

# IKEA of Sweden AB

# TEST REPORT

## SCOPE OF WORK:

FCC Part 15 subpart B – EMC report

### Model:

LED2028G2

### REPORT NUMBER

201200151SHA-001

### ISSUE DATE

January 20, 2021

### DOCUMENT CONTROL NUMBER

TTRFFCCPART15b\_V1

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**Applicant** : **IKEA of Sweden AB**  
**Box 702, SE-343 81 Älmhult, SWEDEN**

**Manufacturer** : **LEEDARSON LIGHTING CO.,LTD.**  
**Xingtai Industrial Park, Economic Development Zone of Changtai**  
**County, Zhangzhou City, Fujian Province, CHINA**

**FCC ID** : **FHO-LED2028G2**

**Summary**

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

**47CFR Part 15 (2019):** Radio Frequency Devices (Subpart B)

**ANSI C63.4 (2014):** American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

**PREPARED BY:**

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Project Engineer



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Reviewer

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### Revision History

| Report No.       | Version | Description             | Issued Date      |
|------------------|---------|-------------------------|------------------|
| 201200151SHA-001 | Rev. 01 | Initial issue of report | January 20, 2021 |
|                  |         |                         |                  |
|                  |         |                         |                  |

## Measurement result summary

| TEST ITEM          | FCC REFERANCE | TEST RESULT | NOTE |
|--------------------|---------------|-------------|------|
| Conducted emission | 15.107        | Pass        |      |
| Radiation emission | 15.109        | 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 : Self-ballasted LED lamps  
Type/Model : LED2028G2  
Description of EUT : We tested it, and listed the worst data.  
Rating : 120V~, 60Hz, 2.2W, 38mA, E26  
Brand name : IKEA  
Category of EUT : Class B  
EUT type :  Table top  
 Floor standing  
Sample received date : December 11, 2020  
Sample identification No. : 0201211-12  
Date of test : December 11-27, 2020

**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 : CNAS Accreditation Lab  
recognized, certified, Registration No. CNAS L0139  
or accredited by these FCC Accredited Lab  
organizations 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 (2019):** Radio Frequency Device: Subpart B

**ANSI C63.4 (2014):** Interim Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz.

### 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. | Name | Band and Model | Description |
|----------|------|----------------|-------------|
|          |      |                |             |
|          |      |                |             |

### 2.5 Record of climatic conditions

| Test Item          | Temperature (°C) | Relative Humidity (%) | Pressure (Kpa) |
|--------------------|------------------|-----------------------|----------------|
| Conducted emission | 24               | 42                    | 101            |
| Radiated Emission  | 24               | 42                    | 101            |

Notes: NA =Not Applicable



## 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      | 2021-07-8  |
| <input checked="" type="checkbox"/>                                 | A.M.N.                | R&S               | ESH2-Z5         | EC 3119      | 2021-11-10 |
| <input checked="" type="checkbox"/>                                 | Shielded room         | Zhongyu           | -               | EC 2838      | 2022-01-12 |
| Radiated Emission   |                       |                   |                 |              |            |
| Used  | Equipment             | Manufacturer      | Type            | Internal no. | Due date   |
| <input checked="" type="checkbox"/>                                 | Test Receiver         | R&S               | ESIB 26         | EC 3045      | 2021-09-16 |
| <input checked="" type="checkbox"/>                                 | Bilog Antenna         | TESEQ             | CBL 6112D       | EC 4206      | 2021-9-25  |
| <input checked="" type="checkbox"/>                                 | Semi-anechoic chamber | Albatross project | -               | EC 3048      | 2021-07-14 |
| Additional instrument   |                       |                   |                 |              |            |
| Used  | Equipment             | Manufacturer      | Type            | Internal no. | Due date   |
| <input checked="" type="checkbox"/>                                 | Therom-Hygrograph     | ZJ1-2A            | S.M.I.F.        | EC 3783      | 2021-03-3  |
| <input checked="" type="checkbox"/>                                 | Therom-Hygrograph     | ZJ1-2A            | S.M.I.F.        | EC 3481      | 2022-01-05 |
| <input checked="" type="checkbox"/>                                 | Pressure meter        | YM3               | Shanghai Mengde | EC 4620      | 2021-09-9  |

## 2.7 Measurement Uncertainty

| Measurement                       | Frequency      | Expanded Uncertainty (k=2) (±) |
|-----------------------------------|----------------|--------------------------------|
| Conducted emission at mains ports | 9kHz ~ 150kHz  | 3.71 dB                        |
|                                   | 150kHz ~ 30MHz | 3.31 dB                        |
| Radiated Emissions up to 1 GHz    | 30MHz ~ 1GHz   | 5.04 dB                        |
| Radiated Emissions above 1 GHz    | 1GHz ~ 6GHz    | 4.97 dB                        |
|                                   | 6GHz ~ 18GHz   | 5.29 dB                        |

### 3 Conducted emission

Test result: **PASS**

#### 3.1 Limits

##### 3.1.1 Limits for conducted emission of class A device

| Frequency range<br>(MHz) | Limits dB( $\mu$ V) |         |
|--------------------------|---------------------|---------|
|                          | 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.

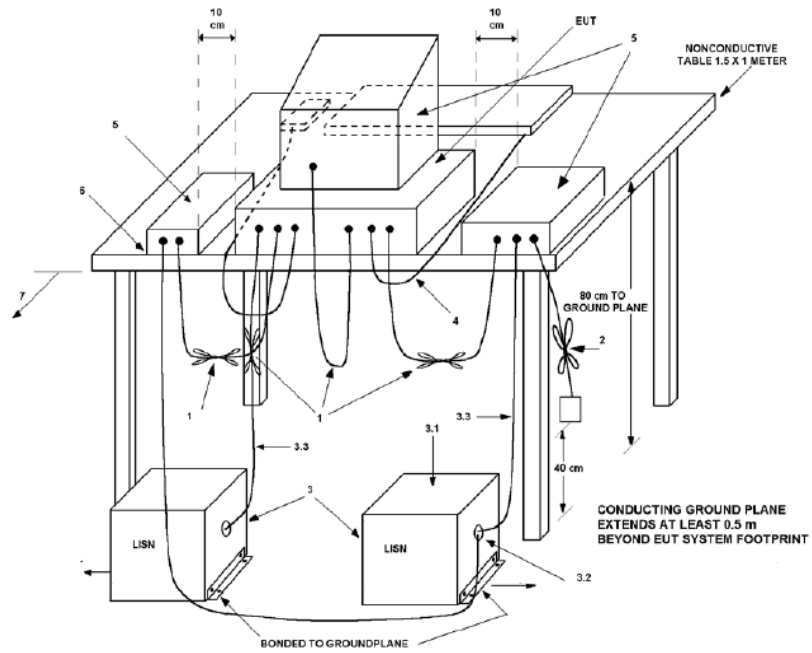
##### 3.1.2 Limits for conducted emission of class B device

| Frequency range<br>(MHz) | Limits dB( $\mu$ V) |           |
|--------------------------|---------------------|-----------|
|                          | Quasi-peak          | Average   |
| 0.15 ~ 0.5               | 66 ~ 56 *           | 56 ~ 46 * |
| 0.5 ~ 5                  | 56                  | 46        |
| 5 ~ 30                   | 60                  | 50        |

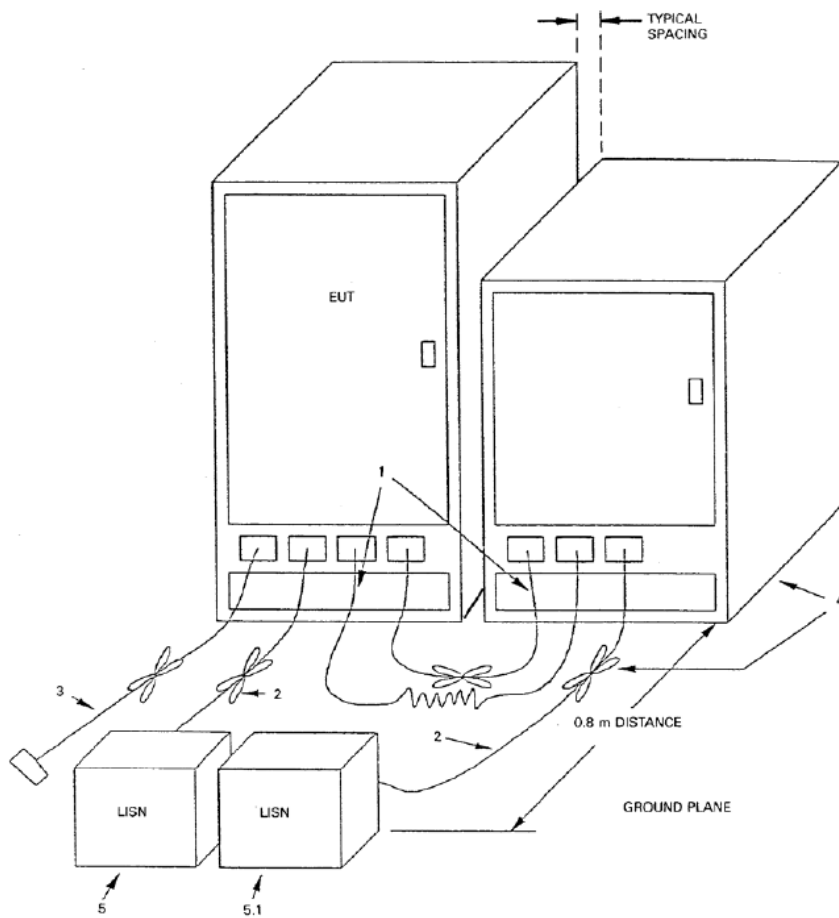
Note: 1. \* Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz  
 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and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

**3.2 Test setup**

For table top equipment



For floor standing equipment



### **3.3 Test Setup and Test Procedure**

Measurement was performed in shielded room, and instruments used were following clause 4 and clause 5 of ANSI 63.4.

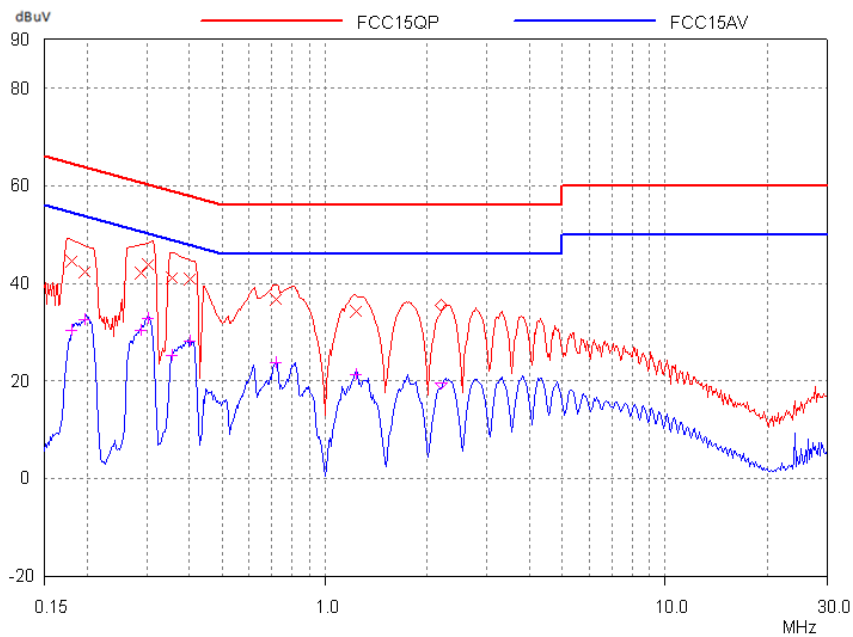
Detailed test procedure was following clause 7.3 of ANSI 63.4.

EUT arrangement and operation conditions were according to clause 6 and clause 7 of ANSI 63.4.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

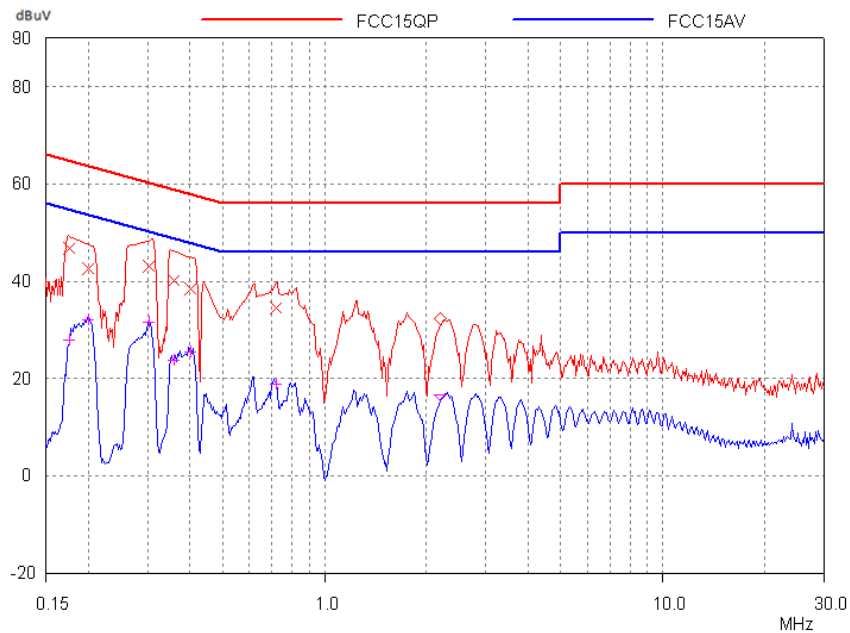
**3.4 Test Protocol**

L line:



**Test Data:**

| Frequency (MHz) | Quasi-peak   |              |             | Average      |              |             |
|-----------------|--------------|--------------|-------------|--------------|--------------|-------------|
|                 | level dB(µV) | Limit dB(µV) | Margin (dB) | level dB(µV) | limit dB(µV) | Margin (dB) |
| 0.17            | 44.48        | 64.51        | 20.03       | 30.44        | 54.51        | 24.07       |
| 0.19            | 42.33        | 63.71        | 21.38       | 32.67        | 53.71        | 21.04       |
| 0.28            | 42.08        | 60.60        | 18.52       | 30.34        | 50.60        | 20.26       |
| 0.30            | 43.81        | 60.16        | 16.35       | 32.74        | 50.16        | 17.42       |
| 0.35            | 41.06        | 58.80        | 17.74       | 25.17        | 48.80        | 23.63       |
| 0.40            | 40.92        | 57.84        | 16.92       | 28.07        | 47.84        | 19.77       |
| 0.71            | 36.73        | 56.00        | 19.27       | 23.81        | 46.00        | 22.19       |
| 1.23            | 34.24        | 56.00        | 21.76       | 21.24        | 46.00        | 24.76       |



**Test Data:**

| Frequency (MHz) | Quasi-peak   |              |             | Average      |              |             |
|-----------------|--------------|--------------|-------------|--------------|--------------|-------------|
|                 | level dB(μV) | Limit dB(μV) | Margin (dB) | level dB(μV) | limit dB(μV) | Margin (dB) |
| 0.17            | 46.72        | 64.71        | 17.99       | 27.82        | 54.71        | 26.89       |
| 0.20            | 42.53        | 63.61        | 21.08       | 32.17        | 53.61        | 21.44       |
| 0.30            | 43.03        | 60.16        | 17.13       | 31.46        | 50.16        | 18.70       |
| 0.35            | 40.07        | 58.77        | 18.70       | 23.72        | 48.77        | 25.05       |
| 0.40            | 38.39        | 57.84        | 19.45       | 25.53        | 47.84        | 22.31       |
| 0.72            | 34.54        | 56.00        | 21.46       | 18.90        | 46.00        | 27.10       |

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.

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

## 4 Radiated emission

Test result: **PASS**

### 4.1 Radiated emission limits

#### 4.1.1 Limits for radiated emission of class A device

| Frequency (MHz) | Permitted limit in dB $\mu$ V/m<br>(Quasi-peak)<br>of Measurement Distance 10m |
|-----------------|--|
| 30 ~ 88         | 39   |
| 88 ~ 216        | 43.5   |
| 216 ~ 960       | 46.4   |
| Above 960       | 49.5   |

Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

#### 4.1.2 Limits for radiated emission of class B device

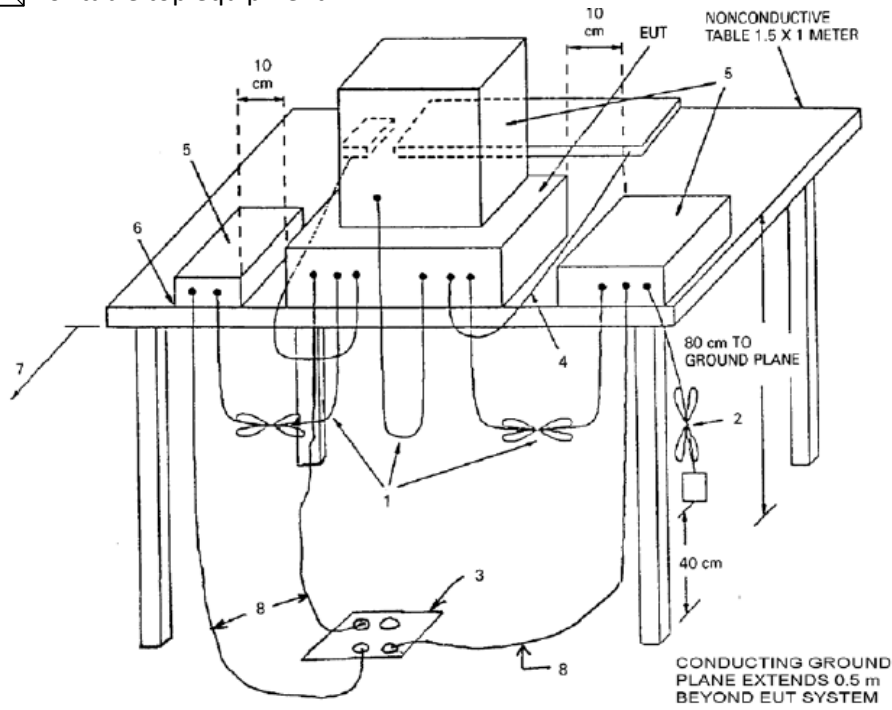
| Frequency (MHz) | Permitted limit in dB $\mu$ V/m<br>(Quasi-peak)<br>of Measurement Distance 3m |
|-----------------|---|
| 30 ~ 88         | 40.0  |
| 88 ~ 216        | 43.5  |
| 216 ~ 960       | 46.0  |
| Above 960       | 54.0  |

Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

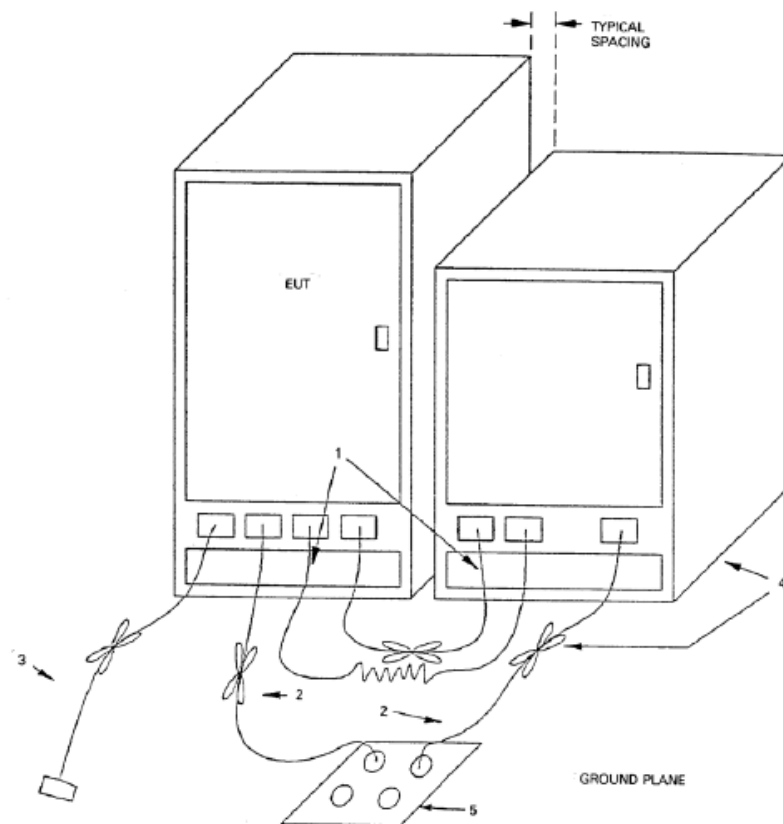


**4.2 Block diagram and test set up**

For table top equipment



For floor standing equipment



### **4.3 Test Setup and Test Procedure**

The measurement was performed in a semi-anechoic chamber.

The distance from EUT to receiving antenna is 3 meter.

Measurement was performed according to clause 4 and clause 5 of ANSI 63.4.

Test procedure was according to clause 8.3 of ANSI 63.4.

EUT arrangement and operate condition were according to clause 6 and clause 8 of ANSI 63.4.

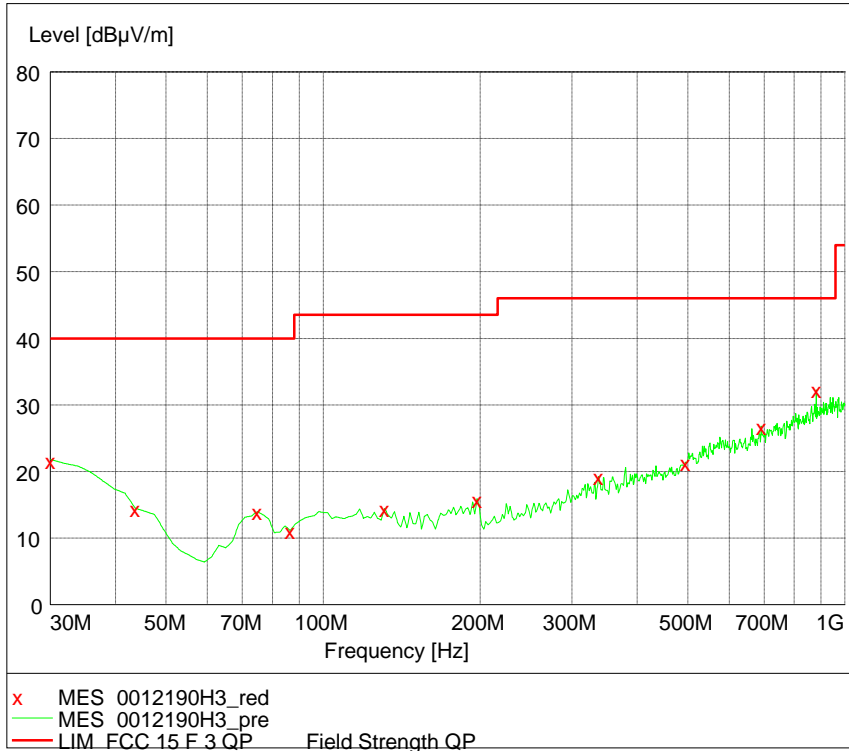
The bandwidth setting on R&S Test Receiver was 120 kHz.

The required measurement frequency range was checked.

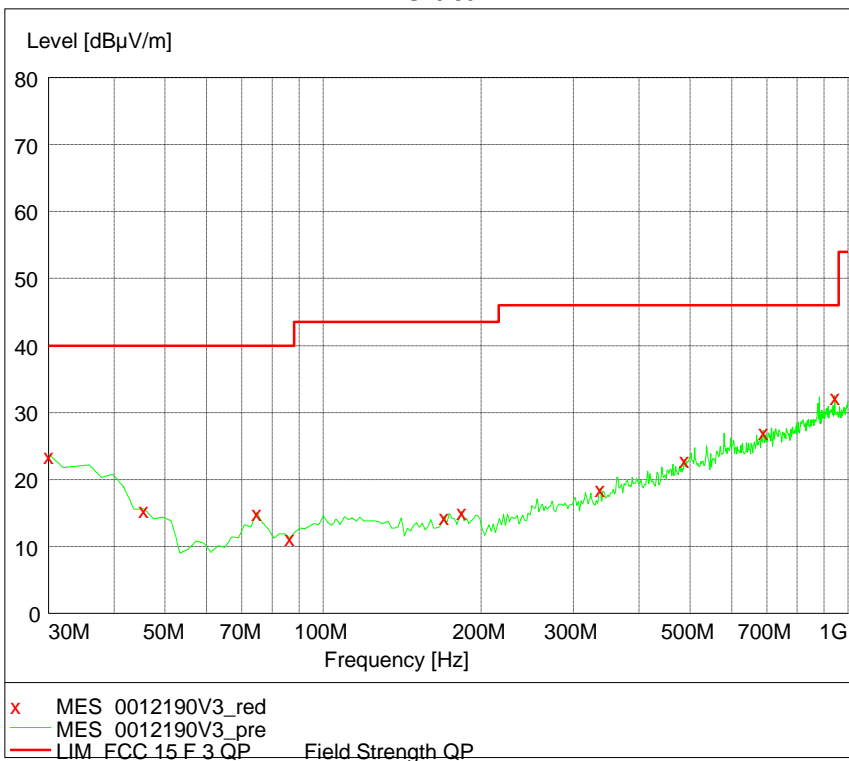
**4.4 Test Protocol**

**Test Curve:**

**Horizontal**



**Vertical**



**Test data 30MHz~1GHz:**

| Polarization | Frequency (MHz) | Measured level (dB $\mu$ V/m) | Factor (dB/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Detector |
|--------------|-----------------|-------------------------------|---------------|-----------------------|-------------|----------|
| H            | 30.00           | 21.8                          | 21.3          | 40.0                  | 18.2        | PK       |
|              | 43.60           | 14.5                          | 13.9          | 40.0                  | 25.5        | PK       |
|              | 74.70           | 14.0                          | 9.5           | 40.0                  | 26.0        | PK       |
|              | 86.37           | 11.1                          | 10.1          | 40.0                  | 28.9        | PK       |
|              | 131.08          | 14.4                          | 11.4          | 43.5                  | 29.1        | PK       |
|              | 197.17          | 15.9                          | 11.2          | 43.5                  | 27.6        | PK       |
|              | 337.13          | 19.3                          | 15.7          | 46.0                  | 26.7        | PK       |
|              | 494.58          | 21.4                          | 19.5          | 46.0                  | 24.6        | PK       |
|              | 690.92          | 26.8                          | 22.2          | 46.0                  | 19.2        | PK       |
|              | 881.42          | 32.3                          | 24.7          | 46.0                  | 13.7        | PK       |
| V            | 30.00           | 23.7                          | 21.3          | 40.0                  | 16.3        | PK       |
|              | 45.55           | 15.6                          | 12.5          | 40.0                  | 24.4        | PK       |
|              | 74.70           | 15.1                          | 9.5           | 40.0                  | 24.9        | PK       |
|              | 86.37           | 11.3                          | 10.1          | 40.0                  | 28.7        | PK       |
|              | 169.95          | 14.5                          | 10.2          | 43.5                  | 29.0        | PK       |
|              | 183.56          | 15.2                          | 10.9          | 43.5                  | 28.3        | PK       |
|              | 337.13          | 18.7                          | 15.7          | 46.0                  | 27.3        | PK       |
|              | 486.81          | 23.0                          | 19.0          | 46.0                  | 23.0        | PK       |
|              | 688.97          | 27.3                          | 22.2          | 46.0                  | 18.7        | PK       |

Note: \* means the emission level is 20dB or more lower than the relevant limit.

- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz)  
 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.

**\*\*\*END of the report\*\*\***