Huawei Technologies Co., Ltd.

C2PC TEST REPORT

Report Type:
FCC Part 15.247 & ISED RSS-247 RF report

Model:
HUAWEI Board-65, HUAWEI Board-65A

REPORT NUMBER:
190902548SHA-003

ISSUE DATE:
November 8, 2019

DOCUMENT CONTROL NUMBER:
TTRF15.247-01_V1 © 2018 Intertek

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

Total Quality. Assured.

TEST REPORT

Report no.: 190902548SHA-003

Applicant:	Huawei Technologies Co., Ltd. Administration Building, Huawei Base, Bantian, Longgang District, Shenzhen 518129 China
Manufacturer:	Huawei Technologies Co., Ltd. Administration Building, Huawei Base, Bantian, Longgang District, Shenzhen 518129 China
Product Name:	Videoconferencing Endpoint
Type/Model:	HUAWEI Board-65, HUAWEI Board-65A
FCC ID:	QIS-BOARD
IC:	6369A-BOARD

SUMMARY:

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

47CFR Part 15 (2018): 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 (April 2018): General Requirements for Compliance of Radio Apparatus

PREPARED BY:	REVIEWED BY:
Stephanie Zhang	Wakeyou Wang
Project Engineer	Reviewer

Total Quality. Assured.

TEST REPORT

Content

TEST REPORT

Revision History

Report No.	Version	Description	Issued Date
190902548SHA-003	Rev. 01	Initial issue of report	November 8, 2019

TEST REPORT

Measurement result summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Radiated Emissions	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
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:	Videoconferencing Endpoint
Type/Model:	HUAWEI Board-65, HUAWEI Board-65A
Description of EUT:	The EUT is a Videoconferencing Endpoint which was install a wireless module, there have two models, and they are electrically identical except touch screen.
Rating:	AC 100-240V, 50/60Hz
EUT type:	☐ Table top ☒ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	Oct 11, 2019
Date of test:	Oct 11, 2019 - Oct 22, 2019

1.2 Technical Specification

Frequency Range:	2400MHz ~ 2483.5MHz
Support Standards:	Bluetooth BR+EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Type of Modulation:	GFSK, π/4 DQPSK, 8DPSK
Channel Number:	79 (0 - 78)
Data Rate:	1Mbps
Channel Separation:	1MHz

Antenna information:			
No.	Antenna Type	Gain (dBi)	Note
1	Internal PIFA Antenna	3.2dBi Max	/

1.3 Frequency Hopping System Requirement

Test Requirement: Section 15.247 (a)(1), (g), (h) requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

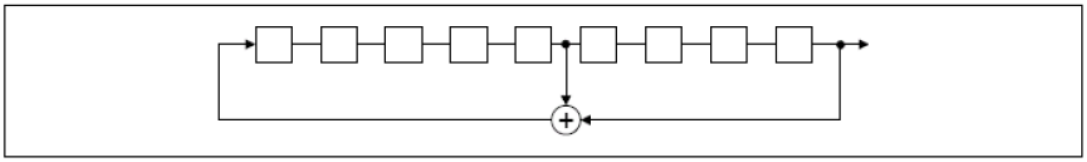
Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1)

According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs;
i.e. the shift register is initialized with nine ones.

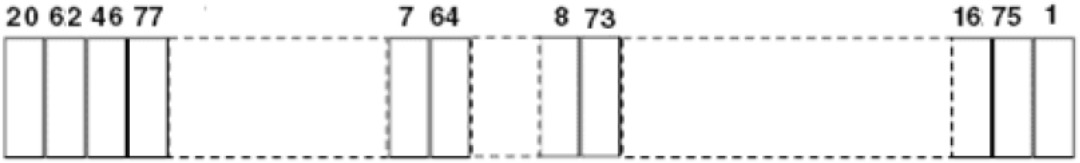
- Number of shift register stages: 9
- Length of pseudo-random sequence: 2^9 -1 = 511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

TEST REPORT

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.
According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g)

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h)

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.
According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinate with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

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 Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2018)
ANSI C63.10 (2013)
RSS-247 Issue 2 (February 2017)
RSS-Gen Issue 5 (April 2018)

2.2 Mode of operation during the test

While testing the transmitter mode of the EUT, the internal modulation is applied. All the functions of the host device except the BT module were set on stand-by mode. 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.

The worst-case modulation configuration:

Worst Modulation Used for Conformance Testing			
Bluetooth Mode	**Data Rate**	**Packet Type**	**Worst Mode**
GFSK	BR-1Mbps	DH1,DH3,DH5	BR-1Mbps DH5 EDR-2Mbps 2DH5 EDR-3Mbps 3DH5
π/4 DQPSK	EDR-2Mbps	2DH1,2DH3,2DH5	
8DPSK	EDR-3Mbps	3DH1,3DH3,3DH5	
Note: The BR-1Mbps DH5 mode was chosen for radiation emission bellow 1GHz and Conducted emission testing as representative in this report.			

The power setting parameter:

The worst-case power setting parameter			
Test software Version	adb command		
Modulation Mode	2402MHz	2441MHz	2480MHz
BR-1Mbps	max	max	max
EDR-2Mbps	max	max	max
EDR-3Mbps	max	max	max

The HUAWEI Board-65 was chosen as a representative, and there have the following test mode:

Radiated test mode:
Mode 1: EUT transmitted signal with internal antenna;

We have verified all test modes and choose the worst mode 1 for radiated test and mode 2 for conducted test as representatively to list the results in this report.

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	HP ProBook 6470b	100-240V AC, 50/60Hz FCC DOC

2.5 Test environment condition:

Test items	Temperature	Humidity
Power line conducted emission	22°C	53% RH
Radiated Emissions	22°C	55% RH

2.6 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESCS 30	EC 2107	2020-07-14
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2019-11-29
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2020-09-16
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2019-12-10
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2020-06-11
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2020-01-13
☐	Shielded room	Zhongyu	-	EC 2839	2020-01-13
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2020-06-31
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Spectrum analyzer	Agilent	E7402A	EC 2254	2020-07-14
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2020-03-10
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2020-02-27
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2020-04-07
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2020-07-14

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
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Power line conducted emission	± 3.19dB

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 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.

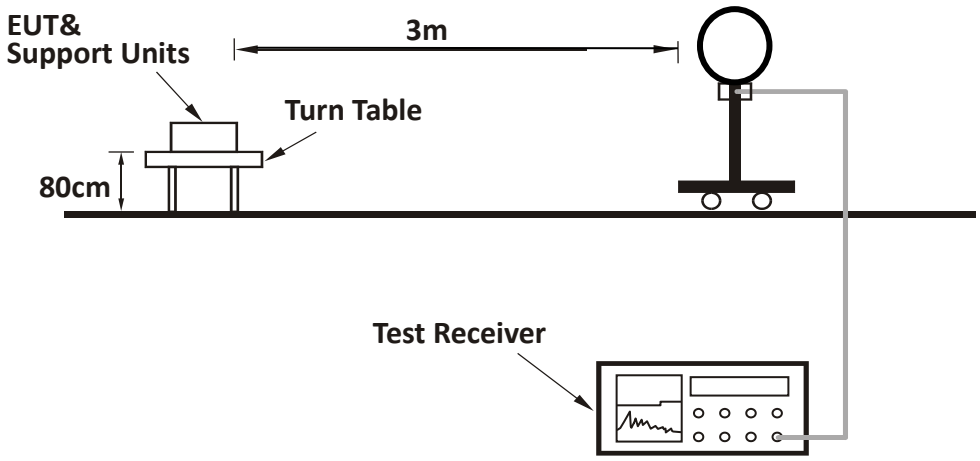
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

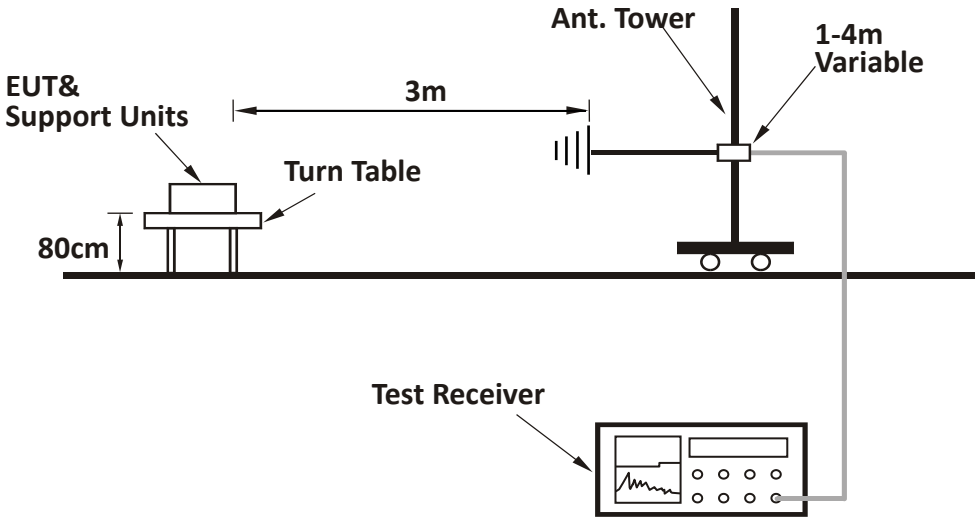
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

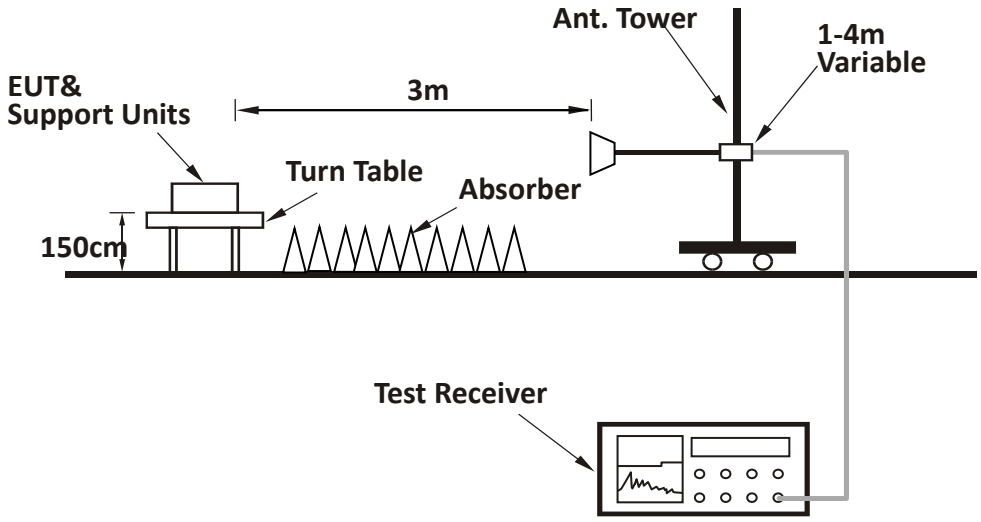
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:



3.4 Test Results of Radiated Emissions

Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	443.948	42.8	19.9	56.4	13.6	PK
H	742.494	50.2	25.6	56.4	6.2	PK
H	890.148	47.0	26.9	56.4	9.4	PK
V	39.993	43.5	13.2	49.0	5.5	PK
V	259.647	46.6	10.4	56.4	9.8	PK
V	648.011	44.9	12.1	56.4	11.5	PK

Test result of 1GHz to 25GHz:

GFSK (DH5) Modulation:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.00	30.7	96.8	Fundamental	/	PK
	H	2390.00	30.2	48.0	74.00	26.0	PK
	H	2390.00	30.2	42.3	54.00	11.7	AV
	H	4804.00	-1.5	45.1	74.00	28.9	PK
M	V	2441.00	30.7	98.7	Fundamental	/	PK
	V	4882.00	-1.1	46.0	74.00	28.0	PK
H	H	2480.00	30.7	96.1	Fundamental	/	PK
	V	2483.50	31.5	47.3	74.00	26.7	PK
	V	2483.50	31.5	41.0	54.00	13.0	AV
	V	4960.00	-0.8	47.4	74.00	26.6	PK

TEST REPORT

π/4DQPSK (2DH5) Modulation:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.00	30.7	94.8	Fundamental	/	PK
	H	2390.00	30.2	46.4	74.00	27.6	PK
	H	2390.00	30.2	40.4	54.00	13.6	AV
	H	4804.00	-1.5	44.7	74.00	29.3	PK
M	V	2441.00	30.7	96.3	Fundamental	/	PK
	V	4882.00	-1.1	43.9	74.00	30.1	PK
H	H	2480.00	30.7	94.3	Fundamental	/	PK
	V	2483.50	31.5	46.4	74.00	27.6	PK
	V	2483.50	31.5	39.6	54.00	14.4	AV
	V	4960.00	-0.8	45.8	74.00	28.2	PK

8DPSK (3DH5) Modulation:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.00	30.7	94.4	Fundamental	/	PK
	H	2390.00	30.2	46.8	74.00	27.2	PK
	H	2390.00	30.2	40.7	54.00	13.3	AV
	H	4804.00	-1.5	45.9	74.00	28.1	PK
M	V	2441.00	30.7	95.6	Fundamental	/	PK
	V	4882.00	-1.1	46.1	74.00	27.9	PK
H	H	2480.00	30.7	94.6	Fundamental	/	PK
	V	2483.50	31.5	46.1	74.00	27.9	PK
	V	2483.50	31.5	40.7	54.00	13.3	AV
	V	4960.00	-0.8	45.1	74.00	28.9	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.

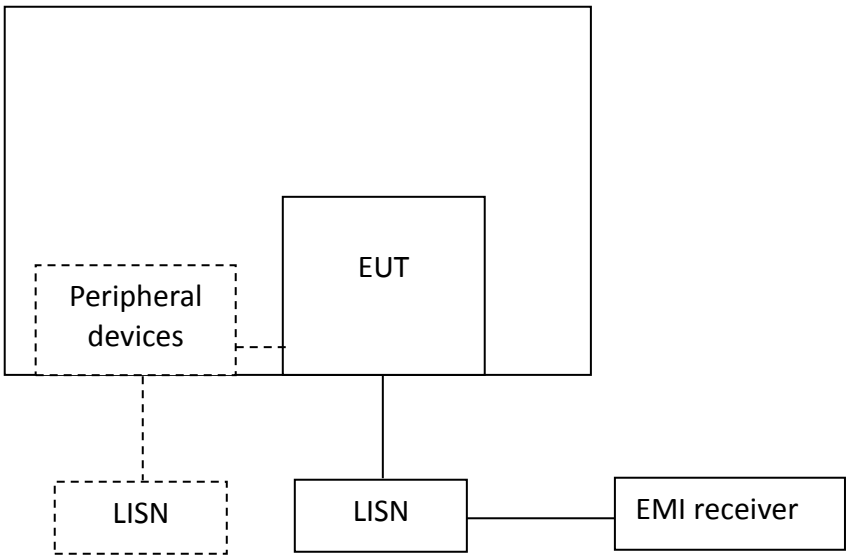
4 Power line conducted emission

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



TEST REPORT

4.3 Measurement Procedure

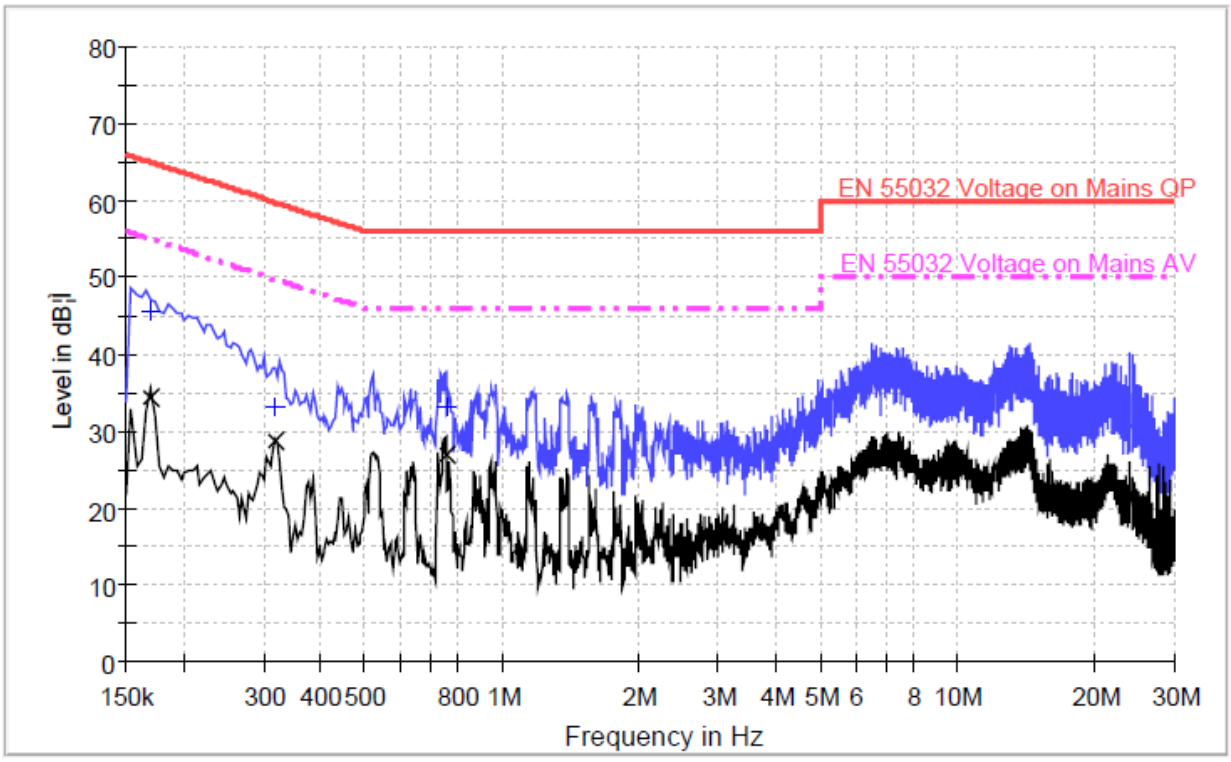
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be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

4.4 Test Results of Power line conducted emission

Test Curve:

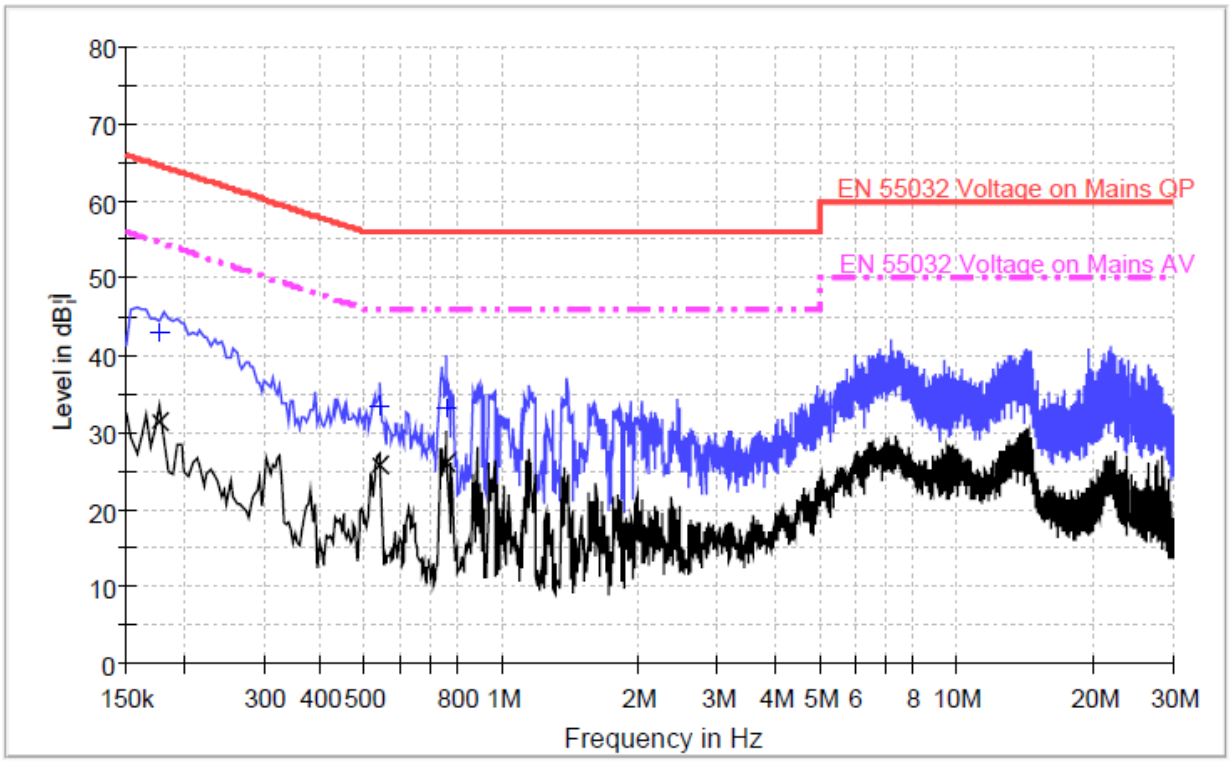


Test Data:

Frequency (MHz)	Quasi-peak			Average			Line
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	
0.170	45.7	65.0	19.3	34.2	55.0	20.8	L
0.318	33.1	59.8	26.7	28.7	49.8	21.1	L
0.754	33.3	56.0	22.7	26.8	46.0	19.2	L

TEST REPORT

Test Curve:



Test Data:

Frequency (MHz)	Quasi-peak			Average			Line
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	
0.178	42.8	64.6	21.8	31.3	54.6	23.3	N
0.538	33.3	56.0	22.7	25.7	46.0	20.3	N
0.758	33.3	56.0	22.7	26.0	46.0	20.0	N

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 **********