

Steelcase Inc.

RF TEST REPORT

Report Type:

FCC Part 15C RF report

Model:

WCECLIPSE

REPORT NUMBER:

230901146SHA-001

ISSUE DATE:

Dec 14, 2023

DOCUMENT CONTROL NUMBER:

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TEST REPORT

Applicant: Steelcase Inc.
901 44th ST SE, Grand Rapids, MI 49508, USA

Manufacturer: Steelcase Inc.
901 44th ST SE, Grand Rapids, MI 49508, USA

FCC ID: ROM-WCECLIPSE

SUMMARY:

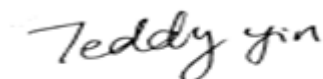
The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2021): 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
Teddy Yin

Reviewer
Wakeyou Wang

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
230901146SHA-001	Rev. 01	Initial issue of report	Dec 14, 2023

Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Radiated emissions	15.209	Pass
Conducted emissions	15.207	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.

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1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Portable Luminaire with LED
Type/Model/HVIN/FVIN:	WCECLIPSE
Description of EUT:	EUT is a LED luminaire with wireless charge function. The worst data is listed in the report.
Rating:	DC 24V, 1.5A Rated lighting power: 4.5W Wireless charge output: 5V/1A, 5V/1.5A, 5V/2A, 9V/1.67A Adaptor: MKE-2401500DEXD Input: 100-240V~, 50/60Hz, 0.8A Output: DC 24V, 1.5A
Category of EUT:	Class B
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample number	0230919-11-004
Sample received date:	Oct 7, 2023
Date of test:	Oct 7~20, 2023

1.2 Technical Specification

Frequency Range:	111kHz – 200kHz
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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: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

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2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
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 are 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.	Name	Brand and Model	Description
1	Wireless load	/	100% power level
2	Wireless load	/	50% power level
3	Wireless load	/	0% power level
4	/	/	/

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	23°C	56% RH
Power line conducted emission	23°C	56% RH

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2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
☒	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-24
☒	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-07-16
☒	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2024-02-14
☒	Semi-anechoic chamber	Albatross	-	EC 3048	2024-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-24
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2024-03-08

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2.7 Measurement uncertainty

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

Measurement	Frequency	Expanded Uncertainty ($k=2$)
Conducted emission at mains ports	9kHz ~ 150kHz	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.90 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 dB

TEST REPORT

3 Radiated emissions

Test result: Pass

3.1 Limit

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:

- 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, the lowest height of the magnetic antenna was 1 m above the ground.
- Both coaxial and coplanar polarizations 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.

For Radiated emission above 30MHz:

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.

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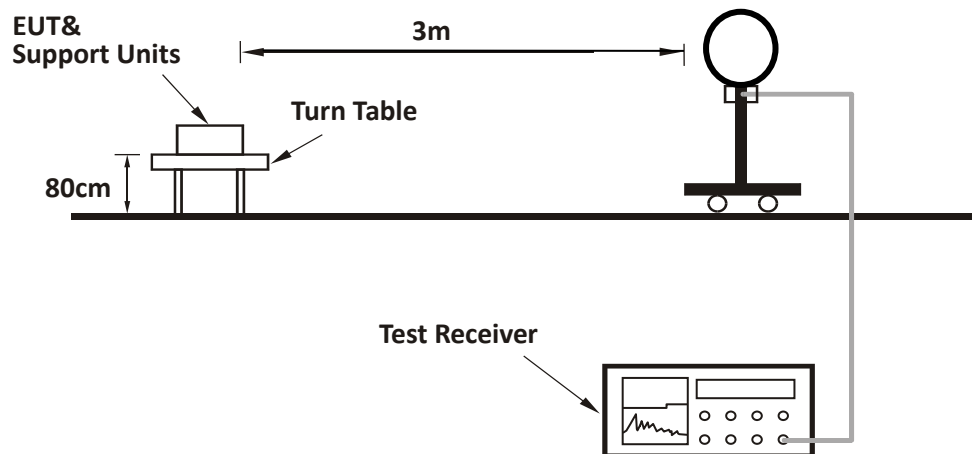
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function 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:

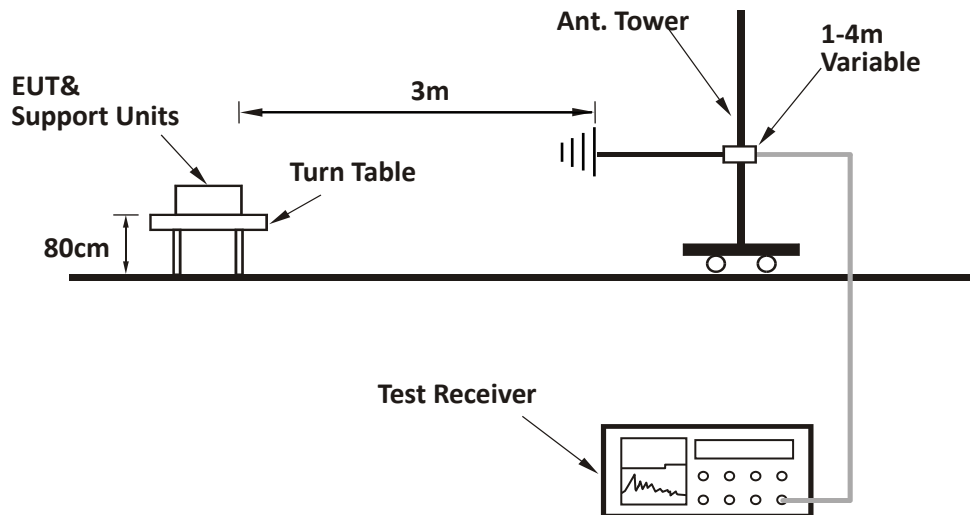
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. All modes of operation were evaluated and the worst-case emissions were reported

3.3 Test Configuration

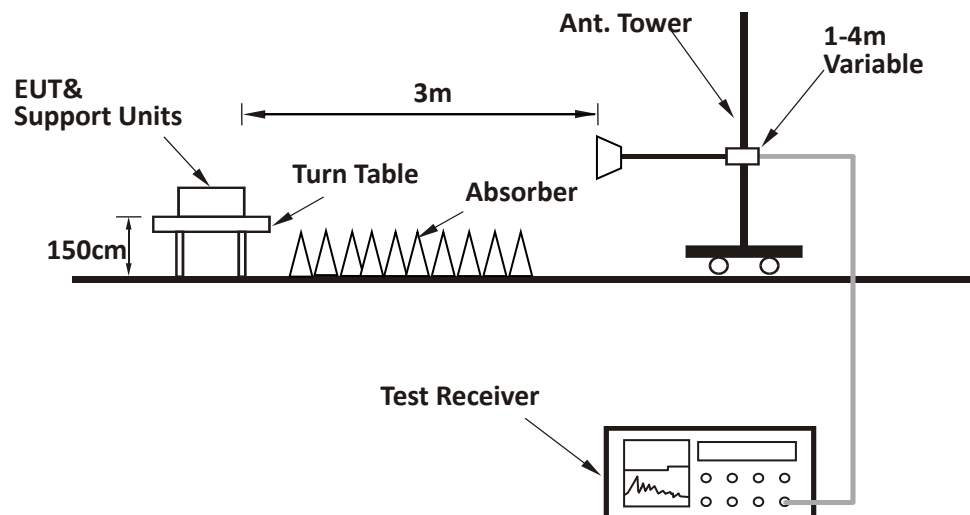
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:



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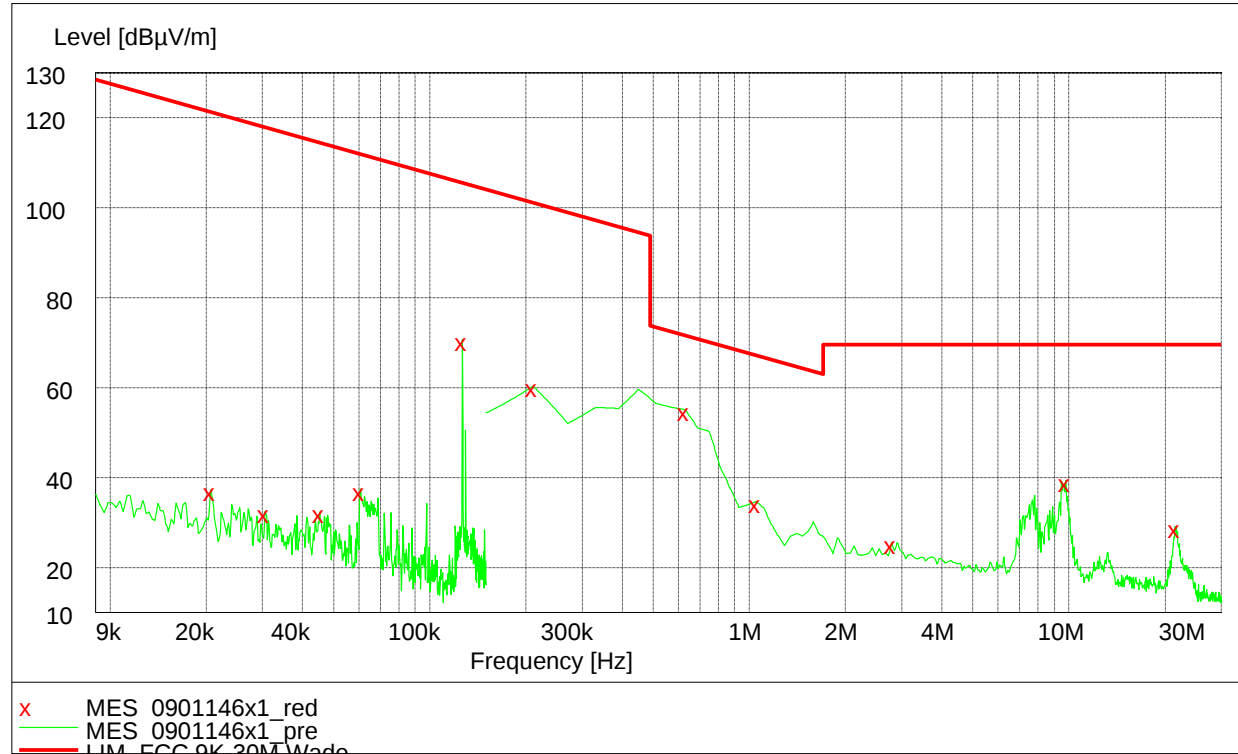
3.4 Test Results of Radiated Emissions

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.

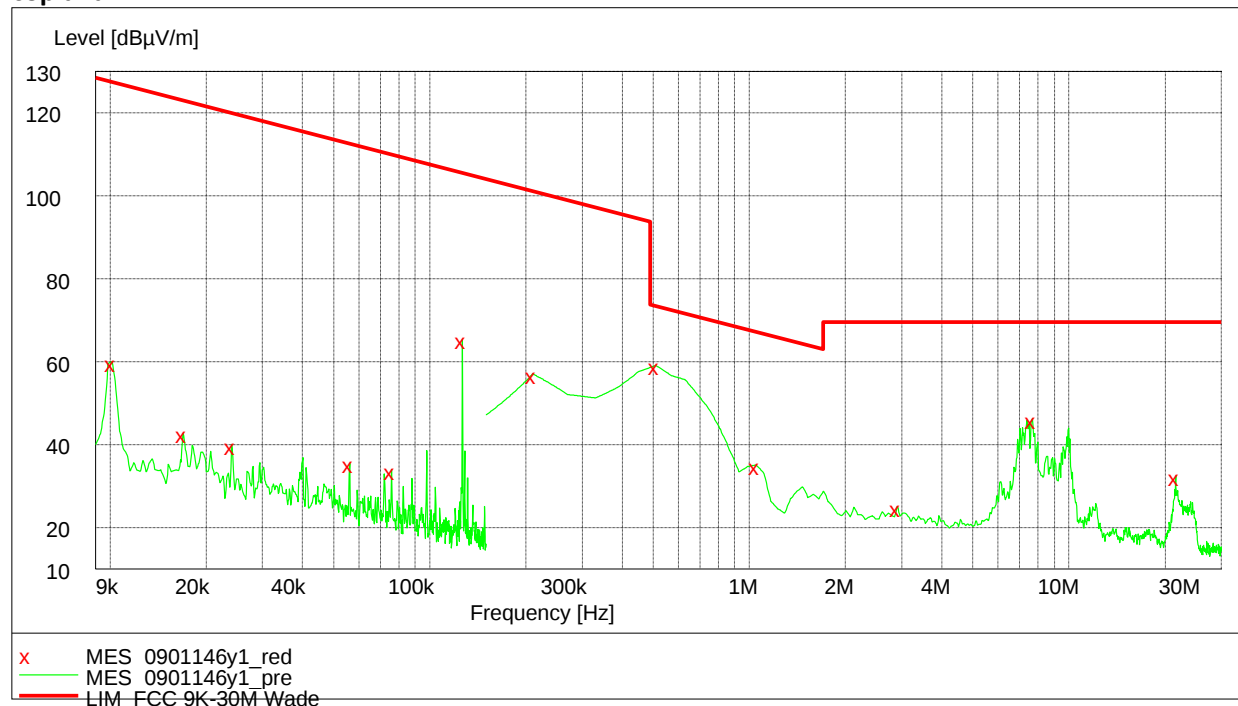
Power supply: 120V~, 60Hz

Test data below 30MHz:

coaxial



coplanar

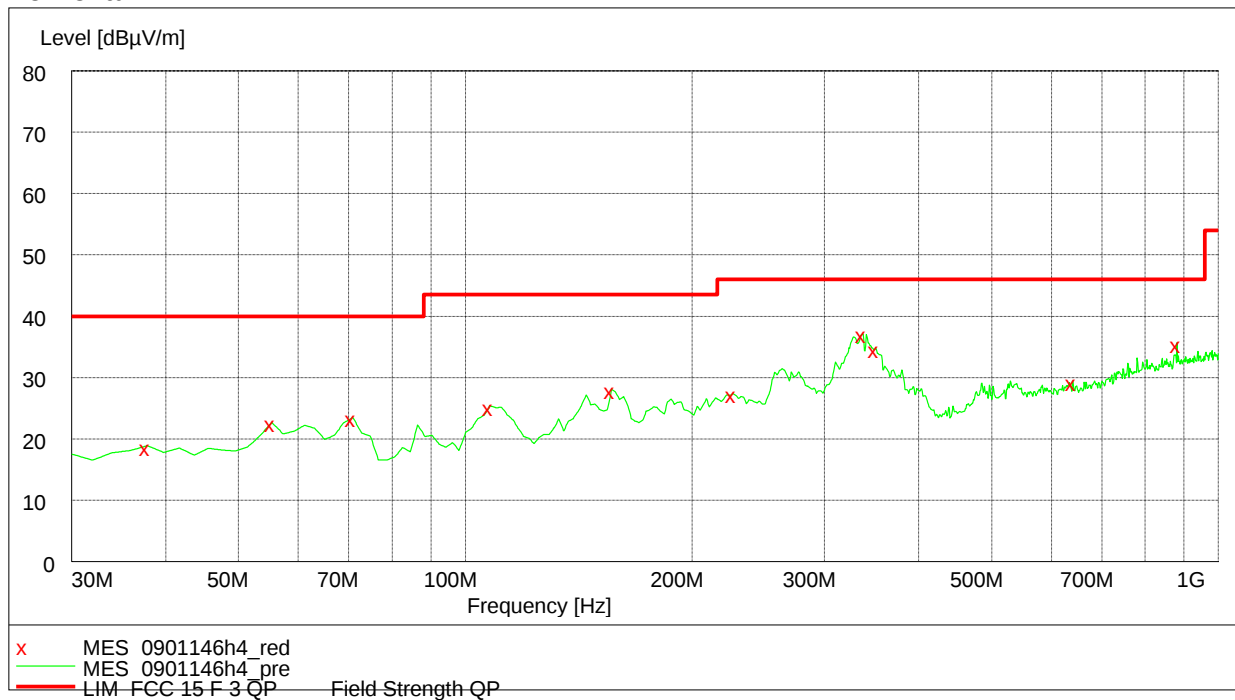


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Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector	Remark
coaxial	0.129640	70.70	20.20	105.60	34.90	PK	Fundamental
coaxial	0.209820	60.30	20.10	101.20	40.90	PK	Spurious
coaxial	0.628557	55.10	20.20	71.60	16.50	PK	Spurious
coaxial	1.047295	34.60	20.40	67.20	32.60	PK	Spurious
coaxial	9.780962	39.30	20.30	69.50	30.20	PK	Spurious
coplanar	0.129640	65.30	20.20	105.60	40.30	PK	Fundamental
coplanar	0.209820	57.00	20.10	101.20	44.20	PK	Spurious
coplanar	0.508918	59.10	20.20	73.50	14.40	PK	Spurious
coplanar	1.047295	35.10	20.40	67.20	32.10	PK	Spurious
coplanar	7.687275	46.20	20.30	69.50	23.30	PK	Spurious

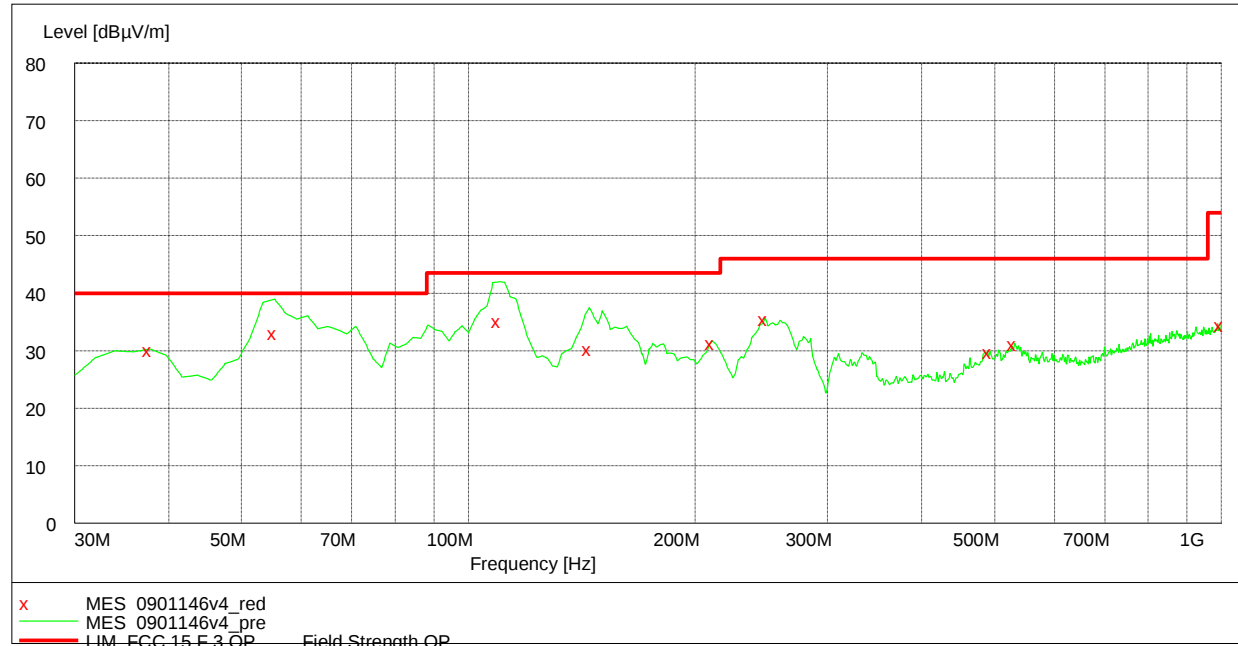
Test data from 30MHz to 1000MHz:

Horizontal



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Vertical



Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector
H	107.7555	25.40	10.60	43.50	18.10	PK
H	156.3527	28.10	14.90	43.50	15.40	PK
H	226.3327	27.40	12.50	46.00	18.60	PK
H	337.1343	37.20	16.10	46.00	8.80	PK
H	350.7415	34.80	16.40	46.00	11.20	PK
H	881.4228	35.70	26.10	46.00	10.30	PK
V	37.77555	30.30	13.60	40.00	9.70	PK
V	55.27054	33.24	14.30	40.00	6.76	QP
V	109.6994	35.41	10.70	43.50	8.09	QP
V	144.6894	30.48	14.50	43.50	13.02	QP
V	210.7816	31.60	11.80	43.50	11.90	PK
V	247.7154	35.70	13.40	46.00	10.30	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.

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4 Conducted emissions

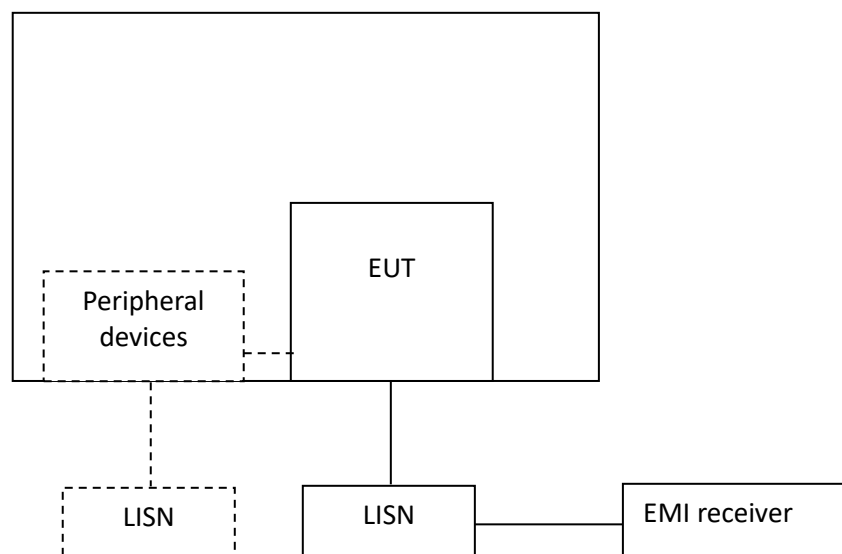
Test result: Pass

4.1 Limit

Frequency of Emission (MHz)	Conducted Emissions 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



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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.

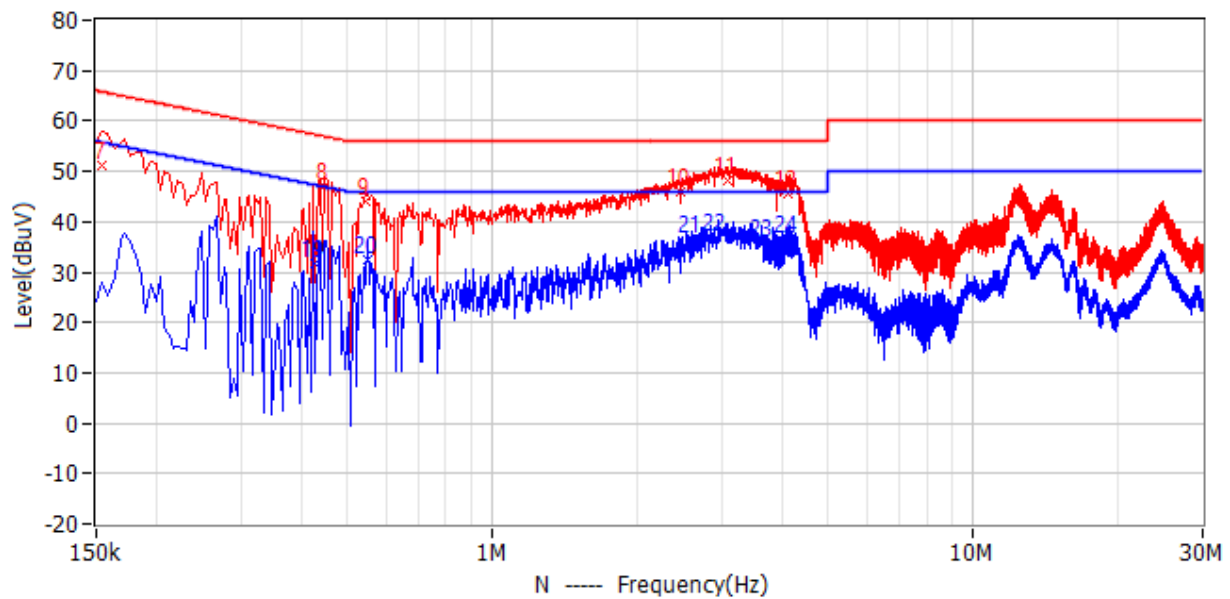
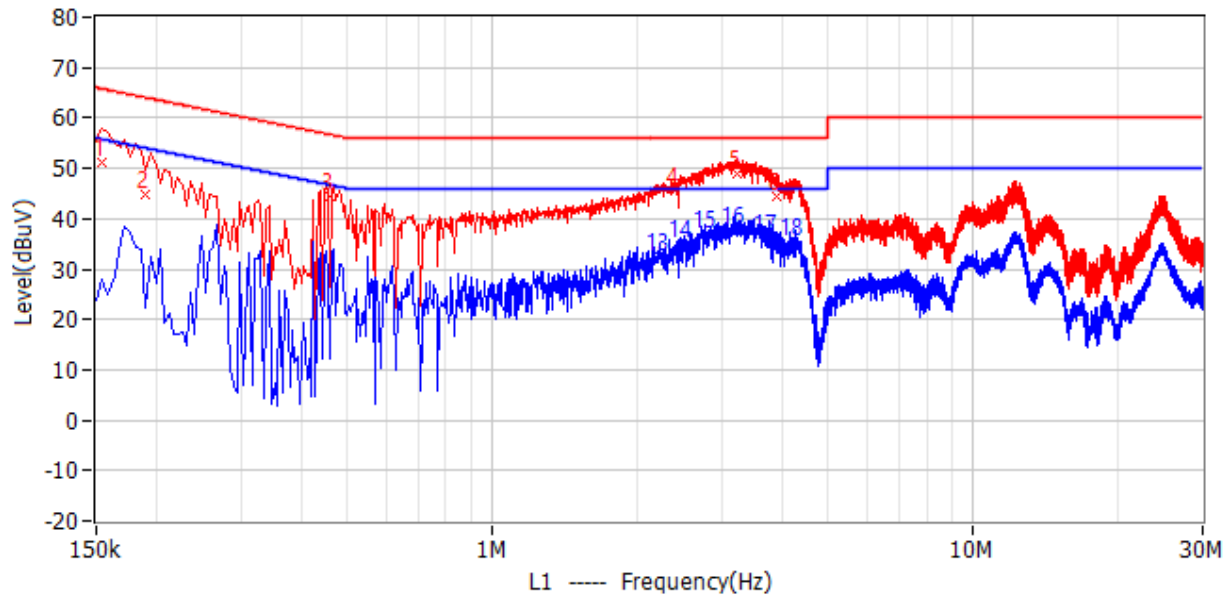
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on 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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4.4 Test Results of Conducted Emissions

Power supply: 120V~, 60Hz



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
1	154.500kHz	65.8	51.0	-14.8	44.8	6.2	QP	L1
2	190.500kHz	64.0	44.9	-19.2	38.6	6.3	QP	L1
3	460.500kHz	56.7	44.6	-12.1	38.4	6.2	QP	L1
4	2.400MHz	56.0	45.6	-10.4	39.3	6.3	QP	L1
5	3.219MHz	56.0	48.8	-7.2	42.5	6.3	QP	L1
6	3.903MHz	56.0	44.4	-11.6	38.0	6.4	QP	L1
7	154.500kHz	65.8	51.2	-14.6	44.9	6.3	QP	N
8	447.000kHz	56.9	47.0	-9.9	40.8	6.2	QP	N
9	546.000kHz	56.0	44.2	-11.8	38.0	6.2	QP	N
10	2.468MHz	56.0	46.0	-10.0	39.7	6.3	QP	N

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No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
11	3.089MHz	56.0	48.2	-7.8	41.9	6.3	QP	N
12	4.119MHz	56.0	45.7	-10.3	39.3	6.4	QP	N
13	2.238MHz	46.0	32.3	-13.7	26.0	6.3	CAV	L1
14	2.495MHz	46.0	34.9	-11.1	28.6	6.3	CAV	L1
15	2.787MHz	46.0	36.8	-9.2	30.5	6.3	CAV	L1
16	3.188MHz	46.0	37.7	-8.3	31.4	6.3	CAV	L1
17	3.737MHz	46.0	36.0	-10.0	29.7	6.3	CAV	L1
18	4.241MHz	46.0	35.3	-10.7	28.9	6.4	CAV	L1
19	429.000kHz	47.3	31.7	-15.6	25.5	6.2	CAV	N
20	550.500kHz	46.0	32.5	-13.5	26.3	6.2	CAV	N
21	2.607MHz	46.0	36.4	-9.6	30.1	6.3	CAV	N
22	2.922MHz	46.0	36.8	-9.2	30.5	6.3	CAV	N
23	3.678MHz	46.0	35.9	-10.1	29.6	6.3	CAV	N
24	4.110MHz	46.0	36.4	-9.6	30.0	6.4	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 Corrected Reading is lower than AV limit, the AV test can be elided.

***** END *****