FCC TEST REPORT

For

AtGames Digital Media Inc.

Legends Ultimate Home Arcade

Test Model: HA8800

List Model No.: Please refer to page 6

Prepared for	:	AtGames Digital Media Inc.
Address	:	2228 E Maple Ave,El Segundo, CA 90245, USA
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	December 31, 2019
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	December 31, 2019 ~ January 10, 2020
Date of Report	:	January 14, 2020

FCC TEST REPORT
FCC CFR 47 PART 15E(15.407)

Report Reference No.	**:**	**LCS191217060AED**
Date of Issue.....	:	January 14, 2020
Testing Laboratory Name	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd., Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	**:**	**AtGames Digital Media Inc.**
Address.....	:	2228 E Maple Ave,El Segundo, CA 90245, USA
Test Specification		
Standard	:	FCC CFR 47 PART 15E(15.407)
Test Report Form No.	**:**	LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

EUT Description.	**:**	**Legends Ultimate Home Arcade**
Trade Mark.....	:	N/A
Test Model	:	HA8800
Ratings.....	:	Input: AC100-240V, 50/60Hz 2A Output: DC12V/5A
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Jayden Zhuo	Jin Wang	Gavin Liang
Jayden Zhuo/ File administrators	Jin Wang / Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCS191217060AED**	January 14, 2020 Date of issue

EUT.....	: Legends Ultimate Home Arcade
Test Model.....	: HA8800
Applicant.....	**: AtGames Digital Media Inc.**
Address.....	: 2228 E Maple Ave,El Segundo, CA 90245, USA
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: AtGames Digital Media Inc.**
Address.....	: 2228 E Maple Ave,El Segundo, CA 90245, USA
Telephone.....	: /
Fax.....	: /
Factory.....	**: AtGames Digital Media Inc.**
Address.....	: 2228 E Maple Ave,El Segundo, CA 90245, USA
Telephone.....	: /
Fax.....	: /

Test Result:	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	January 14, 2020	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Legends Ultimate Home Arcade
Test Model	:	HA8800
Model Number	:	HA8800S,HA8800B,HA8800C;HA8800D,HA8801,HA8801S,HA8801B, HA8801C,HA8801D,HA8802,HA8802S,HA8802B,HA8802C;HA8803, HA8803S,HA8803B,HA8803C,HA8804,HA8804S,HA8804B,HA8804C, HA8805,HA8805S,HA8805B,HA8805C,HA8810,HA8810S,HA8810B, HA8810C,HA8810D,HA8811,HA8811S,HA8811B,HA8811C,HA8812, HA8812S,HA8812B,HA8812C,HA8813,HA8813S,HA8813B,HA8813C, HA8814,HA8814S,HA8814B,HA8814C,HA8815,HA8815S,HA8815B, HA8815C,HA8820,HA8820S,HA8820B,HA8820C,HA2800,HA2800S, HA2800B,HA2800C,HA2800D,HA2801,HA2801S,HA2801B,HA2801C, HA2801D
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, Only the model name is different for these models.
Power Supply	:	Input: AC100-240V, 50/60Hz 2A Output: DC12V/5A
Hardware Version	:	HA8800-V2.2
Software Version	:	HA8800_Wifi_V2.0
Bluetooth	:	
Frequency Range	:	2402-2480MHz
Channel Number	:	79 channels for Bluetooth V4.1 (BDR/EDR) 40 channels for Bluetooth V4.1 (BT LE)
Channel Spacing	:	1MHz for Bluetooth V4.1 (BDR/EDR) 2MHz for Bluetooth V4.1 (BT LE)
Modulation Type	:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V4.1 (BDR/EDR) GFSK for Bluetooth V4.1 (BT LE)
Bluetooth Version	:	V4.1
WIFI(2.4G Band)	:	
Frequency Range	:	2412-2462MHz
Channel Spacing	:	5MHz
Channel Number	:	11 channels for 20MHz bandwidth(2412~2462MHz) 7 channels for 40MHz bandwidth(2422~2452MHz)
Modulation Type	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK); IEEE 802.11g/n: OFDM(64QAM, 16QAM, QPSK, BPSK)
WIFI (5.2G Band)	:	
Frequency Range	:	5180-5240MHz
Channel Number	:	4 channels for 20MHz bandwidth(5180-5240MHz) 2 channels for 40MHz bandwidth(5190~5230MHz) 1 channels for 80MHz bandwidth(5210MHz)
Modulation Type	:	IEEE 802.11a/n/ac: OFDM(64QAM, 16QAM, QPSK, BPSK)
WIFI (5.8G Band)	:	
Frequency Range	:	5745-5825MHz
Channel Number	:	5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5755~5795MHz) 1 channels for 80MHz bandwidth(5775MHz)

Modulation Type	:	IEEE 802.11a/n/ac: OFDM(64QAM, 16QAM, QPSK, BPSK)
2.4G Function	:	
Frequency Range	:	2407- 2469MHz (2407 MHz, 2413 MHz, 2420 MHz, 2426 MHz, 2431 MHz, 2436 MHz, 2439 MHz ,2442 MHz, 2447 MHz, 2449 MHz, 2452 MHz, 2454 MHz, 2459 MHz, 2462 MHz, 2467 MHz, 2469 MHz)
Channel Number	:	16
Modulation Type	:	GFSK
Antenna Description	:	
		One External Antenna(ANT0), for Bluetooth, 2.4G WLAN, 5.2G WLAN and 5.8G WLAN 2.0dBi (Max.) One PCB Antenna(ANT1) used for 2.4G Function TX/RX, 2.0dBi(max.) One PCB Antenna(ANT2) used for 2.4G Function TX/RX, 2.0dBi(max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
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1.3. External I/O Port

I/O Port Description	Quantity	Cable
Charge Port	1	N/A

1.4. Description of Test Facility

FCC Registration Number is 254912.
Industry Canada Registration Number is 9642A-1.
EMSD Registration Number is ARCB0108.
UL Registration Number is 100571-492.
TUV SUD Registration Number is SCN1081.
TUV RH Registration Number is UA 50296516-001.
NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier: CN0071.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/50Hz, recorded worst case.

AC conducted emission pre-test at both at charge from PC and power adapter modes, recorded worst case.

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power, which was determined to be IEEE 802.11ac VHT20 mode (High Channel).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be IEEE 802.11ac VHT20 mode (High Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

IEEE 802.11a Mode: 6 Mbps, OFDM.
IEEE 802.11ac VHT20 Mode: MCS0
IEEE 802.11n HT20 Mode: MCS0, OFDM.
IEEE 802.11ac VHT40 Mode: MCS0, OFDM.
IEEE 802.11n HT40 Mode: MCS0, OFDM.
IEEE 802.11ac VHT80 Mode: MCS0, OFDM.

1.8. Channel and Frequency

Frequency Band	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
5180~5240MHz	36	5180	44	5220
	38	5190	46	5230
	40	5200	48	5240
	42	5210	/	/
For IEEE 802.11a/n HT20/ac VHT20, Channel 36, 40 and 48 were tested. For IEEE 802.11n HT40/ac VHT40, Channel 38 and 46 were tested. For IEEE 802.11ac VHT80, Channel 42 was tested.				

2. 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.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure 789033 D02 General UNII Test Procedures New Rules v01r03 and KDB 662911 D01 Multiple Transmitter Output v02r01 is required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.1 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (Secure CRT and MPTool) provided by applicant.

3.3. Special Accessories

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/ unshielded	Notes
1	--	--	--	--	--	--	--
2	--	--		--	--	--	--

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart E			
FCC Rules	Description of Test	Result	Remark
§15.407(a)	Maximum Conducted Output Power	Compliant	Note 1
§15.209, §15.407(b)	Radiated Emissions	Compliant	Note 1
§15.207(a)	AC Conducted Emissions	Compliant	Note 1
§15.407 §2.1091	RF Exposure	Compliant	Note 2

Remark:
1. Note 1 – Test results inside test report;
2. Note 2 – Test results in other test report (RF Exposure Evaluation Report);

5. TEST RESULT

5.1. Maximum Conducted Output Power Measurement

5.1.1. Standard Applicable

(1) For the band 5.15~5.25GHz

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of the power meter.

5.1.3. Test Procedures

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

According to KDB 789033 D02 Section 3 (a) Method PM (Measurement using an RF average power meter):

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

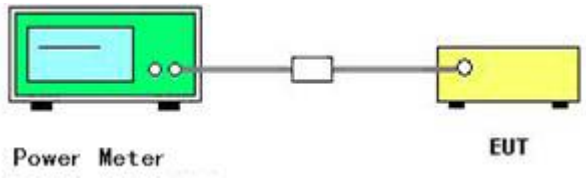
- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
- The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

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

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

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

5.1.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.6. Test Result of Maximum Conducted Output Power

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor(dB)	Report Conducted Power(dBm)	Limit (dBm)	Verdict
11A	36	5180	12.99	0	12.99	24	Pass
	40	5200	13.09	0	13.09		Pass
	48	5240	12.52	0	12.52		Pass
11N20 SISO	36	5180	13.48	0	13.48	24	Pass
	40	5200	12.58	0	12.58		Pass
	48	5240	12.72	0	12.72		Pass
11N40 SISO	38	5190	13.33	0	13.33	24	Pass
	46	5230	13.36	0	13.36		Pass
11AC20 SISO	36	5180	13.22	0	13.22	24	Pass
	40	5200	12.39	0	12.39		Pass
	48	5240	12.7	0	12.7		Pass
11AC40 SISO	38	5190	12.82	0	12.82	24	Pass
	46	5230	12.74	0	12.74		Pass
11AC80 SISO	42	5210	13.36	0	13.36	24	Pass

Remark:

1. *Measured output power at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40, IEEE 802.11ac VHT80;*
4. *Report conducted power = Measured conducted average power + Duty Cycle factor;*

5.2. Radiated Emissions Measurement

5.2.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
\2\ Above 38.6

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 e.i.r.p. of −27 dBm/MHz (68.2dBuV/m at 3m).

In addition, 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 (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

5.2.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

5.2.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

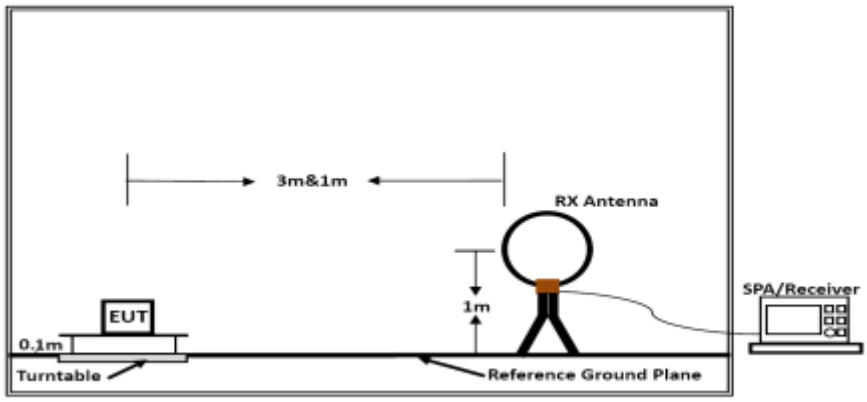
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

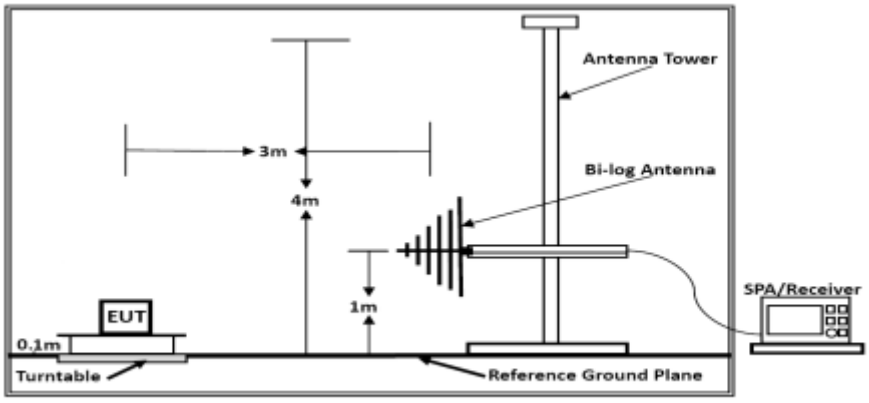
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

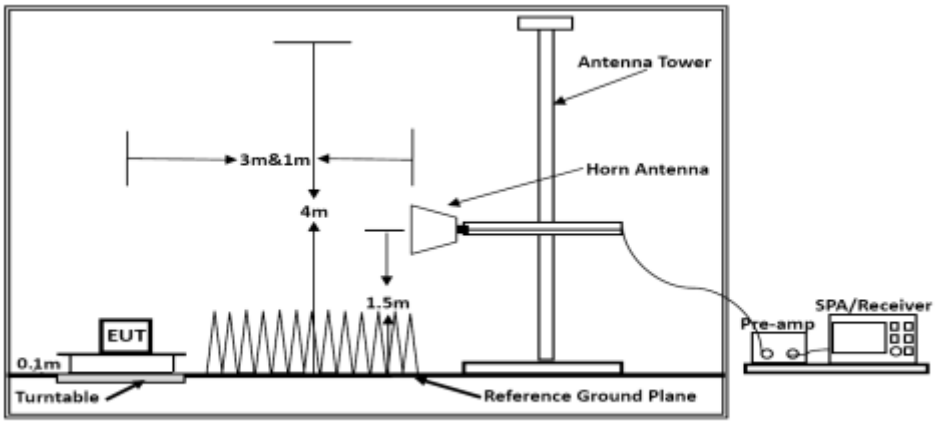
5.2.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	23.6℃	Humidity	53.8%
Test Engineer	Jk Zhou	Configurations	IEEE 802.11a/n/ac

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dB)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

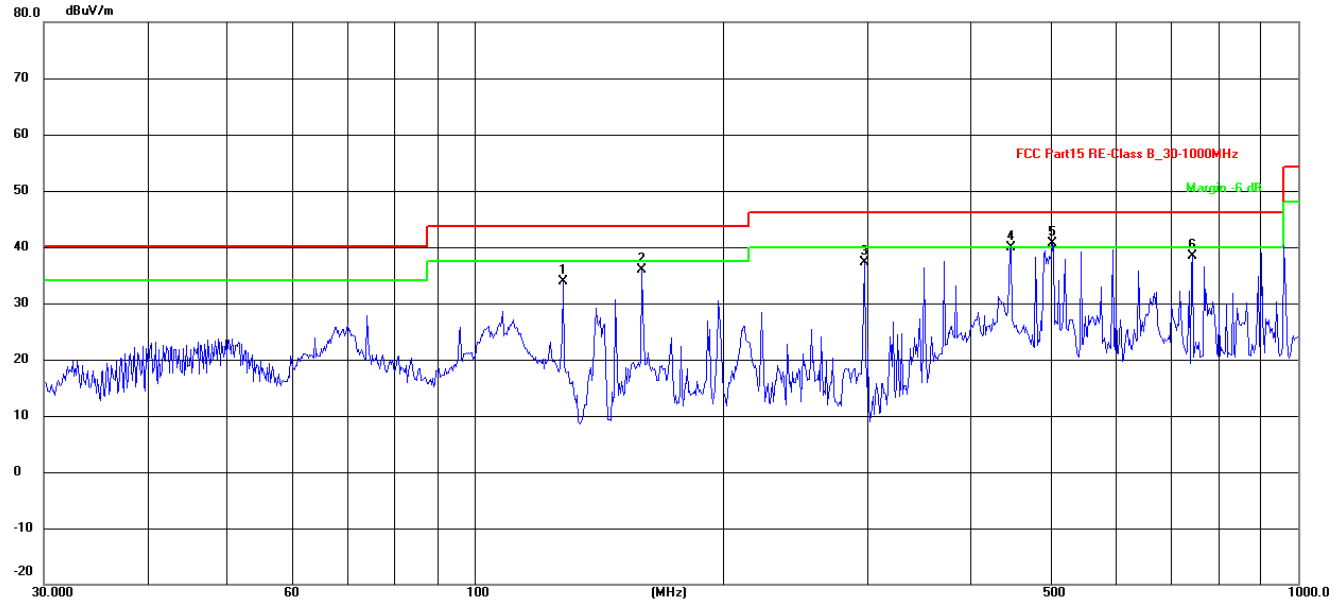
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.2.7. Results of Radiated Emissions (30MHz~1GHz)

Temperature	23.7℃	Humidity	53.8%
Test Engineer	Jk Zhou	Configurations	IEEE 802.11a, High Channel

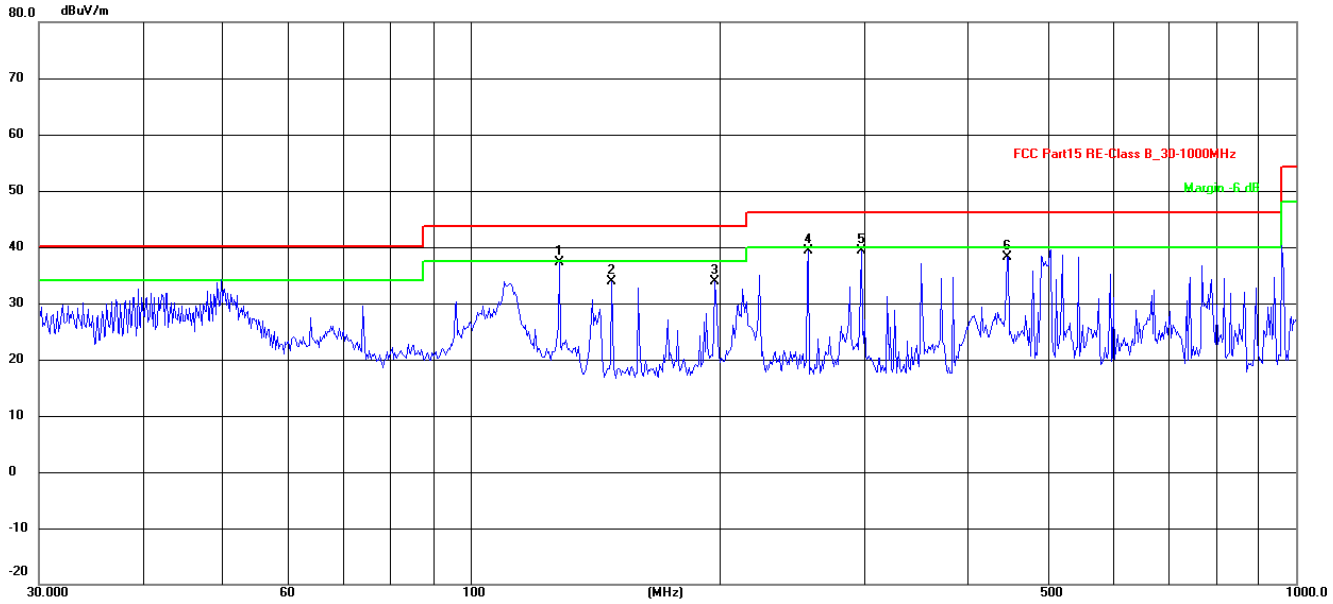
Test result for IEEE 802.11ac VHT20 mode (High Channel)

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	128.1125	54.41	-20.45	33.96	43.50	-9.54	QP			
2	159.7844	56.34	-20.46	35.88	43.50	-7.62	QP			
3	297.2238	52.14	-14.87	37.27	46.00	-8.73	QP			
4	447.9821	51.03	-11.20	39.83	46.00	-6.17	QP			
5 *	502.9395	50.65	-10.07	40.58	46.00	-5.42	QP			
6	744.8659	44.27	-5.80	38.47	46.00	-7.53	QP			

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1 *	128.1125	57.78	-20.45	37.33	43.50	-6.17	QP			
2	148.4410	54.83	-20.88	33.95	43.50	-9.55	QP			
3	197.8925	51.44	-17.56	33.88	43.50	-9.62	QP			
4	256.5210	55.09	-15.78	39.31	46.00	-6.69	QP			
5	297.2238	54.29	-14.87	39.42	46.00	-6.58	QP			
6	446.4139	49.51	-11.23	38.28	46.00	-7.72	QP			

Note:

1). Pre-scan all modes and recorded the worst case results in this report (IEEE 802.11ac VHT20 mode (High Channel)).
2). Emission level (dBuV/m) = 20 log Emission level (uV/m).
3). Corrected Reading: Antenna Factor + Cable Loss + Read Level = Level.

5.2.8. Results for Radiated Emissions (1 – 40 GHz)

IEEE 802.11a (Worst Case)

Channel 36 / 5180 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.54	53.13	33.06	35.04	3.94	55.09	68.20	-13.11	Peak	Horizontal
15.54	43.62	33.06	35.04	3.94	45.58	54.00	-8.42	Average	Horizontal
15.54	57.21	33.06	35.04	3.94	59.17	68.20	-9.03	Peak	Vertical
15.54	43.90	33.06	35.04	3.94	45.86	54.00	-8.14	Average	Vertical

Channel 40 / 5200 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.60	51.22	33.16	35.15	3.96	53.19	68.20	-15.01	Peak	Horizontal
15.60	44.17	33.16	35.15	3.96	46.14	54.00	-7.86	Average	Horizontal
15.60	55.01	33.16	35.15	3.96	56.98	68.20	-11.22	Peak	Vertical
15.60	39.93	33.16	35.15	3.96	41.90	54.00	-12.10	Average	Vertical

Channel 48 / 5240 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.72	57.99	33.26	35.14	3.98	60.09	68.20	-8.11	Peak	Horizontal
15.72	40.88	33.26	35.14	3.98	42.98	54.00	-11.02	Average	Horizontal
15.72	57.44	33.26	35.14	3.98	59.54	68.20	-8.66	Peak	Vertical
15.72	42.59	33.26	35.14	3.98	44.69	54.00	-9.31	Average	Vertical

Notes:

1). Measuring frequencies from 9 KHz ~ 40GHz, No emission found between lowest internal used/generated frequency to 30MHz.
2). Radiated emissions measured in frequency range from 9 KHz ~ 40GHz were made with an instrument using Peak detector mode.
3). 18~40GHz at least have 20dB margin. No recording in the test report.
4). Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40, IEEE 802.11ac VHT80;
5). Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
6). Recorded worst case IEEE 802.11a mode.

7). Measured = Reading + Ant. Fac - Pre. Fac + Cab.Los.

5.3. Power Line Conducted Emissions

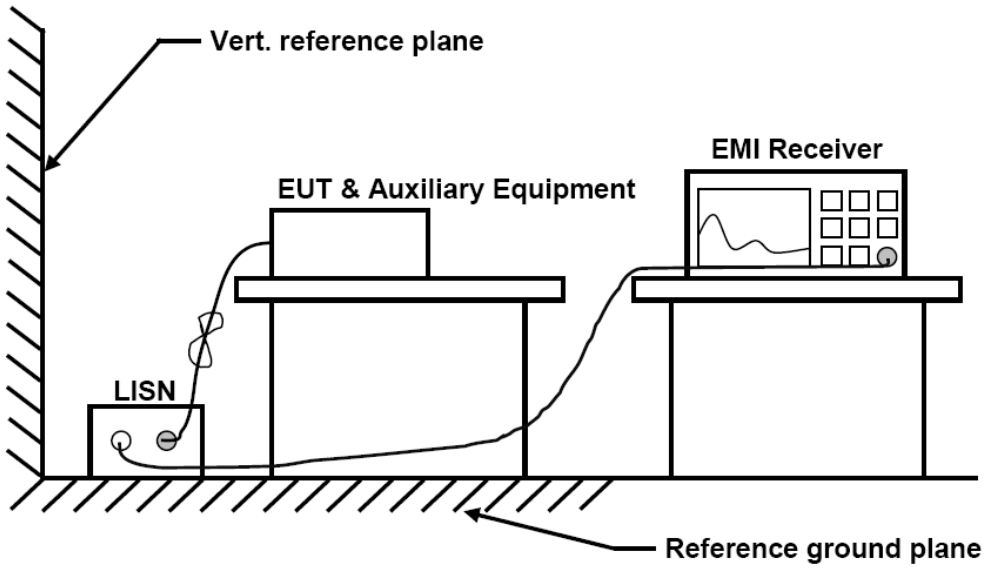
5.3.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.3.2 Block Diagram of Test Setup



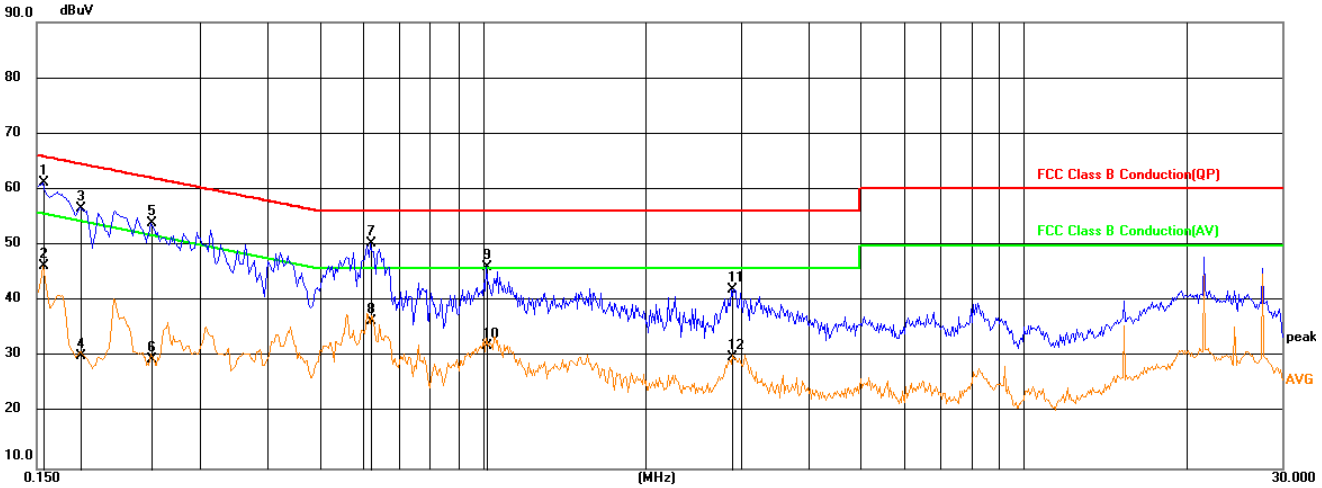
5.3.3 Test Results

PASS.

The test data please refer to following page.

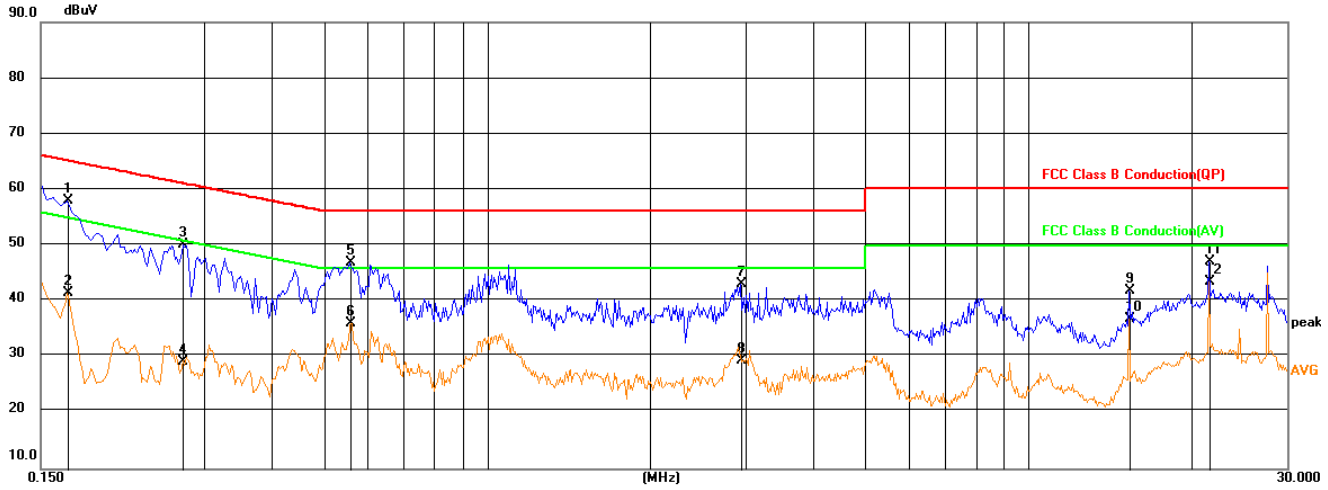
AC Conducted Emission of power by adapter @ AC 120V/60Hz @ IEEE 802.11ac (worst case)

Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1544	42.12	19.14	61.26	65.76	-4.50	QP
2	0.1544	27.17	19.14	46.31	55.76	-9.45	AVG
3	0.1814	37.42	19.17	56.59	64.42	-7.83	QP
4	0.1814	11.16	19.17	30.33	54.42	-24.09	AVG
5	0.2444	34.87	19.22	54.09	61.95	-7.86	QP
6	0.2444	10.37	19.22	29.59	51.95	-22.36	AVG
7	0.6219	31.26	19.20	50.46	56.00	-5.54	QP
8	0.6219	17.34	19.20	36.54	46.00	-9.46	AVG
9	1.0181	26.93	19.26	46.19	56.00	-9.81	QP
10	1.0181	12.86	19.26	32.12	46.00	-13.88	AVG
11	2.8995	22.75	19.47	42.22	56.00	-13.78	QP
12	2.8995	10.48	19.47	29.95	46.00	-16.05	AVG

Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1680	38.95	19.16	58.11	65.06	-6.95	QP
2	0.1680	22.37	19.16	41.53	55.06	-13.53	AVG
3	0.2741	31.04	19.25	50.29	60.99	-10.70	QP
4	0.2741	10.09	19.25	29.34	50.99	-21.65	AVG
5	0.5594	27.81	19.14	46.95	56.00	-9.05	QP
6	0.5594	16.96	19.14	36.10	46.00	-9.90	AVG
7	2.9355	23.74	19.46	43.20	56.00	-12.80	QP
8	2.9355	10.05	19.46	29.51	46.00	-16.49	AVG
9	15.3600	21.80	20.17	41.97	60.00	-18.03	QP
10	15.3600	16.75	20.17	36.92	50.00	-13.08	AVG
11	21.5069	27.08	20.07	47.15	60.00	-12.85	QP
12	21.5069	23.52	20.07	43.59	50.00	-6.41	AVG

****Note: Pre-scan all modes and recorded the worst case results in this report.*

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2019-06-11	2020-06-10
2	Power Sensor	R&S	NRV-Z81	100458	2019-06-11	2020-06-10
3	Power Sensor	R&S	NRV-Z32	10057	2019-06-11	2020-06-10
4	Test Software	Tonscend	JS1120-2	/	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-2	N/A	2019-06-11	2020-06-10
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2019-11-22	2020-11-21
7	DC Power Supply	Agilent	E3642A	N/A	2019-11-14	2020-11-13
8	EMI Test Software	AUDIX	E3	/	N/A	N/A
9	3m Full Anechoic Chamber	MRDIANZI	FAC-3M	MR009	2019-09-27	2020-09-26
10	Positioning Controller	MF	MF-7082	N/A	2019-06-12	2020-06-11
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2019-07-25	2020-07-24
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2019-07-25	2020-07-24
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2019-07-01	2020-06-30
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2017-09-21	2020-09-20
15	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-025	2019-06-17	2020-06-16
16	EMI Test Receiver	R&S	ESR 7	101181	2019-06-12	2020-06-11
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2019-11-14	2020-11-13
18	Broadband Preamplifier	/	BP-01M18G	P190501	2019-07-01	2020-06-30
19	RF Cable-R03m	Jye Bao	RG142	CB021	2019-06-12	2020-06-11
20	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2019-06-12	2020-06-11
21	6dB Attenuator	/	100W/6dB	1172040	2019-06-11	2020-06-10
22	3dB Attenuator	/	2N-3dB	/	2019-06-11	2020-06-10
23	EMI Test Receiver	R&S	ESPI	101840	2019-06-11	2020-06-10
24	Artificial Mains	R&S	ENV216	101288	2019-06-12	2020-06-11
25	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2019-06-11	2020-06-10
Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.						

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------