



TESTING LABORATORY
CERTIFICATE#4323.01



FCC PART 15.407

TEST REPORT

For

Shanghai Sunmi Technology Co.,Ltd.

Room 605, Block 7, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai 200433 China

FCC ID: 2AH25FW010

Report Type: CIIPC Report	Product Type: Wireless Router
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Report Number: <u>RKSA191107001-00B</u>	
Report Date: <u>2019-12-03</u> Oscar Ye	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Shanghai Sunmi Technology Co.,Ltd.
Tested Model:	FW010
Product Type:	Wireless Router
Power Supply:	AC100~240V
RF Function:	2.4G Wi-Fi, 5G Wi-Fi,
Operating Band/Frequency:	2.4G Wi-Fi: 2412-2462MHz 5G Wi-Fi B1: 5150-5250MHz, B4: 5725-5850MHz
Channel Number:	2.4G Wi-Fi: 2412-2462MHz 11; 5G Wi-Fi B1:7, B4:8
Channel Separation:	2.4G Wi-Fi: 5MHz; 5G Wi-Fi B1/B4 a/ac20/n20 mode: 20MHz, n40/ac40 mode: 40MHz; ac80 mode: 80MHz
Modulation Type:	2.4GWi-Fi: DSSS,OFDM; 5GWi-Fi: DSSS, OFDM
Antenna Type:	2.4GWi-Fi, 5Wi-Fi: Monopole Antenna
Maximum Antenna Gain:	2.4G Wi-Fi: Antenna 0: 3.67dBi, Antenna 1: 3.35dBi, Antenna 2: 3.33dBi, Antenna 3: 2.65dBi; 5G Wi-Fi: Antenna 0: 4.58 dBi, Antenna 1: 5.13dBi

**All measurement and test data in this report was gathered from production sample serial number: 20191107001.
(Assigned by the BACL. The EUT supplied by the applicant was received on 2019-11-07)*

Objective

This type approval report is prepared on behalf of *Shanghai Sunmi Technology Co.,Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.205, 15.207, 15.209 and 15.407 rules.

This is a CIIPC report based on the original report RKSA190613001-00D with FCC ID: 2AH25FW010 which was granted on 2019-08-22, the differences between the original device and the current one are as follows:

Update the board of the internal power supply, this change will affect AC Line Conducted Emissions and Spurious Emissions (below 1GHz) testing, so we retested these items and all the other data referred to the original report.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submissions with FCC ID: 2AH25FW010.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Kunshan).

Measurement Uncertainty

Item	Uncertainty	
AC Power Lines Conducted Emissions	3.19 dB	
Radiated emission	30MHz~1GHz	6.11dB
Temperature	1.0°C	
Humidity	6%	

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01), the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

In **5150~5250 MHz** band, test channel list is as below,

802.11a/802.11ac20/n20 mode Channel 36, 40, 48 were tested.

802.11n40/802.11ac40 mode Channel 38, 46 were tested.

802.11ac80 mode Channel 42 was tested

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

For 5725~5850 MHz band,

802.11a/802.11ac20/n20 mode Channel 149, 157, 165 were tested.

802.11n40/802.11ac40 mode Channel 151, 159 were tested.

802.11ac80 mode Channel 155 was tested.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	159	5795
151	5755	161	5805
153	5765	165	5825
155	5775	/	/
157	5785	/	/

EUT Exercise Software

RF test tool: QRCT

The worst case was performed under:

5150MHz-5250MHz Band:

Mode	Data rate	Channel	Power level	
			Chain 0	Chain 1
802.11a	6 Mbps	5180	22	24
		5200	24	24
		5240	24	24
802.11ac20	MCS0	5180	21	21
		5200	22	22
		5240	22	22
802.11n-HT20	MCS0	5180	21	21
		5200	22	22
		5240	22	22
802.11ac40	MCS0	5190	18	18
		5230	23	23
802.11n-HT40	MCS0	5190	18	18
		5230	23	23
802.11ac80	MCS0	5210	16	16

5725MHz-5850MHz Band:

Mode	Data rate	Channel	Power level	
			Chain 0	Chain 1
802.11a	6 Mbps	5745	24	24
		5785		
		5825		
802.11ac20	MCS0	5745	24	24
		5785		
		5825		
802.11n-HT20	MCS0	5745	24	24
		5785		
		5825		
802.11ac40	MCS0	5755	23	23
		5795		
802.11n-HT40	MCS0	5755	23	23
		5795		
802.11ac80	MCS0	5775	20	20

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

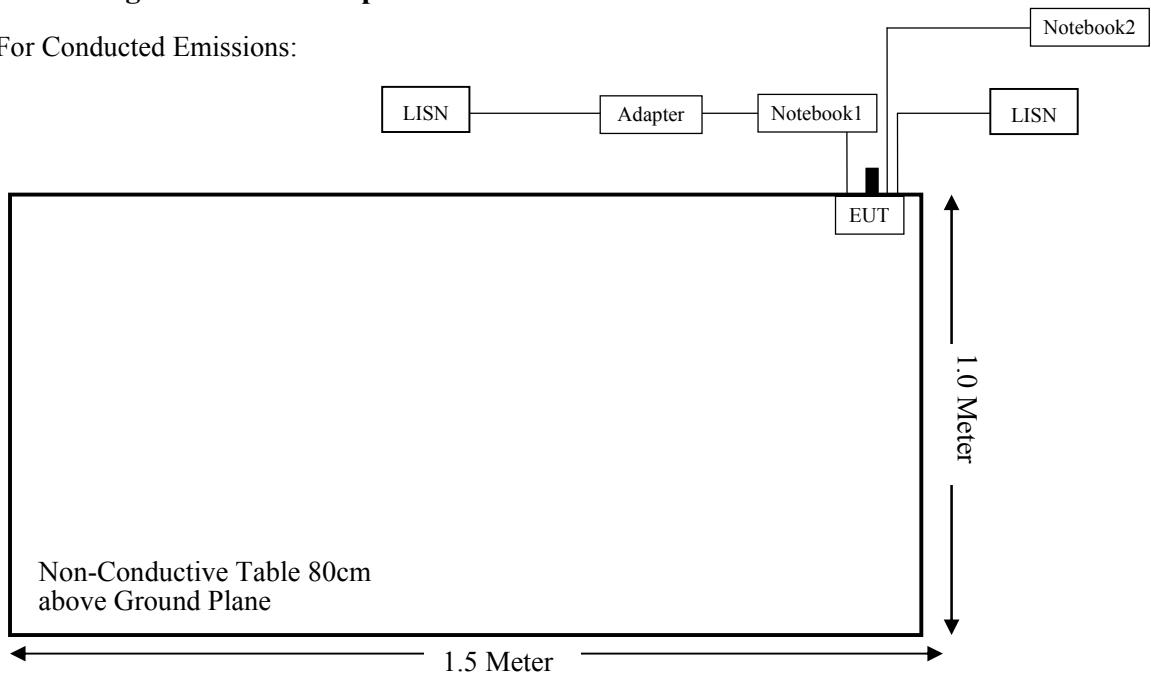
Manufacturer	Description	Model	Serial Number
DELL	Notebook1	GX620	D65874152
DELL	Notebook2	GX620	D65874152
DELL	Adapter	LA65NS0-00	DF263
Sandisk	USB flash disk	16G	/

External I/O Cable

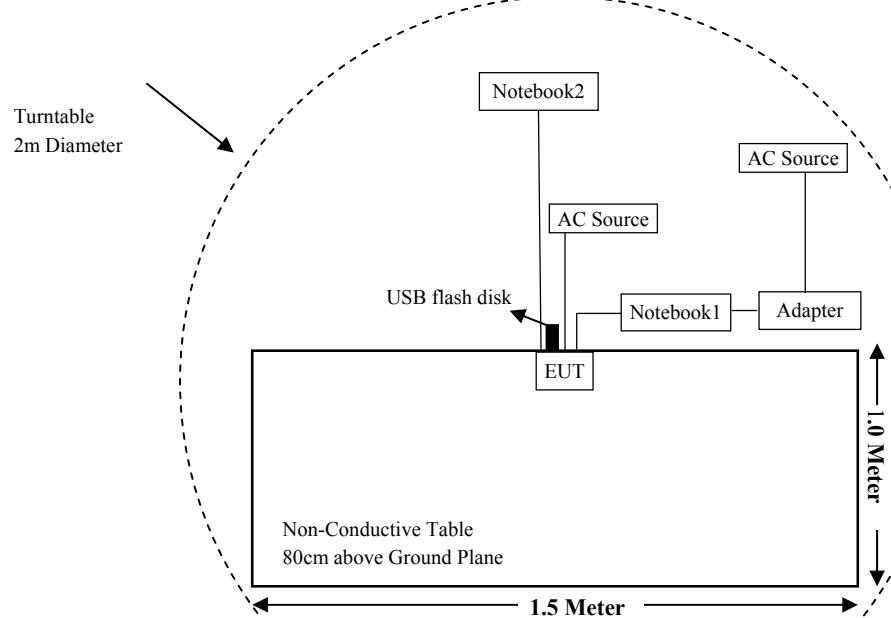
Cable Description	Length (m)	From Port	To
RJ45 Cable	10.0	EUT	Notebook1
RJ45 Cable	10.0	EUT	Notebook2
Power Cable	1.0	Notebook	Adapter
Power Cable	1.0	Adapter	AC Source
Power Cable	1.0	EUT	AC Source

Block Diagram of Test Setup

For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.207 & §15.407(b) (6)	AC Power Line Conducted Emissions	Compliant
§15.205 & §15.209 & §15.407(b) (1) ,(6) ,(7)	Undesirable Emission	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber 1#)					
Rohde & Schwarz	EMI Test receiver	ESR	1316.3003K03-102454-Qd	2019-06-25	2020-06-24
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrunent	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Audix	Test Software	e3	V9	-	-
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-07-11	2020-07-10
Rohde & Schwarz	LISN	ENV216	3560655016	2018-11-30	2019-11-29
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2018-11-30	2019-11-29
Audix	Test Software	e3	V9	---	---
Narda	Attenuator/10dB	10690812-2	26850-6	2019-01-10	2020-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2019-08-15	2020-08-14

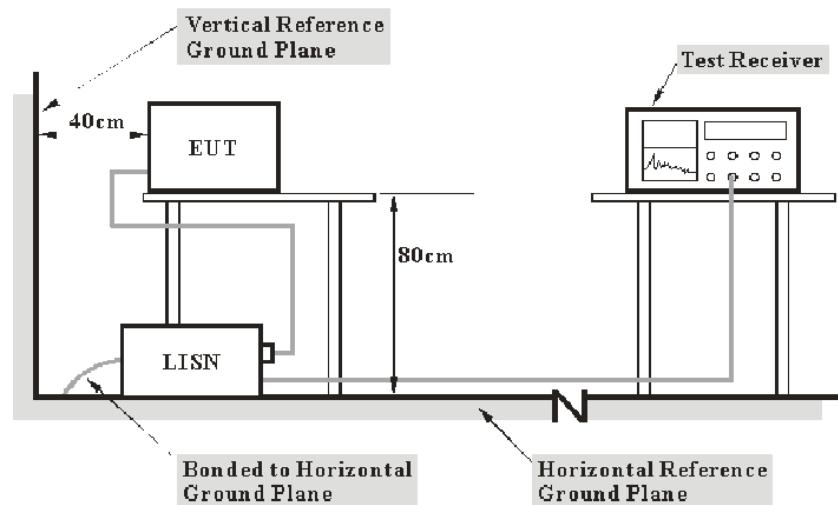
*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.407 (b) (6) §15.207 (a) – AC POWER LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a), §15.407(b) (6)

EUT Setup



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

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the EUT was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Over Limit Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Attenuator. The basic equation is as follows:

$$\text{Corrected Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Attenuator (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7 dB means the emission is 7 dB above the limit. The equation for Over Limit calculation is as follows:

$$\text{Over Limit (dB)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)} - \text{Limit (dB}\mu\text{V)}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the [FCC Part 15.207](#).

Test Data

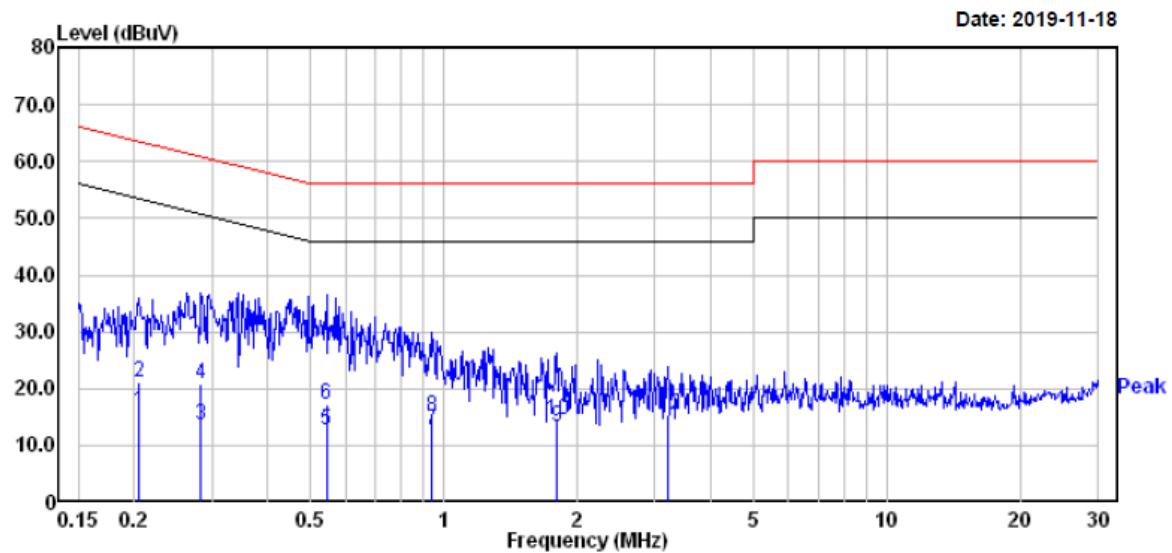
Environmental Conditions

Temperature:	20.2~23.6 °C
Relative Humidity:	48~51 %
ATM Pressure:	101.1~101.3 kPa

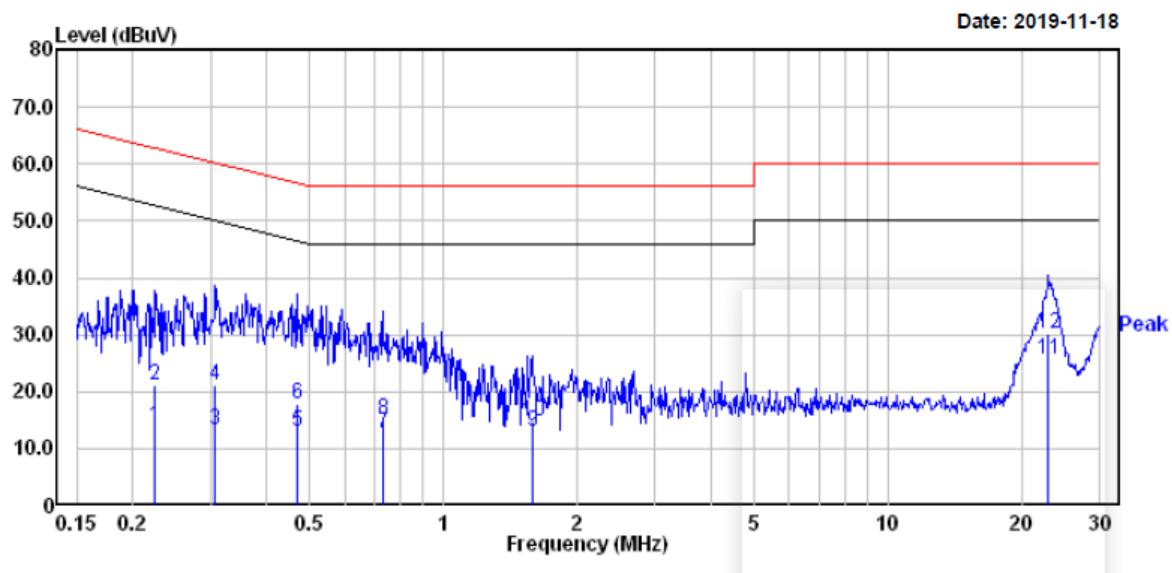
The testing was performed by Jack Jiao from 2019-11-18.

EUT operation mode: Transmitting in 802.11n-HT20 mode at 5200MHz (worst case)

AC 120V/60 Hz, Line



Freq	Read			Limit	Over	Remark	
	MHz	Level	Factor	Level	Line	Limit	
1	0.205	-3.80	19.82	16.02	53.40	-37.38	Average
2	0.205	1.20	19.82	21.02	63.40	-42.38	QP
3	0.283	-6.20	19.82	13.62	50.72	-37.10	Average
4	0.283	0.90	19.82	20.72	60.72	-40.00	QP
5	0.544	-7.00	19.75	12.75	46.00	-33.25	Average
6	0.544	-2.60	19.75	17.15	56.00	-38.85	QP
7	0.943	-7.00	19.77	12.77	46.00	-33.23	Average
8	0.943	-4.70	19.77	15.07	56.00	-40.93	QP
9	1.800	-6.70	19.84	13.14	46.00	-32.86	Average
10	1.800	-5.30	19.84	14.54	56.00	-41.46	QP
11	3.207	-5.80	19.46	13.66	46.00	-32.34	Average
12	3.207	-4.20	19.46	15.26	56.00	-40.74	QP

AC 120V/60 Hz, Neutral

Freq	Read			Limit		Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV		
1	0.224	-5.80	19.82	14.02	52.66	-38.64	Average
2	0.224	1.20	19.82	21.02	62.66	-41.64	QP
3	0.307	-6.41	19.83	13.42	50.06	-36.64	Average
4	0.307	1.19	19.83	21.02	60.06	-39.04	QP
5	0.469	-6.89	19.75	12.86	46.54	-33.68	Average
6	0.469	-1.79	19.75	17.96	56.54	-38.58	QP
7	0.731	-7.20	19.73	12.53	46.00	-33.47	Average
8	0.731	-4.50	19.73	15.23	56.00	-40.77	QP
9	1.585	-6.81	19.85	13.04	46.00	-32.96	Average
10	1.585	-5.11	19.85	14.74	56.00	-41.26	QP
11	23.018	5.91	19.78	25.69	50.00	-24.31	Average
12	23.018	10.31	19.78	30.09	60.00	-29.91	QP

§15.205 & §15.209 & §15.407(B) (1),(6),(7) – UNDESIRABLE EMISSION

Applicable Standard

FCC §15.407 (b) (1), (6), (7); §15.209; §15.205;

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of $-27\text{dBm}/\text{MHz}$

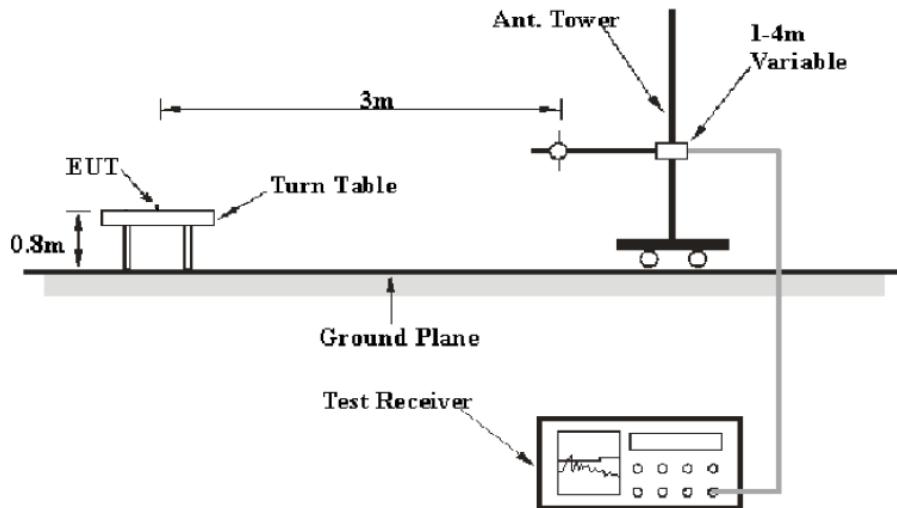
For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of $-27\text{dBm}/\text{MHz}$ at 75 MHz or more above or below the band edge increasing linearly to $10\text{ dBm}/\text{MHz}$ at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of $15.6\text{ dBm}/\text{MHz}$ at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of $27\text{ dBm}/\text{MHz}$ at the band edge.

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000MHz shall be performed using a minimum resolution bandwidth of 1MHz.

According to 789033 D02 General UNII Test Procedures New Rules v02r01, emission shall be computed as: $E [\text{dB}\mu\text{V}/\text{m}] = \text{EIRP} [\text{dBm}] + 95.2$, for $d = 3$ meters.

EUT Setup

Below 1 GHz:



The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 1 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP

Test Procedure

During the radiated emission test, the adapter was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz.

Factor & Over Limit Calculation

The Factor is calculated by adding Antenna Factor , Cable Loss, and Amplifier Gain. The basic equation is as follows:

$$\text{Factor (dB)} = \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7dB means the emission is 7 dB above the limit. The equation for Over Limit calculation is as follows:

$$\text{Over Limit (dB)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB/m)} - \text{Limit (dB}\mu\text{V/m)}$$

Test Data

Environmental Conditions

Temperature:	24.8 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Jack Jiao on 2019-11-26.

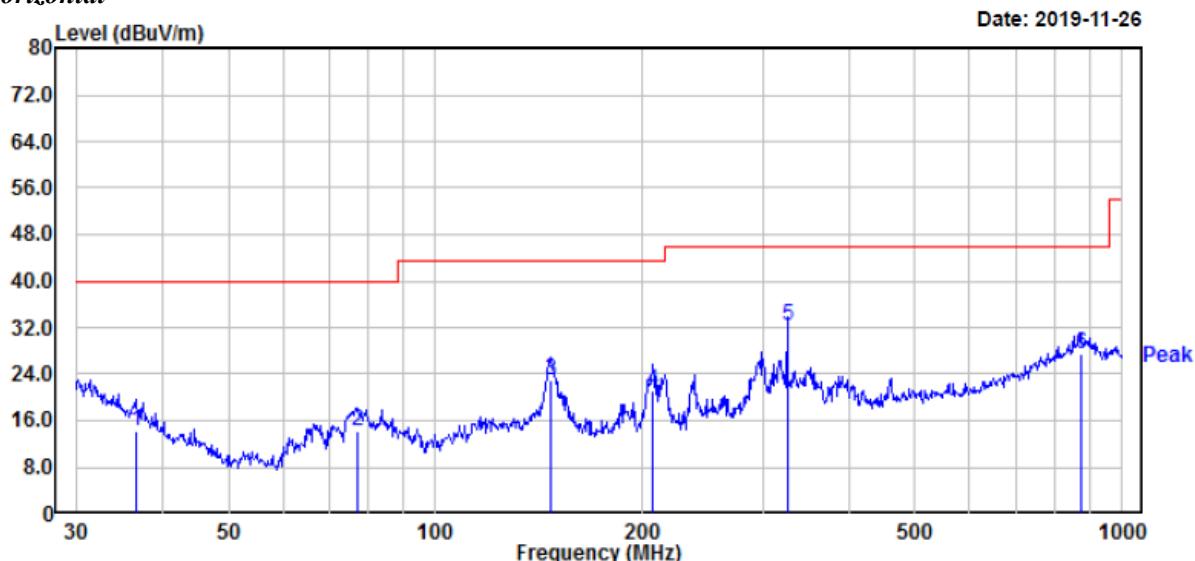
Test Mode: Transmitting

Spurious Emission Test

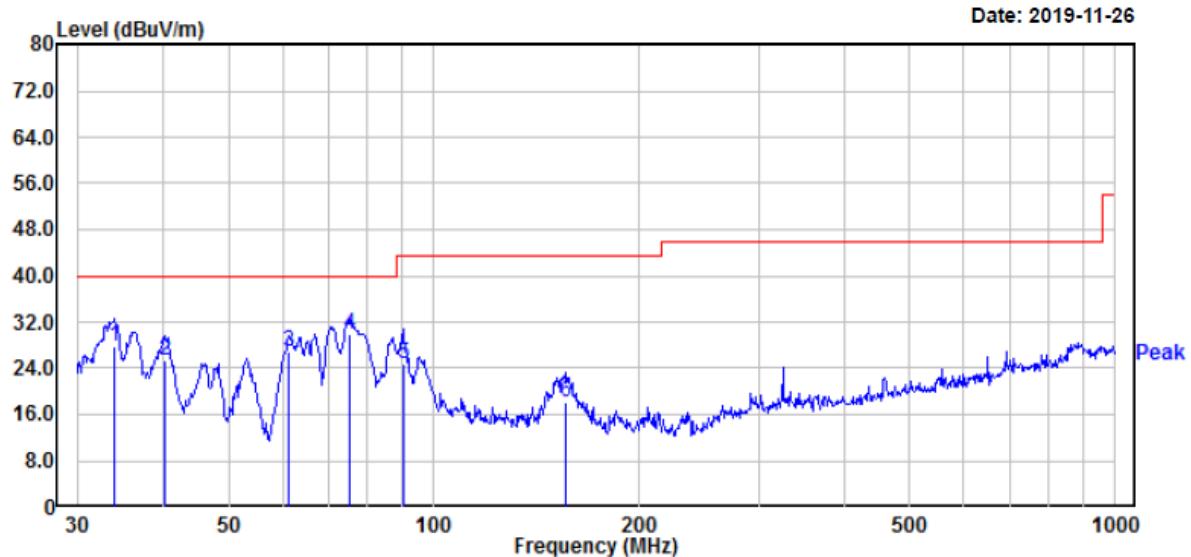
30MHz-1GHz(5150-5250MHz Band):

Pre-scan with 802.11a, 802.11a c20, 802.11n-HT20, 802.11a c40, 802.11n-HT40 and 802.11 a c80 modes of operation in the X,Y and Z axes of orientation, the worst case 802.11n-HT20 MIMO mode in channel 5180 in Z-axis of orientation was recorded

Horizontal



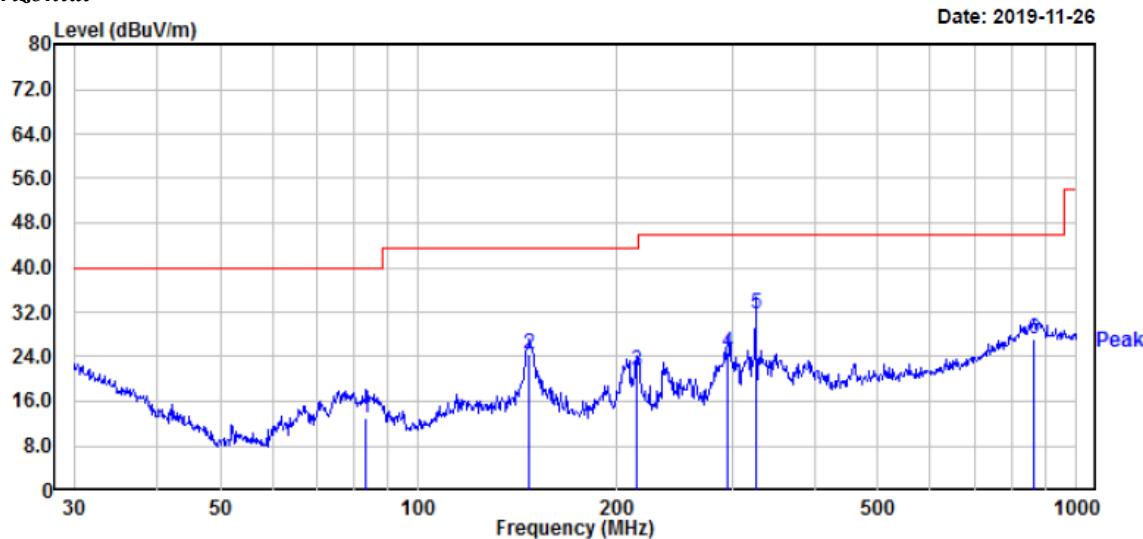
Freq	Read			Limit	Over	APos	TPos	Remark
	MHz	Level	Factor					
1	36.64	22.70	-8.65	14.05	40.00	-25.95	200	360 QP
2	77.05	31.30	-17.09	14.21	40.00	-25.79	200	175 QP
3	147.40	34.70	-11.86	22.84	43.50	-20.66	200	346 QP
4	207.85	33.61	-12.36	21.25	43.50	-22.25	100	187 QP
5	325.60	42.00	-9.72	32.28	46.00	-13.72	100	50 QP
6	872.18	27.10	0.46	27.56	46.00	-18.44	100	193 QP

Vertical

Freq	Read			Limit	Over	APos	TPos	Remark
	MHz	Level	Factor					
1	34.04	34.29	-6.48	27.81	40.00	-12.19	100	1 QP
2	40.28	37.10	-11.60	25.50	40.00	-14.50	100	182 QP
3	61.35	44.20	-17.47	26.73	40.00	-13.27	100	238 QP
4	75.18	46.79	-17.03	29.76	40.00	-10.24	131	1 QP
5	90.22	42.00	-17.19	24.81	43.50	-18.69	100	321 QP
6	155.91	30.20	-11.98	18.22	43.50	-25.28	100	256 QP

30MHz-1GHz(5725-5850MHz Band):

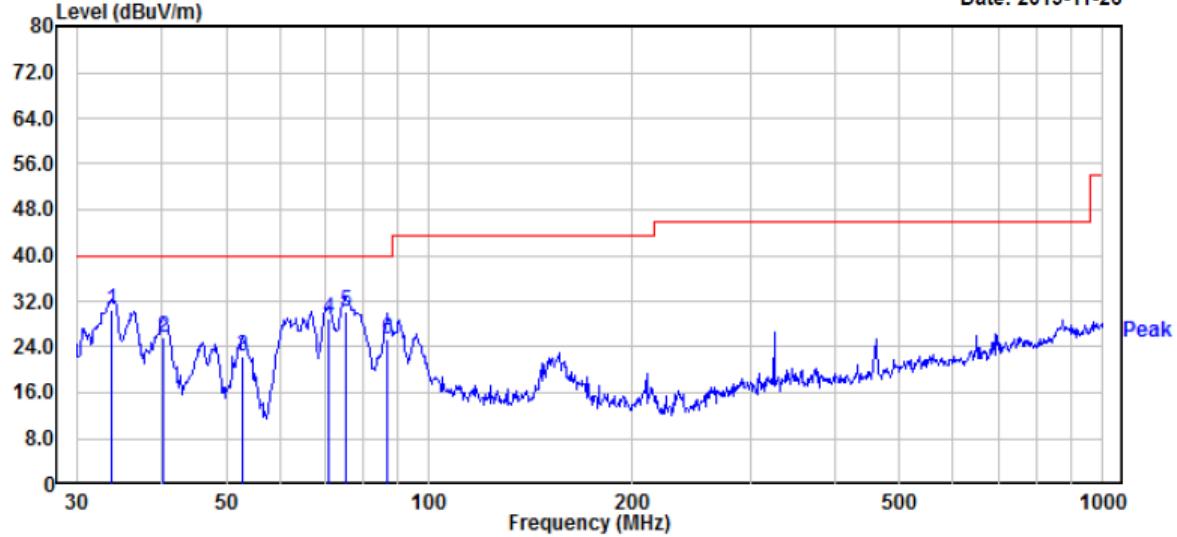
Pre-scan with 802.11a and 802.11n-HT20 modes of operation in the X,Y and Z axes of orientation, the worst case 802.11n-HT20 MIMO mode in channel 5745 in Z-axis of orientation was recorded

Horizontal

Freq	Read			Limit Line	Over Limit	APos	TPos	Remark
	MHz	dBuV	dB/m	dBuV/m				
1	83.23	30.09	-17.19	12.90	40.00	-27.10	200	95 QP
2	147.40	36.20	-11.86	24.34	43.50	-19.16	200	178 QP
3	214.51	34.49	-12.96	21.53	43.50	-21.97	100	220 QP
4	295.15	35.20	-10.34	24.86	46.00	-21.14	100	46 QP
5	325.60	41.50	-9.72	31.78	46.00	-14.22	100	176 QP
6	863.06	26.89	0.28	27.17	46.00	-18.83	100	182 QP

Vertical

Date: 2019-11-26



Freq	Read		Limit	Over	APos	TPos	Remark
	Level	Factor					
1	33.68	36.59	-6.18	30.41	40.00	-9.59	100 153 QP
2	40.42	37.41	-11.68	25.73	40.00	-14.27	100 222 QP
3	52.76	39.60	-17.11	22.49	40.00	-17.51	100 153 QP
4	71.08	45.80	-16.92	28.88	40.00	-11.12	164 -3 QP
5	75.45	47.30	-17.04	30.26	40.00	-9.74	100 4 QP
6	86.81	42.61	-17.23	25.38	40.00	-14.62	100 11 QP

***** END OF REPORT *****