

Qingdao Intelligent&Precise Electronics Co., Ltd

# C2PC RF TEST REPORT

**Report Type:**

FCC Part 15.247 & ISED RSS-247 RF report

**Model:**

ZDGF7618BU-CV

**REPORT NUMBER:**

191102795SHA-001

**ISSUE DATE:**

January 19, 2020

**DOCUMENT CONTROL NUMBER:**

TTRF15.247-01\_V1 © 2018 Intertek





Total Quality. Assured.

## TEST REPORT

Intertek Testing Services Shanghai  
Building No.86, 1198 Qinzhou Road (North)  
Caohejing Development Zone  
Shanghai 200233, China

Telephone: 86 21 6127 8200  
[www.intertek.com](http://www.intertek.com)

Report no.: 191102795SHA-001

**Applicant:** Qingdao Intelligent&Precise Electronics Co., Ltd

No.218, Qianwangang Road, Qingdao Economic&Technological Development Zone, Shandong, China.

**Manufacturer:** Qingdao Intelligent&Precise Electronics Co., Ltd

No.218, Qianwangang Road, Qingdao Economic&Technological Development Zone, Shandong, China.

**Factory:** Qingdao Intelligent&Precise Electronics Co., Ltd

No.218, Qianwangang Road, Qingdao Economic&Technological Development Zone, Shandong, China.

**FCC ID:** 2AJVQ-7618BUC

**IC:** 22470-7618BUC

### SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

**47CFR Part 15 (2019): Radio Frequency Devices (Subpart C)**

**ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

**RSS-247 Issue 2 (February 2017):** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

**RSS-Gen Issue 5 (March 2019) Amendment 1:** General Requirements for Compliance of Radio Apparatus

### PREPARED BY:

Project Engineer  
Nemo Li

### REVIEWED BY:

Reviewer  
Daniel Zhao

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

**TEST REPORT****Content**

<b>REVISION HISTORY.....</b>	<b>4</b>
<b>MEASUREMENT RESULT SUMMARY.....</b>	<b>5</b>
<b>1 GENERAL INFORMATION .....</b>	<b>6</b>
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) .....	6
1.2 TECHNICAL SPECIFICATION .....	7
1.3 ANTENNA INFORMATION.....	7
1.4 DESCRIPTION OF TEST FACILITY .....	8
<b>2 TEST SPECIFICATIONS.....</b>	<b>9</b>
2.1 STANDARDS OR SPECIFICATION .....	9
2.2 MODE OF OPERATION DURING THE TEST.....	9
2.3 TEST SOFTWARE LIST .....	9
2.4 TEST PERIPHERALS LIST .....	9
2.5 TEST ENVIRONMENT CONDITION:.....	9
2.6 INSTRUMENT LIST .....	10
2.7 MEASUREMENT UNCERTAINTY .....	12
<b>3 RADIATED EMISSIONS .....</b>	<b>13</b>
3.1 LIMIT .....	13
3.2 MEASUREMENT PROCEDURE .....	13
3.3 TEST CONFIGURATION .....	15
3.4 TEST RESULTS OF RADIATED EMISSIONS .....	17
<b>4 POWER LINE CONDUCTED EMISSION.....</b>	<b>18</b>
4.1 LIMIT .....	18
4.2 TEST CONFIGURATION .....	18
4.3 MEASUREMENT PROCEDURE .....	19
4.4 TEST RESULTS OF POWER LINE CONDUCTED EMISSION.....	20

**TEST REPORT****Revision History**

Report No.	Version	Description	Issued Date
191102795SHA-001	Rev. 01	Initial issue of report	January 19, 2020

**TEST REPORT****Measurement result summary**

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Radiated Emissions below 1GHz	15.205 & 15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207	RSS-Gen Issue 5 Clause 8.8	Pass

*Notes: 1: NA =Not Applicable*

**TEST REPORT****1 GENERAL INFORMATION****1.1 Description of Equipment Under Test (EUT)**

Product name:	Wireless Module
Type/Model:	ZDGF7618BU-CV
Description of EUT:	Add a new model ZDGF7618BU-CV. For the new model, The Circuit of DC 5V to DC 3.3V was removed. By technical analysis and evaluation, only the conducted emission and radiated emission below 1GHz was retested.
Rating:	DC 3.3V
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	November 28, 2019
Date of test:	November 28, 2019 ~ January 19, 2020

**TEST REPORT**
**1.2 Technical Specification**

Frequency Range:	2400MHz ~ 2483.5MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n(HT20), IEEE 802.11n(HT40)
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n(HT20): OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n(HT40): OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20) 7 Channels for 802.11n(HT40)
Channel Separation:	5 MHz

**1.3 Antenna information**

Antenna No.	Model	Antenna type	Antenna Gain	Note
0	-	PIFA	2.15dBi	-
1	-	PIFA	2.53dBi	-

Mode	Tx/Rx Function	Beamforming function	CDD function	Directional gain (dBi)
802.11b	1Tx/1Rx	NO	NO	-
802.11g	1Tx/1Rx	NO	NO	-
802.11n(HT20)	2Tx/2Rx	NO	NO	2.34
802.11n(HT40)	2Tx/2Rx	NO	NO	2.34

Note: For 802.11b and 802.11g mode, it only supports 1TX.  
 For 802.11n modes, it can support 2TX, all the two transmit signals are completely uncorrelated with each other, so the directional gain =  $10 \log ((10^{G1/10} + 10^{G2/10} + \dots + 10^{Gn/10}) / N_{ANT})$

**TEST REPORT****1.4 Description of Test Facility**

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab CAB identifier.: CN0051
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

**TEST REPORT****2 TEST SPECIFICATIONS****2.1 Standards or specification**

47CFR Part 15 (2019)  
ANSI C63.10 (2013)  
KDB 662911 D01 (v02r01)  
KDB 558074 (v05r02)  
RSS-247 Issue 2 (February 2017)  
RSS-Gen Issue 5 (March 2019) Amendment 1

**2.2 Mode of operation during the test**

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Software name	Manufacturer	Version	Supplied by
QA Tool	MTK	-	Client

**2.3 Test software list**

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

**2.4 Test peripherals list**

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL 5480	-

**2.5 Test environment condition:**

Test items	Temperature	Humidity
Radiated Emissions	19°C	52% RH
Power line conducted emission	19°C	52% RH

**TEST REPORT**
**2.6 Instrument list**

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCS 30	EC 2107	2020-07-14
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2020-11-29
<input type="checkbox"/>	A.M.N.	R&S	ENV 216	EC 3393	2020-07-14
<input type="checkbox"/>	A.M.N.	R&S	ENV4200	EC 3558	2020-06-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2020-09-16
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2020-12-10
<input type="checkbox"/>	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2020-06-11
<input type="checkbox"/>	Horn antenna	R&S	HF 906	EC 3049	2020-11-16
<input type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2020-02-25
<input type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
<input type="checkbox"/>	Horn antenna	ETS	3116C	EC 5954	2021-01-04
<input type="checkbox"/>	Horn antenna	ETS	3116C	EC 5955	2021-01-04
<input type="checkbox"/>	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2020-03-14
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2020-03-04
<input type="checkbox"/>	Power sensor	Agilent	U2021XA	EC 5338-1	2020-03-04
<input type="checkbox"/>	Vector Signal Generator	Agilent	N5182B	EC 5175	2020-03-04
<input type="checkbox"/>	Universal Radio Communication Tester	R&S	CMW500	EC5944	2020-12-22
<input type="checkbox"/>	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2020-03-04
<input type="checkbox"/>	Mobile Test System	Litelpoint	Iqxel	EC 5176	2021-01-08
<input type="checkbox"/>	Test Receiver	R&S	ESCI 7	EC 4501	2020-09-16
<input type="checkbox"/>	Climate chamber	GWS	MT3065	EC 6021	2020-07-04
<input type="checkbox"/>	Spectrum Analyzer	Keysight	N9030B	EC 6078	2020-06-11
Test Site					

**TEST REPORT**

Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2021-01-13
<input type="checkbox"/>	Shielded room	Zhongyu	-	EC 2839	2021-01-13
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2020-06-31
<input type="checkbox"/>	Fully-anechoic chamber	Albatross project	-	EC 3047	2020-06-31
<b>Additional instrument</b>					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2020-03-10
<input type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3481	2020-12-22
<input type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2020-02-27
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2020-04-07
<input type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2020-07-14

**TEST REPORT****2.7 Measurement uncertainty**

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

**TEST REPORT**

### 3 Radiated Emissions

**Test result:** Pass

#### 3.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

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

#### 3.2 Measurement Procedure

##### For Radiated emission below 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) Both X and Y axes of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

**NOTE:**

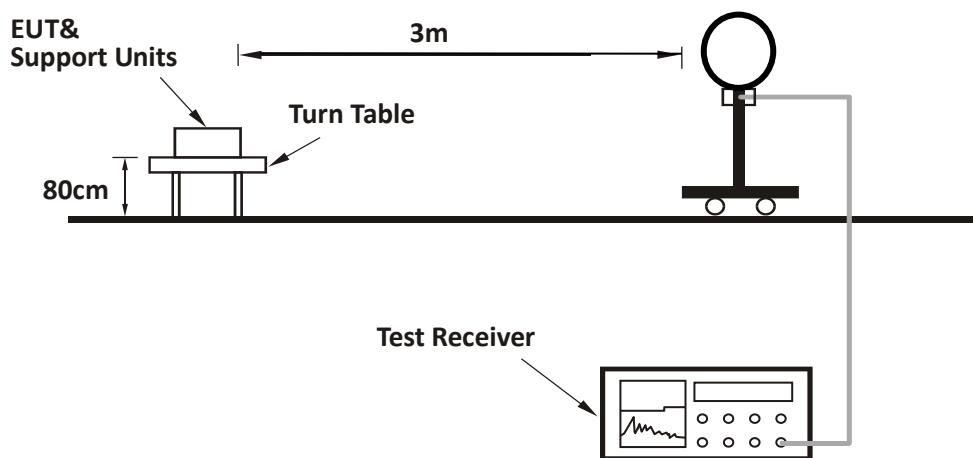
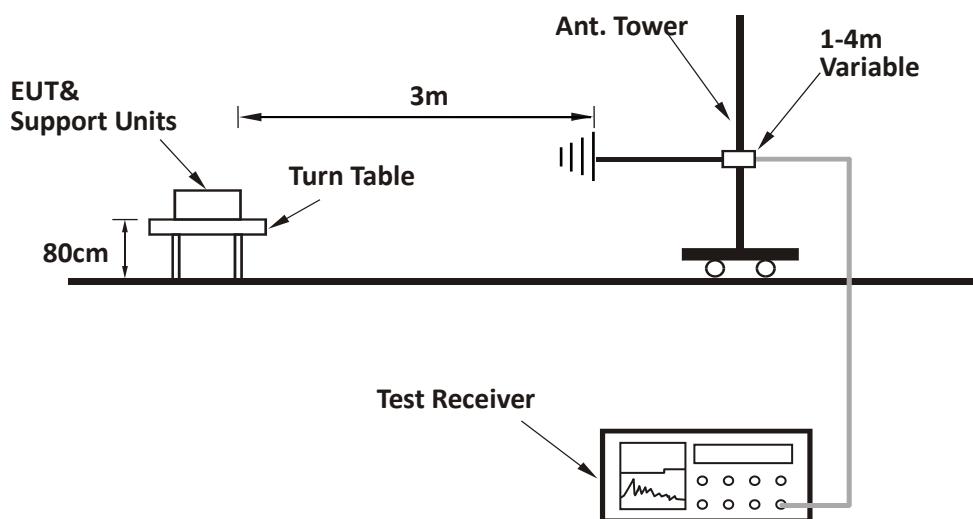
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

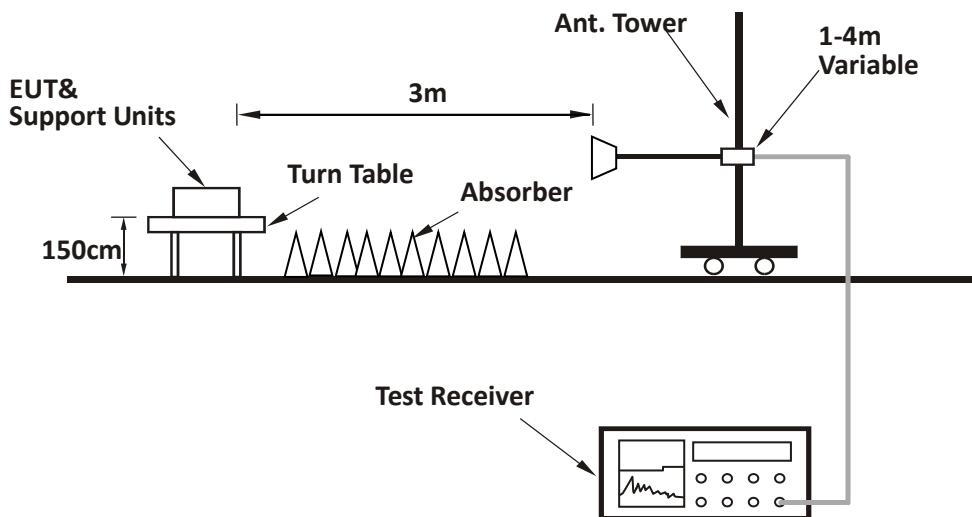
**TEST REPORT****For Radiated emission above 30MHz:**

- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detector function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or  $3 \times RBW$  (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were evaluated and the worst-case emissions were reported

**TEST REPORT****3.3 Test Configuration****For Radiated emission below 30MHz:****For Radiated emission 30MHz to 1GHz:**

**TEST REPORT****For Radiated emission above 1GHz:**

**TEST REPORT****3.4 Test Results of Radiated Emissions**

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.

EUT was tested with WiFi on and off, and the worst data was listed in the report.

**Test data below 1GHz:**

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	20.4	18.8	40	19.6	PK
H	96.09	31.7	11.3	43.5	11.8	PK
H	99.98	26.9	12.1	43.5	16.6	PK
H	263.27	33.3	15.3	46	12.7	PK
H	319.64	31.8	15.6	46	14.2	PK
H	943.63	30.5	24.1	46	15.5	PK
V	51.38	27.6	8.5	40	12.4	PK
V	96.09	34.4	11.3	43.5	9.1	PK
V	99.98	31.5	12.1	43.5	12.0	PK
V	267.15	30.9	15.1	46	15.1	PK
V	552.91	27.4	20.3	46	18.6	PK
V	955.29	30.9	24.3	46	15.1	PK

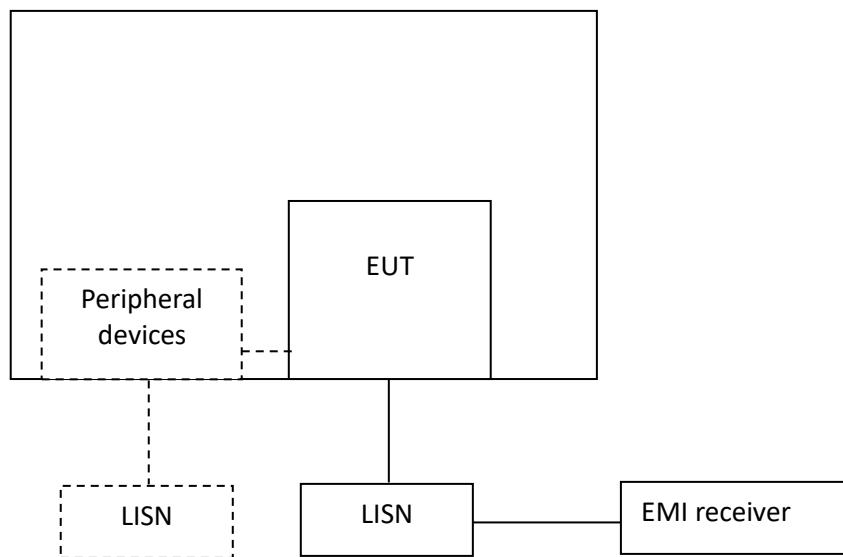
Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.  
2. Corrected Reading = Original Receiver Reading + Correct Factor  
3. Margin = Limit - Corrected Reading  
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,  
Limit = 40.00dBuV/m.  
Then Correct Factor =  $30.20 + 2.00 - 32.00 = 0.20$ dB/m;  
Corrected Reading =  $10\text{dBuV} + 0.20\text{dB/m} = 10.20\text{dBuV/m}$ ;  
Margin =  $40.00\text{dBuV/m} - 10.20\text{dBuV/m} = 29.80\text{dB}$ .

**TEST REPORT****4 Power line conducted emission****Test result:** Pass**4.1 Limit**

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
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.

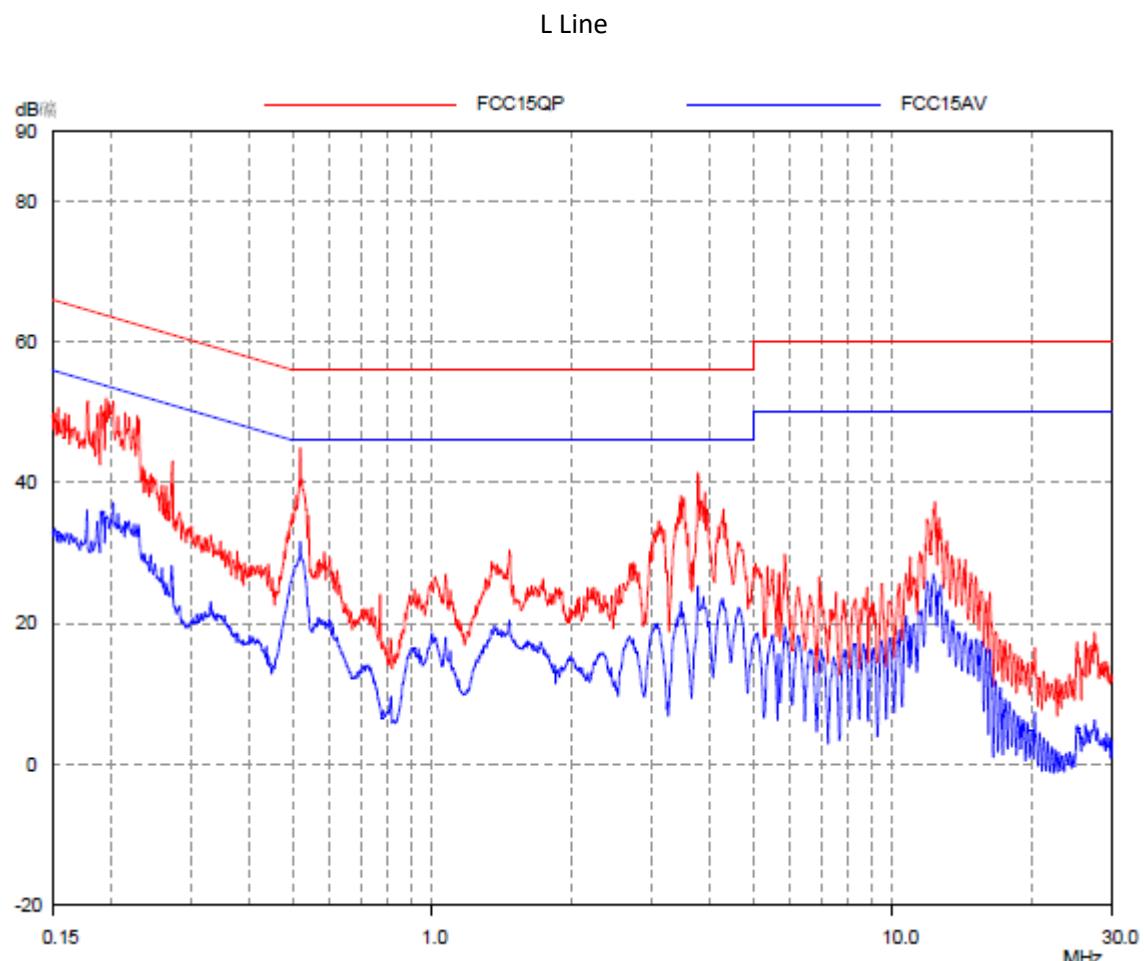
**4.2 Test Configuration**

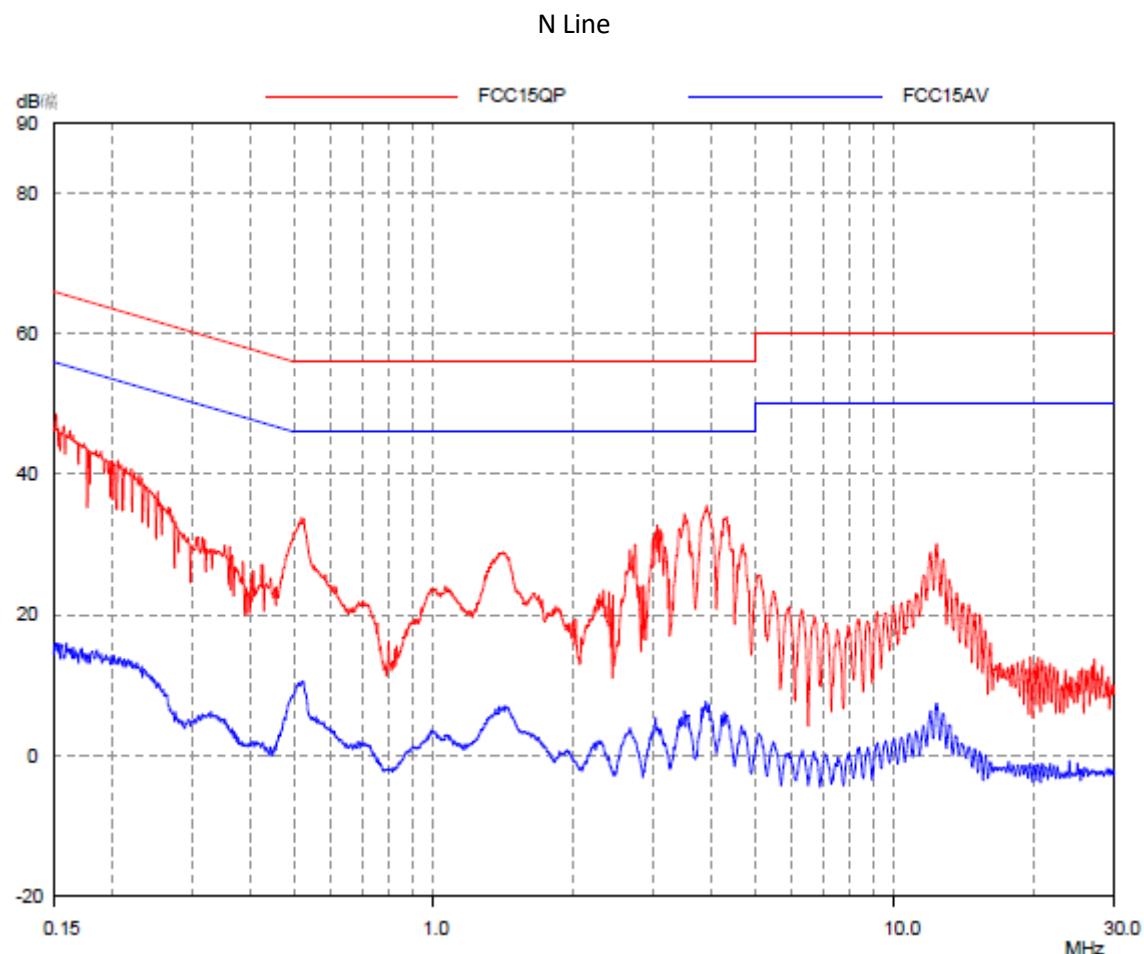
**TEST REPORT****4.3 Measurement Procedure**

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

**TEST REPORT****4.4 Test Results of Power line conducted emission**

**TEST REPORT**

*Remark:*

1. *Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.*
2. *Corrected Reading = Original Receiver Reading + Correct Factor*
3. *Margin = Limit - Corrected Reading*
4. *If the PK Corrected Reading is lower than AV limit, the AV test can be elided.*

\*\*\*\*\* END \*\*\*\*\*