

FCC RF Test Report

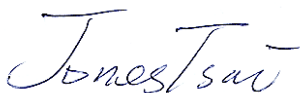
APPLICANT : TP-LINK TECHNOLOGIES CO., LTD.
EQUIPMENT : AC1200 Wi-Fi Range Extender
BRAND NAME : TP-LINK
MODEL NAME : RE350K
MARKETING NAME : AC1200 Wi-Fi Range Extender
FCC ID : TE7RE350K
STANDARD : FCC Part 15 Subpart E §15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure

The product was received on Nov. 02, 2015 and testing was completed on Dec. 06, 2015. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR5N0208C	Rev. 01	Initial issue of report	Dec. 11, 2015



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	≤ -17, -27 dBm/MHz & 15.209(a)	Pass	Under limit 0.33 dB at 5861.760 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 15.40 dB at 0.526 MHz
3.6	15.407(g)	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

TP-LINK TECHNOLOGIES CO., LTD.

Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd,
Nanshan, Shenzhen, China

1.2 Manufacturer

TP-LINK TECHNOLOGIES CO., LTD.

Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd,
Nanshan, Shenzhen, China

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	AC1200 Wi-Fi Range Extender
Brand Name	TP-LINK
Model Name	RE350K
Marketing Name	AC1200 Wi-Fi Range Extender
FCC ID	TE7RE350K
EUT supports Radios application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard												
Tx/Rx Channel Frequency Range		5745 MHz ~ 5825 MHz										
Maximum Output Power		SISO <Ant. 1> 802.11a : 22.91 dBm / 0.1954 W 802.11n HT20 : 23.06 dBm / 0.2023 W 802.11n HT40 : 19.50 dBm / 0.0891 W 802.11ac VHT20: 23.07 dBm / 0.2028 W 802.11ac VHT40: 19.19 dBm / 0.0830 W 802.11ac VHT80: 16.60 dBm / 0.0457 W SISO <Ant. 2> 802.11a : 22.92 dBm / 0.1959 W 802.11n HT20 : 23.11 dBm / 0.2046 W 802.11n HT40 : 19.37 dBm / 0.0865 W 802.11ac VHT20: 23.10 dBm / 0.2042 W 802.11ac VHT40: 19.39 dBm / 0.0869 W 802.11ac VHT80: 16.61 dBm / 0.0458 W MIMO <Ant. 1 + 2> 802.11a : 25.93 dBm / 0.3917 W 802.11n HT20 : 26.12 dBm / 0.4093 W 802.11n HT40 : 22.53 dBm / 0.1791 W 802.11ac VHT20: 26.11 dBm / 0.4083 W 802.11ac VHT40: 22.50 dBm / 0.1778 W 802.11ac VHT80: 19.68 dBm / 0.0929 W										
99% Occupied Bandwidth		802.11a : 30.40 MHz 802.11n HT20 : 33.10 MHz 802.11n HT40 : 37.00 MHz 802.11ac VHT20 : 33.90 MHz 802.11ac VHT40 : 37.00 MHz 802.11ac VHT80 : 76.08 MHz										
Type of Modulation		802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)										
Antenna Type		Ant. 1 : Dipole Antenna Ant. 2 : Dipole Antenna										
Antenna Gain		Ant. 1 : 2.61 dBi Ant. 2 : 2.61 dBi										
Antenna Function Description		<table><tr><td></td><td>Ant. 1</td><td>Ant. 2</td></tr><tr><td>802.11a/n/ac SISO</td><td>V</td><td>V</td></tr><tr><td>802.11a/n/ac MIMO</td><td>V</td><td>V</td></tr></table>			Ant. 1	Ant. 2	802.11a/n/ac SISO	V	V	802.11a/n/ac MIMO	V	V
	Ant. 1	Ant. 2										
802.11a/n/ac SISO	V	V										
802.11a/n/ac MIMO	V	V										

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH05-HY	CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
	03CH11-HY	

Note: The test site complies with ANSI C63.4 2014 requirement.

1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v01
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151	5755	159	5795
	153	5765	161	5805
	155	5775	165	5825

Note: The above Frequency and Channel in boldface were 802.11n HT40.



2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test in the following tables.

SISO <Ant. 1>

5GHz 802.11a mode								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Average Power (dBm)	22.91	22.90	22.90	22.85	22.84	22.89	22.89	22.87

5GHz 802.11n HT20 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Average Power (dBm)	23.06	23.02	22.98	22.93	23.02	23.05	23.05	22.94

5GHz 802.11n HT40 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Average Power (dBm)	19.50	19.49	19.43	19.48	19.42	19.47	19.46	19.44

5GHz 802.11ac VHT20 mode									
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
Average Power (dBm)	23.07	23.05	23.04	23.03	22.91	22.95	22.91	22.93	22.96

5GHz 802.11ac VHT40 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Average Power (dBm)	19.19	19.12	19.01	19.07	19.09	19.17	18.99	19.14	19.07	19.10

5GHz 802.11ac VHT80 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Average Power (dBm)	16.60	16.59	16.55	16.57	16.53	16.56	16.57	16.49	16.52	16.47

**SISO <Ant. 2>**

5GHz 802.11a mode								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Average Power (dBm)	22.92	22.90	22.91	22.82	22.91	22.91	22.91	22.89

5GHz 802.11n HT20 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Average Power (dBm)	23.11	23.10	23.06	23.01	23.01	23.09	23.08	23.04

5GHz 802.11n HT40 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Average Power (dBm)	19.37	19.30	19.35	19.19	19.17	19.31	19.33	19.33

5GHz 802.11ac VHT20 mode									
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
Average Power (dBm)	23.10	23.09	23.09	23.05	23.05	23.03	22.99	23.02	23.07

5GHz 802.11ac VHT40 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Average Power (dBm)	19.39	19.35	19.34	19.35	19.32	19.37	19.35	19.27	19.28	19.27

5GHz 802.11ac VHT80 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Average Power (dBm)	16.61	16.54	16.55	16.47	16.46	16.56	16.59	16.47	16.58	16.51

**MIMO <Ant. 1+2>**

5GHz 802.11a mode								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Average Power (dBm)	25.93	25.89	25.87	25.91	25.84	25.90	25.85	25.87

5GHz 802.11n HT20 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Average Power (dBm)	26.12	26.08	26.09	26.10	26.09	26.09	26.04	26.03

5GHz 802.11n HT40 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Average Power (dBm)	22.53	22.38	22.29	22.33	22.31	22.33	22.31	22.38

5GHz 802.11ac VHT20 mode									
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
Average Power (dBm)	26.11	26.09	26.06	26.07	26.08	26.05	26.00	25.96	26.03

5GHz 802.11ac VHT40 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Average Power (dBm)	22.50	22.44	22.46	22.32	22.38	22.35	22.34	22.34	22.40	22.38

5GHz 802.11ac VHT80 mode										
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Average Power (dBm)	19.68	19.55	19.55	19.54	19.46	19.64	19.66	19.66	19.66	19.65

Note: MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.

2.3 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

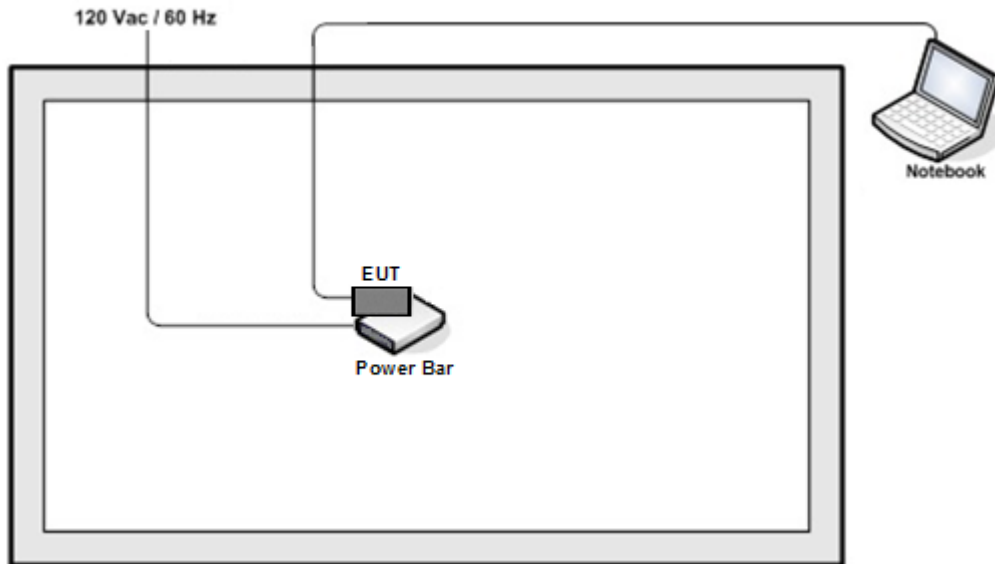
AC Conducted Emission	Mode 1 : WLAN (5GHz) Link + LAN Link
------------------------------	--------------------------------------

Ch. #		Band IV : 5725-5850 MHz		
		802.11a	802.11n HT20	802.11n HT40
L	Low	149	149	151
M	Middle	157	157	-
H	High	165	165	159

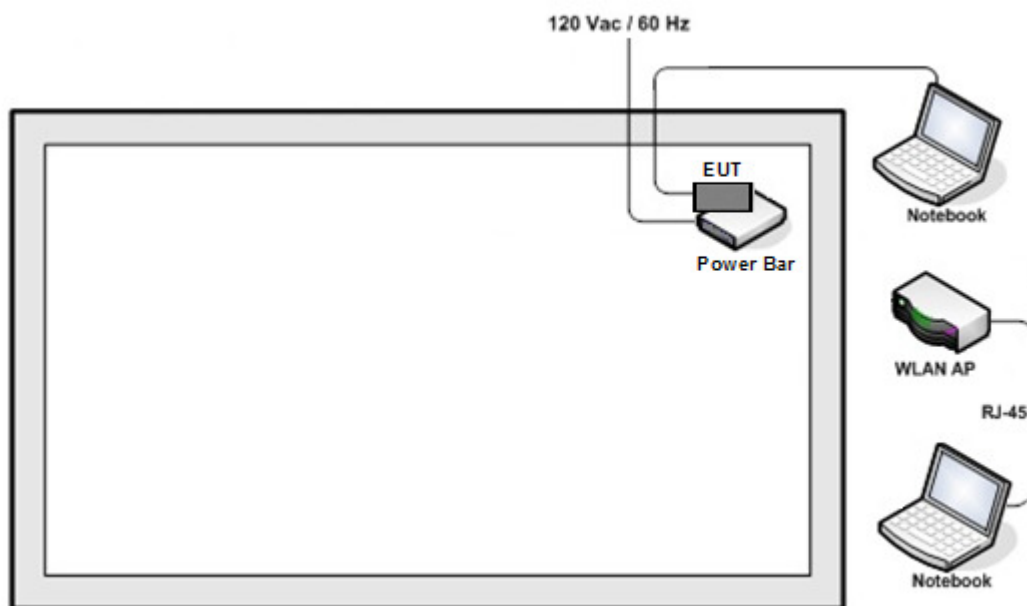
Ch. #		Band IV : 5725-5850 MHz		
		802.11ac VHT20	802.11ac VHT40	802.11ac VHT80
L	Low	149	151	-
M	Middle	157	-	155
H	High	165	159	-

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Notebook	DELL	P20G	FCC DoC/ Contains FCC ID: QDS-BRCM1051	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.6 EUT Operation Test Setup

For WLAN function, programmed RF utility, "bin\cart.exe" installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

2.7 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 4.2 + 10 = 14.2 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

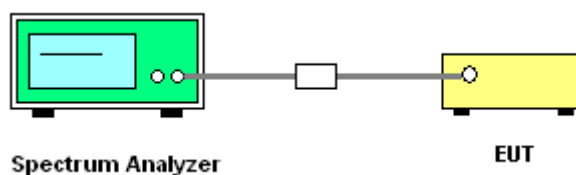
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

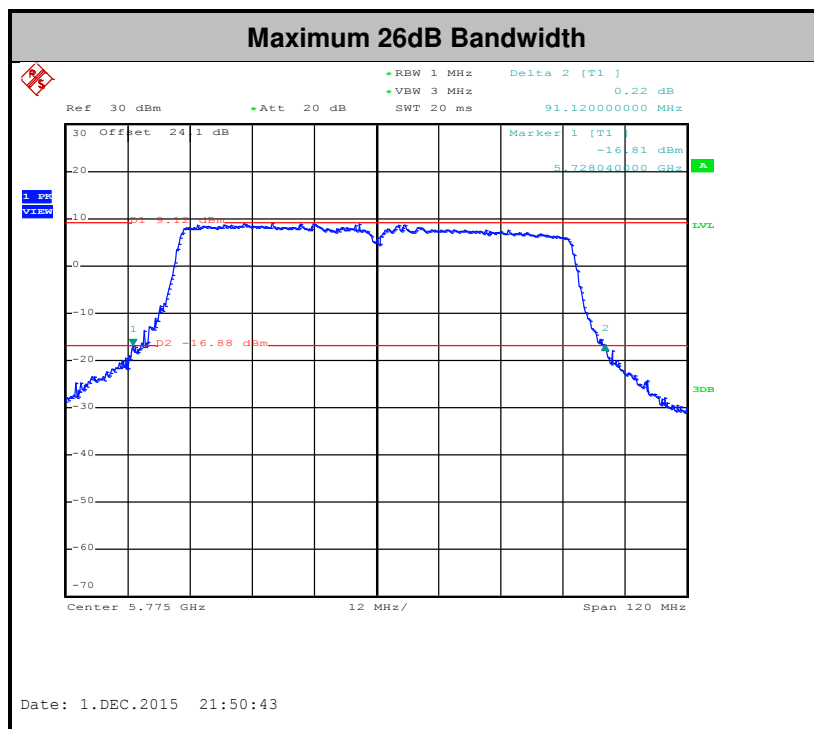
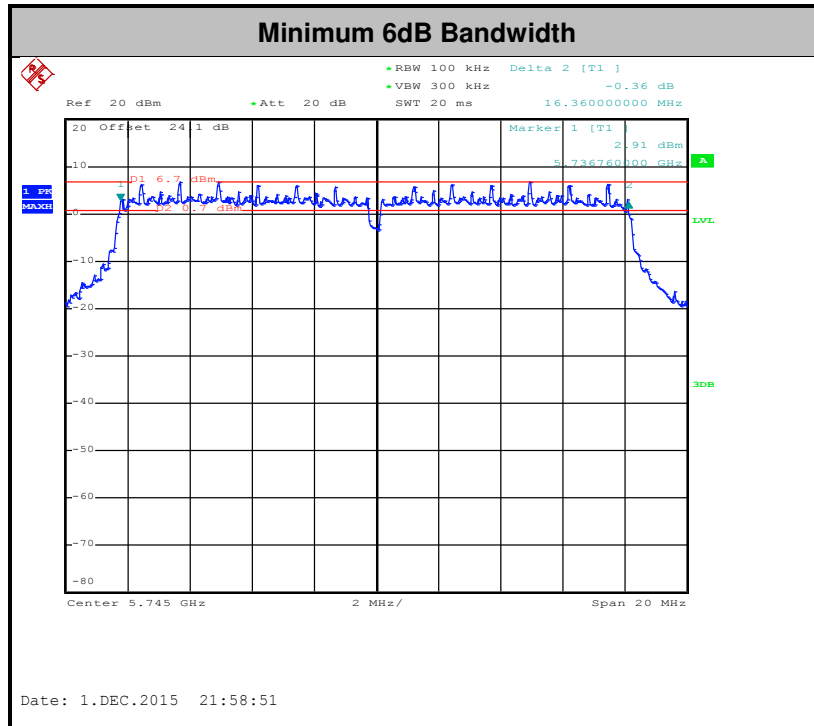
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

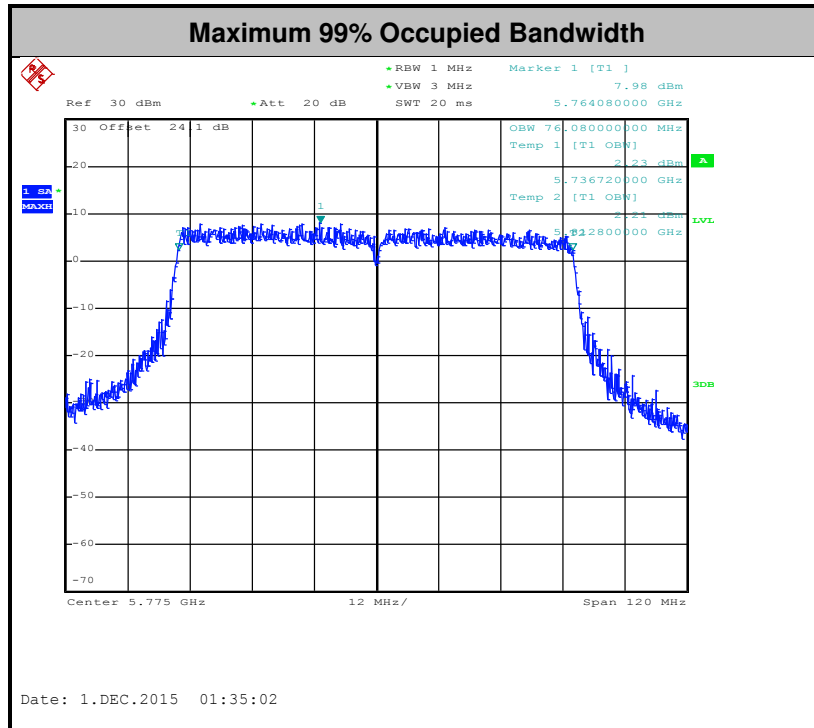
3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.





Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

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 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.2.2 Measuring Instruments

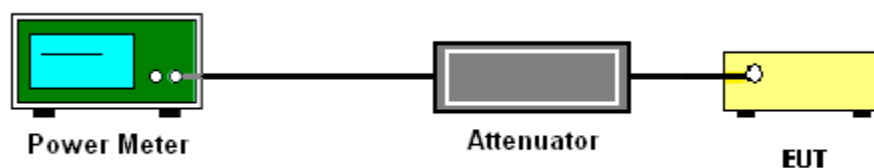
The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

1. Method PM (Measurement using an RF average power meter):
2. Measurement is performed using a wideband RF power meter.
3. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
4. Measure the average power of the transmitter, and the average power is corrected with duty factor, $10 \log(1/x)$, where x is the duty cycle.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.



3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
Section F) Maximum power spectral density.

Method SA-2

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

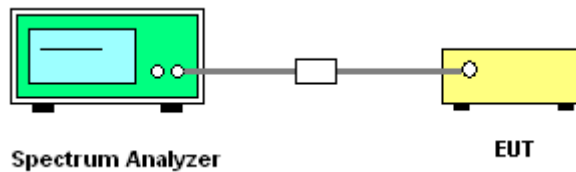
1. The testing follows Method SA-2 of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
 - Measure the duty cycle.
 - Set span to encompass the entire emission bandwidth (EBW) of the signal.
 - Set RBW = 300 kHz.
 - Set VBW $\geq$ 1 MHz.
 - Number of points in sweep $\geq$ 2 Span / RBW.
 - Sweep time = auto.
 - Detector = RMS
 - Trace average at least 100 traces in power averaging mode.
 - Add $10 \log(500\text{kHz}/\text{RBW})$ to the test result.
 - Add $10 \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add $10 \log(1/0.25) = 6$ dB if the duty cycle is 25 percent.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.
4. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter

Output v02r01.

Method (a): Measure and sum the spectra across the outputs.

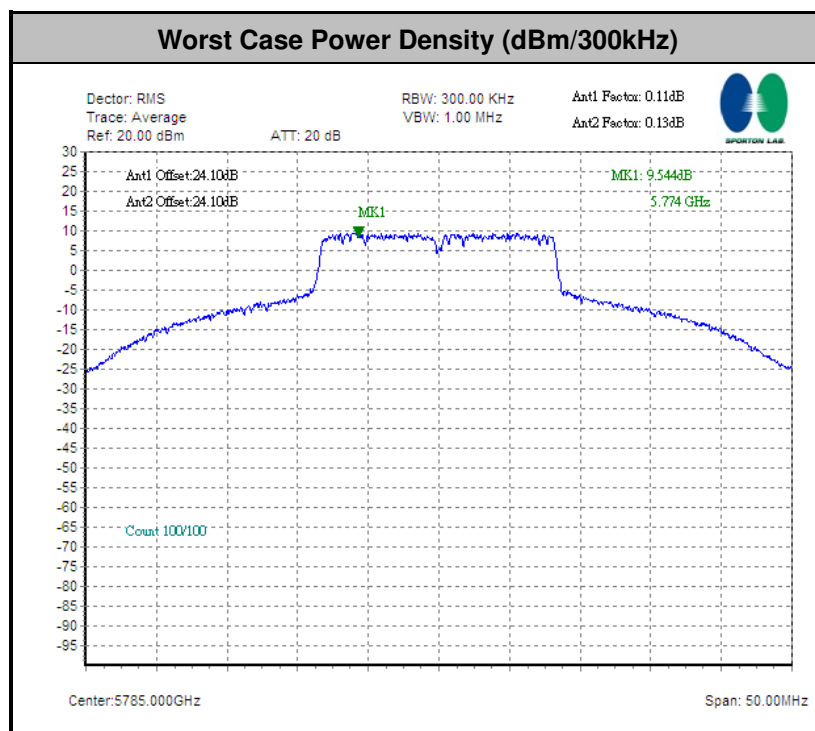
The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part 15.205.

3.4.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5725-5850 MHz band: 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 (78.3dBμV/m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBμV/m).
- (2) Unwanted spurious emissions fallen in restricted bands per FCC Part 15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,

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

Note: The following formula is used to convert the EIRP to field strength.

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

EIRP (dBm)	Field Strength at 3m (dBμV/m)
-17	78.3
- 27	68.3

- (3) KDB 789033 D02 General UNII Test Procedures New Rules v01 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.

3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

Section G) Unwanted emissions measurement.

(1) Procedure for Unwanted Emissions Measurements Below 1000MHz

- RBW = 120 kHz
- VBW = 300 kHz
- Detector = Peak
- Trace mode = max hold

(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

- RBW = 1 MHz
- VBW $\geq$ 3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

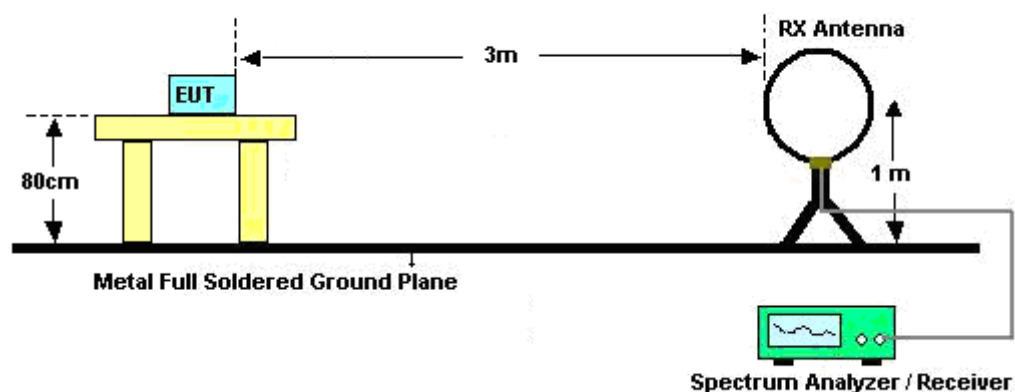
- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
0+1	802.11a for Ant 1	97.49	2716.00	0.37	1kHz
0+1	802.11a for Ant 2	97.00	2716.00	0.37	1kHz
0+1	5GHz 802.11n HT20 for Ant 1	97.30	2520.00	0.40	1kHz
0+1	5GHz 802.11n HT20 for Ant 2	97.31	2534.00	0.39	1kHz
0+1	5GHz 802.11n HT40 for Ant 1	95.09	1240.00	0.81	1kHz
0+1	5GHz 802.11n HT40 for Ant 2	94.48	1232.00	0.81	1kHz
0+1	5GHz 802.11n VHT80 for Ant 1	89.29	600.00	1.67	3kHz
0+1	5GHz 802.11n VHT80 for Ant 2	89.29	600.00	1.67	3kHz

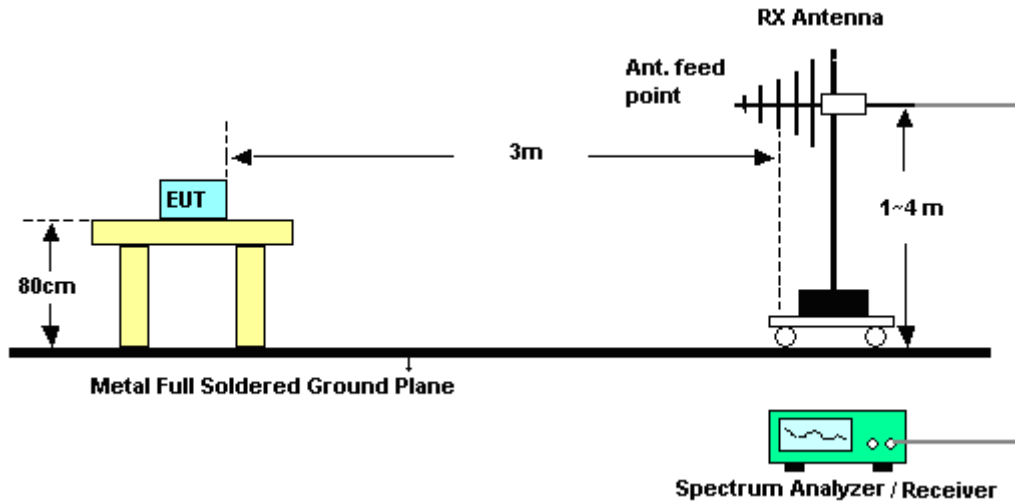
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

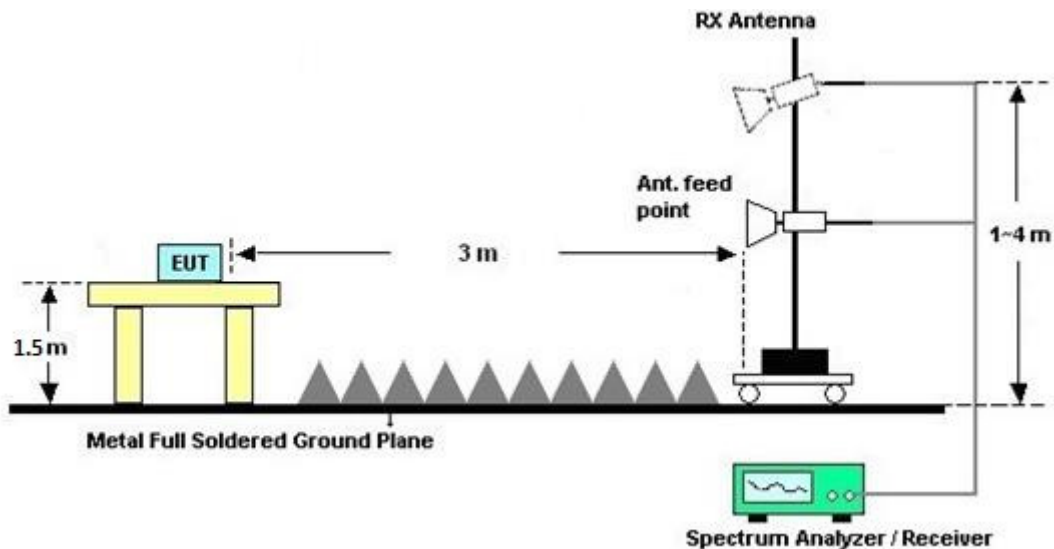
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

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.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix B.

3.4.7 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
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.

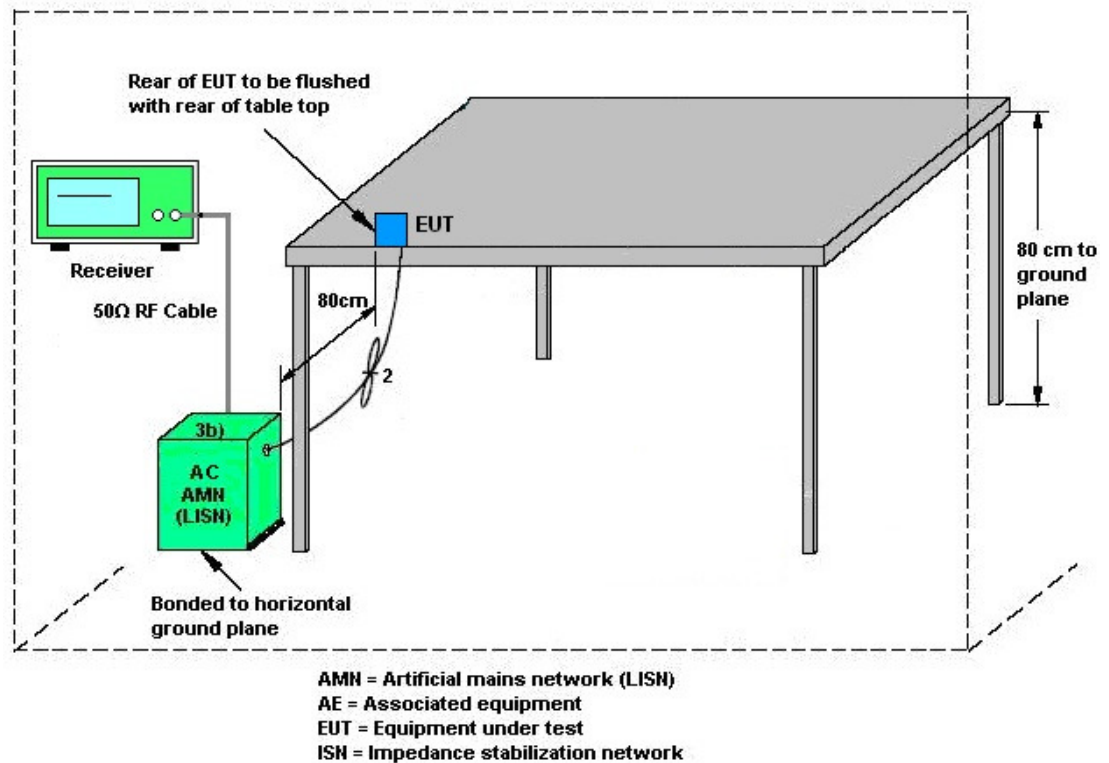
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

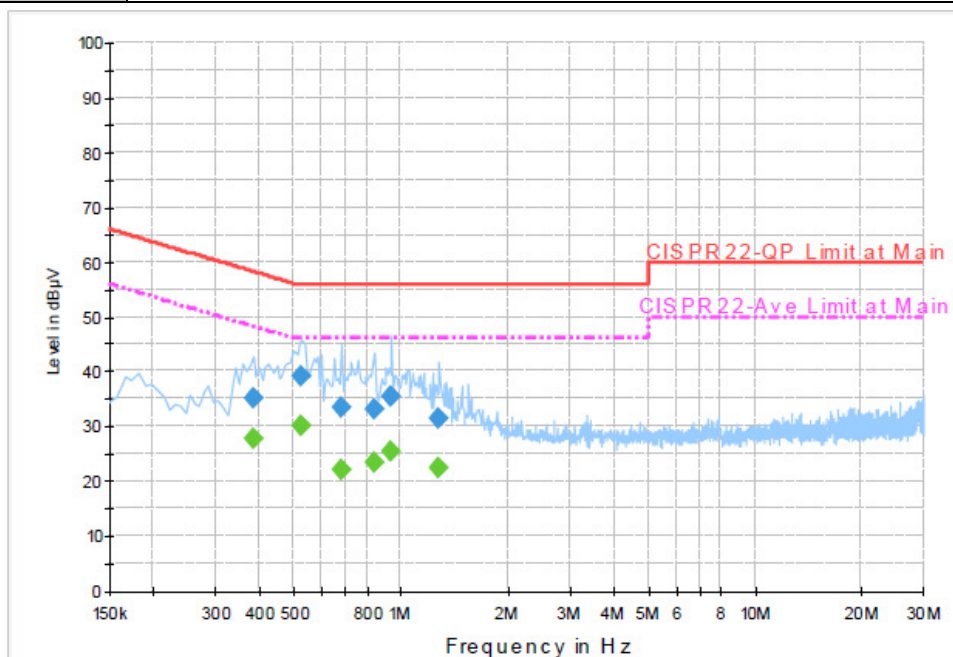
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~23°C
Test Engineer :	Derreck Chen	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (5GHz) Link + LAN Link		



Final Result : QuasiPeak

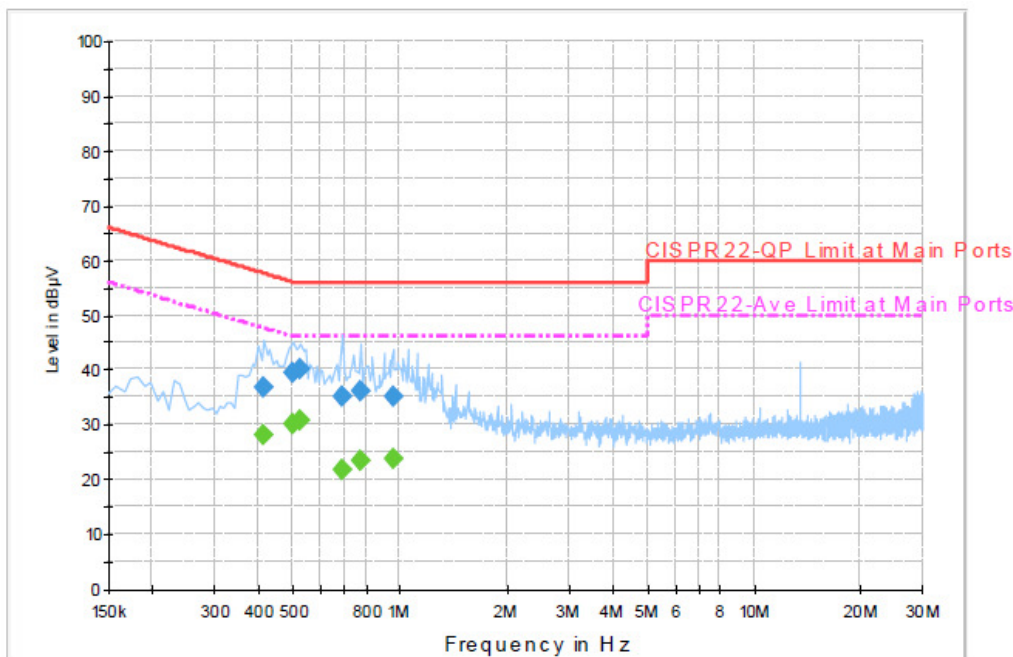
Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.382000	35.3	Off	L1	19.6	22.9	58.2
0.526000	39.2	Off	L1	19.5	16.8	56.0
0.678000	33.5	Off	L1	19.6	22.5	56.0
0.846000	33.1	Off	L1	19.6	22.9	56.0
0.942000	35.5	Off	L1	19.6	20.5	56.0
1.286000	31.4	Off	L1	19.6	24.6	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.382000	27.7	Off	L1	19.6	20.5	48.2
0.526000	30.3	Off	L1	19.5	15.7	46.0
0.678000	22.1	Off	L1	19.6	23.9	46.0
0.846000	23.3	Off	L1	19.6	22.7	46.0
0.942000	25.4	Off	L1	19.6	20.6	46.0
1.286000	22.4	Off	L1	19.6	23.6	46.0



Test Mode :	Mode 1	Temperature :	22~23°C
Test Engineer :	Derreck Chen	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (5GHz) Link + LAN Link		

**Final Result : QuasiPeak**

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.414000	36.8	Off	N	19.5	20.8	57.6
0.502000	39.4	Off	N	19.5	16.6	56.0
0.526000	40.2	Off	N	19.5	15.8	56.0
0.686000	35.0	Off	N	19.6	21.0	56.0
0.774000	36.0	Off	N	19.6	20.0	56.0
0.958000	35.3	Off	N	19.6	20.7	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.414000	28.2	Off	N	19.5	19.4	47.6
0.502000	30.3	Off	N	19.5	15.7	46.0
0.526000	30.6	Off	N	19.5	15.4	46.0
0.686000	21.6	Off	N	19.6	24.4	46.0
0.774000	23.5	Off	N	19.6	22.5	46.0
0.958000	23.6	Off	N	19.6	22.4	46.0

3.6 Frequency Stability Measurement

3.6.1 Limit of Frequency Stability

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.

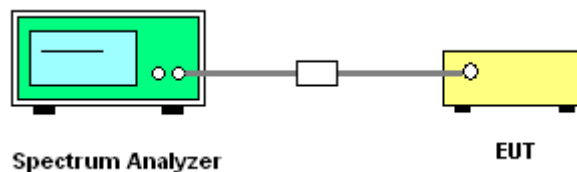
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

3.6.4 Test Setup



3.6.5 Test Result of Frequency Stability

Please refer to Appendix A.



3.7 Automatically Discontinue Transmission

3.7.1 Limit of Automatically Discontinue Transmission

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 to describe how this requirement is met.

3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.7.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.8 Antenna Requirements

3.8.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2), if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.8.2 Antenna Anti-Placement Construction

An embedded-in antenna design is used.

3.8.3 Antenna Gain

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS}=1)$ dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

The EUT supports CDD mode.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant 1 (dBi)	Ant 2 (dBi)				
Band IV	2.61	2.61	2.61	5.62	0.00	0.00

Power limit reduction = Composite gain – 6dBi, (min = 0)

PSD limit reduction = Composite gain + PSD Array gain – 6dBi, (min = 0)



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1240001	300MHz~40GHz	Sep. 17, 2015	Nov. 05, 2015 ~ Dec. 06, 2015	Sep. 16, 2016	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1207349	300MHz~40GHz	Sep. 17, 2015	Nov. 05, 2015 ~ Dec. 06, 2015	Sep. 16, 2016	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz ~ 40GHz	Jun. 18, 2015	Nov. 05, 2015 ~ Dec. 06, 2015	Jun. 17, 2016	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-40℃ ~ 90℃	Sep. 08, 2015	Nov. 05, 2015 ~ Dec. 06, 2015	Sep. 07, 2016	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890089	1V~20V 0.5A~5A	Jan. 14, 2015	Nov. 05, 2015 ~ Dec. 06, 2015	Jan. 13, 2016	Conducted (TH05-HY)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 02, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Nov. 01, 2016	Radiation (03CH11-HY)
Preamplifier	MITEQ	JS44-1800400 0-33-8P	1840917	18GHz ~ 40GHz	Jun. 02, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Jun. 01, 2016	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187231	9kHz~1GHz	Jan. 14, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Jan. 13, 2016	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D	35419	30MHz to 1GHz	Mar. 30, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Mar. 29, 2016	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Oct. 08, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Oct. 07, 2016	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 20, 2014	Nov. 09, 2015 ~ Nov. 18, 2015	Nov. 19, 2015	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz ~ 26.5GHz	Nov. 19, 2015	Nov. 19, 2015 ~ Nov. 27, 2015	Nov. 18, 2016	Radiation (03CH11-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1902247	1GHz ~ 18GHz	Jul. 01, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Jun. 30, 2016	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHz	Sep. 24, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Sep. 23, 2016	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-1080 -1200-1500-60 SS	SN32	1.2G High Pass	Oct. 05, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Oct. 04, 2016	Radiation (03CH11-HY)
Filter	Wainwright	WLK10-4630-5 093-11000-40 SS	SN1	4.5G High Pass	Oct. 05, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Oct. 04, 2016	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Nov. 09, 2015 ~ Nov. 27, 2015	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0-360 degree	N/A	Nov. 09, 2015 ~ Nov. 27, 2015	N/A	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz ~ 30 MHz	Sep. 02, 2015	Nov. 09, 2015 ~ Nov. 27, 2015	Sep. 01, 2016	Radiation (03CH11-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Dec. 01, 2014	Nov. 12, 2015	Nov. 30, 2015	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 02, 2014	Nov. 12, 2015	Dec. 01, 2015	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 08, 2014	Nov. 12, 2015	Dec. 07, 2015	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 12, 2015	N/A	Conduction (CO05-HY)



5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.90
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Appendix A. Conducted Test Results

Test Engineer:	Bill Kuo	Temperature:	21~25	°C
Test Date:	2015/11/05 ~ 2015/12/06	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 26dB EBW and 99% OBW

Band IV													
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	17.50	17.70	24.48	24.72	16.36	16.36	0.5		Pass
11a	6Mbps	2	157	5785	28.50	30.40	46.92	48.12	16.36	16.36	0.5		Pass
11a	6Mbps	2	165	5825	17.60	17.65	25.92	26.76	16.36	16.36	0.5		Pass
HT20	MCS0	2	149	5745	18.75	18.80	24.84	26.76	17.56	17.60	0.5		Pass
HT20	MCS0	2	157	5785	31.45	33.10	52.20	53.04	17.56	17.60	0.5		Pass
HT20	MCS0	2	165	5825	18.65	18.70	25.92	26.40	17.56	17.60	0.5		Pass
HT40	MCS0	2	151	5755	36.80	36.90	46.56	46.32	36.08	36.08	0.5		Pass
HT40	MCS0	2	159	5795	36.90	37.00	48.96	54.24	36.08	36.40	0.5		Pass
VHT20	MCS0	2	149	5745	18.70	18.70	25.32	26.16	17.56	17.60	0.5		Pass
VHT20	MCS0	2	157	5785	31.15	33.90	50.40	53.76	17.56	17.64	0.5		Pass
VHT20	MCS0	2	165	5825	18.70	18.70	25.56	26.28	17.60	17.56	0.5		Pass
VHT40	MCS0	2	151	5755	36.80	36.90	45.36	49.44	36.08	36.32	0.5		Pass
VHT40	MCS0	2	159	5795	37.00	36.90	50.16	56.88	36.40	36.40	0.5		Pass
VHT80	MCS9	2	155	5775	75.84	76.08	88.48	91.12	75.84	75.84	0.5		Pass

TEST RESULTS DATA
Average Power Table

Band IV															
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)			Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	2	149	5745	0.11	0.13	17.89	18.48	21.21	30.00		2.61			Pass
11a	6Mbps	2	157	5785	0.11	0.13	22.70	23.12	25.93	30.00		2.61			Pass
11a	6Mbps	2	165	5825	0.11	0.13	19.56	19.66	22.62	30.00		2.61			Pass
HT20	MCS0	2	149	5745	0.12	0.12	18.55	18.78	21.68	30.00		2.61			Pass
HT20	MCS0	2	157	5785	0.12	0.12	23.01	23.21	26.12	30.00		2.61			Pass
HT20	MCS0	2	165	5825	0.12	0.12	19.10	19.04	22.08	30.00		2.61			Pass
HT40	MCS0	2	151	5755	0.22	0.25	18.11	18.64	21.39	30.00		2.61			Pass
HT40	MCS0	2	159	5795	0.22	0.25	19.21	19.81	22.53	30.00		2.61			Pass
VHT20	MCS0	2	149	5745	0.11	0.12	18.30	18.98	21.66	30.00		2.61			Pass
VHT20	MCS0	2	157	5785	0.11	0.12	23.00	23.21	26.11	30.00		2.61			Pass
VHT20	MCS0	2	165	5825	0.11	0.12	19.00	19.13	22.07	30.00		2.61			Pass
VHT40	MCS0	2	151	5755	0.22	0.22	18.17	18.57	21.38	30.00		2.61			Pass
VHT40	MCS0	2	159	5795	0.22	0.22	19.14	19.81	22.50	30.00		2.61			Pass
VHT80	MCS9	2	155	5775	2.63	2.62	16.34	16.98	19.68	30.00		2.61			Pass

TEST RESULTS DATA
Power Spectral Density

Band IV																
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Duty Factor (dB)		10log (500kHz /RBW) Factor (dB)		Average Power Density (dBm/500kHz)			Average PSD Limit (dBm/500kHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	0.11	0.13	2.22					7.49	30.00	5.62		Pass
11a	6Mbps	2	157	5785	0.11	0.13	2.22					11.76	30.00	5.62		Pass
11a	6Mbps	2	165	5825	0.11	0.13	2.22					8.49	30.00	5.62		Pass
HT20	MCS0	2	149	5745	0.12	0.12	2.22					7.58	30.00	5.62		Pass
HT20	MCS0	2	157	5785	0.12	0.12	2.22					11.62	30.00	5.62		Pass
HT20	MCS0	2	165	5825	0.12	0.12	2.22					7.90	30.00	5.62		Pass
HT40	MCS0	2	151	5755	0.22	0.25	2.22					3.63	30.00	5.62		Pass
HT40	MCS0	2	159	5795	0.22	0.25	2.22					5.11	30.00	5.62		Pass
VHT20	MCS0	2	149	5745	0.11	0.12	2.22					7.54	30.00	5.62		Pass
VHT20	MCS0	2	157	5785	0.11	0.12	2.22					11.36	30.00	5.62		Pass
VHT20	MCS0	2	165	5825	0.11	0.12	2.22					7.87	30.00	5.62		Pass
VHT40	MCS0	2	151	5755	0.22	0.22	2.22					3.65	30.00	5.62		Pass
VHT40	MCS0	2	159	5795	0.22	0.22	2.22					5.12	30.00	5.62		Pass
VHT80	MCS9	2	155	5775	2.63	2.62	2.22					-1.61	30.00	5.62		Pass

TEST RESULTS DATA
Frequency Stability

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stability (ppm)	Temperature (°C)	Voltage (V)	Note
11a	6Mbps	1	149	5745	5745.000	0.000	0.00	20	100	
11a	6Mbps	1	149	5745	5745.000	0.000	0.00	20	240	
11a	6Mbps	1	149	5745	5745.000	0.000	0.00	20	120	
11a	6Mbps	1	149	5745	5744.950	-0.050	-8.70	-30	120	
11a	6Mbps	1	149	5745	5744.950	-0.050	-8.70	50	120	



Appendix B. Radiated Spurious Emission

Test Engineer :	J.C. Liang, Bill Chang, and Ken Wu	Temperature :	22~24°C
		Relative Humidity :	55~58%

Band 4 5725~5850MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		5712.44	67.34	-0.96	68.3	59.23	32.29	9.39	33.57	294	0	P	H
		5722.76	74.9	-3.4	78.3	66.72	32.31	9.44	33.57	294	0	P	H
	*	5745	115.79	-	-	107.58	32.34	9.44	33.57	294	0	P	H
		5745	108.75	-	-	100.54	32.34	9.44	33.57	294	0	A	H
													H
													H
													H
													H
		5714.84	64.36	-3.94	68.3	56.25	32.29	9.39	33.57	378	61	P	V
		5724.76	72.84	-5.46	78.3	64.66	32.31	9.44	33.57	378	61	P	V
	*	5745	111.04	-	-	102.83	32.34	9.44	33.57	378	61	P	V
		5745	103.95	-	-	95.74	32.34	9.44	33.57	378	61	A	V
													V
													V
													V
													V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 157 5785MHz		5704.76	66.63	-1.67	68.3	58.52	32.29	9.39	33.57	289	0	P	H
		5724.76	72.34	-5.96	78.3	64.16	32.31	9.44	33.57	289	0	P	H
	*	5785	120.15	-	-	111.86	32.39	9.49	33.59	289	0	P	H
		5785	113.43	-	-	105.14	32.39	9.49	33.59	289	0	A	H
		5850.24	69.78	-8.52	78.3	61.37	32.48	9.54	33.61	289	0	P	H
		5865.52	66.52	-1.78	68.3	58.09	32.51	9.54	33.62	289	0	P	H
													H
													H
		5714.76	61.75	-6.55	68.3	53.64	32.29	9.39	33.57	370	61	P	V
		5720.28	64.58	-13.72	78.3	56.45	32.31	9.39	33.57	370	61	P	V
	*	5785	112.76	-	-	104.47	32.39	9.49	33.59	370	61	P	V
		5785	107.21	-	-	98.92	32.39	9.49	33.59	370	61	A	V
		5854	62.47	-15.83	78.3	54.03	32.51	9.54	33.61	370	61	P	V
		5860.72	63.05	-5.25	68.3	54.62	32.51	9.54	33.62	370	61	P	V
													V
													V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 165 5825MHz	*	5825	115.32	-	-	106.94	32.46	9.52	33.6	301	0	P	H
		5825	109.79	-	-	101.41	32.46	9.52	33.6	301	0	A	H
		5850.72	73.26	-5.04	78.3	64.85	32.48	9.54	33.61	301	0	P	H
		5860.96	67.07	-1.23	68.3	58.64	32.51	9.54	33.62	301	0	P	H
													H
													H
													H
													H
	*	5825	110.6	-	-	102.22	32.46	9.52	33.6	100	354	P	V
		5825	104.39	-	-	96.01	32.46	9.52	33.6	100	354	A	V
		5852	71.28	-7.02	78.3	62.87	32.48	9.54	33.61	100	354	P	V
		5861.44	61.54	-6.76	68.3	53.11	32.51	9.54	33.62	100	354	P	V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		11490	44.85	-29.15	74	56.73	39.91	13.95	65.74	100	0	P	H
		17235	45.71	-22.59	68.3	51.84	41	16.95	64.08	100	0	P	H
													H
													H
		11490	46.44	-27.56	74	58.32	39.91	13.95	65.74	100	0	P	V
		17235	48.72	-19.58	68.3	54.85	41	16.95	64.08	100	0	P	V
													V
													V
802.11a CH 157 5785MHz		11570	47.82	-26.18	74	59.72	39.76	14	65.66	100	0	P	H
		17355	55.96	-12.34	68.3	61.8	41.35	17.03	64.22	100	0	P	H
													H
													H
		11570	52.09	-21.91	74	63.99	39.76	14	65.66	100	0	P	V
		17355	62.88	-5.42	68.3	68.72	41.35	17.03	64.22	100	0	P	V
													V
													V
802.11a CH 165 5825MHz		11650	50.36	-23.64	74	62.31	39.62	14.05	65.62	100	0	P	H
		17475	53.29	-15.01	68.3	58.85	41.7	17.1	64.36	100	0	P	H
													H
													H
		11650	50.05	-23.95	74	62	39.62	14.05	65.62	100	0	P	V
		17475	51.96	-16.34	68.3	57.52	41.7	17.1	64.36	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 149 5745MHz		5713	65.15	-3.15	68.3	57.04	32.29	9.39	33.57	293	0	P	H
		5722.52	75.39	-2.91	78.3	67.21	32.31	9.44	33.57	293	0	P	H
	*	5745	113.38	-	-	105.17	32.34	9.44	33.57	293	0	P	H
		5745	108.6	-	-	100.39	32.34	9.44	33.57	293	0	A	H
													H
													H
													H
													H
		5712.76	65.68	-2.62	68.3	57.57	32.29	9.39	33.57	153	348	P	V
		5725	75.69	-2.61	78.3	67.51	32.31	9.44	33.57	153	348	P	V
	*	5745	110.95	-	-	102.74	32.34	9.44	33.57	153	348	P	V
		5745	104.19	-	-	95.98	32.34	9.44	33.57	153	348	A	V
													V
													V
													V
													V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 157 5785MHz		5713.8	67.43	-0.87	68.3	59.32	32.29	9.39	33.57	287	360	P	H
		5718.2	70.18	-8.12	78.3	62.05	32.31	9.39	33.57	287	360	P	H
	*	5785	117.48	-	-	109.19	32.39	9.49	33.59	287	360	P	H
		5785	111.65	-	-	103.36	32.39	9.49	33.59	287	360	A	H
		5850.8	70.1	-8.2	78.3	61.69	32.48	9.54	33.61	287	360	P	H
		5860.48	66.66	-1.64	68.3	58.23	32.51	9.54	33.62	287	360	P	H
													H
													H
		5714.28	62.48	-5.82	68.3	54.37	32.29	9.39	33.57	119	355	P	V
		5718.12	65.94	-12.36	78.3	57.81	32.31	9.39	33.57	119	355	P	V
	*	5785	113.29	-	-	105	32.39	9.49	33.59	119	355	P	V
		5785	107.42	-	-	99.13	32.39	9.49	33.59	119	355	A	V
		5853.2	66.01	-12.29	78.3	57.6	32.48	9.54	33.61	119	355	P	V
		5871.76	60.66	-7.64	68.3	52.21	32.53	9.54	33.62	119	355	P	V
													V
													V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 165 5825MHz	*	5825	115.46	-	-	107.08	32.46	9.52	33.6	284	0	P	H
		5825	108.78	-	-	100.4	32.46	9.52	33.6	284	0	A	H
		5851.2	67.35	-10.95	78.3	58.94	32.48	9.54	33.61	284	0	P	H
		5860.4	66.55	-1.75	68.3	58.12	32.51	9.54	33.62	284	0	P	H
													H
													H
													H
													H
	*	5825	110.13	-	-	101.75	32.46	9.52	33.6	111	357	P	V
		5825	103.5	-	-	95.12	32.46	9.52	33.6	111	357	A	V
		5851.84	64.91	-13.39	78.3	56.5	32.48	9.54	33.61	111	357	P	V
		5860.48	62.61	-5.69	68.3	54.18	32.51	9.54	33.62	111	357	P	V
													V
													V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 149 5745MHz		11490	47.72	-26.28	74	59.6	39.91	13.95	65.74	100	0	P	H
		17235	50.33	-17.97	68.3	56.46	41	16.95	64.08	100	0	P	H
													H
													H
		11490	46.33	-27.67	74	58.21	39.91	13.95	65.74	100	0	P	V
		17235	48.11	-20.19	68.3	54.24	41	16.95	64.08	100	0	P	V
													V
													V
802.11n HT20 CH 157 5785MHz		11570	50.73	-23.27	74	62.63	39.76	14	65.66	100	0	P	H
		17355	61.7	-6.6	68.3	67.54	41.35	17.03	64.22	100	0	P	H
													H
													H
		11570	50.36	-23.64	74	62.26	39.76	14	65.66	100	0	P	V
		17355	58.28	-10.02	68.3	64.12	41.35	17.03	64.22	100	0	P	V
													V
													V
802.11n HT20 CH 165 5825MHz		11650	53.38	-20.62	74	65.33	39.62	14.05	65.62	100	0	P	H
		17475	50.34	-17.96	68.3	55.9	41.7	17.1	64.36	100	0	P	H
													H
													H
		11650	49.13	-24.87	74	61.08	39.62	14.05	65.62	100	0	P	V
		17475	49.27	-19.03	68.3	54.83	41.7	17.1	64.36	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 151 5755MHz		5711.72	67.57	-0.73	68.3	59.46	32.29	9.39	33.57	301	0	P	H
		5723.88	74.81	-3.49	78.3	66.63	32.31	9.44	33.57	301	0	P	H
	*	5755	112.12	-	-	103.89	32.36	9.44	33.57	301	0	P	H
		5755	105.98	-	-	97.75	32.36	9.44	33.57	301	0	A	H
		5858	53.4	-24.9	78.3	44.97	32.51	9.54	33.62	301	0	P	H
		5864.24	53.06	-15.24	68.3	44.63	32.51	9.54	33.62	301	0	P	H
													H
													H
		5714.6	64.82	-3.48	68.3	56.71	32.29	9.39	33.57	128	350	P	V
		5722.04	70.85	-7.45	78.3	62.67	32.31	9.44	33.57	128	350	P	V
	*	5755	107.55	-	-	99.32	32.36	9.44	33.57	128	350	P	V
		5755	100.57	-	-	92.34	32.36	9.44	33.57	128	350	A	V
		5852.08	51.33	-26.97	78.3	42.92	32.48	9.54	33.61	128	350	P	V
		5862.32	50.76	-17.54	68.3	42.33	32.51	9.54	33.62	128	350	P	V
													V
													V



WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 159 5795MHz		5711.96	60.25	-8.05	68.3	52.14	32.29	9.39	33.57	317	0	P	H
		5724.44	65.02	-13.28	78.3	56.84	32.31	9.44	33.57	317	0	P	H
	*	5795	113.59	-	-	105.28	32.41	9.49	33.59	317	0	P	H
		5795	107.38	-	-	99.07	32.41	9.49	33.59	317	0	A	H
		5856.72	69.03	-9.27	78.3	60.59	32.51	9.54	33.61	317	0	P	H
		5861.76	67.97	-0.33	68.3	59.54	32.51	9.54	33.62	317	0	P	H
													H
													H
		5703.4	56.16	-12.14	68.3	48.04	32.29	9.39	33.56	100	37	P	V
		5724.04	65.18	-13.12	78.3	57	32.31	9.44	33.57	100	37	P	V
	*	5795	109.89	-	-	101.58	32.41	9.49	33.59	100	37	P	V
		5795	102.35	-	-	94.04	32.41	9.49	33.59	100	37	A	V
		5859.12	65.82	-12.48	78.3	57.39	32.51	9.54	33.62	100	37	P	V
		5862.72	65.27	-3.03	68.3	56.84	32.51	9.54	33.62	100	37	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 151 5755MHz		11510	46.12	-27.88	74	57.97	39.9	13.95	65.7	100	0	P	H
		17265	47.46	-20.84	68.3	53.53	41.1	16.95	64.12	100	0	P	H
													H
													H
		11510	44.87	-29.13	74	56.72	39.9	13.95	65.7	100	0	P	V
		17265	46.88	-21.42	68.3	52.95	41.1	16.95	64.12	100	0	P	V
													V
													V
802.11n HT40 CH 159 5795MHz		11590	44.69	-29.31	74	56.61	39.73	14	65.65	100	0	P	H
		17385	49.58	-18.72	68.3	55.36	41.45	17.03	64.26	100	0	P	H
													H
													H
		11590	44.01	-29.99	74	55.93	39.73	14	65.65	100	0	P	V
		17385	46.76	-21.54	68.3	52.54	41.45	17.03	64.26	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 155 5775MHz		5712.76	67.93	-0.37	68.3	59.82	32.29	9.39	33.57	295	360	P	H
		5725	77.72	-0.58	78.3	69.54	32.31	9.44	33.57	295	360	P	H
	*	5775	108.08	-	-	99.78	32.39	9.49	33.58	295	360	P	H
		5775	100.02	-	-	91.72	32.39	9.49	33.58	295	360	A	H
		5858.24	62.43	-15.87	78.3	54	32.51	9.54	33.62	295	360	P	H
		5860.08	61.46	-6.84	68.3	53.03	32.51	9.54	33.62	295	360	P	H
													H
													H
		5708.28	61.3	-7	68.3	53.19	32.29	9.39	33.57	100	38	P	V
		5724.2	70.48	-7.82	78.3	62.3	32.31	9.44	33.57	100	38	P	V
	*	5775	103.5	-	-	95.2	32.39	9.49	33.58	100	38	P	V
		5775	89.7	-	-	81.4	32.39	9.49	33.58	100	38	A	V
		5852.24	58.42	-19.88	78.3	50.01	32.48	9.54	33.61	100	38	P	V
		5860.8	59.51	-8.79	68.3	51.08	32.51	9.54	33.62	100	38	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

**Band 4 5725~5850MHz****WIFI 802.11ac VHT80 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 155 5775MHz		11550	41.49	-32.51	74	53.39	39.8	13.97	65.67	100	0	P	H
		17325	44.1	-24.2	68.3	50.03	41.25	17	64.18	100	0	P	H
													H
													H
		11550	40.79	-33.21	74	52.69	39.8	13.97	65.67	100	0	P	V
		17325	43.85	-24.45	68.3	49.78	41.25	17	64.18	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

5GHz WIFI 802.11n HT40 (LF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.		(MHz)	(dBμV/m)	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2				(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
5GHz 802.11n HT40 LF		108.03	19.3	-24.2	43.5	38.66	11.14	1.28	31.78	-	-	P	H
		200.1	18.68	-24.82	43.5	40.22	8.6	1.64	31.78	-	-	P	H
		261.12	22.07	-23.93	46	38.94	12.96	1.94	31.77	-	-	P	H
		600.3	33.61	-12.39	46	44.35	18.41	2.89	32.04	371	354	P	H
		720	31.88	-14.12	46	41.26	19.5	3.14	32.02	-	-	P	H
		899.9	28.94	-17.06	46	36.72	20.1	3.55	31.43	-	-	P	H
													H
													H
													H
													H
													H
													H
		49.71	27.93	-12.07	40	50.89	7.8	1.04	31.8	217	54	P	V
		81.57	24.13	-15.87	40	47.97	6.91	1.04	31.79	-	-	P	V
		260.31	20.19	-25.81	46	37.03	12.99	1.94	31.77	-	-	P	V
		600.3	33.33	-12.67	46	44.07	18.41	2.89	32.04	-	-	P	V
		801.2	26.12	-19.88	46	34.97	19.72	3.35	31.92	-	-	P	V
		903.4	28.18	-17.82	46	35.94	20.1	3.55	31.41	-	-	P	V
													V
													V
													V
													V
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical

A calculation example for radiated spurious emission is shown as below:

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Setup Photographs

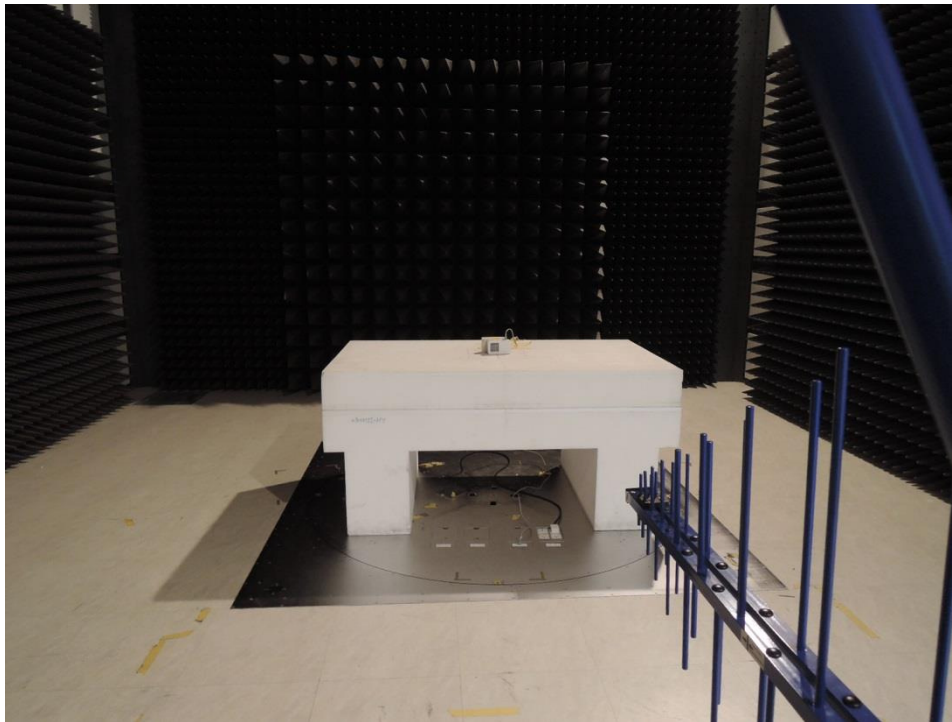
<Conducted Emission>



<Radiated Emission>

Z Plane

LF



HF

