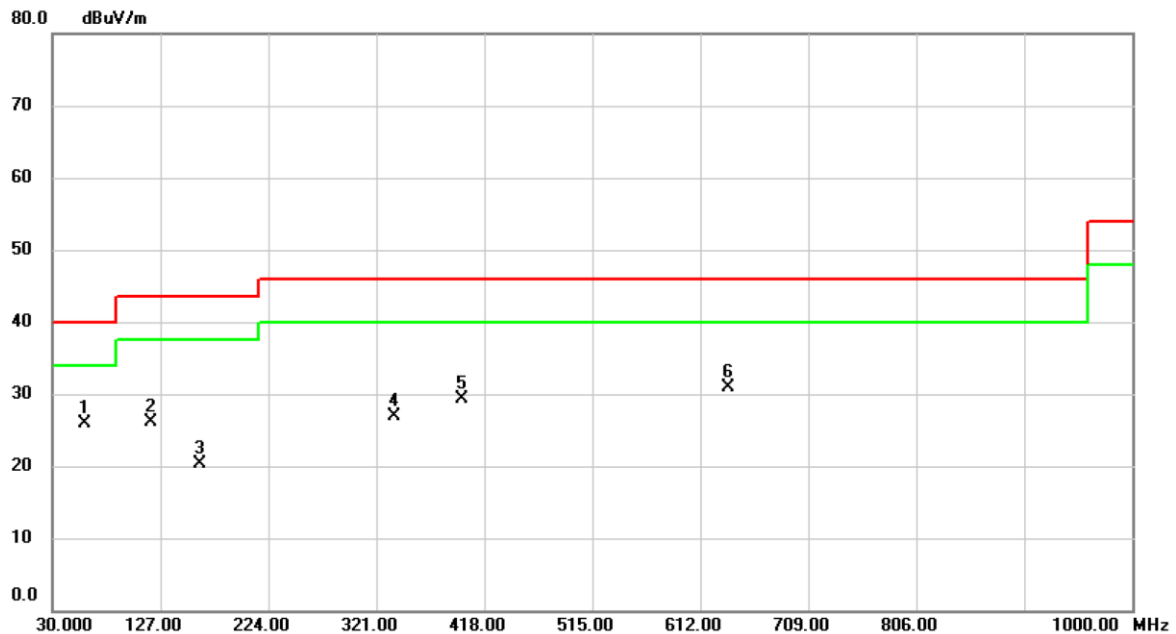


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		66.8600	42.62	-19.56	23.06	40.00	-16.94	peak	
2		107.6000	46.65	-18.79	27.86	43.50	-15.64	peak	
3		237.5800	40.30	-17.32	22.98	46.00	-23.02	peak	
4	*	319.0600	54.00	-15.42	38.58	46.00	-7.42	peak	
5		397.6300	44.28	-13.22	31.06	46.00	-14.94	peak	
6		633.3400	37.89	-9.22	28.67	46.00	-17.33	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW20)_External Antenna	Test Date	2019/12/3
Test Frequency	CH165: 5825 MHz	Polarization	Vertical

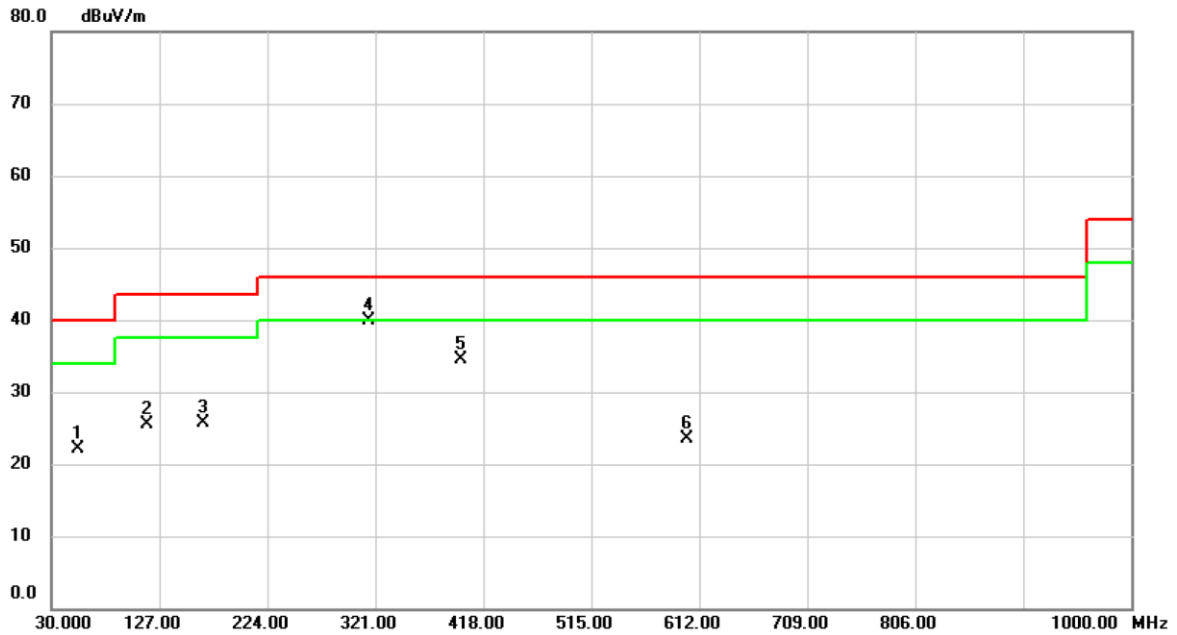


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	59.1000	43.73	-17.75	25.98	40.00	-14.02	peak	
2		118.2700	43.84	-17.68	26.16	43.50	-17.34	peak	
3		162.8900	36.04	-15.70	20.34	43.50	-23.16	peak	
4		336.5200	41.97	-14.98	26.99	46.00	-19.01	peak	
5		397.6300	42.47	-13.22	29.25	46.00	-16.75	peak	
6		637.2200	40.00	-9.05	30.95	46.00	-15.05	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW20)_External Antenna	Test Date	2019/12/3
Test Frequency	CH165: 5825 MHz	Polarization	Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		53.2800	39.59	-17.53	22.06	40.00	-17.94	peak	
2		116.3300	43.28	-17.81	25.47	43.50	-18.03	peak	
3		166.7700	42.20	-16.45	25.75	43.50	-17.75	peak	
4	*	315.1800	55.38	-15.43	39.95	46.00	-6.05	peak	
5		397.6300	47.75	-13.22	34.53	46.00	-11.47	peak	
6		600.3600	33.22	-9.72	23.50	46.00	-22.50	peak	

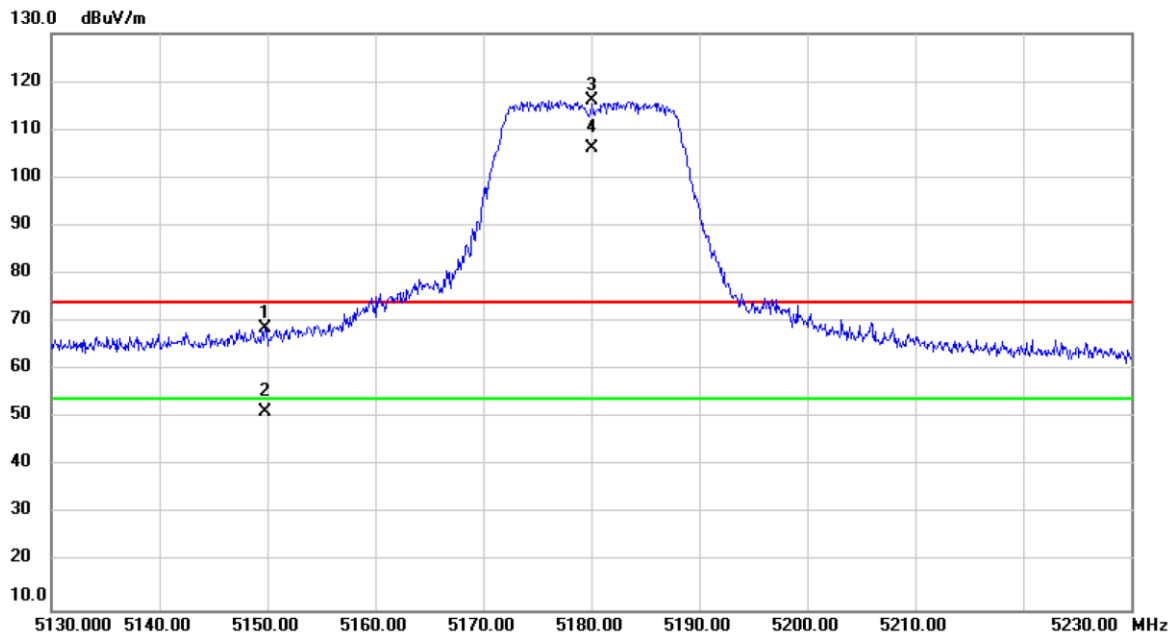
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

APPENDIX C RADIATED EMISSIONS - ABOVE 1 GHZ

Test Mode	IEEE 802.11a_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH36: 5180 MHz	Polarization	Horizontal

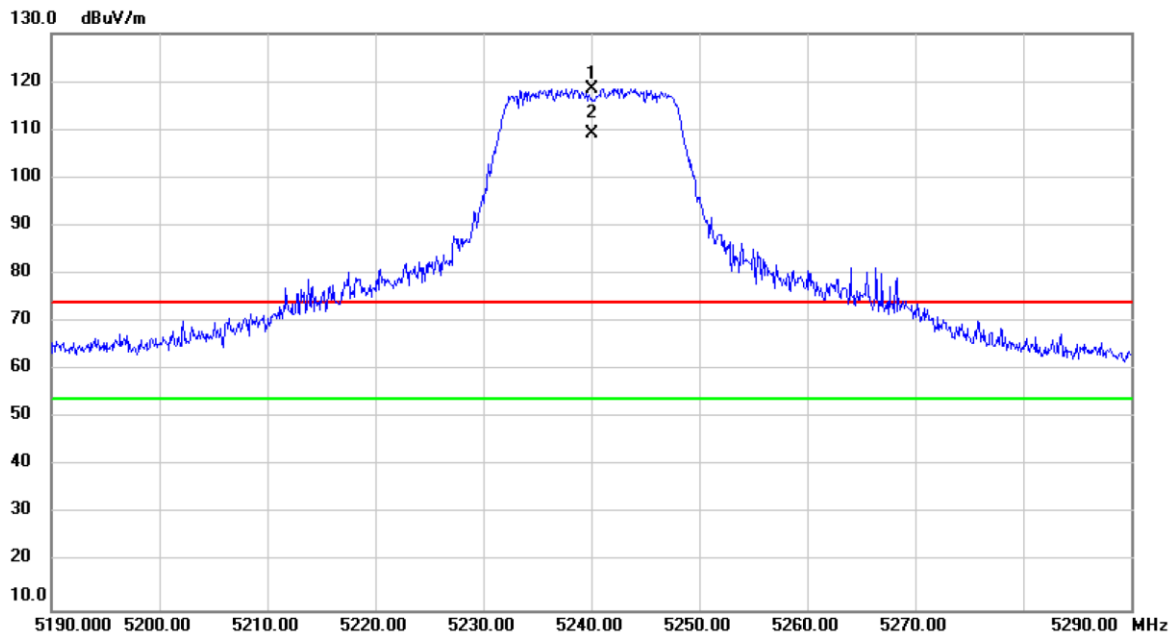


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5149.800	30.77	37.80	68.57	74.00	-5.43	peak	
2		5149.800	13.52	37.80	51.32	54.00	-2.68	AVG	
3	X	5180.000	78.17	37.83	116.00	74.00	42.00	peak	No Limit
4	*	5180.000	68.30	37.83	106.13	54.00	52.13	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11a_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH48: 5240 MHz	Polarization	Horizontal

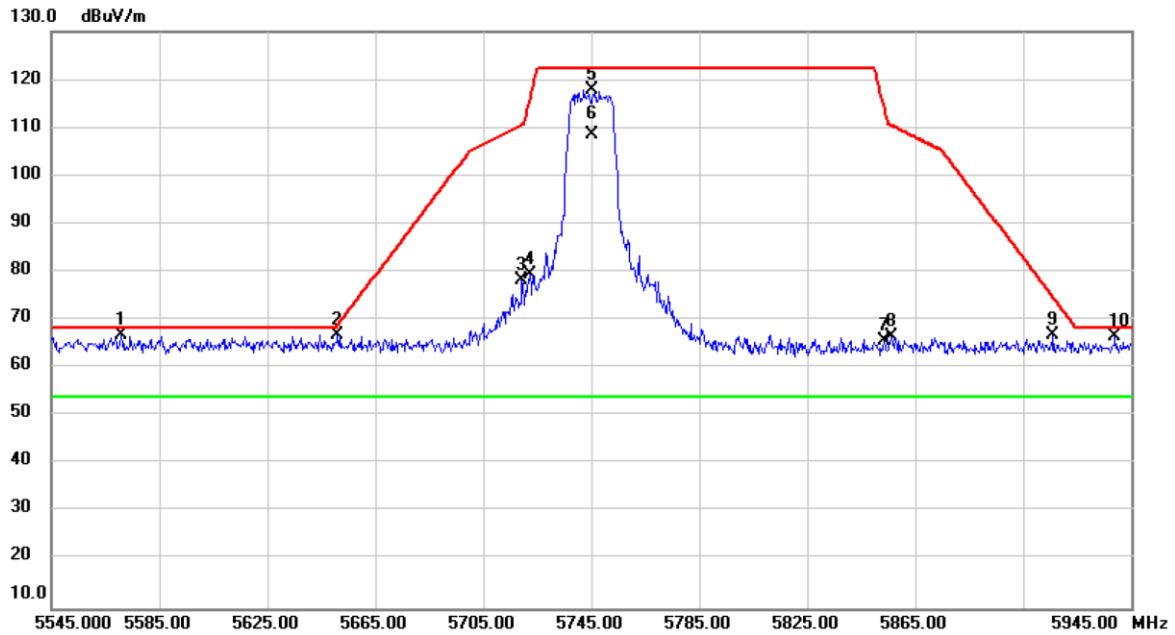


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	5240.000	80.64	37.90	118.54	74.00	44.54	peak	No Limit
2	*	5240.000	71.30	37.90	109.20	54.00	55.20	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11a_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH149: 5745 MHz	Polarization	Horizontal

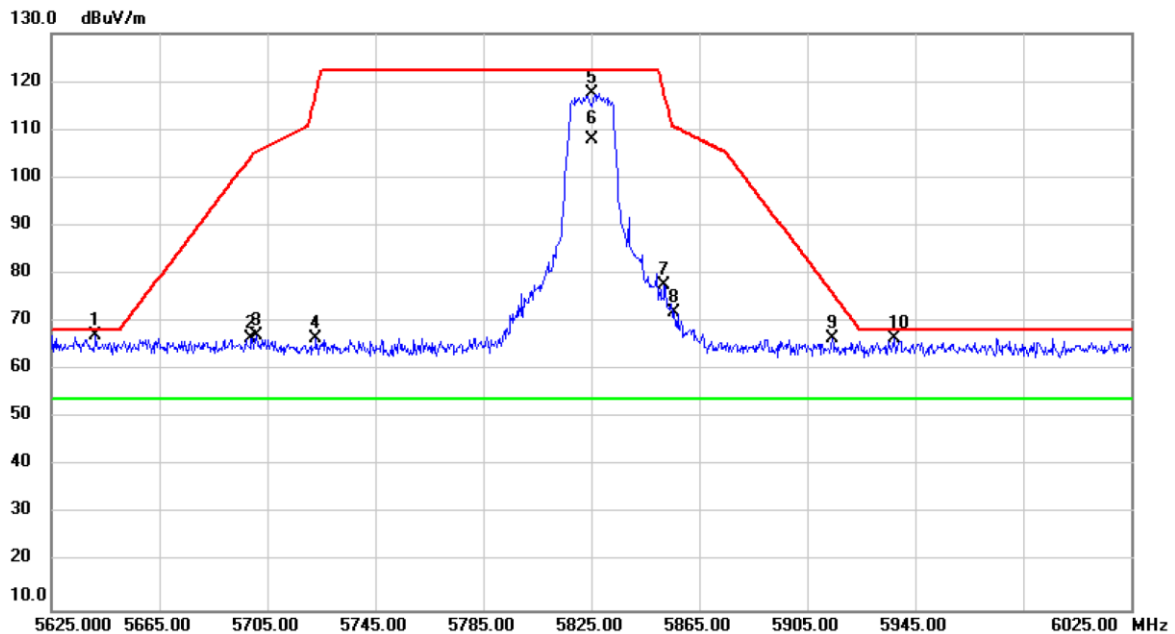


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5570.600	28.70	38.26	66.96	68.20	-1.24	peak	
2		5651.000	28.44	38.32	66.76	68.94	-2.18	peak	
3		5719.400	39.90	38.38	78.28	110.63	-32.35	peak	
4		5722.200	41.11	38.37	79.48	115.82	-36.34	peak	
5		5745.000	79.33	38.39	117.72	122.20	-4.48	peak	No Limit
6	*	5745.000	70.06	38.39	108.45	54.00	54.45	AVG	No Limit
7		5853.400	27.24	38.47	65.71	114.45	-48.74	peak	
8		5856.200	27.94	38.47	66.41	110.46	-44.05	peak	
9		5916.200	28.44	38.52	66.96	74.71	-7.75	peak	
10		5939.000	28.06	38.53	66.59	68.20	-1.61	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11a_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH165: 5825 MHz	Polarization	Horizontal

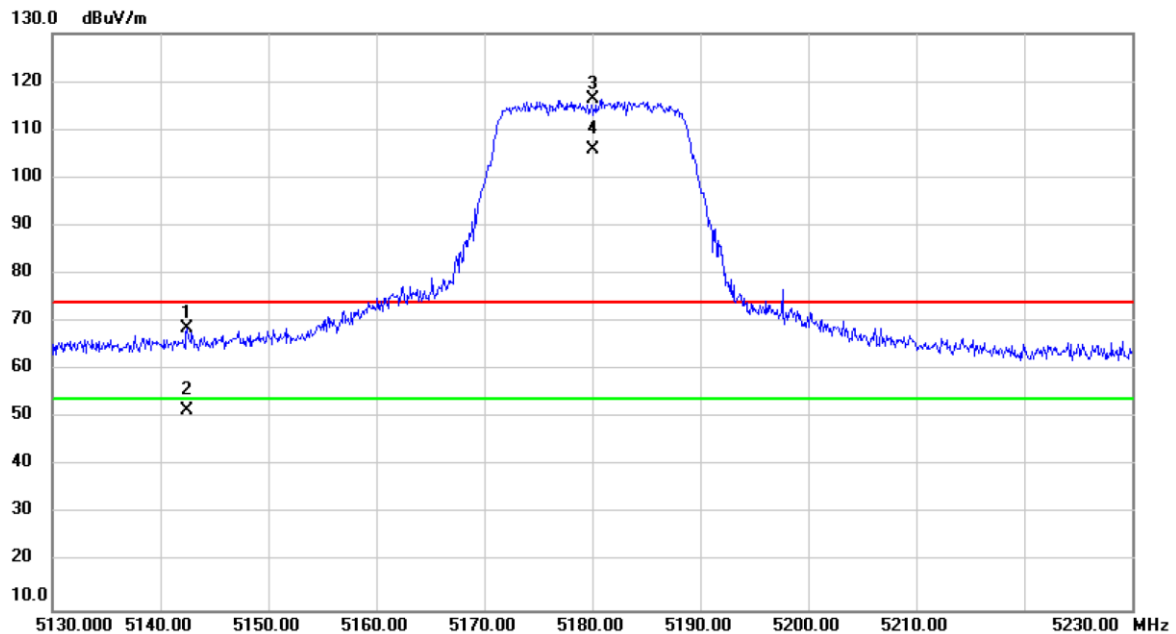


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5641.400	28.74	38.32	67.06	68.20	-1.14	peak	
2		5699.000	28.13	38.36	66.49	104.46	-37.97	peak	
3		5701.000	28.91	38.36	67.27	105.48	-38.21	peak	
4		5723.000	28.18	38.37	66.55	117.64	-51.09	peak	
5		5825.000	78.95	38.46	117.41	122.20	-4.79	peak	No Limit
6	*	5825.000	69.63	38.46	108.09	54.00	54.09	AVG	No Limit
7		5852.200	39.23	38.47	77.70	117.18	-39.48	peak	
8		5855.800	33.60	38.48	72.08	110.58	-38.50	peak	
9		5914.200	28.07	38.52	66.59	76.19	-9.60	peak	
10		5937.000	28.09	38.53	66.62	68.20	-1.58	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT20)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH36: 5180 MHz	Polarization	Horizontal

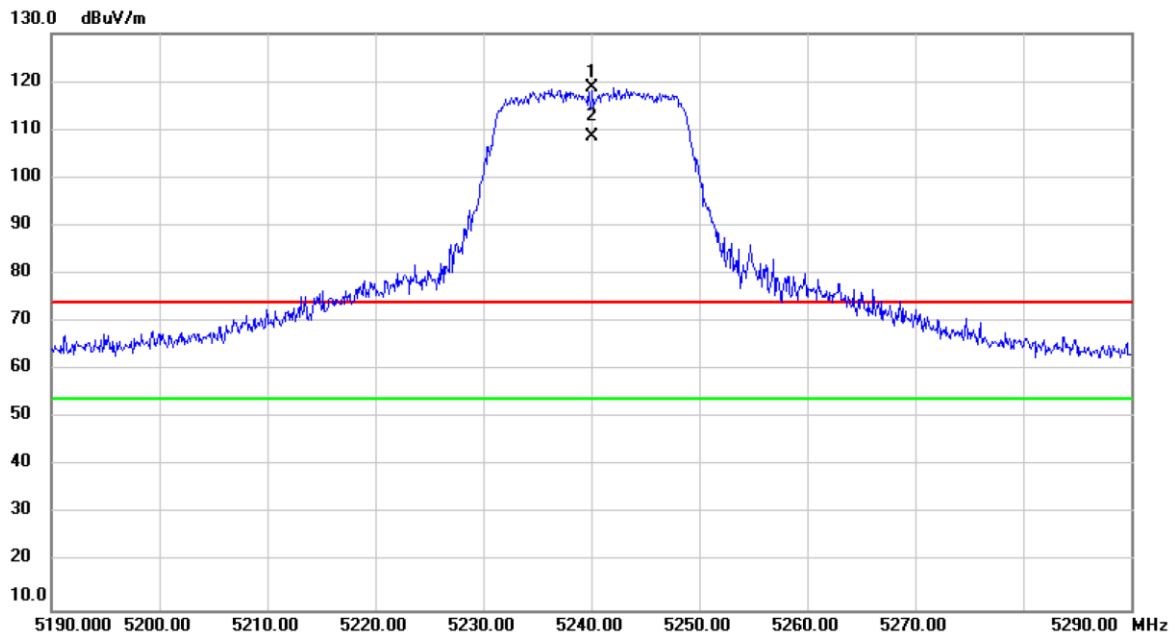


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5142.500	30.76	37.79	68.55	74.00	-5.45	peak	
2		5142.500	13.82	37.79	51.61	54.00	-2.39	AVG	
3	X	5180.000	78.64	37.83	116.47	74.00	42.47	peak	No Limit
4	*	5180.000	68.17	37.83	106.00	54.00	52.00	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT20)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH48: 5240 MHz	Polarization	Horizontal

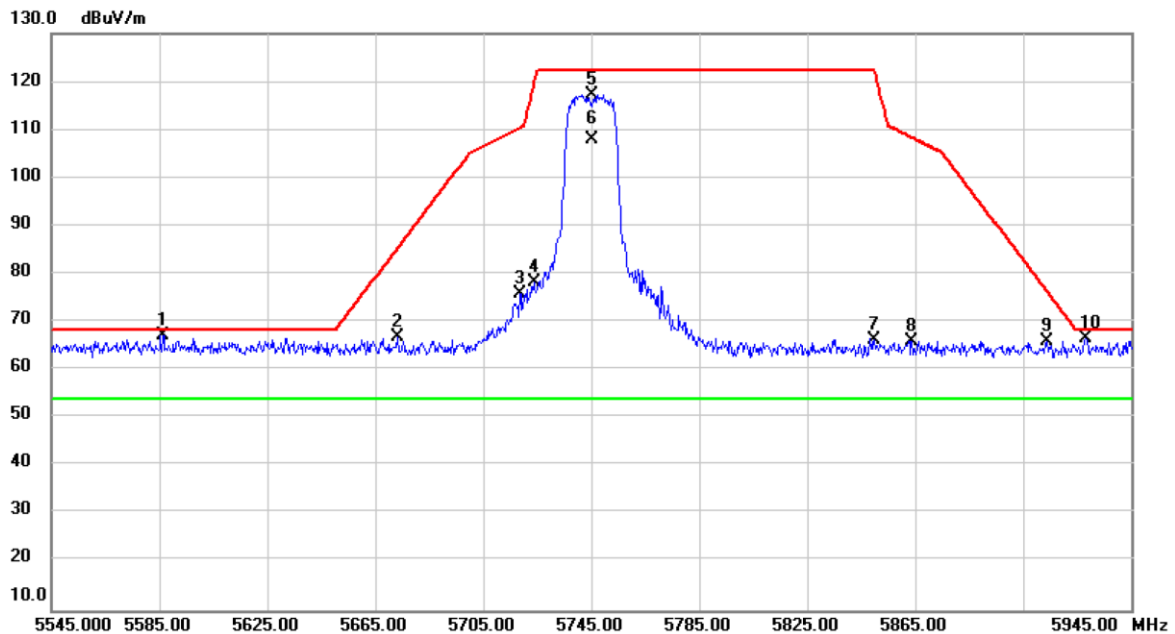


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	5240.000	80.73	37.90	118.63	74.00	44.63	peak	No Limit
2	*	5240.000	70.59	37.90	108.49	54.00	54.49	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT20)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH149: 5745 MHz	Polarization	Horizontal



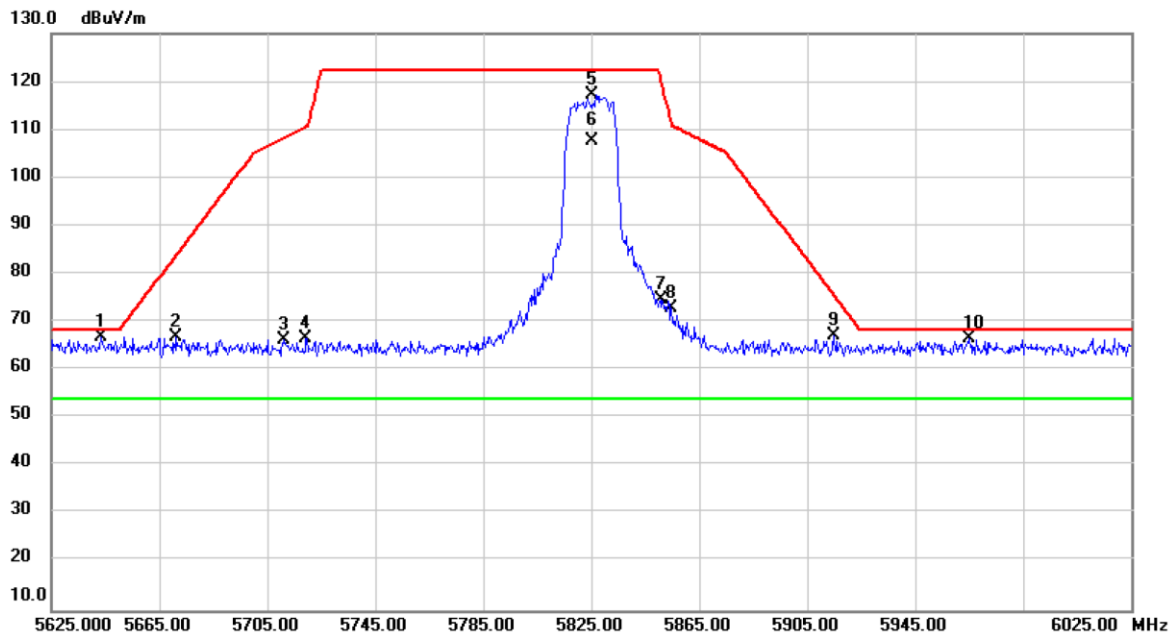
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5586.200	28.88	38.27	67.15	68.20	-1.05	peak	
2		5673.400	28.56	38.34	66.90	85.52	-18.62	peak	
3		5718.600	37.55	38.38	75.93	110.41	-34.48	peak	
4		5723.800	39.74	38.37	78.11	119.46	-41.35	peak	
5		5745.000	78.99	38.39	117.38	122.20	-4.82	peak	No Limit
6	*	5745.000	69.42	38.39	107.81	54.00	53.81	AVG	No Limit
7		5849.800	27.69	38.47	66.16	122.20	-56.04	peak	
8		5863.800	27.56	38.48	66.04	108.34	-42.30	peak	
9		5913.800	27.49	38.52	66.01	76.49	-10.48	peak	
10		5928.200	28.10	38.53	66.63	68.20	-1.57	peak	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT20)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH165: 5825 MHz	Polarization	Horizontal

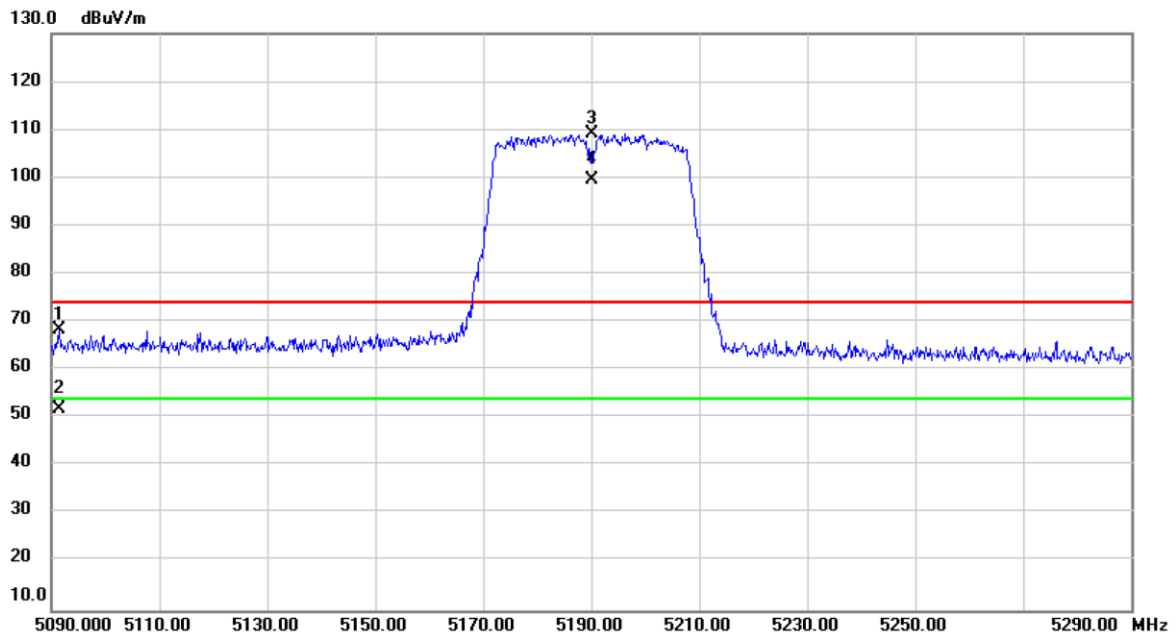


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5643.400	28.41	38.32	66.73	68.20	-1.47	peak	
2		5671.400	28.42	38.34	66.76	84.04	-17.28	peak	
3		5711.400	27.92	38.37	66.29	108.39	-42.10	peak	
4		5719.400	28.16	38.38	66.54	110.63	-44.09	peak	
5		5825.000	78.83	38.46	117.29	122.20	-4.91	peak	No Limit
6	*	5825.000	69.16	38.46	107.62	54.00	53.62	AVG	No Limit
7		5850.600	36.22	38.47	74.69	120.83	-46.14	peak	
8		5854.600	34.29	38.48	72.77	111.71	-38.94	peak	
9		5914.600	28.69	38.52	67.21	75.90	-8.69	peak	
10		5965.000	28.06	38.55	66.61	68.20	-1.59	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT40)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH38: 5190 MHz	Polarization	Horizontal

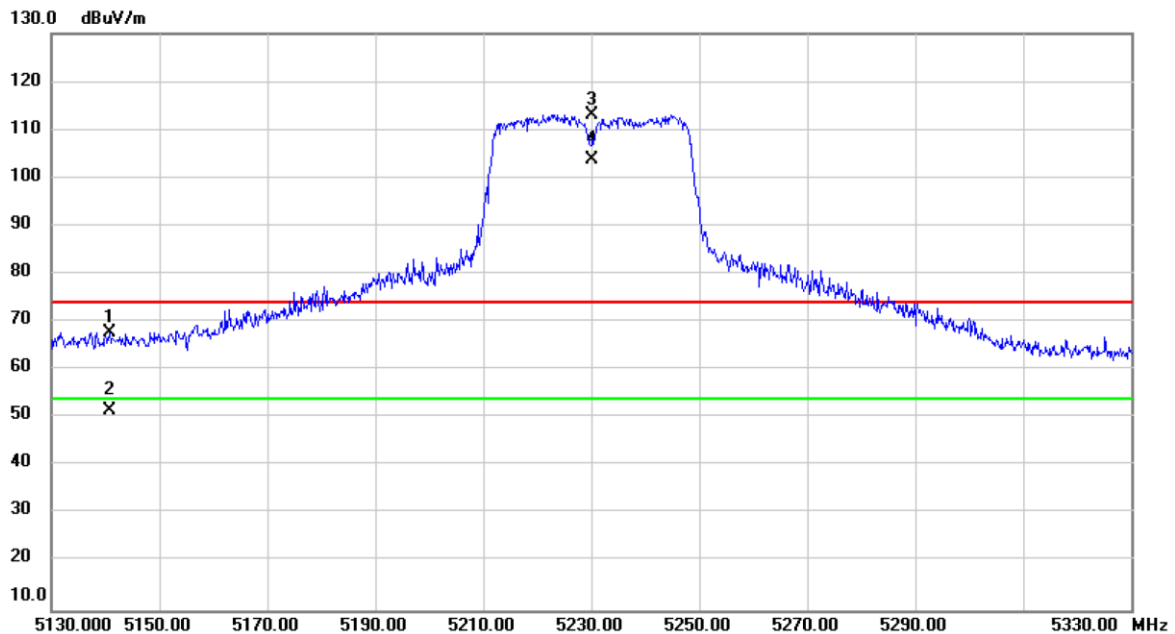


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5091.400	30.63	37.72	68.35	74.00	-5.65	peak	
2		5091.400	14.15	37.72	51.87	54.00	-2.13	AVG	
3	X	5190.000	71.21	37.84	109.05	74.00	35.05	peak	No Limit
4	*	5190.000	61.82	37.84	99.66	54.00	45.66	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT40)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH46: 5230 MHz	Polarization	Horizontal



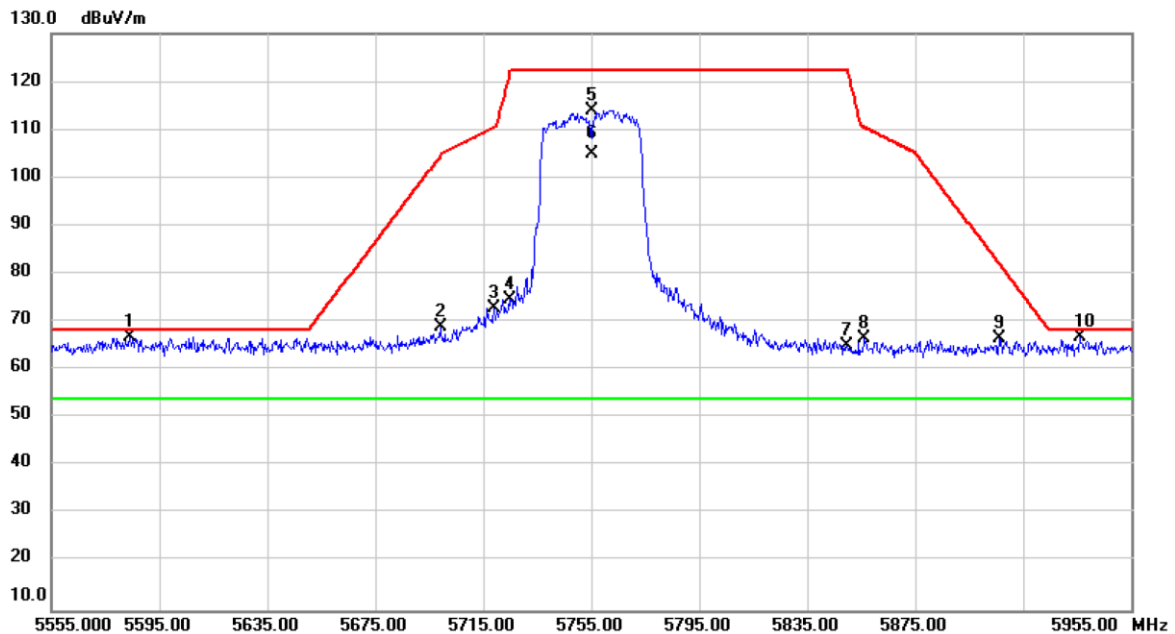
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5140.800	30.01	37.78	67.79	74.00	-6.21	peak	
2		5140.800	13.64	37.78	51.42	54.00	-2.58	AVG	
3	X	5230.000	75.31	37.89	113.20	74.00	39.20	peak	No Limit
4	*	5230.000	65.79	37.89	103.68	54.00	49.68	AVG	No Limit

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT40)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH151: 5755 MHz	Polarization	Horizontal



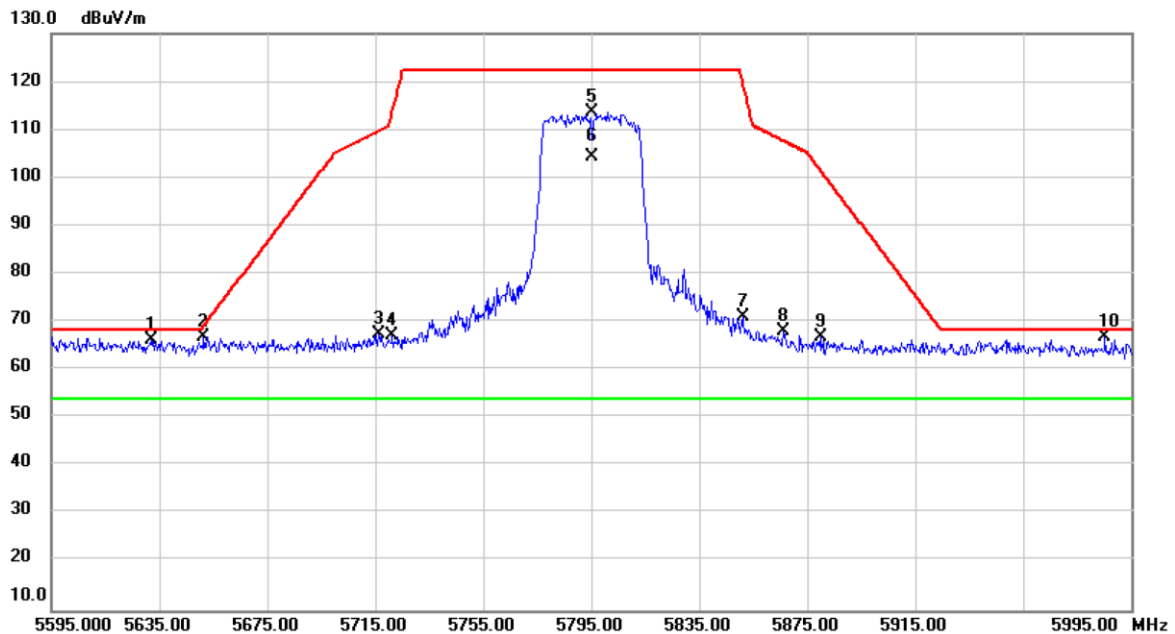
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5583.800	28.54	38.27	66.81	68.20	-1.39	peak	
2		5699.000	30.55	38.36	68.91	104.46	-35.55	peak	
3		5719.000	34.46	38.38	72.84	110.52	-37.68	peak	
4		5724.600	36.21	38.37	74.58	121.29	-46.71	peak	
5		5755.000	75.57	38.40	113.97	122.20	-8.23	peak	No Limit
6	*	5755.000	66.48	38.40	104.88	54.00	50.88	AVG	No Limit
7		5849.800	26.46	38.47	64.93	122.20	-57.27	peak	
8		5856.200	28.09	38.47	66.56	110.46	-43.90	peak	
9		5906.200	27.99	38.51	66.50	82.11	-15.61	peak	
10		5935.800	28.43	38.53	66.96	68.20	-1.24	peak	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11n (HT40)_Internal Antenna	Test Date	2019/12/2
Test Frequency	CH159: 5795 MHz	Polarization	Horizontal

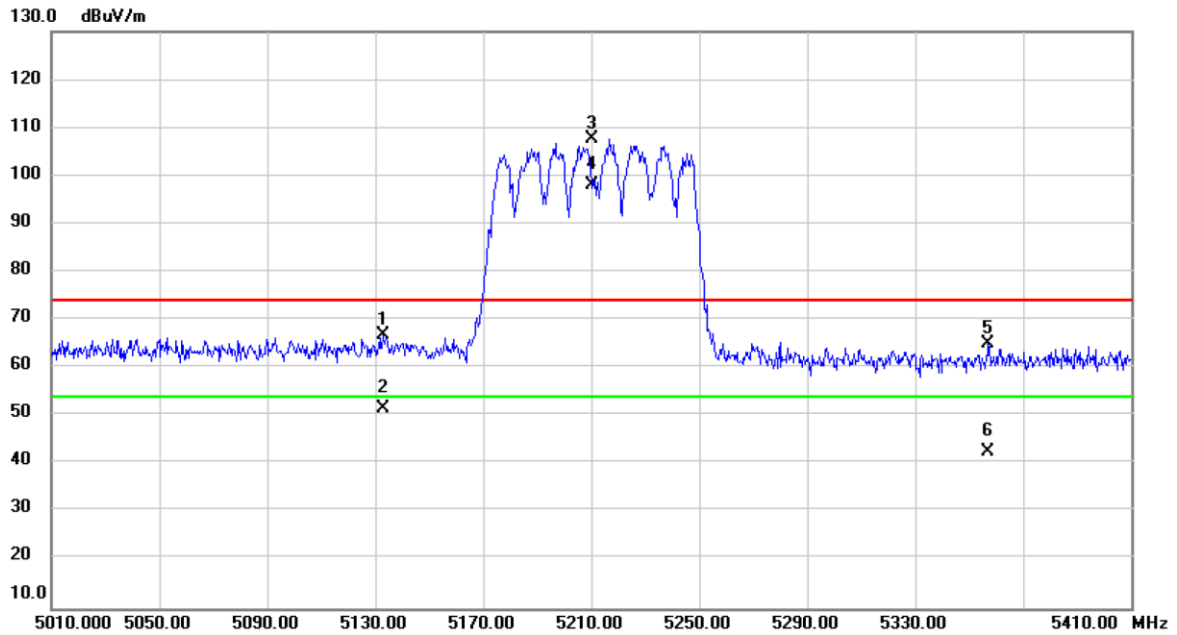


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5631.800	27.91	38.30	66.21	68.20	-1.99	peak	
2		5651.400	28.57	38.32	66.89	69.24	-2.35	peak	
3		5716.200	29.22	38.37	67.59	109.74	-42.15	peak	
4		5721.400	28.77	38.37	67.14	113.99	-46.85	peak	
5		5795.000	75.33	38.43	113.76	122.20	-8.44	peak	No Limit
6	*	5795.000	65.81	38.43	104.24	54.00	50.24	AVG	No Limit
7		5851.000	32.58	38.47	71.05	119.92	-48.87	peak	
8		5866.200	29.57	38.48	68.05	107.66	-39.61	peak	
9		5879.800	28.45	38.49	66.94	101.65	-34.71	peak	
10		5985.400	28.15	38.57	66.72	68.20	-1.48	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ac (VHT80)_Internal Antenna	Test Date	2019/12/3
Test Frequency	CH42: 5210 MHz	Polarization	Horizontal

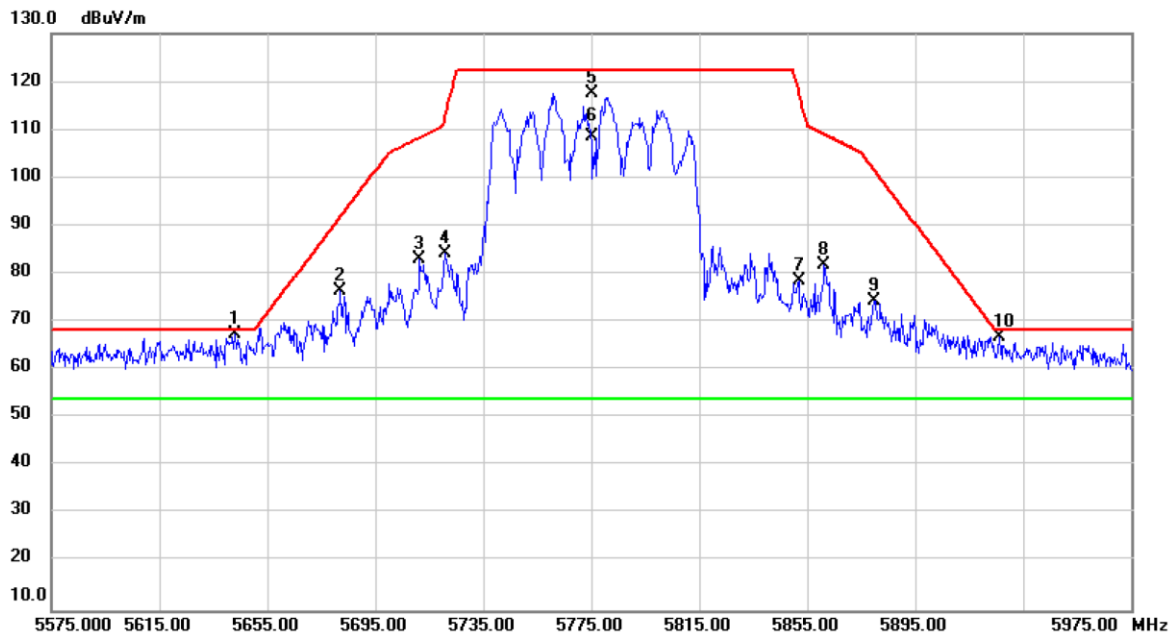


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5133.200	28.98	37.78	66.76	74.00	-7.24	peak	
2		5133.200	13.78	37.78	51.56	54.00	-2.44	AVG	
3	X	5210.000	69.90	37.87	107.77	74.00	33.77	peak	No Limit
4	*	5210.000	60.30	37.87	98.17	54.00	44.17	AVG	No Limit
5		5357.200	27.09	38.04	65.13	74.00	-8.87	peak	
6		5357.200	4.53	38.04	42.57	54.00	-11.43	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ac (VHT80)_Internal Antenna	Test Date	2019/12/3
Test Frequency	CH155: 5775 MHz	Polarization	Horizontal

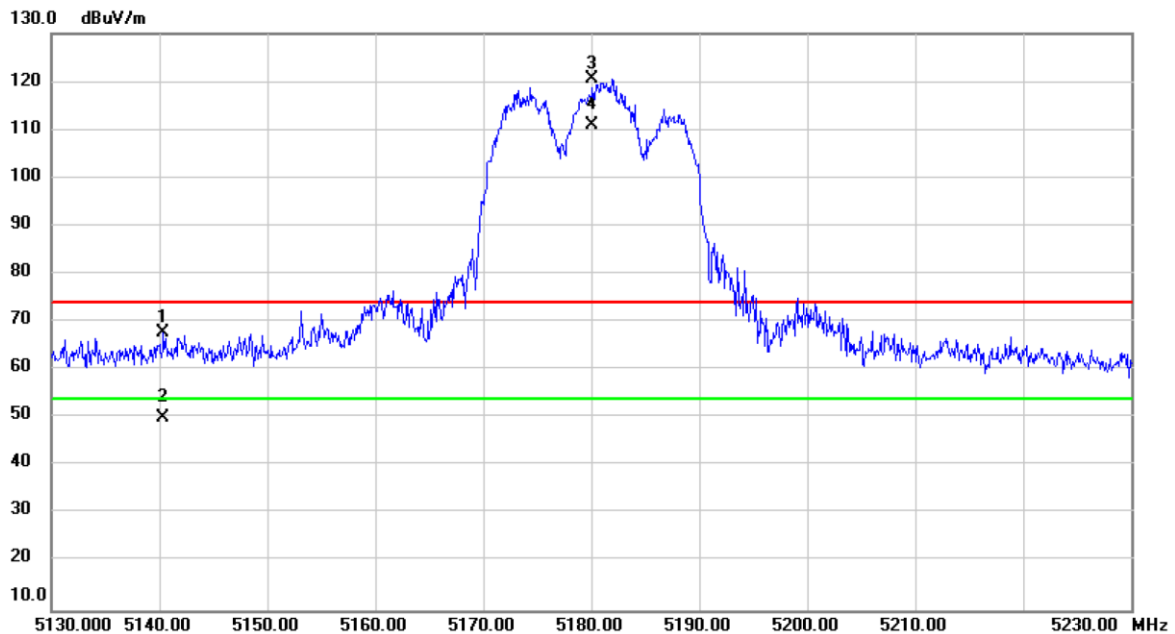


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5643.000	29.12	38.32	67.44	68.20	-0.76	peak	
2		5682.200	37.97	38.35	76.32	92.03	-15.71	peak	
3		5711.400	44.56	38.37	82.93	108.39	-25.46	peak	
4		5720.600	45.94	38.37	84.31	112.17	-27.86	peak	
5		5775.000	79.13	38.41	117.54	122.20	-4.66	peak	No Limit
6	*	5775.000	70.05	38.41	108.46	54.00	54.46	AVG	No Limit
7		5851.800	40.00	38.47	78.47	118.10	-39.63	peak	
8		5861.400	43.25	38.48	81.73	109.01	-27.28	peak	
9		5879.800	35.90	38.49	74.39	101.65	-27.26	peak	
10		5926.200	28.41	38.53	66.94	68.20	-1.26	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW20)_Internal Antenna	Test Date	2019/12/12
Test Frequency	CH36: 5180 MHz	Polarization	Horizontal

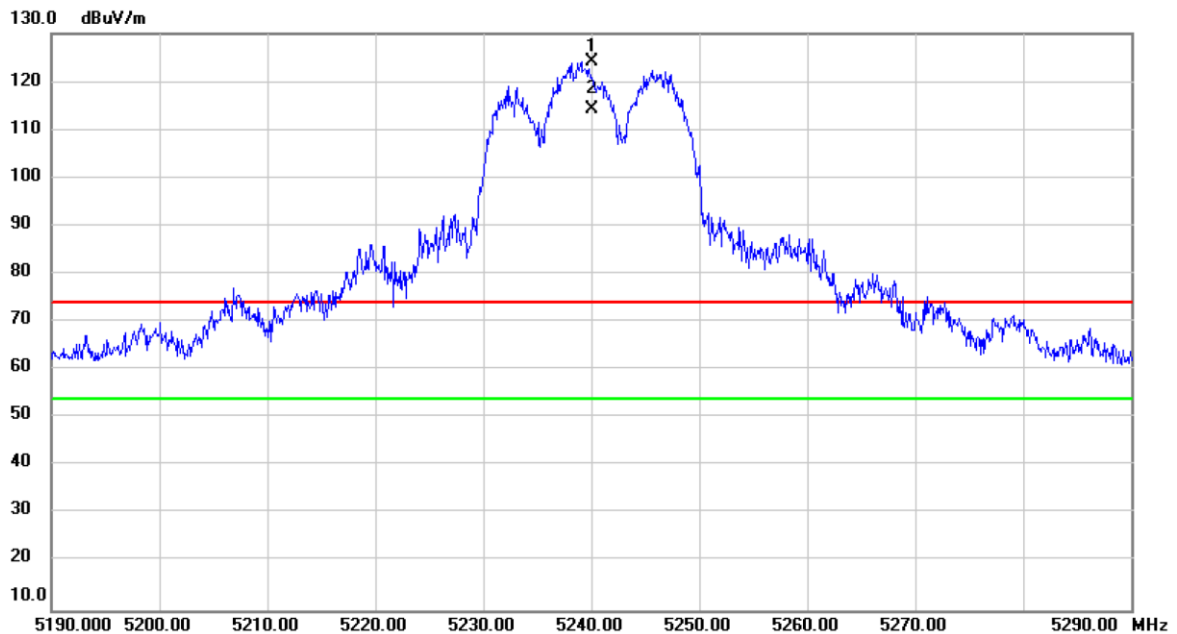


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5140.400	29.92	37.78	67.70	74.00	-6.30	peak	
2		5140.400	12.38	37.78	50.16	54.00	-3.84	AVG	
3	X	5180.000	82.73	37.83	120.56	74.00	46.56	peak	No Limit
4	*	5180.000	73.06	37.83	110.89	54.00	56.89	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW20)_Internal Antenna	Test Date	2019/12/12
Test Frequency	CH48: 5240 MHz	Polarization	Horizontal

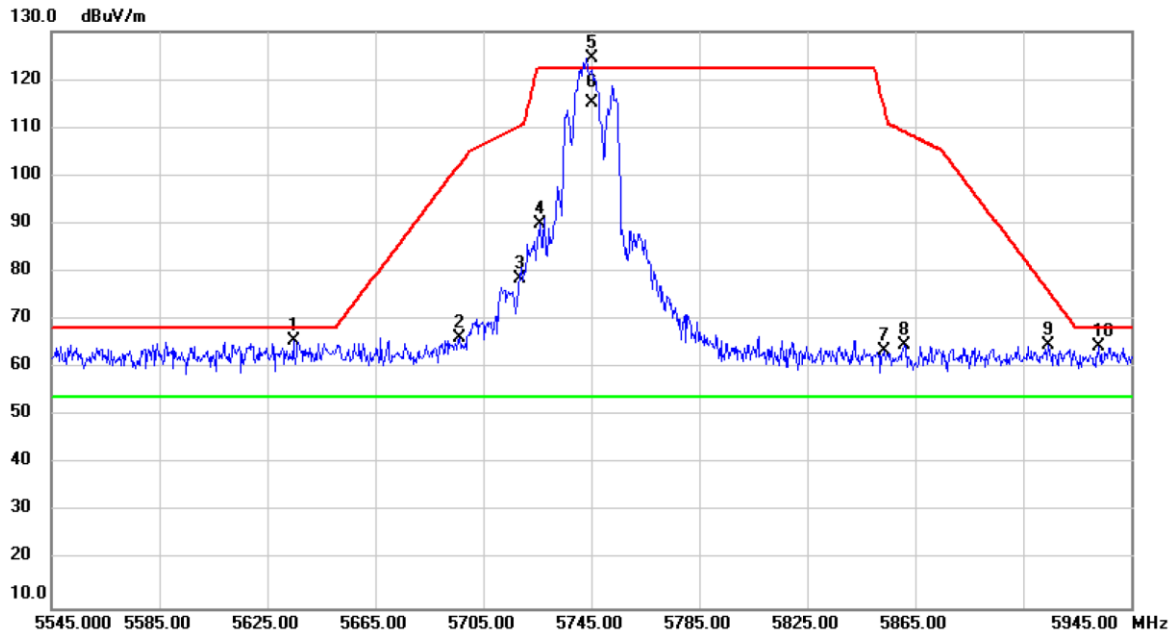


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	5240.000	86.14	37.90	124.04	74.00	50.04	peak	No Limit
2	*	5240.000	76.47	37.90	114.37	54.00	60.37	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW20)_Internal Antenna	Test Date	2019/12/12
Test Frequency	CH149: 5745 MHz	Polarization	Horizontal

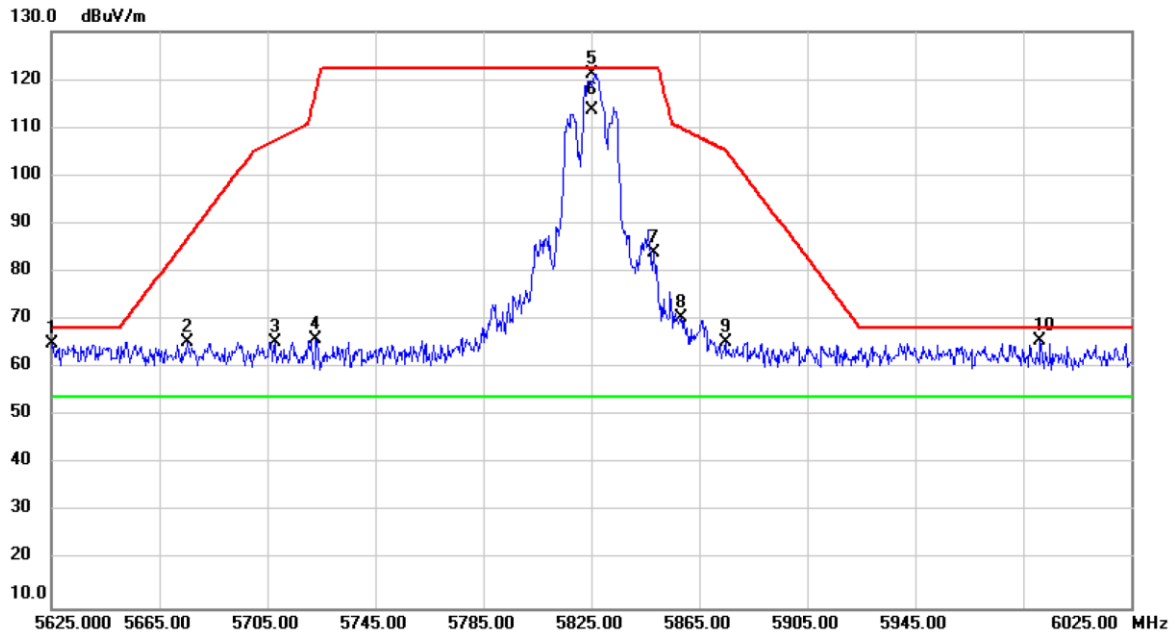


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5634.600	27.23	38.31	65.54	68.20	-2.66	peak	
2		5696.200	28.03	38.35	66.38	102.39	-36.01	peak	
3		5718.600	40.30	38.38	78.68	110.41	-31.73	peak	
4		5725.800	51.58	38.38	89.96	122.20	-32.24	peak	
5	X	5745.000	86.17	38.39	124.56	122.20	2.36	peak	No Limit
6	*	5745.000	76.73	38.39	115.12	54.00	61.12	AVG	No Limit
7		5853.400	25.12	38.47	63.59	114.45	-50.86	peak	
8		5861.000	26.24	38.48	64.72	109.12	-44.40	peak	
9		5914.200	26.28	38.52	64.80	76.19	-11.39	peak	
10		5933.000	25.80	38.53	64.33	68.20	-3.87	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW20)_Internal Antenna	Test Date	2019/12/12
Test Frequency	CH165: 5825 MHz	Polarization	Horizontal

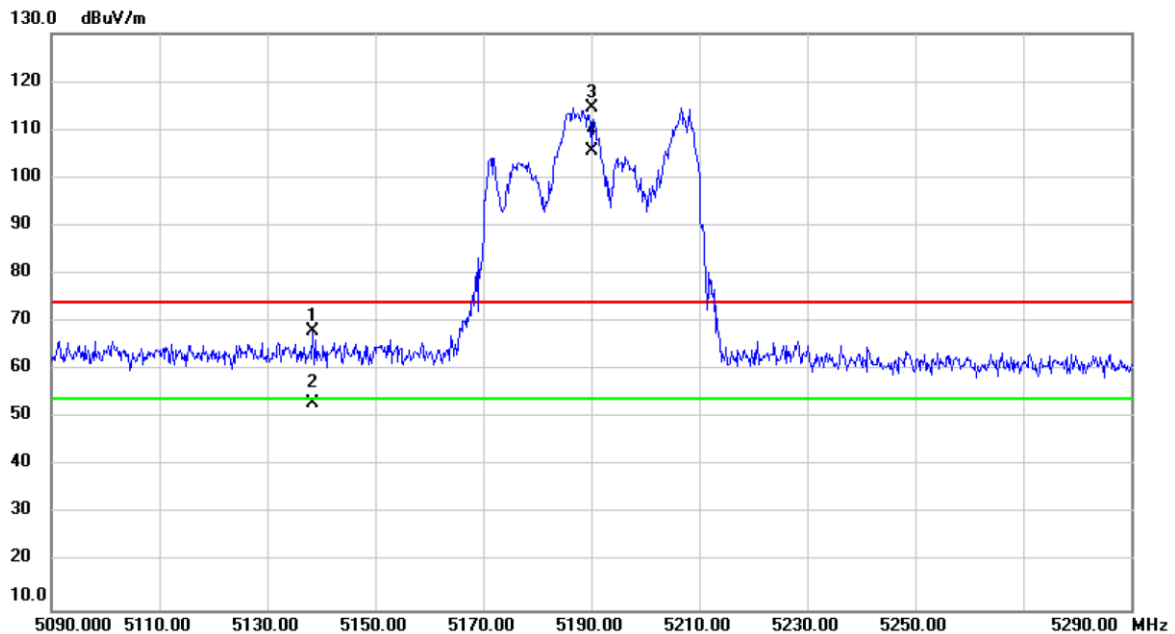


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5625.400	26.85	38.31	65.16	68.20	-3.04	peak	
2		5675.400	27.14	38.34	65.48	87.00	-21.52	peak	
3		5707.800	27.13	38.36	65.49	107.38	-41.89	peak	
4		5723.000	27.55	38.37	65.92	117.64	-51.72	peak	
5		5825.000	82.81	38.46	121.27	122.20	-0.93	peak	No Limit
6	*	5825.000	75.33	38.46	113.79	54.00	59.79	AVG	No Limit
7		5848.200	45.55	38.47	84.02	122.20	-38.18	peak	
8		5858.200	32.09	38.47	70.56	109.90	-39.34	peak	
9		5874.600	27.01	38.48	65.49	105.31	-39.82	peak	
10		5991.400	27.07	38.58	65.65	68.20	-2.55	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW40)_Internal Antenna	Test Date	2020/3/6
Test Frequency	CH38: 5190 MHz	Polarization	Horizontal

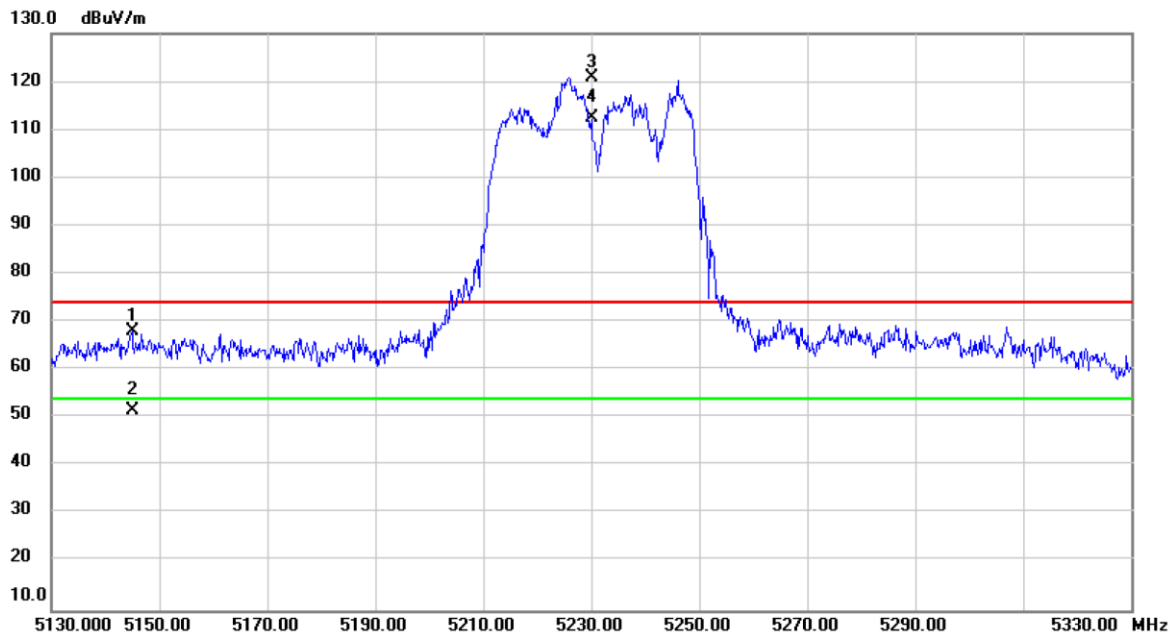


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5138.400	30.17	37.78	67.95	74.00	-6.05	peak	
2		5138.400	15.20	37.78	52.98	54.00	-1.02	AVG	
3	X	5190.000	76.71	37.84	114.55	74.00	40.55	peak	No Limit
4	*	5190.000	67.64	37.84	105.48	54.00	51.48	AVG	No Limit

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW40)_Internal Antenna	Test Date	2020/2/26
Test Frequency	CH46: 5230 MHz	Polarization	Horizontal



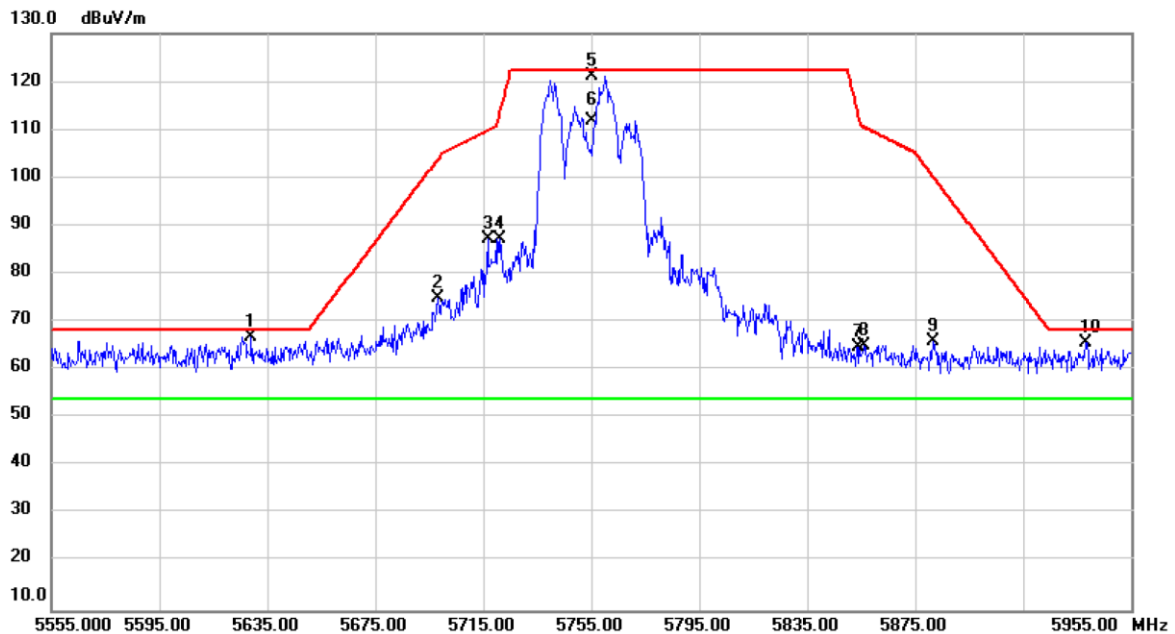
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5145.000	30.26	37.79	68.05	74.00	-5.95	peak	
2		5145.000	13.69	37.79	51.48	54.00	-2.52	AVG	
3	X	5230.000	83.00	37.89	120.89	74.00	46.89	peak	No Limit
4	*	5230.000	74.59	37.89	112.48	54.00	58.48	AVG	No Limit

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	IEEE 802.11ax (HEW40)_Internal Antenna	Test Date	2019/12/12
Test Frequency	CH151: 5755 MHz	Polarization	Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		5629.000	28.54	38.30	66.84	68.20	-1.36	peak	
2		5698.200	36.70	38.36	75.06	103.87	-28.81	peak	
3		5716.600	48.95	38.37	87.32	109.85	-22.53	peak	
4		5721.400	48.85	38.37	87.22	113.99	-26.77	peak	
5		5755.000	82.66	38.40	121.06	122.20	-1.14	peak	No Limit
6	*	5755.000	73.54	38.40	111.94	54.00	57.94	AVG	No Limit
7		5853.800	26.17	38.48	64.65	113.54	-48.89	peak	
8		5856.200	26.66	38.47	65.13	110.46	-45.33	peak	
9		5881.800	27.38	38.49	65.87	100.17	-34.30	peak	
10		5938.200	27.00	38.53	65.53	68.20	-2.67	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.