



# CE EMC TEST REPORT

**Product** : mSATA SSD  
**Model Name** : SV240-300  
**Series Model** : SX240-300 (X=A~Z)  
**Applicant** : APACER TECHNOLOGY INC  
1F., No.32, Zhongcheng Rd., Tucheng Dist.,  
New Taipei City 236, Taiwan  
**Manufacturer** : APACER TECHNOLOGY INC  
1F., No.32, Zhongcheng Rd., Tucheng Dist.,  
New Taipei City 236, Taiwan  
**Standard** : EN 55032:2015/AC:2016 Class B  
EN 61000-3-2:2014  
EN 61000-3-3:2013  
EN 55035:2017  
CISPR32:2015

The product was received on Mar. 31, 2020, and testing was started from Mar. 31, 2020 and completed on May 07, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in above standards and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: William Li

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**  
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



## Table of Contents

|   |           |
|---|-----------|
| <b>History of this test report</b> .....                    | <b>3</b>  |
| <b>Summary of Test Result</b> .....                         | <b>4</b>  |
| <b>1. General Description of Equipment under Test</b> ..... | <b>6</b>  |
| 1.1. Basic Description of Equipment under Test.....         | 6         |
| 1.2. Feature of Equipment under Test.....                   | 6         |
| 1.3. Table for Multiple Listing.....                        | 6         |
| <b>2. Test Configuration of Equipment under Test</b> .....  | <b>7</b>  |
| 2.1. Details of EUT Test Modes.....                         | 7         |
| 2.2. Description of Test System.....                        | 7         |
| 2.3. Connection Diagram of Test System.....                 | 9         |
| 2.4. Test Manner.....                                       | 11        |
| <b>3. General Information of Test</b> .....                 | <b>12</b> |
| 3.1. Test Facilities.....                                   | 12        |
| 3.2. Test Standards.....                                    | 13        |
| 3.3. Test Voltage/Frequencies.....                          | 13        |
| 3.4. Test Distance and Frequency Range Investigated.....    | 13        |
| 3.5. Operating Condition.....                               | 13        |
| <b>4. Emissions Measurement</b> .....                       | <b>14</b> |
| 4.1. Conducted Emissions at Powerline.....                  | 14        |
| 4.2. Radiated Emission below 1GHz.....                      | 18        |
| 4.3. Radiated Emission above 1GHz.....                      | 24        |
| 4.4. Harmonic Current Emissions Measurement.....            | 29        |
| 4.5. Voltage Fluctuations and Flicker Measurement.....      | 31        |
| <b>5. Immunity Measurement</b> .....                        | <b>33</b> |
| 5.1. General performance criteria.....                      | 33        |
| 5.2. Electrostatic Discharge (ESD).....                     | 34        |
| 5.3. Radio Frequency Electromagnetic Field (RS).....        | 39        |
| 5.4. Power Frequency Magnetic Field (PFMF).....             | 42        |
| <b>6. Uncertainty of Test Site</b> .....                    | <b>44</b> |
| 6.1. Emission Test Measurement Uncertainty.....             | 44        |
| 6.2. Immunity Test Measurement Uncertainty.....             | 45        |
| <b>7. List of Measuring Equipment Used</b> .....            | <b>47</b> |
| <b>Appendix A. Test Photos</b>                              |           |
| <b>Photographs of EUT v01</b>                               |           |





### Summary of Test Result

| Report Clause  | Ref Std. Clause | Test Standard                 | Test Items                                     | Result (PASS/FAIL) | Remark                            |
|--|-----------------|-------------------------------|--|--------------------|-----------------------------------|
| <b>Emission Tests and Conformance Test Specifications</b>  |                 |                               |  |                    |                                   |
| 4.1  | A.3             | EN 55032:2015/AC:2016 Class B | Conducted Emission                             | PASS               | Under limit 17.60 dB at 0.19 MHz  |
| -  | A.3             |                               | Conducted Emissions of telecommunication Ports | Not Applicable     | Note 1                            |
| 4.2  | A.2             |                               | Radiated Emissions below 1GHz                  | PASS               | Under limit 5.98 dB at 66.800 MHz |
| 4.3  | A.2             |                               | Radiated Emissions above 1GHz                  | PASS               | Under limit 19.19 dB at 1.195 GHz |
| 4.4  | 6.2             | EN 61000-3-2:2014             | Harmonic Current Emissions                     | PASS               | Note 2                            |
| 4.5  | 6.1             | EN 61000-3-3:2013             | Voltage Fluctuations and Flicker               | PASS               | -                                 |
| Note 1: This EUT without telecommunication ports, it's not necessary to apply to Telecom Port Conducted emission test.<br>Note 2: The power consumption of EUT is lower than 75W, so the limit is not specified in IEC 61000-3-2:2014. |                 |                               |  |                    |                                   |

| Report Clause  | Ref Std. Clause | Test Standard                      | Test Items                           | Result (PASS/FAIL) | Remark |
|--|-----------------|------------------------------------|--------------------------------------|--------------------|--------|
| <b>Immunity Tests and Conformance Test Specifications - EN 55035:2017</b>  |                 |                                    |                                      |                    |        |
| 5.2  | 4.2.1           | IEC 61000-4-2 Edition 2.0 2008-12  | ESD                                  | PASS               | -      |
| 5.3  | 4.2.2.2         | IEC 61000-4-3 Edition 3.2 2010-04  | RS                                   | PASS               | -      |
| -  | 4.2.4           | IEC 61000-4-4 Edition 3.0 2012-04  | EFT/B - Power Port                   | Not Applicable     | Note 1 |
|  | 4.2.4           | IEC 61000-4-4 Edition 3.0 2012-04  | EFT/B - Analogue/digital data ports  | Not Applicable     | Note 2 |
| -  | 4.2.5           | IEC 61000-4-5 Edition 3.1 2017-08  | Surges - Power Port                  | Not Applicable     | Note 1 |
|  | 4.2.5           | IEC 61000-4-5 Edition 3.1 2017-08  | Surges - Analogue/digital data ports | Not Applicable     | Note 2 |
| -  | 4.2.2.3         | IEC 61000-4-6 Edition 4.0 2013-10  | CS - Power Port                      | Not Applicable     | Note 1 |
|  | 4.2.2.3         | IEC 61000-4-6 Edition 4.0 2013-10  | CS - Analogue/digital data ports     | Not Applicable     | Note 2 |
| 5.4  | 4.2.3           | IEC 61000-4-8 Edition 2.0 2009-09  | Power Frequency Magnetic Fields      | PASS               | -      |
| -  | 4.2.6           | IEC 61000-4-11 Edition 2.1 2017-05 | Voltage dips                         | Not Applicable     | Note 1 |
|  | 4.2.6           | IEC 61000-4-11 Edition 2.1 2017-05 | Voltage interruptions                | Not Applicable     | Note 1 |
| Note 1: According to the EUT specification, it does not apply to the test requirements of Table 4 of the standard.<br>Note 2: This EUT without signal ports and telecommunication ports. |                 |                                    |                                      |                    |        |



**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and explanations:**

None

**Reviewed by: Mark Ma**

**Report Producer: Michelle Tsai**



## 1. General Description of Equipment under Test

### 1.1. Basic Description of Equipment under Test

Product : mSATA SSD  
Model Name : SV240-300  
Series Model : SX240-300 (X=A~Z)  
Power Supply Type : From Host System  
The maximum operating frequency : 350MHz

### 1.2. Feature of Equipment under Test

For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

### 1.3. Table for Multiple Listing

| Series Model      | Description                                     |
|-------------------|---|
| SX240-300 (X=A~Z) | The difference of models is in sales marketing. |

Note: The information from manufacturer.



## 2. Test Configuration of Equipment under Test

### 2.1. Details of EUT Test Modes

From the above models, Model: SV240-300 was selected as representative model for the test and its data was recorded in this report. The equipment under test was performed the following test modes:

| Test Items                      | Description of test modes |
|---------------------------------|---------------------------|
| Conducted Emission              | Mode 1. DATA COPY         |
| Radiated Emissions <below 1GHz> | Mode 1. DATA COPY         |
| Radiated Emissions <above 1GHz> | Mode 1. DATA COPY         |

| Test Items                     | Description of test modes |
|--------------------------------|---------------------------|
| Harmonic and Flicker Emissions | Mode 1. DATA COPY         |
| EMS                            | Mode 1. DATA COPY         |

### 2.2. Description of Test System

#### Conducted emission and radiated emission below 1GHz

| No.       | Peripheral        | Manufacturer | Model Number | FCC ID | Remarks |
|-----------|-------------------|--------------|--------------|--------|---------|
| For Local |                   |              |              |        |         |
| A         | Personal Computer | ASUS         | M32CD        | DoC    | -       |
| B         | LCD Monitor       | ASUS         | VS197DE      | DoC    | -       |
| C         | Keyboard          | ASUS         | AW211        | DoC    | -       |
| D         | Mouse             | ASUS         | MOBTUO       | DoC    | -       |
| E         | Printer           | Fuji Xerox   | Phaser 3121  | DoC    | -       |
| F         | iPod Nano         | Apple        | A1137        | DoC    | -       |

#### Radiated emission above 1GHz

| No.       | Peripheral        | Manufacturer | Model Number | FCC ID | Remarks |
|-----------|-------------------|--------------|--------------|--------|---------|
| For Local |                   |              |              |        |         |
| A         | Personal Computer | ASUS         | M32CD        | DoC    | -       |
| B         | LCD Monitor       | DELL         | U2410f       | DoC    | -       |
| C         | Keyboard          | Microsoft    | 1366         | DoC    | -       |
| D         | Mouse             | Microsoft    | 1113         | DoC    | -       |
| E         | Printer           | EPSON        | C61          | N/A    | -       |
| F         | iPod Nano         | Apple        | A1137        | DoC    | -       |



**Harmonic and Flicker Emissions, RS and Power Frequency Magnetic Fields**

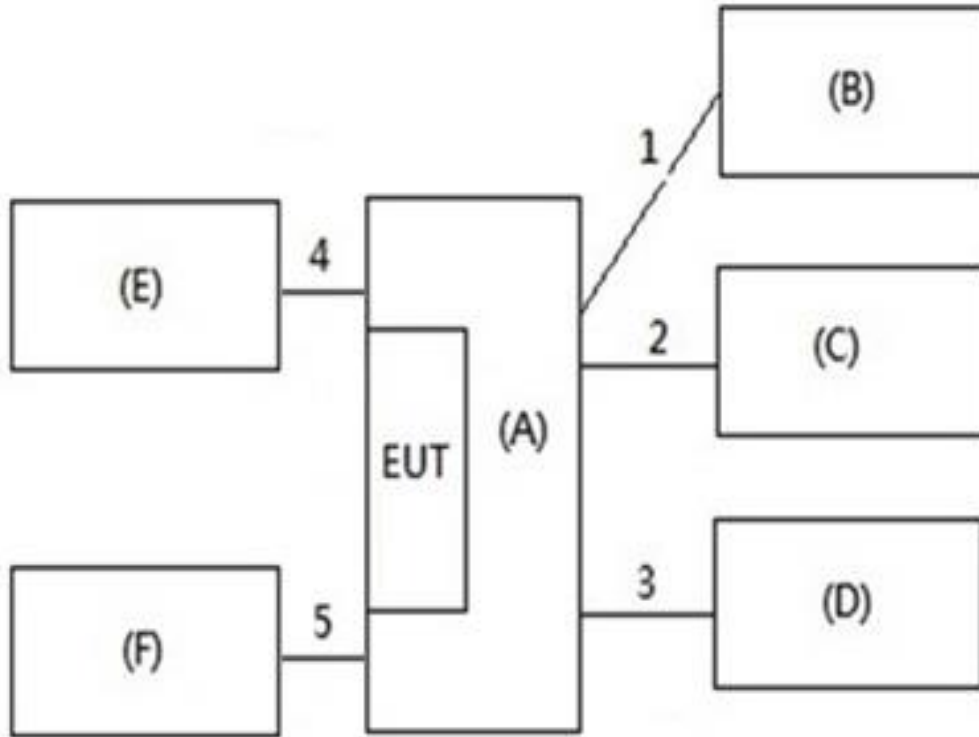
| No.              | Peripheral        | Manufacturer | Model Number | Sing Cable  | Cable Type    | Length (m) | Remarks |
|------------------|-------------------|--------------|--------------|-------------|---------------|------------|---------|
| <b>For Local</b> |                   |              |              |             |               |            |         |
| A                | Personal Computer | ASUS         | M32CD        | -           | -             | -          | -       |
| B                | LCD Monitor       | ViewSonic    | VS15032      | D-SUB cable | D-Shielded    | 1.8        | -       |
| C                | Keyboard          | Microsoft    | 1576         | USB cable   | AL-F-Shielded | 2.0        | -       |
| D                | Mouse             | Microsoft    | MSK-1113     | USB cable   | AL-F-Shielded | 1.8        | -       |

**ESD**

| No.              | Peripheral        | Manufacturer | Model Number | Sing Cable | Cable Type    | Length (m) | Remarks |
|------------------|-------------------|--------------|--------------|------------|---------------|------------|---------|
| <b>For Local</b> |                   |              |              |            |               |            |         |
| A                | Personal Computer | ASUS         | M32CD        | -          | -             | -          | -       |
| B                | LCD Monitor       | DELL         | U2410f       | HDMI cable | D-Shielded    | 1.8        | -       |
| C                | Keyboard          | ASUS         | AW211        | USB cable  | AL-F-Shielded | 1.8        | -       |
| D                | Mouse             | ASUS         | MOBTUO       | USB cable  | AL-F-Shielded | 1.8        | -       |

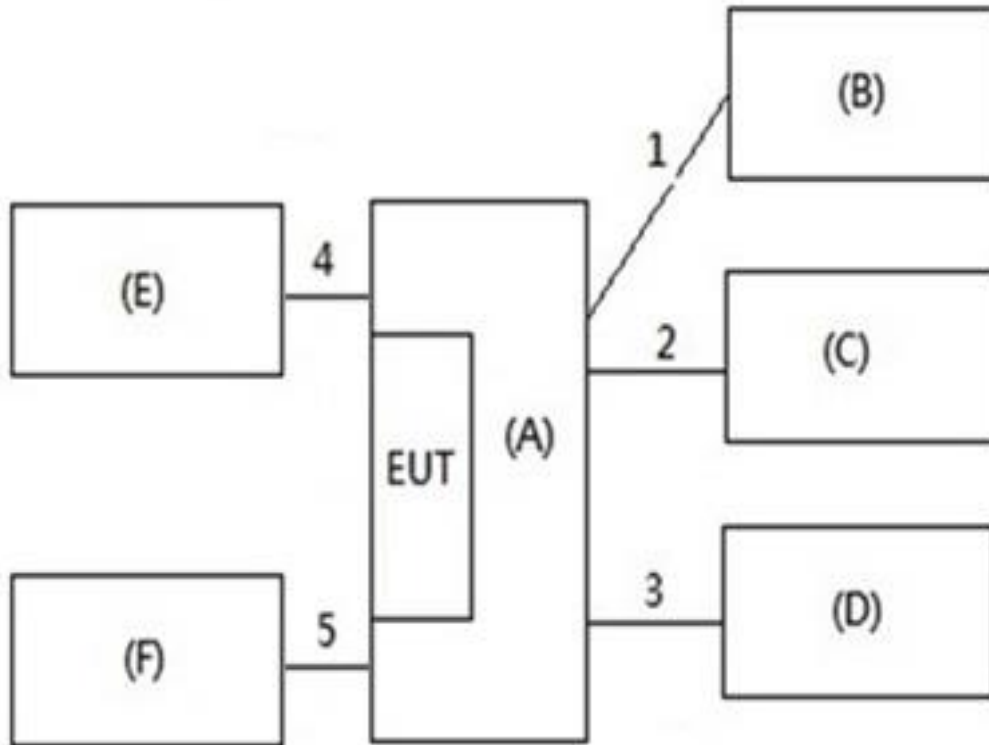
**2.3. Connection Diagram of Test System**

**Test Setup Diagram - Conducted emission and radiated emission below 1GHz**



| No. | Types of Cables | Shielding on Cable | Length (m) | Remarks |
|-----|-----------------|--------------------|------------|---------|
| 1   | D-SUB Cable     | D-Shielded         | 1.8        | -       |
| 2   | USB Cable       | AL-F-Shielded      | 1.5        | -       |
| 3   | USB Cable       | AL-F-Shielded      | 1.5        | -       |
| 4   | USB Cable       | D-Shielded         | 1.8        | -       |
| 5   | USB Cable       | D-Shielded         | 1.0        | -       |

**Test Setup Diagram - Radiated emission above 1GHz**



| No. | Types of Cables | Shielding on Cable | Length (m) | Remarks |
|-----|-----------------|--------------------|------------|---------|
| 1   | D-SUB Cable     | D-Shielded         | 1.8        | -       |
| 2   | USB Cable       | AL-F-Shielded      | 2.0        | -       |
| 3   | USB Cable       | AL-F-Shielded      | 1.8        | -       |
| 4   | USB Cable       | D-Shielded         | 1.8        | -       |
| 5   | USB Cable       | D-Shielded         | 1.0        | -       |



## **2.4. Test Manner**

An executive program, "BurnInTest" under WIN 10 was used as the test software. The program was executed as follows:

- Turn on the power of all equipment.
- The PC reads the test program from the hard disk drive and runs it.
- The PC executed "MCLB\_MPEG4" to keep displaying the Standard television color bar signal (ITU-R BT.471-1).
- The PC executed "BurnInTest" to read and write data from iPod Nano and EUT.
- The PC open "Word" to sends "H" messages to the printer, then the printer prints them on the paper.

## **EMS**

An executive program, "BurnInTest" under WIN 10 was used as the test software. The program was executed as follows:

- Turn on the power of all equipment.
- The PC executed "BurnInTest" to read and write data from EUT.

**3. General Information of Test****3.1. Test Facilities**

| <b>Test Site : SPORTON INTERNATIONAL INC.</b> |          |  |
|---|----------|--|
| <input checked="" type="checkbox"/>           | HUA YA   | ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)<br>TEL : 886-3-327-3456 FAX : 886-3-318-0055               |
| <input checked="" type="checkbox"/>           | DONG HU  | ADD : No. 3, Ln. 238, Kangle St., Neihu Dist., Taipei City, Taiwan (R.O.C.)<br>TEL : 886-2-2631-5551 FAX : 886-2-2631-9740           |
| <input type="checkbox"/>                      | LIN KOU  | ADD : No. 30-2, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan (R.O.C.)<br>TEL : 886-2-2601-1640 FAX : 886-2-2601-1695           |
| <input checked="" type="checkbox"/>           | His Chih | ADD : 6F, No.106, Sec. 1, Hsin Tai Wu Rd., His Chih, New Taipei City, Taiwan (R.O.C.)<br>TEL : 886-2-2696-2468 FAX : 886-2-2696-2255 |

| Test Items                       | Test Site No. | Test Engineer | Test Environment |            |              | Test Date   | Remark |
|----------------------------------|---------------|---------------|------------------|------------|--------------|-------------|--------|
|                                  |               |               | temp °C          | humidity % | pressure kPa |             |        |
| Powerline Conducted Emissions    | CO01-NH       | Willy Lee     | 23.4~23.7        | 52.3~52.5  | -            | 06/Apr/2020 | -      |
| Radiated Emissions (below 1GHz)  | OS03-NH       | Louis Lin     | 20.1~20.2        | 55.2~55.4  | -            | 06/Apr/2020 | -      |
| Radiated Emissions (above 1GHz)  | 03CH04-HY     | Alan Chen     | 23.6~23.7        | 61~62      | -            | 09/Apr/2020 | -      |
| Harmonic Current Emissions       | EX01-HY       | Easton        | 25.1~25.3        | 50.1~50.3  | 100.1        | 05/May/2020 |        |
| Voltage Fluctuations and Flicker | EX01-HY       | Easton        | 25.1~25.3        | 50.1~50.3  | 100.1        | 28/Apr/2020 |        |
| ESD                              | ES01-HC       | Keven         | 26.1~26.5        | 45~45.7    | 101          | 07/May/2020 | -      |
| RS                               | RS06-HY       | Easton        | 22.1~22.3        | 48.2~48.3  | 100.1        | 10/Apr/2020 | -      |
| Power Frequency Magnetic Fields  | EX02-HY       | Easton        | 25.1~25.3        | 49.1~49.5  | 100.1        | 10/Apr/2020 | -      |

**3.2. Test Standards**

| Test items                       | Test Standards and Test Procedures   |
|----------------------------------|--|
| Radiated and Conducted Emissions | European Standard EN 55032 Class B   |
| Harmonics                        | European Standard EN 61000-3-2   |
| Voltage Fluctuations             | European Standard EN 61000-3-3   |
| EMS                              | European Standard EN 55035<br>(ESD: IEC 61000-4-2, RS: IEC 61000-4-3, EFT: IEC 61000-4-4,<br>SURGES: IEC 61000-4-5, CS: IEC 61000-4-6, PFMF: IEC 61000-4-8,<br>DIPs: IEC 61000-4-11) |

**3.3. Test Voltage/Frequencies**

| Power Supply Type | Voltage/Frequencies |
|-------------------|---------------------|
| AC Power Supply   | 230V / 50Hz         |

**3.4. Test Distance and Frequency Range Investigated**

| Test Items                                     | Frequency Range                                 | Remark                        |
|--|---|-------------------------------|
| Powerline Conducted Emissions                  | 150 kHz to 30 MHz                               | -                             |
| Radiated Emissions (below 1GHz)                | 30 MHz to 1,000 MHz                             | Measurement distance is 10 m. |
| Radiated Emissions (above 1GHz)                | 1,000 MHz to 6,000 MHz                          | Measurement distance is 3 m.  |
| Radio frequency electromagnetic field immunity | 80 to 1,000 MHz                                 | Measurement distance is 3 m.  |
|  | 1,800 MHz / 2,600 MHz /<br>3,500 MHz /5,000 MHz | Measurement distance is 3 m.  |

**3.5. Operating Condition**

- Full system.



### 4. Emissions Measurement

The EUT is which satisfies the Class B disturbance limits.

#### 4.1. Conducted Emissions at Powerline

##### 4.1.1.Limit

| conducted emissions from the AC mains power ports of Class A equipment |                 |                           |                       |
|--|-----------------|---------------------------|-----------------------|
| Frequency range MHz  | Coupling device | Detector type / bandwidth | Class A limits dB(µV) |
| 0,15 – 0,5   | AMN             | Quasi-peak / 9 kHz        | 79                    |
| 0,50 – 30  |                 |                           | 73                    |
| 0,15 – 0,5   | AMN             | Average / 9 kHz           | 66                    |
| 0,50 – 30  |                 |                           | 60                    |

| conducted emissions from the AC mains power ports of Class B equipment |                 |                           |                       |
|--|-----------------|---------------------------|-----------------------|
| Frequency range MHz  | Coupling device | Detector type / bandwidth | Class B limits dB(µV) |
| 0,15 – 0,5   | AMN             | Quasi-peak / 9 kHz        | 66 - 56               |
| 0,5 – 5  |                 |                           | 56                    |
| 5 – 30   |                 |                           | 60                    |
| 0,15 – 0,5   | AMN             | Average / 9 kHz           | 56 - 46               |
| 0,5 – 5  |                 |                           | 46                    |
| 5 – 30   |                 |                           | 50                    |

Note: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

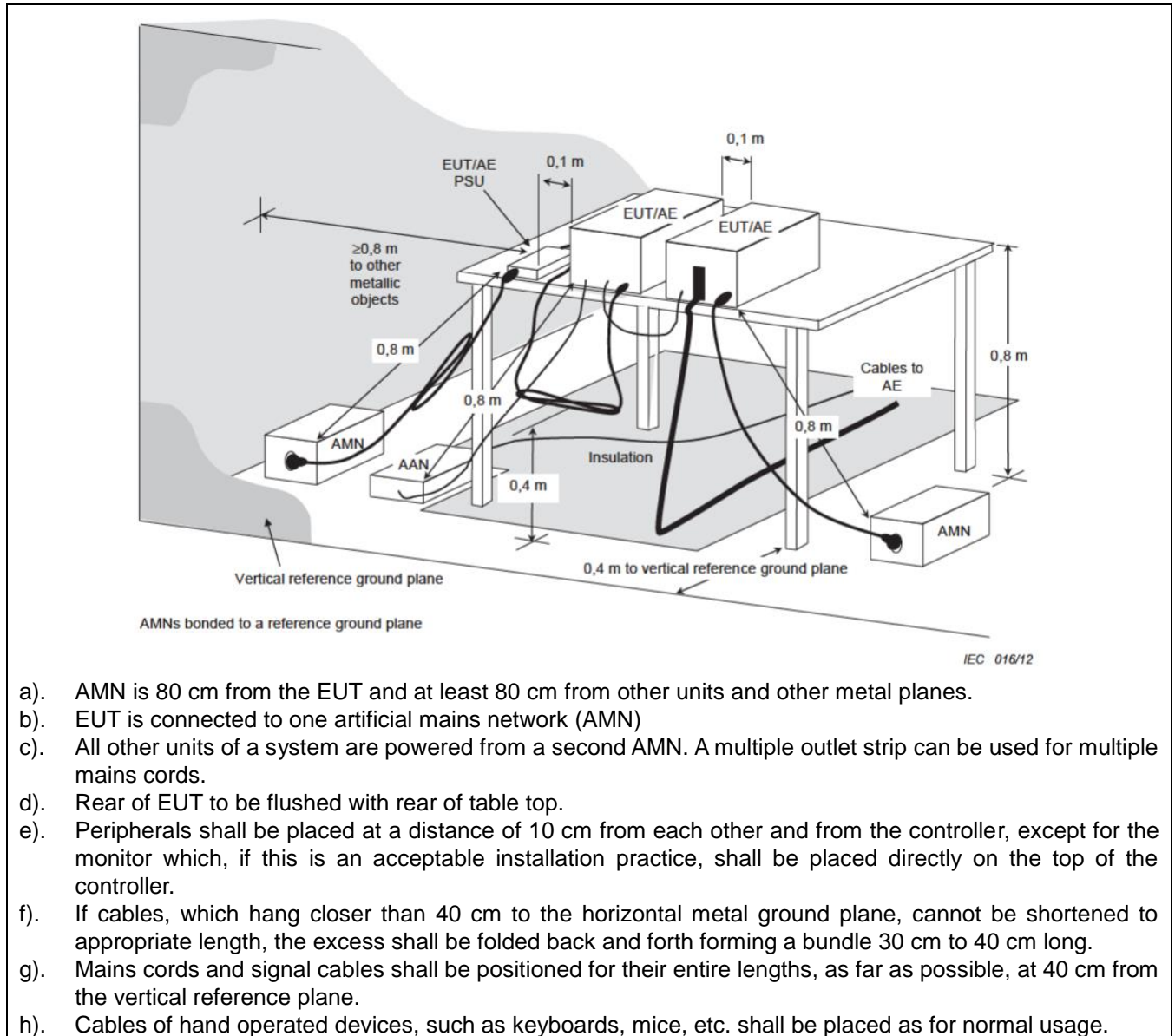
##### 4.1.2. Test Procedures

- a). The EUT was warmed up for 15 minutes before testing started.
- b). The EUT was placed on a desk 0.8 meter height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meter from any other grounded conducting surface.
- c). Connect EUT to the power mains through a line impedance stabilization network (LISN).
- d). All the support units are connect to the other LISN.
- e). The LISN provides 50 ohm, coupling impedance for the measuring instrument.
- f). The CISPR states that a 50 ohm, 50 microhenry LISN should be used.
- g). Both sides of AC line were checked for maximum conducted interference.
- h). The frequency range from 150 kHz to 30 MHz was searched.
- i). Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- j). All emissions not reported here are more than 10 dB below the prescribed limit.

##### 4.1.3.Measurement Results Calculation

The measurand Level is calculated using:  
 Corrected Reading (dBµV) = LISN Factor + Cable Loss + Read Level  
 For example at 0.3 MHz if the LISN Factor is 10.48 dB, the cable loss is 0.10 dB, the measured voltage is 36.39 dBµV, the signal strength would be calculated:  
 Corrected Reading (dBµV) = 10.48 dB + 0.10 dB + 36.39 dBµV = 46.97 dBµV

**4.1.4. Typical Test Setup Layout**

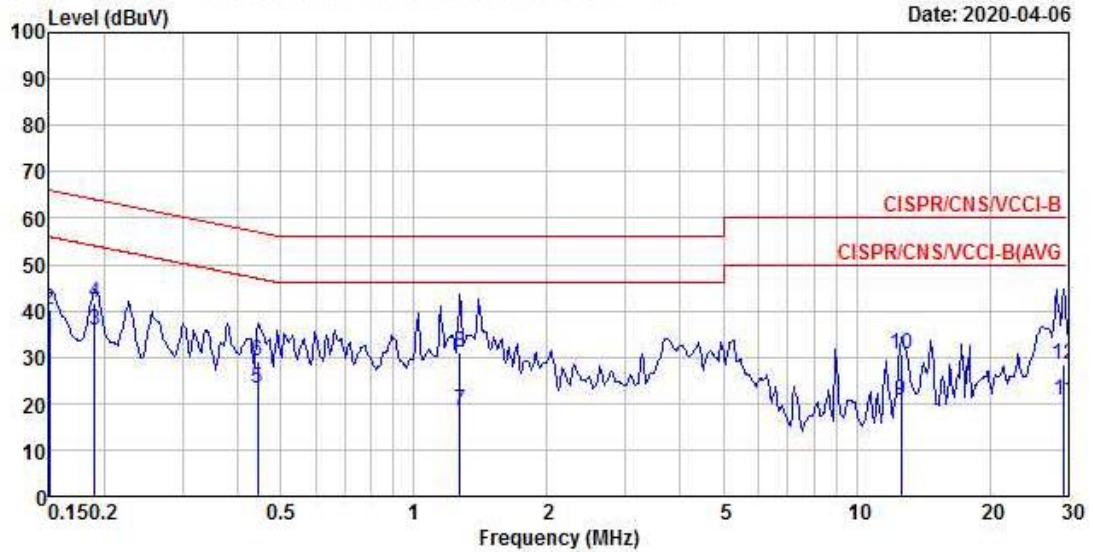




**4.1.5. Test Result**

|   |                   |                     |                |
|---|-------------------|---------------------|----------------|
| <b>Test Mode</b>  | Mode 1            |                     |                |
| <b>Test Frequency</b>   | 0.15 MHz ~ 30 MHz | <b>Test Voltage</b> | AC 230V / 50Hz |
| <p>■ The test was passed at the minimum margin that marked by the frame in the following data</p> |                   |                     |                |

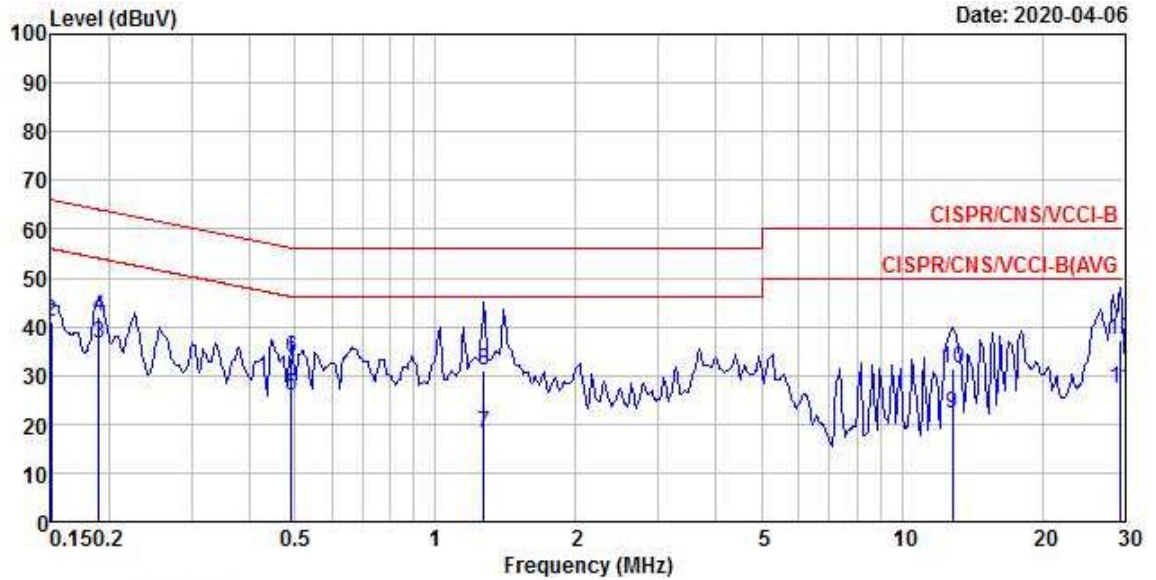
Line



|    | Freq  | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark  |
|----|-------|-------|------------|------------|------------|-------------|------------|---------|
|    | MHz   | dBuV  | dB         | dBuV       | dBuV       | dB          | dB         |         |
| 1  | 0.15  | 33.95 | -22.05     | 56.00      | 23.56      | 10.29       | 0.10       | Average |
| 2  | 0.15  | 40.34 | -25.66     | 66.00      | 29.95      | 10.29       | 0.10       | QP      |
| 3  | 0.19  | 35.70 | -18.32     | 54.02      | 25.30      | 10.30       | 0.10       | Average |
| 4  | 0.19  | 41.62 | -22.40     | 64.02      | 31.22      | 10.30       | 0.10       | QP      |
| 5  | 0.44  | 23.14 | -23.84     | 46.98      | 12.73      | 10.30       | 0.11       | Average |
| 6  | 0.44  | 29.04 | -27.94     | 56.98      | 18.63      | 10.30       | 0.11       | QP      |
| 7  | 1.27  | 18.42 | -27.58     | 46.00      | 7.90       | 10.32       | 0.20       | Average |
| 8  | 1.27  | 30.90 | -25.10     | 56.00      | 20.38      | 10.32       | 0.20       | QP      |
| 9  | 12.59 | 20.58 | -29.42     | 50.00      | 9.77       | 10.51       | 0.30       | Average |
| 10 | 12.59 | 30.66 | -29.34     | 60.00      | 19.85      | 10.51       | 0.30       | QP      |
| 11 | 29.37 | 20.77 | -29.23     | 50.00      | 9.54       | 10.83       | 0.40       | Average |
| 12 | 29.37 | 28.26 | -31.74     | 60.00      | 17.03      | 10.83       | 0.40       | QP      |



Neutral



|     | Freq  | Level | Over   | Limit | Read  | LISN   | Cable | Remark  |
|-----|-------|-------|--------|-------|-------|--------|-------|---------|
|     | MHz   | dBuV  | Limit  | Line  | Level | Factor | Loss  |         |
|     |       |       | dB     | dBuV  | dBuV  | dB     | dB    |         |
| 1   | 0.15  | 34.28 | -21.72 | 56.00 | 23.89 | 10.29  | 0.10  | Average |
| 2   | 0.15  | 40.95 | -25.05 | 66.00 | 30.56 | 10.29  | 0.10  | QP      |
| 3 @ | 0.19  | 36.42 | -17.60 | 54.02 | 26.02 | 10.30  | 0.10  | Average |
| 4   | 0.19  | 41.93 | -22.09 | 64.02 | 31.53 | 10.30  | 0.10  | QP      |
| 5   | 0.49  | 25.89 | -20.25 | 46.14 | 15.46 | 10.31  | 0.12  | Average |
| 6   | 0.49  | 33.65 | -22.49 | 56.14 | 23.22 | 10.31  | 0.12  | QP      |
| 7   | 1.27  | 17.98 | -28.02 | 46.00 | 7.45  | 10.33  | 0.20  | Average |
| 8   | 1.27  | 30.98 | -25.02 | 56.00 | 20.45 | 10.33  | 0.20  | QP      |
| 9   | 12.85 | 22.08 | -27.92 | 50.00 | 11.23 | 10.55  | 0.30  | Average |
| 10  | 12.85 | 31.45 | -28.55 | 60.00 | 20.60 | 10.55  | 0.30  | QP      |
| 11  | 29.46 | 27.13 | -22.87 | 50.00 | 15.80 | 10.93  | 0.40  | Average |
| 12  | 29.46 | 37.44 | -22.56 | 60.00 | 26.11 | 10.93  | 0.40  | QP      |



### 4.2. Radiated Emission below 1GHz

#### 4.2.1.Limit

| radiated emissions at frequencies up to 1 GHz for Class A equipment |                 |                              |                         |
|---|-----------------|------------------------------|-------------------------|
| Frequency range<br>MHz  | Measurement     |                              | Class A limits dB(µV/m) |
|   | Distance<br>(m) | Detector type /<br>bandwidth | OATS/SAC                |
| 30 – 230  | 10              | Quasi Peak /<br>120 kHz      | 40                      |
| 230 – 1000  |                 |                              | 47                      |
| 30 – 230  | 3               |                              | 50                      |
| 230 – 1000  |                 |                              | 57                      |

| radiated emissions at frequencies up to 1 GHz for Class B equipment |                 |                              |                         |
|---|-----------------|------------------------------|-------------------------|
| Frequency range<br>MHz  | Measurement     |                              | Class B limits dB(µV/m) |
|   | Distance<br>(m) | Detector type /<br>bandwidth | OATS/SAC                |
| 30 – 230  | 10              | Quasi Peak /<br>120 kHz      | 30                      |
| 230 – 1000  |                 |                              | 37                      |
| 30 – 230  | 3               |                              | 40                      |
| 230 – 1000  |                 |                              | 47                      |

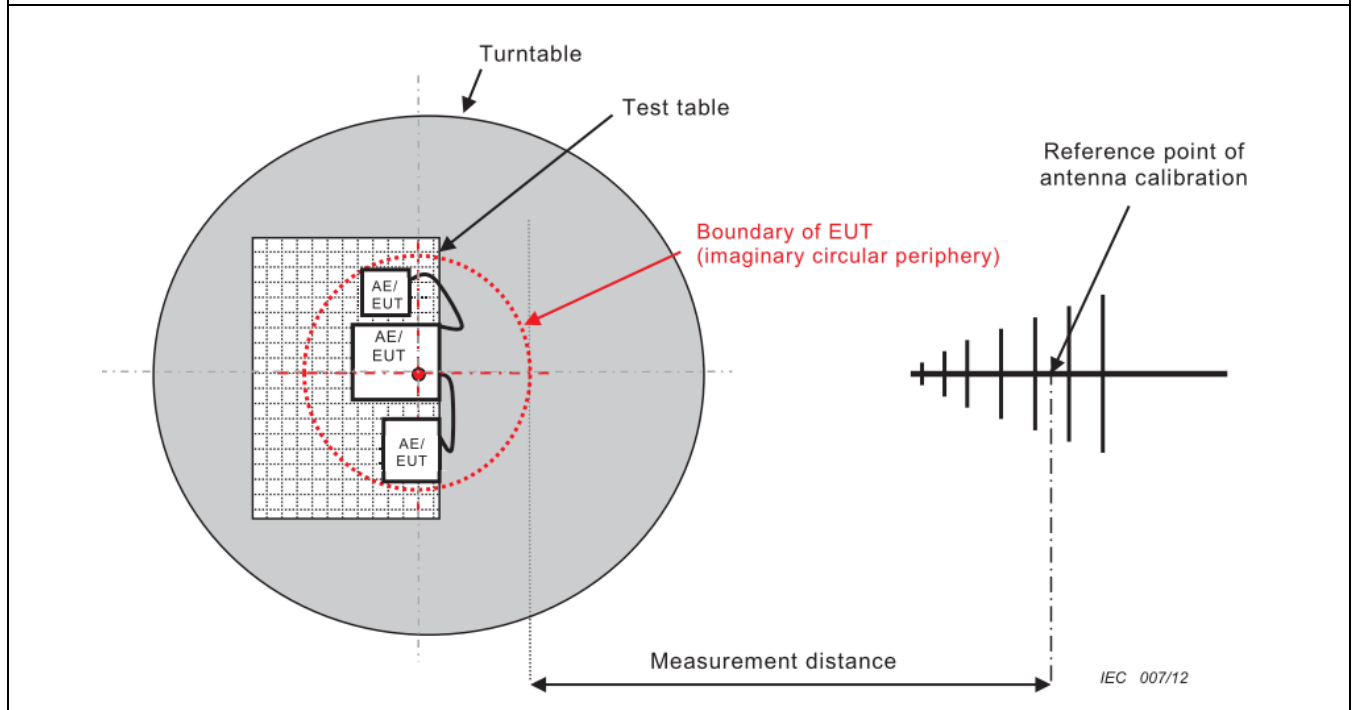
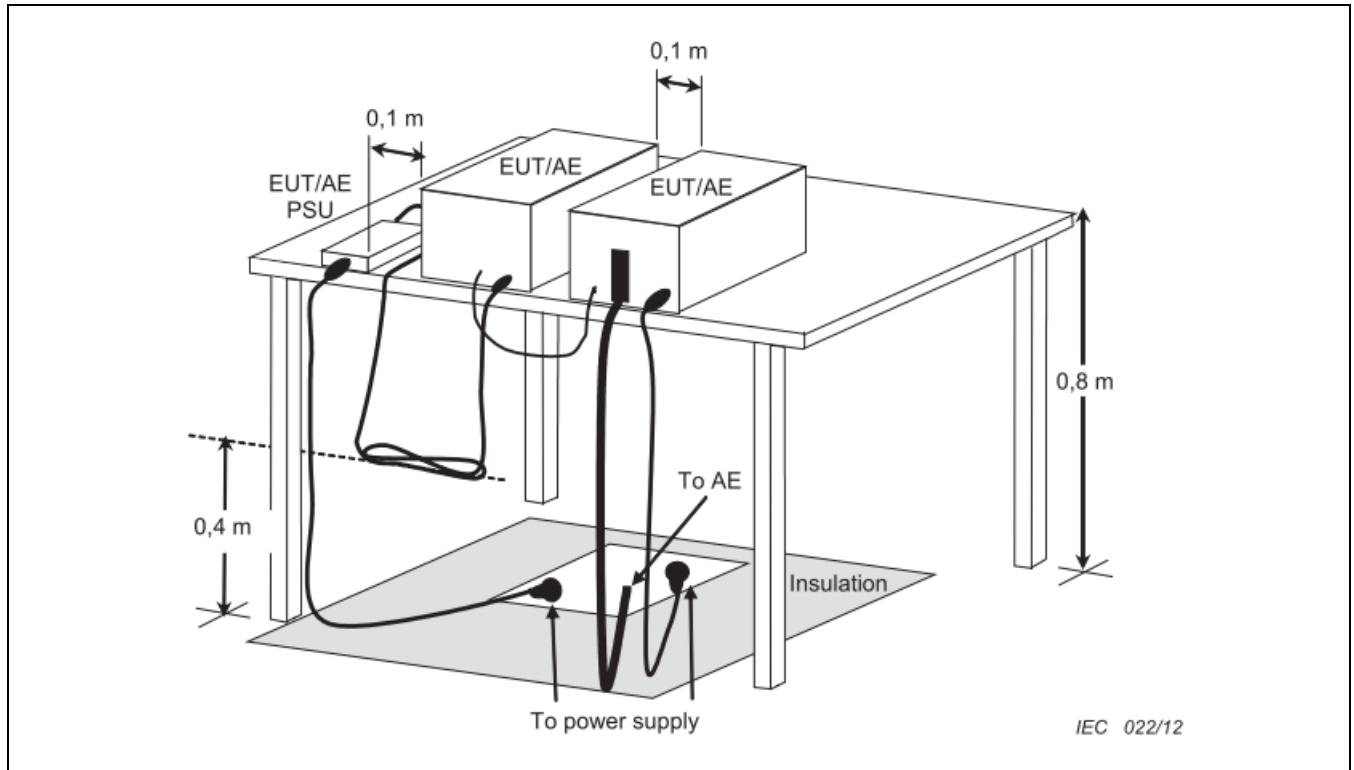
#### 4.2.2. Test Procedures

- a). The EUT was placed on a rotatable table top 0.8 meter above ground.
- b). The EUT was set 10 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c). The table was rotated 360 degrees to determine the position of the highest radiation.
- d). The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e). For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f). Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g). If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h). The central point of the EUT shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.

#### 4.2.3.Measurement Results Calculation

The measurand Level is calculated using:  
 Corrected Reading (dBµV/m) = Antenna Factor + Cable Loss + Read Level – Preamp Factor  
 For example at 125 MHz if the Antenna Factor is 17.24 dB/m, the cable loss is 1.20 dB, the measured voltage is 35.80 dBµV and the Preamp Factor is 27.18 dB, the signal strength would be calculated:  
 Corrected Reading (dBµV/m) = 17.24 dB/m + 1.20 dB + 35.80 dBµV - 27.18 dB = 27.06 dBµV/m  
 Note: If a hybrid antenna is used, the antenna factor shall be the sum of the Antenna Factor + Attenuator Factor.

**4.2.4. Typical Test Setup Layout**

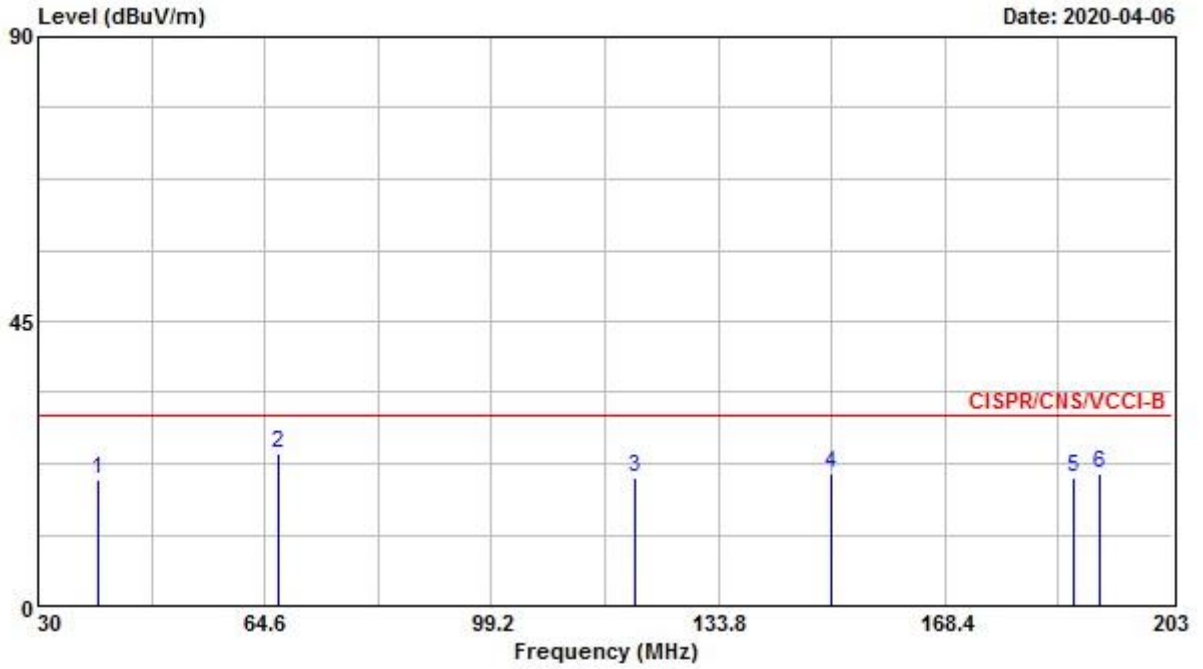




**4.2.5. Test Result**

|   |                   |                     |                |
|---|-------------------|---------------------|----------------|
| <b>Test mode</b>  | Mode 1            |                     |                |
| <b>Test frequency</b>   | 30 MHz ~ 1000 MHz | <b>Test Voltage</b> | AC 230V / 50Hz |
| <p>■ The test was passed at the minimum margin that marked by the frame in the following data</p> |                   |                     |                |

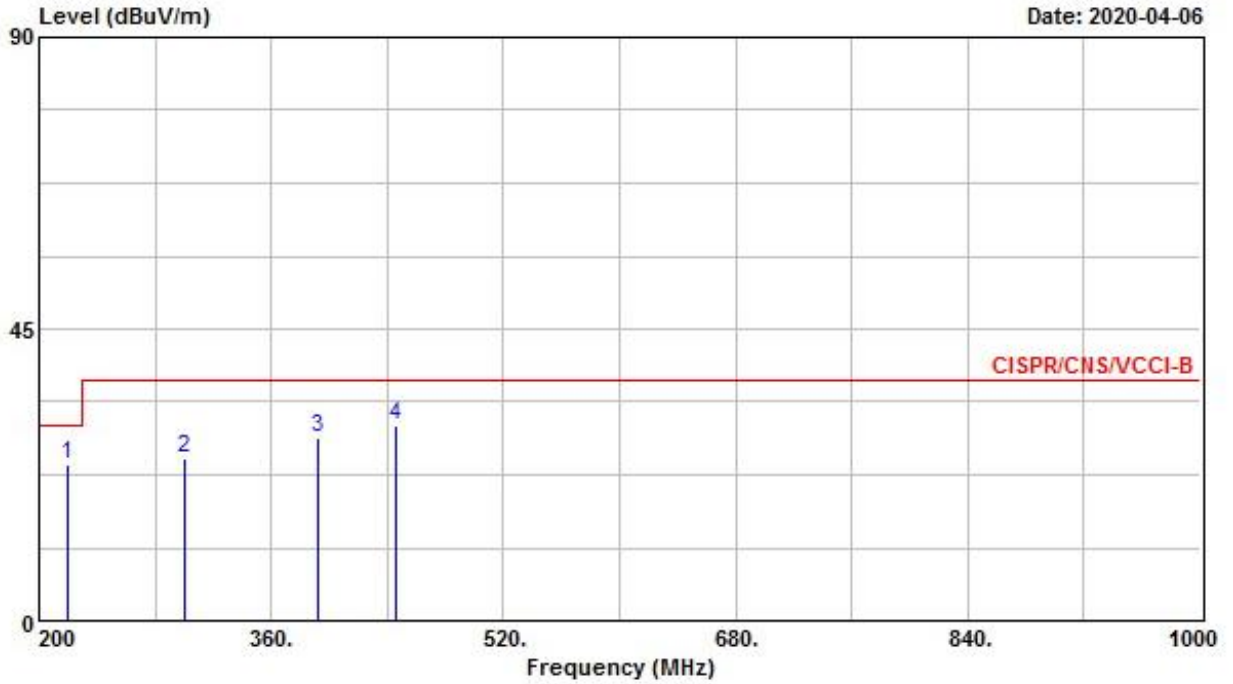
**Vertical**



|   | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---------|--------|------------|------------|-------------------|----------------|------------|---------------|--------|---------|-----------|
|   | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            |        | cm      | deg       |
| 1 | 39.020  | 20.10  | -9.90      | 30.00      | 29.26             | 18.20          | 1.06       | 28.42         | Peak   | ---     | ---       |
| 2 | 66.800  | 24.02  | -5.98      | 30.00      | 39.38             | 11.61          | 1.41       | 28.38         | Peak   | 100     | 181       |
| 3 | 121.020 | 20.41  | -9.59      | 30.00      | 28.87             | 17.87          | 1.90       | 28.23         | Peak   | ---     | ---       |
| 4 | 151.010 | 21.02  | -8.98      | 30.00      | 31.20             | 15.77          | 2.16       | 28.11         | Peak   | ---     | ---       |
| 5 | 188.020 | 20.40  | -9.60      | 30.00      | 31.43             | 14.41          | 2.53       | 27.97         | Peak   | ---     | ---       |
| 6 | 192.050 | 21.02  | -8.98      | 30.00      | 31.98             | 14.43          | 2.57       | 27.96         | Peak   | ---     | ---       |



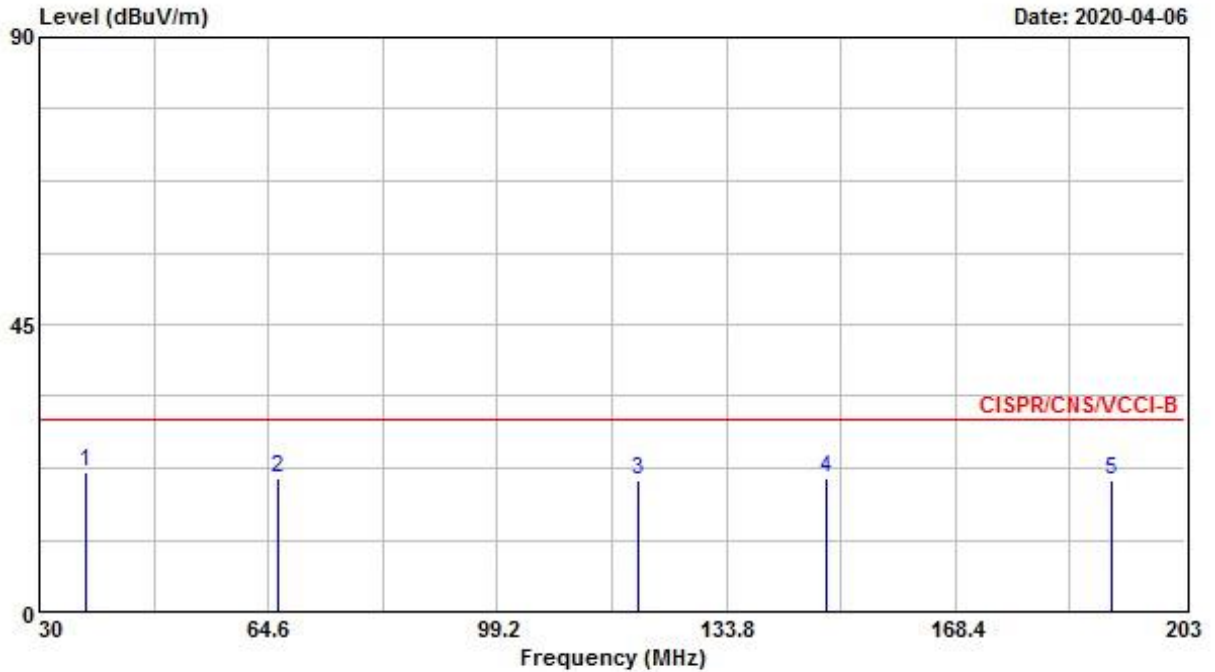
Vertical



|   | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---------|--------|------------|------------|-------------------|----------------|------------|---------------|--------|---------|-----------|
|   | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            |        | cm      | deg       |
| 1 | 220.010 | 24.02  | -5.98      | 30.00      | 34.26             | 14.86          | 2.80       | 27.90         | Peak   | ---     | ---       |
| 2 | 301.020 | 25.01  | -11.99     | 37.00      | 30.86             | 18.69          | 3.27       | 27.81         | Peak   | ---     | ---       |
| 3 | 392.020 | 28.14  | -8.86      | 37.00      | 31.97             | 20.84          | 3.78       | 28.45         | Peak   | ---     | ---       |
| 4 | 446.200 | 30.02  | -6.98      | 37.00      | 32.61             | 22.05          | 4.12       | 28.76         | Peak   | ---     | ---       |



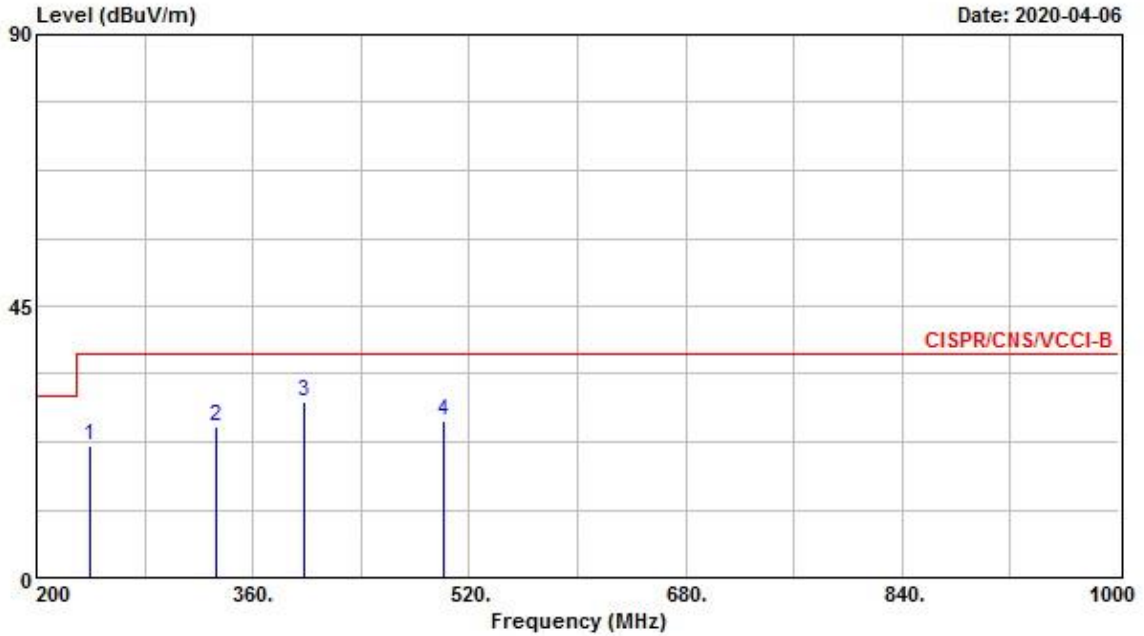
**Horizontal**



|   | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---------|--------|------------|------------|-------------------|----------------|------------|---------------|--------|---------|-----------|
|   | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            |        | cm      | deg       |
| 1 | 37.020  | 22.01  | -7.99      | 30.00      | 30.05             | 19.35          | 1.03       | 28.42         | Peak   | ---     | ---       |
| 2 | 66.020  | 21.02  | -8.98      | 30.00      | 36.40             | 11.61          | 1.39       | 28.38         | Peak   | ---     | ---       |
| 3 | 120.520 | 20.63  | -9.37      | 30.00      | 29.07             | 17.90          | 1.89       | 28.23         | Peak   | ---     | ---       |
| 4 | 149.050 | 21.00  | -9.00      | 30.00      | 31.09             | 15.88          | 2.15       | 28.12         | Peak   | ---     | ---       |
| 5 | 192.020 | 20.52  | -9.48      | 30.00      | 31.48             | 14.43          | 2.57       | 27.96         | Peak   | ---     | ---       |



Horizontal



|   | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---------|--------|------------|------------|-------------------|----------------|------------|---------------|--------|---------|-----------|
|   | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            |        | cm      | deg       |
| 1 | 240.010 | 22.01  | -14.99     | 37.00      | 30.08             | 16.87          | 2.94       | 27.88         | Peak   | ---     | ---       |
| 2 | 333.020 | 25.04  | -11.96     | 37.00      | 30.34             | 19.30          | 3.43       | 28.03         | Peak   | ---     | ---       |
| 3 | 397.600 | 29.02  | -7.98      | 37.00      | 32.64             | 21.06          | 3.82       | 28.50         | Peak   | ---     | ---       |
| 4 | 501.020 | 26.02  | -10.98     | 37.00      | 27.87             | 22.74          | 4.46       | 29.05         | Peak   | ---     | ---       |



**4.3. Radiated Emission above 1GHz**

**4.3.1.Limit**

| radiated emissions at frequencies above 1 GHz for Class A equipment |                 |                              |                         |
|---|-----------------|------------------------------|-------------------------|
| Frequency range<br>MHz  | Measurement     |                              | Class A limits dB(μV/m) |
|   | Distance<br>(m) | Detector type /<br>bandwidth | SAC                     |
| 1000 – 3000   | 3               | Average / 1 MHz              | 56                      |
| 3000 – 6000   |                 |                              | 60                      |
| 1000 – 3000   |                 | Peak / 1 MHz                 | 76                      |
| 3000 – 6000   |                 |                              | 80                      |

| radiated emissions at frequencies above 1 GHz for Class B equipment |                 |                              |                         |
|---|-----------------|------------------------------|-------------------------|
| Frequency range<br>MHz  | Measurement     |                              | Class B limits dB(μV/m) |
|   | Distance<br>(m) | Detector type /<br>bandwidth | SAC                     |
| 1000 – 3000   | 3               | Average / 1 MHz              | 50                      |
| 3000 – 6000   |                 |                              | 54                      |
| 1000 – 3000   |                 | Peak / 1 MHz                 | 70                      |
| 3000 – 6000   |                 |                              | 74                      |

| Required highest frequency for radiated measurement |   |
|---|---|
| Highest internal frequency<br>( $F_x$ )             | Highest measured frequency              |
| $F_x \leq 108$ MHz                                  | 1 GHz                                   |
| $108 \text{ MHz} < F_x \leq 500$ MHz                | 2 GHz                                   |
| $500 \text{ MHz} < F_x \leq 1$ GHz                  | 5 GHz                                   |
| $F_x > 1$ GHz                                       | $5 \times F_x$ up to a maximum of 6 GHz |



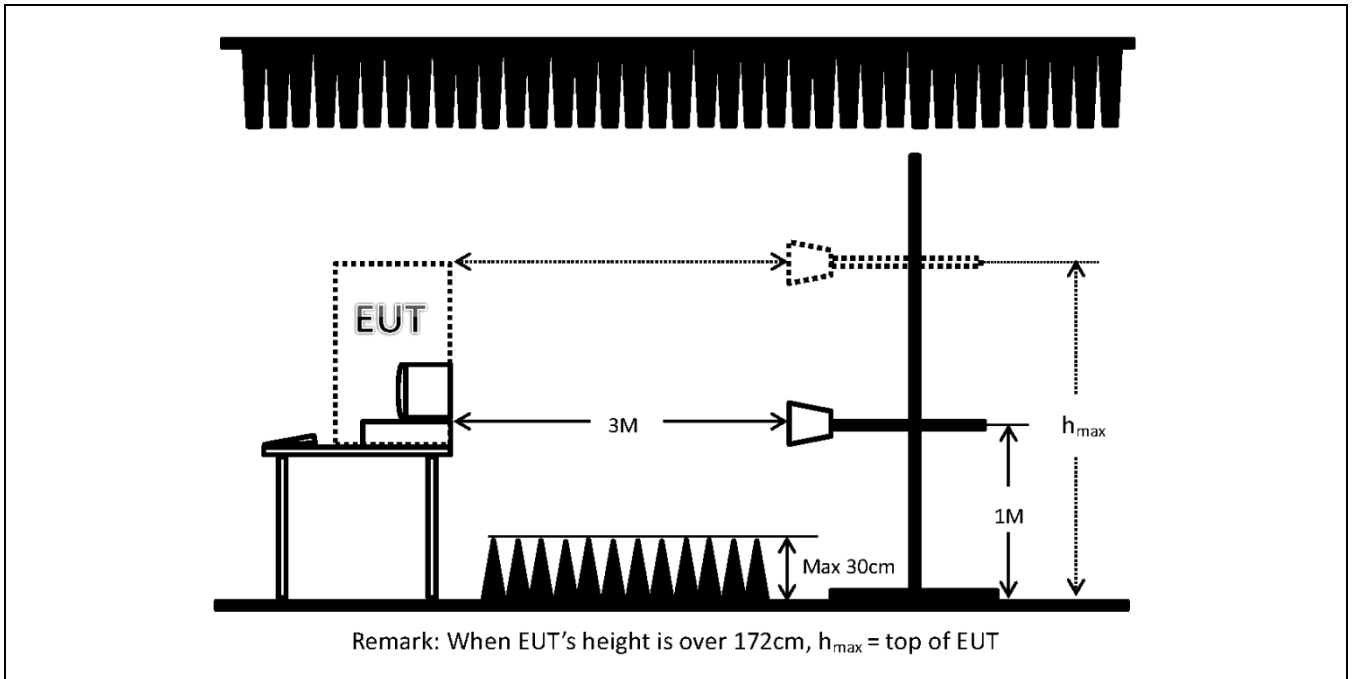
**4.3.2. Test Procedures**

- a). Same test set up as below 1GHz radiated testing.
- b). The EUT was set 3 meter from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c). There should be absorber placed between the EUT and Antenna and its located size should let the test site meet CISPR16-1-4 requirement.
- d). The table was rotated 360 degrees to determine the position of the highest radiation.
- e). The measured using a test-receiver system with both a peak and CISPR average detector.
- f). Set the DRG Horn Antenna at 1M height, then run the turn table to get the maximum noise reading from Horizontal and Vertical polarity separately. t the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g). When EUT locating on the turn-table, and its height is over 172cm (Antenna’s 3dB beam width of 6GHz is 27°), the DRG Horn Antenna must be raised up and descended down, then turning around the turn-table to get the maximum noise reading of the Horizontal and Vertical polarity separately. Note the maximum raise up height is same as the top of EUT.
- h). If emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- i). The central point of the EUT shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.

**4.3.3. Measurement Results Calculation**

The measurand Level is calculated using:  
Corrected Reading (dBµV/m) = Raw(Read Level)+AF(Antenna Factor)+CL(Cable Loss)-PA( Preamp Factor)  
For example at 1980 MHz if the Antenna Factor is 26.19 dB/m, the cable loss is 4.08 dB, the measured voltage is 51.30 dBµV and the Preamp Factor is 33.34 dB, the signal strength would be calculated:  
Corrected Reading (dBµV/m) = 51.30 dBµV + 26.19 dB/m + 4.08 dB + - 33.34 dB = 48.23 dBµV/m

#### 4.3.4. Typical Test Setup Layout





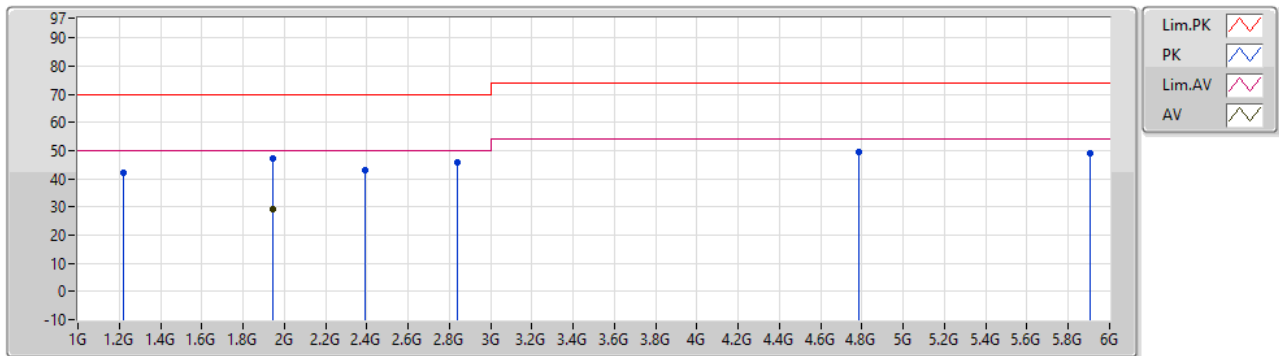
**4.3.5. Test Result**

|   |               |                     |                |
|---|---------------|---------------------|----------------|
| <b>Test mode</b>  | Mode 1        |                     |                |
| <b>Test frequency</b>   | 1 GHz ~ 6 GHz | <b>Test Voltage</b> | AC 230V / 50Hz |
| <p>■ The test was passed at the minimum margin that marked by the frame in the following data</p> |               |                     |                |

**Vertical**

**Radiated Emissions above 1GHz\_Mode 1**

09/04/2020



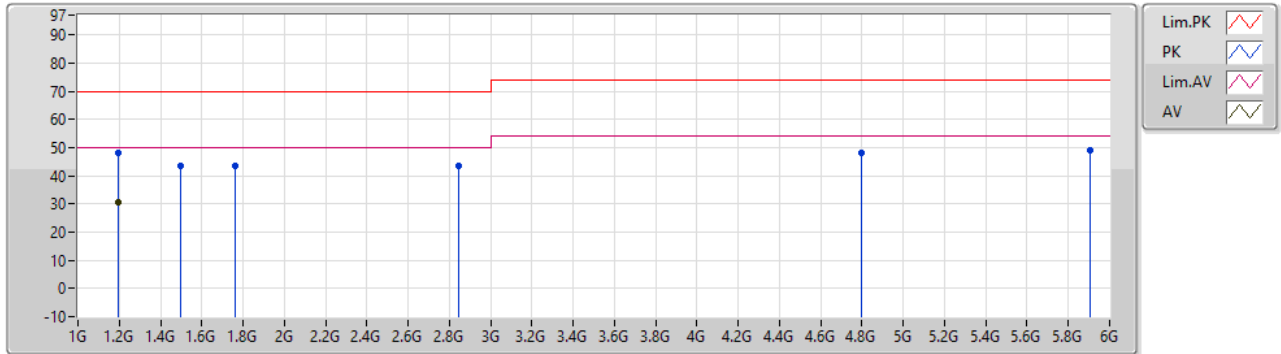
| Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Factor (dB) | Dist (m) | Condition | Azimuth (°) | Height (m) | Comment | Raw (dBuV) | AF (dB/m) | CL (dB) | PA (dB) |
|------|-----------|----------------|----------------|-------------|-------------|----------|-----------|-------------|------------|---------|------------|-----------|---------|---------|
| PK   | 1.22G     | 42.16          | 70.00          | -27.84      | -5.37       | 3        | Vertical  | -           | -          | -       | 47.53      | 25.16     | 3.32    | 33.85   |
| PK   | 1.945G    | 47.38          | 70.00          | -22.62      | -3.10       | 3        | Vertical  | 0           | 1          | -       | 50.48      | 25.87     | 4.49    | 33.46   |
| AV   | 1.945G    | 29.19          | 50.00          | -20.81      | -3.10       | 3        | Vertical  | 0           | 1          | "Worst" | 32.29      | 25.87     | 4.49    | 33.46   |
| PK   | 2.39G     | 43.01          | 70.00          | -26.99      | -1.49       | 3        | Vertical  | -           | -          | -       | 44.50      | 27.53     | 4.59    | 33.61   |
| PK   | 2.84G     | 45.69          | 70.00          | -24.31      | -0.44       | 3        | Vertical  | -           | -          | -       | 46.13      | 28.18     | 5.24    | 33.86   |
| PK   | 4.785G    | 49.38          | 74.00          | -24.62      | 4.14        | 3        | Vertical  | -           | -          | -       | 45.24      | 30.98     | 7.06    | 33.90   |
| PK   | 5.905G    | 48.94          | 74.00          | -25.06      | 6.07        | 3        | Vertical  | -           | -          | -       | 42.87      | 32.20     | 7.80    | 33.93   |



**Horizontal**

**Radiated Emissions above 1GHz\_Mode 1**

09/04/2020



| Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Factor (dB) | Dist (m) | Condition  | Azimuth (°) | Height (m) | Comment | Raw (dBuV) | AF (dB/m) | CL (dB) | PA (dB) |
|------|-----------|----------------|----------------|-------------|-------------|----------|------------|-------------|------------|---------|------------|-----------|---------|---------|
| PK   | 1.195G    | 48.10          | 70.00          | -21.90      | -5.62       | 3        | Horizontal | 240         | 1          | -       | 53.72      | 24.98     | 3.29    | 33.89   |
| AV   | 1.195G    | 30.81          | 50.00          | -19.19      | -5.62       | 3        | Horizontal | 240         | 1          | "Worst" | 36.43      | 24.98     | 3.29    | 33.89   |
| PK   | 1.495G    | 43.29          | 70.00          | -26.71      | -4.15       | 3        | Horizontal | -           | -          | -       | 47.44      | 25.72     | 3.63    | 33.50   |
| PK   | 1.765G    | 43.66          | 70.00          | -26.34      | -4.18       | 3        | Horizontal | -           | -          | -       | 47.84      | 25.16     | 4.13    | 33.47   |
| PK   | 2.845G    | 43.62          | 70.00          | -26.38      | -0.43       | 3        | Horizontal | -           | -          | -       | 44.05      | 28.19     | 5.25    | 33.87   |
| PK   | 4.795G    | 48.26          | 74.00          | -25.74      | 4.19        | 3        | Horizontal | -           | -          | -       | 44.07      | 31.00     | 7.09    | 33.90   |
| PK   | 5.905G    | 49.12          | 74.00          | -24.88      | 6.07        | 3        | Horizontal | -           | -          | -       | 43.05      | 32.20     | 7.80    | 33.93   |

### 4.4. Harmonic Current Emissions Measurement

#### 4.4.1. Limit

Harmonic current emissions evaluate the potential for the EUT to cause distortion on the AC power lines. It is applicable to electrical and electronic equipment having an input current  $\leq 16$  A per phase, and intended to be connected to public low-voltage distribution systems.

| Harmonics [n]         | Class A [A] | Class B [A]  | Class C [% of fund] | Class D [mA/W] |
|-----------------------|-------------|--------------|---------------------|----------------|
| <b>Odd harmonics</b>  |             |              |                     |                |
| 3                     | 2.30        | 3.45         | 30 x $\lambda$      | 3.4            |
| 5                     | 1.14        | 1.71         | 10                  | 1.9            |
| 7                     | 0.77        | 1.155        | 7                   | 1.0            |
| 9                     | 0.40        | 0.60         | 5                   | 0.5            |
| 11                    | 0.33        | 0.495        | 3                   | 0.35           |
| 13                    | 0.21        | 0.315        | 3                   | 3.85/13        |
| 15 $\leq$ n $\leq$ 39 | 0.15 x 15/n | 0.225 x 15/n | 3                   | 3.85/n         |
| <b>Even harmonics</b> |             |              |                     |                |
| 2                     | 1.08        | 1.62         | 2                   | -              |
| 4                     | 0.43        | 0.645        | -                   | -              |
| 6                     | 0.30        | 0.45         | -                   | -              |
| 8 $\leq$ n $\leq$ 40  | 0.23 x 8/n  | 0.345 x 8/n  | -                   | -              |

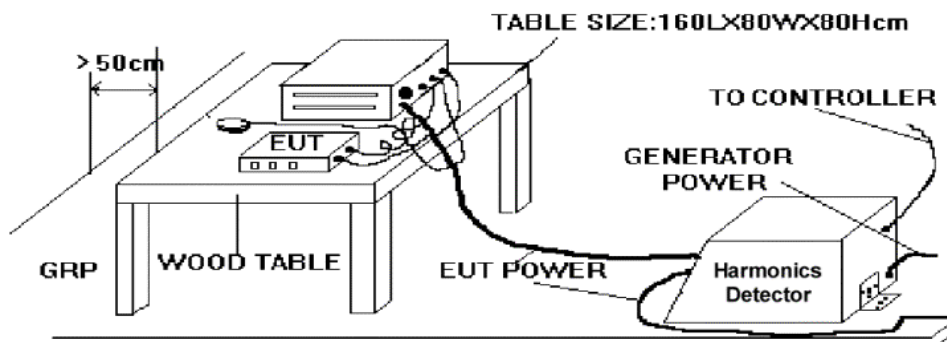
#### 4.4.2. Test Procedure

The test procedures followed are those specified in EN 61000-3-2:2014.

#### 4.4.3. Test Equipment Settings

| Harmonic Parameters                   | Setting      |
|---------------------------------------|--------------|
| Line Voltage                          | 230 V        |
| Line Frequency                        | 50 Hz        |
| Current Measurement Range             | High         |
| Measurement Delay                     | 10.0 seconds |
| Test Duration                         | 10.0 minutes |
| Class determination Pre-test Duration | 10.0 seconds |

#### 4.4.4. Typical Test Setup Layout





**4.4.5. Test Result**

|                     |                |                     |   |
|---------------------|----------------|---------------------|---|
| <b>Test mode</b>    | Mode 1         |                     |   |
| <b>Test Voltage</b> | AC 230V / 50Hz | <b>Device Class</b> | A |

|                       |               |                       |              |
|-----------------------|---------------|-----------------------|--------------|
| <b>V_RMS (Volts):</b> | <b>230.73</b> | <b>Frequency(Hz):</b> | <b>50.00</b> |
| <b>I_Peak (Amps):</b> | <b>0.869</b>  | <b>I_RMS (Amps):</b>  | <b>0.334</b> |
| <b>I_Fund (Amps):</b> | <b>0.257</b>  | <b>Crest Factor:</b>  | <b>3.374</b> |
| <b>Power (Watts):</b> | <b>57.4</b>   | <b>Power Factor:</b>  | <b>0.924</b> |

The power consumption of EUT is lower than 75W, so the limit is not specified in IEC 61000-3-2:2014.

## 4.5. Voltage Fluctuations and Flicker Measurement

### 4.5.1. Limit

The objective of voltage changes, voltage fluctuations and flicker in public low voltage supply systems during equipment with rated current  $\leq 16$  A per phase, ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same power system.

#### Voltage Fluctuation and Flicker Limits:

- The value of  $P_{st}$  shall not be greater than 1.0.
- The value of  $P_{it}$  shall not be greater than 0.65.
- The value of  $d(t)$  during a voltage change shall not exceed 3.3 % for more than 500 ms.
- The relative steady-state voltage change,  $d_c$ , shall not exceed 3.3 %.
- The maximum relative voltage change,  $d_{max}$ , shall not exceed 4.0 %.

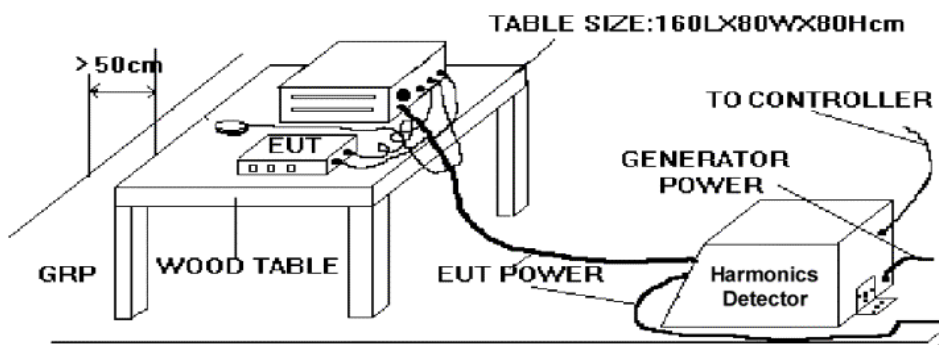
### 4.5.2. Test Procedure

The test procedures followed are those specified in EN 61000-3-3:2013.

### 4.5.3. Test Equipment Settings

| Flicker Parameters      | Setting      |
|-------------------------|--------------|
| Line Voltage            | 230 V        |
| Line Frequency          | 50 Hz        |
| Measurement Delay       | 10.0 seconds |
| Pst Integration Time    | 10.0 minutes |
| Pst Integration Periods | 1            |
| Test Duration           | 10.0 minutes |

### 4.5.4. Typical Test Setup Layout





**4.5.5. Test Result**

|                  |        |                     |                |
|------------------|--------|---------------------|----------------|
| <b>Test mode</b> | Mode 1 | <b>Test Voltage</b> | AC 230V / 50Hz |
|------------------|--------|---------------------|----------------|

**Parameter values recorded during the test:**

|  |               |                         |              |             |
|--|---------------|-------------------------|--------------|-------------|
| <b>Vrms at the end of test (Volt):</b> | <b>230.61</b> |                         |              |             |
| <b>Highest dt (%):</b>                 | <b>0.00</b>   | <b>Test limit (%):</b>  | <b>3.30</b>  | <b>Pass</b> |
| <b>T-max (mS):</b>                     | <b>0</b>      | <b>Test limit (mS):</b> | <b>500.0</b> | <b>Pass</b> |
| <b>Highest dc (%):</b>                 | <b>0.00</b>   | <b>Test limit (%):</b>  | <b>3.30</b>  | <b>Pass</b> |
| <b>Highest dmax (%):</b>               | <b>0.07</b>   | <b>Test limit (%):</b>  | <b>4.00</b>  | <b>Pass</b> |
| <b>Highest Pst (10 min. period):</b>   | <b>0.248</b>  | <b>Test limit:</b>      | <b>1.000</b> | <b>Pass</b> |



## 5. Immunity Measurement

### 5.1. General performance criteria

| Applicable Standard: EN 55035 |   |
|-------------------------------|---|
| <b>Criteria A</b>             | The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended..   |
| <b>Criteria B</b>             | During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended. |
| <b>Criteria C</b>             | Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.  |



## 5.2. Electrostatic Discharge (ESD)

### 5.2.1. Test Specification

|                       |                       |
|-----------------------|-----------------------|
| Reference Standard    | IEC 61000-4-2         |
| Discharge Impedance   | 330 Ω / 150 pF        |
| Polarity              | Positive and negative |
| Single Discharge Mode | 1 discharge per 1s    |

### 5.2.2. Test Levels

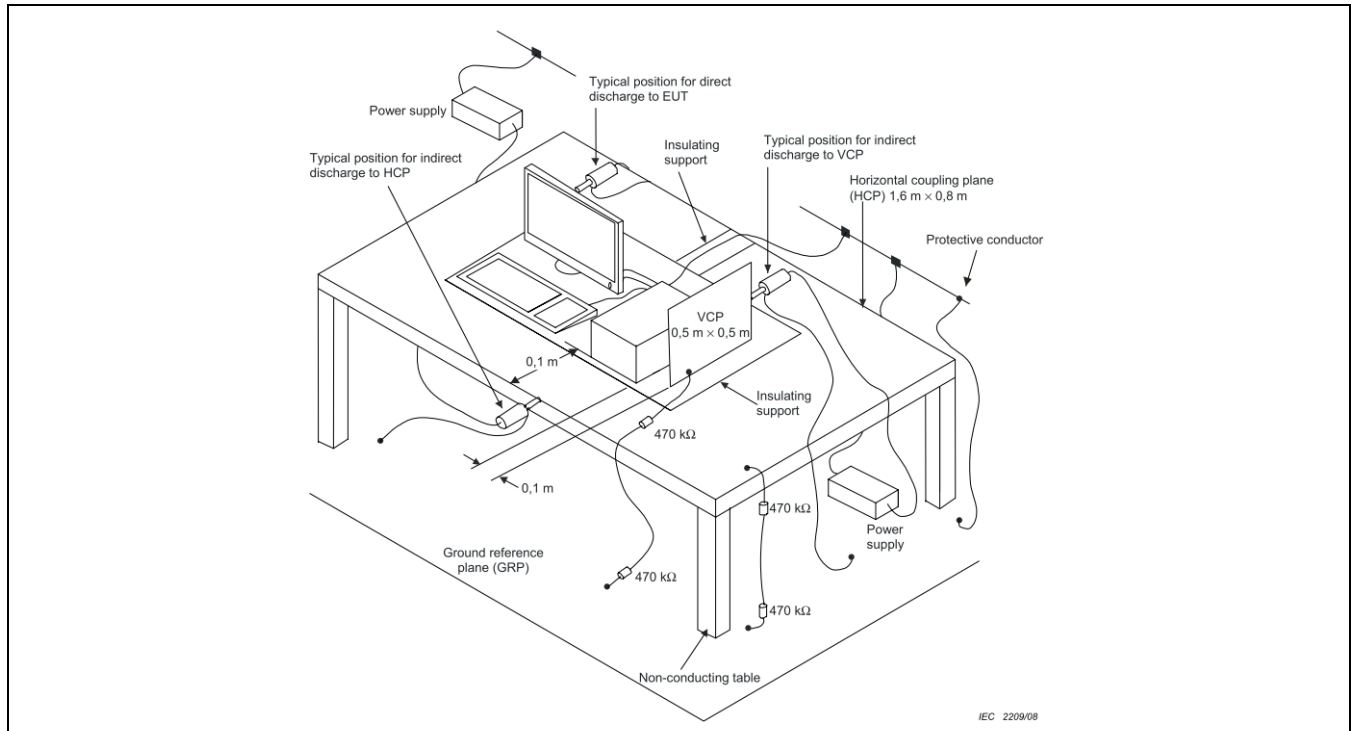
| Contact discharge |                    | Air Discharge |                    |
|-------------------|--------------------|---------------|--------------------|
| Level             | Test Voltage<br>kV | Level         | Test Voltage<br>kV |
| 1                 | 2                  | 1             | 2                  |
| 2                 | 4                  | 2             | 4                  |
| 3                 | 6                  | 3             | 8                  |
| 4                 | 8                  | 4             | 15                 |
| x                 | Specified          | x             | Specified          |

Remark : "x" can be any level, above, below or in between the others. The level shall be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.

### 5.2.3. Test Procedure

- a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
  - ambient temperature: 15 °C to 35 °C;
  - relative humidity : 30 % to 60 %;
  - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).
- b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.
- d. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
- e. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- f. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted:
  - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
  - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
  - The contact discharge test shall not be applied to such surfaces.
- g. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

**5.2.4. Test Setup**



The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the following manner:

- a). CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- b). AIR DISCHARGE at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

**5.2.5. Test Setup for Tests Performed in Laboratory**

A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm, minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the SPORTON EMC LAB., we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.

The EUT was arranged and connected according to its functional requirements. A distance of 1 m minimum was provided between the EUT and the wall of the Lab., and any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2 m to other conductive parts in the test setup.

Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resistor located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8 m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

**5.2.6. Test Result**

|                             |               |                          |             |
|-----------------------------|---------------|--------------------------|-------------|
| <b>Test mode</b>            | Mode 1        |                          |             |
| <b>Applicable Standard</b>  | EN 55035:2017 | <b>Final Test Result</b> | <b>PASS</b> |
| <b>Contact discharge</b>    | 2, 4 kV       |                          |             |
| <b>Air discharge</b>        | 2, 4, 8 kV    |                          |             |
| <b>Performance Criteria</b> | B             |                          |             |

**Test Result - Air Discharge/Round Tip**

| Test Point | No. of Disch. | Test Result (Criteria) |      |      |      |      |      | Remark |
|------------|---------------|------------------------|------|------|------|------|------|--------|
|            |               | +2kV                   | -2kV | +4kV | -4kV | +8kV | -8kV |        |
| 1~5        | 10            | A                      | A    | A    | A    | A    | A    | -      |

**Test Result - Contact Discharge/Pointed Tip**

| Test Point | No. of Disch. | Test Result (Criteria) |      |      |      | Remark |
|------------|---------------|------------------------|------|------|------|--------|
|            |               | +2kV                   | -2kV | +4kV | -4kV |        |
| 1~5        | 25            | A                      | A    | A    | A    | -      |

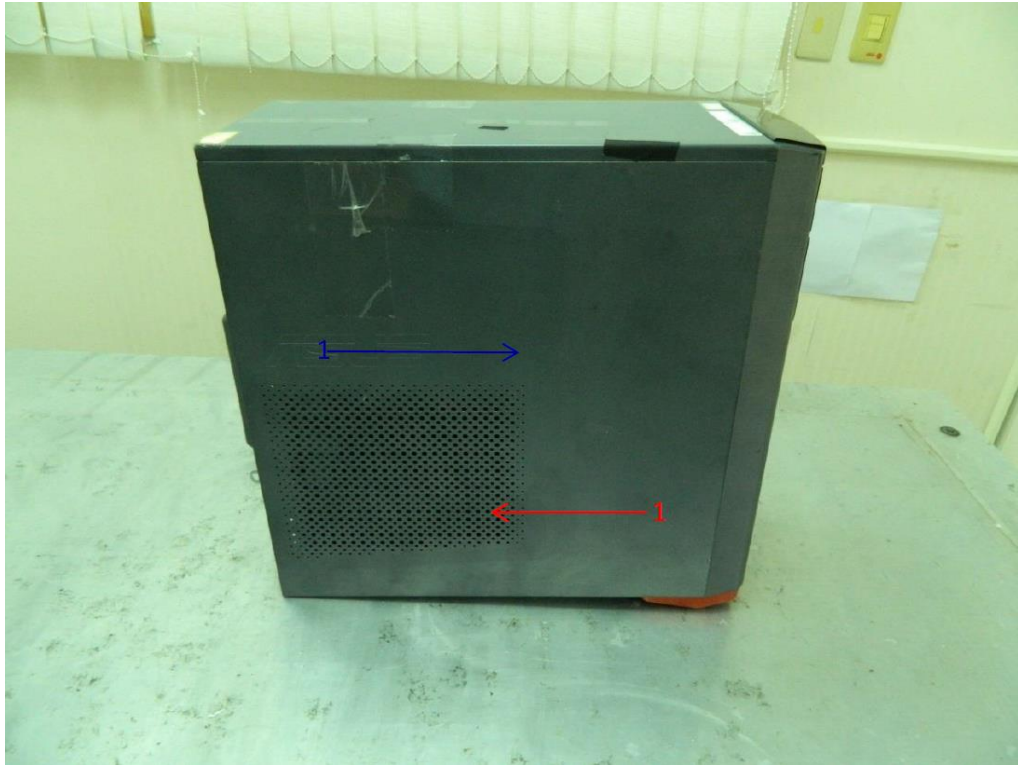
**Indirect discharge to HCP and VCP**

| Test Point     | No. of Disch. | Test Result (Criteria) |      |      |      | Remark |
|----------------|---------------|------------------------|------|------|------|--------|
|                |               | +2kV                   | -2kV | +4kV | -4kV |        |
| HCP (At Front) | 10            | A                      | A    | A    | A    | -      |
| HCP (At Left)  | 10            | A                      | A    | A    | A    | -      |
| HCP (At Right) | 10            | A                      | A    | A    | A    | -      |
| HCP (At Rear)  | 10            | A                      | A    | A    | A    | -      |
| VCP (At Front) | 10            | A                      | A    | A    | A    | -      |
| VCP (At Left)  | 10            | A                      | A    | A    | A    | -      |
| VCP (At Right) | 10            | A                      | A    | A    | A    | -      |
| VCP (At Rear)  | 10            | A                      | A    | A    | A    | -      |

### 5.2.7. Photographs of Electrostatic Discharge Immunity Test

#### Test Points

— Contact test point  
— Air test point



— Contact test point  
— Air test point

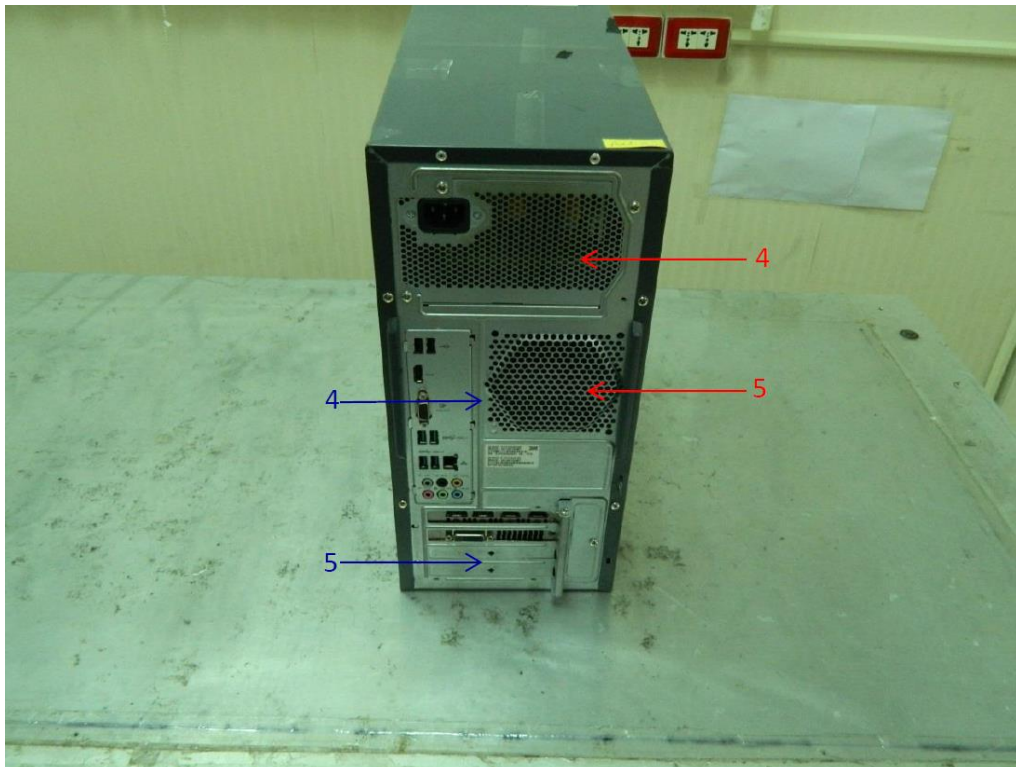


**Test Points**

— Contact test point  
— Air test point



— Contact test point  
— Air test point





### 5.3. Radio Frequency Electromagnetic Field (RS)

#### 5.3.1. Test Specification

|                     |                                      |
|---------------------|--------------------------------------|
| Reference Standard  | IEC 61000-4-3                        |
| Dwell Time          | 2.9 seconds                          |
| Frequency Step size | 1 % of the preceding frequency value |
| Antenna Polarity    | Vertical and Horizontal              |

#### 5.3.2. Test Levels

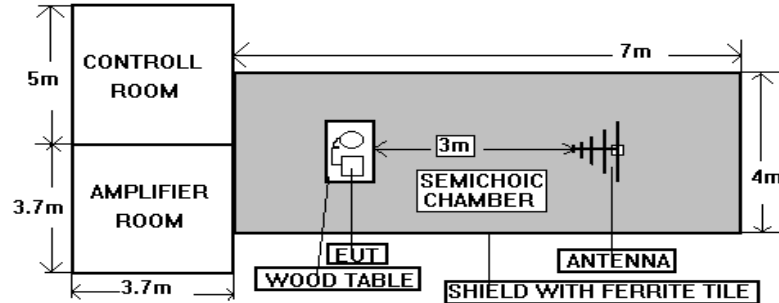
| Level | Test field strength<br>V/m |
|-------|----------------------------|
| 1     | 1                          |
| 2     | 3                          |
| 3     | 10                         |
| 4     | 30                         |
| x     | Specified                  |

Remark : "x" is an open test level and the associated field strength may be any value. This level may be given in the product standard.

#### 5.3.3. Test Procedure

- a). The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
- b). The bilog antenna which is enabling the complete frequency range of 80 to 1000 MHz, The horn antenna which is enabling the complete frequency range 1000 to 5000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
- c). The test is normally performed with the generating antenna facing each of four sides of the EUT. The polarization of the field generated by the broadband (bilog) antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.
- d). The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency(ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- e). At each of the above conditions, the frequency range is swept 80 to 5000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of  $1.5 \times 10^{-3}$  decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

**5.3.4. Test Setup**



**NOTE :** The SPORTON 7m x 4m x 4m semi-anechoic chamber is compliance with the sixteen point's uniform field requirement as stated in IEC 61000-4-3 Section 6.2.

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

**5.3.5. Test Result**

|                               |                                       |                          |             |
|-------------------------------|---------------------------------------|--------------------------|-------------|
| <b>Test mode</b>              | Mode 1                                |                          |             |
| <b>Applicable Standard</b>    | EN 55035:2017                         | <b>Final Test Result</b> | <b>PASS</b> |
| <b>Frequency Range(swept)</b> | 80 to 1000 MHz                        |                          |             |
| <b>Frequency Range(spot)</b>  | 1800,2600,3500,5000 MHz ( $\pm 1\%$ ) |                          |             |
| <b>Electromagnetic field</b>  | 3 V/m (unmodulated, r.m.s)            |                          |             |
| <b>Amplitude modulated</b>    | 80% AM (1 kHz)                        |                          |             |
| <b>Performance Criteria</b>   | A                                     |                          |             |

| Frequency Range<br>MHz | Test field strength<br>V/m | Antenna<br>Polarization | Azimuth<br>Degree | Test Result<br>(Criteria) | Remark |
|------------------------|----------------------------|-------------------------|-------------------|---------------------------|--------|
| 80~1000                | 3                          | V&H                     | 0, 90, 180, 270   | A                         | -      |
| 1800                   | 3                          | V&H                     | 0, 90, 180, 270   | A                         | -      |
| 2600                   | 3                          | V&H                     | 0, 90, 180, 270   | A                         | -      |
| 3500                   | 3                          | V&H                     | 0, 90, 180, 270   | A                         | -      |
| 5000                   | 3                          | V&H                     | 0, 90, 180, 270   | A                         | -      |

## 5.4. Power Frequency Magnetic Field (PFMF)

### 5.4.1. Test Specification

|                    |               |
|--------------------|---------------|
| Reference Standard | IEC 61000-4-8 |
| Frequency Range    | 50 or 60 Hz   |
| Inductance Coil    | 1 m x 1 m     |

### 5.4.2. Test Levels

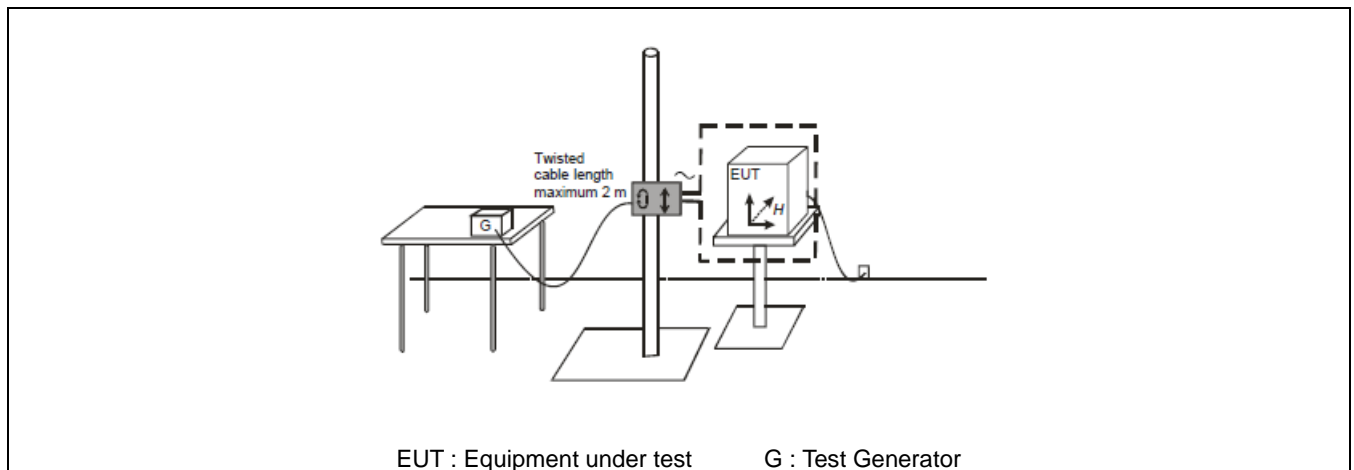
| Level | Magnetic field strength<br>A/m |
|-------|--------------------------------|
| 1     | 1                              |
| 2     | 3                              |
| 3     | 10                             |
| 4     | 30                             |
| 5     | 100                            |
| x     | Specified                      |

Remark : " x " can be any level, above, below or in-between the other levels. This level can be given in the products specification.

### 5.4.3. Test Procedure

- The equipment is configured and connected to satisfy its functional requirements.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

### 5.4.4. Test Setup





**5.4.5. Test Result**

|                             |               |                          |                |
|-----------------------------|---------------|--------------------------|----------------|
| <b>Test mode</b>            | Mode 1        |                          |                |
| <b>Applicable Standard</b>  | EN 55035:2017 | <b>Final Test Result</b> | <b>PASS</b>    |
| <b>Power-frequency</b>      | 50 Hz         | <b>Magnetic field</b>    | 1 A/m (r.m.s.) |
| <b>Performance Criteria</b> | A             |                          |                |

| <b>Power Frequency<br/>Magnetic Field</b> | <b>Testing<br/>duration</b> | <b>Coil<br/>Orientation</b> | <b>Test Result<br/>(Criteria)</b> | <b>Remark</b> |
|---|-----------------------------|-----------------------------|-----------------------------------|---------------|
| 50Hz, 1A/m                                | 1.0 Min                     | X-axis                      | A                                 | -             |
| 50Hz, 1A/m                                | 1.0 Min                     | Y-axis                      | A                                 | -             |
| 50Hz, 1A/m                                | 1.0 Min                     | Z-axis                      | A                                 | -             |



## 6. Uncertainty of Test Site

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

### 6.1. Emission Test Measurement Uncertainty

| Test Items                    | Test Site No. | $U_{LAB}$ |
|-------------------------------|---------------|-----------|
| Conducted Emissions           | CO01-NH       | 2.7 dB    |
| Radiated Emissions below 1GHz | OS03-NH       | 5.9 dB    |
| Radiated Emissions above 1GHz | 03CH04-HY     | 6.47 dB   |



### 6.2. Immunity Test Measurement Uncertainty

- ESD Immunity (IEC 61000-4-2)

| Input quantity | $X_i$ | Uncertainty of $x_i$ |                                   | $u(x_i)$ | $c_i$ | $c_i u(x_i)$ | $kuc(y)$ |
|----------------|-------|----------------------|-----------------------------------|----------|-------|--------------|----------|
|                |       | %                    | Probability distribution function | %        |       | %            | %        |
| Current Peak   | $I_D$ | ± 0.8                | k=2                               | ± 0.4    | 1     | 0.39         | 0.78     |
| Current @ 30ns | 130   | ± 1.2                | k=2                               | ± 0.6    | 1     | 0.61         | 1.23     |
| Current @ 60ns | 160   | ± 2.3                | k=2                               | ± 1.2    | 1     | 1.17         | 2.33     |
| Rising Time    | T     | ± 2.0                | k=2                               | ± 1.0    | 1     | 1.01         | 2.03     |

It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95% confidence

- RF Radiated Immunity (IEC 61000-4-3)

For 80MHz to 6,000 MHz:

Level setting uncertainty=1.7 dB

It has been demonstrated that the RS generator meets the specified requirements in the standard with at least a 95% confidence.



● **Magnetic Field Immunity (IEC 61000-4-8)**

**Power Frequency Magnetic Field Immunity**

**AC Current Accuracy Check**

| Freq.( Hz ) | Range (A) | Standard (A) | Reading (A) | Uncertainty (%) |
|-------------|-----------|--------------|-------------|-----------------|
| 50          | 0~10      | 1.038        | 1           | 0.3             |
| 50          | 0~10      | 3.091        | 3           | 0.3             |
| 50          | 0~10      | 10.254       | 10          | 0.3             |
| 50          | 10~125    | 10.183       | 10          | 0.3             |
| 50          | 10~125    | 30.45        | 30          | 0.3             |
| 50          | 10~125    | 101.23       | 100         | 0.3             |
| 60          | 0~10      | 1.06         | 1           | 0.3             |
| 60          | 0~10      | 3.26         | 3           | 0.3             |
| 60          | 0~10      | 10.85        | 10          | 0.3             |
| 60          | 10~125    | 10.9         | 10          | 0.3             |
| 60          | 10~125    | 32.6         | 30          | 0.3             |
| 60          | 10~125    | 108.8        | 100         | 0.3             |

**Magnetic Measurement Check : (@50Hz)**

| Range (A) | Standard (A/m) | Reading (A) | Uncertainty (%) |
|-----------|----------------|-------------|-----------------|
| 0~10      | 1              | 1.06        | 1               |
| 0~10      | 3              | 3.26        | 1               |
| 0~10      | 10             | 10.85       | 1               |
| 10~125    | 10             | 10.9        | 1               |
| 10~125    | 30             | 32.6        | 1               |
| 10~125    | 100            | 108.8       | 1               |

**It has been demonstrated that the PFMF the specified requirements in the standard with at least a 95% confidence.**



## 7. List of Measuring Equipment Used

### Conducted Emission - Test Date: 06/Apr/2020

| Instrument   | Manufacturer       | Model No. | Serial No. | Characteristics | Calibration Date | Remark               |
|--------------|--------------------|-----------|------------|-----------------|------------------|----------------------|
| EMI Receiver | R&S                | ESR3      | 102318     | 9K Hz – 3.6 GHz | 30/Jul/2019      | Conduction (CO01-NH) |
| LISN         | SCHAFFNER          | NNB41     | 06/10024   | 9kHz - 30MHz    | 27/Dec/2019      | Conduction (CO01-NH) |
| LISN         | ROLF HEINE         | NNB-2/16Z | 99079      | 9kHz - 30MHz    | 10/Jan/2020      | Conduction (CO01-NH) |
| Power Filter | CORCOM             | MR12030   | N/A        | 30A*2           | NCR              | Conduction (CO01-NH) |
| RF Cable-CON | Suhner Switzerland | RG223/U   | CB004      | 9kHz - 30MHz    | 26/Dec/2019      | Conduction (CO01-NH) |
| software     | Audix              | E3        | 6.12160806 | -               | NCR              | Conduction (CO01-NH) |

Note: Calibration Interval of instruments listed above is one year. NCR: No Calibration Request.

### Radiated Emission below 1GHz - Test Date: 06/Apr/2020

| Instrument                        | Manufacturer | Model No. | Serial No. | Characteristics           | Calibration Date | Remark              |
|-----------------------------------|--------------|-----------|------------|---------------------------|------------------|---------------------|
| Open Area Test Site               | SPORTON      | OATS-10   | OS03-NH    | 30 MHz - 1 GHz<br>10m, 3m | 22/Oct/2019      | Radiation (OS03-NH) |
| Amplifier                         | HP           | 8447D     | 2944A08292 | 0.1 MHz - 1.3 GHz         | 04/Jul/2019      | Radiation (OS03-NH) |
| Spectrum Analyzer                 | R&S          | FSP7      | 838858/038 | 9 kHz – 7GHz              | 16/Apr/2019      | Radiation (OS03-NH) |
| Receiver                          | R&S          | ESCS30    | 838251/002 | 9 kHz – 2.75 GHz          | 05/Jul/ 2019     | Radiation (OS03-NH) |
| Bilog Antenna With 5dB Attenuator | CHASE        | CBL6112D  | 25234      | 30 MHz - 2 GHz            | 27/Apr/2019      | Radiation (OS03-NH) |
| Turn Table                        | EMCO         | 2080      | 9805-2065  | 0 - 360 degree            | NCR              | Radiation (OS03-NH) |
| Antenna Mast                      | EMCO         | 2075      | 9804-2151  | 1 m - 4 m                 | NCR              | Radiation (OS03-NH) |
| RF Cable-R10m                     | HSCN         | RG213U    | 2X11N      | 30 MHz - 1 GHz            | 22/Jul/2019      | Radiation (OS03-NH) |
| Software                          | Audix        | E3        | Ver.4      | -                         | NCR              | Radiation (OS03-NH) |

Note: Calibration Interval of instruments listed above is one year. NCR: No Calibration Request.

**Radiated Emission above 1GHz - Test Date: 09/Apr/2020**

| Instrument                                 | Manufacturer | Model No.   | Serial No.         | Characteristics      | Calibration Date | Remark                   |
|--|--------------|-------------|--------------------|----------------------|------------------|--------------------------|
| EMI Test Receiver                          | R&S          | ESU-26      | 100422             | 20Hz ~ 26.5GHz       | 23/Oct/2019      | Radiation<br>(03CH04-HY) |
| Turn Table                                 | Chaintek     | 3000        | MF7802056          | 0 ~ 360 degree       | NCR              | Radiation<br>(03CH04-HY) |
| Antenna Mast                               | MF           | MF-7802     | MF780208163        | 1 m ~ 4 m            | NCR              | Radiation<br>(03CH04-HY) |
| 3m Semi Anechoic Chamber<br>(Site V.S.W.R) | RIKEN        | 3m SAC      | 03CH04-HY          | 1 GHz ~ 18 GHz<br>3m | 27/Feb/2020      | Radiation<br>(03CH04-HY) |
| Microwave Preamplifier                     | Agilent      | 8449B       | 3008A02364         | 1GHz ~ 26.5GHz       | 12/Dec/2019      | Radiation<br>(03CH04-HY) |
| Horn Antenna                               | SCHWARZBECK  | BBHA9120    | BBHA 9120 D-1130   | 1 GHz ~ 18 GHz       | 04/Nov/2019      | Radiation<br>(03CH04-HY) |
| RF Cable-HIGH                              | HUBER+SUHNER | SUOFLEX 104 | SN805197/4+MY39497 | 1 GHz ~ 18 GHz       | 13/Mar/2020      | Radiation<br>(03CH04-HY) |
| Software                                   | Sporton      | SENSE-EMI   | V5.10.7.2          | -                    | NCR              | Radiation<br>(03CH04-HY) |

Note: Calibration Interval of instruments listed above is one year. NCR: No Calibration Request.



**EMS - Test Date: 10/Apr/2020 ~ 07/May/2020**

| Instrument                   | Manufacturer        | Model No.            | Serial No.         | Characteristics                                  | Calibration Date | Calibration Due Date | Remark           |
|------------------------------|---------------------|----------------------|--------------------|--|------------------|----------------------|------------------|
| ESD Simulator                | TESEQ               | NSG437               | 1193               | Air: 0 ~ 30kV<br>Contact: 0 ~ 30kV               | 11/Jul/2019      | 10/Jul/2020          | ESD              |
| Magnetic field Immunity Loop | FCC (KEYTEK)        | F-1000-4-8/9/10-L-1M | 05004, 03004       | 30A//CONTINUOUS<br>US<br>100A/2Hrs<br>230A/30SEC | 09/Oct/2019      | 08/Oct/2020          | Magnetic         |
| Magnetic Generator           | FCC (KEYTEK)        | F-1000-4-8-G-1-25A   | 05004, 03004       | 30A//CONTINUOUS<br>US<br>100A/2Hrs<br>230A/30SEC | 09/Oct/2019      | 08/Oct/2020          | Magnetic         |
| Harmonic/Flicker Test System | TESEQ               | CCN1000-1            | 72471              | 4000VA<br>16A PEAK                               | 01/Apr/2020      | 31/Mar/2021          | Harmonic/Flicker |
| AC Power Source              | TESEQ               | NSG 1007-5           | 1510A00144         | 16A PEAK   | 01/Apr/2020      | 31/Mar/2021          | Harmonic/Flicker |
| Software                     | TESEQ               | Win2100v4            | Version4.6.0(2014) | -  | NCR              | NCR                  | Harmonic/Flicker |
| Signal Generator             | ROHDE&SCHWARZ       | SMB100A              | 108589             | 9kHz ~ 6GHz                                      | 14/May/2019      | 13/May/2020          | RS               |
| Power Amplifier              | MILMEGA             | 80RF1000-300         | 1079234            | 80MHz ~ 1GHz,<br>300W                            | NCR              | NCR                  | RS               |
| Power Amplifier              | MILMEGA             | AS0860B-50/50        | 1079525            | 0.8 ~ 6GHz ,50W(0.8GHz~2GHz and 1.8GHz~6.0GHz)   | NCR              | NCR                  | RS               |
| AMPLIFIER CONTROLLER         | MILMEGA             | AC-001               | N/A                | N/A  | NCR              | NCR                  | RS               |
| Antenna                      | AR                  | ATL80M1G             | 348541             | 80MHz ~ 1GHz,<br>30W                             | NCR              | NCR                  | RS               |
| Antenna                      | SCHWARZBECK         | STLP 9149            | STLP9149 #490      | 700MHz ~ 10.5GHz                                 | NCR              | NCR                  | RS               |
| EPM Series Power Meter       | KEYSIGHT            | N1914A               | MY57070002         | 9 kHz to 110 GHz                                 | 24/Apr/2019      | 23/Apr/2020          | RS               |
| Avg Power Sensor             | KEYSIGHT            | E9304A               | MY57020004         | 9kHz ~ 6GHz                                      | 24/Apr/2019      | 23/Apr/2020          | RS               |
| Avg Power Sensor             | KEYSIGHT            | E9304A               | MY57030009         | 9kHz ~ 6GHz                                      | 24/Apr/2019      | 23/Apr/2020          | RS               |
| Fiber Optic modem            | ETS-LINDGREN        | HI-4413P             | N/A                | N/A  | NCR              | NCR                  | RS               |
| Dual Directional Coupler     | WERLATONE           | C10117-10            | 112093             | N/A  | NCR              | NCR                  | RS               |
| Dual Directional Coupler     | WERLATONE           | C3908-10             | 112109             | N/A  | NCR              | NCR                  | RS               |
| RS immunity Test system      | Sporton combination | Sporton RS           | RS06HY             | 3V/m , 80MHz ~ 6GHz                              | 19/Sep/2019      | 18/Sep/2020          | RS               |
| RF-SWITCH NETWORK            | TESEQ               | RFB 2000             | 45818              | N/A  | NCR              | NCR                  | RS               |
| Probe                        | ETS-LINDGREN        | HI-6005              | 00052473           | 0.1 MHz - 6 GHz                                  | 10/May/2019      | 09/May/2020          | RS               |
| Software                     | Audix               | i2                   | Version:5          | -  | NCR              | NCR                  | RS               |

NCR: No Calibration Request.

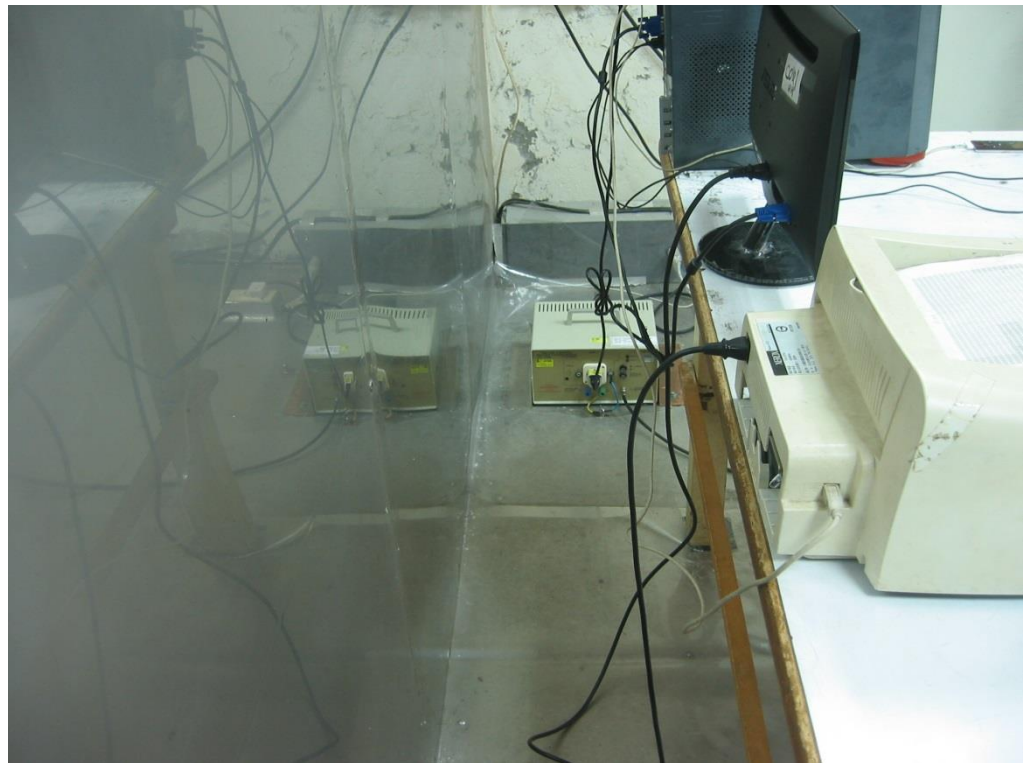
## Appendix A. Test Photos

### 1. Photographs of Conducted Emissions Test Configuration

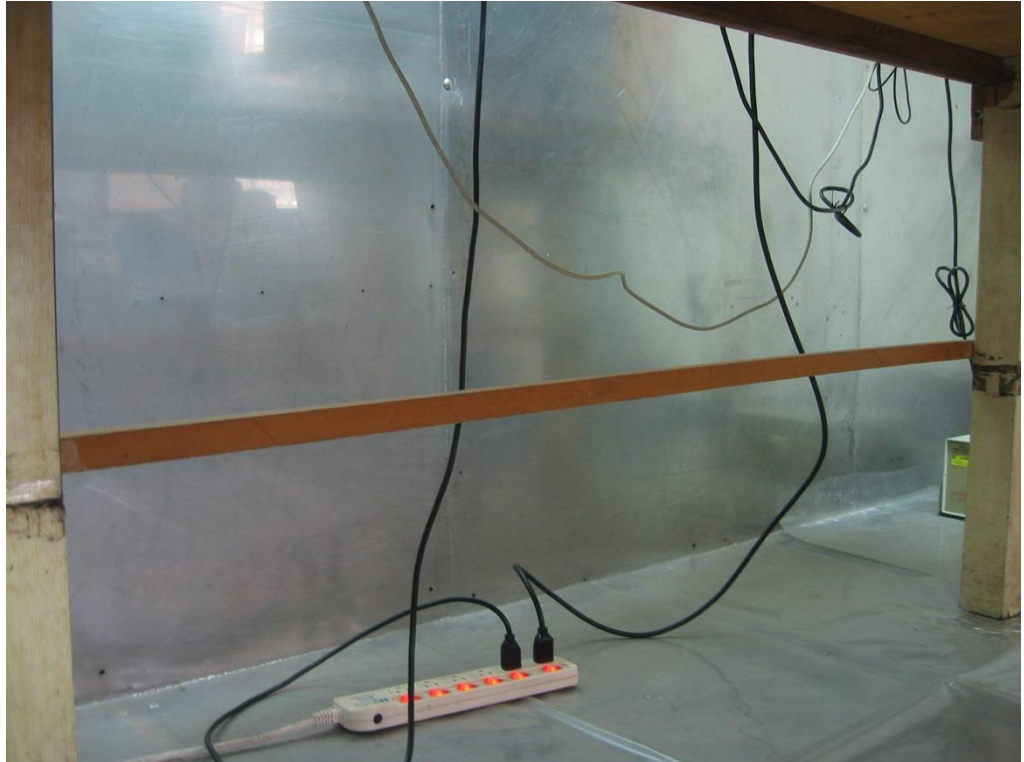
Front View



Side View



**Under Table View**



### 3. Photographs of Radiated Emissions Test Configuration

For radiated emissions below 1GHz

Front View

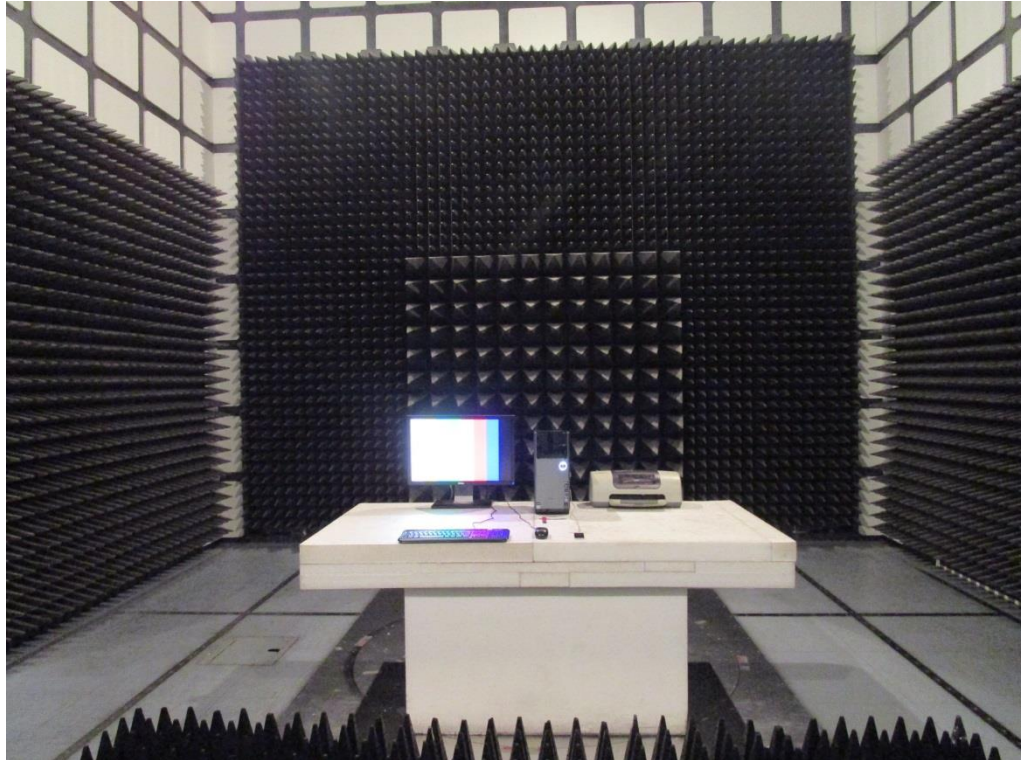


Rear View



For radiated emissions above 1GHz

Front View

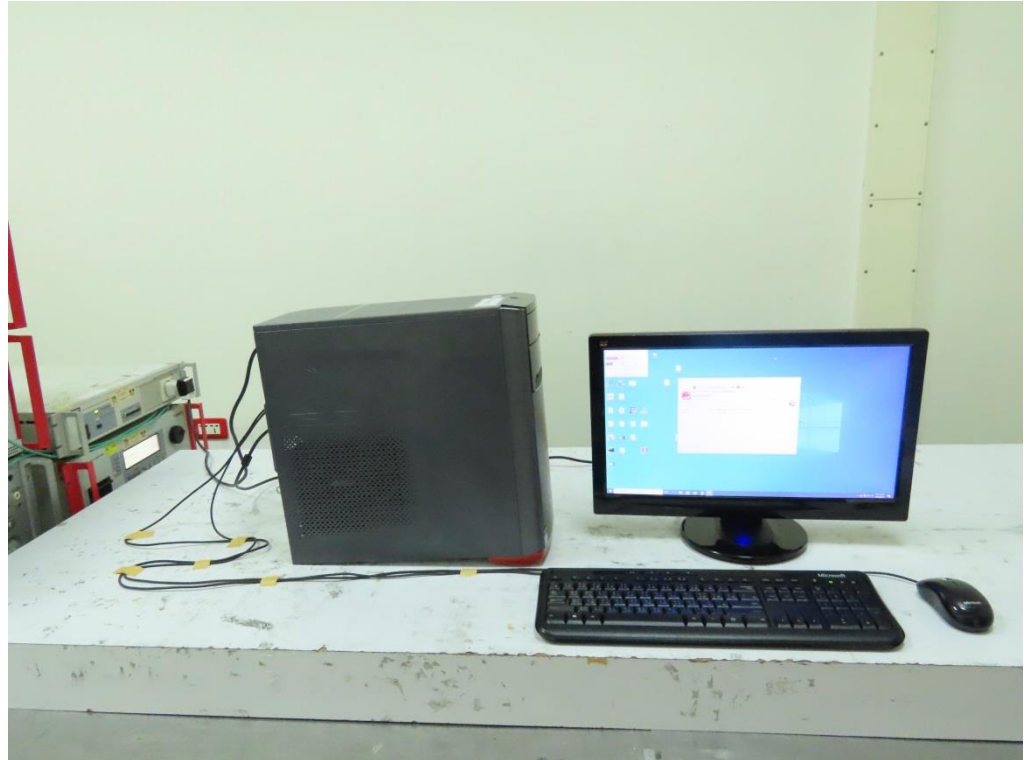


Rear View



#### 4. Photographs of Harmonic, Flicker Test Configuration

Front View



## 6. Photographs of ESD Immunity Test Configuration

Front View

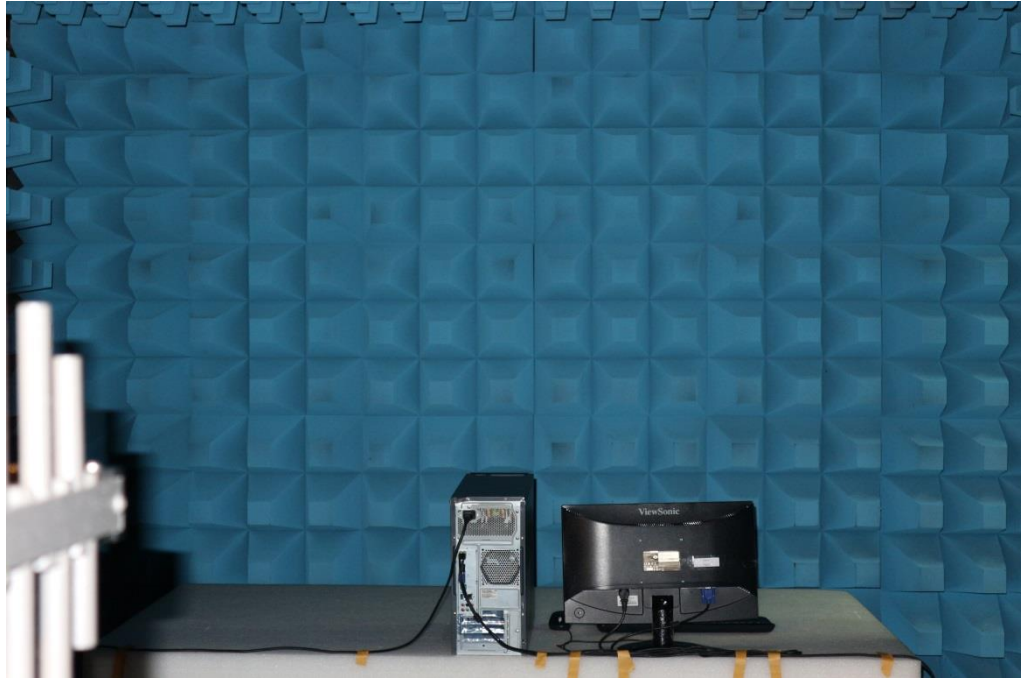


Rear View



## 7. Photographs of RS Immunity Test Configuration

Front View



Rear View



## 8. Power Frequency Magnetic Field immunity Measurement (PFMF)

Front View



—THE END—