

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 15 C(15.247)**Report Reference No. : LCS191217060AEA**

Date of Issue : January 14, 2020

Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.Address : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue,
Bao'an District, Shenzhen, Guangdong, ChinaTesting 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 15 C(15.247)

Test Report Form No..... : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2011-03

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EUT Description. : Legends Ultimate Home Arcade

Trade Mark : N/A

Test Model : HA8800

Ratings : Input: AC100-240V, 50/60Hz 2A
Output: DC12V/5AResult : **Positive****Compiled by:**

Jayden Zhuo/ File administrators

Supervised by:

Jin Wang / Technique principal

Approved by:

Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS191217060AEA	January 14, 2020 Date of issue
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Test Model.....	: HA8800
EUT.....	: Legends Ultimate Home Arcade
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
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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

Description	Page
1. GENERAL INFORMATION	6
1.1. DESCRIPTION OF DEVICE (EUT)	6
1.2. HOST SYSTEM CONFIGURATION LIST AND DETAILS	7
1.3. EXTERNAL I/O CABLE	7
1.4. DESCRIPTION OF TEST FACILITY	7
1.5. STATEMENT OF THE MEASUREMENT UNCERTAINTY	7
1.6. MEASUREMENT UNCERTAINTY	8
1.7. DESCRIPTION OF TEST MODES	8
1.8. CHANNEL LIST	8
2. TEST METHODOLOGY	9
2.1. EUT CONFIGURATION	9
2.2. EUT EXERCISE	9
2.3. GENERAL TEST PROCEDURES	9
2.4. TEST SAMPLE	9
3. SYSTEM TEST CONFIGURATION	10
3.1. JUSTIFICATION	10
3.2. EUT EXERCISE SOFTWARE	10
3.3. SPECIAL ACCESSORIES	10
3.4. BLOCK DIAGRAM/SCHEMATICS	10
3.5. EQUIPMENT MODIFICATIONS	10
3.6. TEST SETUP	10
4. SUMMARY OF TEST RESULTS	11
5. MEASUREMENT RESULTS	12
5.1. PEAK POWER	12
5.2. RESTRICTED BAND EMISSION LIMIT	16
5.3. AC POWER LINE CONDUCTED EMISSIONS	27
6. SUMMARY OF TEST EQUIPMENT	30
7. TEST SETUP PHOTOGRAPHS OF EUT	31
8. EXTERIOR PHOTOGRAPHS OF THE EUT	31
9. INTERIOR PHOTOGRAPHS OF THE EUT	31

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, $\pi/4$ -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
--	--	--	--	--

1.3. External I/O Cable

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

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. With basic data rate feature, the data rates can be up to 1 Mb/s by modulating the RF carrier using GFSK techniques. The EUT works in the X-axis, Y-axis, Z-axis. The following operating modes were applied for the related test items. All test modes were tested, only the result of the worst case was recorded in the report.

Mode of Operations	Frequency Range (MHz)	Data Rate (Mbps)
BT V4.1(BDR/EDR)	2402	1/2/3
	2441	1/2/3
	2480	1/2/3
For Conducted Emission		
Test Mode	TX Mode	
For Radiated Emission		
Test Mode	TX Mode	

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/50Hz modes, 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 that was determined to be TX (1Mbps).

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 TX(1Mbps-Low Channel).

1.8. Channel List

BT V4.1(BDR/EDR)

Frequency Band	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
2402~2480MHz	0	2402	40	2442
	1	2403	--	--
	2	2404	--	--
	--	--	76	2478
	--	--	77	2479
	39	2441	78	2480

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR PART 15C 15.207, 15.209, 15.247 and DA 00-705.

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 normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is directly placed on the ground. 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 turntable, which is directly placed on the ground. 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

2.4. Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1	Engineer sample – continuous transmit
Sample 2	Normal sample – Intermittent transmit

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 C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.247(b)(1)	Maximum Conducted Output Power	Sample 1	Compliant	Note 1
§15.209, §15.247(d)	Radiated Spurious Emissions	Sample 1	Compliant	Note 1
§15.207(a)	AC Conducted Emissions	Sample 1	Compliant	Note 1
§15.247(i)§2.1091	RF Exposure	Sample 1	Compliant	Note 2

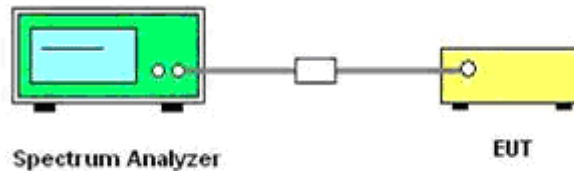
Remark:

- 1. Note 1 – Test results inside test report;*
- 2. Note 2 – Test results in other test report (RF Exposure Evaluation);*

5. MEASUREMENT RESULTS

5.1. Peak Power

5.1.1 Block Diagram of Test Setup



5.1.2 Limit

According to §15.247(b)(1), For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

5.1.3 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer. According to ANSI C63.10:2013 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices; this is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW ≥ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

5.1.4 Test Results

Please refer to next page.

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-3.632	30	PASS
	MCH	-4.864	30	PASS
	HCH	-3.779	30	PASS
$\pi/4$ DQPSK	LCH	-4.754	21	PASS
	MCH	-5.024	21	PASS
	HCH	-4.600	21	PASS
8DPSK	LCH	-4.183	21	PASS
	MCH	-5.257	21	PASS
	HCH	-4.693	21	PASS

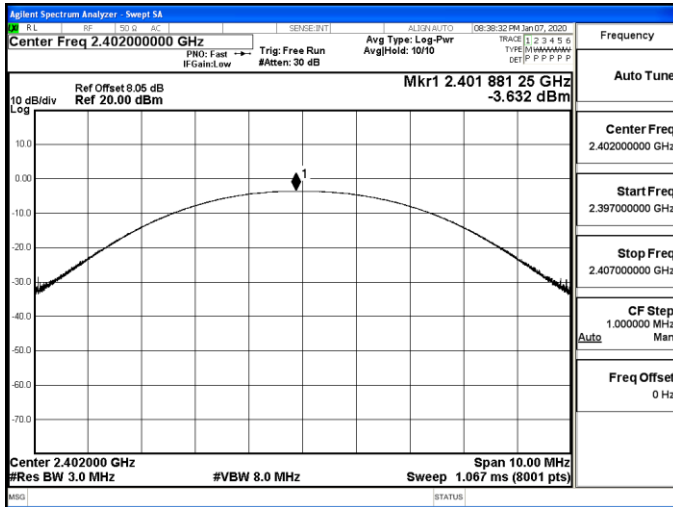
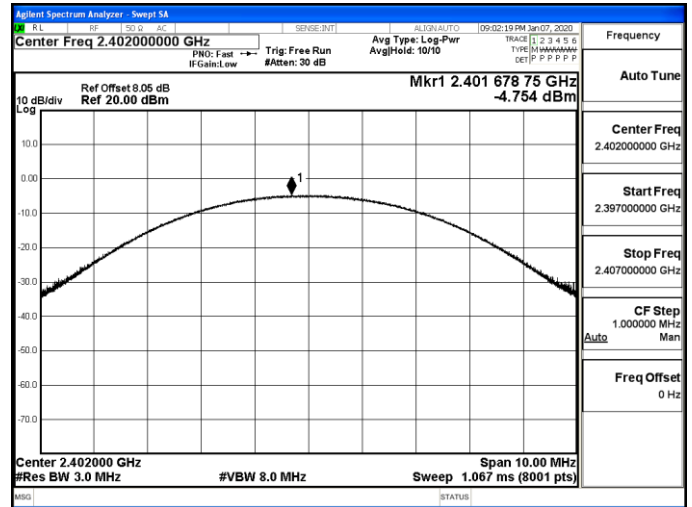
Remark:

1) Test results including cable loss;

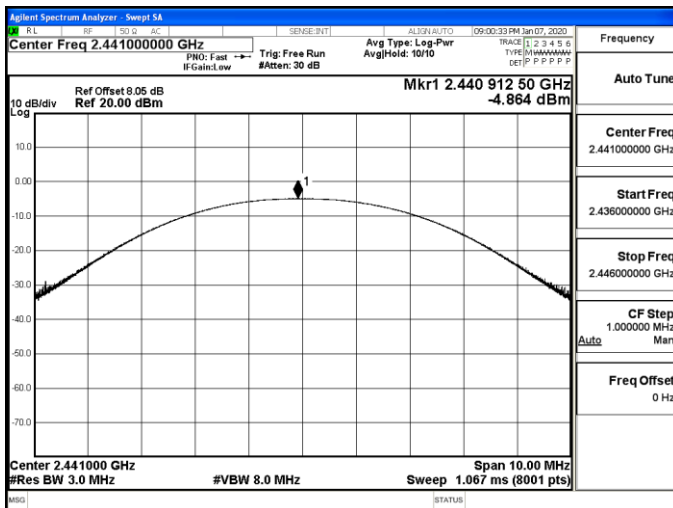
2) Measured at difference Packet Type for each mode and recorded worst case for each mode.

Maximum Peak Output Power

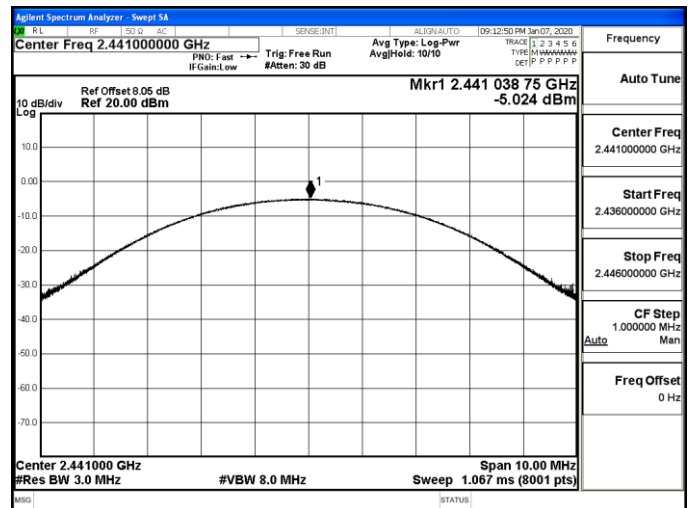
GFSK

 $\pi/4$ DQPSK

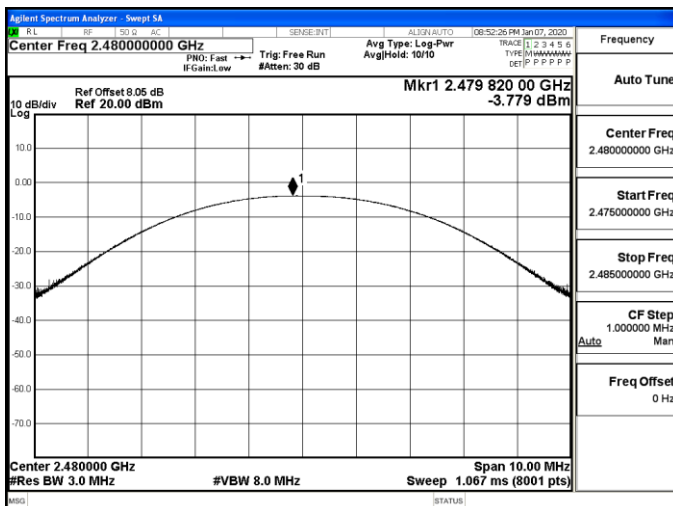
Channel 0 / 2402 MHz



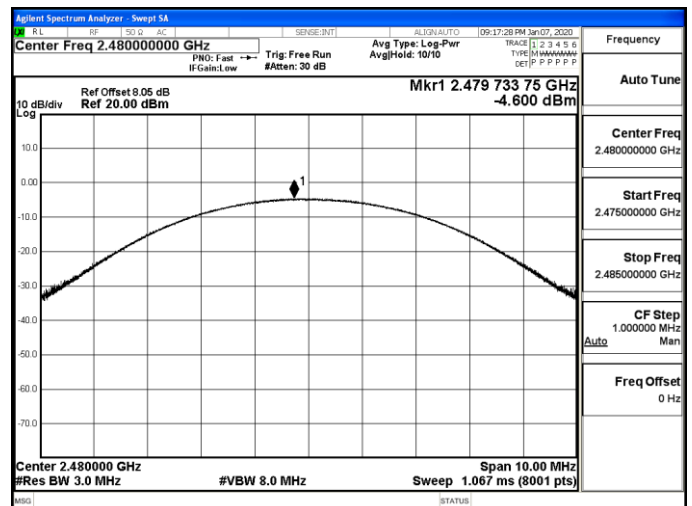
Channel 0 / 2402 MHz



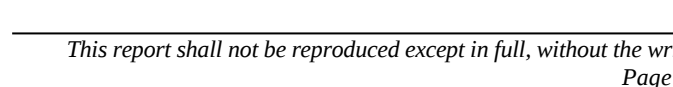
Channel 39 / 2441 MHz



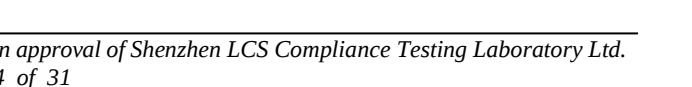
Channel 39 / 2441 MHz



Channel 78 / 2480 MHz

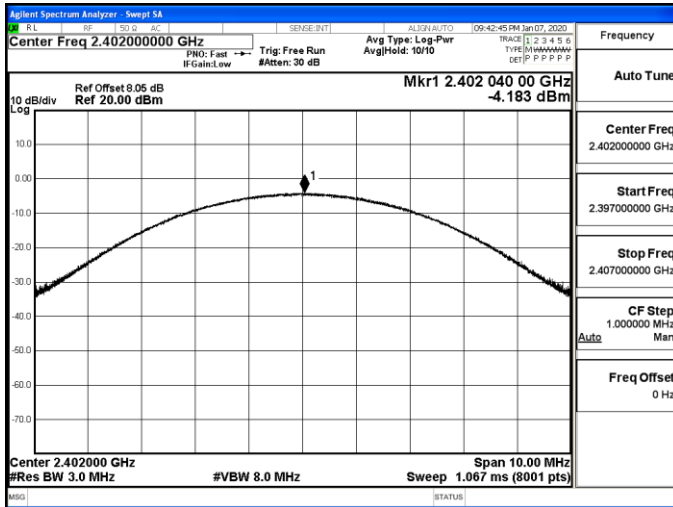


Channel 78 / 2480 MHz

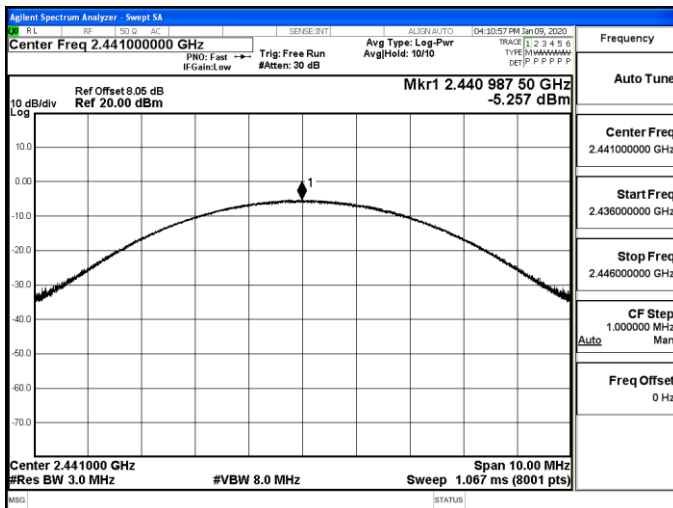


Maximum Peak Output Power

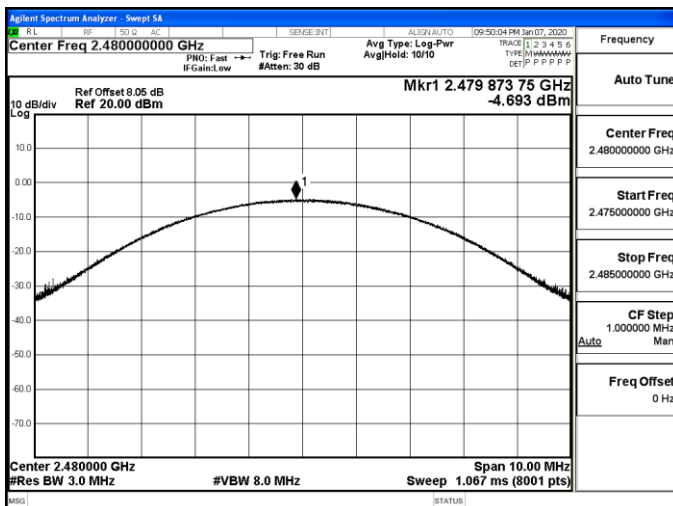
8DPSK



Channel 0 / 2402 MHz



Channel 39 / 2441 MHz



Channel 78 / 2480 MHz

5.2. Restricted Band Emission Limit

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

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (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	10 th 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/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

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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 ($\pm 45^\circ$) 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 ($\pm 45^\circ$) 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.

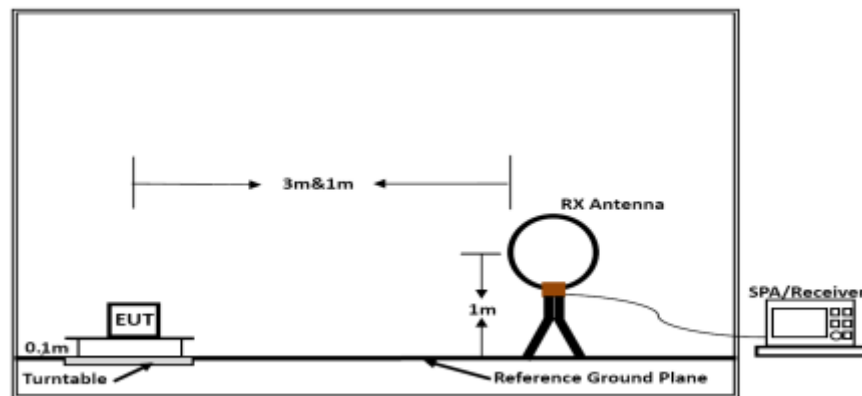
Premeasurement:

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

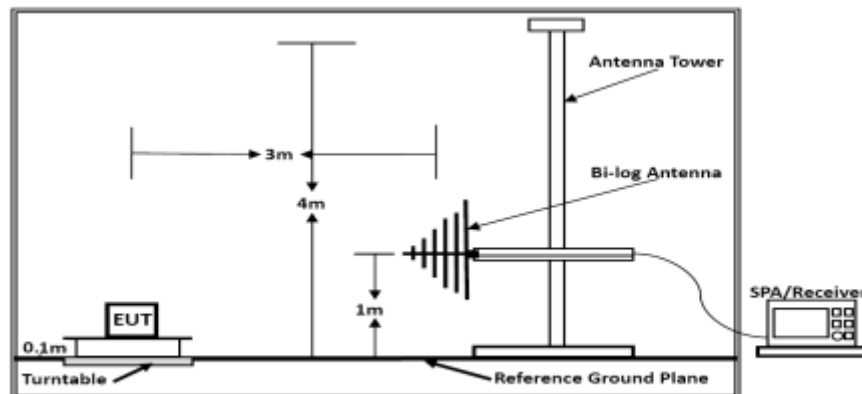
Final measurement:

- 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.

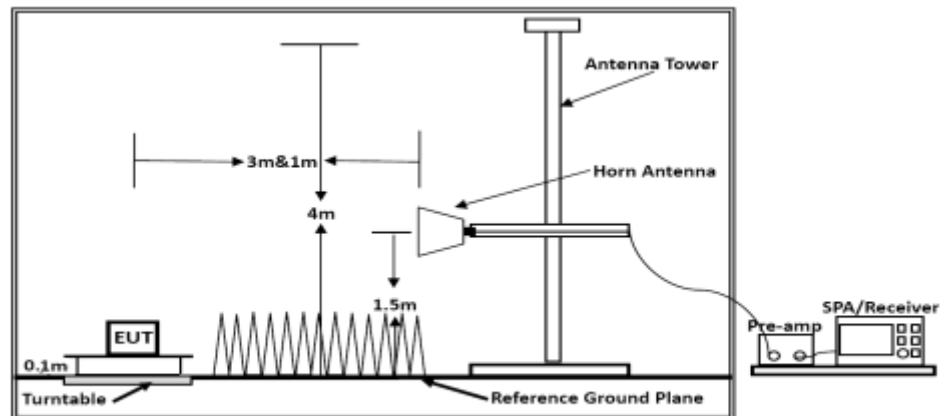
5.2.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

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

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1.5m]})$ (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	23.7℃	Humidity	53.8%
Test Engineer	Jk Zhou	Configurations	BT

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	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);

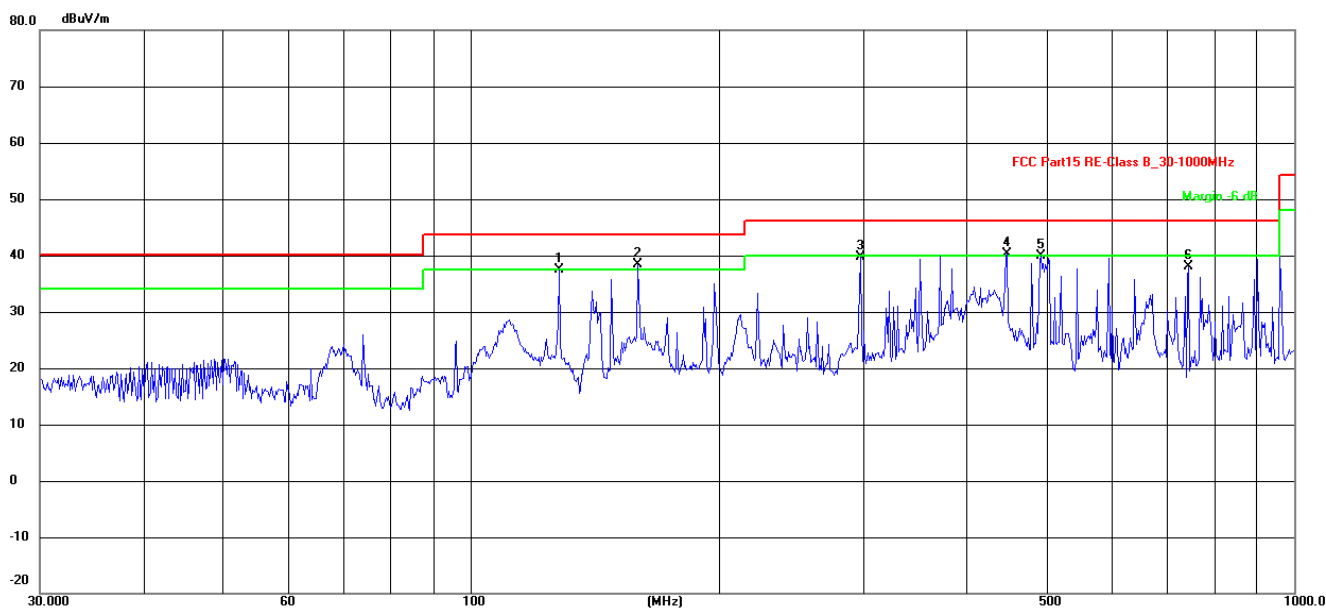
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.2.7. Results of Radiated Emissions (30 MHz – 1000 MHz)

PASS.

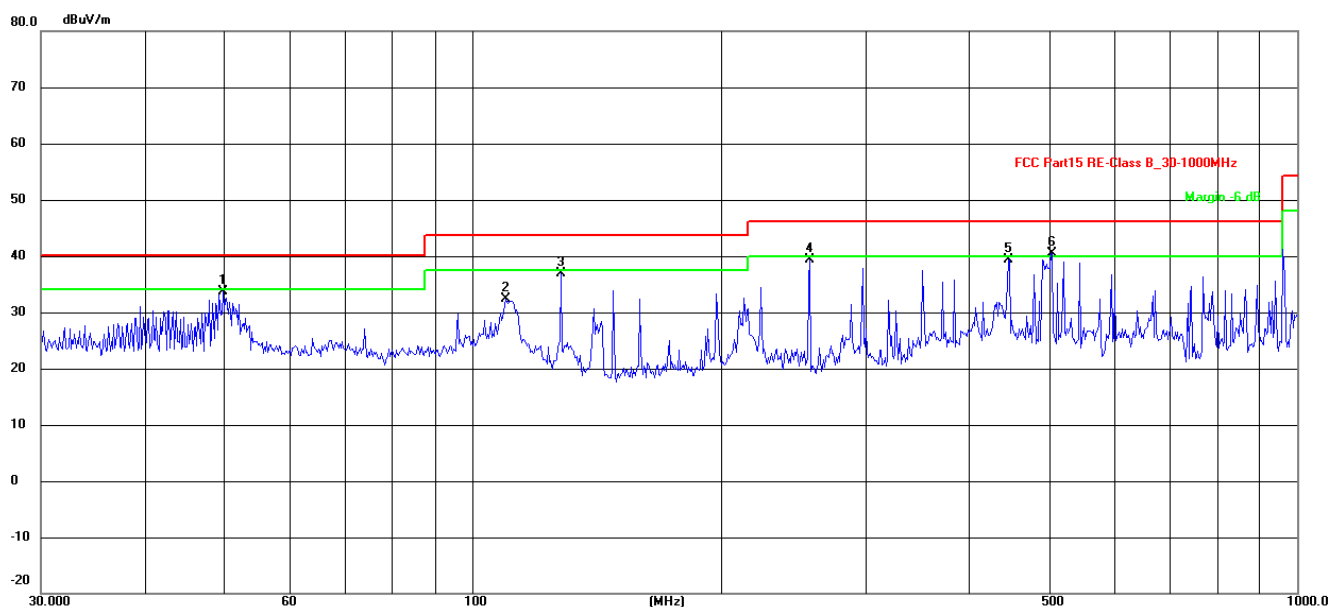
Only record the worst test result in this report.

The test data please refer to following page.

Below 1GHz*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	57.91	-20.45	37.46	43.50	-6.04	QP			
2 *	159.7844	58.84	-20.46	38.38	43.50	-5.12	QP			
3	297.2238	54.64	-14.87	39.77	46.00	-6.23	QP			
4 !	447.9821	51.53	-11.20	40.33	46.00	-5.67	QP			
5	492.4685	50.21	-10.30	39.91	46.00	-6.09	QP			
6	744.8659	43.77	-5.80	37.97	46.00	-8.03	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	49.8813	49.36	-15.66	33.70	40.00	-6.30	QP			
2	109.7959	49.95	-17.58	32.37	43.50	-11.13	QP			
3	128.1125	57.28	-20.45	36.83	43.50	-6.67	QP			
4	256.5210	55.09	-15.78	39.31	46.00	-6.69	QP			
5	446.4139	50.51	-11.23	39.28	46.00	-6.72	QP			
6 *	504.7062	50.52	-10.03	40.49	46.00	-5.51	QP			

Note:

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

5.6.8. Results of Radiated Emissions (1 GHz – 26 GHz)

Note: All the modes have been tested and recorded worst mode in the report.

The worst test result for GFSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4804.00	57.52	33.06	35.04	3.94	59.48	74.00	-14.52	Peak	Horizontal
4804.00	42.08	33.06	35.04	3.94	44.04	54.00	-9.96	Average	Horizontal
4804.00	51.10	33.06	35.04	3.94	53.06	74.00	-20.94	Peak	Vertical
4804.00	40.67	33.06	35.04	3.94	42.63	54.00	-11.37	Average	Vertical

The worst test result for GFSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4882.00	56.96	33.16	35.15	3.96	58.93	74.00	-15.07	Peak	Horizontal
4882.00	39.70	33.16	35.15	3.96	41.67	54.00	-12.33	Average	Horizontal
4882.00	53.68	33.16	35.15	3.96	55.65	74.00	-18.35	Peak	Vertical
4882.00	40.88	33.16	35.15	3.96	42.85	54.00	-11.15	Average	Vertical

The worst test result for GFSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4960.00	56.42	33.26	35.14	3.98	58.52	74.00	-15.48	Peak	Horizontal
4960.00	42.53	33.26	35.14	3.98	44.63	54.00	-9.37	Average	Horizontal
4960.00	49.45	33.26	35.14	3.98	51.55	74.00	-22.45	Peak	Vertical
4960.00	37.83	33.26	35.14	3.98	39.93	54.00	-14.07	Average	Vertical

The worst test result for $\pi/4$ -DQPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4804.00	56.26	33.06	35.04	3.94	58.22	74.00	-15.78	Peak	Horizontal
4804.00	40.59	33.06	35.04	3.94	42.55	54.00	-11.45	Average	Horizontal
4804.00	50.66	33.06	35.04	3.94	52.62	74.00	-21.38	Peak	Vertical
4804.00	41.59	33.06	35.04	3.94	43.55	54.00	-10.45	Average	Vertical

The worst test result for $\pi/4$ -DQPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4882.00	56.77	33.16	35.15	3.96	58.74	74.00	-15.26	Peak	Horizontal
4882.00	39.34	33.16	35.15	3.96	41.31	54.00	-12.69	Average	Horizontal
4882.00	42.67	33.16	35.15	3.96	44.64	74.00	-29.36	Peak	Vertical
4882.00	38.85	33.16	35.15	3.96	40.82	54.00	-13.18	Average	Vertical

The worst test result for $\pi/4$ -DQPSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4960.00	55.07	33.26	35.14	3.98	57.17	74.00	-16.83	Peak	Horizontal
4960.00	43.58	33.26	35.14	3.98	45.68	54.00	-8.32	Average	Horizontal
4960.00	49.73	33.26	35.14	3.98	51.83	74.00	-22.17	Peak	Vertical
4960.00	35.85	33.26	35.14	3.98	37.95	54.00	-16.05	Average	Vertical

The worst test result for 8DPSK, Channel 0 / 2402 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4804.00	56.40	33.06	35.04	3.94	58.36	74.00	-15.64	Peak	Horizontal
4804.00	41.64	33.06	35.04	3.94	43.60	54.00	-10.40	Average	Horizontal
4804.00	53.52	33.06	35.04	3.94	55.48	74.00	-18.52	Peak	Vertical
4804.00	40.40	33.06	35.04	3.94	42.36	54.00	-11.64	Average	Vertical

The worst test result for 8DPSK, Channel 39 / 2441 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4882.00	56.69	33.16	35.15	3.96	58.66	74.00	-15.34	Peak	Horizontal
4882.00	38.41	33.16	35.15	3.96	40.38	54.00	-13.62	Average	Horizontal
4882.00	54.80	33.16	35.15	3.96	56.77	74.00	-17.23	Peak	Vertical
4882.00	39.78	33.16	35.15	3.96	41.75	54.00	-12.25	Average	Vertical

The worst test result for 8DPSK, Channel 78 / 2480 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab. Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4960.00	53.19	33.26	35.14	3.98	55.29	74.00	-18.71	Peak	Horizontal
4960.00	43.17	33.26	35.14	3.98	45.27	54.00	-8.73	Average	Horizontal
4960.00	52.18	33.26	35.14	3.98	54.28	74.00	-19.72	Peak	Vertical
4960.00	36.19	33.26	35.14	3.98	38.29	54.00	-15.71	Average	Vertical

Notes:

- 1). Measuring frequencies from 9 KHz~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30 MHz.
- 2). Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.
- 3). 18~25GHz at least have 20dB margin. No recording in the test report.
- 4). Measured = Reading + Ant. Fac - Pre. Fac + Cab.Los.

5.3. AC Power Line Conducted Emissions

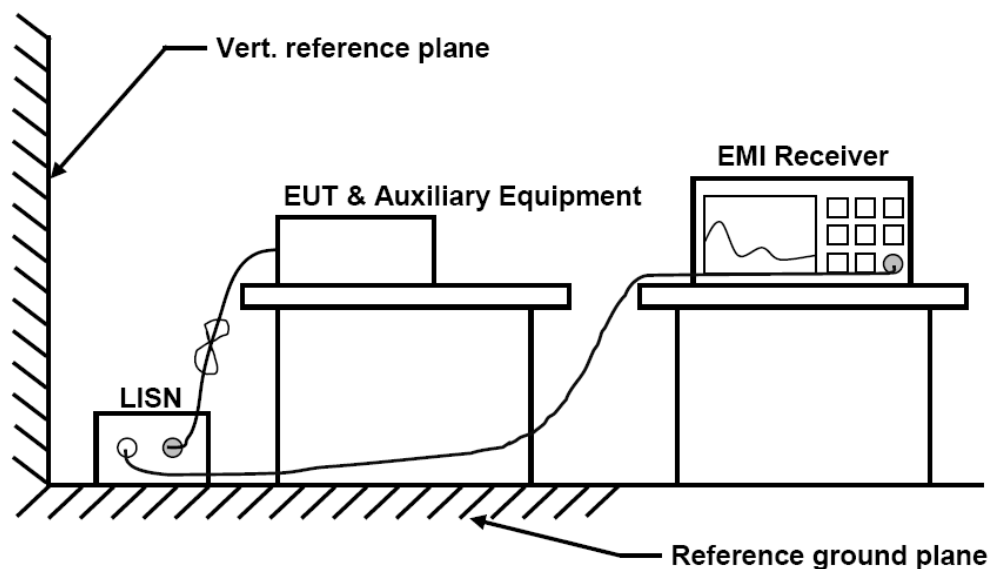
5.3.1 Standard Applicable

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 (dB μ V)	
	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



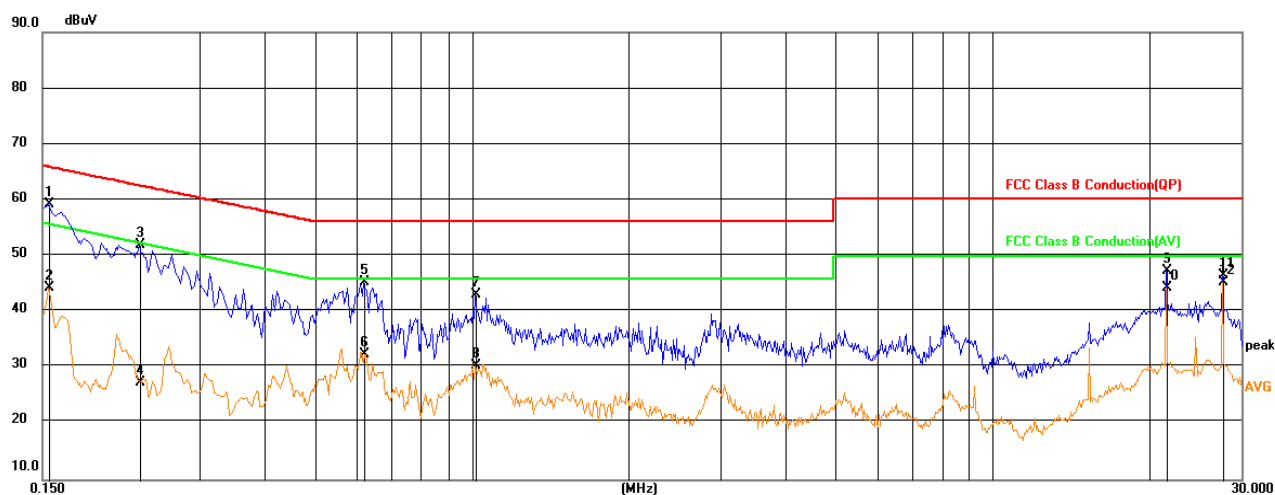
5.3.3 Test Results

PASS.

The test data please refer to following page.

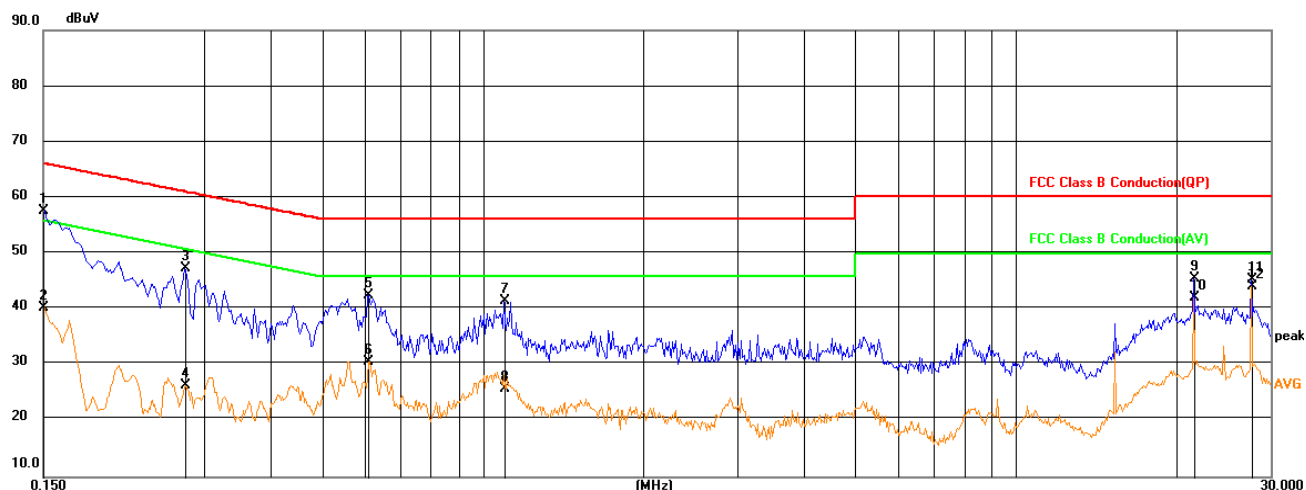
AC Conducted Emission of charge from power adapter mode @ AC 120V/60Hz (worst case)

Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1544	40.12	19.14	59.26	65.76	-6.50	QP
2	0.1544	25.17	19.14	44.31	55.76	-11.45	AVG
3	0.2310	32.81	19.21	52.02	62.41	-10.39	QP
4	0.2310	8.20	19.21	27.41	52.41	-25.00	AVG
5	0.6219	26.26	19.20	45.46	56.00	-10.54	QP
6	0.6219	13.18	19.20	32.38	46.00	-13.62	AVG
7	1.0181	23.93	19.26	43.19	56.00	-12.81	QP
8	1.0181	11.25	19.26	30.51	46.00	-15.49	AVG
9	21.5069	27.18	20.29	47.47	60.00	-12.53	QP
10	21.5069	24.05	20.29	44.34	50.00	-5.66	AVG
11	27.6493	26.40	20.15	46.55	60.00	-13.45	QP
12	27.6493	25.29	20.15	45.44	50.00	-4.56	AVG

Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1507	38.58	19.14	57.72	65.96	-8.24	QP
2	0.1507	21.23	19.14	40.37	55.96	-15.59	AVG
3	0.2760	28.06	19.25	47.31	60.94	-13.63	QP
4	0.2760	7.09	19.25	26.34	50.94	-24.60	AVG
5	0.6088	23.42	19.19	42.61	56.00	-13.39	QP
6	0.6088	11.50	19.19	30.69	46.00	-15.31	AVG
7	1.0987	22.32	19.26	41.58	56.00	-14.42	QP
8	1.0987	6.65	19.26	25.91	46.00	-20.09	AVG
9	21.5069	25.58	20.07	45.65	60.00	-14.35	QP
10	21.5069	22.02	20.07	42.09	50.00	-7.91	AVG
11	27.6493	25.16	20.13	45.29	60.00	-14.71	QP
12	27.6493	24.12	20.13	44.25	50.00	-5.75	AVG

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

6. SUMMARY OF TEST EQUIPMENT

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	SCHWARZBEC K	FMZB 1519B	00005	2019-07-25	2020-07-24
12	By-log Antenna	SCHWARZBEC K	VULB9163	9163-470	2019-07-25	2020-07-24
13	Horn Antenna	SCHWARZBEC K	BBHA 9120D	9120D-1925	2019-07-01	2020-06-30
14	Broadband Horn Antenna	SCHWARZBEC K	BBHA 9170	791	2017-09-21	2020-09-20
15	Broadband Preamplifier	SCHWARZBEC K	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	SCHWARZBEC K	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-----