

IKEA of Sweden AB

EMC TEST REPORT

Report Type:
FCC Part 15C EMC report

Model:
E1903 Nordmärke

REPORT NUMBER:
190501693SHA-001

ISSUE DATE:
November 20, 2019

DOCUMENT CONTROL NUMBER:
TTRF15c_V1 © 2018 Intertek



Applicant: IKEA of Sweden AB
Box 702, 343 81 ÄLMHULT Sweden

Manufacturer: IKEA of Sweden AB
Box 702, 343 81 ÄLMHULT Sweden

FCC ID: FHO-E1903

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

PREPARED BY:

REVIEWED BY:



Project Engineer
Erick Liu

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

REVISION HISTORY..... 4

MEASUREMENT RESULT SUMMARY..... 5

1 GENERAL INFORMATION 6

1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) 6

1.2 DESCRIPTION OF TEST FACILITY 7

2 TEST SPECIFICATIONS..... 8

2.1 STANDARDS OR SPECIFICATION 8

2.2 MODE OF OPERATION DURING THE TEST..... 8

2.3 TEST SOFTWARE LIST 8

2.4 TEST PERIPHERALS LIST 8

2.5 TEST ENVIRONMENT CONDITION:..... 8

2.6 INSTRUMENT LIST 9

2.7 MEASUREMENT UNCERTAINTY 10

3 RADIATED EMISSIONS 11

3.1 LIMIT 11

3.2 BLOCK DIAGRAM AND TEST SET UP 12

3.3 MEASUREMENT PROCEDURE 13

3.4 TEST RESULTS OF RADIATED EMISSIONS 15

4 POWER LINE CONDUCTED EMISSION..... 18

4.1 LIMIT 18

4.1.1 *Limits for conducted disturbance voltage at the mains ports of class A device* 18

4.1.2 *Limits for conducted disturbance voltage at the mains ports of class B device* 18

4.2 BLOCK DIAGRAM AND TEST SET UP 19

4.3 MEASUREMENT PROCEDURE 20

4.4 TEST RESULTS OF POWER LINE CONDUCTED EMISSION..... 21

Revision History

Report No.	Version	Description	Issued Date
190501693SHA-001	Rev. 01	Initial issue of report	November 20, 2019

Measurement result summary

TEST ITEM	FCC REFERANCE	TEST RESULT	NOTE
Power line conducted emission	15.207	Pass	
Radiated emission	15.209	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:	Wireless Charger
Type/Model:	E1903 Nordmärke
Description of EUT:	The EUT is a Wireless Charger for indoor use. It can be supplied by adapter. When test is performed, it is loaded by 3x Qi charger pad.
Rating:	Input: 19Vdc, 1.74A
Category of EUT:	Class B
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Operating frequency range	
Software Version:	/
Hardware Version:	/
Sample received date:	May 21, 2019
Date of test:	May 22, 2019- June 14, 2019

TEST REPORT**1.2 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
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2018)

ANSI C63.10 (2013)

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

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.	Model number	Brand name	Mode
1	Load1	Provided by client	100% Power level
2	Load2	Provided by client	50% Power level
3	Load3	Provided by client	Stand by

We tested the load at all three power level modes, and the 100% Power level mode is the worst case, we listed the results in this report.

2.5 Test environment condition:

Test items	Temperature	Humidity
Power line conducted emission	24°C	52% RH
Radiated Emissions	25°C	53% RH

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	2020-09-12
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2020-12-07
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2020-01-07
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2020-09-12
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2020-05-30
<input type="checkbox"/>	Horn antenna	R&S	HF 906	EC 3049	2020-11-17
<input type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2020-01-09
<input type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2021-07-09
<input checked="" type="checkbox"/>	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2020-03-07
<input type="checkbox"/>	Pre-amplifier	R&S	Pre-amp 18	EC5881	2020-06-20
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2020-09-15
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2020-06-14
<input type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2020-06-28

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
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 Radiated Emissions

Test result: Pass

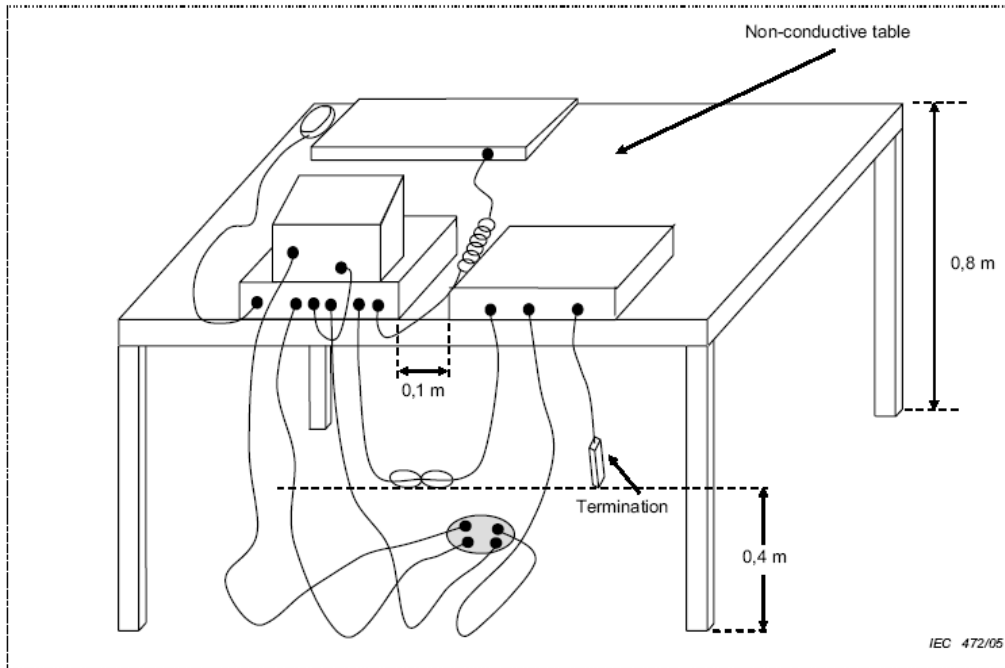
3.1 Limit

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

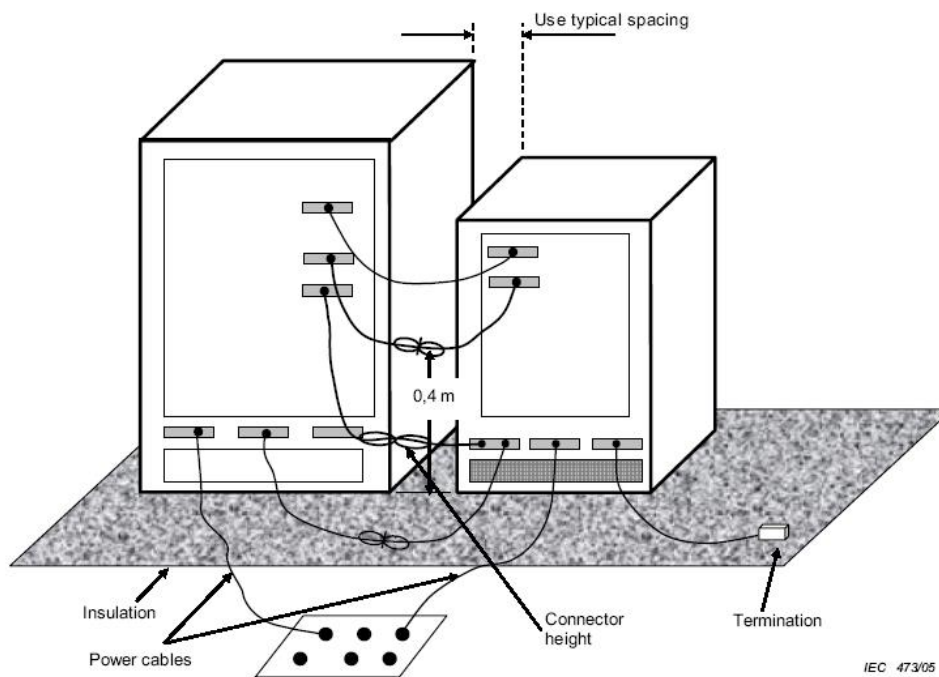
Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

3.2 Block diagram and test set up

For table top equipment



For floor standing equipment



3.3 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, Y and Z 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 $\geq 1/T$ (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

3.4 Test Results of Radiated Emissions

EUT was tested with empty load, half load and full load, the full load is the worst case and we listed the results in the report.

Test data below 30MHz

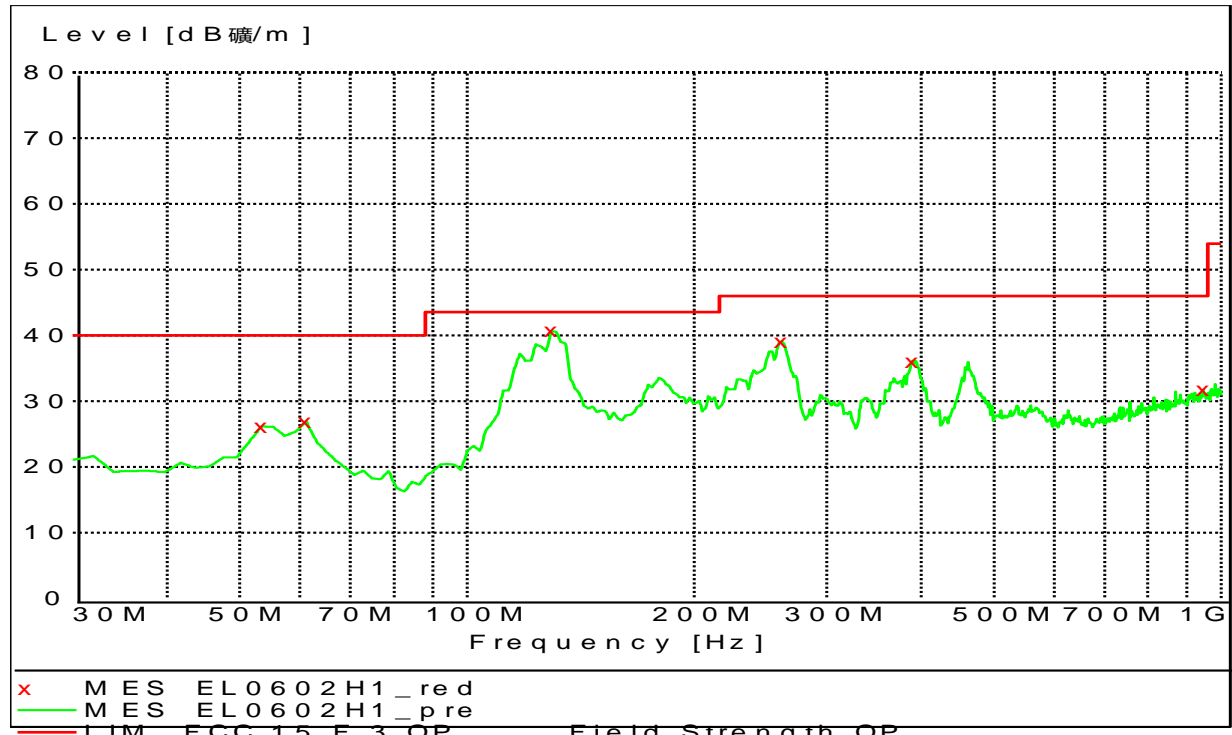
Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
X	0.13	82.40	105.33	22.93	PK
X	0.14	81.20	104.68	23.48	PK
X	0.14	77.60	104.68	27.08	PK
Y	0.13	69.40	105.33	35.93	PK
Y	0.14	69.10	104.68	35.58	PK
Y	7.57	47.00	69.54	22.54	PK
Z	0.11	82.50	106.78	24.28	PK
Z	0.12	81.10	106.02	24.92	PK
Z	0.13	80.10	105.33	25.23	PK
Z	0.75	60.60	70.10	9.50	PK

TEST REPORT

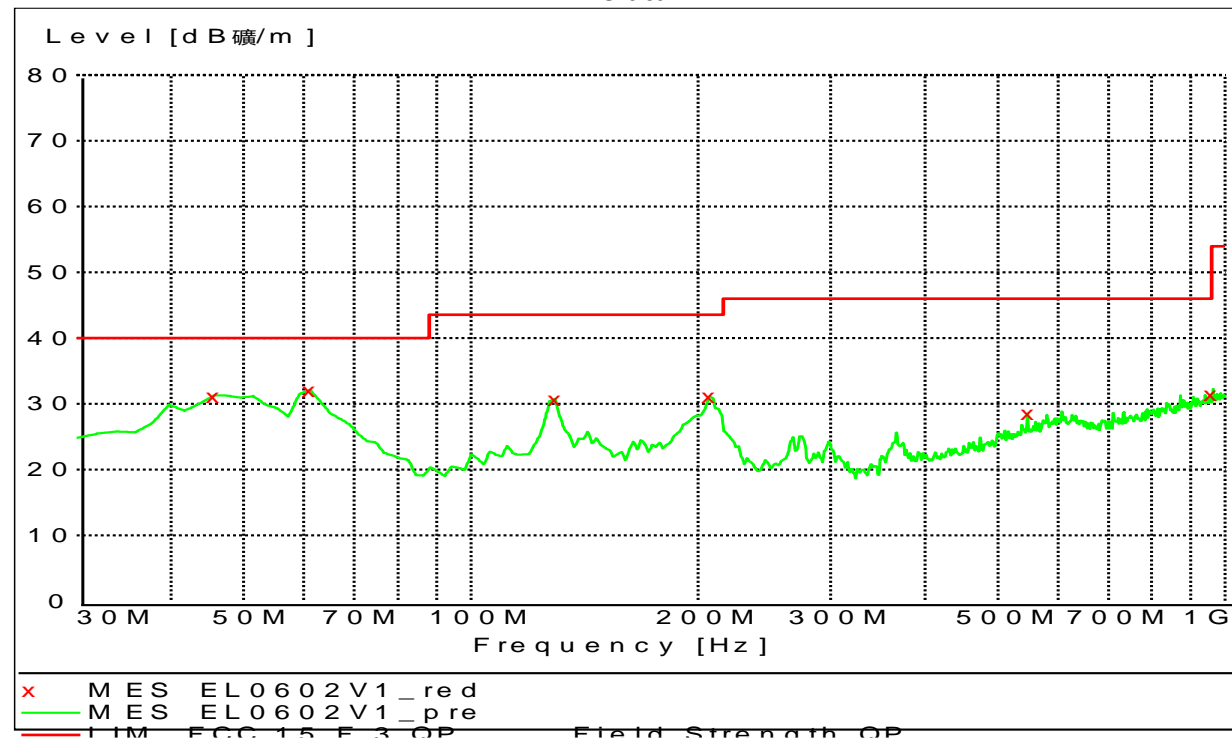
Test data from 30MHz to 1GHz

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



TEST REPORT

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	53.33	26.10	8.20	40.00	13.90	PK
H	61.10	26.90	6.90	40.00	13.10	PK
H	129.14	40.70	13.20	43.50	2.80	PK
H	261.32	39.10	15.70	46.00	6.90	PK
H	389.62	36.10	17.90	46.00	9.90	PK
H	947.52	31.70	24.90	46.00	14.30	PK
V	45.55	31.20	10.90	40.00	8.80	PK
V	61.10	32.10	6.90	40.00	7.90	PK
V	129.14	30.70	13.20	43.50	12.80	PK
V	206.89	31.10	11.30	43.50	12.40	PK
V	547.07	28.50	20.80	46.00	17.50	PK
V	957.23	31.40	25.00	46.00	14.60	PK

4 Power line conducted emission

Test result: Pass

4.1 Limit

4.1.1 Limits for conducted disturbance voltage at the mains ports of class A device

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

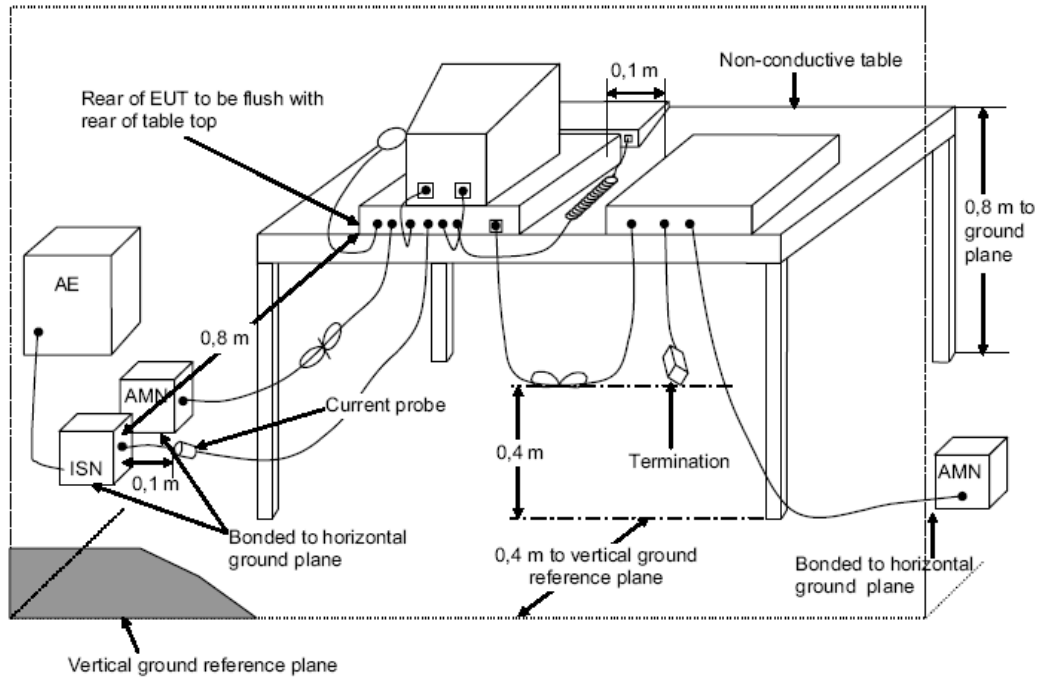
4.1.2 Limits for conducted disturbance voltage at the mains ports of class B device

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

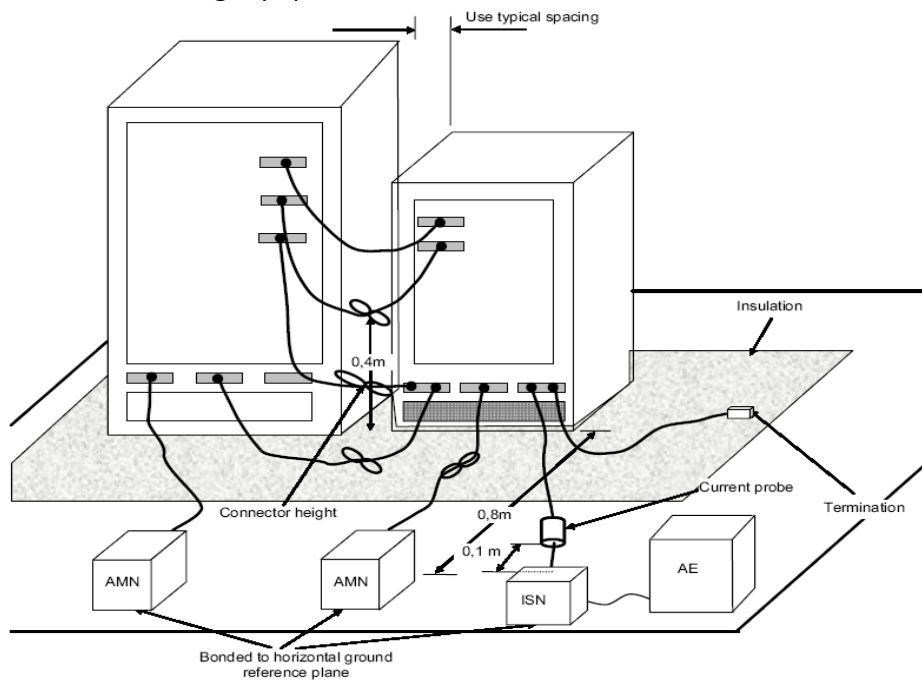
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.2 Block diagram and test set up

For table top equipment



For floor standing equipment



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.

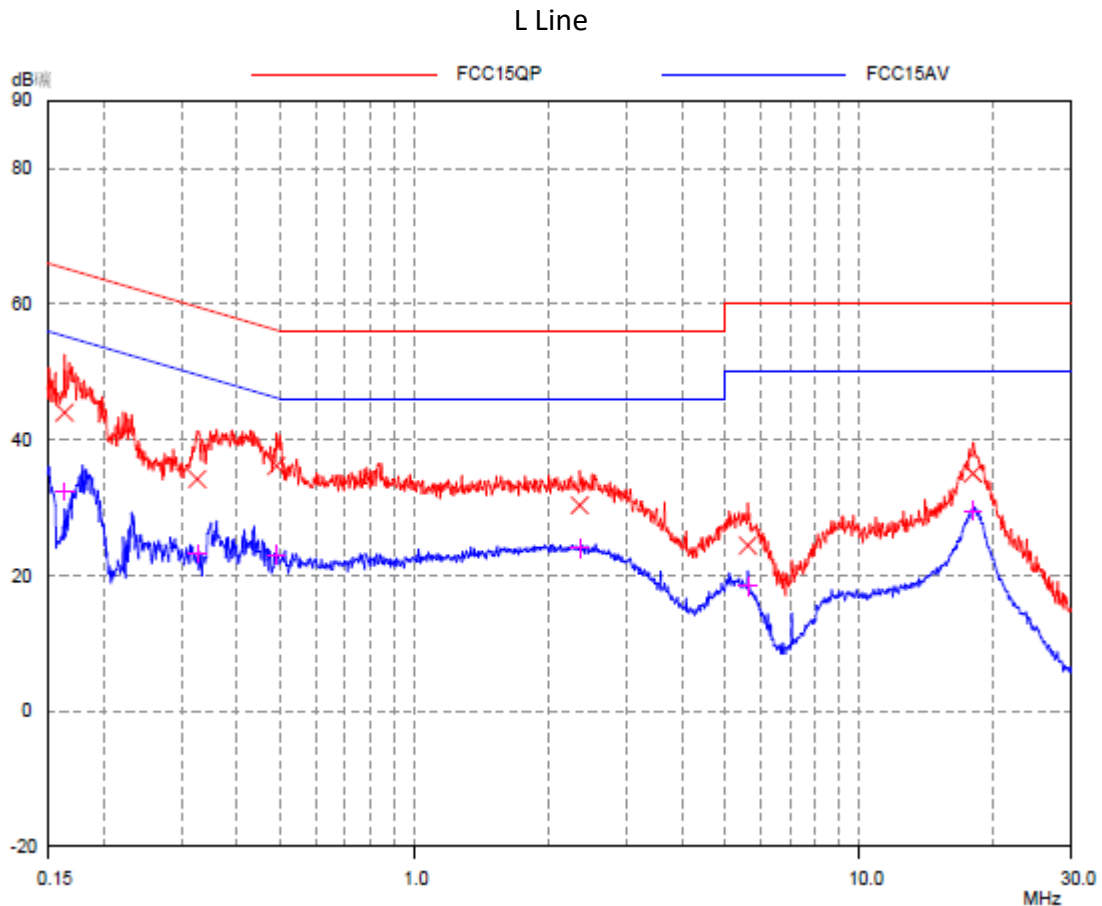
The bandwidth of the test receiver is set at 9 kHz.

TEST REPORT

4.4 Test Results of Power line conducted emission

EUT was tested with empty load, half load and full load, the full load is the worst case and we listed the results in the report.

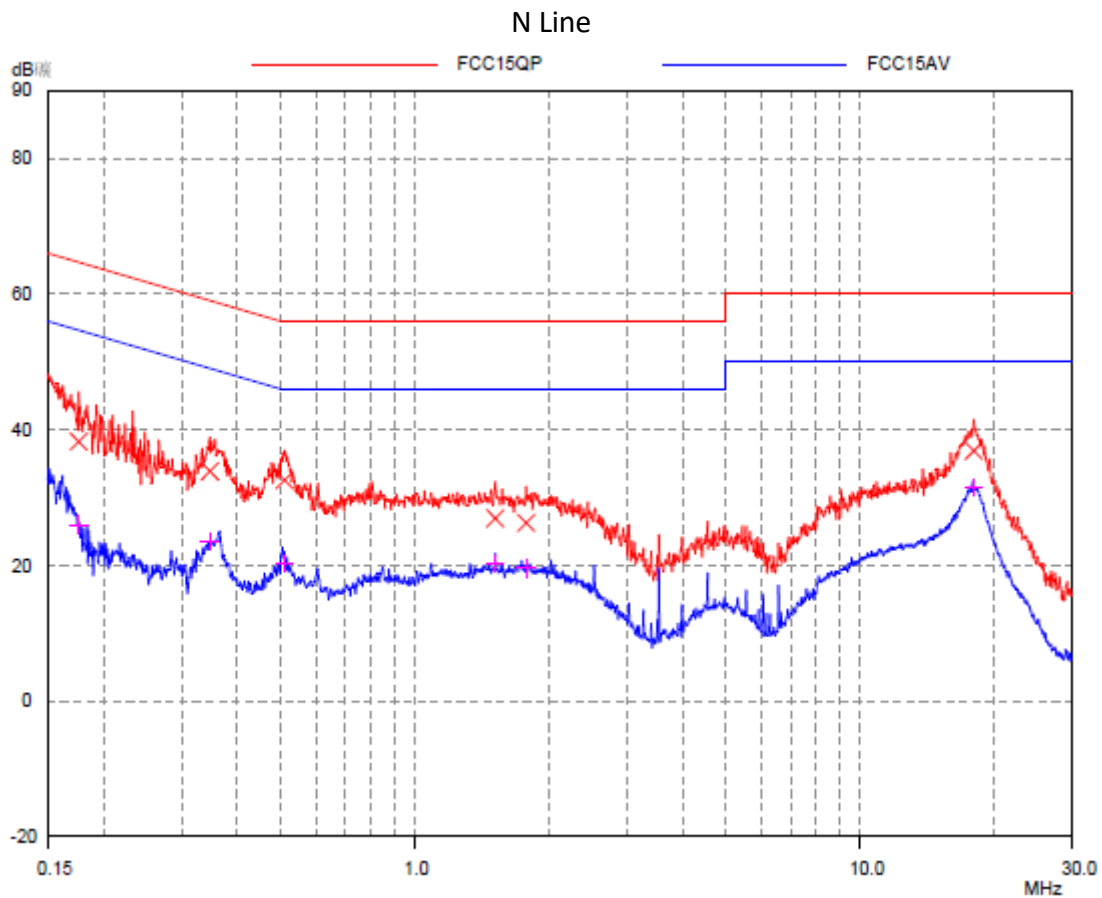
Test Curve:



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.16	43.99	65.27	21.28	32.36	55.27	22.91
0.33	34.17	59.57	25.40	23.22	49.57	26.35
0.49	36.13	56.15	20.02	23.06	46.15	23.09
2.36	30.32	56.00	25.68	24.02	46.00	21.98
5.63	24.42	60.00	35.58	18.38	50.00	31.62
18.05	35.01	60.00	24.99	29.51	50.00	20.49

Test Curve:



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.18	38.25	64.67	26.42	26.00	54.67	28.67
0.35	33.87	59.04	25.17	23.45	49.04	25.59
0.51	32.55	56.00	23.45	20.32	46.00	25.68
1.52	26.93	56.00	29.07	20.23	46.00	25.77
1.78	26.26	56.00	29.74	19.61	46.00	26.39
18.05	36.89	60.00	23.11	31.46	50.00	18.54

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 *****