

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:

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Manufacturing site: Huawei Technologies Co., Ltd.
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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

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
190902548SHA-001	Rev. 01	Initial issue of report	November 8, 2019

Measurement result summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207(a)	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.

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:	<p>The EUT is a Videoconferencing Endpoint which was install a WIFI module, there have two models, and they are electrically identical except touch screen.</p> <p>This report is based on the original report 181001259SHA-001 for class II permissive change while the touch screen of the DUTs are modified and all other schematics keep identical.</p>
Rating:	AC 100~240V,50~60Hz
EUT type:	<input type="checkbox"/> Table top <input checked="" type="checkbox"/> Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	Oct 11, 2019
Date of test:	Oct 11, 2019 - Oct 22, 2019

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1.2 Technical Specification

Frequency Range:	2412MHz ~ 2462MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20
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)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7
Channel Separation:	5 MHz

1.3 Antenna information

Antenna No.	Model	Antenna type	Antenna Gain	Note
1	/	PIFA	3.2dBi Max	

Mode	Tx/Rx Function	Beamforming function	CDD function
802.11b	1Tx/1Rx	NO	NO
802.11g	1Tx/1Rx	NO	NO
802.11n(HT20)	2Tx/2Rx	NO	NO

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

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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)
 KDB 558074 D01 (v05r02)

2.2 Mode of operation during the test

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

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

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2400-2483.5	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n(HT20)	2412	2437	2462

Data rate VS Power:

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. After this pre-scan, we choose the following table of the data rate as the worst case.

Frequency Band (MHz)	Mode	Worst case data rate
2400-2483.5	802.11b	1Mbps
	802.11g	6Mbps
	802.11n(HT20)	MCS0

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

Radiated test mode:

Mode 1: EUT transmitted signal with internal antenna;

Conducted test mode:

Mode 2: EUT transmitted signal from PCBA RF port connected to SPA directly;

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, 6470b	AC 230V 50Hz

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated Emissions in restricted frequency bands	27°C	57% RH
Power line conducted emission	26°C	55% RH

2.6 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
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	2019-11-29
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	2019-12-10
<input checked="" type="checkbox"/>	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2020-06-11
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2020-01-13
<input type="checkbox"/>	Shielded room	Zhongyu	-	EC 2839	2020-01-13
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2020-06-31
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Spectrum analyzer	Agilent	E7402A	EC 2254	2020-07-14
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2020-03-10
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2020-02-27
<input type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2020-04-07
<input checked="" 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	$\pm 0.74\text{dB}$
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$

3 Maximum conducted output power and e.i.r.p.

Test result: Pass

3.1 Limit

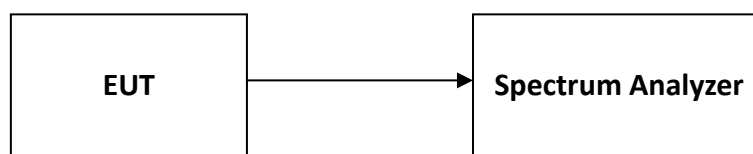
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

3.2 Measurement Procedure

- a) Measure the duty cycle, x, of the transmitter output signal as described in Section 6.0.
- b) Set span to at least 1.5 x OBW.
- c) Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
- d) Set VBW $\geq 3 \times$ RBW.
- e) Number of points in sweep $\geq 2 \times$ span / RBW. (This gives bin-to-bin spacing \leq RBW/2, so that narrowband signals are not lost between frequency bins.)
- f) Sweep time = auto.
- g) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- h) Do not use sweep triggering. Allow the sweep to “free run”.
- i) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the on and off periods of the transmitter.
- j) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- k) Add $10 \log (1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on- and off-times of the transmission). For example, add $10 \log (1/0.25) = 6 \text{ dB}$ if the duty cycle is 25 %.

3.3 Test Configuration



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3.4 Test Results of Maximum conducted output power

WLAN AVGSA Output Power						
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	Max Power (dBm)	Limit (dBm)	Result
802.11b	2437	Ant0	0.00	16.70	30	Pass
802.11b	2437	Ant1	0.00	16.74	30	Pass

4 Radiated Emissions in restricted frequency bands

Test result: Pass

4.1 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

4.2 Measurement Procedure

For Radiated emission below 30MHz:

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- 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.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

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

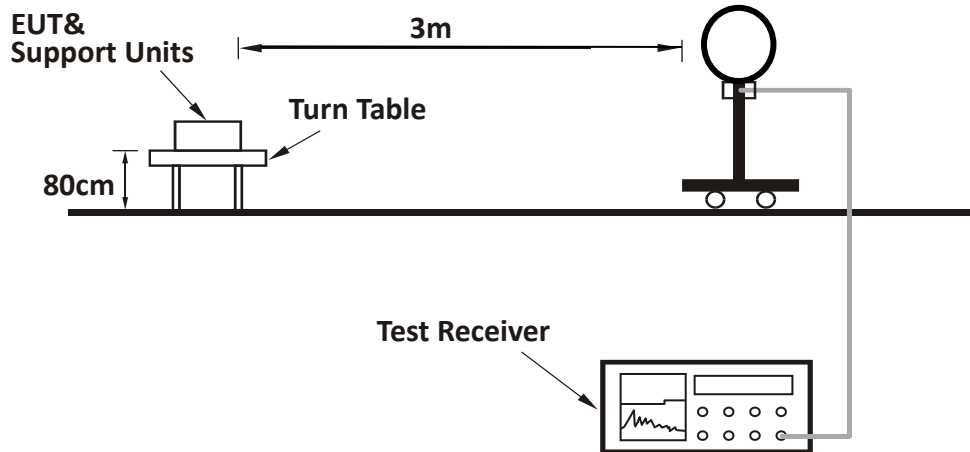
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving 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:

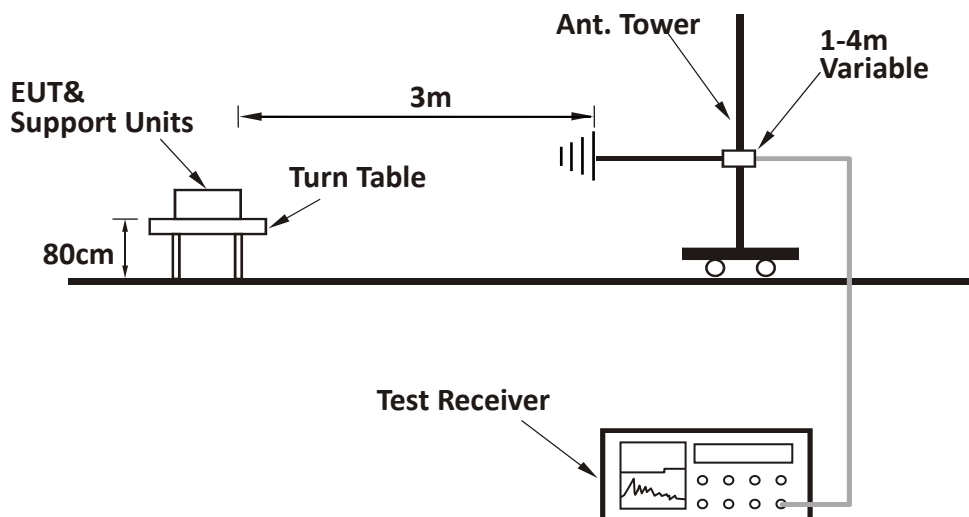
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.3 Test Configuration

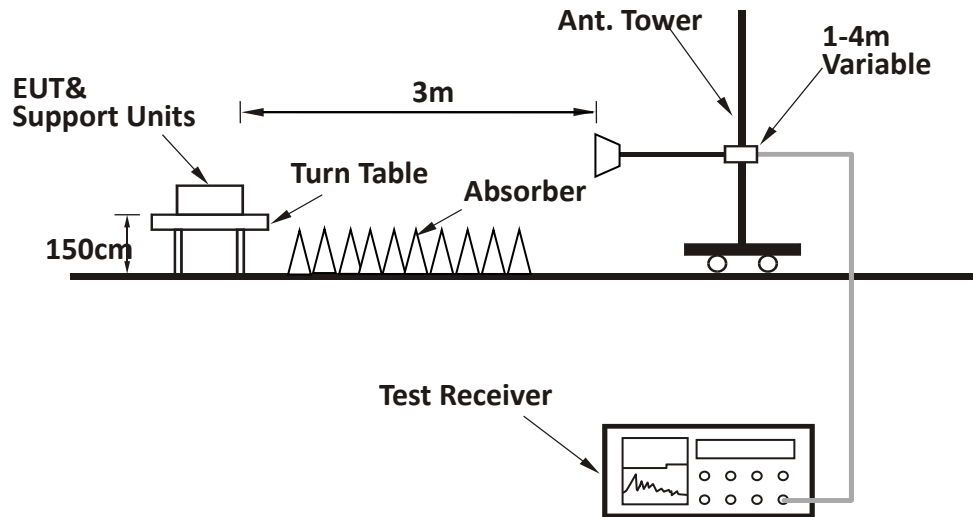
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:



TEST REPORT

4.4 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 above 1GHz:

The emission was conducted from 1GHz to 25GHz

802.11b

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	57.8	26.7	74.0	16.2	PK
	H	2390.00	47.5	16.5	54.0	6.5	AV
	H	4824.00	46.5	43.9	74.0	27.5	PK
	V	4824.00	43.6	41.1	74.0	30.4	PK
M	H	4874.00	47.1	44.7	74.0	26.9	PK
	V	4874.00	45.1	42.7	74.0	28.9	PK
H	H	2483.50	53.6	22.6	74.0	20.4	PK
	H	2483.50	43.5	12.5	54.0	10.5	AV
	H	4924.00	45.4	42.8	74.0	28.6	PK
	V	4924.00	43.7	40.6	74.0	30.3	PK

TEST REPORT

802.11g

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	58.2	31.2	74.0	15.8	PK
	V	2390.00	47.6	31.2	54.0	6.4	AV
	H	4824.00	44.8	2.7	74.0	29.2	PK
	V	4824.00	42.5	2.7	74.0	31.5	PK
M	H	4874.00	46.4	2.7	74.0	27.6	PK
	V	4874.00	42.0	2.7	74.0	32.0	PK
	H	7311.00	43.0	8.0	74.0	31.0	PK
	V	7311.00	42.5	8.0	74.0	31.5	PK
H	H	2483.50	55.7	31.2	74.0	18.3	PK
	V	2483.50	47.7	31.2	54.0	6.3	AV
	H	4924.00	46.6	2.8	74.0	27.4	PK
	V	4924.00	45.3	2.8	74.0	28.7	PK

802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	57.2	31.2	74.00	16.8	PK
	V	2390.00	45.4	31.2	54.00	8.6	AV
	H	4824.00	44.2	2.7	74.00	29.8	PK
	V	4824.00	42.8	2.7	74.00	31.2	PK
M	H	4874.00	44.1	2.7	74.00	29.9	PK
	V	4874.00	42.9	2.7	74.00	31.1	PK
H	H	2483.50	54.2	31.2	74.00	19.8	PK
	V	2483.50	44.3	31.2	54.00	9.7	AV
	H	4924.00	45.9	2.8	74.00	28.1	PK
	V	4924.00	42.7	2.8	74.00	31.3	PK

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- 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 = $30.20 + 2.00 - 32.00 = 0.20\text{dB/m}$;
Corrected Reading = $10\text{dBuV} + 0.20\text{dB/m} = 10.20\text{dBuV/m}$;
Margin = $40.00\text{dBuV/m} - 10.20\text{dBuV/m} = 29.80\text{dB}$.

5 Power line conducted emission

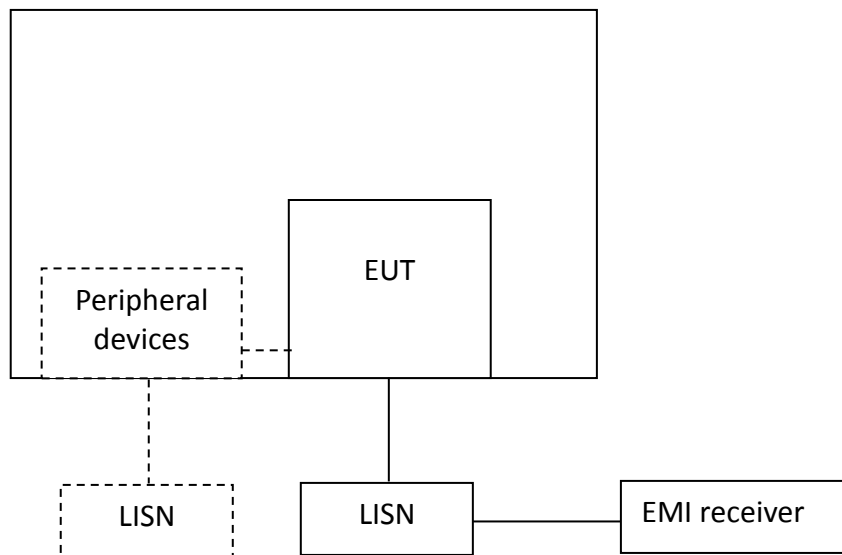
Test result: Pass

5.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	79	66
0.5-5	73	60
5-30	73	60

Class A.

5.2 Test Configuration



TEST REPORT**5.3 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.

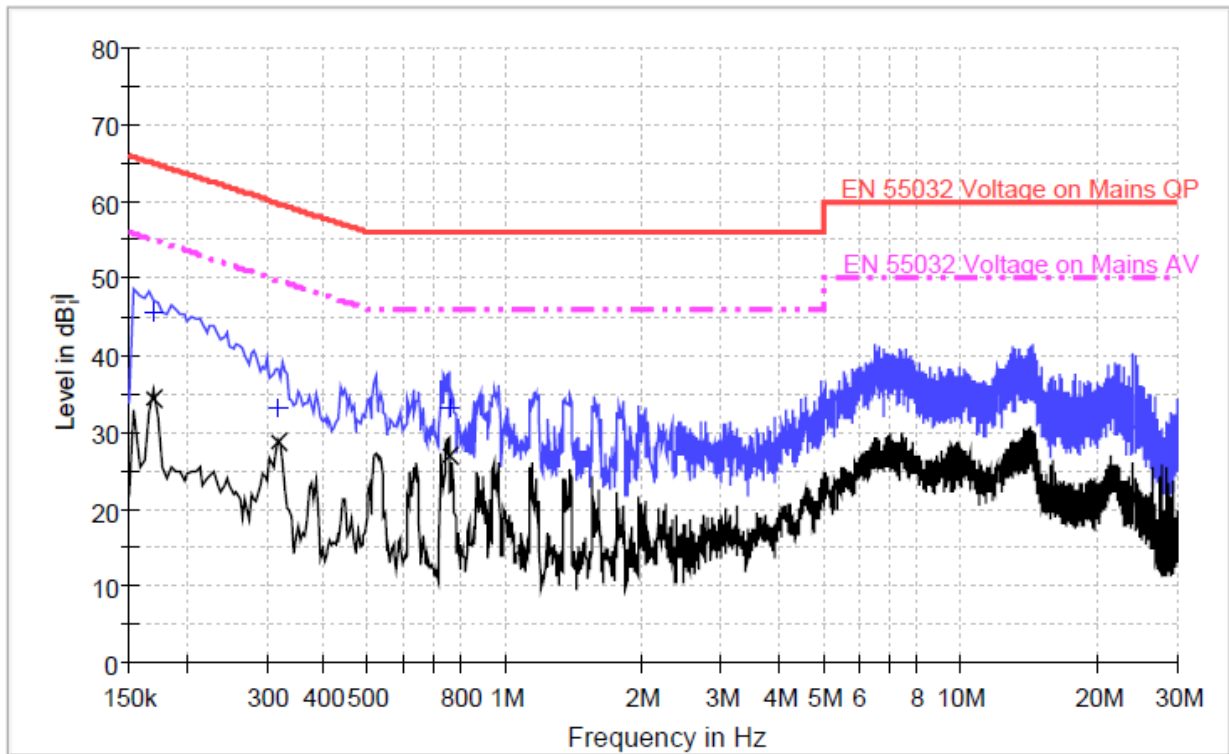
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on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

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5.4 Test Results of Power line conducted emission

Test Curve:

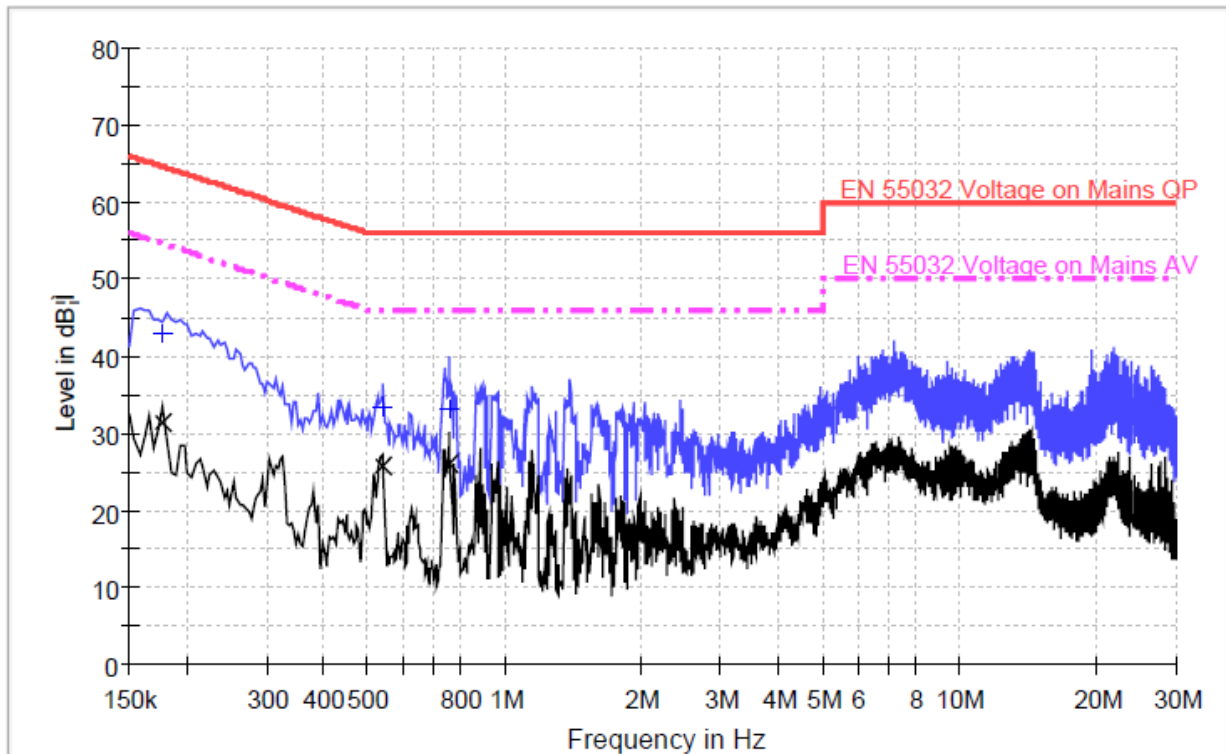


Test Data:

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

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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 *****