FCC Part 15C Test Report

FCC ID: 2AFW8XZH-787

Product Name:	Binj-amin 1.0
Trademark:	Binj
Model Name :	Binj-amin 1.0
Prepared For : Address :	**Webtuner Corp.** 11121 Willows Rd. Suite #101Redmond,WA 98052,USA
Prepared By : Address :	**Shenzhen BCTC Technology Co., Ltd.** No.101,Yousong Road,Longhua New District, Shenzhen,China
Test Date:	Sep. 22 – Sep. 30, 2015
Date of Report :	Sep. 30, 2015
Report No.:	BCTC-150912063

VERIFICATION OF COMPLIANCE

Applicant's name.....:	**Webtuner Corp.**
Address .....:	11121 Willows Rd. Suite #101Redmond,WA 98052,USA
Manufacture's Name .....:	**MOVEON TECHNOLOGY LIMITED**
Address .....:	World Trade Plaza-A block#3201-3202,Fuhong Road, Futian,Shenzhen,China
Product description	
Product name.....:	Binj-amin 1.0
Trademark:	Binj
Model Name:	Binj-amin 1.0
Test procedure	FCC Part15.407
Standards	ANSI C63.10-2013

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Result : **Pass**

Testing Engineer : Eric Yang

(Eric Yang)

Technical Manager : Sophie Lu

(Sophia Lee)

Authorized Signatory : Carson. Zhang

(Carson. Zhang)

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Test Report Declaration Page

1.TEST SUMMARY

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emissions	15.407(b), 15.209	PASS
26dB bandwidth and 99%dB Bandwidth	15.403(i) 15.407(e)	PASS
Power density	15.407 (a)	PASS
Maximum Peak Output Power	15.407 (a)	PASS
Emissions from out of band	15.407 (b)	PASS
Transmission in case of Absence of Information	15.407(c)	PASS
Frequency Stability	15.407(g)	PASS
Antenna Requirement	15.203	PASS
Peak Excursion Ratio test	15.407	PASS

2.GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Product Name:	Binj-amin 1.0
Model No.:	Binj-amin 1.0
Operation Frequency:	5745-5825 MHz(5G 802.11a/n(HT20)) 5755-5795 MHz(802.11n(HT40))
Channel numbers:	5channels for 5G 802.11a/n(HT20) 2channels for 802.11n(HT40)
Modulation technology:	64QAM, 16QAM, QPSK, BPSK for OFDM
Data speed (IEEE 802.11a):	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps,54Mbps
Data speed (IEEE 802.11n):	Up to 150Mbps
Antenna Type:	FPCB ANT
Antenna gain:	0dBi
Power Supply:	DC 3.7V

Channel List for 802.11a/n(20)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785	06	

Channel List for 802.11n(40)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
106	5755	161	5795

2.3. Test Supporting System

None.

2.4. Independent Operation Modes

The basic operation modes are:

These is Digital Transmission system (DTS) and have modulation OFDM, DSSS, DBPSK, DQPSK, CCK, 16QAM, 64QAM. According exploratory test, EUT will have maximum output power in those data rate (802.11a/n: MCS0), so those data rate were used for all test. The equipment enables high-speed access without wires to network assets. This adapter uses the IEEE 802.11 protocol to enable wireless communications between the host and Wireless rooter.

For 802.11a/n(HT20):

1.lowest channel : 5745MHz (Channel 149)

2. middle channel : 5785MHz (Channel 157)

3. highest channel : 5825MHz (Channel 165)

For 802.11n(HT40):

4. lowest channel : 5755MHz (Channel 151)

5. For highest channel : 5795MHz (Channel 159)

Note: for conducted emission test, we pretest all mode,the worst mode was 802.11a channel 36.
for radiated emissions test, we pretest all mode,the worst mode was 802.11a.
The worst mode's data was recording and show in the test report.

2.5. Test Sites

2.5.1. Test Facilities

Lab Qualifications : FCC Registration No.:187086

2.6. List of Test and Measurement Instruments

Conduction test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	1166.5950K03-101165-ha	2015.07.06	2016.07.05	1 year
2	LISN	R&S	NSLK8126	8126466	2015.08.24	2016.08.23	1 year
3	LISN	R&S	NSLK8126	8126487	2015.08.24	2016.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2015.07.06	2016.07.05	1 year
5	RF cables	R&S	R204	R20X	2015.07.06	2016.07.05	1 year

Radiation test, Band-edge test and 6db bandwith test equipment

Item	Kind of equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2015.07.06	2016.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.07.06	2016.07.05	1 year
3	Bilog Antenna	R&S	VULB9168	VULB9168-438	2015.07.06	2016.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.07.06	2016.07.05	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2015.07.06	2016.07.05	1 year
6	Horn Antenna	R&S	HF906	10027	2015.07.06	2016.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2015.07.06	2016.07.05	1 year
8	Amplifier	R&S	BBV9743	9743-019	2015.12.22	2016.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2015.07.06	2016.07.05	1 year
10	RF cables	R&S	R203	R20X	2015.07.06	2016.07.05	1 year
11	Antenna connector	Florida RFLabs	Lab-Fle	RF 01#	2015.07.06	2016.07.05	1 year
12	Power Metter	ANRITSU	ML2487A	6K00001568	2015.07.06	2016.07.05	1 year
13	Power Sensor (AV)	ANRITSU	ML2491A	030989	2015.07.06	2016.07.05	1 year
14	Signal Analyzer	Agilent	N9010A	MY48030494	2015.07.06	2016.07.05	1 year

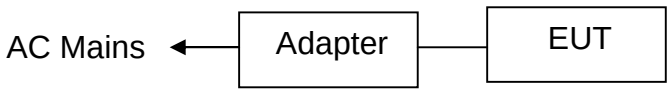
3. TEST SET-UP AND OPERATION MODES

3.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



(EUT: Binj-amin 1.0)

3.3. Test Operation Mode and Test Software

None.

3.4. Special Accessories and Auxiliary Equipment

Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
Adapter	N/A	JX-B050100-1	N/A	

3.5. Countermeasures to Achieve EMC Compliance

None.

4. EMISSION TEST RESULTS

4.1. Conducted Emission Measurement

POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class B (dBuV)		Standard
	Quasi -peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

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.

The following table is the setting of the receiver

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

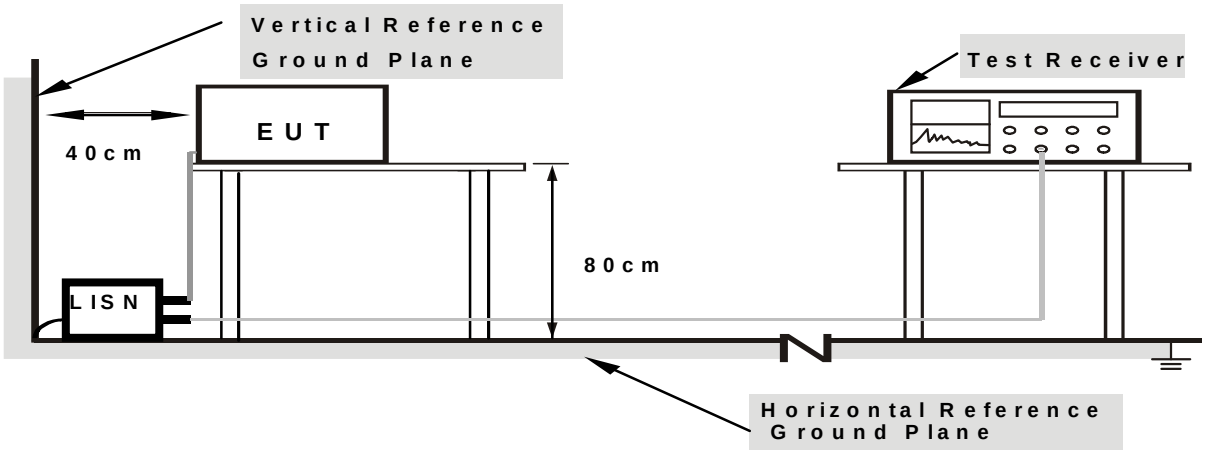
4.1.1. TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling 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 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.2. DEVIATION FROM TEST STANDARD

No deviation

4.1.3. TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

4.1.4. EUT OPERATING CONDITIONS

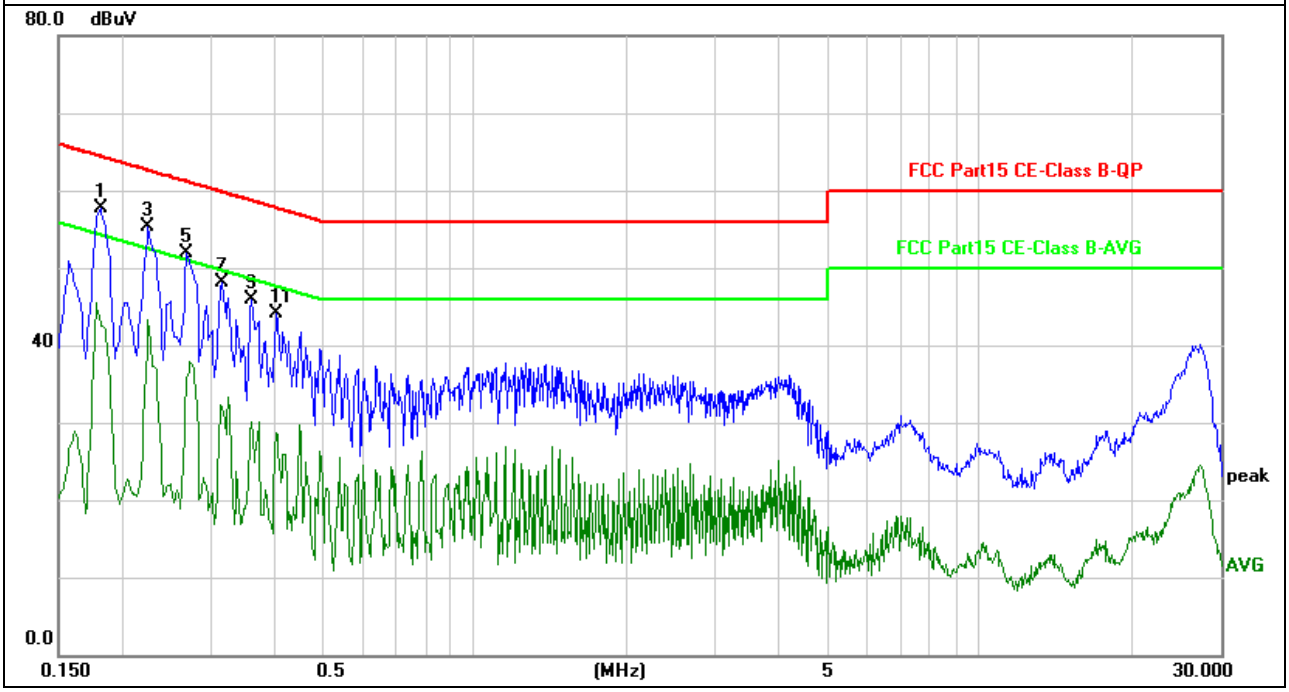
The EUT was configured for testing in a typical fashion (as a customer would normally use it).
The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.
We pretest all adapter's emission, only the adapter 1's data was worst and the data was recording in the report.
The data only show the worst mode.
If peak level comply with Quasi-Peak limit, then the Quasi-Peak level is deemed to comply with Quasi-Peak limit.
We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

4.1.5. TEST RESULTS

EUT:	Binj-amin 1.0	Model Name :	Binj-amin 1.0
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
Test Voltage :	DC 5V from adapter input AC 120V/60Hz	Test Mode:	TX Mode

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1820	47.68	10.06	57.74	64.39	-6.65	QP
0.1820	35.46	10.06	45.52	54.39	-8.87	AVG
0.2260	45.16	10.07	55.23	62.60	-7.37	QP
0.2260	33.27	10.07	43.34	52.60	-9.26	AVG
0.2700	41.81	10.09	51.90	61.12	-9.22	QP
0.2700	27.80	10.09	37.89	51.12	-13.23	AVG
0.3180	37.97	10.10	48.07	59.76	-11.69	QP
0.3180	23.17	10.10	33.27	49.76	-16.49	AVG
0.3620	35.76	10.10	45.86	58.68	-12.82	QP
0.3620	20.02	10.10	30.12	48.68	-18.56	AVG
0.4060	34.02	10.11	44.13	57.73	-13.60	QP
0.4060	18.50	10.11	28.61	47.73	-19.12	AVG

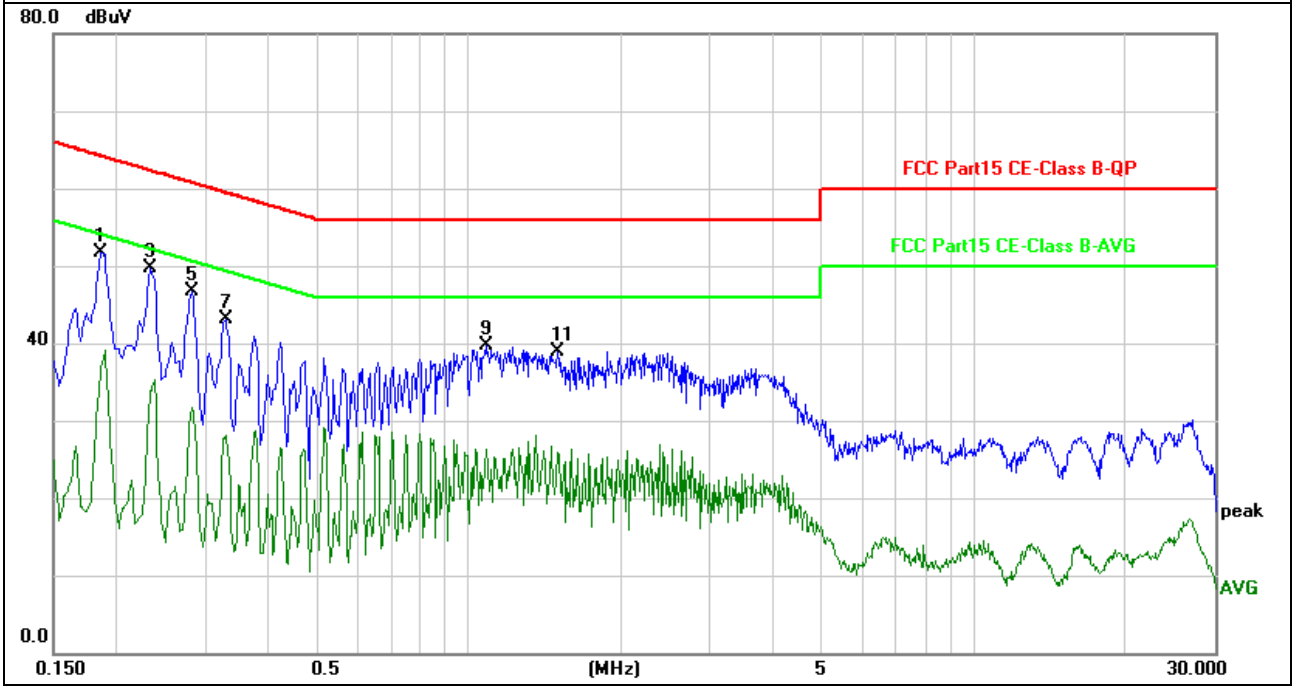
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT:	Binj-amin 1.0	Model Name :	Binj-amin 1.0
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	DC 5V from adapter input AC 120V/60Hz	Test Mode:	TX Mode

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1860	41.62	10.06	51.68	64.21	-12.53	QP
0.1860	29.03	10.06	39.09	54.21	-15.12	AVG
0.2340	39.60	10.07	49.67	62.31	-12.64	QP
0.2340	25.14	10.07	35.21	52.31	-17.10	AVG
0.2820	36.71	10.09	46.80	60.76	-13.96	QP
0.2820	21.67	10.09	31.76	50.76	-19.00	AVG
0.3300	33.07	10.10	43.17	59.45	-16.28	QP
0.3300	17.95	10.10	28.05	49.45	-21.40	AVG
1.0780	29.46	10.17	39.63	56.00	-16.37	QP
1.0780	16.20	10.17	26.37	46.00	-19.63	AVG
1.4980	28.76	10.17	38.93	56.00	-17.07	QP
1.4980	16.58	10.17	26.75	46.00	-19.25	AVG

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



4.2. Radiated Emission Measurement

4.2.1. Radiated Emission Limits (Frequency Range 9kHz-1000MHz)

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.

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (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).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

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

4.2.2. TEST PROCEDURE

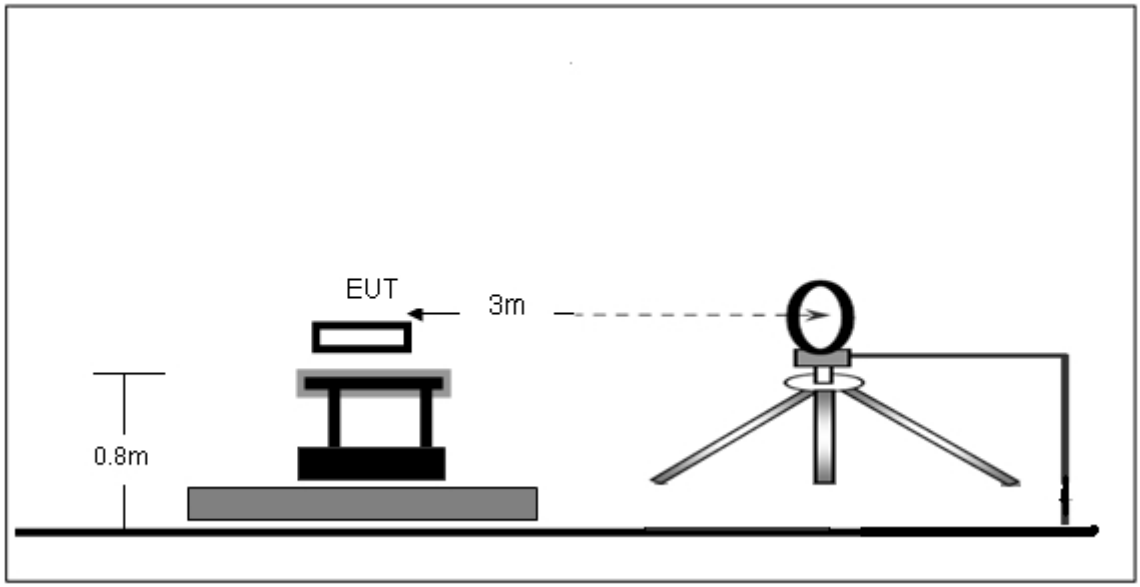
a. The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 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.
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.
g. For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
Note:
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported
We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

4.2.3. DEVIATION FROM TEST STANDARD

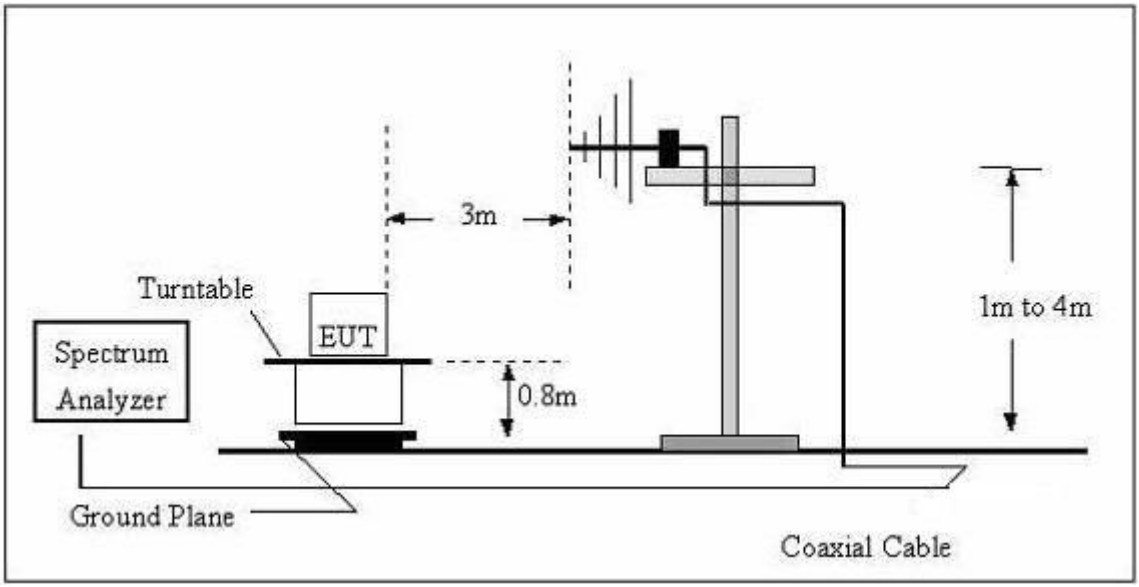
No deviation

4.2.4. TEST SETUP

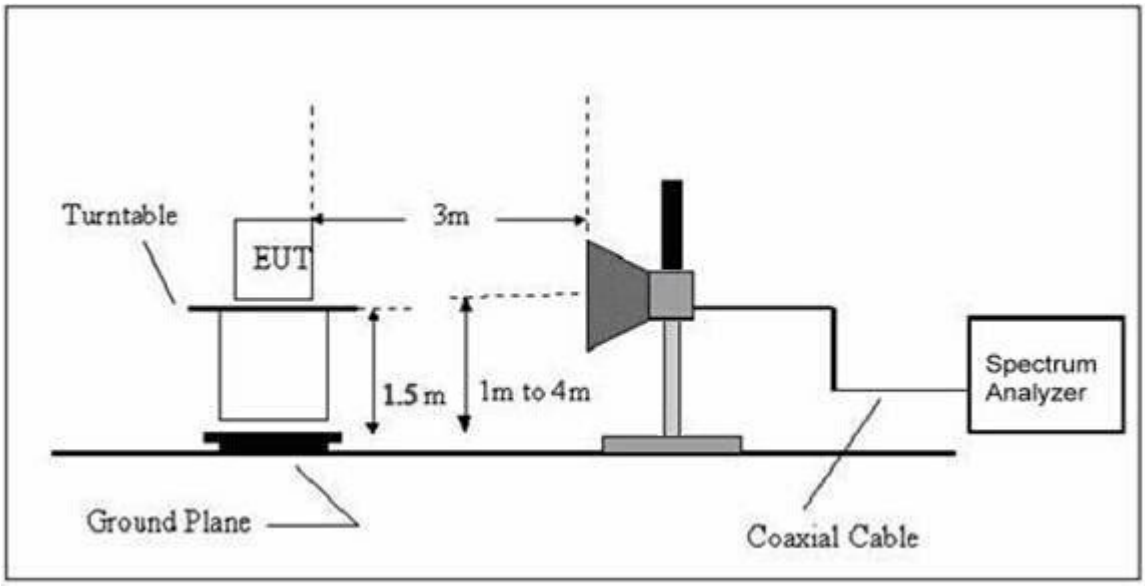
（A）Radiated Emission Test-Up Frequency Below 30MHz



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



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



4.2.5. EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

We pretest all adapter's emission, only the adapter 1's data was worst and the data was recording in the report.

The data only show the worst mode.

Radiated Spurious Emission (Below 30MHz)

EUT：	Binj-amin 1.0	Model Name ：	Binj-amin 1.0
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization :	---
Test Voltage ：	DC 3.7V		
Test Mode ：	TX		

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

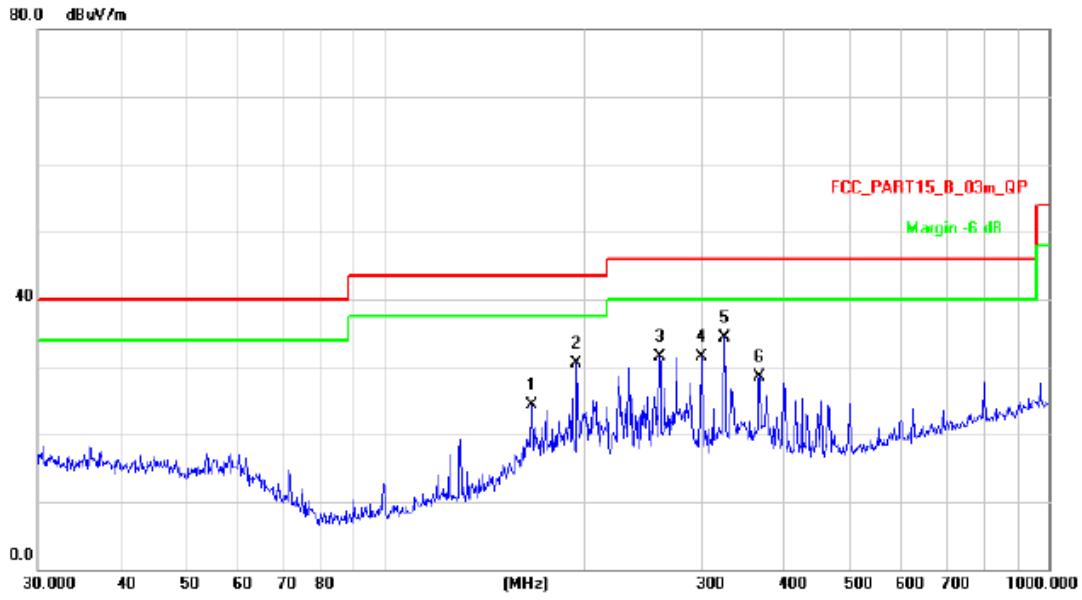
Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

Radiated Spurious Emission (Between 30MHz – 1GHz)

EUT：	Binj-amin 1.0	Model Name ：	Binj-amin 1.0
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Polarization：	Horizontal
Test Voltage ：	DC 3.7V		
Test Mode ： (Worst)	802.11a low channel		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
166.0680	37.50	-13.23	24.27	43.50	-19.23	QP
194.4534	46.40	-15.86	30.54	43.50	-12.96	QP
259.2338	45.39	-13.94	31.45	46.00	-14.55	QP
300.3672	44.11	-12.57	31.54	46.00	-14.46	QP
324.4561	46.30	-11.95	34.35	46.00	-11.65	QP
366.8231	39.55	-11.03	28.52	46.00	-17.48	QP

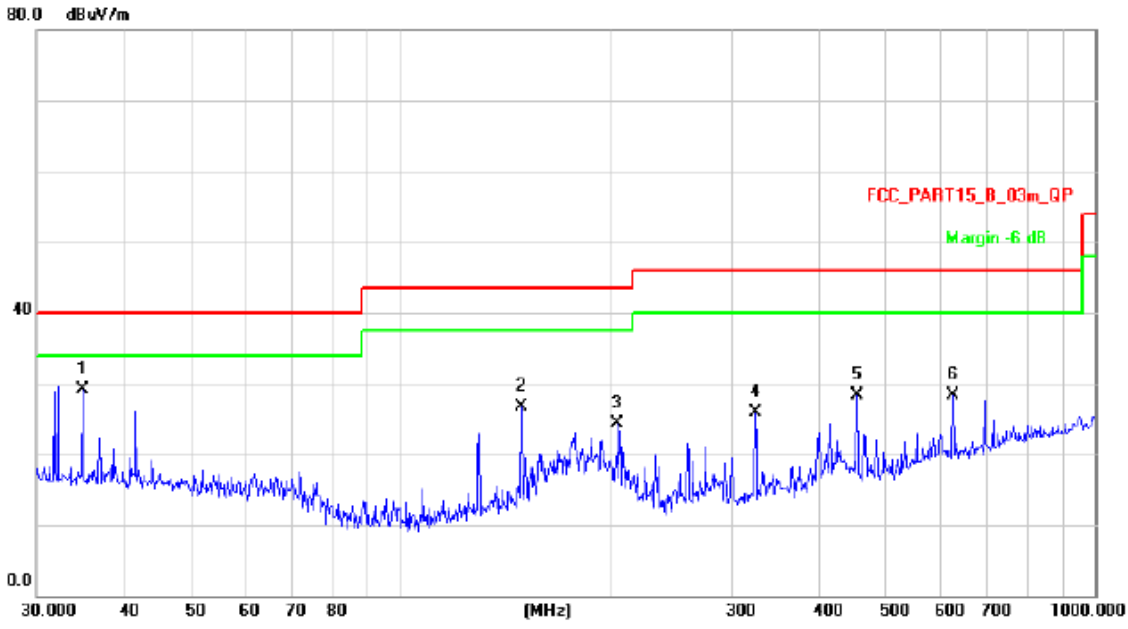
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All interfaces was connected, and BT TX mode was link.



EUT：	Binj-amin 1.0	Model Name ：	Binj-amin 1.0
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Polarization：	Vertical
Test Voltage ：	DC 3.7V		
Test Mode ： (Worst)	802.11a low channel		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
34.8823	37.60	-8.49	29.11	40.00	-10.89	QP
149.4857	39.61	-12.88	26.73	43.50	-16.77	QP
205.6751	40.31	-16.04	24.27	43.50	-19.23	QP
324.4561	37.88	-11.95	25.93	46.00	-20.07	QP
454.3100	37.24	-8.95	28.29	46.00	-17.71	QP
625.0780	33.82	-5.52	28.30	46.00	-17.70	QP

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All interfaces was connected, and BT TX mode was link.



Radiated Spurious Emission (1GHz to 5th harmonics)
802.11a

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5745MHz	11490.00	58.65	PK	H	2.32	60.97	74.00	Pass
	11490.00	48.47	Ave	H	2.32	50.79	54.00	Pass
	17235.00	60.32	PK	H	-2.15	58.17	74.00	Pass
	17235.00	49.46	Ave	H	-2.15	47.31	54.00	Pass
	11490.00	58.49	PK	V	2.32	60.81	74.00	Pass
	11490.00	49.31	Ave	V	2.32	51.63	54.00	Pass
	17235.00	59.73	PK	V	-2.15	57.58	74.00	Pass
	17235.00	49.67	Ave	V	-2.15	47.52	54.00	Pass
Middle Channel 5785MHz	11570.00	57.33	PK	H	2.54	59.87	74.00	Pass
	11570.00	48.21	Ave	H	2.54	50.75	54.00	Pass
	17355.00	59.87	PK	H	-1.98	57.89	74.00	Pass
	17355.00	48.22	Ave	H	-1.98	46.24	54.00	Pass
	11570.00	58.14	PK	V	2.54	60.68	74.00	Pass
	11570.00	49.21	Ave	V	2.54	51.75	54.00	Pass
	17355.00	59.62	PK	V	-1.98	57.64	74.00	Pass
	17355.00	48.51	Ave	V	-1.98	46.53	54.00	Pass
Upper Channel 5825MHz	11650.00	57.52	PK	H	2.68	60.20	74.00	Pass
	11650.00	48.03	Ave	H	2.68	50.71	54.00	Pass
	17475.00	59.86	PK	H	-1.27	58.59	74.00	Pass
	17475.00	48.52	Ave	H	-1.27	47.25	54.00	Pass
	11650.00	58.53	PK	V	2.68	61.21	74.00	Pass
	11650.00	47.84	Ave	V	2.68	50.52	54.00	Pass
	17475.00	59.91	PK	V	-1.27	58.64	74.00	Pass
	17475.00	48.67	Ave	V	-1.27	47.40	54.00	Pass

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Meter Reading + Factor
Margin = Emission Level - Limit
Other harmonics emissions are lower than 20dB below the allowable limit.

802.11n(HT20)

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5745MHz	11490.00	57.19	PK	H	2.32	59.51	74.00	Pass
	11490.00	48.10	Ave	H	2.32	50.42	54.00	Pass
	17235.00	58.88	PK	H	-2.15	56.73	74.00	Pass
	17235.00	48.04	Ave	H	-2.15	45.89	54.00	Pass
	11490.00	56.85	PK	V	2.32	59.17	74.00	Pass
	11490.00	47.93	Ave	V	2.32	50.25	54.00	Pass
	17235.00	59.12	PK	V	-2.15	56.97	74.00	Pass
	17235.00	48.24	Ave	V	-2.15	46.09	54.00	Pass
Middle Channel 5785MHz	11570.00	57.86	PK	H	2.54	60.4	74.00	Pass
	11570.00	48.34	Ave	H	2.54	50.88	54.00	Pass
	17355.00	58.48	PK	H	-1.98	56.5	74.00	Pass
	17355.00	48.82	Ave	H	-1.98	46.84	54.00	Pass
	11570.00	57.79	PK	V	2.54	60.33	74.00	Pass
	11570.00	48.12	Ave	V	2.54	50.66	54.00	Pass
	17355.00	59.37	PK	V	-1.98	57.39	74.00	Pass
	17355.00	47.86	Ave	V	-1.98	45.88	54.00	Pass
Upper Channel 5825MHz	11650.00	58.46	PK	H	2.68	61.08	74.00	Pass
	11650.00	48.33	Ave	H	2.68	50.95	54.00	Pass
	17475.00	60.14	PK	H	-1.27	58.96	74.00	Pass
	17475.00	48.29	Ave	H	-1.27	47.11	54.00	Pass
	11650.00	58.76	PK	V	2.68	61.38	74.00	Pass
	11650.00	49.21	Ave	V	2.68	51.83	54.00	Pass
	17475.00	59.57	PK	V	-1.27	58.39	74.00	Pass
	17475.00	48.54	Ave	V	-1.27	47.36	54.00	Pass

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Meter Reading + Factor
Margin = Emission Level - Limit
Other harmonics emissions are lower than 20dB below the allowable limit.

802.11n(HT40)

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5755MHz	11510.00	58.36	PK	H	2.43	60.79	74.00	Pass
	11510.00	48.12	Ave	H	2.43	50.55	54.00	Pass
	17265.00	59.35	PK	H	-1.97	57.38	74.00	Pass
	17265.00	48.48	Ave	H	-1.97	46.51	54.00	Pass
	11510.00	57.66	PK	V	2.43	60.09	74.00	Pass
	11510.00	48.56	Ave	V	2.43	50.99	54.00	Pass
	17265.00	59.93	PK	V	-1.97	57.96	74.00	Pass
	17265.00	48.68	Ave	V	-1.97	46.71	54.00	Pass
Upper Channel 5795MHz	11590.00	58.59	PK	H	2.62	61.21	74.00	Pass
	11590.00	48.43	Ave	H	2.62	51.05	54.00	Pass
	17385.00	60.22	PK	H	-1.18	59.04	74.00	Pass
	17385.00	48.47	Ave	H	-1.18	47.29	54.00	Pass
	11590.00	58.28	PK	V	2.62	60.9	74.00	Pass
	11590.00	49.45	Ave	V	2.62	52.07	54.00	Pass
	17385.00	59.92	PK	V	-1.18	58.74	74.00	Pass
	17385.00	48.85	Ave	V	-1.18	47.67	54.00	Pass

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Meter Reading + Factor
Margin = Emission Level - Limit
Other harmonics emissions are lower than 20dB below the allowable limit.

5. BAND EDGE COMPLIANCE TEST

5.1. Limits

Band 5.725-5.825GHz:

FCC: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

5.2. Test setup

Test method: FCC KDB 789033 G)& Parts 15.407(b)(4) & 15.209(a)

Same as Clause 4.2.

5.3. Test Data

Please see data as below:

Note: we pretest horizontal and vertical, the worst was horizontal and show in the report.

Modulation	Test Frequency (MHz)	Max Level (dBμV/m)	EIRP[dBm]	Limit[dBm]	Result
802.11a	5745	51.39	-43.81	-27.00	Pass
	5825	51.37	-43.83	-27.00	Pass
802.11n(HT20)	5745	51.13	-44.07	-27.00	Pass
	5825	51.34	-43.86	-27.00	Pass
802.11n(HT40)	5755	51.29	-43.91	-27.00	Pass
	5795	51.50	-43.70	-27.00	Pass

Remark: 1. According to KDB 789033 D02 section H) d) (iii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows: EIRP[dBm] = E[dBμV/m] - 95.2

6. 6DB AND 99% BANDWIDTH TEST

6.1. Measurement Procedure

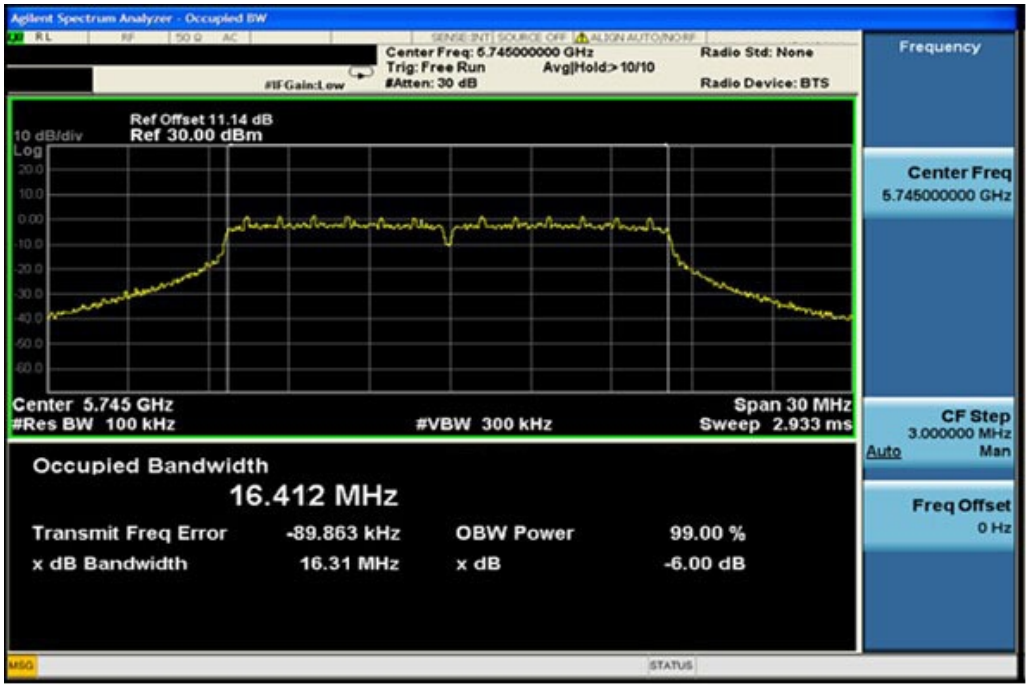
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

The 26 dB bandwidth is used to determine the conducted power limits.

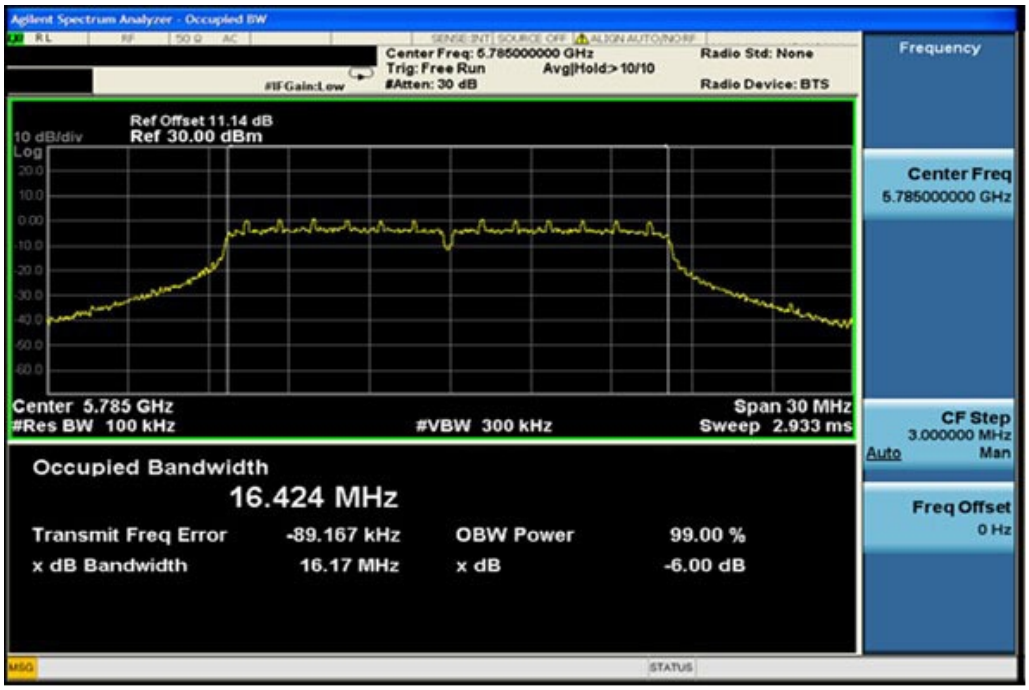
The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

	Channel number	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)
802.11a	149	5745	16.31	16.412	>0.5
	157	5785	16.17	16.424	>0.5
	165	5825	16.35	16.224	>0.5
802.11n (HT20)	149	5745	17.33	17.335	>0.5
	157	5785	17.73	17.626	>0.5
	165	5825	17.66	17.637	>0.5
802.11n (HT40)	151	5755	35.59	35.886	>0.5
	159	5795	35.76	35.377	>0.5

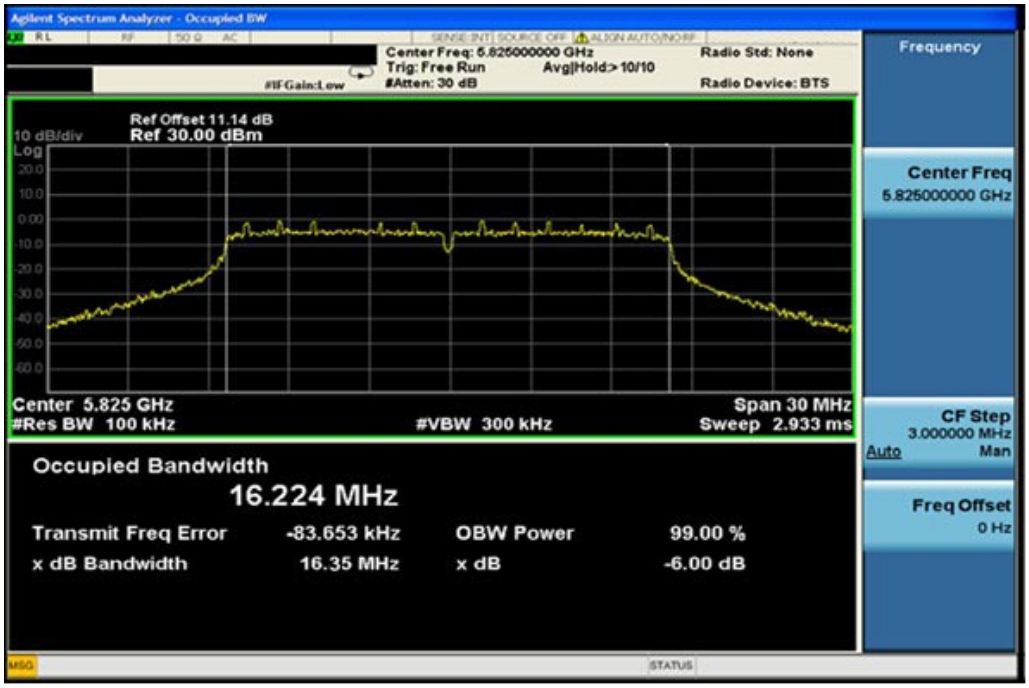
802.11a 5745MHz



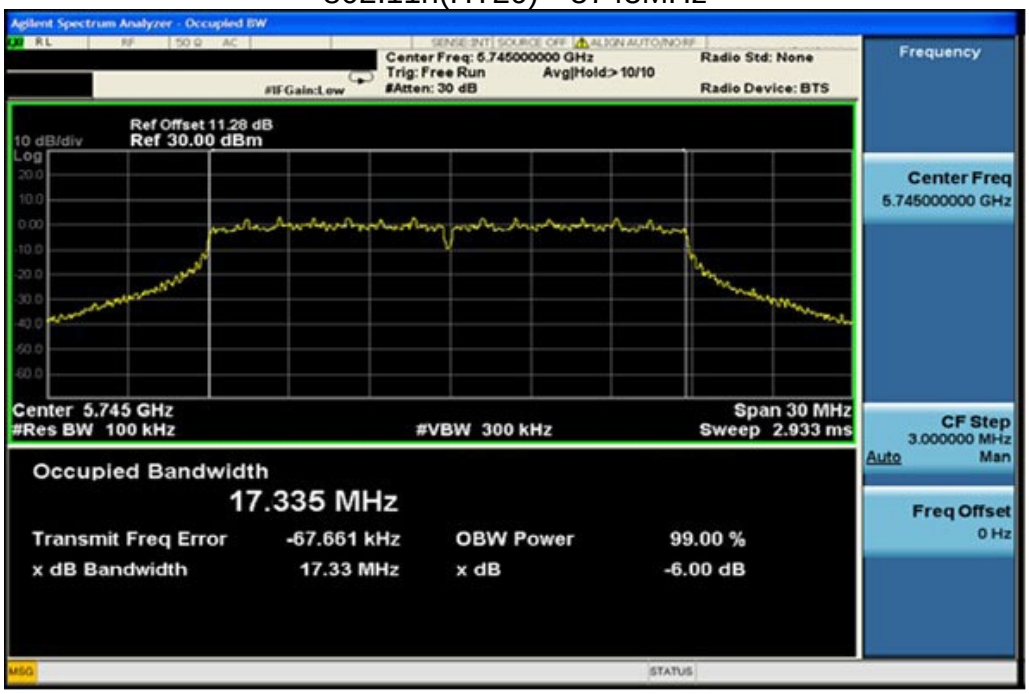
802.11a 5785MHz



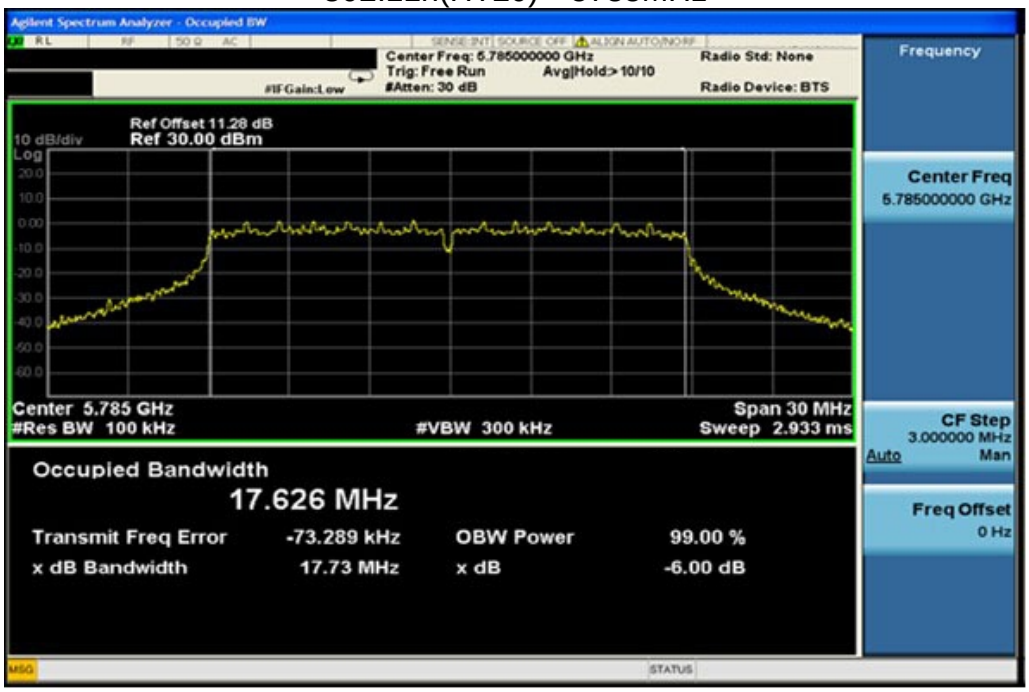
802.11a 5825MHz



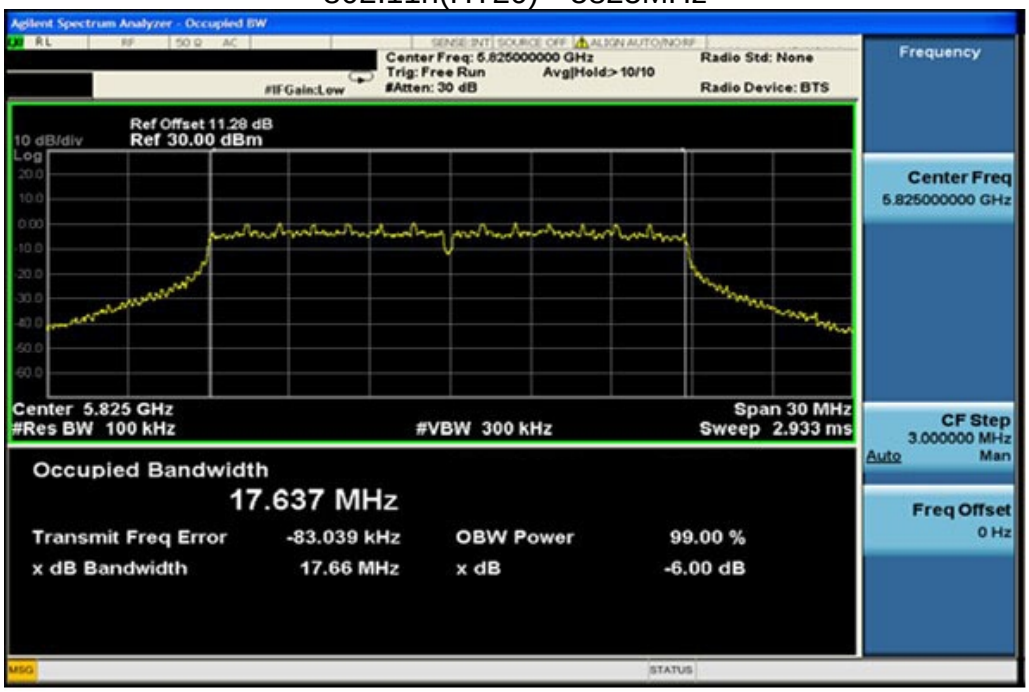
802.11n(HT20) 5745MHz



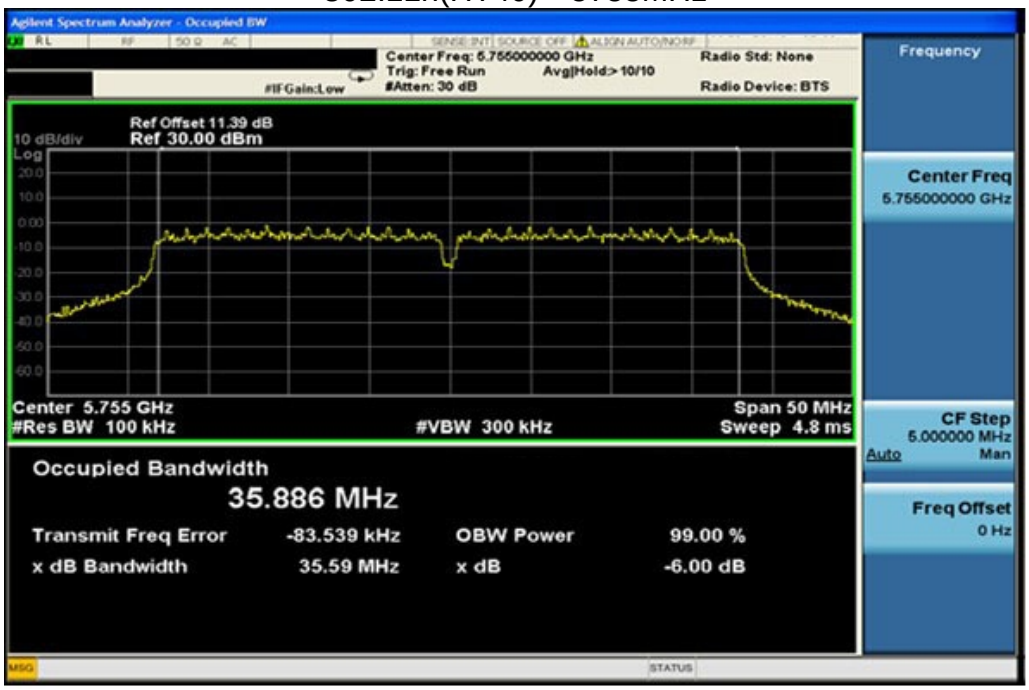
802.11n(HT20) 5785MHz



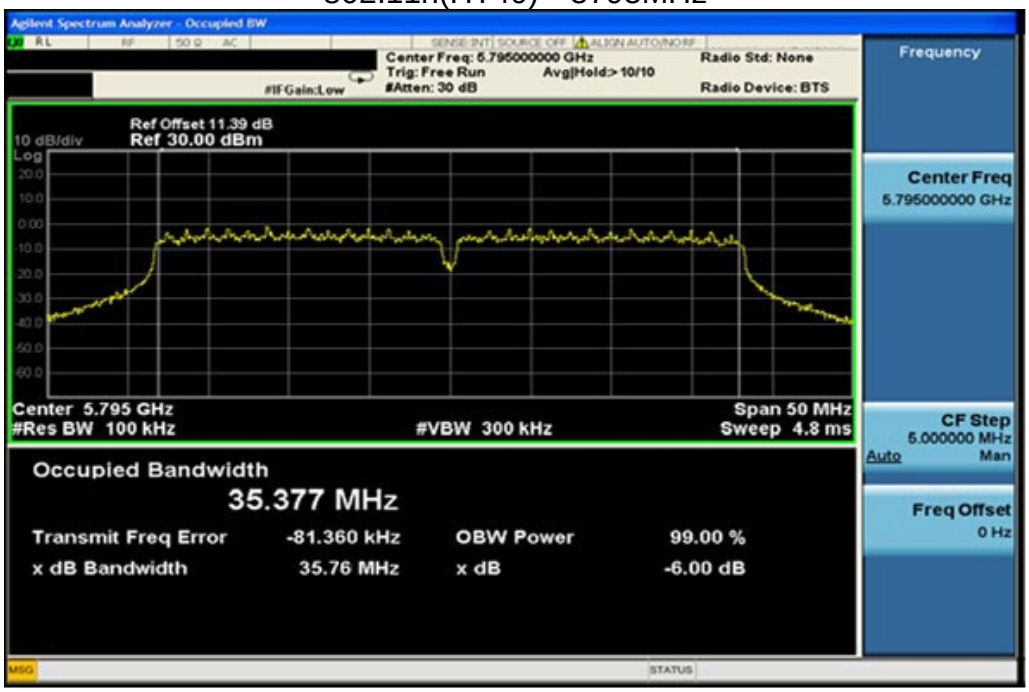
802.11n(HT20) 5825MHz



802.11n(HT40) 5755MHz



802.11n(HT40) 5795MHz



7. OUTPUT POWER TEST

7.1. Limits

Band 5.725-5.825GHz:

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

7.2. Test setup

1. The maximum average conducted output power can be measured using Method PM-G (Measurement using a gated RF average power meter):
2. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

a. The Transmitter output (antenna port) was connected to the power meter.

b. Turn on the EUT and power meter and then record the power value.

c. Repeat above procedures on all channels needed to be tested.

7.3. Test result

	Frequency (MHz)	Average Output Power(dBm)	Average Output Power(mW)	FCC Limit (dBm)	Result
802.11a	5745	7.5	5.62	30.0	Pass
	5785	7.3	5.37	30.0	Pass
	5825	7.2	5.25	30.0	Pass
802.11n (HT20)	5745	6.9	4.90	30.0	Pass
	5785	6.7	4.68	30.0	Pass
	5825	6.5	4.47	30.0	Pass
802.11n (HT40)	5755	6.3	4.27	30.0	Pass
	5795	6.0	3.98	30.0	Pass

8. PEAK POWER SPECTRAL DENSITY TEST

8.1. Limits

Band 5.725-5.825GHz:

In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

8.2. Test setup

Methods refer to FCC KDB 789033

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”.

2) Use the peak search function on the instrument to find the peak of the spectrum.

3) The result is the PPSD.

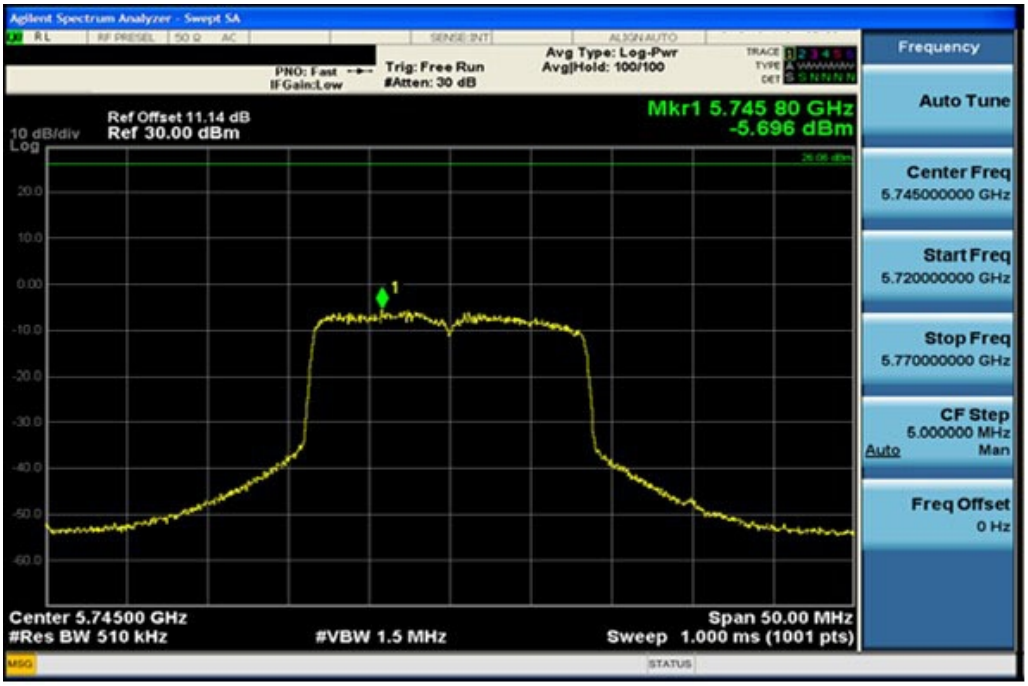
4) The above procedures make use of 1 MHz resolution bandwidth to satisfy the 1 MHz Measurement bandwidth specified in the 15.407(a)(5). That rule section also permits use of resolution bandwidths less than 1 MHz “provided that the measured power is integrated to show the total power over the measurement bandwidth” (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth

8.3. Test data

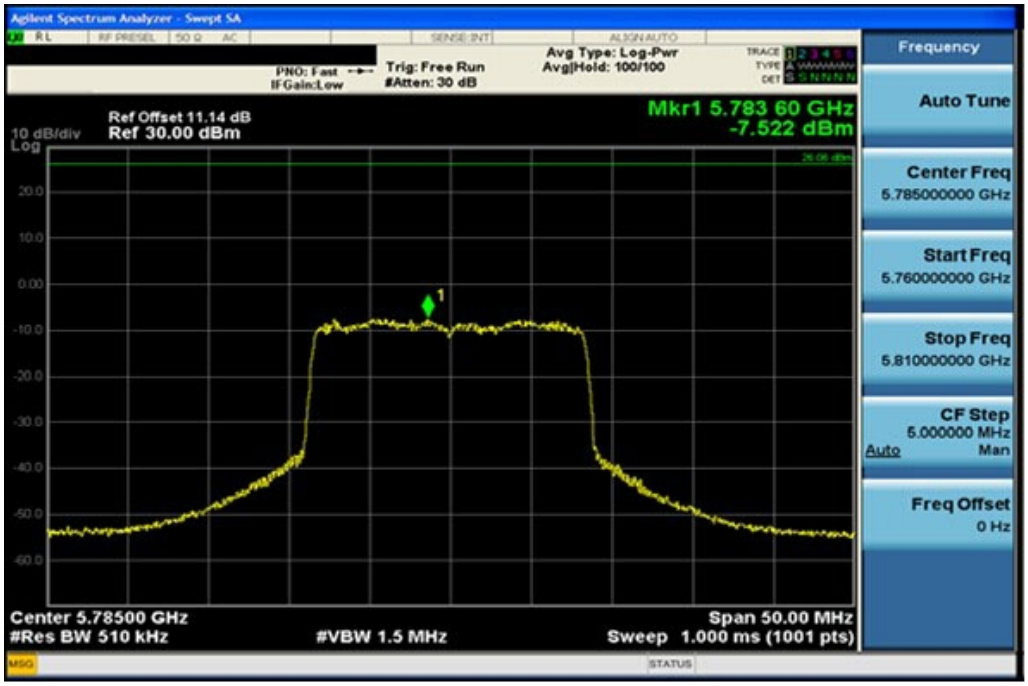
Test data as below

	Frequency (MHz)	Reading Level (dBm)	Duty cycle factor	10log(500kHz/RBW) factor	PPSD (dBm)	FCC Limit (dBm)	Result
802.11a	5745	-5.696	0.06	-0.09	-5.636	30.0	Pass
	5785	-7.522	0.06	-0.09	-7.462	30.0	Pass
	5825	-7.807	0.06	-0.09	-7.747	30.0	Pass
802.11n (HT20)	5745	-7.664	0.07	-0.09	-7.594	30.0	Pass
	5785	-6.757	0.07	-0.09	-6.687	30.0	Pass
	5825	-7.686	0.14	-0.09	-7.546	30.0	Pass
802.11n (HT40)	5755	-8.701	0.14	-0.09	-8.561	30.0	Pass
	5795	-9.520	0.14	-0.09	-9.380	30.0	Pass

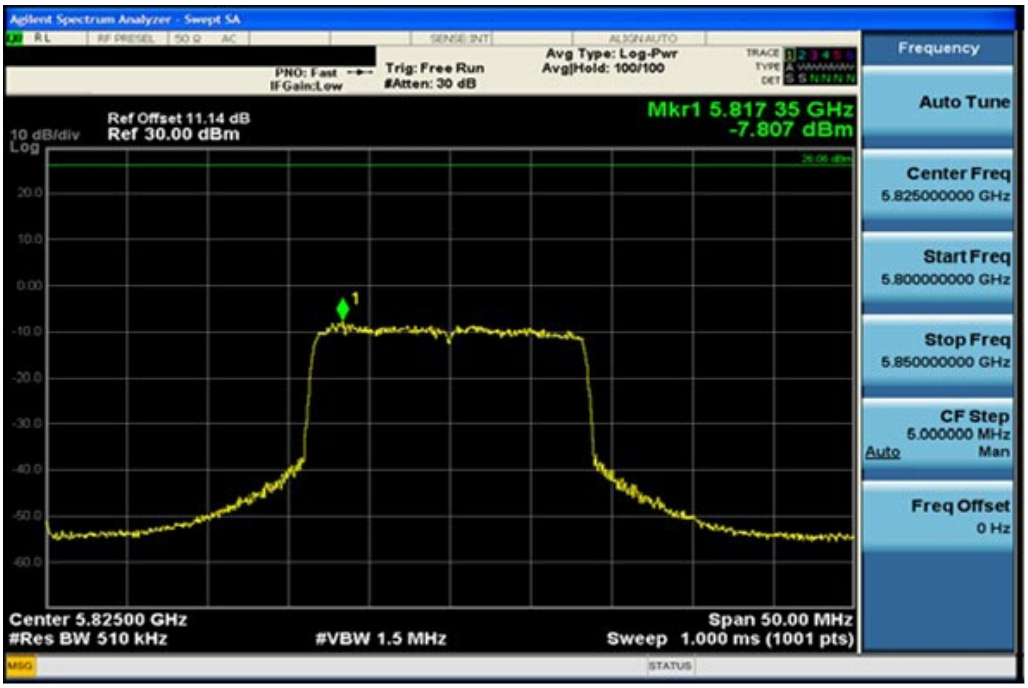
802.11a 5745MHz



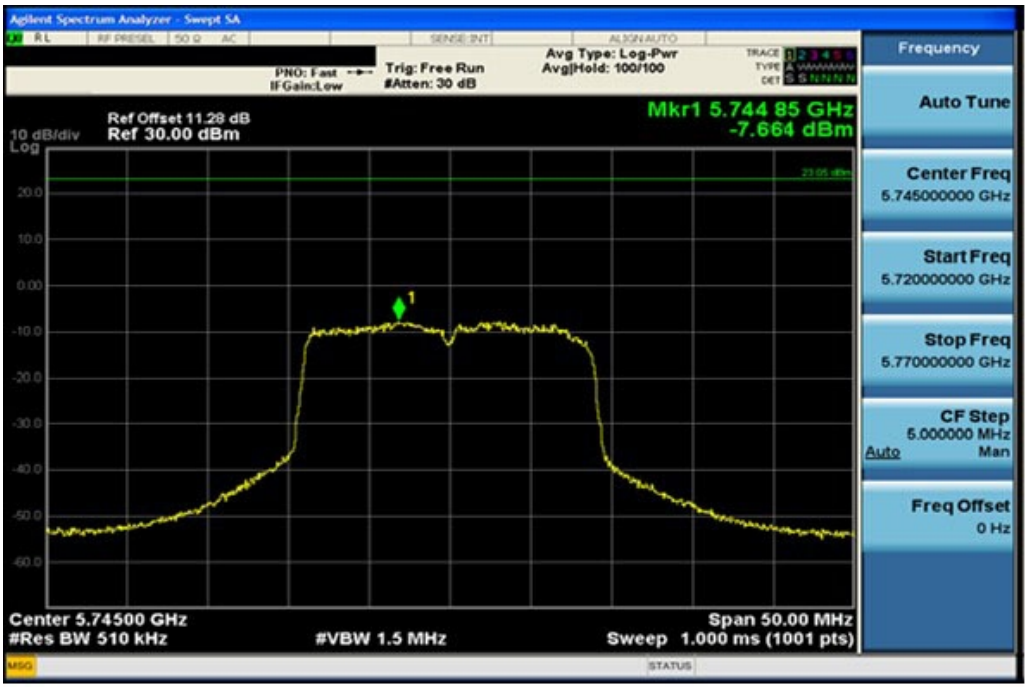
802.11a 5785MHz



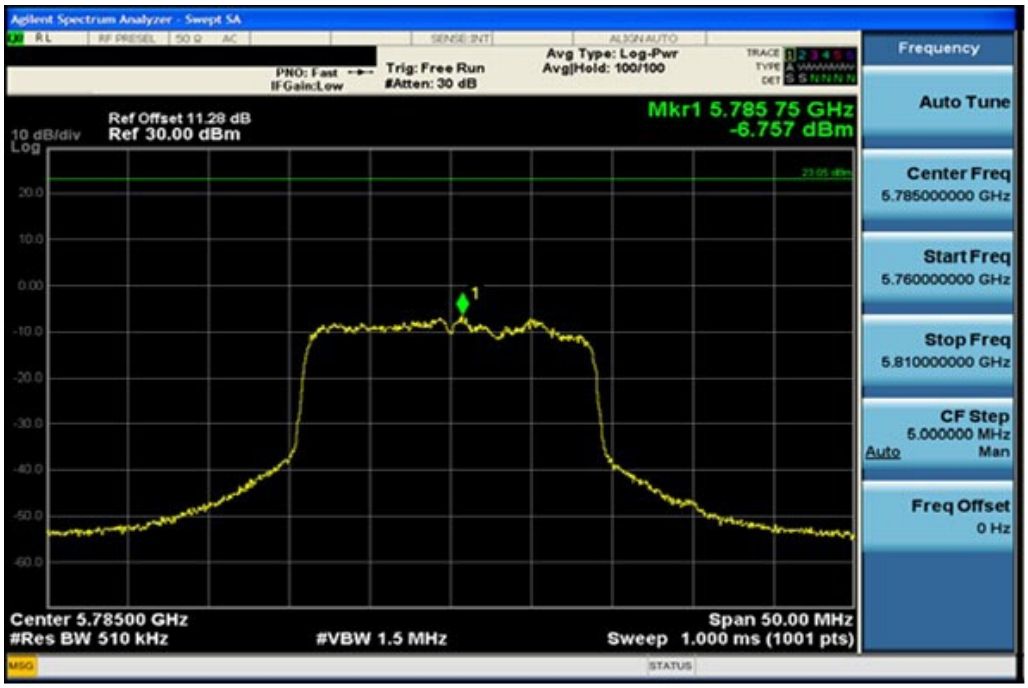
802.11a 5825MHz



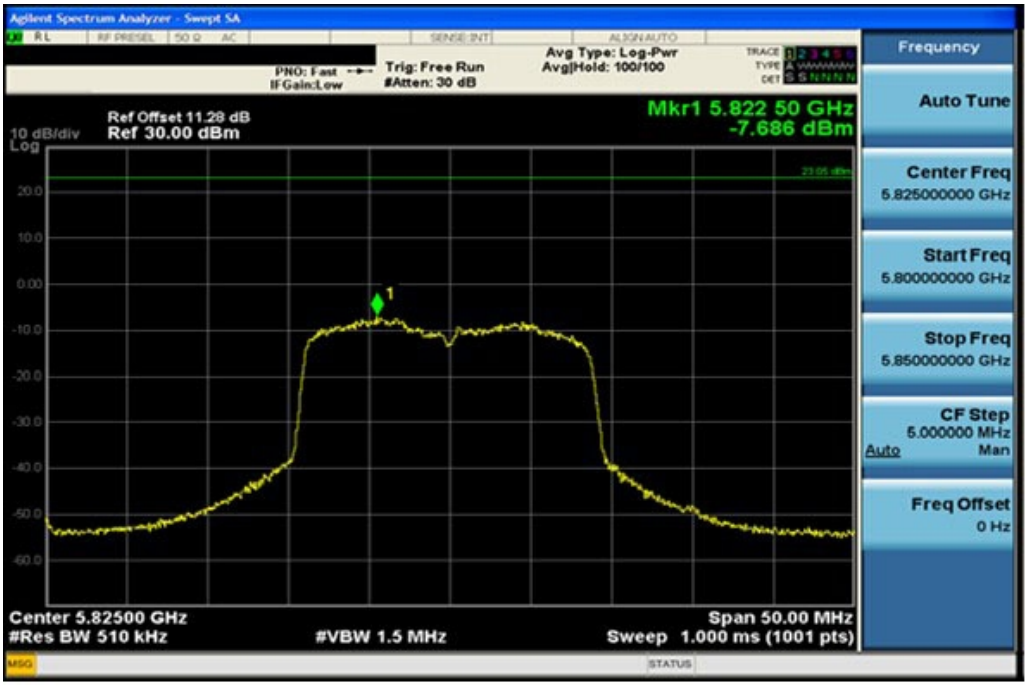
802.11n (HT20) 5745MHz



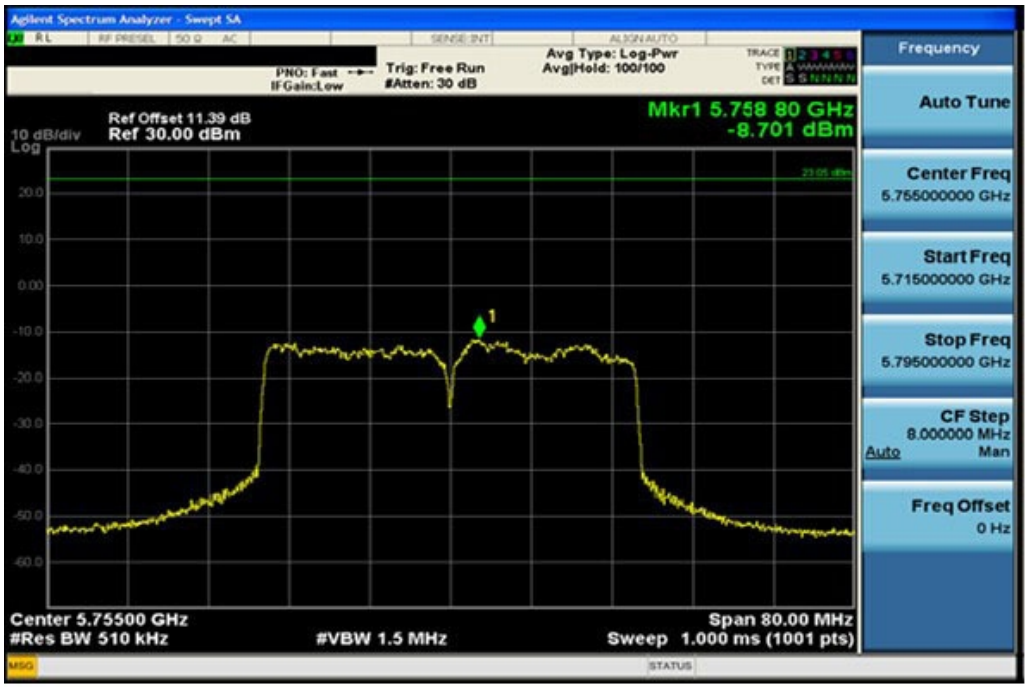
802.11n (HT20) 5785MHz



802.11n (HT20) 5825MHz



802.11 n (HT40) 5755MHz



802.11 n (HT40) 5795MHz

9. DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

Operation Mode	Duty Cycle	Duty Fator (dB) 10 * log (1/ Duty cycle)
802.11a	98.6%	0.06
802.11n(HT20)	98.5%	0.07
802.11n(HT40)	96.9%	0.14

802.11a

802.11n(HT20)

802.11n(HT40)

10. FREQUENCY STABILITY

10.1. Limits

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

10.2. Test setup

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.

10.3. Test data

Test data as below

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11a	4.255V	-20℃	5745.000	5745.05470	-0.0547
			5785.000	5785.05141	-0.0514
			5825.000	5825.05434	-0.0543
	3.145V		5745.000	5745.05350	-0.0535
			5785.000	5785.05247	-0.0525
			5825.000	5825.05361	-0.0536
	3.70V	25℃	5745.000	5745.05276	-0.0528
			5785.000	5785.05241	-0.0524
			5825.000	5825.05351	-0.0535
	4.255V	50℃	5745.000	5745.05286	-0.0529
			5785.000	5785.05146	-0.0515
			5825.000	5825.05240	-0.0524
	3.145V		5745.000	5745.05316	-0.0532
			5785.000	5785.05236	-0.0524
			5825.000	5825.05427	-0.0543

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11n (HT20)	4.255V	-20℃	5745.000	5745.05427	-0.0543
			5785.000	5785.05461	-0.0546
			5825.000	5825.05367	-0.0537
	3.145V		5745.000	5745.05387	-0.0539
			5785.000	5785.05297	-0.0530
			5825.000	5825.05268	-0.0527
	3.70V	25℃	5745.000	5745.05367	-0.0537
			5785.000	5785.05247	-0.0525
			5825.000	5825.05347	-0.0535
	4.255V	50℃	5745.000	5745.05244	-0.0524
			5785.000	5785.05341	-0.0534
			5825.000	5825.05547	-0.0555
	3.145V		5745.000	5745.05518	-0.0552
			5785.000	5785.05347	-0.0535
			5825.000	5825.05513	-0.0551
802.11n (HT40)	4.255V	-20℃	5755.000	5755.05614	-0.0561
			5795.000	5795.05517	-0.0552
	3.145V		5755.000	5755.05516	-0.0552
			5795.000	5795.05287	-0.0529
	3.70V	25℃	5755.000	5755.05377	-0.0538
			5795.000	5795.05417	-0.0542
	4.255V	50℃	5755.000	5755.05287	-0.0529
			5795.000	5795.05316	-0.0532
	3.145V		5755.000	5755.05418	-0.0542
			5795.000	5795.05288	-0.0529

11. TRANSMISSION IN THE ABSENCE OF DATA

11.1. Limits

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

11.2. Test result

No non-compliance noted:

Refer to the theory of operation.

12. PEAK EXCURSION RATIO TEST

12.1. Limits

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less

12.2. Test setup

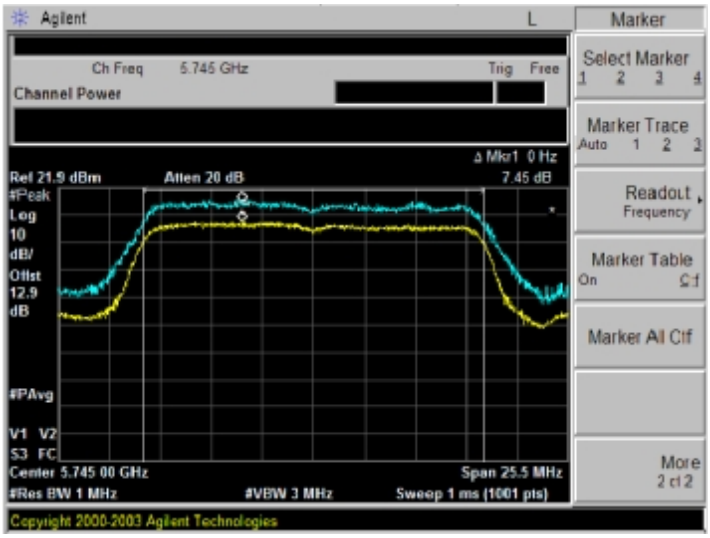
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2014. Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

12.3. Test result

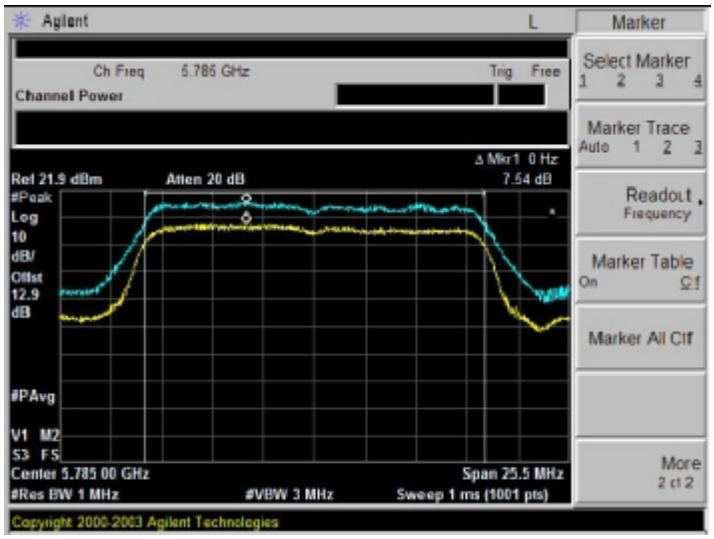
	Measured Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Result
802.11a	5745.000	7.45	13.00	Pass
	5785.000	7.54	13.00	Pass
	5825.000	6.55	13.00	Pass
802.11n20	5745.000	6.12	13.00	Pass
	5785.000	6.34	13.00	Pass
	5825.000	6.47	13.00	Pass
802.11n40	5755.000	6.05	13.00	Pass
	5795.000	6.14	13.00	Pass

Note: the plots only show the worst mode.

802.11a 5745MHz

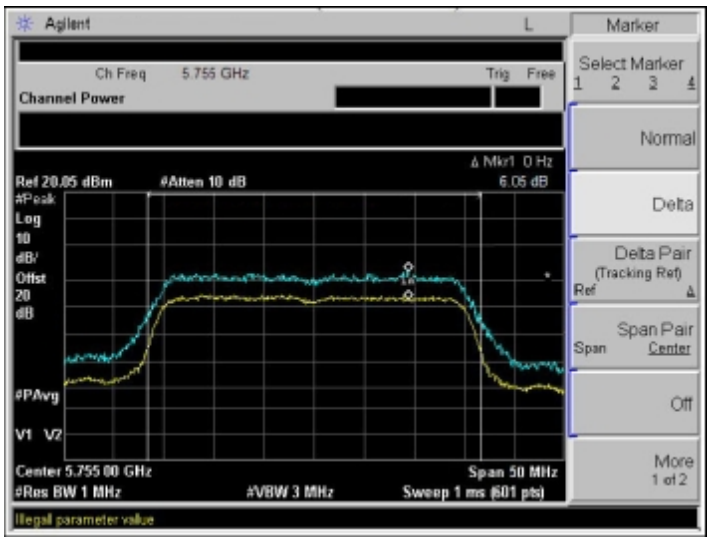


802.11a 5785MHz

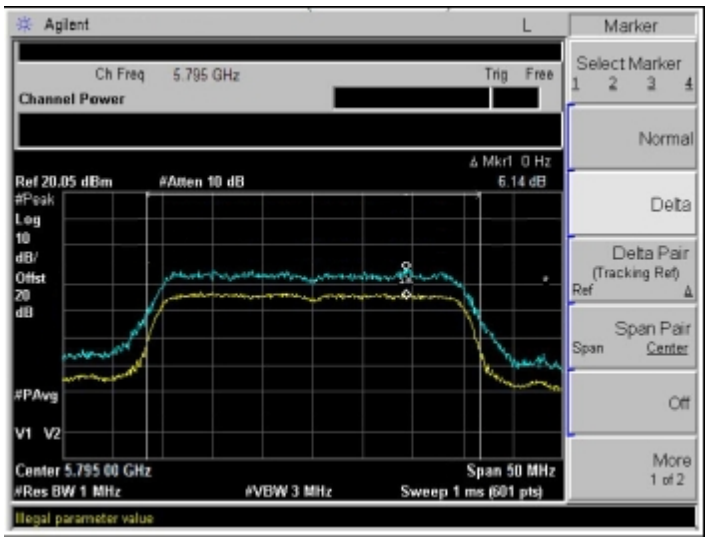


802.11a 5825MHz

802.11n(HT40) 5755MHz



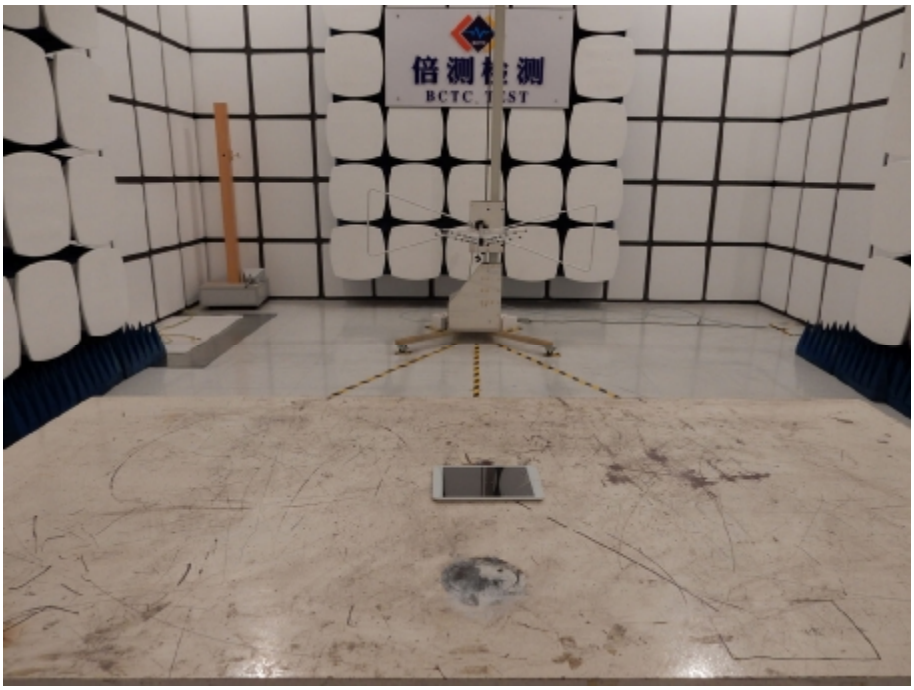
802.11n(HT40) 5795MHz

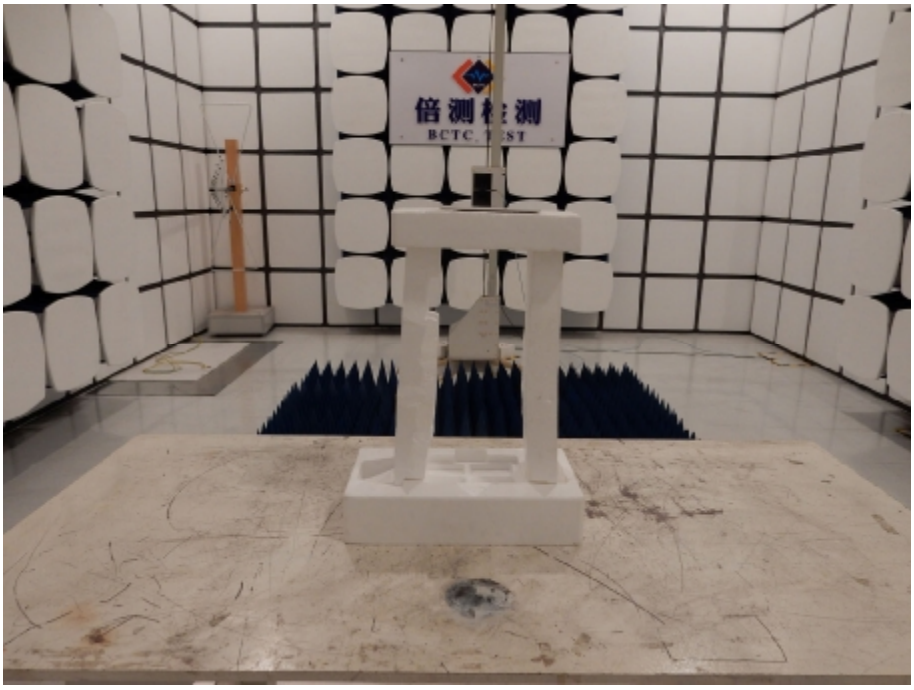


13. PHOTOGRAPHS OF TEST SET-UP

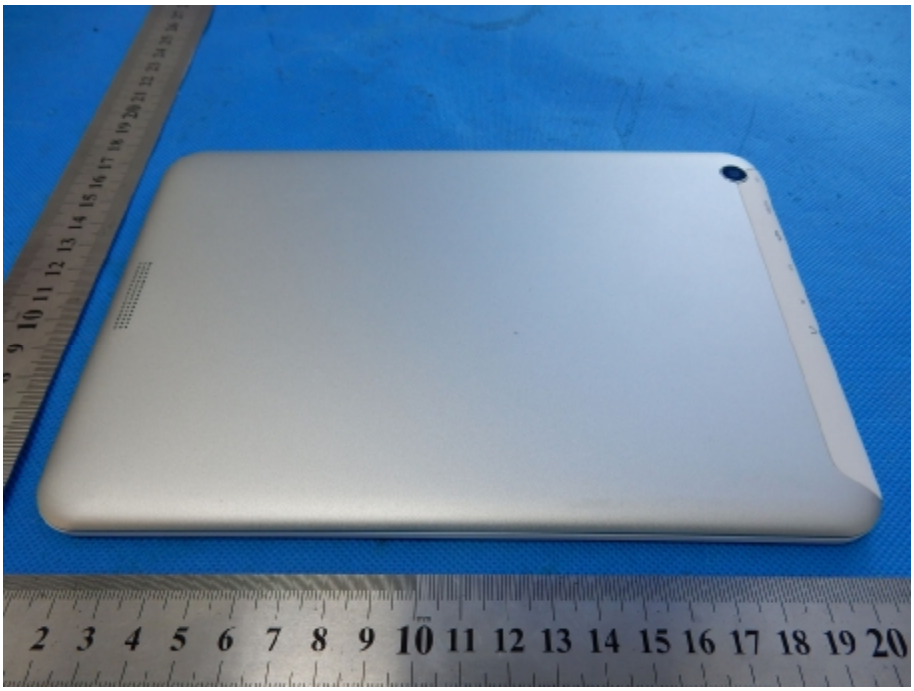
Conducted Emission

Radiated Emission Test





14. PHOTOGRAPHS OF THE EUT



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