Qingdao Intelligent&Precise Electronics Co., Ltd

C2PC RF TEST REPORT

Report Type:
FCC Part 15.407 & ISED RSS-247 RF report

Model:
ZDGF7668AU-F

REPORT NUMBER:
190900303SHA-002

ISSUE DATE:
September 25, 2019

DOCUMENT CONTROL NUMBER:
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Intertek Testing Services Shanghai
Building No.86, 1198 Qinzhou Road (North)
Caohejing Development Zone
Shanghai 200233, China

Telephone: 86 21 6127 8200
www.intertek.com

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TEST REPORT

Report no.: 190900303SHA-002

Applicant:	Qingdao Intelligent&Precise Electronics Co., Ltd No.218, Qianwangang Road, Qingdao Economic&Technological Development Zone, Shandong, China.
Manufacturer:	Qingdao Intelligent&Precise Electronics Co., Ltd No.218, Qianwangang Road, Qingdao Economic&Technological Development Zone, Shandong, China.
Factory 1:	Qingdao Intelligent&Precise Electronics Co., Ltd No.218, Qianwangang Road, Qingdao Economic&Technological Development Zone, Shandong, China.
FCC ID:	2AJVQ-ZDGF7668AU
IC:	22470-ZDGF7668AU

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2018): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-247 Issue 2 (February 2017): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (March 2019): General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
Project Engineer Nemo Li	Reviewer Daniel Zhao

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Revision History

Report No.	Version	Description	Issued Date
190900303SHA-002	Rev. 01	Initial issue of report	September 25, 2019

Measurement result summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Maximum Conducted Output Power	15.407(a)	RSS-247 Issue 2 Clause 6	Pass
Radiated emission	15.407(b) 15.205 15.209	RSS-247 Issue 2 Clause 6 RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.407(b) 15.207	RSS-Gen Issue 5 Clause 8.8	Pass

Notes: 1: NA =Not Applicable

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Wireless Module
Type/Model:	ZDGF7668AU-F
Description of EUT:	Add a new model ZDGF7668AU-F. For the new model, the connector of the module is changed from HX1.25-10P-W-K to F05049-16P. Component R1046 is changed from 0 Ω to 0.6nH, Component L1006 is changed from NC to 0.2pF, in order to improve the spurious emission. By technical analysis and evaluation, only the conducted output power, radiated emission and Power line conducted emission on the worst mode was retested.
Rating:	DC 5V
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	September 9, 2019
Date of test:	September 9, 2019 ~ September 20, 2019

1.2 Technical Specification

Frequency Range:	5150 ~ 5250MHz 5250 ~ 5350MHz 5470 ~ 5725MHz 5725 ~ 5850MHz
Support Standards:	802.11a, 802.11n(HT20), 802.11n(HT40), 802.11ac(VHT20), 802.11ac(VHT40), 802.11ac(VHT80)
Type of Modulation:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Channel Number:	For 5150 ~ 5250MHz band: Channel 36 - 48 For 5250 ~ 5350MHz Band: Channel 52 - 64 For 5470 ~ 5725MHz Band: Channel 100 - 140 For 5725 ~ 5850MHz band: Channel 149 - 165

1.3 Antenna information

Antenna No.	Model	Antenna type	Antenna Gain	Note
0	-	PIFA	3.17dBi	-
1	-	PIFA	3.43dBi	-

Mode	Tx/Rx Function	Beamforming function	CDD function	Directional gain (dBi)
802.11a	1Tx/1Rx	NO	NO	-
802.11n(HT20) 802.11ac(VHT20)	2Tx/2Rx	NO	NO	3.30
802.11n(HT40) 802.11ac(VHT40)	2Tx/2Rx	NO	NO	3.30
802.11ac(VHT80)	2Tx/2Rx	NO	NO	3.30

Note: For 802.11b and 802.11g mode, it only supports 1TX.
For 802.11n modes, it can support 2TX, all the two transmit signals are completely uncorrelated with each other, so the directional gain = 10 log $((10^{G1/10} + 10^{G2/10} + \ldots + 10^{Gn/10}) / N_{ANT})$

1.4 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab CAB identifier.: CN0051
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2018)
ANSI C63.10 (2013)
RSS-247 Issue 2 (February 2017)
RSS-Gen Issue 5 (March 2019)
KDB 789033 D02 v02r01

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the continuously transmission was applied by following software.

Software name	Manufacturer	Version	Supplied by
QA Tool	MTK	-	Client

The worst mode as below was chosen to perform all the tests.

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
5150 - 5250	802.11n(HT40)	5190	/	5230
5250 - 5350	802.11n(HT20)	5260	5300	5320
5470 - 5725	802.11n(HT40)	5510	5590	5670
5725 – 5850	802.11ac(VHT80)	/	5775	/

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL 5480	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Maximum Conducted Output Power	24°C	56% RH
Radiated Emissions	24°C	56% RH
Power line conducted emission	24°C	56% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESCS 30	EC 2107	2020-07-14
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2019-11-29
☐	A.M.N.	R&S	ENV 216	EC 3393	2020-07-14
☐	A.M.N.	R&S	ENV4200	EC 3558	2020-06-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2020-09-12
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2019-12-10
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2020-06-11
☒	Horn antenna	R&S	HF 906	EC 3049	2019-11-16
☐	Horn antenna	ETS	3117	EC 4792-1	2020-02-25
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2020-03-14
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2020-03-04
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2020-03-04
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2020-03-04
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2019-12-22
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2020-03-04
☐	Mobile Test System	Litepoint	Iqxel	EC 5176	2020-01-08
☐	Test Receiver	R&S	ESCI 7	EC 4501	2020-09-12
☐	Climate chamber	GWS	MT3065	EC 6021	2020-07-04
☒	Spectrum Analyzer	Keysight	N9030B	EC 6078	2020-06-11
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2020-01-13

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☐	Shielded room	Zhongyu	-	EC 2839	2020-01-13
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2020-07-31
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2020-07-31
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2020-03-10
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3481	2019-12-23
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2020-02-27
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2020-04-07

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

3 Maximum conducted output power and e.i.r.p.

Test result: **Pass**

3.1 Limit

☐ For an outdoor access point operating in the band 5.15-5.25GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W provided the maximum antenna gain does not exceed 6dBi.
The maximum e.i.r.p. at any elevation angle above 30 degrees from the horizon must not exceed 125mW (21 dBm).

☐ For an indoor access point operating in the band 5.15-5.25GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6dBi.

☐ For fixed point-to-point access points operating in the band 5.15-5.25GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W.

☒ For client devices in the 5.15-5.25GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi.

☒ For the 5.25-5.35GHz and 5.47-5.725GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or 11dBm + 10logB, where B is the 26dB emission bandwidth in megahertz.

☒ For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W.

☒ For Frequency Band 5150-5250 MHz, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

☒ For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 99% emission bandwidth in megahertz.

☒ For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz.

☒ For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

3.2 Measurement Procedure

The EUT was tested according to test procedure of "KDB789033 D02 General UNII Test Procedures New Rules"

For 802.11a and 802.11n(HT20) mode:

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in II.B.

(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

(iv) Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (1/0.25) if the duty cycle is 25%).

For 802.11n(HT40) and 802.11ac(VHT80):

(i) Measure the duty cycle, x, of the transmitter output signal as described in II.B.

(ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(iii) Set RBW = 1 MHz.

(iv) Set VBW ≥ 3 MHz.

(v) 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.)

(vi) Sweep time = auto.

(vii) Detector = power averaging (rms), if available. Otherwise, use sample detector mode.

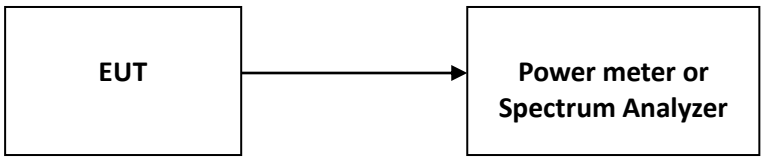
(viii) Do not use sweep triggering. Allow the sweep to "free run."

(ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.

(x) 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 levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(xi) Add 10 log (1/x), where x is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log (1/0.25) = 6 dB if the duty cycle is 25%.

3.3 Test Configuration



3.4 Test Results of Maximum conducted output power and e.i.r.p.

1.1 Test Data

U-NII-1 Duty Cycle				
Mode	Test Frequency (MHz)	Ant	Duty Cycle (%)	Duty Cycle Factor (dB)
802.11n (HT40)	5190	Ant0	92.11	0.36
802.11n (HT40)	5190	Ant1	89.74	0.47
802.11n (HT40)	5230	Ant0	92.11	0.36
802.11n (HT40)	5230	Ant1	89.74	0.47

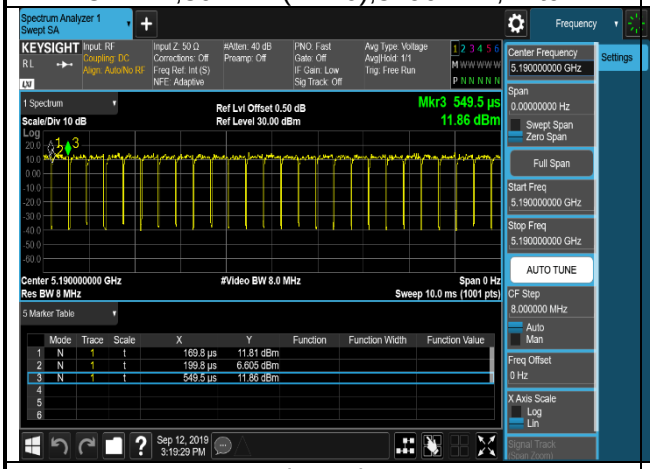
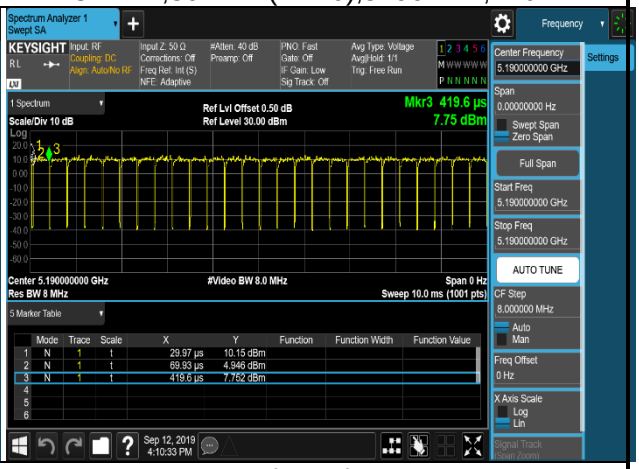
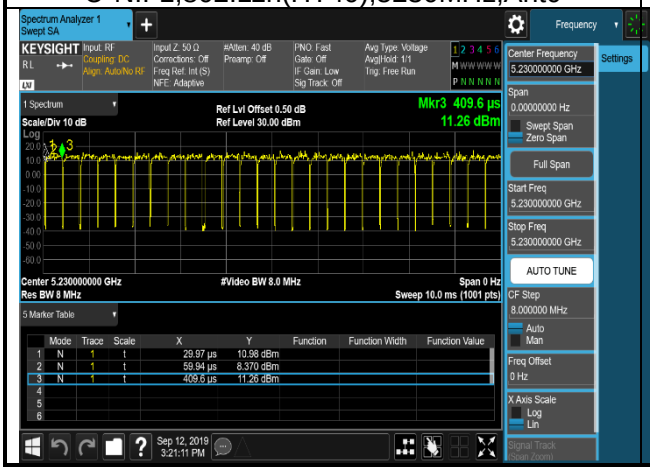
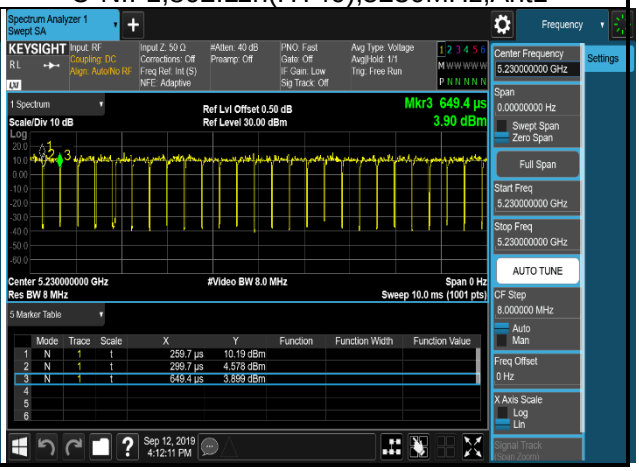
U-NII-2a Duty Cycle				
Mode	Test Frequency (MHz)	Ant	Duty Cycle (%)	Duty Cycle Factor (dB)
802.11n (HT20)	5260	Ant0	95.77	0.19
802.11n (HT20)	5260	Ant1	94.37	0.25
802.11n (HT20)	5300	Ant0	95.71	0.19
802.11n (HT20)	5300	Ant1	95.71	0.19
802.11n (HT20)	5320	Ant0	94.37	0.25
802.11n (HT20)	5320	Ant1	94.37	0.25

U-NII-2c Duty Cycle				
Mode	Test Frequency (MHz)	Ant	Duty Cycle (%)	Duty Cycle Factor (dB)
802.11n (HT40)	5510	Ant0	92.11	0.36
802.11n (HT40)	5510	Ant1	92.11	0.36
802.11n (HT40)	5550	Ant0	89.74	0.47
802.11n (HT40)	5550	Ant1	92.11	0.36
802.11n (HT40)	5590	Ant0	92.11	0.36
802.11n (HT40)	5590	Ant1	92.11	0.36
802.11n (HT40)	5670	Ant0	92.11	0.36
802.11n (HT40)	5670	Ant1	89.47	0.48

U-NII-3 Duty Cycle				
Mode	Test Frequency	Ant	Duty Cycle (%)	Duty Cycle Factor

	(MHz)			(dB)
802.11ac (VHT80)	5775	Ant0	84.26	0.74
802.11ac (VHT80)	5775	Ant1	84.21	0.75

1.2 Test Plots

U-NII-1,802.11n(HT40),5190MHz,Ant0	U-NII-1,802.11n(HT40),5190MHz,Ant1
	
U-NII-1,802.11n(HT40),5230MHz,Ant0	U-NII-1,802.11n(HT40),5230MHz,Ant1
	

U-NII-2a,802.11n(HT20),5260MHz ,Ant0	U-NII-2a,802.11n(HT20),5260MHz ,Ant1

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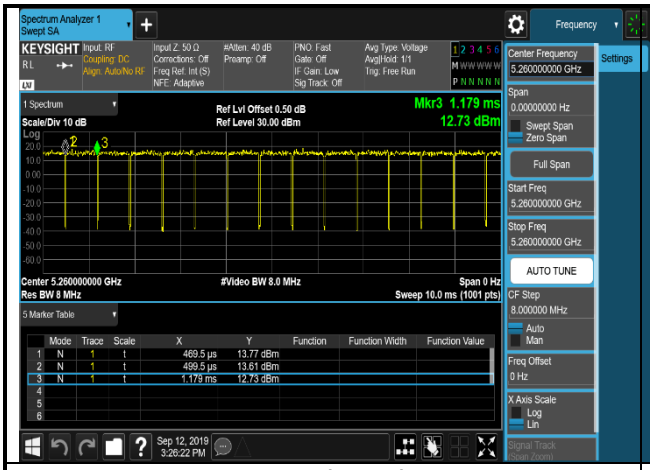

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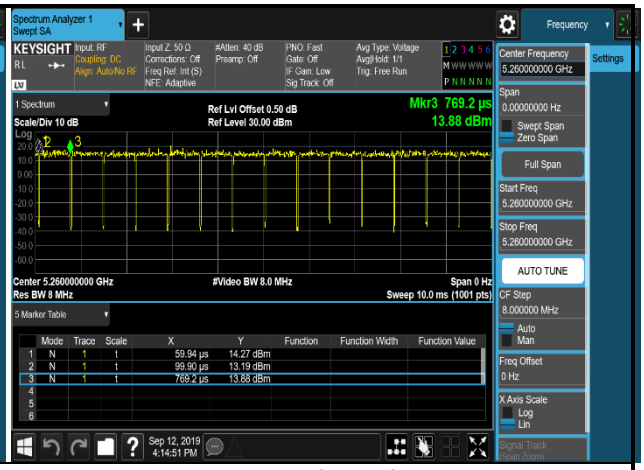

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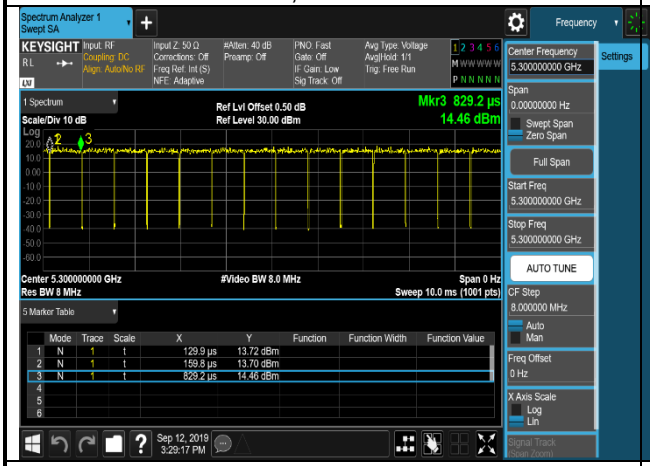

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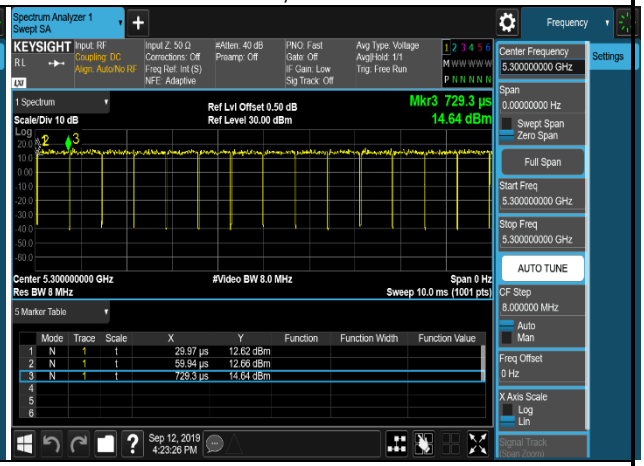

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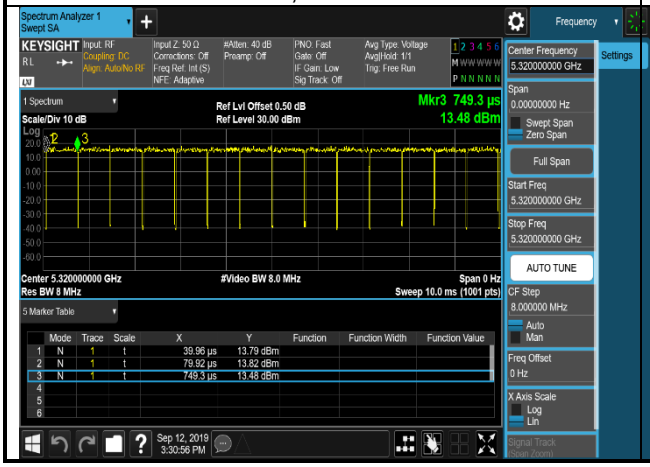
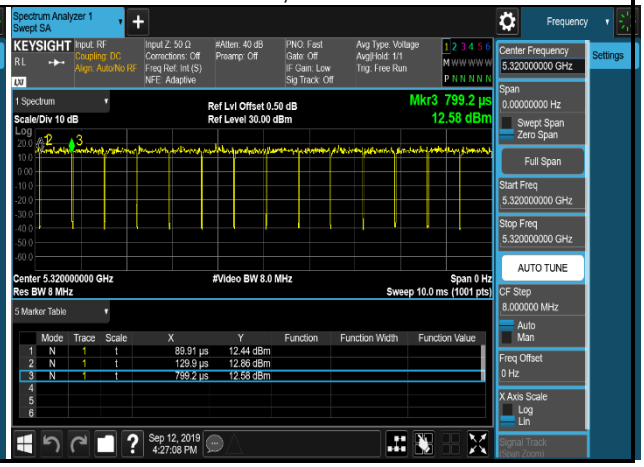


U-NII-2c,802.11n(HT40),5510MHz ,Ant0



U-NII-2c,802.11n(HT40),5510MHz ,Ant1

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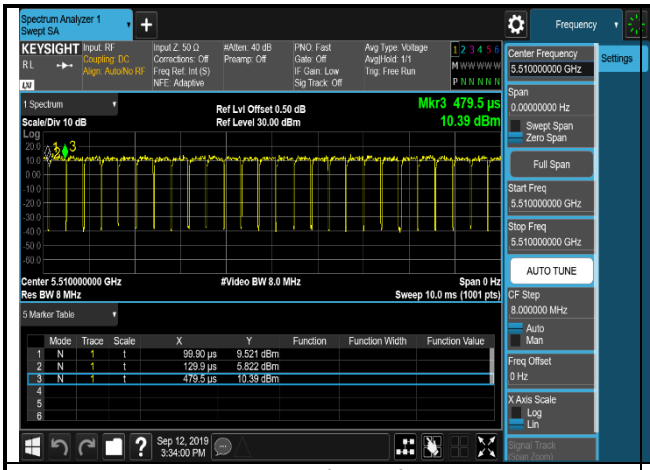
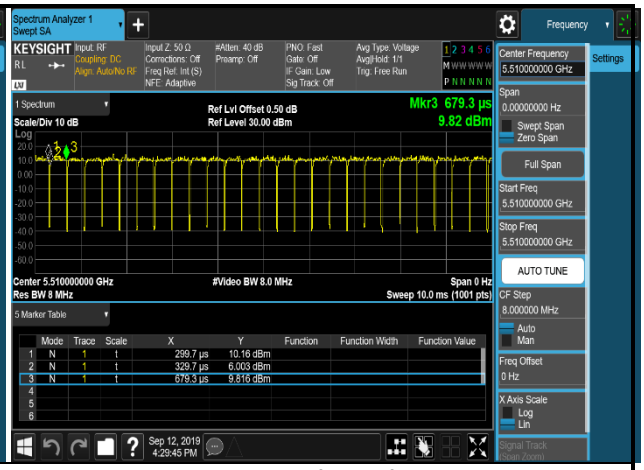
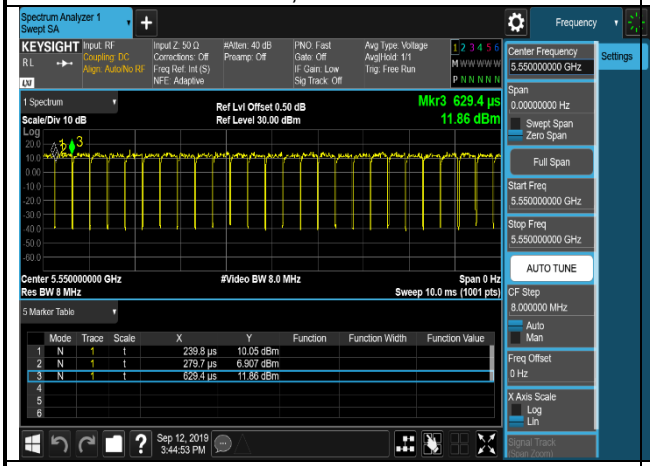


U-NII-2c,802.11n(HT40),5550MHz ,Ant0



U-NII-2c,802.11n(HT40),5550MHz ,Ant1



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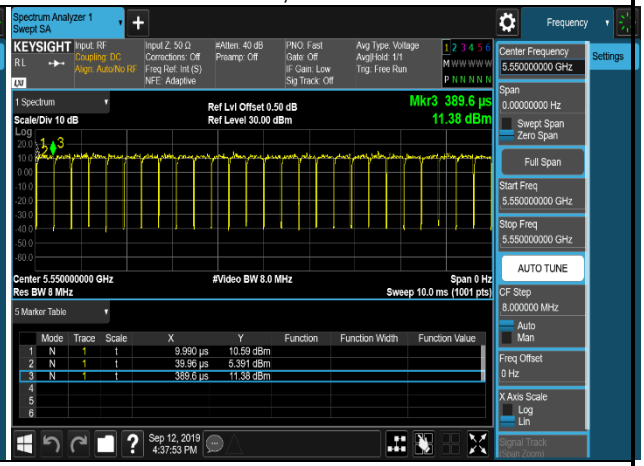

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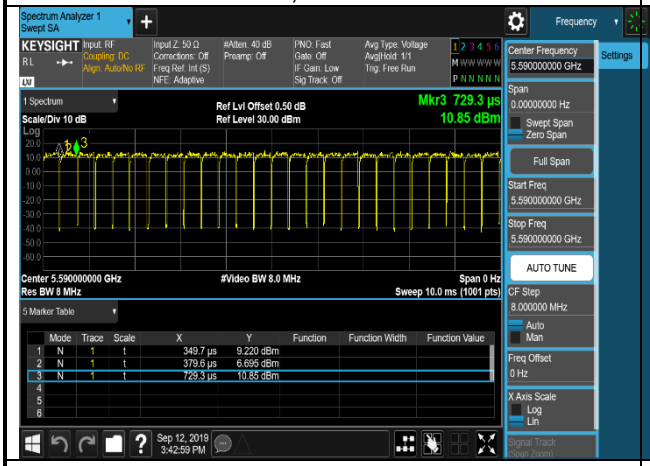

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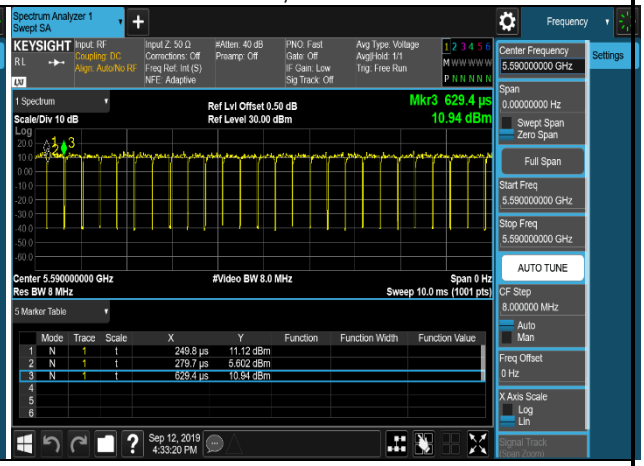

U-NII-2c,802.11n(HT40),5670MHz ,Ant1

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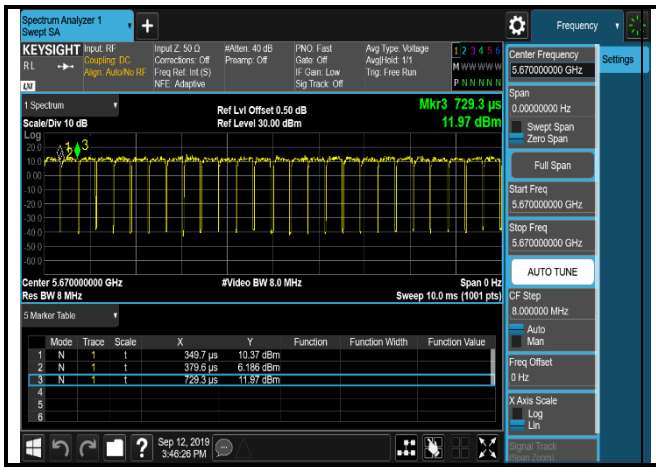
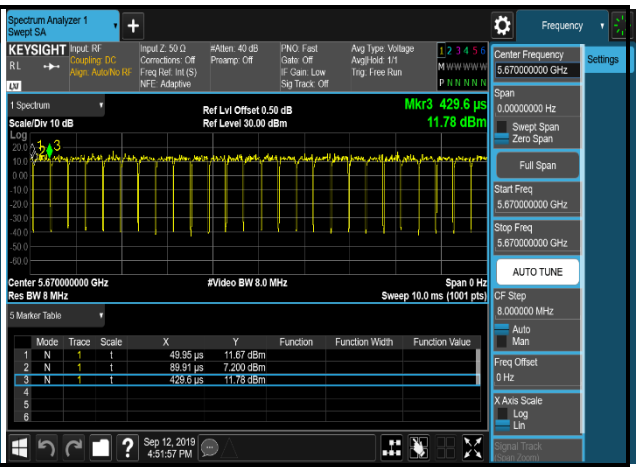
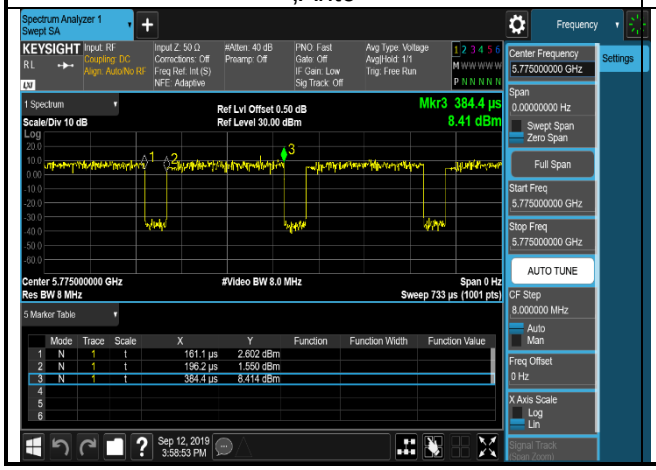
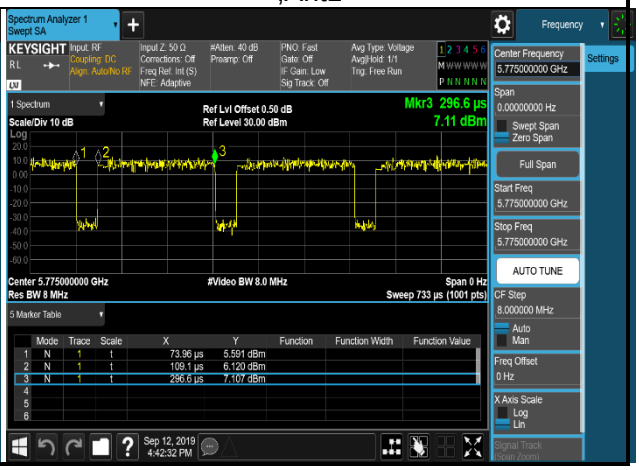




U-NII-3,802.11ac(VHT80),5775MHz ,Ant0	U-NII-3,802.11ac(VHT80),5775MHz ,Ant1





2. AVGSA Output Power

2.1 Test Data

U-NII-1 AVGSA Output Power								
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	Max Power (dBm)	Total or max Power (dBm)	Limit (dBm)	EIRP (dBm)	Result
802.11n (HT40)	5190	Ant0	0.36	10.60	12.90	24	16.20	Pass
802.11n (HT40)	5190	Ant1	0.47	9.05				
802.11n (HT40)	5230	Ant0	0.36	10.81	13.14	24	16.44	Pass
802.11n (HT40)	5230	Ant1	0.47	9.33				

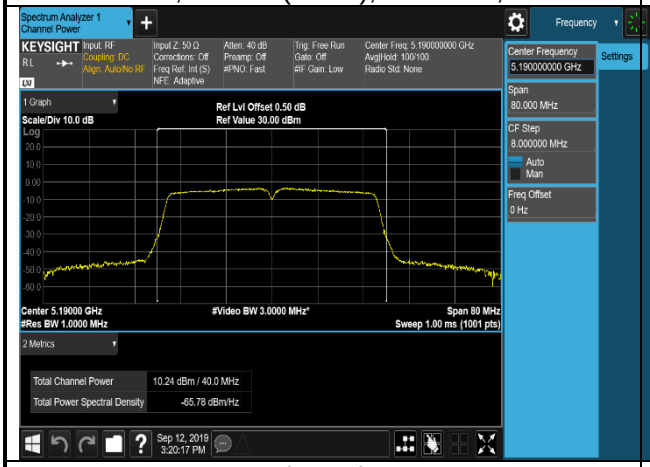
U-NII-2a AVGSA Output Power								
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	Max Power (dBm)	Total or max Power (dBm)	Limit (dBm)	EIRP (dBm)	Result
802.11n (HT20)	5260	Ant0	0.19	11.21	13.57	24	16.87	Pass
802.11n (HT20)	5260	Ant1	0.25	9.79				
802.11n (HT20)	5300	Ant0	0.19	11.25	13.61	24	16.91	Pass
802.11n (HT20)	5300	Ant1	0.19	9.84				
802.11n (HT20)	5320	Ant0	0.25	11.17	13.63	24	16.93	Pass
802.11n (HT20)	5320	Ant1	0.25	9.99				

U-NII-2c AVGSA Output Power								
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	Max Power (dBm)	Total or max Power (dBm)	Limit (dBm)	EIRP (dBm)	Result
802.11n (HT40)	5510	Ant0	0.36	10.28	13.07	24	16.37	Pass
802.11n (HT40)	5510	Ant1	0.36	9.82				
802.11n (HT40)	5550	Ant0	0.47	10.77	13.40	24	16.70	Pass
802.11n	5550	Ant1	0.36	9.98				

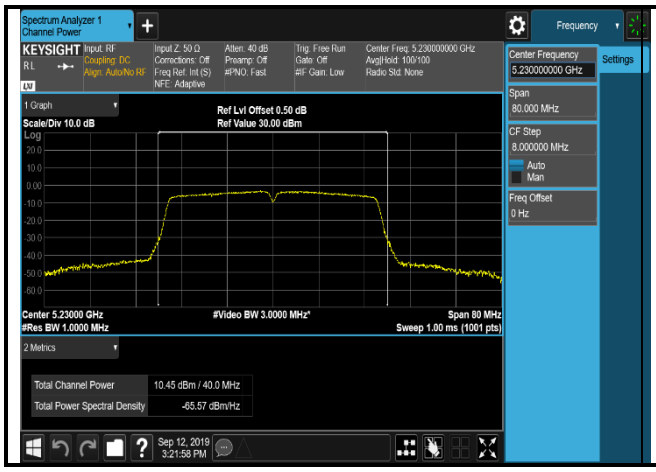
(HT40)								
802.11n (HT40)	5590	Ant0	0.36	10.45	13.11	24	16.41	Pass
802.11n (HT40)	5590	Ant1	0.36	9.72				
802.11n (HT40)	5670	Ant0	0.36	10.22	13.19	24	16.49	Pass
802.11n (HT40)	5670	Ant1	0.48	10.13		24		Pass

U-NII-3 AVGSA Output Power								
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	Max Power (dBm)	Total or max Power (dBm)	Limit (dBm)	EIRP (dBm)	Result
802.11ac (VHT80)	5775	Ant0	0.74	10.82	13.58	30	16.88	Pass
802.11ac (VHT80)	5775	Ant1	0.75	10.30				

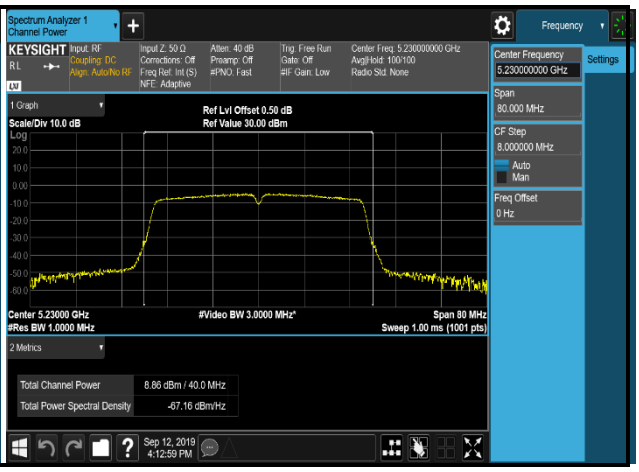
2.2 Test Plots

U-NII-1,802.11n(HT40),5190MHz,Ant0	U-NII-1,802.11n(HT40),5190MHz,Ant1
	
U-NII-1,802.11n(HT40),5230MHz,Ant0	U-NII-1,802.11n(HT40),5230MHz,Ant1

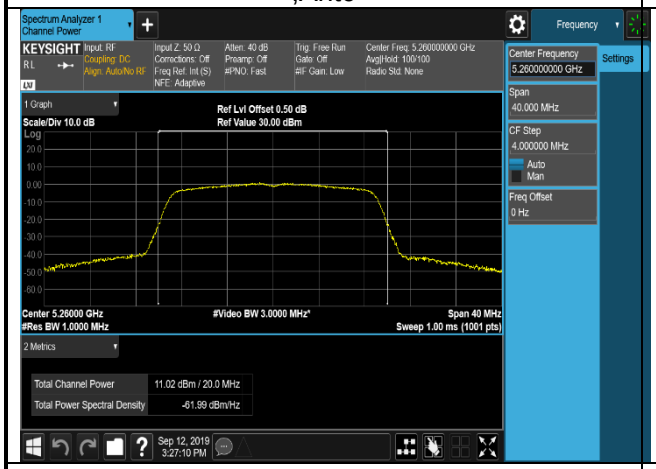
TEST REPORT



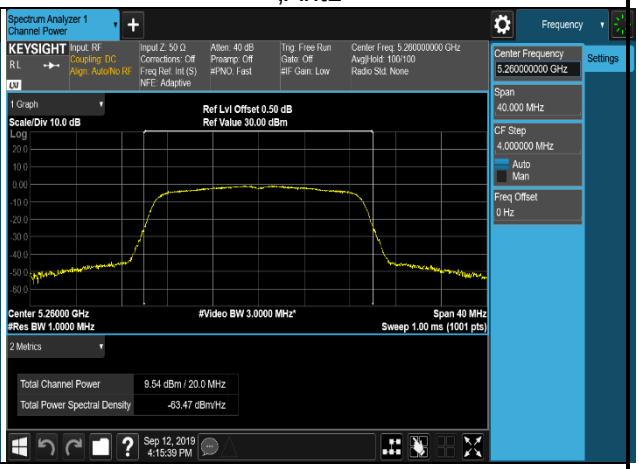
U-NII-2a,802.11n(HT20),5260MHz ,Ant0



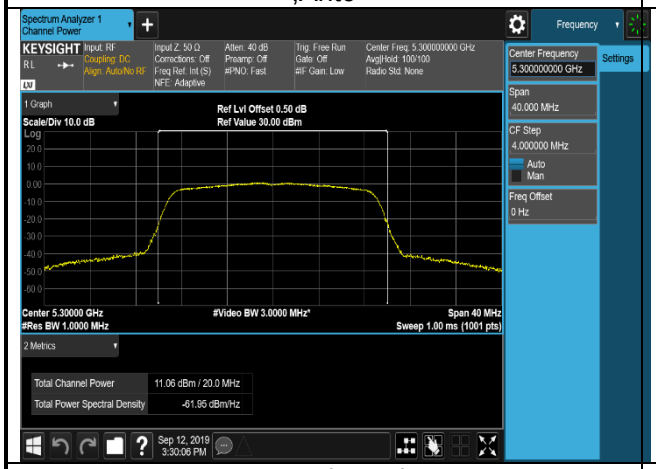
U-NII-2a,802.11n(HT20),5260MHz ,Ant1



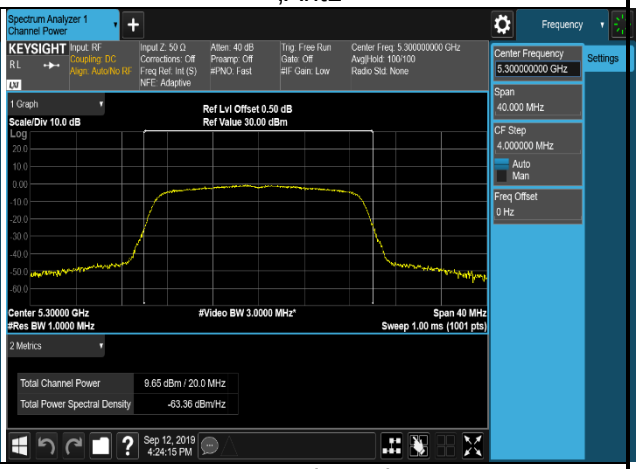
U-NII-2a,802.11n(HT20),5300MHz ,Ant0



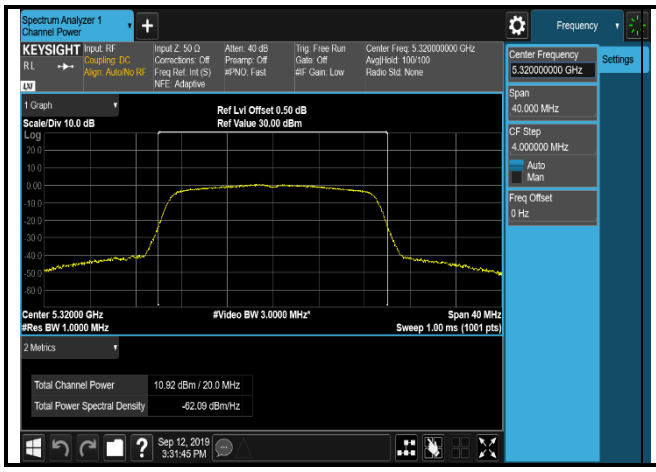
U-NII-2a,802.11n(HT20),5300MHz ,Ant1



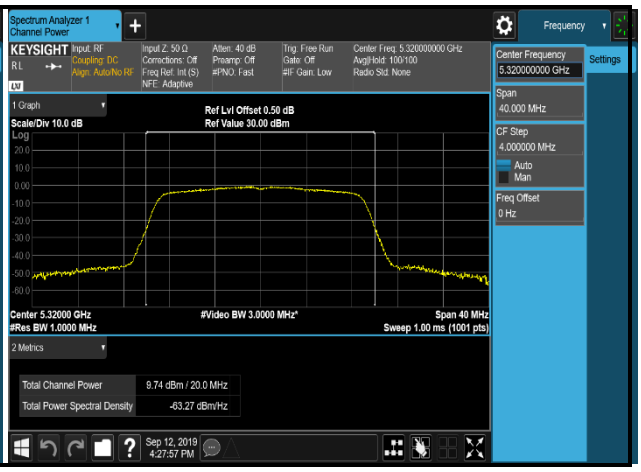
U-NII-2a,802.11n(HT20),5320MHz ,Ant0



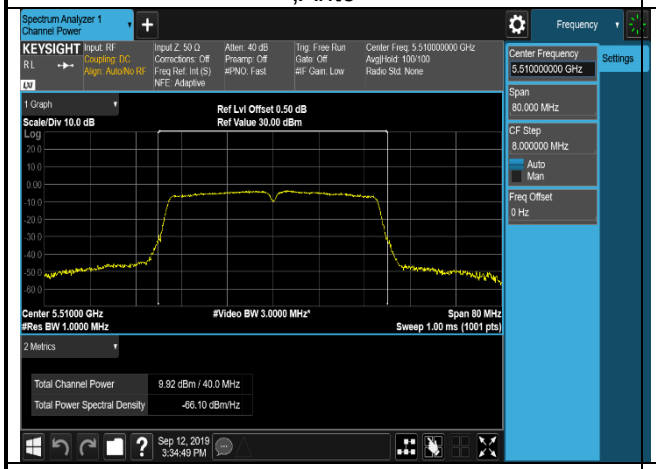
U-NII-2a,802.11n(HT20),5320MHz ,Ant1



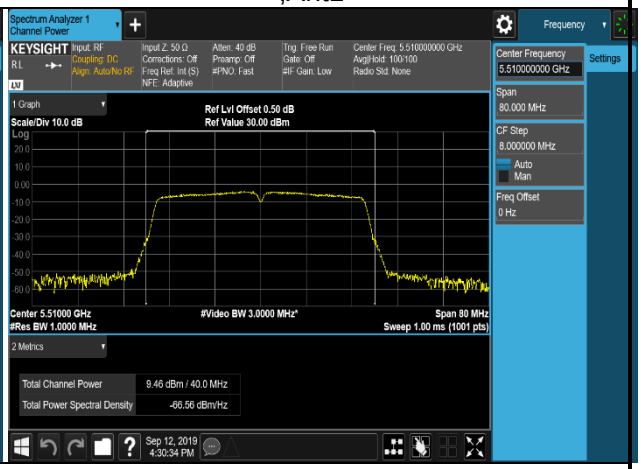
U-NII-2c,802.11n(HT40),5510MHz ,Ant0



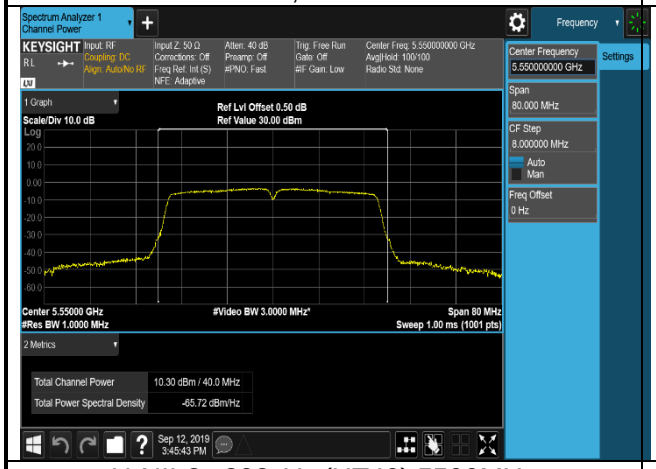
U-NII-2c,802.11n(HT40),5510MHz ,Ant1



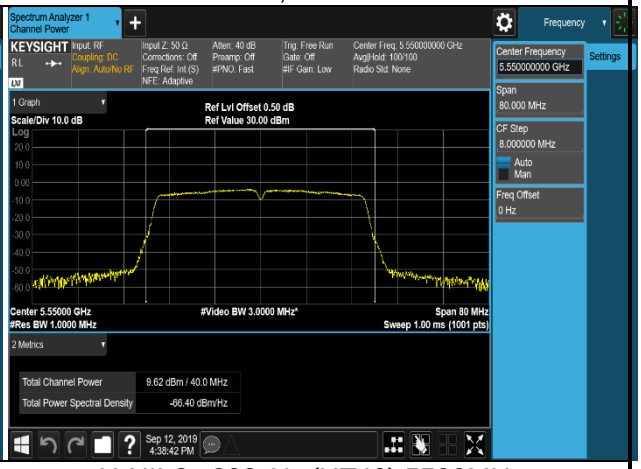
U-NII-2c,802.11n(HT40),5550MHz ,Ant0



U-NII-2c,802.11n(HT40),5550MHz ,Ant1

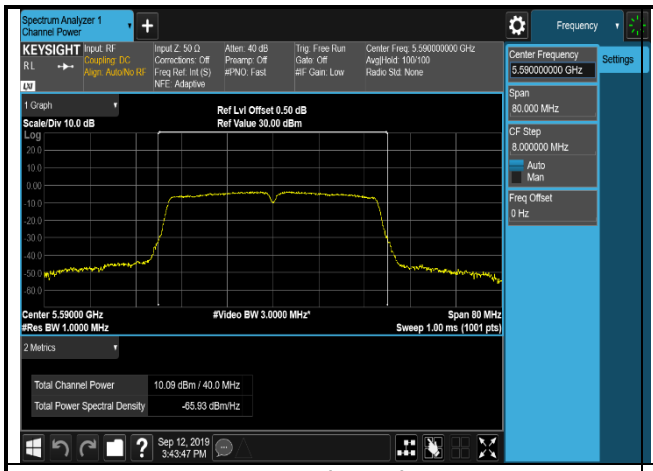


U-NII-2c,802.11n(HT40),5590MHz ,Ant0

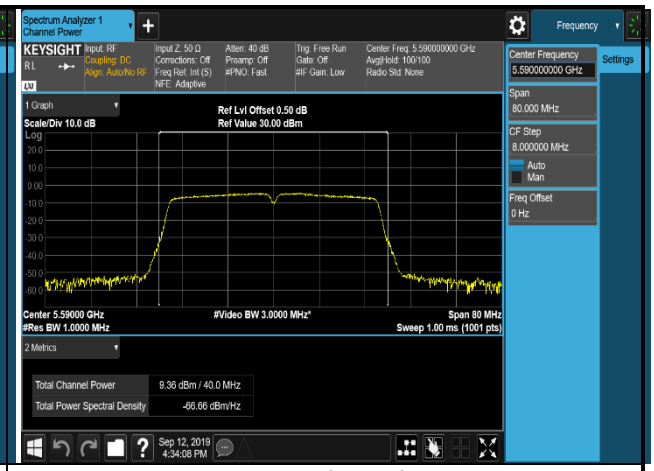


U-NII-2c,802.11n(HT40),5590MHz ,Ant1

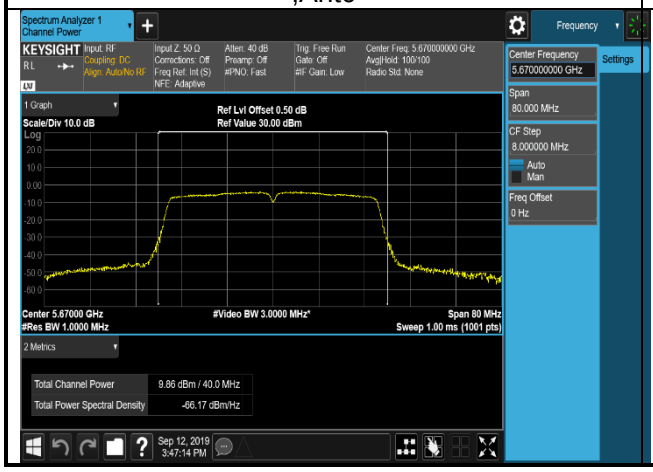
TEST REPORT

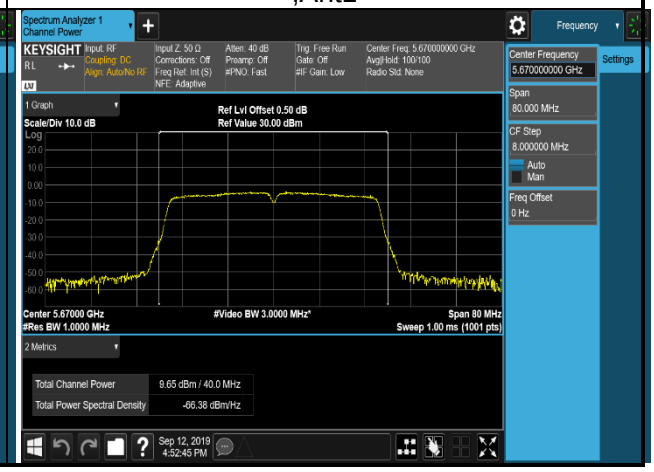


U-NII-2c,802.11n(HT40),5670MHz ,Ant0

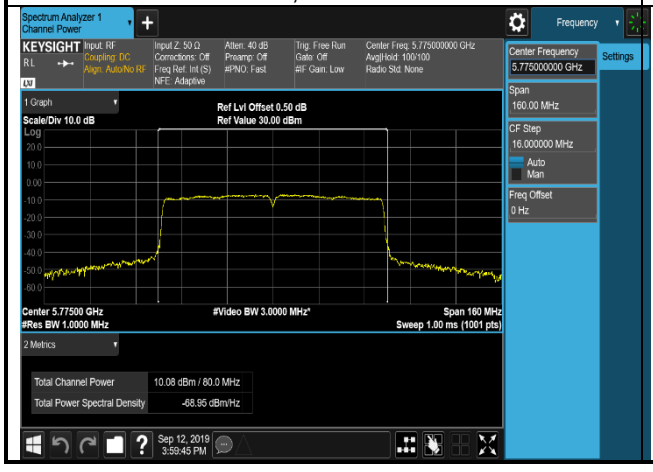


U-NII-2c,802.11n(HT40),5670MHz ,Ant1

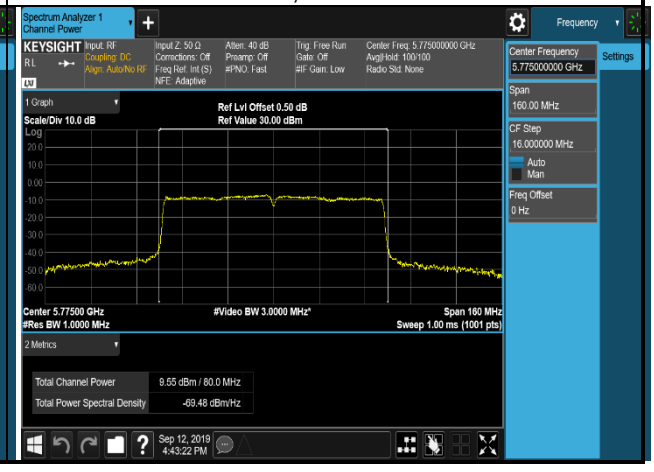




U-NII-3,802.11ac(VHT80),5775MHz ,Ant0



U-NII-3,802.11ac(VHT80),5775MHz ,Ant1



4 Radiated Emissions

Test result: **Pass**

4.1 Limit

The radiated emissions which fall in the restricted bands, and the radiated emissions below 1GHz, must comply with the radiated emission limits specified showed as below:

Frequencies (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
Above 960	500	3

The radiated emissions which fall outside the restrict bands, should comply with the EIRP limit as below:

For transmitters operating in the 5.15 - 5.25 / 5.25 - 5.35 / 5.47 - 5.725GHz band:

Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength (3m) (dBµV/m)
<5150	-27	68.20
>5350		
<5470		
>5725		

For transmitters operating in the 5.725 - 5.85GHz band:

Frequency (MHz)	EIRP Limit (dBm/MHz)	Equivalent Field Strength (3m) (dBµV/m)
<5650	-27	68.20
5650 ~ 5700	-27 ~ 10	68.20 ~ 105.20
5700 ~ 5720	10 ~ 15.6	105.20 ~ 110.80
5720 ~ 5725	15.6 ~ 27	110.80 ~ 122.20
5850 ~ 5855	27 ~ 15.6	122.20 ~ 110.80
5855 ~ 5875	15.6 ~ 10	110.80 ~ 105.20
5875 ~ 5925	10 ~ -27	105.20 ~ 68.20
>5925	-27	68.20

4.2 Measurement Procedure

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to peak or quasi-peak detect function and specified bandwidth with maximum hold mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

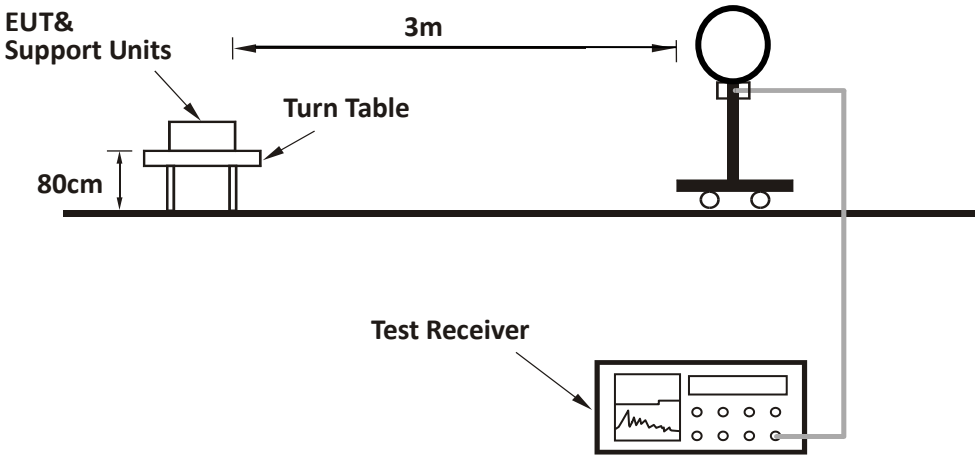
a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to peak or quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

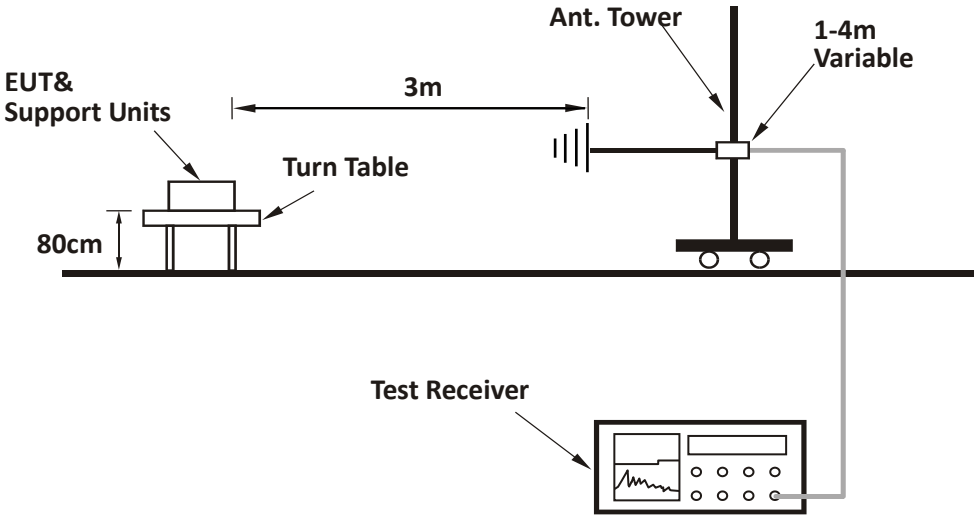
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for peak or quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz at frequency above 1GHz for peak detection above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.3 Test Configuration

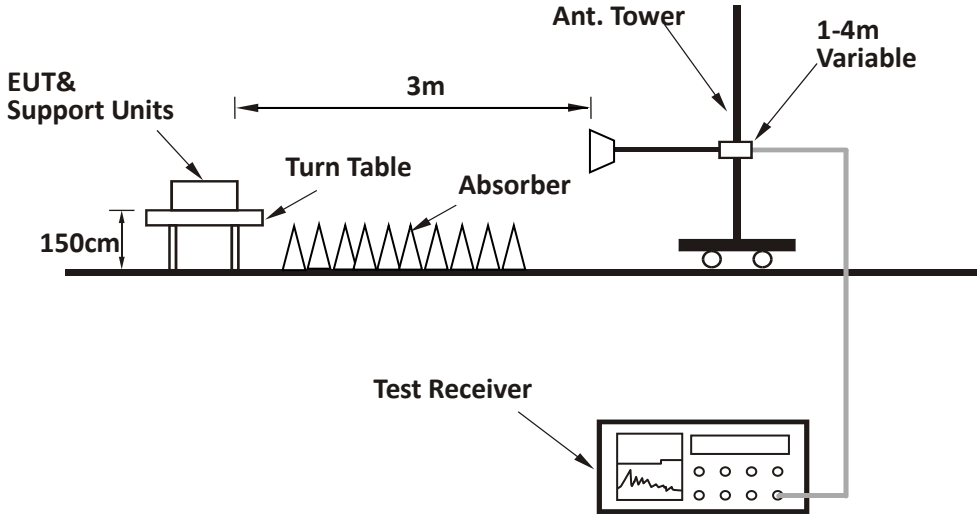
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:



4.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

EUT was tested with Bluetooth transmitting on and off simultaneously, and the worst data was listed in the report.

Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	24.60	21.30	40	15.40	PK
H	55.27	19.70	6.00	40	20.30	PK
H	156.35	30.70	10.10	43.5	12.80	PK
H	239.94	38.60	12.80	46	7.40	PK
H	341.02	36.80	15.80	46	9.20	PK
H	935.85	32.90	25.40	46	13.10	PK
V	30.00	24.30	21.30	40	15.70	PK
V	84.43	18.90	10.00	40	21.10	PK
V	123.31	21.80	11.80	43.5	21.70	PK
V	199.12	29.30	11.20	43.5	14.20	PK
V	533.47	29.00	19.80	46	17.00	PK
V	922.24	33.40	25.40	46	12.60	PK

Test result above 1GHz:

The emission was conducted from 1GHz to 40GHz

U-NII-1 Band:

802.11n(HT40)

Channel	Polarity	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	5190	40.80	103.50	Fundamental	/	PK
	H/V	5150	40.80	64.50	74.00	9.50	PK
	H/V	5150	40.80	49.11	54.00	4.89	AV
H	H/V	5230	40.80	103.50	Fundamental	/	PK
	H/V	5150	40.80	52.60	74.00	21.40	PK

U-NII-2A Band:

802.11n(HT20)

Channel	Polarity	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	5260	40.80	107.50	Fundamental	/	PK
	H/V	5350	40.80	52.60	74.00	21.40	PK
M	H/V	5300	40.80	107.50	Fundamental	/	PK
H	H/V	5320	40.80	107.50	Fundamental	/	PK
	H/V	5350	40.80	63.00	74.00	11.00	PK
	H/V	5350	40.80	49.74	54.00	5.26	AV

U-NII-2C Band:

802.11n(HT40)

Channel	Polarity	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	5510	40.90	103.50	Fundamental	/	PK
	H/V	5469	40.90	63.50	68.20	4.70	PK
M	H/V	5600	40.90	103.50	Fundamental	/	PK

H	H/V	5700	40.90	103.50	Fundamental	/	PK
	H/V	5725	40.90	61.50	68.20	6.70	PK

U-NII-3 Band:

802.11ac(VHT80)

Channel	Polarity	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	5775	40.80	103.00	Fundamental	/	PK
	H/V	5647	40.50	62.40	68.20	5.80	PK
	H/V	5936	41.00	64.60	68.20	3.60	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (- Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

5 Power line conducted emission

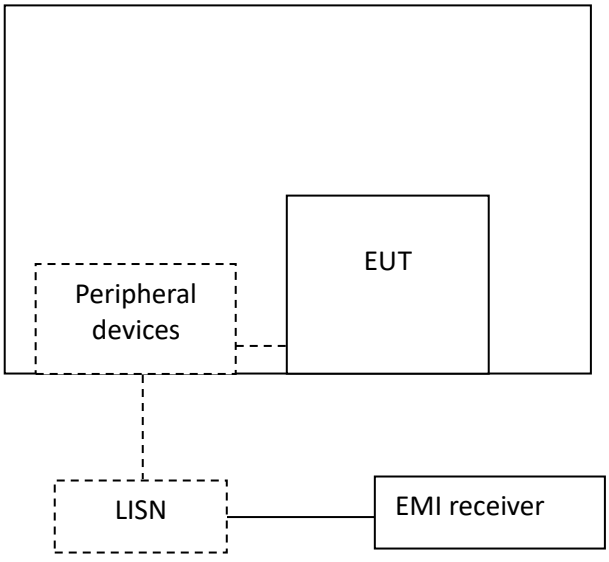
Test result: **Pass**

5.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

5.2 Test Configuration

5.3



5.4 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

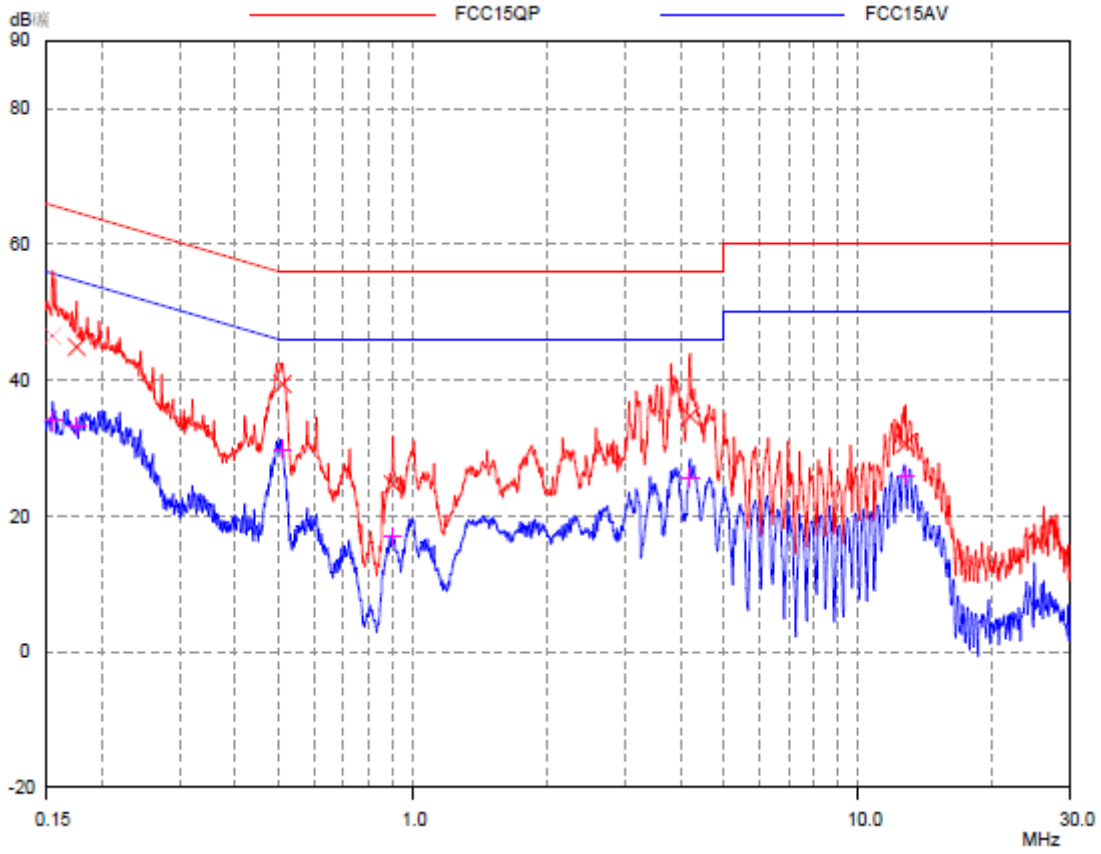
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

5.5 Test Results of Power line conducted emission

Test Curve:

L Line



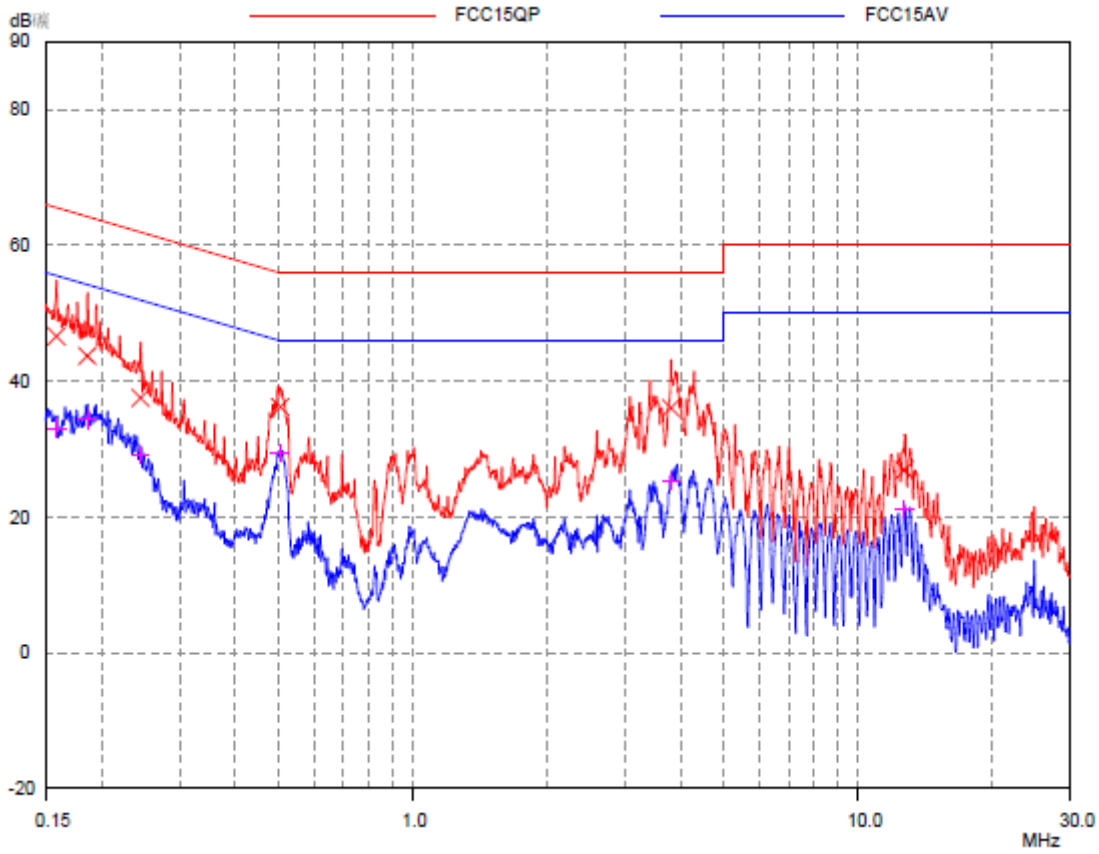
Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.16	46.49	65.70	19.21	34.04	55.70	21.66
0.18	44.87	64.67	19.80	33.24	54.67	21.43
0.51	39.43	56.00	16.57	29.84	46.00	16.16
0.90	24.63	56.00	31.37	17.04	46.00	28.96
4.20	34.71	56.00	21.29	25.70	46.00	20.30
12.81	30.63	60.00	29.37	25.82	50.00	24.18

TEST REPORT

Test Curve:

N Line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.16	46.61	65.54	18.93	33.09	55.54	22.45
0.19	43.71	64.21	20.50	34.35	54.21	19.86
0.25	37.51	61.92	24.41	29.08	51.92	22.84
0.50	36.19	56.00	19.81	29.47	46.00	16.53
3.81	36.04	56.00	19.96	25.32	46.00	20.68
12.76	26.92	60.00	33.08	21.20	50.00	28.80

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

********** END **********

Total Quality. Assured.

TEST REPORT