# FCC SDoC Test Report

| | | |
|---|---|---|
| **Filing Type** | : | **Supplier's Declaration Of Conformity** |
| **Product** | : | **Industrial MicroSD** |
| **Model Name** | : | **Industrial MicroSD(HC)** |
| **Applicant** | : | **APACER TECHNOLOGY INC**<br>**1F., No.32, Zhongcheng Rd., Tucheng Dist.,**<br>**New Taipei City 236, Taiwan** |
| **Manufacturer** | : | **APACER TECHNOLOGY INC**<br>**1F., No.32, Zhongcheng Rd., Tucheng Dist.,**<br>**New Taipei City 236, Taiwan** |
| **Standard** | : | **47 CFR FCC Rules and Regulations Part 15**<br>**Subpart B, Class B Digital Device** |

**The product was received on Sep. 07, 2020, and testing was started from Sep. 07, 2020 and completed on Sep. 11, 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 ANSI C63.4-2014 and shown compliance with the applicable technical standards.**

**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**

**SDoC by:**

***SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory***

*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

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# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FD090316 | 01 | Initial issue of report | Sep. 30, 2020 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 4 | 15.107 | Conducted Emissions of Powerline | PASS | Under limit 7 dB at 28.96 MHz |
| 5.1 | 15.109 | Radiated Emissions below 1GHz | PASS | Under limit 4.12 dB at 960 MHz |
| 5.2 | 15.109 | Radiated Emissions above 1GHz | PASS | Under limit 27.36 dB at 1.196 GHz |

| **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: Ann Hou**

# 1. General Description of Equipment under Test

## 1.1. Basic Description of Equipment under Test

Equipment : Industrial MicroSD
Model No. : Industrial MicroSD(HC)
Power Supply Type : From Host system
The maximum operating frequency : 208MHz

## 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. Modification of EUT

No modifications to the EUT were made.

# 2. Test Configuration of Equipment under Test

## 2.1. Details of EUT Test Modes

From the above models, Model: Industrial MicroSD(HC) was selected as representative model for the test and its data was recorded in this report. The equipment under test were performed the following test modes:

| Test Items | Description of test modes |
|---|---|
| **Conducted Emission** | Mode 1. Read/Write |
| **Radiated Emissions <below 1GHz>** | Mode 1. Read/Write |
| **Radiated Emissions <above 1GHz>** | Mode 1. Read/Write |

## 2.2. Description of Test System

**Conducted emission and radiated emission below 1GHz**

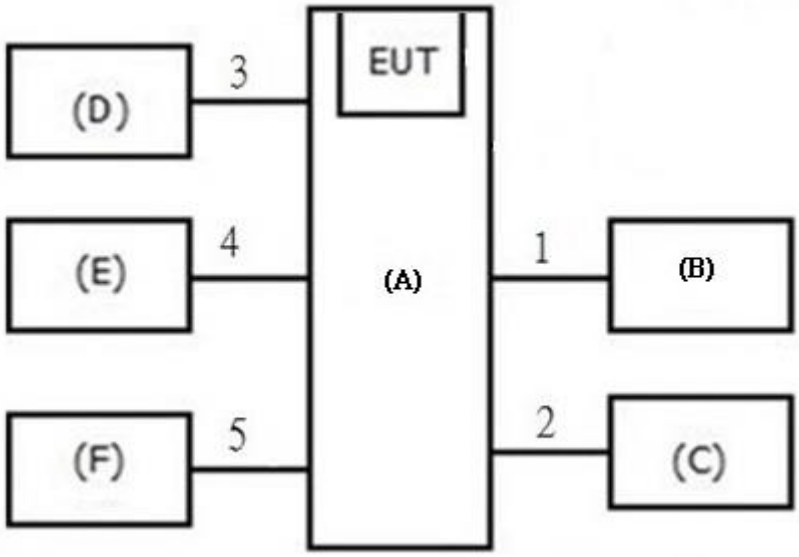
| No. | Peripheral | Manufacturer | Model Number | FCC ID | Remarks |
|---|---|---|---|---|---|
| **For Local** | | | | | |
| A | Personal Computer | ASUS | M32CD | DoC | - |
| B | LCD Monitor | ASUS | VS197DE | DoC | - |
| C | Keyboard | ASUS | AW211 | DoC | - |
| D | Mouse | ASUS | MOBTUO | DoC | - |
| E | Printer | Fuji Xerox | Phaser 3121 | DoC | - |
| F | Portable External HDD | PQI | H566 | DoC | - |

**Radiated emission above 1GHz**

| No. | Peripheral | Manufacturer | Model Number | FCC ID | Remarks |
|---|---|---|---|---|---|
| **For Local** | | | | | |
| A | Personal Computer | HP | HP Compaq 8300 | DoC | - |
| B | LCD Monitor | DELL | UltraSharp U2410f | DoC | - |
| C | Keyboard | Microsoft | 1366 | DoC | - |
| D | Mouse | Microsoft | 1113 | DoC | - |
| E | Printer | EPSON | C61 | N/A | - |
| F | iPod nano | Apple | A1285 | DoC | - |

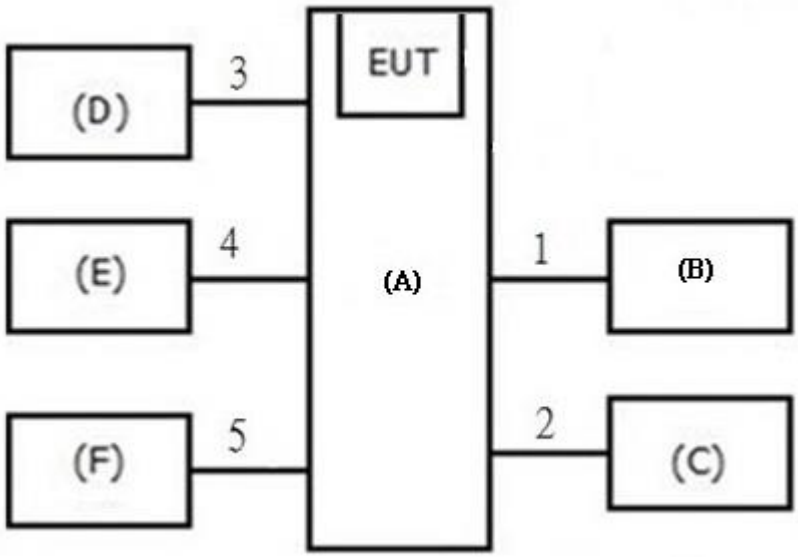
## 2.3. Connection Diagram of Test System

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




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

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




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

## 2.4. Test Manner

An executive program, “EMIprogram.exe” under WIN 10 was used as the test software. The program was executed as follows:

- The PC executed "BurnInTest" to sends "H" pattern to the monitor, and the monitor displays "H" patterns on the screen.
- The PC executed "BurnInTest" which reads/writes to the EUT (MicroSD)/HDD.
- The PC opened "Word" to send "H" messages to the printer, and then the printer prints them on the paper.

# 3. General Information of Test

## 3.1. Test Facilities

| Test Site：SPORTON INTERNATIONAL INC. | | |
|---|---|---|
| ☒ | 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<br>FCC Designation Number: TW1093 |
| ☒ | 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<br>FCC Designation Number: TW1094 |
| ☐ | 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<br>FCC Designation Number: TW1095 |

| Test Items | Test Site No. | Test Engineer | Test Environment | | Test Date | Remark |
|---|---|---|---|---|---|---|
| | | | temp °C | hum % | | |
| Conducted Emissions of Powerline | CO01-NH | Willy Lee | 25.5~25.8 | 52~53 | 08/Sep/2020 | - |
| Radiated Emissions below 1GHz | OS02-NH | Chas Yeh | 28.8~29.0 | 50.1~50.3 | 09/Sep/2020 | - |
| Radiated Emissions above 1GHz | 03CH01-HY | Yen-Liang | 26.5~27.5 | 56~58 | 11/Sep/2020 | - |

## 3.2. Test Standards

| Test items | Test Standards and Test Procedures |
|---|---|
| Radiated and Conducted Emissions | ANSI C63.4:2014 with FCC Method 47 CFR Part 15, Subpart B, Class B Digital Device, CISPR PUB. 22 |

## 3.3. Test Voltage/Frequencies

| Power Supply Type | Voltage/Frequencies |
|---|---|
| AC Power Supply | 120V / 60Hz |

## 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 2,000 MHz | Measurement distance is 3 m. |

## 3.5. Operating Condition

- Full system.

## 3.6. Labelling requirements

The devices shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## 3.7. User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.

# 4. Conducted Emissions Measurement

Conducted Emissions were measured according to the methods defined in ANSI C63.4-2014 Section 7.
The EUT is which satisfies the Class B disturbance limits.

## 4.1. Limit

| Limits for conducted disturbance at the mains ports of class B | | | |
|---|---|---|---|
| **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 1: The lower limit shall apply at the transition frequencies.<br>Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz. | | | |

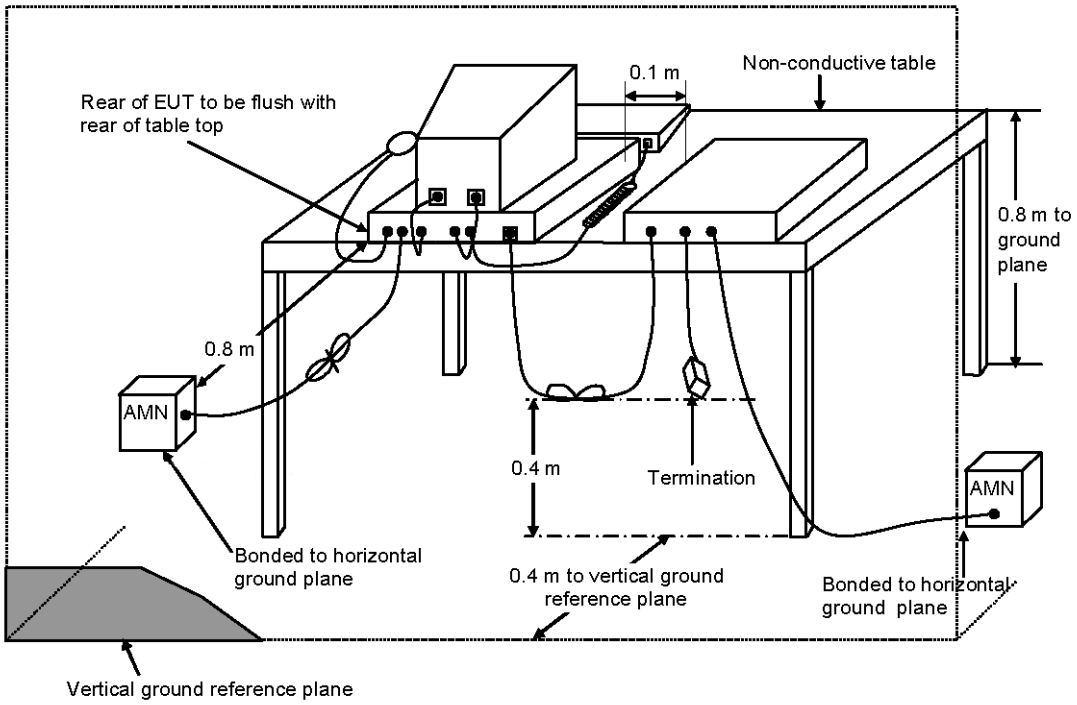
## 4.2. Test Procedures

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 FCC 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.

## 4.3. 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

## 4.4. Typical Test Setup Layout

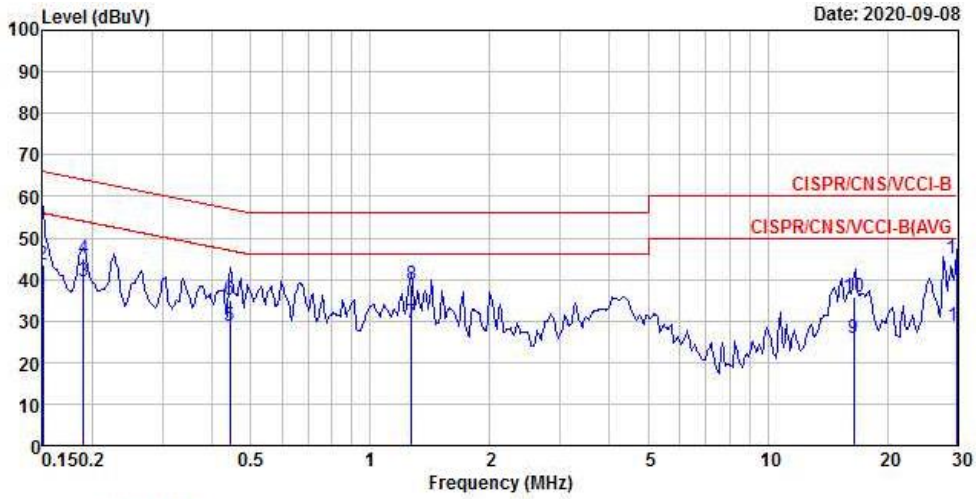



a). AMN is 80 cm from the EUT and at least 80 cm from other units and other metal planes.
b). EUT is connected to one artificial mains network (AMN).
c). All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
d). Rear of EUT to be flushed with rear of table top.
e). Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
f). If cables, which hang closer than 40 cm to the horizontal metal ground plane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
g). Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
h). Cables of hand operated devices, such as keyboards, mice, etc. shall be placed as for normal usage.

## 4.5. Test Result

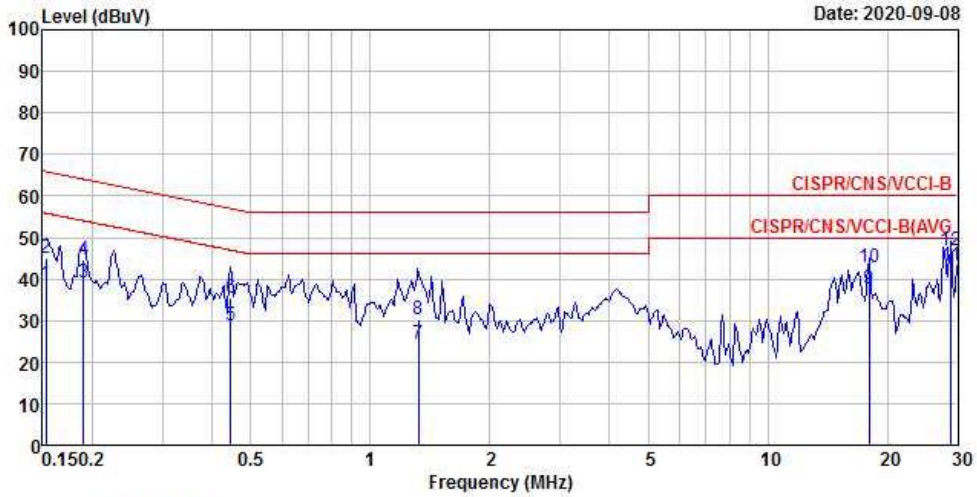
| Test Mode | Mode 1 | | |
|---|---|---|---|
| Test Frequency | 0.15 MHz ~ 30 MHz | Test Voltage | AC 120V / 60Hz |
| ■ The test was passed at the minimum margin that marked by the frame in the following data | | | |

**Line**




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.15 | 36.95 | -19.05 | 56.00 | 26.55 | 10.29 | 0.11 | Average |
| 2 | 0.15 | 43.57 | -22.43 | 66.00 | 33.17 | 10.29 | 0.11 | QP |
| 3 @ | 0.19 | 39.51 | -14.51 | 54.02 | 29.10 | 10.30 | 0.11 | Average |
| 4 | 0.19 | 44.89 | -19.13 | 64.02 | 34.48 | 10.30 | 0.11 | QP |
| 5 | 0.44 | 28.66 | -18.32 | 46.98 | 18.26 | 10.30 | 0.10 | Average |
| 6 | 0.44 | 35.20 | -21.78 | 56.98 | 24.80 | 10.30 | 0.10 | QP |
| 7 | 1.27 | 29.58 | -16.42 | 46.00 | 19.16 | 10.32 | 0.10 | Average |
| 8 | 1.27 | 38.60 | -17.40 | 56.00 | 28.18 | 10.32 | 0.10 | QP |
| 9 | 16.45 | 25.99 | -24.01 | 50.00 | 14.95 | 10.59 | 0.45 | Average |
| 10 | 16.45 | 35.66 | -24.34 | 60.00 | 24.62 | 10.59 | 0.45 | QP |
| 11 | 30.00 | 28.87 | -21.13 | 50.00 | 17.47 | 10.84 | 0.56 | Average |
| 12 | 30.00 | 45.09 | -14.91 | 60.00 | 33.69 | 10.84 | 0.56 | QP |

**Neutral**




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.15 | 38.57 | -17.25 | 55.82 | 28.17 | 10.29 | 0.11 | Average |
| 2 | 0.15 | 45.10 | -20.72 | 65.82 | 34.70 | 10.29 | 0.11 | QP |
| 3 | 0.19 | 39.11 | -14.91 | 54.02 | 28.70 | 10.30 | 0.11 | Average |
| 4 | 0.19 | 44.63 | -19.39 | 64.02 | 34.22 | 10.30 | 0.11 | QP |
| 5 | 0.45 | 28.70 | -18.25 | 46.95 | 18.29 | 10.31 | 0.10 | Average |
| 6 | 0.45 | 35.42 | -21.53 | 56.95 | 25.01 | 10.31 | 0.10 | QP |
| 7 | 1.32 | 24.46 | -21.54 | 46.00 | 14.03 | 10.33 | 0.10 | Average |
| 8 | 1.32 | 30.27 | -25.73 | 56.00 | 19.84 | 10.33 | 0.10 | QP |
| 9 | 17.96 | 37.74 | -12.26 | 50.00 | 26.62 | 10.66 | 0.46 | Average |
| 10 | 17.96 | 42.64 | -17.36 | 60.00 | 31.52 | 10.66 | 0.46 | QP |
| 11 @ | 28.96 | 43.00 | -7.00 | 50.00 | 31.54 | 10.92 | 0.54 | Average |
| 12 | 28.96 | 46.76 | -13.24 | 60.00 | 35.30 | 10.92 | 0.54 | QP |

# 5. Radiated Emissions Measurement

Radiated Emissions were measured according to the methods defined in ANSI C63.4-2014 Section 8.
The EUT is which satisfies the Class B disturbance limits.

## 5.1. Radiated Emission below 1GHz

### 5.1.1. Limit

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

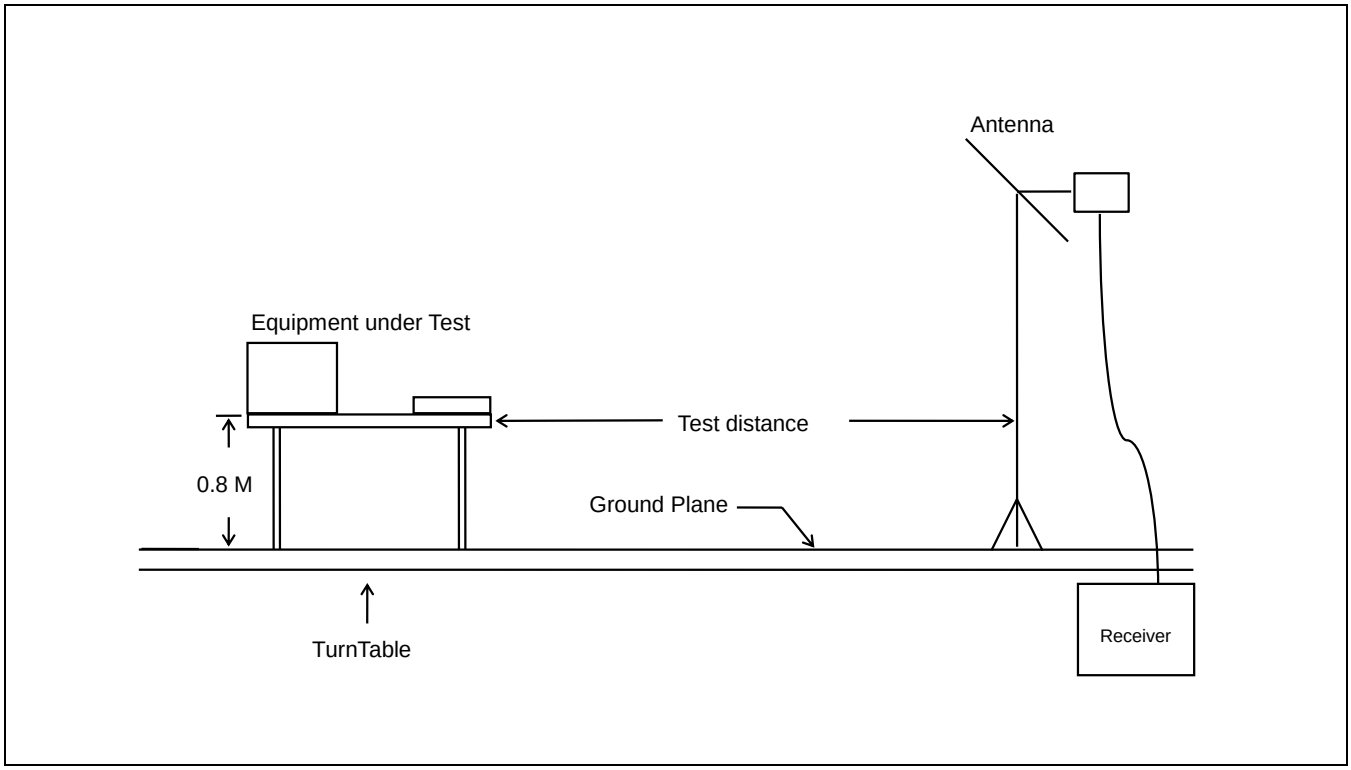
### 5.1.2. Test Procedures

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 FCC Part 15.109(g) permit parties seeking to authorize a digital device to choose to demonstrate that the device complies with either the Part 15 standards or the international standards found in Publication 22 of the International Special Committee on Radio Interference (CISPR).

### 5.1.3. 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 shell be the sum of the Antenna Factor + Attenuator Factor.

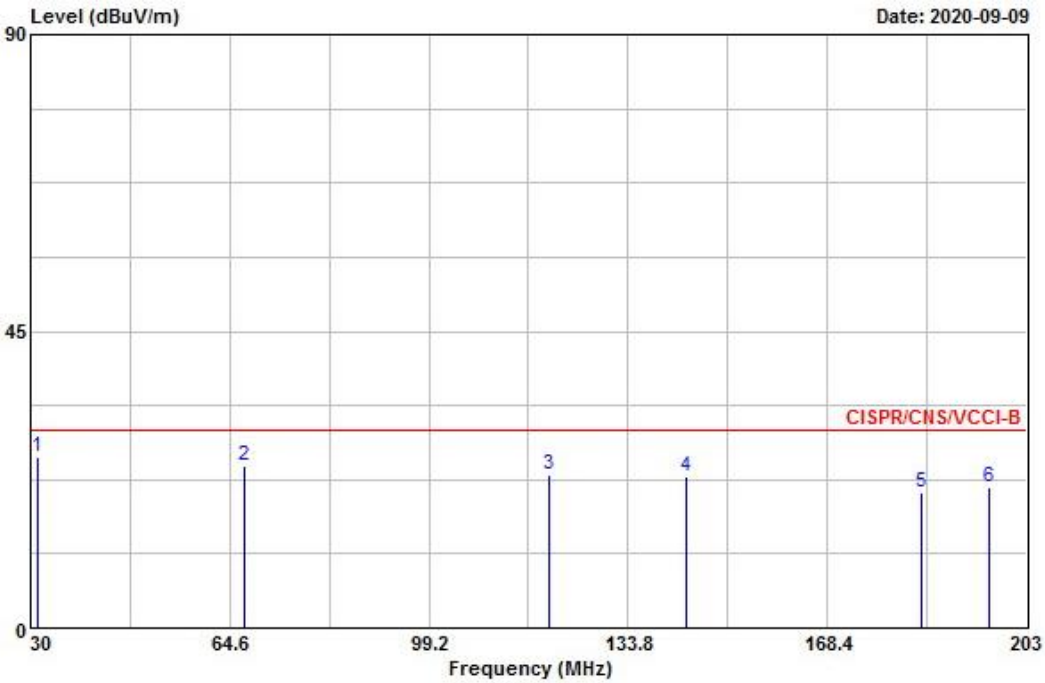
### 5.1.4. Typical Test Setup Layout



### 5.1.5. Test Result

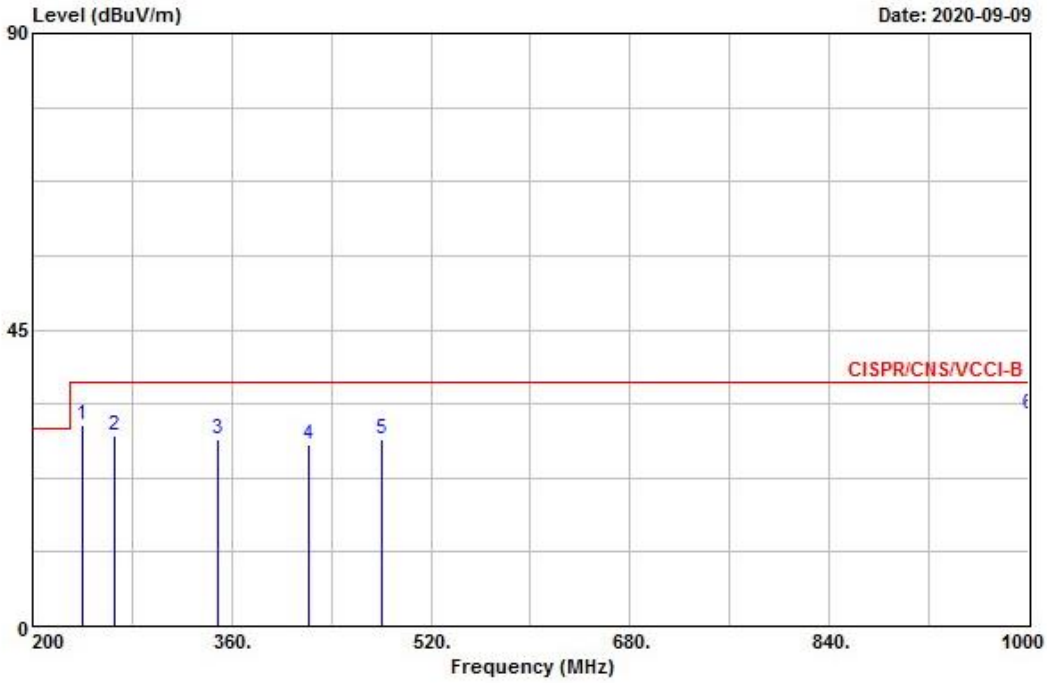
| Test mode | Mode 1 | | |
|---|---|---|---|
| Test frequency | 30 MHz ~ 1000 MHz | Test Voltage | AC 120V / 60Hz |
| ■ The test was passed at the minimum margin that marked by the frame in the following data | | | |

**Vertical**



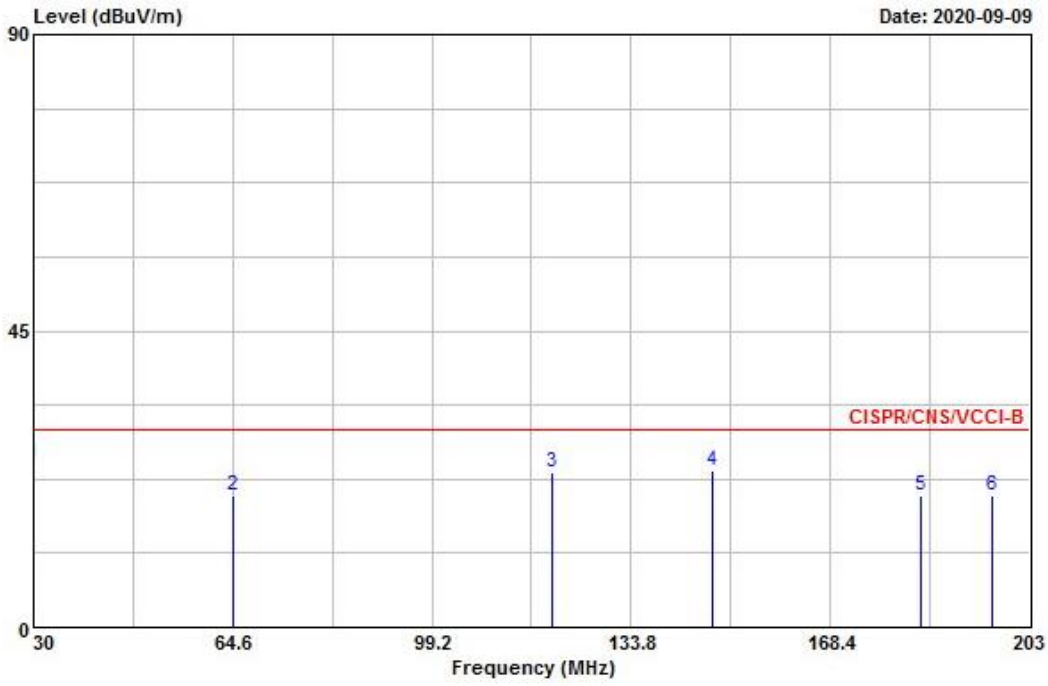

| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 @ | 31.210 | 25.82 | -4.18 | 30.00 | 29.67 | 22.59 | 1.02 | 27.46 | Peak | --- | --- |
| 2 @ | 67.200 | 24.64 | -5.36 | 30.00 | 39.40 | 11.19 | 1.40 | 27.35 | Peak | --- | --- |
| 3 | 119.960 | 23.14 | -6.86 | 30.00 | 31.64 | 16.91 | 1.80 | 27.21 | Peak | --- | --- |
| 4 | 144.010 | 23.07 | -6.93 | 30.00 | 32.40 | 15.77 | 2.02 | 27.12 | Peak | --- | --- |
| 5 | 184.660 | 20.56 | -9.44 | 30.00 | 31.39 | 13.88 | 2.22 | 26.93 | Peak | --- | --- |
| 6 | 196.600 | 21.33 | -8.67 | 30.00 | 31.92 | 14.00 | 2.28 | 26.87 | Peak | --- | --- |

**Vertical**



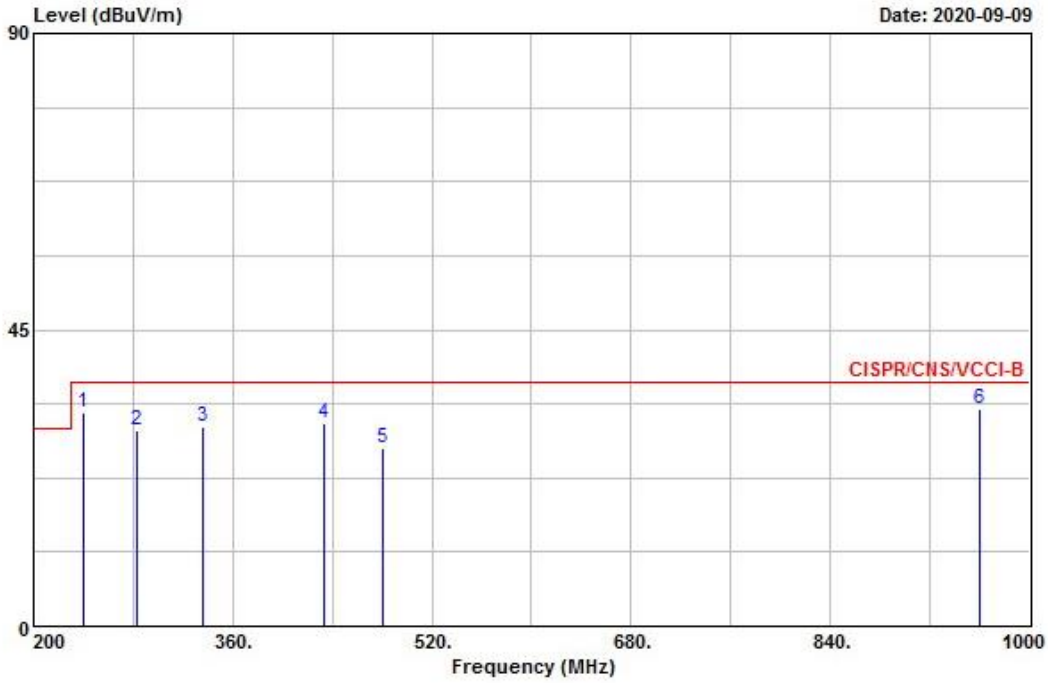

| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 240.000 | 30.66 | -6.34 | 37.00 | 38.69 | 16.13 | 2.54 | 26.70 | Peak | --- | --- |
| 2 | 265.600 | 28.97 | -8.03 | 37.00 | 34.83 | 18.08 | 2.73 | 26.67 | Peak | --- | --- |
| 3 | 348.800 | 28.35 | -8.65 | 37.00 | 32.75 | 19.34 | 3.29 | 27.03 | Peak | --- | --- |
| 4 | 421.600 | 27.67 | -9.33 | 37.00 | 29.94 | 21.91 | 3.50 | 27.68 | Peak | --- | --- |
| 5 | 480.000 | 28.31 | -8.69 | 37.00 | 30.46 | 22.33 | 3.56 | 28.04 | Peak | --- | --- |
| 6 @ | 1000.000 | 32.14 | -4.86 | 37.00 | 27.42 | 26.47 | 5.50 | 27.25 | Peak | --- | --- |

**Horizontal**




| | Freq | Level | Over Limit | Limit Line | Read 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 @ | 30.000 | 24.75 | -5.25 | 30.00 | 27.94 | 23.28 | 1.00 | 27.47 | Peak | --- | --- |
| 2 | 64.600 | 19.89 | -10.11 | 30.00 | 34.71 | 11.13 | 1.40 | 27.35 | Peak | --- | --- |
| 3 | 119.960 | 23.64 | -6.36 | 30.00 | 32.14 | 16.91 | 1.80 | 27.21 | Peak | --- | --- |
| 4 | 147.990 | 23.69 | -6.31 | 30.00 | 33.17 | 15.58 | 2.04 | 27.10 | Peak | --- | --- |
| 5 | 184.140 | 19.93 | -10.07 | 30.00 | 30.76 | 13.88 | 2.22 | 26.93 | Peak | --- | --- |
| 6 | 196.600 | 20.08 | -9.92 | 30.00 | 30.67 | 14.00 | 2.28 | 26.87 | Peak | --- | --- |

**Horizontal**




| | Freq | Level | Over Limit | Limit Line | Read 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 @ | 240.000 | 32.46 | -4.54 | 37.00 | 40.49 | 16.13 | 2.54 | 26.70 | QP | --- | --- |
| 2 | 283.200 | 29.86 | -7.14 | 37.00 | 35.79 | 17.87 | 2.87 | 26.67 | Peak | --- | --- |
| 3 | 336.000 | 30.25 | -6.75 | 37.00 | 35.12 | 18.86 | 3.21 | 26.94 | Peak | --- | --- |
| 4 | 432.800 | 30.79 | -6.21 | 37.00 | 33.26 | 21.81 | 3.50 | 27.78 | Peak | --- | --- |
| 5 | 480.000 | 26.95 | -10.05 | 37.00 | 29.10 | 22.33 | 3.56 | 28.04 | Peak | --- | --- |
| 6 @ | 960.000 | 32.88 | -4.12 | 37.00 | 29.29 | 25.76 | 5.42 | 27.59 | Peak | 100 | 346 |

## 5.2. Radiated Emission above 1GHz

### 5.2.1. Limit

| radiated emissions at frequencies above 1 GHz for Class B equipment | | | |
|---|---|---|---|
| **Frequency range** GHz | **Measurement** | | **Class B limits** |
| | **Distance** (m) | **Detector type / RBW / VBW** | **dB(μV/m)** |
| 1 – 2 | 3 | Average / 1MHz / 1Hz | 54 |
| 1 – 2 | | Peak / 1MHz / 3MHz | 74 |

| Required highest frequency for radiated measurement | |
|---|---|
| **Highest internal frequency ($F_x$)** | **Highest measured frequency** |
| $F_x \leq 108$ MHz | 1 GHz |
| 108 MHz < $F_x \leq 500$ MHz | 2 GHz |
| 500 MHz < $F_x \leq 1$ GHz | 5 GHz |
| $F_x > 1$ GHz | 5 x $F_x$ up to a maximum of 40 GHz |

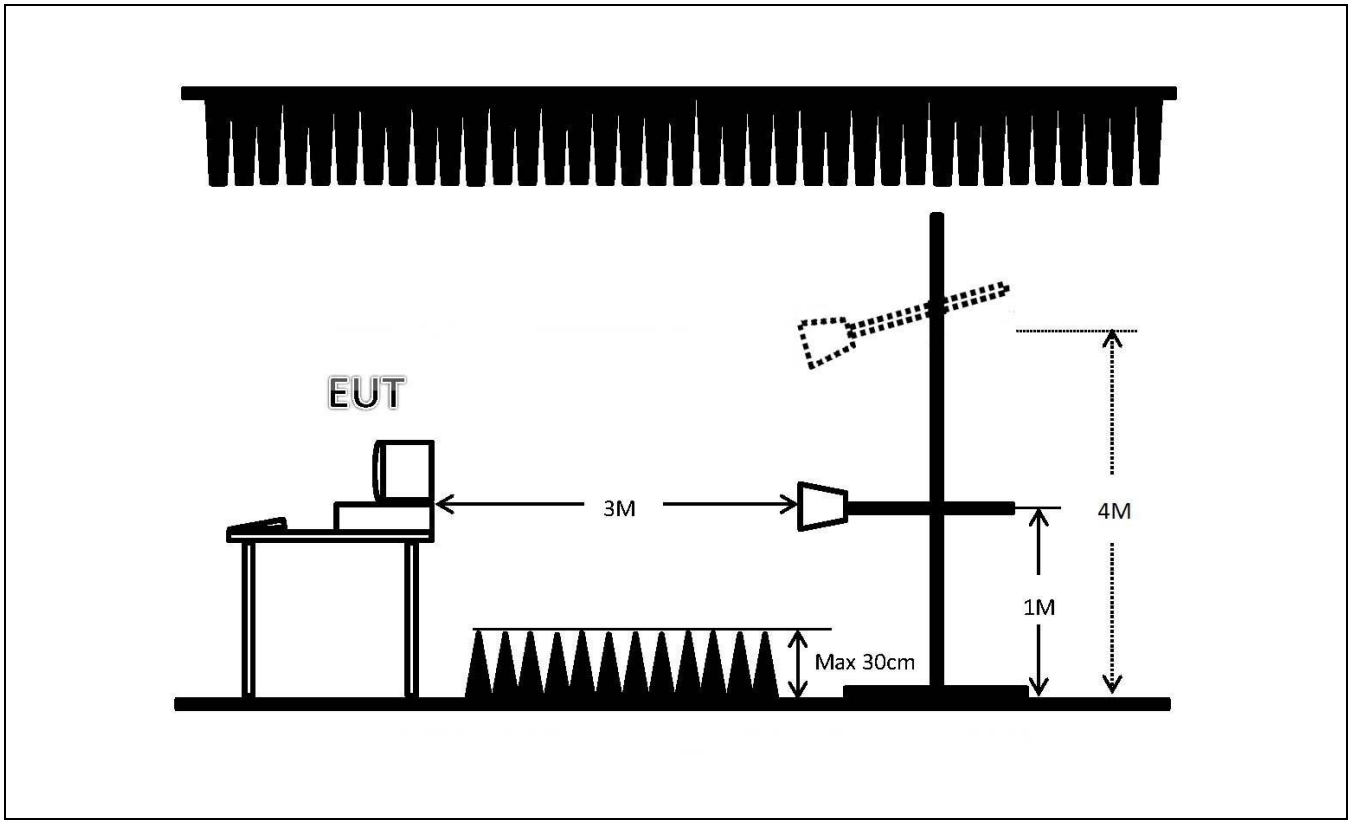
### 5.2.2. Test Procedures

a). Same test set up as below 1GHz radiated testing.
b). The EUT was set 3m (1 – 2GHz) 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). If the EUT is having a Wireless or Bluetooth modular, install the filter at the input connector of test-receiver system.
g). 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.
h). 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.
i). 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.

### 5.2.3. 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

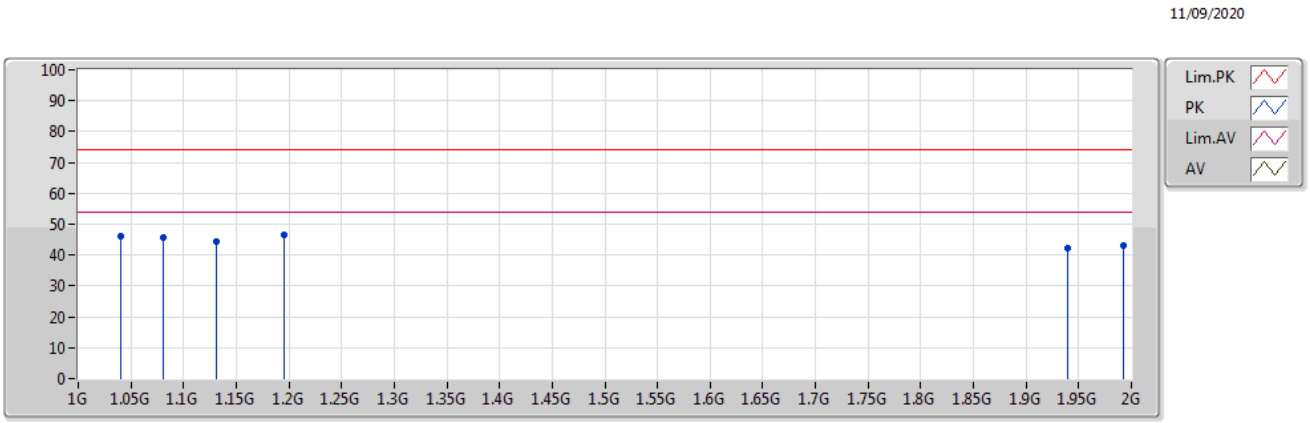
### 5.2.4. Typical Test Setup Layout



## 5.2.5. Test Result

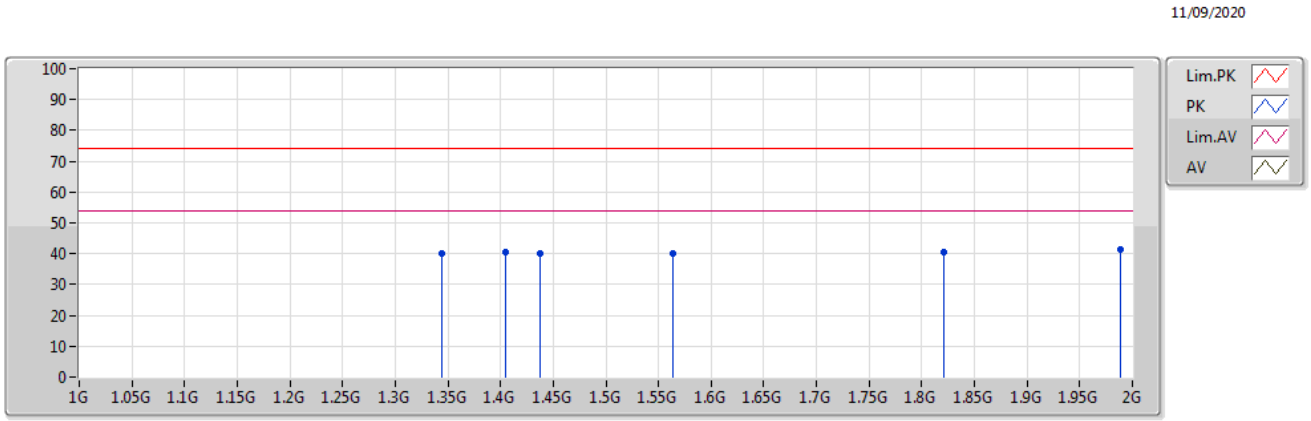
| Test mode | Mode 1 | | |
|---|---|---|---|
| Test frequency | Above 1GHz | Test Voltage | AC 120V / 60Hz |
| ■ The test was passed at the minimum margin that marked by the frame in the following data | | | |

**Vertical**




| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB/m) | (dB) | (dB) |
| PK | 1.04G | 46.02 | 74.00 | -27.98 | -8.60 | 3 | Vertical | - | - | - | 54.62 | 24.34 | 2.88 | 35.82 |
| PK | 1.081G | 45.85 | 74.00 | -28.15 | -8.50 | 3 | Vertical | - | - | - | 54.35 | 24.28 | 2.96 | 35.74 |
| PK | 1.131G | 44.33 | 74.00 | -29.67 | -7.77 | 3 | Vertical | - | - | - | 52.10 | 24.82 | 3.06 | 35.65 |
| PK | 1.196G | 46.64 | 74.00 | -27.36 | -7.05 | 3 | Vertical | 351 | 1 | "Worst" | 53.69 | 25.29 | 3.19 | 35.53 |
| PK | 1.94G | 42.45 | 74.00 | -31.55 | -4.94 | 3 | Vertical | - | - | - | 47.39 | 25.92 | 3.94 | 34.80 |
| PK | 1.993G | 43.07 | 74.00 | -30.93 | -4.62 | 3 | Vertical | - | - | - | 47.69 | 26.17 | 3.99 | 34.78 |

## Horizontal




| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB/m) | (dB) | (dB) |
| PK | 1.344G | 39.99 | 74.00 | -34.01 | -6.03 | 3 | Horizontal | - | - | - | 46.02 | 25.96 | 3.27 | 35.26 |
| PK | 1.405G | 40.57 | 74.00 | -33.43 | -5.93 | 3 | Horizontal | - | - | - | 46.50 | 25.91 | 3.31 | 35.15 |
| PK | 1.438G | 40.26 | 74.00 | -33.74 | -5.75 | 3 | Horizontal | - | - | - | 46.01 | 25.98 | 3.36 | 35.09 |
| PK | 1.564G | 40.15 | 74.00 | -33.85 | -6.08 | 3 | Horizontal | - | - | - | 46.23 | 25.32 | 3.55 | 34.95 |
| PK | 1.821G | 40.54 | 74.00 | -33.46 | -5.69 | 3 | Horizontal | - | - | - | 46.23 | 25.34 | 3.82 | 34.85 |
| PK | 1.989G | 41.41 | 74.00 | -32.59 | -4.63 | 3 | Horizontal | 183 | 1 | "Worst" | 46.04 | 26.16 | 3.99 | 34.78 |

# 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 | OS02-NH | 5.8 dB |
| Radiated Emissions above 1GHz | 03CH01-HY | 5.71 dB |

# 7. List of Measuring Equipment Used

**Conducted Emission - Test Date:** 08/Sep/2020

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| EMI Receiver | R&S | ESR3 | 102318 | 9kHz – 3.6GHz | 03/Aug/2020 | 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:** 09/Sep/2020

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| Open Area Test Site | SPORTON | OATS-10 | OS02-NH | 30 MHz - 1 GHz 10m, 3m | 08/Mar/2020 | Radiation (OS02-NH) |
| Amplifier | HP | 8447D | 2944A06292 | 0.1 MHz - 1.3 GHz | 29/Apr/2020 | Radiation (OS02-NH) |
| Receiver | R&S | ESCI | 100497 | 9 kHz – 3 GHz | 19/May/2020 | Radiation (OS02-NH) |
| Bilog Antenna With 5dB Attenuator | TESEO | CBL6112D | 35376 | 30 MHz - 2 GHz | 26/Apr/2020 | Radiation (OS02-NH) |
| Turn Table | EMCO | 2080 | 9508-1805 | 0 - 360 degree | NCR | Radiation (OS02-NH) |
| Antenna Mast | ETS | 2075-2 | 2385 | 1 m - 4 m | NCR | Radiation (OS02-NH) |
| RF Cable-R10m | MIYAZAKI | 5DFB | CB044 | 30 MHz - 1 GHz | 21/Aug/2020 | Radiation (OS02-NH) |
| Software | Audix | E3 | Ver.4 | - | NCR | Radiation (OS02-NH) |

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

**Radiated Emission above 1GHz - Test Date:** 11/Sep/2020

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date | Remark |
|---|---|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESU-26 | 100422 | 20Hz ~ 26.5GHz | 23/Oct/2019 | 22/Oct/2020 | Radiation (03CH01-HY) |
| Site V.S.W.R | Riken | 3m SAC | 03CH01-HY | 1 GHz ~ 18 GHz 3m | 08/Jan/2020 | 07/Jan/2021 | Radiation (03CH01-HY) |
| Microwave Preamplifier | Agilent | 8449B | 3008A02602 | 1GHz~26.5GHz | 20/Mar/2020 | 19/Mar/2021 | Radiation (03CH01-HY) |
| Horn Antenna | SCHWARZBECK | BBHA9120 | BBHA9120D01834 | 1 GHz ~ 18 GHz | 06/Feb/2020 | 05/Feb/2021 | Radiation (03CH01-HY) |
| Turn Table | MF | DS 420 | 420/648/00 | 0 ~ 360 degree | NCR | NCR | Radiation (03CH01-HY) |
| Antenna Mast | MF | MFA-515BSN | MFA-515BSN1308261 | 1 m ~ 4 m | NCR | NCR | Radiation (03CH01-HY) |
| RF Cable | SUHNER | SUCOFLEX 104 | CB001-03CH01 | 30MHz~18GHz | 02/Mar/2020 | 01/Mar/2021 | Radiation (03CH01-HY) |
| Software | Sporton | SENSE-EMI | V5.10.7 | - | NCR | NCR | Radiation (03CH01-HY) |

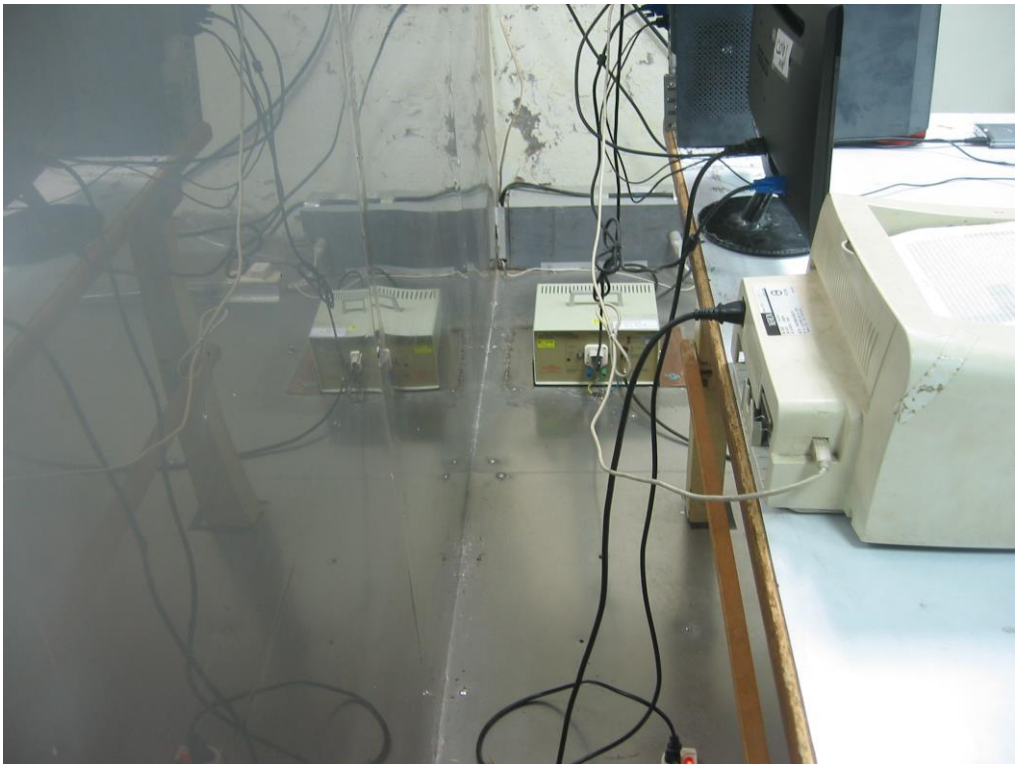
NCR: No Calibration Request.

# Appendix A. Test Photos

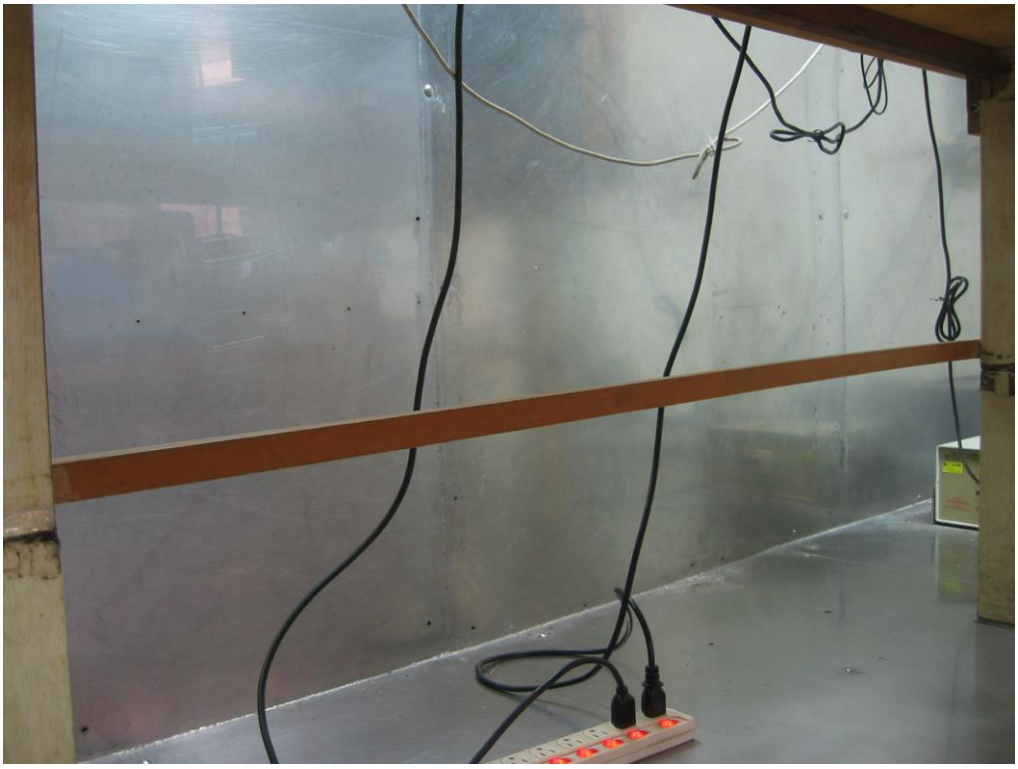
## 1. Photographs of Conducted Emissions Test Configuration

**Front View**

**Side View**



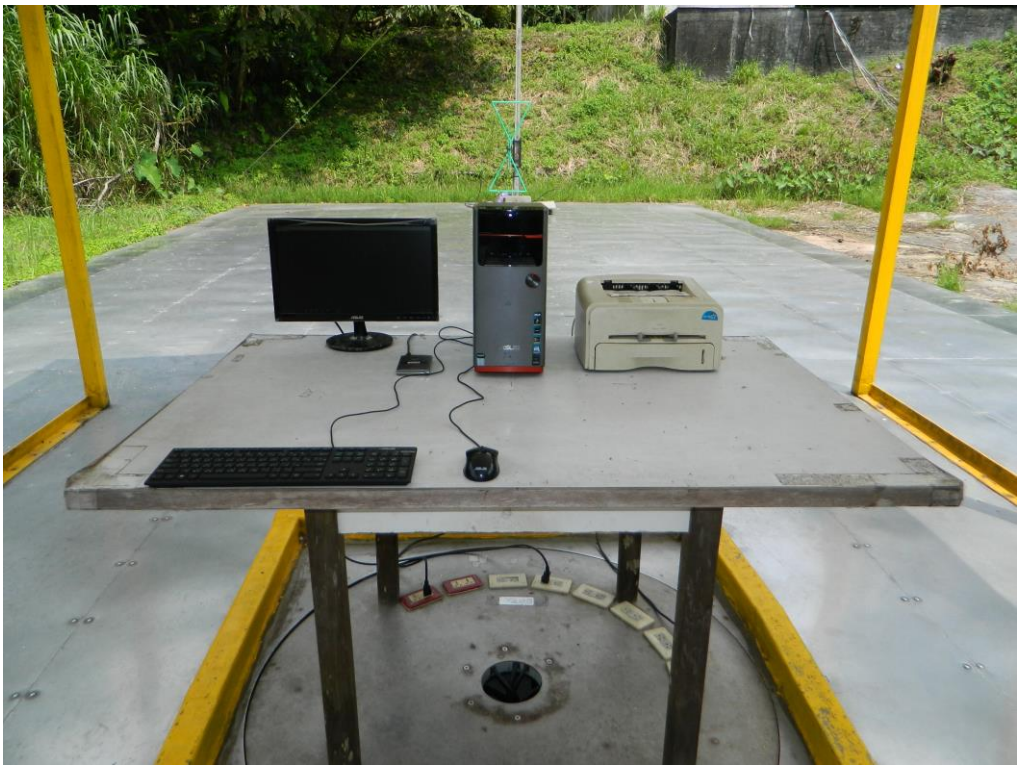
**Under Table View**



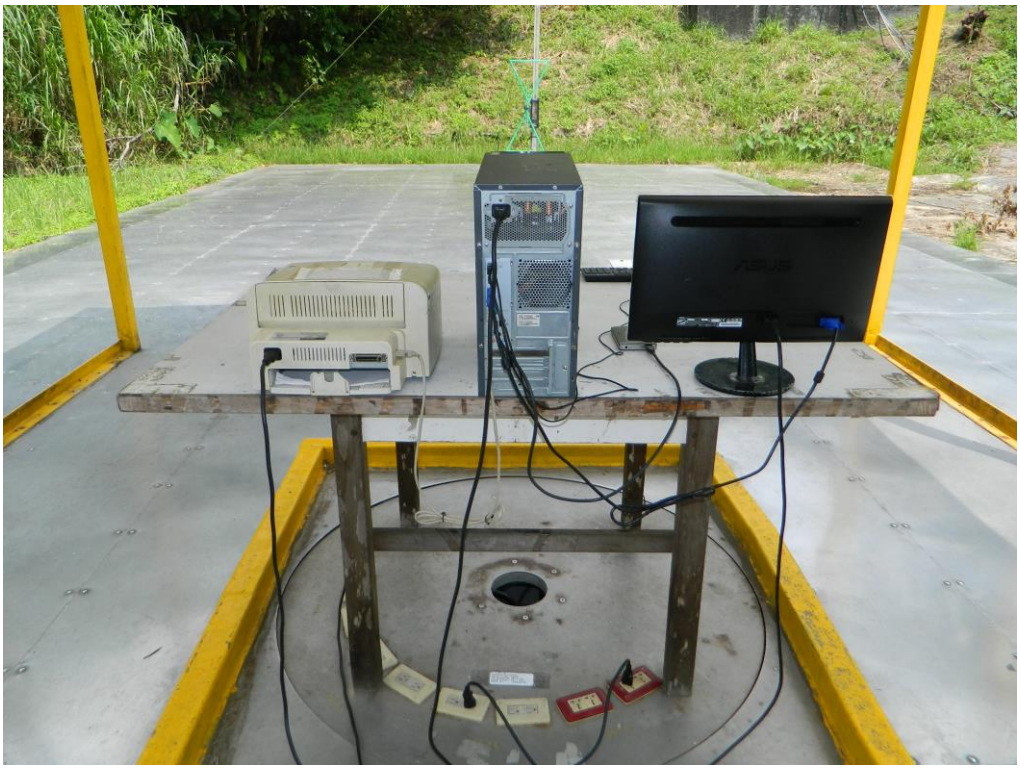
# 2. Photographs of Radiated Emissions Test Configuration

**For radiated emissions below 1GHz**

**Front View**

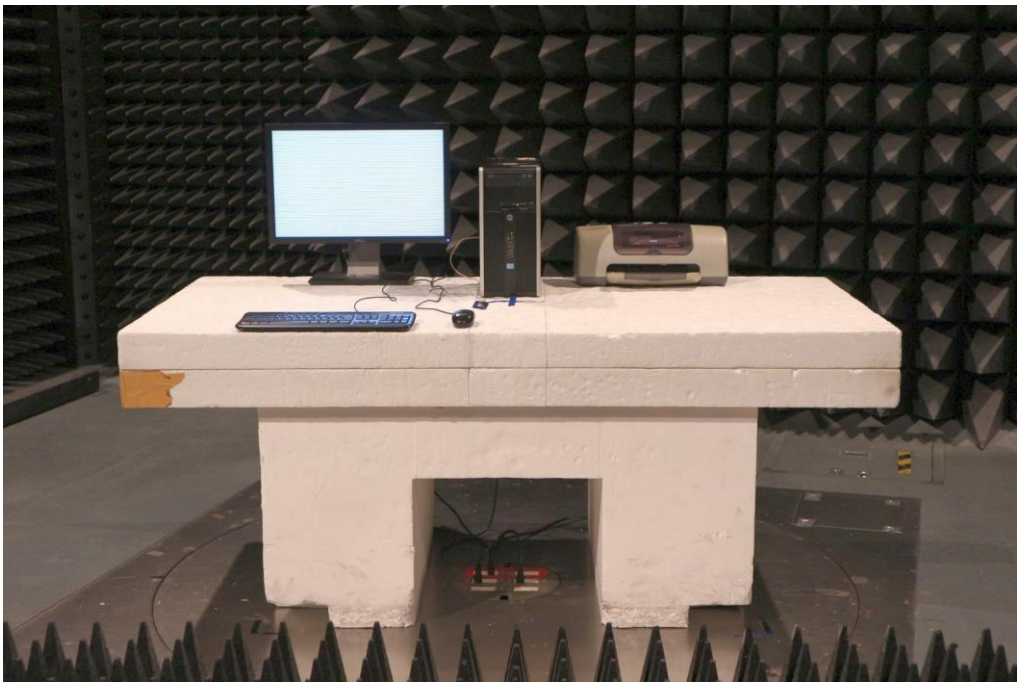


**Rear View**

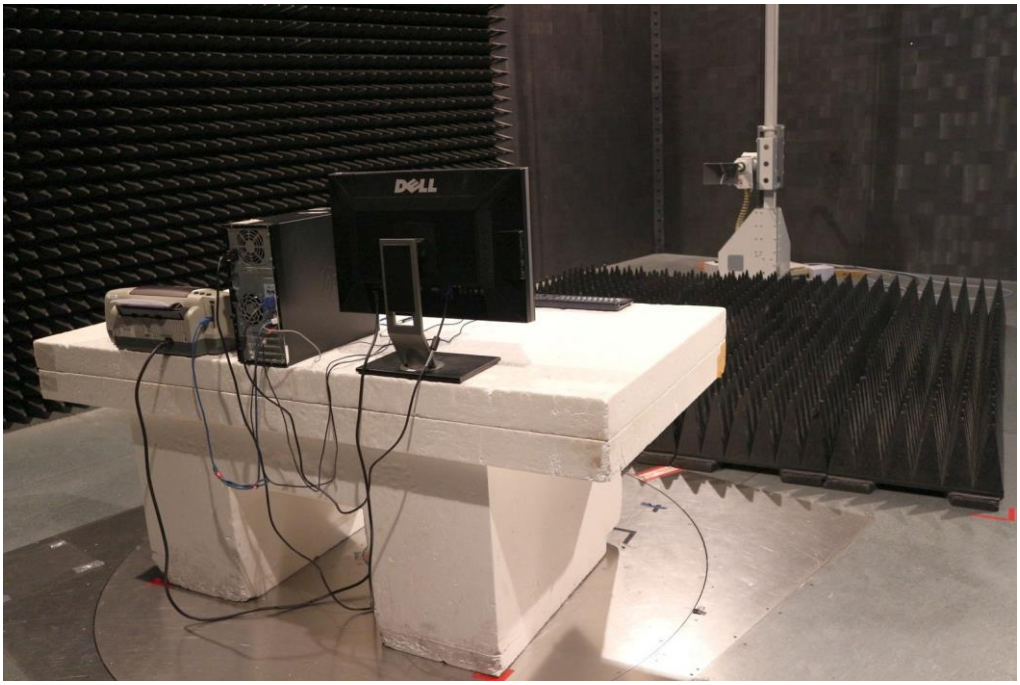


**For radiated emissions above 1GHz**

**Front View**



**Rear View**




———THE END———