Qingdao Richmat Intelligence Technology Inc

FCC Class II Permissive Change Report

Report Type:
FCC Part 15.249 RF report

Model:
HJBLE

REPORT NUMBER:
220901680SHA-001

ISSUE DATE:
October 14, 2022

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 220901680SHA-001

Applicant:	Qingdao Richmat Intelligence Technology Inc NO.78 Kongquehe 4th Road, Qingdao Clothing Industry park, Jimo, Qingdao, Shandong Province, China.
Manufacturer:	Qingdao Richmat Intelligence Technology Inc NO.78 Kongquehe 4th Road, Qingdao Clothing Industry park, Jimo, Qingdao, Shandong Province, China.
FCC ID:	2AJJGHJBLE

SUMMARY:

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

47CFR Part 15 (2020): Radio Frequency Devices (Subpart C)

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

PREPARED BY:	REVIEWED BY:
Project Engineer Erick Liu	Reviewer Wakeyou Wang

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TEST REPORT

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TEST REPORT

Revision History

Report No.	Version	Description	Issued Date
220901680SHA-001	Rev. 01	Initial issue of report	October 14, 2022

Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Radiated emission	15.249 & 15.209	Pass
Power line conducted emission	15.207	Pass
Assigned bandwidth (20dB bandwidth)	15.215(c)	NA
Antenna requirement	15.203	NA

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Bluetooth Module
Type/Model:	HJBLE
Description of EUT:	EUT is a Bluetooth module, it has only one model. It was tested in the host. The report is C2PC report, the host HJC9GA Ble and HJC9GB Ble were added, they are same except the models names, after evaluation, we choose HJC9GA Ble for all tests.
Host models:	HJC9GA Ble, HJC9GB Ble
Rating:	DC 24-30V
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	August 21, 2022
Date of test:	August 23, 2022 ~ August 25, 2022

1.2 Technical Specification

Frequency Range:	2402MHz - 2480MHz
Support Standards:	Bluetooth LE
Type of Modulation:	GFSK
Channel Number:	40
Data Rate:	1Mbps
Channel Separation:	2 MHz
Antenna Information:	PCB antenna, 3dBi Peak gain

1.3 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

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2020)
ANSI C63.10 (2013)

2.2 Mode of operation during the test

Three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)				2402 ~ 2480			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	**19**	**2440**	29	2460	**39**	**2480**

The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Test Software	-		
Working Mode	BLE		
Test Channel	2402MHz	2440MHz	2480MHz
Power Setting	7	7	7

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

1) Radiated test mode: EUT transmitted signal with BT antenna;
2) Conducted test mode: EUT transmitted signal from BT RF port connected to SPA directly;

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
-	-	-	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	21°C	52% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESCS 30	EC 2107	2023-07-08
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-08
☒	Shielded room	Zhongyu	-	EC 2838	2023-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2023-10-18
☒	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2023-08-05
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2023-06-09
☒	Horn antenna	R&S	HF 906	EC 3049	2023-05-21
☒	Semi-anechoic chamber	Albatross	-	EC 3048	2023-08-21
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2023-03-24
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2023-01-04

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

3 Radiated emission

Test result: **Pass**

3.1 Limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
☐ 902 - 928	94	54
☒ 2400 - 2483.5	94	54
☐ 5725 - 5875	94	54
☐ 24000 - 24250	108	68

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

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 meter 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 meter 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.

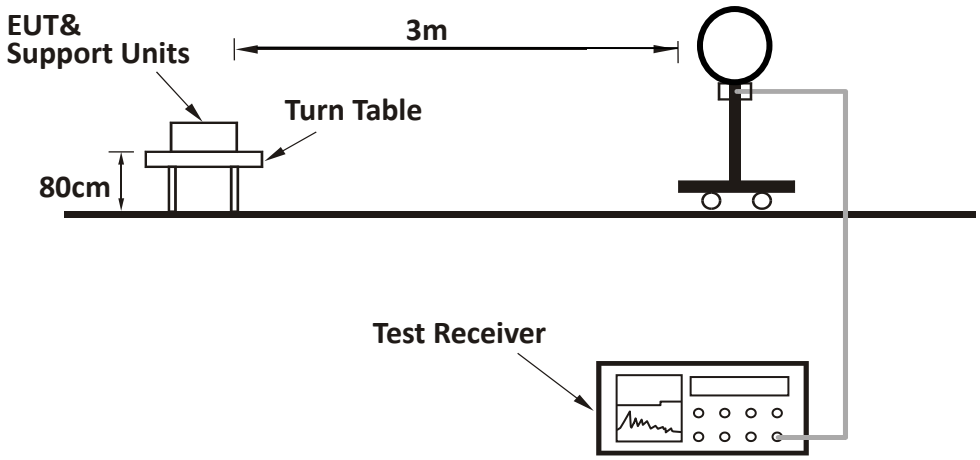
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

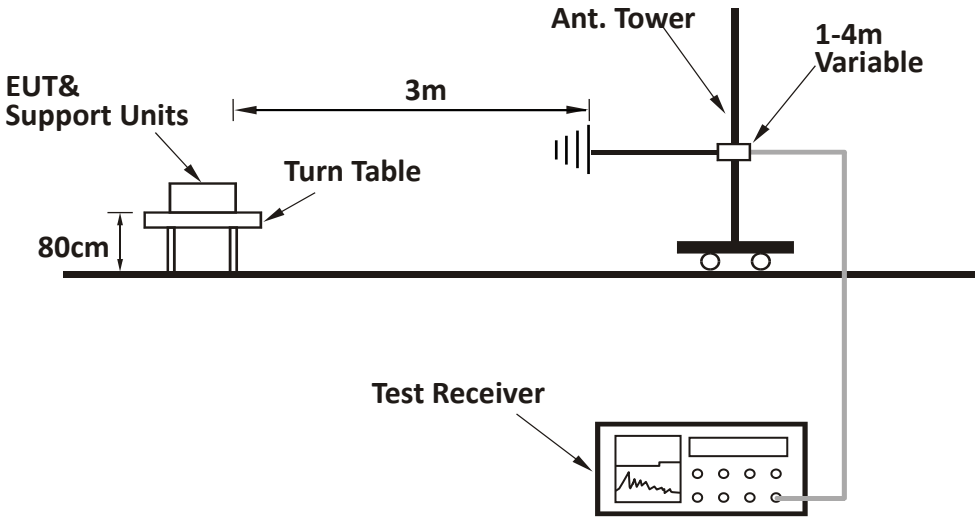
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

3.3 Test Configuration

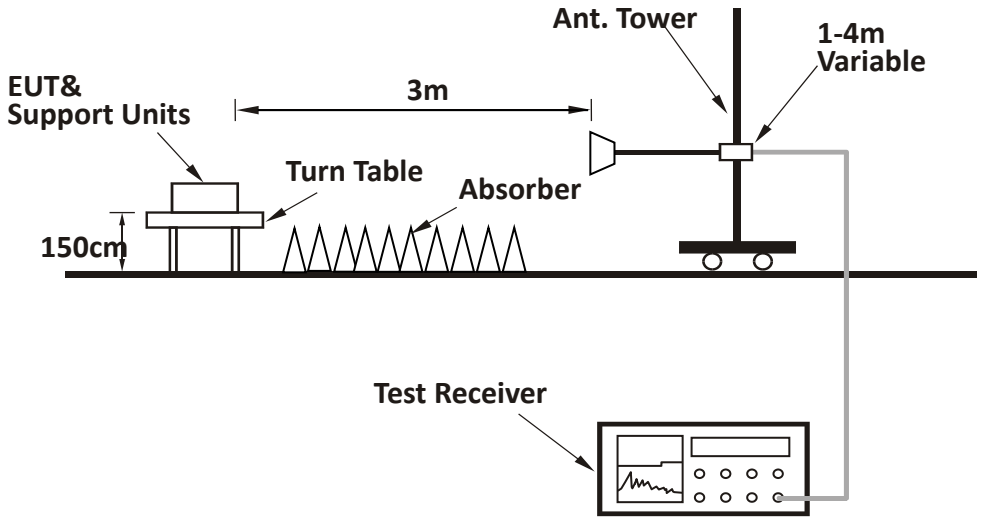
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

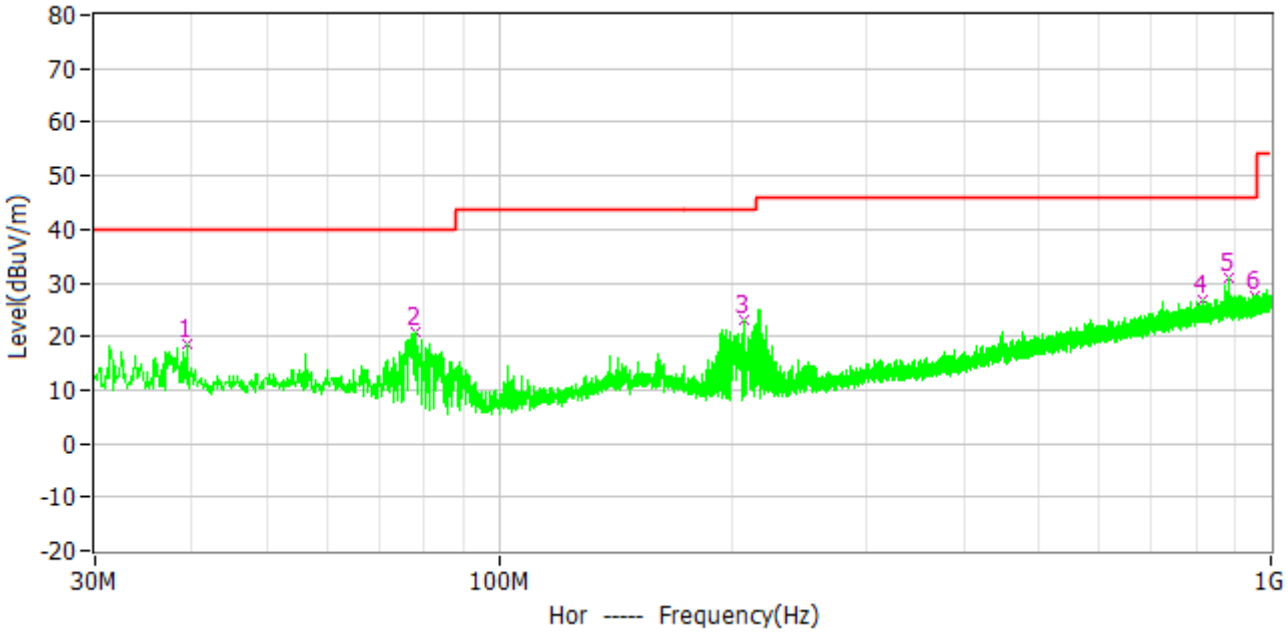


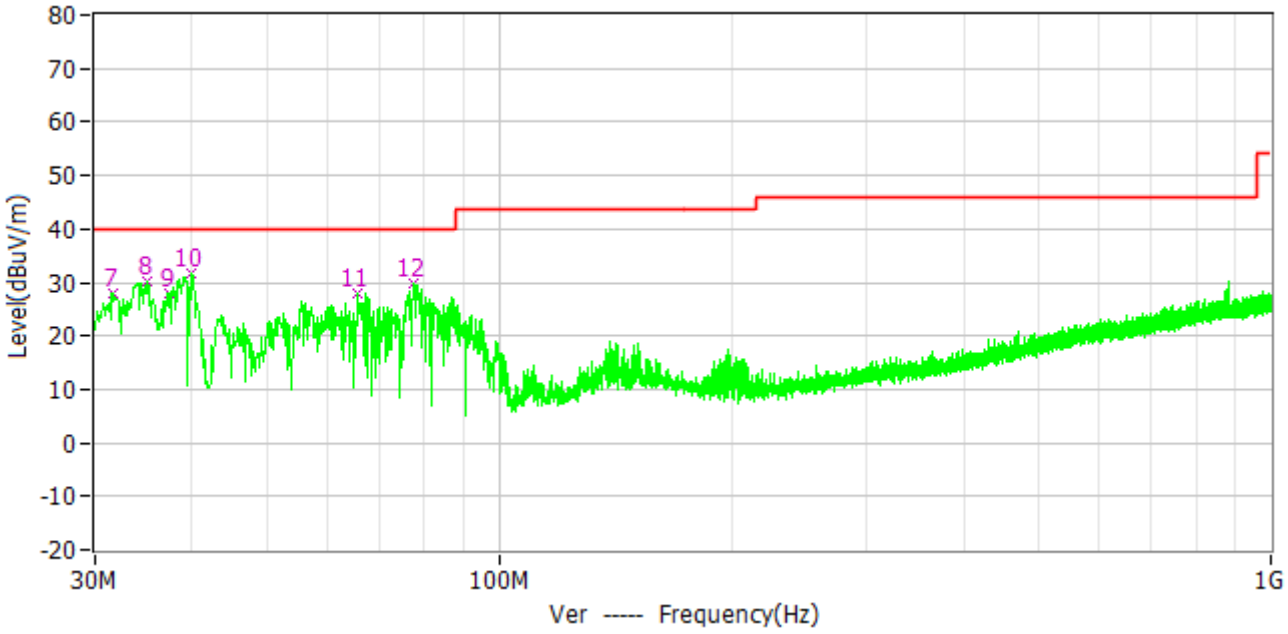
3.4 Test Results of Radiated Emissions

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.

Test data below 1GHz:

All the models were tested and the worst result was listed in the report as below:





TEST REPORT

No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	39.409MHz	40.0	18.5	-21.5	4.8	13.7	PK	Hor	100.0	174.0
2*	78.112MHz	40.0	20.8	-19.2	10.3	10.5	PK	Hor	100.0	218.0
3*	207.607MHz	43.5	22.9	-20.6	11.3	11.6	PK	Hor	100.0	95.0
4*	818.319MHz	46.0	26.7	-19.3	1.1	25.6	PK	Hor	100.0	39.0
5*	879.914MHz	46.0	31.1	-14.9	5.0	26.1	PK	Hor	100.0	0.0
6*	955.768MHz	46.0	27.5	-18.5	0.7	26.8	PK	Hor	100.0	161.0
7*	31.649MHz	40.0	28.1	-11.9	15.1	13.0	PK	Ver	100.0	244.0
8*	35.141MHz	40.0	30.2	-9.8	16.9	13.3	PK	Ver	100.0	202.0
9*	37.469MHz	40.0	28.1	-11.9	14.6	13.5	PK	Ver	100.0	323.0
10*	39.991MHz	40.0	31.7	-8.3	17.9	13.8	PK	Ver	100.0	169.0
11*	65.696MHz	40.0	28.0	-12.0	14.7	13.3	PK	Ver	100.0	290.0
12*	77.627MHz	40.0	29.9	-10.1	19.3	10.6	PK	Ver	100.0	279.0

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Level = Original Receiver Reading + Factor
3. Delta= Level - Limit
4. If the PK Level is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Factor = 10.00 + 2.00 = 12.00dB;
Level = 10dBuV + 12.00dB = 22.00dBuV;
Delta = 22.00dBuV - 66.00dBuV = –44.00dB.

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Test result above 1GHz:

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402	91.90	34.34	114.00	22.10	PK
	V	2402	87.60	34.34	114.00	26.40	PK
	H	2390	48.70	34.29	74.00	25.30	PK
	H	4804	48.10	6.50	74.00	25.90	PK
	H	9606	50.30	9.30	74.00	23.70	PK
M	H	2440	92.90	34.36	114.00	21.10	PK
	V	2440	87.50	34.36	114.00	26.50	PK
	H	4880	48.10	6.50	74.00	25.90	PK
	H	9760	50.70	9.30	74.00	23.30	PK
H	H	2480	92.70	34.38	114.00	21.30	PK
	V	2480	87.30	34.38	114.00	26.70	PK
	H	2483.5	51.50	34.63	74.00	22.50	PK
	H	4960	48.70	6.70	74.00	25.30	PK
	H	9920	48.40	9.30	74.00	25.60	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 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

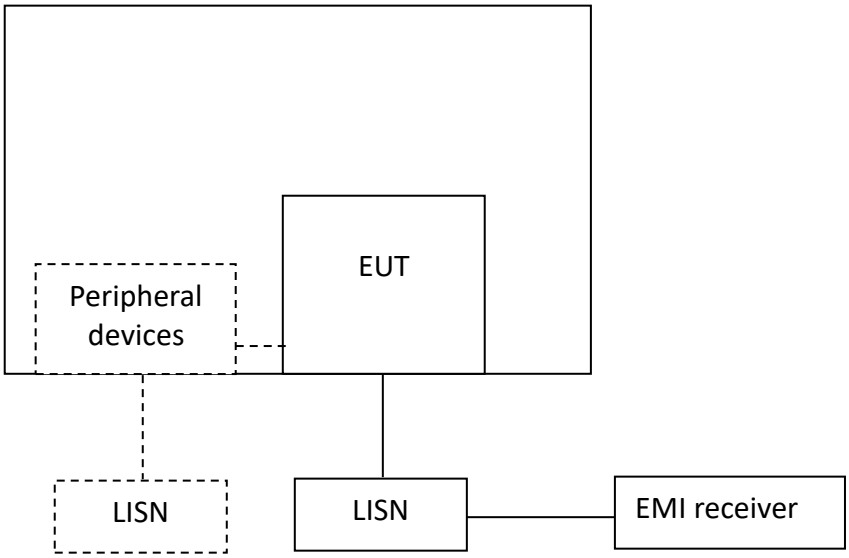
4 Power line conducted emission

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



4.3 Measurement Procedure

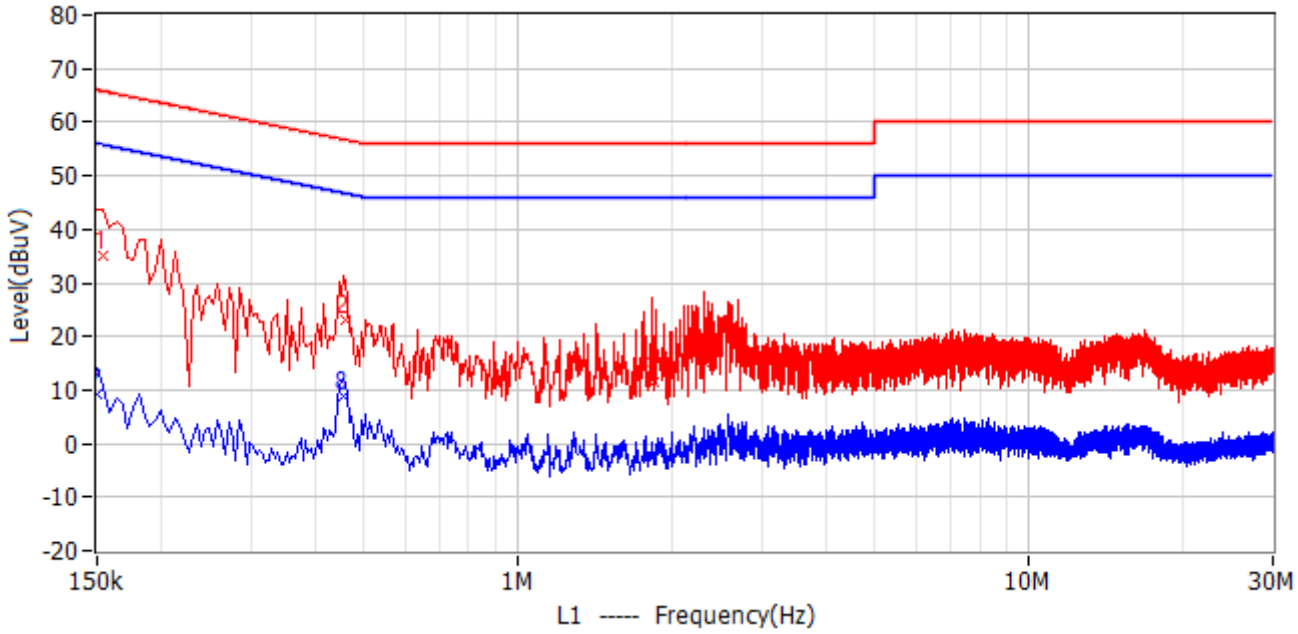
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be 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.

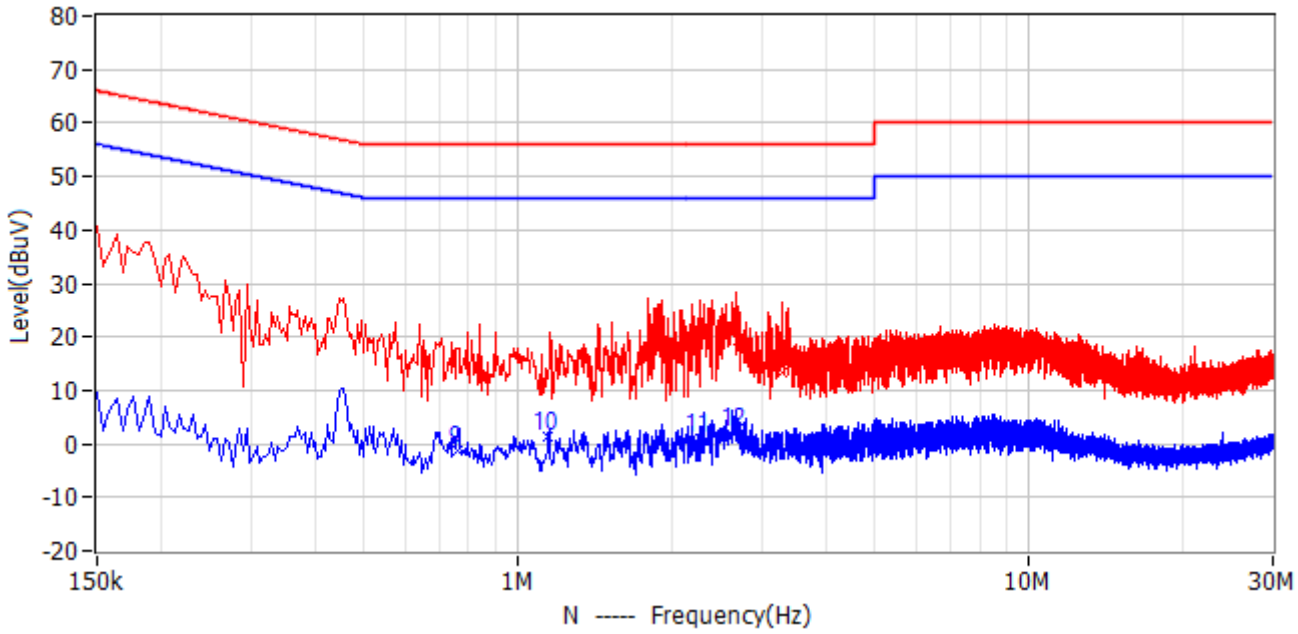
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on 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.

4.4 Test Results of Power line conducted emission

Test Curve:





TEST REPORT

Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
1	154.500kHz	65.8	35.2	-30.5	29.0	6.2	QP	L1
2	460.500kHz	56.7	23.2	-33.5	17.0	6.2	QP	L1
3	1.851MHz	56.0	11.5	-44.5	5.3	6.2	QP	L1
4	2.333MHz	56.0	14.9	-41.1	8.7	6.2	QP	L1
5	2.684MHz	56.0	19.5	-36.5	13.2	6.3	QP	N
6	3.296MHz	56.0	13.2	-42.8	6.9	6.3	QP	N
7	150.000kHz	56.0	9.2	-46.8	3.0	6.2	CAV	L1
8	456.000kHz	46.8	9.0	-37.8	2.8	6.2	CAV	L1
9	762.000kHz	46.0	-1.3	-47.3	-7.6	6.3	CAV	N
10	1.145MHz	46.0	1.5	-44.5	-4.8	6.3	CAV	N
11	2.279MHz	46.0	0.8	-45.2	-5.5	6.3	CAV	N
12	2.675MHz	46.0	2.0	-44.0	-4.3	6.3	CAV	N

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Level = Original Receiver Reading + Factor
3. Delta= Level - Limit
4. If the PK Level is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Factor = 10.00 + 2.00 = 12.00dB;
Level = 10dBuV + 12.00dB = 22.00dBuV;
Delta = 22.00dBuV - 66.00dBuV = –44.00dB.

********** END **********