TEST REPORT

Report No.:	BCTC2011117264-2E
Applicant:	Reolink Innovation Limited
Product Name:	WiFi IP Camera
Model/Type Ref.:	RLC-511WA
Tested Date:	2020-11-25 to 2020-12-02
Issued Date:	2020-12-02

Shenzhen BCTC Testing Co., Ltd.

FCC ID: 2AYHE-2012A

Product Name:	WiFi IP Camera
Trademark:	reolink
Model/Type Ref.:	RLC-511WA RLC-510WA, RLC-523WA, E2 Zoom
Prepared For:	Reolink Innovation Limited
Address:	Room B, 4th Floor, Kingway Commercial Building, 171-173 Lockhart Road, Wan Chai, Hong Kong
Manufacturer:	SHENZHEN BAICHUAN SECURITY TECHNOLOGY CO., LTD.
Address:	2-4th Floor, Building 2, YuanLing Industrial Park, ShangWu, Shiyan Street, Bao'an District, Shenzhen, China
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., East of B Building, Pengzhou Industrial Park, Fuyuan 1st Road, Qiaotou, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2020-11-25
Sample tested Date:	2020-11-25 to 2020-12-02
Issue Date:	2020-12-02
Report No.:	BCTC2011117264-2E
Test Standards	FCC Part15 15.407 ANSI C63.10-2013 KDB 662911 D01 v02r01 KDB 789033 D02 v02r01
Test Results	PASS

Tested by:

Eric Yang/Project Handler

Approved by:

Zero Zhou/Reviewer

The test report is effective only with both signature and specialized stamp.This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full.The tested sample(s) and the sample information are provided by the client.

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(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
BCTC2011117264-2E	2020-12-02	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
1	Spurious Radiated Emissions	15.209 15.407(b)	PASS
2	Conducted Emission	15.207	PASS
3	26 dB and 99% Emission Bandwidth	15.407(a)	PASS
4	Minimum 6 dB bandwidth	15.407(e)	PASS
5	Maximum Conducted Output Power	15.407(a)	PASS
6	Band Edge	15.407(b)	PASS
7	Power Spectral Density	15.407(a)	PASS
8	Spurious Emissions at Antenna Terminals	15.407(b)	PASS
9	Antenna Requirement	15.203	PASS

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
3	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
4	Conducted Adjacent channel power	U=1.38dB
5	Conducted output power uncertainty Above 1G	U=1.576dB
6	Conducted output power uncertainty below 1G	U=1.28dB
7	humidity uncertainty	U=5.3%
8	Temperature uncertainty	U=0.59℃

4. PRODUCT INFORMATION AND TEST SETUP

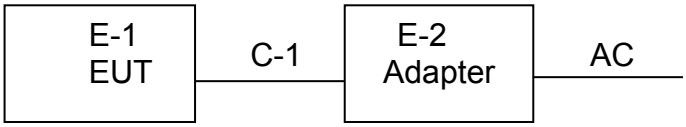
4.1 Product Information

Model/Type Ref.:	RLC-511WA RLC-510WA, RLC-523WA, E2 Zoom
Model differences:	All the model are the same circuit and RF module, except model names.
IEEE 802.11 WLAN Mode Supported	802.11n(20MHz channel bandwidth) 802.11n(40MHz channel bandwidth)
Operation Frequency:	5180-5240MHz for 802.11n(HT20); 5190-5230MHz for 802.11n(HT40); 5745-5825 MHz for 802.11n(HT20); 5755-5795 MHz for 802.11n(HT40);
Data Rate	802.11n(HT20/HT40):MCS0-MCS15;
Type of Modulation:	OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11n;
Number Of Channel	4 channels for 802.11n20 in the 5180-5240MHz band ; 2 channels for 802.11 n40 in the 5190-5230MHz band ; 5 channels for 802.11n20 in the 5745-5825MHz band ; 2 channels for 802.11 n40 in the 5755-5795MHz band ;
Antenna installation:	External antenna
Antenna Gain:	Antenna A: 2dBi Antenna B: 2dBi
Ratings:	AC 120V
Adapter:	MODEL:DCT12W120100US-B0 INPUT:AC100-240~50/60Hz 0.3A max OUTPUT:DC12.0V 1.0A

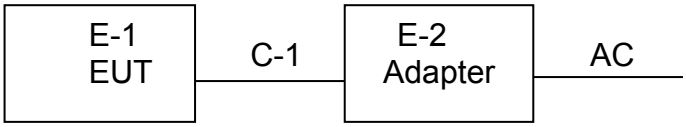
4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

Conducted Emission Test:



Radiated Spurious Emission



4.3 Support Equipment

	Device Type	Brand	Model	Series No.	Note
E-1	WiFi IP Camera	reolink	RLC-511WA	N/A	EUT
E-2	Adapter	N/A	DCT12W120100 US-B0	N/A	Auxiliary

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1.5M	DC cable unshielded

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

802.11n(20MHz) Carrier Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220	40	5200	48	5240
149	5745	153	5765	157	5785	161	5805
165	5825	-	-	-	-	-	-

802.11n (40MHz) Carrier Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230	-	-	-	-
151	5755	159	5795	-	-	-	-

4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	802.11n 20 CH36/ CH40/ CH 48
Mode 2	802.11n 20 CH149/ CH157/ CH 165
Mode 3	802.11n40 CH38/ CH 46
Mode 4	802.11n40 CH 151 / CH 159
Mode 5	Link Mode

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

4.6 Antenna

Antenna	Brand	Model Name	Antenna Type	Gain (dBi)	NOTE
A	N/A	N/A	External antenna	2	
B	N/A	N/A	External antenna	2	

EUT has two External antennas with Max gain GANT 2dBi on every antenna, CDD device with two spatial streams, also can operat with one spatial streams according to KDB662911 D01 v02r01,
Directional gain= GANT + Array Gain, where Array Gain is as follows.
1)For power spectral density(PSD) measurements,
Array Gain=10log(NANT/NSS)dB=10log(2/1)=3.01dB,
So the directional gain for PSD is 5.01dBi
2)For power measurements,
The Array gain=0 dB for NANT≤4,
So the directional gain for Power measurements is 2dBi

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., East of B Building, Pengzhou Industrial Park, Fuyuan 1st Road, Qiaotou, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance wih the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

FCC Test Firm Registration Number: 712850

IC Registered No.: 23583

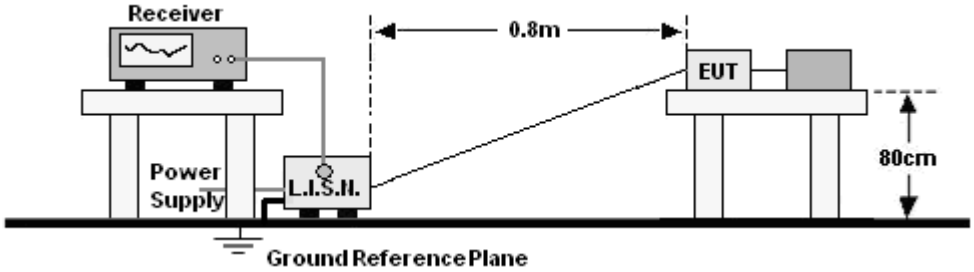
5.2 Test Instrument Used

Conducted emissions Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Receiver	R&S	ESR3	102075	Jun. 08, 2020	Jun. 07, 2021
LISN	R&S	ENV216	101375	Jun. 04, 2020	Jun. 03, 2021
ISN	HPX	ISN T800	S1509001	Jun. 04, 2020	Jun. 03, 2021
Software	Frad	EZ-EMC	EMC-CON 3A1	\	\

Radiated emissions Test (966 chamber)					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
966 chamber	ChengYu	966 Room	966	Jun. 06. 2020	Jun. 05, 2023
Receiver	R&S	ESR3	102075	Jun. 08, 2020	Jun. 07, 2021
Receiver	R&S	ESRP	101154	Jun. 08, 2020	Jun. 07, 2021
Amplifier	Schwarzbeck	BBV9718	9718-309	Jun. 04, 2020	Jun. 03, 2021
Amplifier	Schwarzbeck	BBV9744	9744-0037	Jun. 04, 2020	Jun. 03, 2021
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	VULB9163-942	Jun. 08, 2020	Jun. 07, 2021
Horn Antenna	SCHWARZBECK	BBHA9120D	1201	Jun. 10, 2020	Jun. 09, 2021
Horn Antenna (18GHz-40GHz)	SCHWARZBECK	BBHA9170	822	Jun. 10, 2020	Jun. 09, 2021
Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	Jun. 08, 2020	Jun. 07, 2021
Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	014	Jun. 08, 2020	Jun. 07, 2021
RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-0008	Jun. 08, 2020	Jun. 07, 2021
RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	Jun. 08, 2020	Jun. 07, 2021
RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	Jun. 08, 2020	Jun. 07, 2021
Power Metter	Keysight	E4419B	\	Jun. 08, 2020	Jun. 07, 2021
Power Sensor (AV)	Keysight	E9 300A	\	Jun. 08, 2020	Jun. 07, 2021
Signal Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY49100060	Jun. 04, 2020	Jun. 03, 2021
Spectrum Analyzer 9kHz-40GHz	Agilent	FSP40	100363	Jun. 13, 2020	Jun. 12, 2021
Software	Frad	EZ-EMC	FA-03A2 RE	\	\

6. CONDUCTED EMISSIONS

6.1 Block Diagram Of Test Setup



6.2 Limit

FREQUENCY (MHz)	Limit (dBuV)	
	Quas-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Notes:
1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

6.3 Test procedure

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).

b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.

c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

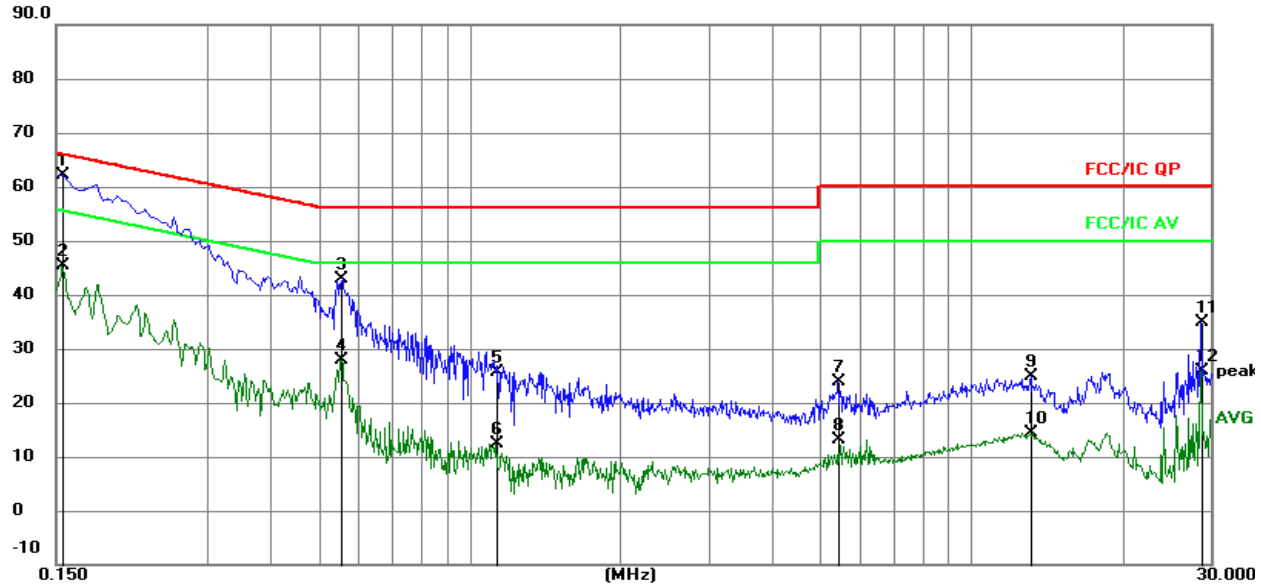
6.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

6.5 Test Result

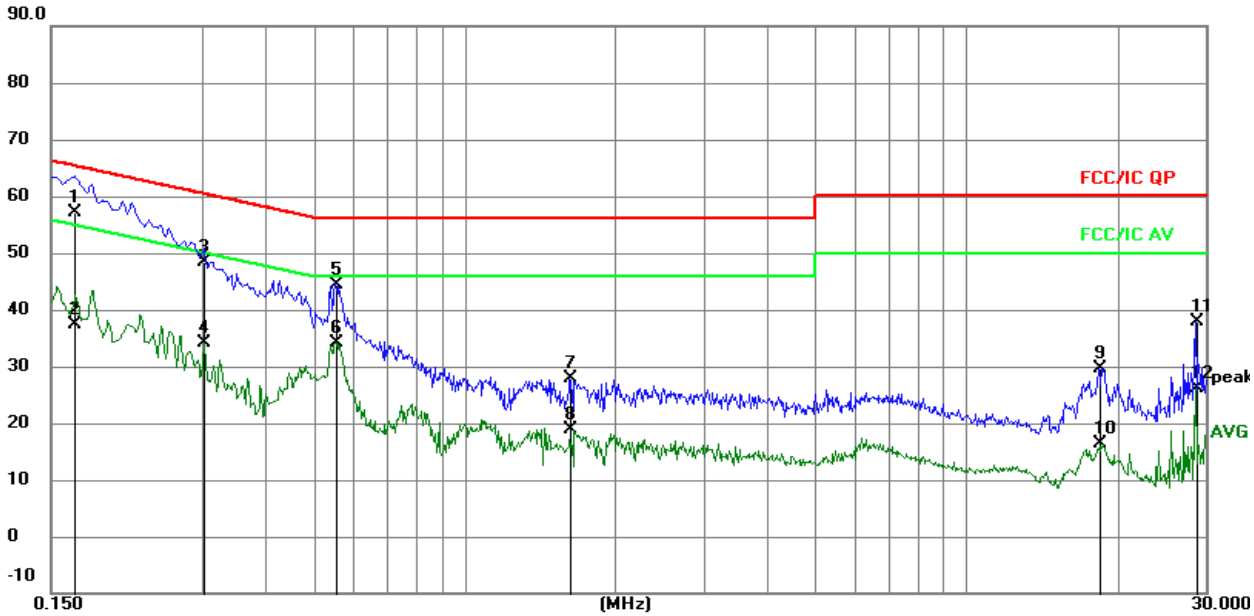
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	L
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 5



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1	*	0.1545	52.68	9.51	62.19	65.75	-3.56	QP
2		0.1545	35.76	9.51	45.27	55.75	-10.48	AVG
3		0.5550	33.08	9.82	42.90	56.00	-13.10	QP
4		0.5550	17.96	9.82	27.78	46.00	-18.22	AVG
5		1.1310	16.05	9.57	25.62	56.00	-30.38	QP
6		1.1310	2.86	9.57	12.43	46.00	-33.57	AVG
7		5.4195	14.02	9.78	23.80	60.00	-36.20	QP
8		5.4195	3.44	9.78	13.22	50.00	-36.78	AVG
9		13.1685	15.12	9.70	24.82	60.00	-35.18	QP
10		13.1685	4.58	9.70	14.28	50.00	-35.72	AVG
11		28.7385	25.10	9.71	34.81	60.00	-25.19	QP
12		28.7385	16.12	9.71	25.83	50.00	-24.17	AVG

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	N
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 5



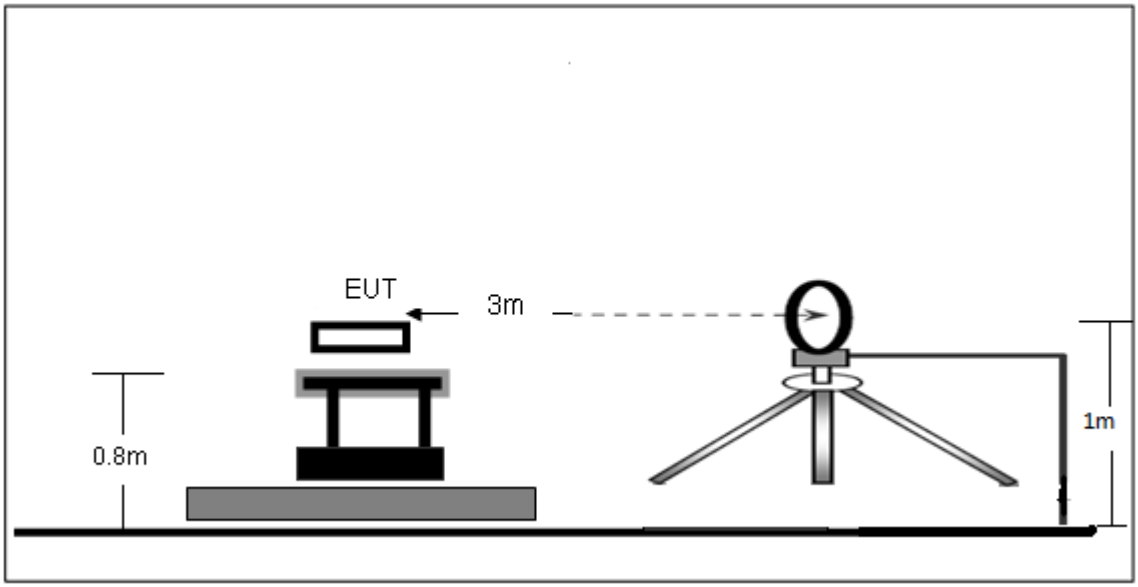
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1	*	0.1669	47.69	9.50	57.19	65.11	-7.92	QP
2		0.1669	27.84	9.50	37.34	55.11	-17.77	AVG
3		0.3030	38.75	9.58	48.33	60.16	-11.83	QP
4		0.3030	24.66	9.58	34.24	50.16	-15.92	AVG
5		0.5550	34.68	9.82	44.50	56.00	-11.50	QP
6		0.5550	24.42	9.82	34.24	46.00	-11.76	AVG
7		1.6215	18.41	9.58	27.99	56.00	-28.01	QP
8		1.6215	9.25	9.58	18.83	46.00	-27.17	AVG
9		18.4155	19.78	9.76	29.54	60.00	-30.46	QP
10		18.4155	6.73	9.76	16.49	50.00	-33.51	AVG
11		28.7160	28.25	9.71	37.96	60.00	-22.04	QP
12		28.7160	16.53	9.71	26.24	50.00	-23.76	AVG

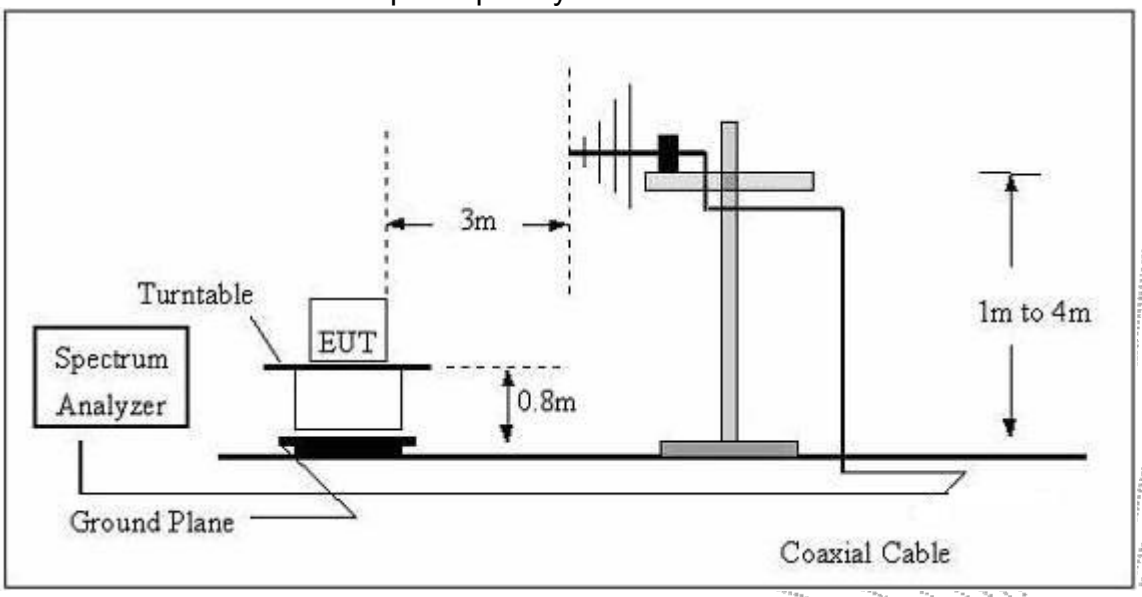
7. RADIATED EMISSIONS

7.1 Block Diagram Of Test Setup

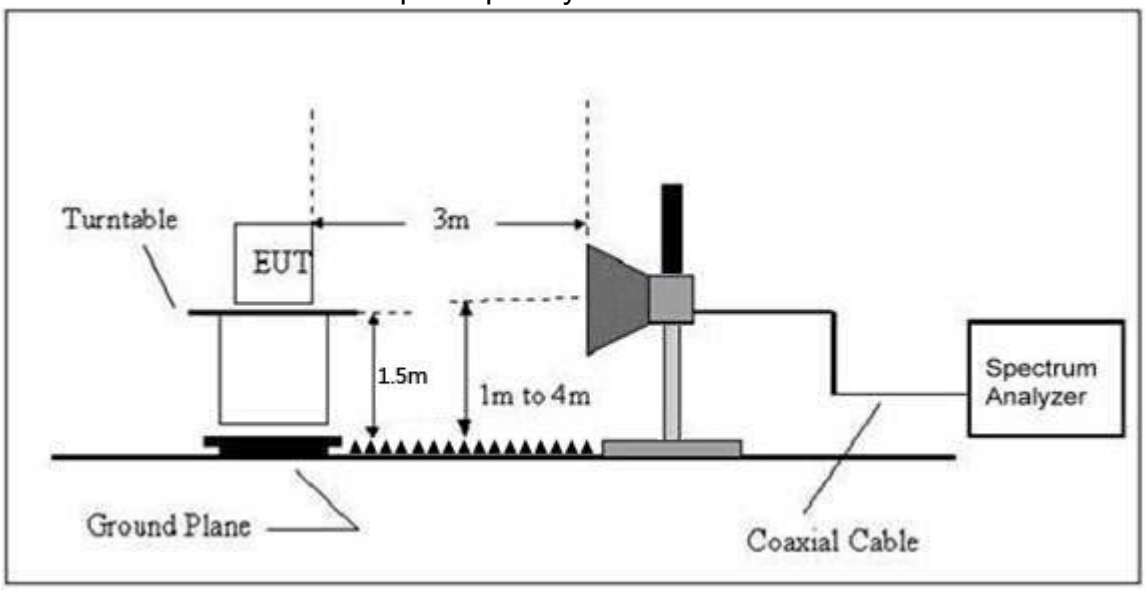
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance	
(MHz)	uV/m	(m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:
(1)The limit for radiated test was performed according to FCC PART 15C.
(2)The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).

7.3 Test procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.
This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205.
It must be performed with the highest gain of each type of antenna proposed for use with the EUT.
Use the following spectrum analyzer settings:

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; 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.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.
Note:
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*lg(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the
narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

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7.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

7.5 Test Result

Below 30MHz

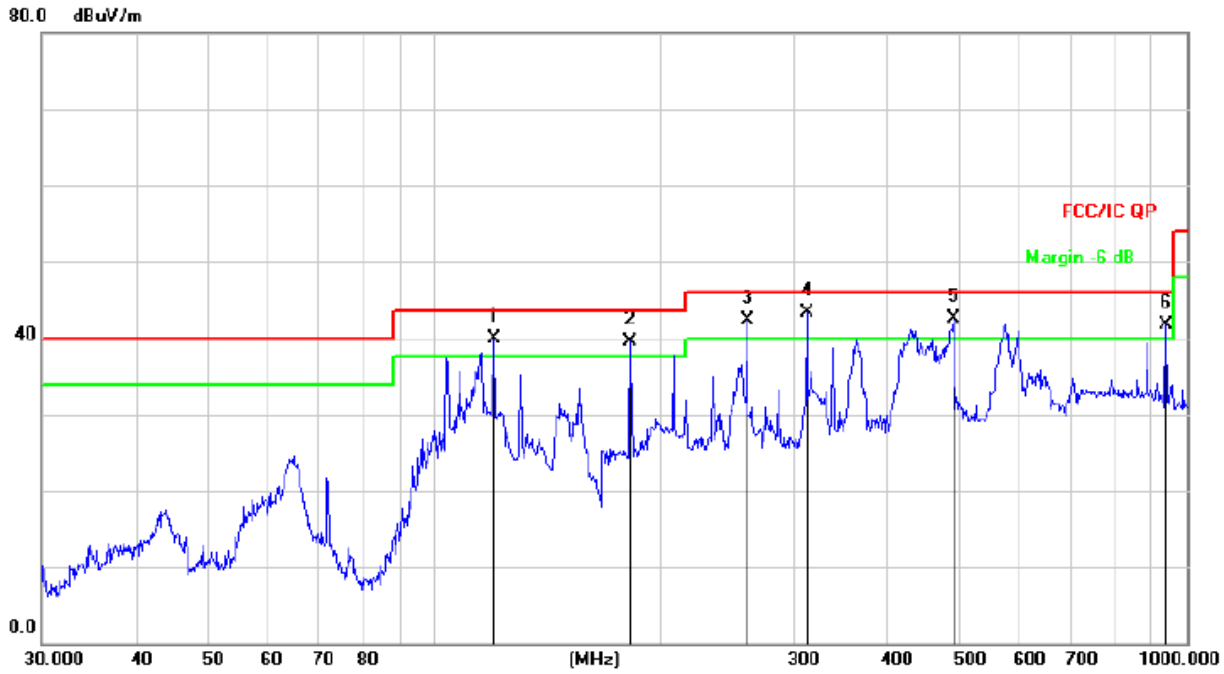
Temperature:	26℃	Relative Humidtity:	24%
Pressure:	101 kPa	Test Voltage :	AC 120V
Test Mode :	Mode 5	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 1GHz

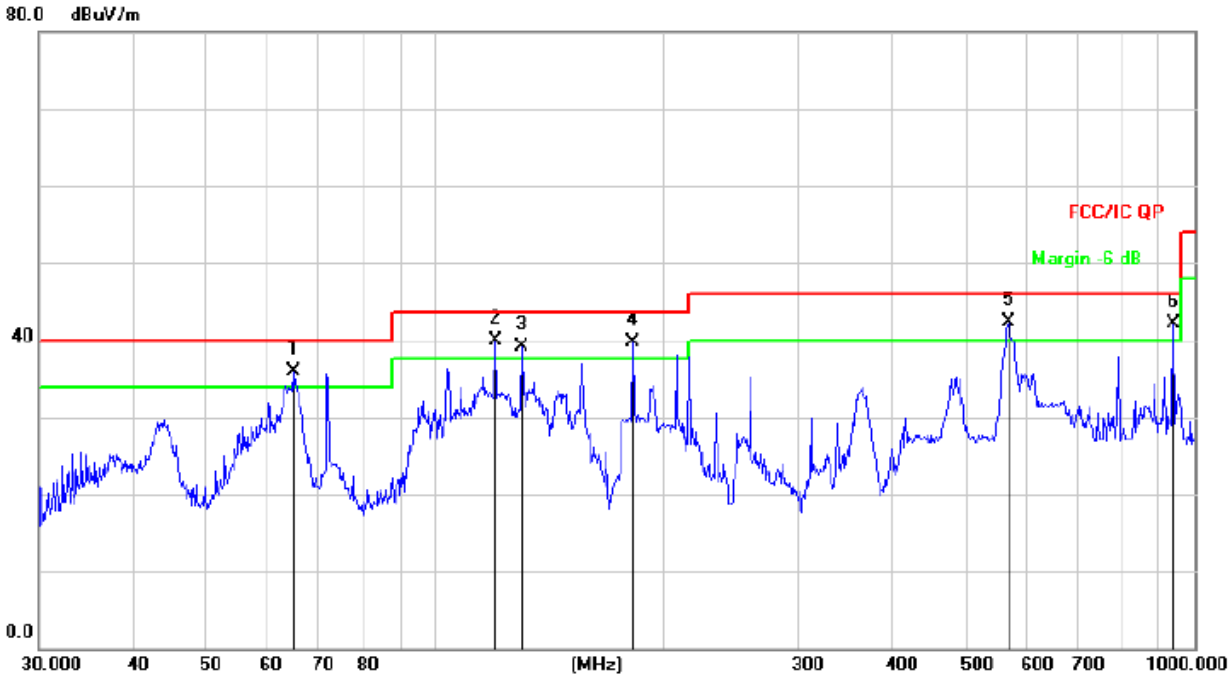
Temperature:	26℃	Relative Humidtity:	54%
Pressure:	101 kPa	Test Voltage :	AC 120V
Test Mode :	Mode 5	Polarization :	Horizontal



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	119.8555	56.60	-16.76	39.84	43.50	-3.66	QP
2	!	181.9200	55.92	-16.51	39.41	43.50	-4.09	QP
3	!	260.1444	56.09	-13.86	42.23	46.00	-3.77	QP
4	*	312.1792	55.36	-12.08	43.28	46.00	-2.72	QP
5	!	489.0269	50.32	-7.80	42.52	46.00	-3.48	QP
6	!	938.8324	42.14	-0.42	41.72	46.00	-4.28	QP

Temperature:	26℃	Relative Humidtity:	54%
Pressure:	101 kpa	Test Voltage :	AC 120V
Test Mode :	Mode 5	Polarization :	Vertical



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	64.8863	51.73	-15.92	35.81	40.00	-4.19	QP
2	*	119.8555	56.74	-16.76	39.98	43.50	-3.52	QP
3	!	129.9225	56.61	-17.41	39.20	43.50	-4.30	QP
4	!	181.9199	56.14	-16.51	39.63	43.50	-3.87	QP
5	!	568.6127	48.24	-5.84	42.40	46.00	-3.60	QP
6	!	938.8324	42.46	-0.42	42.04	46.00	-3.96	QP

Between 1GHz – 40GHz

Test Mode :	TX(5.2G) - 802.11n-HT20

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Cable loss (dB)	Antenna Factor dB/m	Preamp Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel (5180 MHz)-Above 1G									
V	4434.067	63.68	5.94	35.40	44.00	61.02	68.20	-7.18	PK
V	4434.067	43.35	5.94	35.40	44.00	40.69	54.00	-13.31	AV
V	10360.081	61.21	8.46	39.75	44.50	64.92	68.20	-3.28	PK
V	10360.081	43.31	8.46	39.75	44.50	47.02	54.00	-6.98	AV
V	15540.180	61.13	10.12	38.80	44.10	65.95	74.00	-8.05	PK
V	15540.180	43.86	10.12	38.80	42.70	50.08	54.00	-3.92	AV
H	4434.159	63.62	5.94	35.18	44.00	60.74	68.20	-7.46	PK
H	4434.159	43.50	5.94	35.18	44.00	40.62	54.00	-13.38	AV
H	10360.096	53.62	8.46	38.71	44.50	56.29	68.20	-11.91	PK
H	10360.096	43.85	8.46	38.71	44.50	46.52	54.00	-7.48	AV
H	15540.199	50.38	10.12	38.38	44.10	54.78	74.00	-19.22	PK
H	15540.199	43.77	10.12	38.38	44.10	48.17	54.00	-5.83	AV
middle Channel (5200 MHz)-Above 1G									
V	4592.098	60.81	6.48	36.35	44.05	59.59	74.00	-14.41	PK
V	4592.098	43.50	6.48	36.35	44.05	42.28	54.00	-11.72	AV
V	10400.011	64.09	8.47	37.88	44.51	65.93	68.20	-2.27	PK
V	10400.011	43.61	8.47	37.88	44.51	45.45	54.00	-8.55	AV
V	15600.102	64.04	10.12	38.80	44.10	68.86	74.00	-5.14	PK
V	15600.102	43.63	10.12	38.80	42.70	49.85	54.00	-4.15	AV
H	4592.167	61.09	6.48	36.37	44.05	59.89	74.00	-14.11	PK
H	4592.167	43.25	6.48	36.37	44.05	42.05	54.00	-11.95	AV
H	10400.163	54.16	8.47	38.64	44.50	56.77	68.20	-11.43	PK
H	10400.163	43.61	8.47	38.64	44.50	46.22	54.00	-7.78	AV
H	15600.041	54.71	10.12	38.38	44.10	59.11	74.00	-14.89	PK
H	15600.041	42.35	10.12	38.38	44.10	46.75	54.00	-7.25	AV
High Channel (5240 MHz)-Above 1G									
V	4739.131	63.33	7.10	37.24	43.50	64.17	74.00	-9.83	PK
V	4739.131	43.26	7.10	37.24	43.50	44.10	54.00	-9.90	AV
V	10480.092	64.37	8.46	37.68	44.50	66.01	68.20	-2.19	PK
V	10480.092	43.91	8.46	37.68	44.50	45.55	54.00	-8.45	AV
V	15720.190	62.03	10.12	38.80	44.10	66.85	74.00	-7.15	PK
V	15720.190	43.42	10.12	38.80	42.70	49.64	54.00	-4.36	AV
H	4739.092	60.26	7.10	37.24	43.50	61.10	74.00	-12.90	PK
H	4739.092	44.00	7.10	37.24	43.50	44.84	54.00	-9.16	AV
H	10480.134	53.97	8.46	38.57	44.50	56.50	68.20	-11.70	PK
H	10480.134	40.86	8.46	38.57	44.50	43.39	54.00	-10.61	AV
H	15720.058	50.30	10.12	38.38	44.10	54.70	74.00	-19.30	PK
H	15720.058	44.94	10.12	38.38	44.10	49.34	54.00	-4.66	AV

Note: PK value is lower than the Average value limit, So average didn't record.
The 26.5-40G amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.
Test Mode is MIMO Mode.

Test Mode :	TX(5.2G) - 802.11n-HT40

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Cable loss (dB)	Antenna Factor dB/m	Preamp Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel (5190 MHz)-Above 1G									
V	4434.029	61.42	5.94	35.40	44.00	58.76	74.00	-15.24	PK
V	4434.029	43.67	5.94	35.40	44.00	41.01	54.00	-12.99	AV
V	10380.175	63.59	8.46	39.75	44.50	67.30	68.20	-0.90	PK
V	10380.175	43.73	8.46	39.75	44.50	47.44	54.00	-6.56	AV
V	15570.034	61.35	10.12	38.80	44.10	66.17	74.00	-7.83	PK
V	15570.034	43.63	10.12	38.80	42.70	49.85	54.00	-4.15	AV
H	4434.186	62.58	5.94	35.18	44.00	59.70	74.00	-14.30	PK
H	4434.186	43.17	5.94	35.18	44.00	40.29	54.00	-13.71	AV
H	10380.198	52.13	8.46	38.71	44.50	54.80	68.20	-13.40	PK
H	10380.198	43.12	8.46	38.71	44.50	45.79	54.00	-8.21	AV
H	15570.152	50.14	10.12	38.38	44.10	54.54	74.00	-19.46	PK
H	15570.152	43.77	10.12	38.38	44.10	48.17	54.00	-5.83	AV
middle Channel (5230 MHz)-Above 1G									
V	4739.131	63.08	6.48	36.35	44.05	61.86	74.00	-12.14	PK
V	4739.131	43.65	6.48	36.35	44.05	42.43	54.00	-11.57	AV
V	10460.011	60.01	8.47	37.88	44.51	61.85	68.20	-6.35	PK
V	10460.011	43.73	8.47	37.88	44.51	45.57	54.00	-8.43	AV
V	15690.172	64.76	10.12	38.80	44.10	69.58	74.00	-4.42	PK
V	15690.172	43.35	10.12	38.80	42.70	49.57	54.00	-4.43	AV
H	4739.095	63.08	6.48	36.37	44.05	61.88	74.00	-12.12	PK
H	4739.095	43.39	6.48	36.37	44.05	42.19	54.00	-11.81	AV
H	10460.087	50.97	8.47	38.64	44.50	53.58	68.20	-14.62	PK
H	10460.087	43.35	8.47	38.64	44.50	45.96	54.00	-8.04	AV
H	15690.099	50.00	10.12	38.38	44.10	54.40	74.00	-19.60	PK
H	15690.099	43.08	10.12	38.38	44.10	47.48	54.00	-6.52	AV

Note: PK value is lower than the Average value limit, So average didn't record.
The 26.5-40G amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.
Test Mode is MIMO Mode.

Test Mode :	TX (5.8G) --802.11n-HT20

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Cable loss (dB)	Antenna Factor dB/m	Preamp Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel (5745 MHz)-Above 1G									
V	4679.126	60.50	5.94	35.40	44.00	57.84	74.00	-16.16	PK
V	4679.126	43.08	5.94	35.40	44.00	40.42	54.00	-13.58	AV
V	11490.172	62.32	8.46	39.75	44.50	66.03	68.20	-2.17	PK
V	11490.172	43.47	8.46	39.75	44.50	47.18	54.00	-6.82	AV
V	17235.016	63.02	10.12	38.80	44.10	67.84	74.00	-6.16	PK
V	17235.016	43.08	10.12	38.80	42.70	49.30	54.00	-4.70	AV
H	4679.021	61.85	5.94	35.18	44.00	58.97	74.00	-15.03	PK
H	4679.021	43.23	5.94	35.18	44.00	40.35	54.00	-13.65	AV
H	11490.115	52.47	8.46	38.71	44.50	55.14	68.20	-13.06	PK
H	11490.115	41.81	8.46	38.71	44.50	44.48	54.00	-9.52	AV
H	17235.004	52.48	10.12	38.38	44.10	56.88	74.00	-17.12	PK
H	17235.004	40.08	10.12	38.38	44.10	44.48	54.00	-9.52	AV
middle Channel (5785 MHz)-Above 1G									
V	4592.121	61.49	6.48	36.35	44.05	60.27	74.00	-13.73	PK
V	4592.121	43.36	6.48	36.35	44.05	42.14	54.00	-11.86	AV
V	11570.083	61.92	8.47	37.88	44.51	63.76	68.20	-4.44	PK
V	11570.083	43.90	8.47	37.88	44.51	45.74	54.00	-8.26	AV
V	17355.073	61.80	10.12	38.80	44.10	66.62	74.00	-7.38	PK
V	17355.073	43.46	10.12	38.80	42.70	49.68	54.00	-4.32	AV
H	4592.184	62.49	6.48	36.37	44.05	61.29	74.00	-12.71	PK
H	4592.184	43.13	6.48	36.37	44.05	41.93	54.00	-12.07	AV
H	11570.148	52.12	8.47	38.64	44.50	54.73	68.20	-13.47	PK
H	11570.148	43.88	8.47	38.64	44.50	46.49	54.00	-7.51	AV
H	17355.127	50.64	10.12	38.38	44.10	55.04	74.00	-18.96	PK
H	17355.127	42.06	10.12	38.38	44.10	46.46	54.00	-7.54	AV
High Channel (5825 MHz)-Above 1G									
V	6039.073	62.94	7.10	37.24	43.50	63.78	68.20	-4.42	PK
V	6039.073	43.88	7.10	37.24	43.50	44.72	54.00	-9.28	AV
V	11650.086	64.22	8.46	37.68	44.50	65.86	74.00	-8.14	PK
V	11650.086	43.66	8.46	37.68	44.50	45.30	54.00	-8.70	AV
V	17475.076	61.53	10.12	38.80	44.10	66.35	68.20	-1.85	PK
V	17475.076	43.73	10.12	38.80	42.70	49.95	54.00	-4.05	AV
H	6039.082	62.76	7.10	37.24	43.50	63.60	68.20	-4.60	PK
H	6039.082	43.19	7.10	37.24	43.50	44.03	54.00	-9.97	AV
H	11650.184	50.10	8.46	38.57	44.50	52.63	74.00	-21.37	PK
H	11650.184	43.29	8.46	38.57	44.50	45.82	54.00	-8.18	AV
H	17475.008	51.01	10.12	38.38	44.10	55.41	68.20	-12.79	PK
H	17475.008	43.20	10.12	38.38	44.10	47.60	54.00	-6.40	AV

Note: PK value is lower than the Average value limit, So average didn't record.
The 26.5-40G amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.
Test Mode is MIMO Mode.

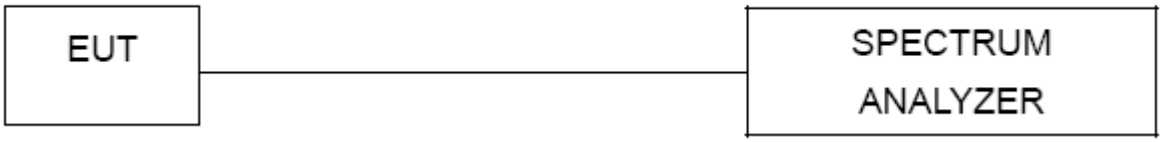
Test Mode :	TX (5.8G) -- 802.11n-HT40

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Cable loss (dB)	Antenna Factor dB/m	Preamp Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel (5755 MHz)-Above 1G									
V	4679.050	61.84	5.94	35.40	44.00	59.18	74.00	-14.82	PK
V	4679.050	43.31	5.94	35.40	44.00	40.65	54.00	-13.35	AV
V	11550.115	60.32	8.46	39.75	44.50	64.03	68.20	-4.17	PK
V	11550.115	43.94	8.46	39.75	44.50	47.65	54.00	-6.35	AV
V	17325.082	64.62	10.12	38.80	44.10	69.44	74.00	-4.56	PK
V	17325.082	43.94	10.12	38.80	42.70	50.16	54.00	-3.84	AV
H	4679.060	63.11	5.94	35.18	44.00	60.23	74.00	-13.77	PK
H	4679.060	43.93	5.94	35.18	44.00	41.05	54.00	-12.95	AV
H	11550.183	51.75	8.46	38.71	44.50	54.42	68.20	-13.78	PK
H	11550.183	40.51	8.46	38.71	44.50	43.18	54.00	-10.82	AV
H	17325.041	51.81	10.12	38.38	44.10	56.21	74.00	-17.79	PK
H	17325.041	42.69	10.12	38.38	44.10	47.09	54.00	-6.91	AV
middle Channel (5795 MHz)-Above 1G									
V	6039.139	60.48	6.48	36.35	44.05	59.26	68.20	-8.94	PK
V	6039.139	43.94	6.48	36.35	44.05	42.72	54.00	-11.28	AV
V	11590.149	62.77	8.47	37.88	44.51	64.61	74.00	-9.39	PK
V	11590.149	43.79	8.47	37.88	44.51	45.63	54.00	-8.37	AV
V	17385.104	60.67	10.12	38.80	44.10	65.49	68.20	-2.71	PK
V	17385.104	43.05	10.12	38.80	42.70	49.27	54.00	-4.73	AV
H	6039.107	61.95	6.48	36.37	44.05	60.75	68.20	-7.45	PK
H	6039.107	43.21	6.48	36.37	44.05	42.01	54.00	-11.99	AV
H	11590.190	52.14	8.47	38.64	44.50	54.75	74.00	-19.25	PK
H	11590.190	43.52	8.47	38.64	44.50	46.13	54.00	-7.87	AV
H	17385.182	51.35	10.12	38.38	44.10	55.75	68.20	-12.45	PK
H	17385.182	43.77	10.12	38.38	44.10	48.17	54.00	-5.83	AV

Note: PK value is lower than the Average value limit, So average didn't record.
The 26.5-40G amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.
The Worst mode is Antenna A.

8. POWER SPECTRAL DENSITY TEST

8.1 Block Diagram Of Test Setup



8.2 Limit

For the band 5.15-5.25 GHz,

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 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. 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).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, 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.

For the band 5.725-5.85 GHz

(3)For the band 5.725-5.85 GHz, 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.

8.3 Test procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

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8.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

8.5 Test Result

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V
Test Mode :	TX Frequency U-NII-1 (5180-5240MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

Mode	Frequency	Measured Power Density (dBm/MHz)			Limit (dBm/MHz)	Result
		ANT A	ANT B	Total		
802.11 n20	5180 MHz	4.569	0.075	5.89	17	PASS
	5200 MHz	4.040	-0.120	5.45	17	PASS
	5240 MHz	5.453	-0.351	6.47	17	PASS
802.11 n40	5190 MHz	0.594	-3.601	1.99	17	PASS
	5230 MHz	0.555	-3.535	1.98	17	PASS

(802.11n20) PSD plot on channel 36

(802.11n40) PSD plot on channel 38

(802.11n20) PSD plot on channel 40

(802.11n40) PSD plot on channel 46

(802.11n20) PSD plot on channel 48

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V
Test Mode :	TX Frequency U-NII-3 (5745-5825MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B ,only shown Antenna B Plot.

Mode	Frequency	Measured Power Density (dBm/500KHz)			Limit (dBm/500kHz)	Result
		ANT A	ANT B	Total		
802.11 n20	5745 MHz	-2.142	2.105	3.49	30	PASS
	5785 MHz	-4.328	1.571	2.56	30	PASS
	5825 MHz	-4.940	1.908	2.72	30	PASS
802.11 n40	5755 MHz	-5.728	-1.821	-0.34	30	PASS
	5795 MHz	-7.271	-1.787	-0.71	30	PASS

(802.11n20) PSD plot on channel 149

(802.11n40) PSD plot on channel 151

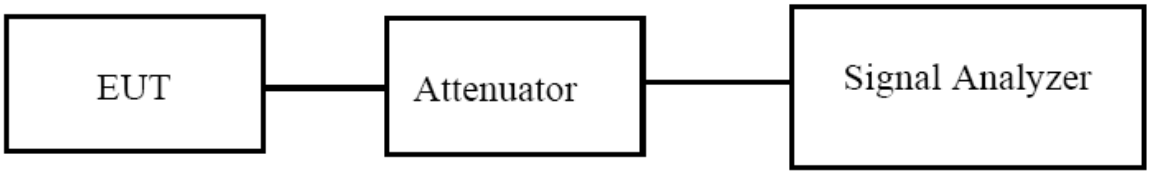
(802.11n20) PSD plot on channel 157

(802.11n40) PSD plot on channel 159

(802.11n20) PSD plot on channel 165

9. 26DB & 6DB & 99% EMISSION BANDWIDTH

9.1 Block Diagram Of Test Setup



9.2 Limit

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

9.3 Test procedure

a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 · RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

9.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

9.5 Test Result

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V
Test Mode :	TX Frequency U-NII-1 (5180-5240MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A ,only shown Antenna A Plot.

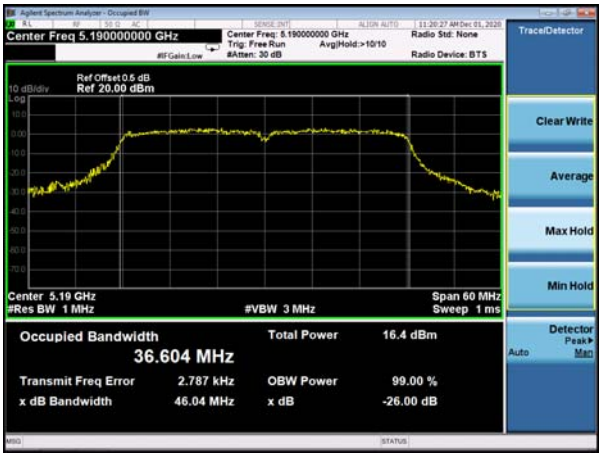
Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT A	ANT A		
802.11 n20	CH36	5180	17.789	22.03	N/A	Pass
	CH40	5200	17.778	22.03	N/A	Pass
	CH48	5240	17.782	23.29	N/A	Pass
802.11 n40	CH 38	5190	36.604	46.04	N/A	Pass
	CH 46	5230	36.811	50.78	N/A	Pass

Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT B	ANT B		
802.11 n20	CH36	5180	17.726	21.78	N/A	Pass
	CH40	5200	17.764	22.01	N/A	Pass
	CH48	5240	17.769	22.97	N/A	Pass
802.11 n40	CH 38	5190	36.585	46.48	N/A	Pass
	CH 46	5230	36.849	50.74	N/A	Pass

Test plot

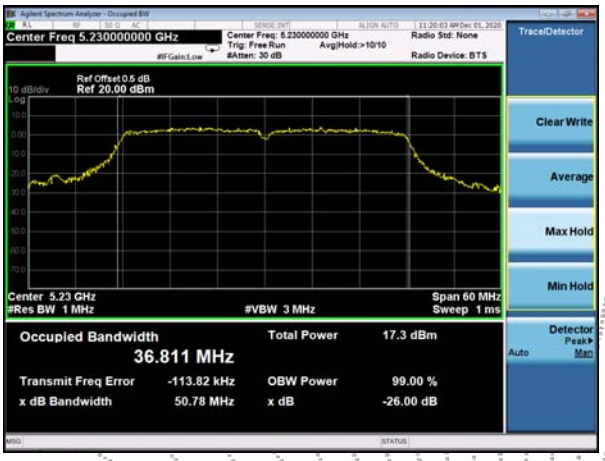
(802.11 n20) 26dB&99%Bandwidth plot on channel 36

(802.11 n40) 26dB&99%Bandwidth plot on channel 38



(802.11 n20) 26dB&99%Bandwidth plot on channel 40

(802.11 n40) 26dB&99%Bandwidth plot on channel 46



(802.11 n20) 26dB&99%Bandwidth plot on channel 48

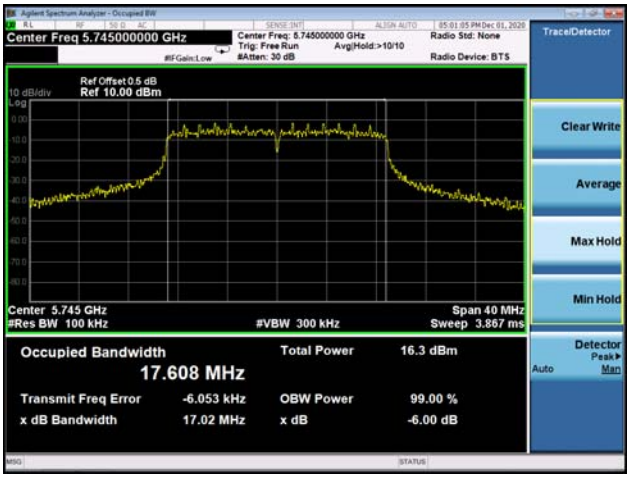
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V
Test Mode :	TX Frequency U-NII-3(5745-5825MHz)		

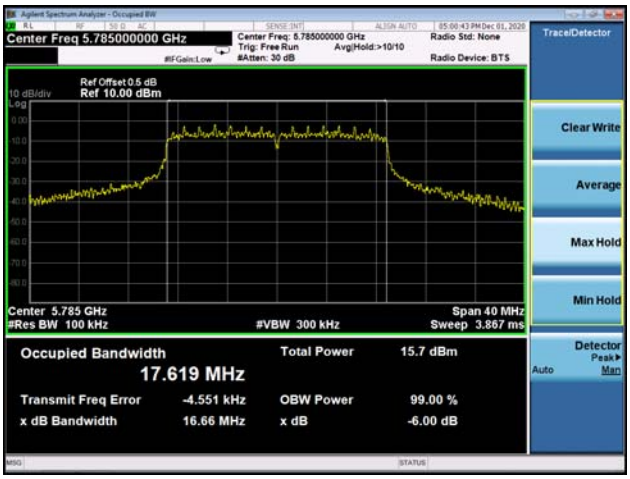
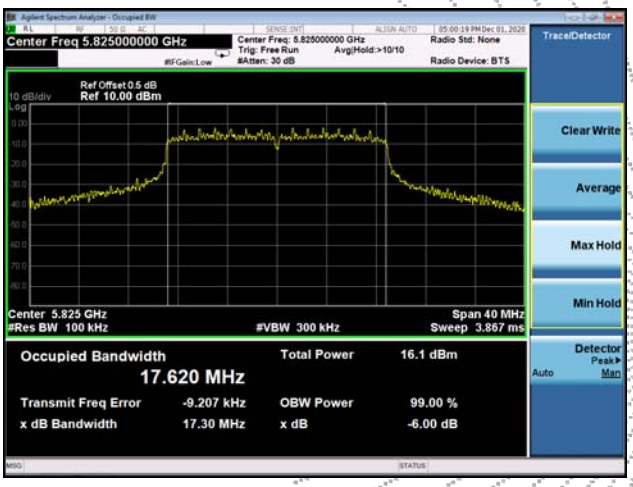
Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B, only shown Antenna B Plot.

Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	6dB bandwidth (MHz)	Limit MHz	Result
			ANT A	ANT A		
802.11 n20	CH149	5745	17.749	17.02	≥500	Pass
	CH157	5785	17.776	16.68	≥500	Pass
	CH165	5825	17.795	16.99	≥500	Pass
802.11 n40	CH151	5755	36.615	35.69	≥500	Pass
	CH159	5795	36.624	35.73	≥500	Pass

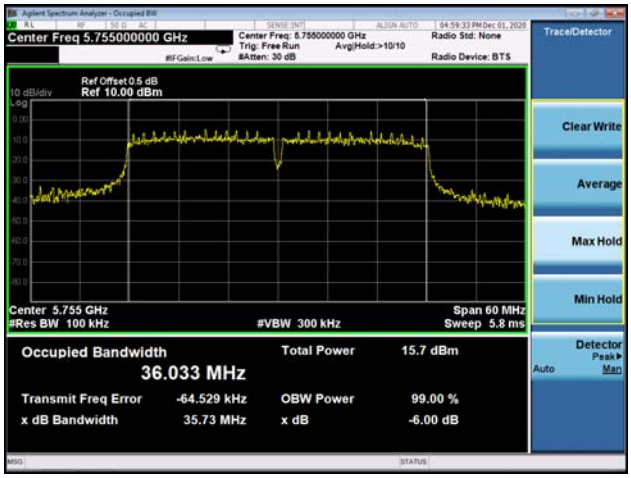
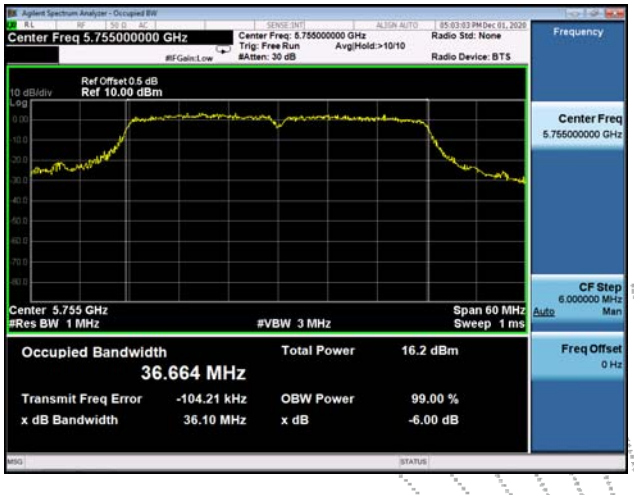
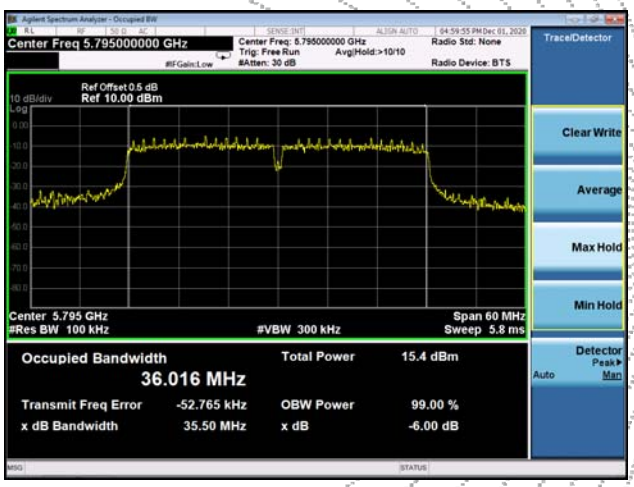
Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	6dB bandwidth (MHz)	Limit MHz	Result
			ANT B	ANT B		
802.11 n20	CH157	5745	17.794	17.02	≥500	Pass
	CH157	5785	17.778	16.66	≥500	Pass
	CH165	5825	17.763	17.30	≥500	Pass
802.11 n40	CH151	5755	36.664	35.73	≥500	Pass
	CH159	5795	36.697	35.50	≥500	Pass

Antenna B: 5725-5850MHz

Mode:	802.11n-HT20
5745MHz **6dB bandwidth**	
5745MHz 99% bandwidth	

5785MHz **6dB bandwidth**	
5785MHz 99% bandwidth	
5825MHz **6dB bandwidth**	

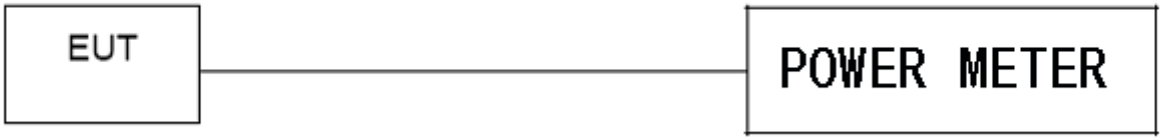
5825MHz 99% bandwidth	

Mode:	802.11n-HT40
5755 MHz **6dB bandwidth**	
5755 MHz 99% bandwidth	
5795 MHz **6dB bandwidth**	

5795 MHz **99% bandwidth**	

10. MAXIMUM CONDUCTED OUTPUT POWER

10.1 Block Diagram Of Test Setup



10.2 Limit

According to FCC §15.407
The maximum conduced output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	1W
5725~5850	1W

10.3 Test procedure

Maximum conducted output power may be measured using a spectrum analyzer/EMI receiver or an RF power meter.

1. Device Configuration
If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

a) The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)
Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.1 However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

• The EUT transmits continuously (or with a duty cycle ≥ 98 percent).

• Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be

averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than ± 2 percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

10.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.