Testing Laboratory
3785

EMI TEST REPORT

Equipment	:	USB-C® PD Multi-Port Adapter
Brand Name	:	j5create
Model Name	:	JCD391
Applicant	:	KAIJET TECHNOLOGY INTERNATIONAL CORPORATION 8F., No.109, Zhongcheng Rd., Tucheng Dist., New Taipei City 236, Taiwan, R.O.C.
Manufacturer	:	Magic Control Technology Corporation 10F., No.123, Zhongcheng Rd., Tucheng Dist., New Taipei City 236, Taiwan R.O.C.
Standard	:	ICES-003 Issue 7, Class B

The product was received on Nov. 15, 2021, and testing was started from Nov. 16, 2021 and completed on Dec. 02, 2021. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4a-2017 standards 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. Hsinhua Laboratory, the test report shall not be reproduced except in full.

Approved by: Jack Deng

SPORTON INTERNATIONAL INC. Hsinhua Laboratory
No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
CI1N1032-01	01	Initial issue of report	Jan. 05, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
4	3.2.1	Conducted Emissions of Powerline	PASS	Under limit 11.30 dB at 0.31 MHz
5.1	3.2.2	Radiated Emissions below 1GHz	PASS	Under limit 6.62 dB at 112.690 MHz
5.2	3.2.2	Radiated Emissions above 1GHz	PASS	Under limit 25.85 dB at 2.65 GHz
Note 1: From Sporton Project No.:CI1N1032.				

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: Anne Kuo

1. General Description of Equipment under Test

1.1. Basic Description of Equipment under Test

Equipment	:	USB-C® PD Multi-Port Adapter
Model No.	:	JCD391
Power Supply Type	:	From Power Adapter of Host System
AC Power Cord	:	Wall-Mount, 2 pin
DC Power Cable	:	D-Shielded, 2 m

The maximum operating frequency : 500 MHz

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.

2. Test Configuration of Equipment under Test

2.1. Details of EUT Test Modes

Model No.: JCD391 was selected as the main test model 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. HDMI:3840*2160 60Hz,USB R/W,LAN 1Gbps Mode 2. HDMI:2560*1440 60Hz,USB R/W,LAN 1Gbps cause “mode 1” generated the worst test result; it was reported as final data.
Radiated Emissions <below 1GHz>	Mode 1. HDMI:3840*2160 60Hz,USB R/W,LAN 1Gbps Mode 2. HDMI:2560*1440 60Hz,USB R/W,LAN 1Gbps cause “mode 1” generated the worst test result; it was reported as final data.
Radiated Emissions <above 1GHz>	Mode 1. HDMI:3840*2160 60Hz,USB R/W,LAN 1Gbps Mode 2. HDMI:2560*1440 60Hz,USB R/W,LAN 1Gbps cause “mode 1” generated the worst test result; it was reported as final data.

2.2. Description of Test System

Conducted emission and radiated emission below 1GHz

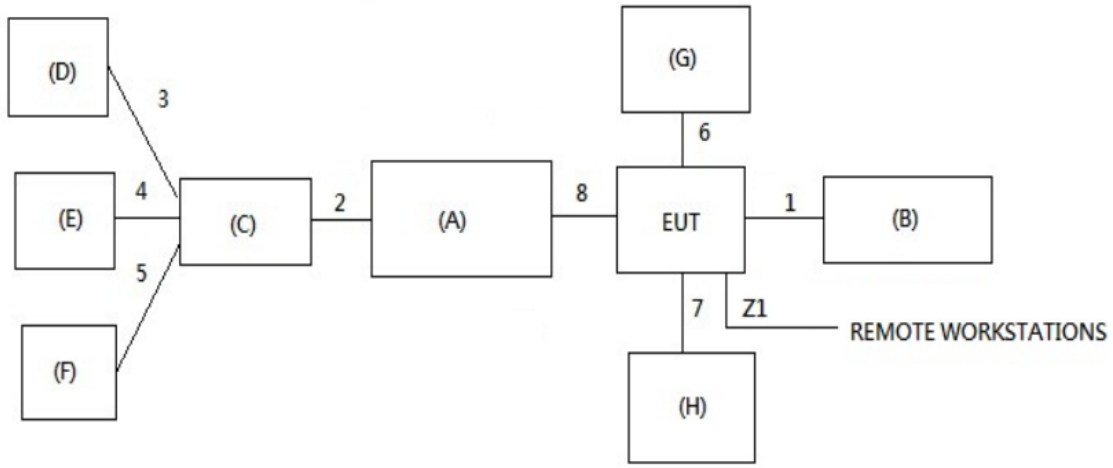
No.	Peripheral	Manufacturer	Model Number	FCC ID	Remarks
For Local					
A	Laptop	Lenovo	TP00103J	DoC	-
B	Adapter	Apple	A2166	DoC	-
C	USB HUB	j5create	JUH340	DoC	-
D	Printer	Fuji Xerox	Phaser 3121	DoC	-
E	Mouse	ASUS	MOBTUO	DoC	-
F	Portable External HDD	PQI	H566	DoC	-
G	LCD Monitor	ASUS	PA329	DoC	-
H	Portable SSD*2	Transcend	TS120GESD240C	DoC	-
For Remote					
Z1	Laptop	DELL	Latitude E5520	DoC	-

Radiated emission above 1GHz

No.	Peripheral	Manufacturer	Model Number	FCC ID	Remarks
For Local					
A	Laptop	Lenovo	TP00103J	DoC	-
B	Adapter	Apple	A2166	DoC	-
C	USB HUB	j5create	JCH377	DoC	-
D	Printer	EPSON	C61	N/A	-
E	Mouse	Microsoft	1113	DoC	-
F	Portable External HDD	PQI	H566	DoC	-
G	LCD Monitor	Benq	EL2870-B	N/A	-
H	Portable SSD*2	Transcend	TS120GESD240C	DoC	-
For Remote					
Z1	Laptop	DELL	Latitude E5520	DoC	-

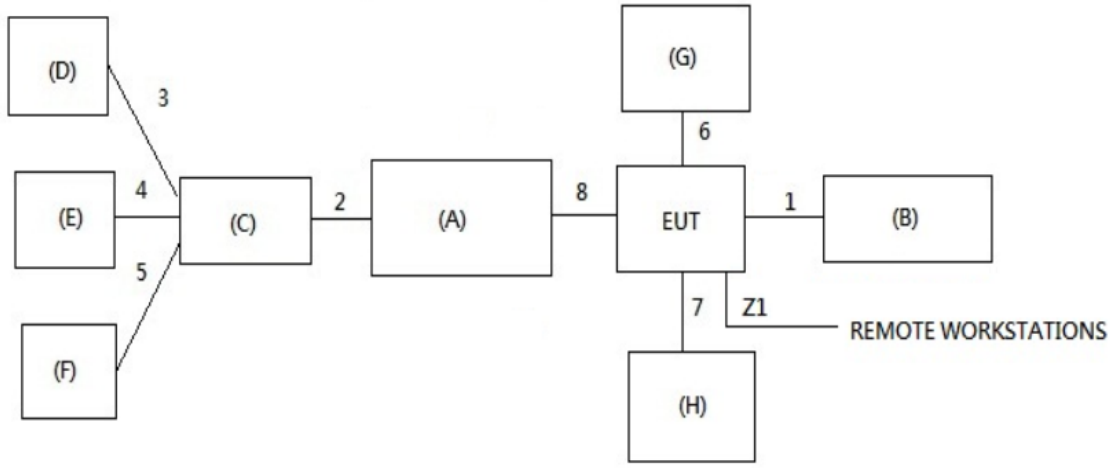
2.3. Connection Diagram of Test System

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



No.	Types of Cables	Shielding on Cable	Length (m)	Remarks
1	DC	D-Shielded	2	-
2	USB	D-Shielded	0.6	-
3	USB	D-Shielded	1.8	-
4	USB	AL-F-Shielded	1.5	-
5	USB	D-Shielded	1	-
6	HDMI	D-Shielded	1.8	-
7	USB*2	D-Shielded	0.5	-
8	USB	D-Shielded	0.2	EUT
Z1	RJ45	Non-Shielded	20	Remote

Test Setup Diagram - Radiated emission above 1GHz



No.	Types of Cables	Shielding on Cable	Length (m)	Remarks
1	DC	D-Shielded	2	-
2	USB	D-Shielded	1	-
3	USB	D-Shielded	1.8	-
4	USB	AL-F-Shielded	1.8	-
5	USB	D-Shielded	1	-
6	HDMI	D-Shielded	1.8	-
7	USB*2	D-Shielded	0.5	-
8	USB	D-Shielded	0.2	EUT
Z1	RJ45	Non-Shielded	20	Remote

2.4. Details of EUT Test Setup

An executive program, under WIN 10 (local) & WIN 7 (remote) was used as the test software. The program was executed as follows:

- Turn on the power of all equipment.
- The local Laptop executed "BurnInTest" to display "H" patterns on the screen via the EUT.
- The local Laptop executed "BurnInTest" to continuously read and write to Portable SSD via the EUT.
- The local Laptop executed "BurnInTest" to continuously read and write to Portable External HDD.
- The local Laptop executed "Word" to make the printer continue to print.
- The local Laptop executed "Media player" to play audio via the EUT.
- The local Laptop executed "ping" to link with the remote Laptop to maintain the connection by the EUT.

3. General Information of Test

3.1. Test Facilities

Test Lab : Sporton International Inc. Hsinhua Laboratory			
☒	Hsinhua (TAF: 3785)	**ADD** : No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)	
		TEL : 886-3-327-3456	**FAX** : 886-3-327-0973
☒		**ADD :** No.3, Ln. 238, Kangle St., Neihu Dist., Taipei City 114040, Taiwan (R.O.C.)	
		TEL : 886-2-2631-5551	**FAX :** 886-2-2631-9740

Test Items	Test Site No.	Test Engineer	Test Environment		Test Date	Remark
			temp °C	humidity %		
Powerline Conducted Emissions	CO01-NH	Willy Lee	24.1~24.2	55~56	19/Nov/2021	-
Radiated Emissions (below 1GHz)	OS03-NH	Louis Lin	22.6~22.7	59.2~59.3	22/Nov/2021	-
Radiated Emissions (above 1GHz)	03CH04-HY	Yen-Liang Ou	21.5~22.5	57~58	02/Dec/2021	-

3.2. Test Standards

Test items	Test Standards and Test Procedures
Radiated and Conducted Emissions	Canada Standard ICES-003 Issue 7 , Class B ANSI C63.4a-2017

3.3. Test Voltage/Frequencies

Power Supply Type	Voltage/Frequencies
Power Adapter of Host System	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 18,000 MHz	Measurement distance is 3 m.
	Above 18,000 MHz	Measurement distance is 1 m.

3.5. Operating Condition

- Full system.

3.6. ICES Labelling requirements

The requirements specified in ICES-Gen shall apply. An example ISED compliance label, to be placed on each unit of an equipment model (or in the user manual, if allowed), is given below:

CAN ICES-003(*) / NMB-003(*)

* Insert either “A” or “B”, but not both, to identify the applicable Class of the device used for compliance verification.

The above label is only an example. The specific format is left to the manufacturer to decide, as long as the label includes the required information, in accordance with ICES-Gen.

4. Conducted Emissions Measurement (AC mains power terminals)

The EUT is which satisfies the Class B disturbance limits.

4.1. Limit

Limits for conducted disturbance at the mains ports of class A			
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 – 5			73
5 – 30			73
0,15 – 0,5	AMN	Average / 9 kHz	66
0,50 – 5			60
5 – 30			60
Note : The more stringent limit applies at transition frequencies.			

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 to 56
0,50 – 5			56
5 – 30			60
0,15 – 0,5	AMN	Average / 9 kHz	56 to 46
0,50 – 5			46
5 – 30			50
Note : The more stringent limit applies at transition frequencies.			

4.2. Test Procedures

Tabletop equipment:

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.

Floor-standing equipment:

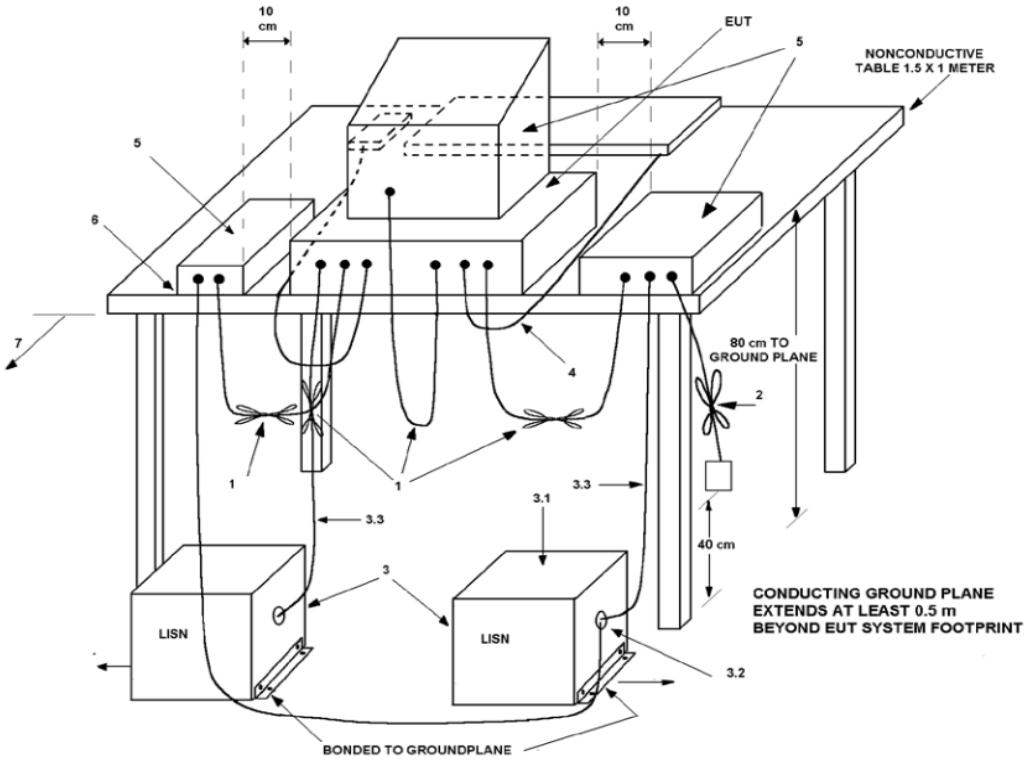
a). The EUT was warmed up for 15 minutes before testing started.
b). The EUT was placed on the horizontal ground reference plane, 12 mm above ground.
c). Connect EUT to the power mains through a line impedance stabilization network (LISN).
d). All the support units are connect to the other LISN.
e). 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.

4.3. Measurement Results Calculation

The measured 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

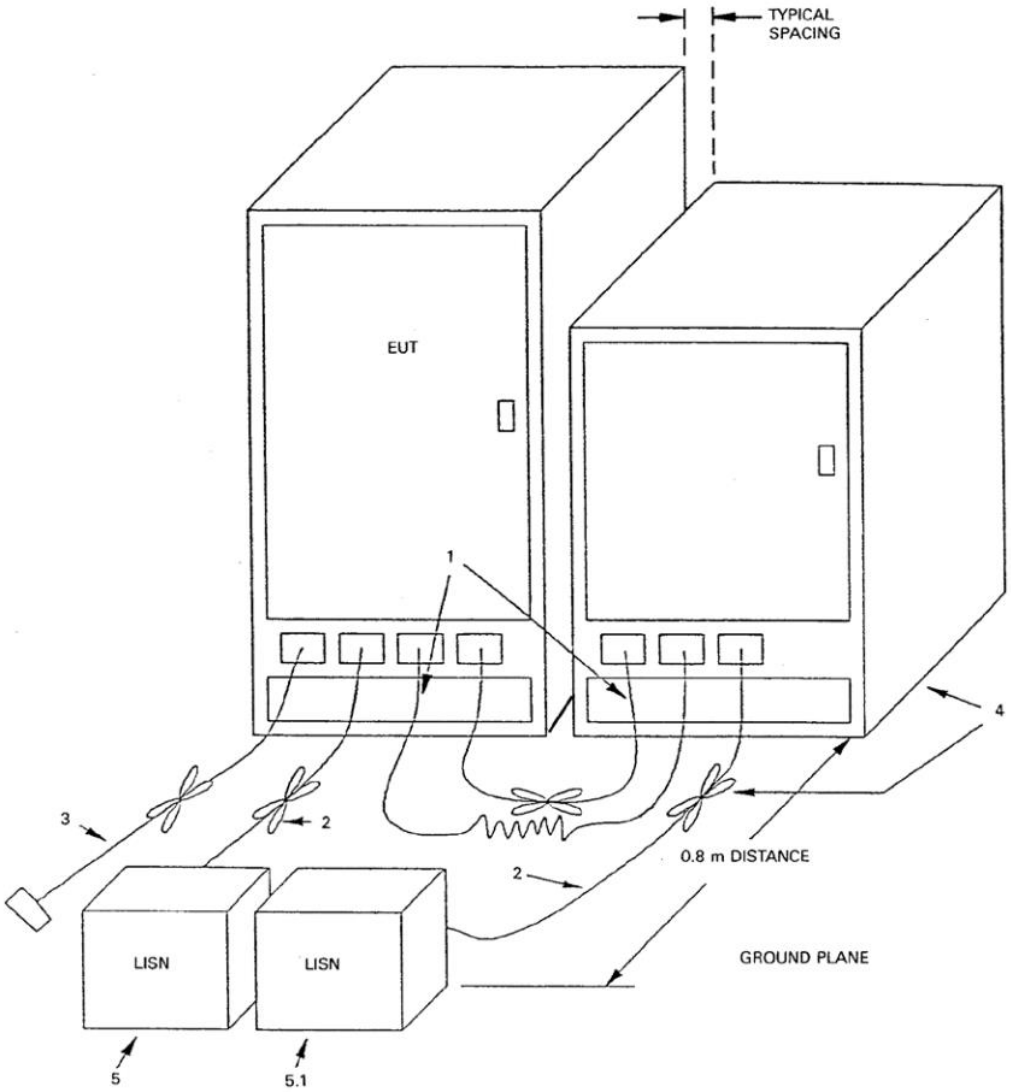
4.4. Typical Test Setup Layout

Tabletop equipment



a). Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
b). Input/output (I/O) cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
c). EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated into 50 Ω loads. LISN can be placed on top of, or immediately beneath, reference ground plane.
3.1 All other equipment powered from additional LISN(s).
3.2 Multiple outlet strips can be used for multiple power cords of non-EUT equipment.
3.3 LISN at least 80 cm from nearest part of EUT chassis.
d). Cables of hand-operated devices, such as keyboards and mice, shall be placed as for normal use.
e). Non-EUT components of EUT system being tested.
f). Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
g). Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

Floor-standing equipment

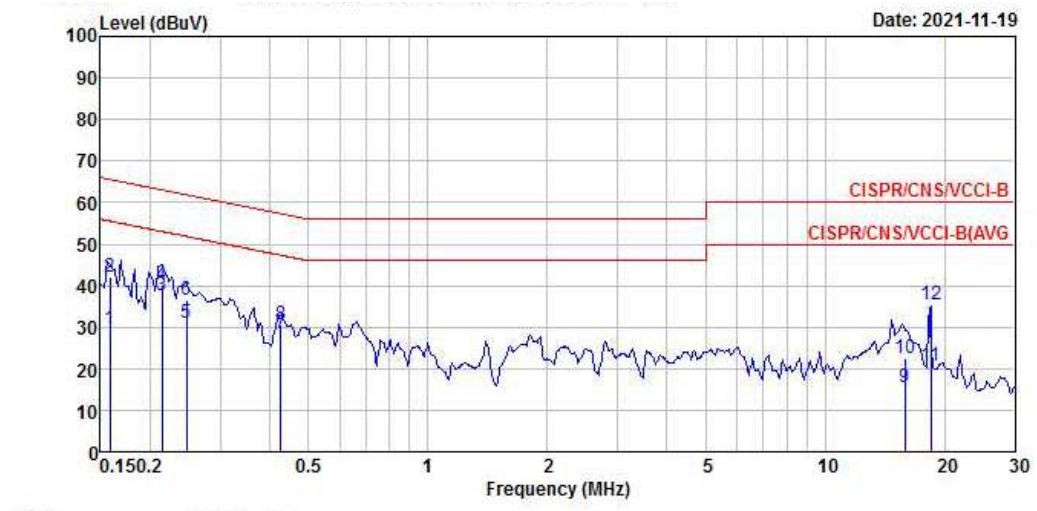


a). Excess I/O cables shall be bundled in the center. If bundling is not possible, the cables shall be arranged in a serpentine fashion. Bundling shall not exceed 40 cm in length.
b). Excess power cords shall be bundled in the center or shortened to appropriate length.
c). I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in a serpentine fashion.
d). EUT and all cables shall be insulated, if required, from the ground plane by up to 12 mm of insulating material.
e). EUT connected to one LISN. LISN can be placed on top of, or immediately beneath, the ground plane.
5.1 All other equipment powered from a second LISN or additional LISN(s).
5.2 A multiple outlet strip can be used for multiple power cords of non-EUT equipment.

4.5. Test Result

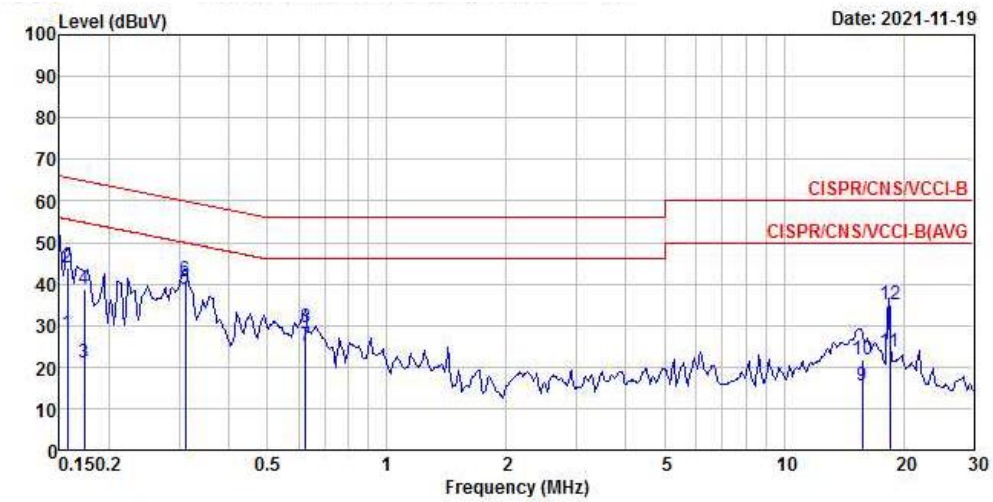
Test Mode	Mode 1		
Test Frequency	0.15 MHz ~ 30 MHz	Test Voltage	AC 120V / 60Hz
■ The test was passed at the minimum margin that marked by the frame in the following data			

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	29.42	-26.12	55.54	19.03	10.29	0.10	Average
2	0.16	42.15	-23.39	65.54	31.76	10.29	0.10	QP
3 @	0.21	37.56	-15.50	53.06	27.18	10.28	0.10	Average
4	0.21	40.24	-22.82	63.06	29.86	10.28	0.10	QP
5	0.25	30.82	-21.05	51.87	20.44	10.28	0.10	Average
6	0.25	36.66	-25.21	61.87	26.28	10.28	0.10	QP
7	0.43	28.29	-19.02	47.31	17.91	10.27	0.11	Average
8	0.43	30.65	-26.66	57.31	20.27	10.27	0.11	QP
9	15.85	15.33	-34.67	50.00	4.47	10.54	0.32	Average
10	15.85	22.54	-37.46	60.00	11.68	10.54	0.32	QP
11	18.50	20.62	-29.38	50.00	9.71	10.58	0.33	Average
12	18.50	35.24	-24.76	60.00	24.33	10.58	0.33	QP

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	27.96	-27.65	55.61	17.56	10.30	0.10	Average
2	0.16	44.07	-21.54	65.61	33.67	10.30	0.10	QP
3	0.17	20.86	-33.96	54.82	10.46	10.30	0.10	Average
4	0.17	38.76	-26.06	64.82	28.36	10.30	0.10	QP
5 @	0.31	38.63	-11.30	49.93	28.24	10.28	0.11	Average
6	0.31	40.97	-18.96	59.93	30.58	10.28	0.11	QP
7	0.62	25.04	-20.96	46.00	14.64	10.28	0.12	Average
8	0.62	29.45	-26.55	56.00	19.05	10.28	0.12	QP
9	15.74	15.40	-34.60	50.00	4.48	10.60	0.32	Average
10	15.74	21.66	-38.34	60.00	10.74	10.60	0.32	QP
11	18.48	23.73	-26.27	50.00	12.74	10.66	0.33	Average
12	18.48	35.15	-24.85	60.00	24.16	10.66	0.33	QP

5. Radiated Emissions Measurement

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 A equipment				
Frequency range MHz	**Measurement**		**Class A limits**	
	Distance (m)	**Detector type / bandwidth**	**3m(dBµV/m)**	**10m(dBµV/m)**
30 – 88	3 or 10	Quasi Peak / 120 kHz	50.0	40.0
88 – 216			54.0	43.5
216 – 230			56.9	46.4
230 – 960			57.0	47.0
960 – 1000			60.0	49.5
Note: The more stringent limit applies at transition frequencies.				
radiated emissions at frequencies up to 1 GHz for Class B equipment				
Frequency range MHz	**Measurement**		**Class B limits**	
	Distance (m)	**Detector type / bandwidth**	**3m(dBµV/m)**	**10m(dBµV/m)**
30 – 88	3 or 10	Quasi Peak / 120 kHz	40.0	30.0
88 – 216			43.5	33.1
216 – 230			46.0	35.6
230 – 960			47.0	37.0
960 – 1000			54.0	43.5
Note: The more stringent limit applies at transition frequencies.				

5.1.2. Test Procedures

Tabletop equipment:

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). If the EUT is having a Wireless modular, can choose to install the filter at the input connector of test-receiver system.

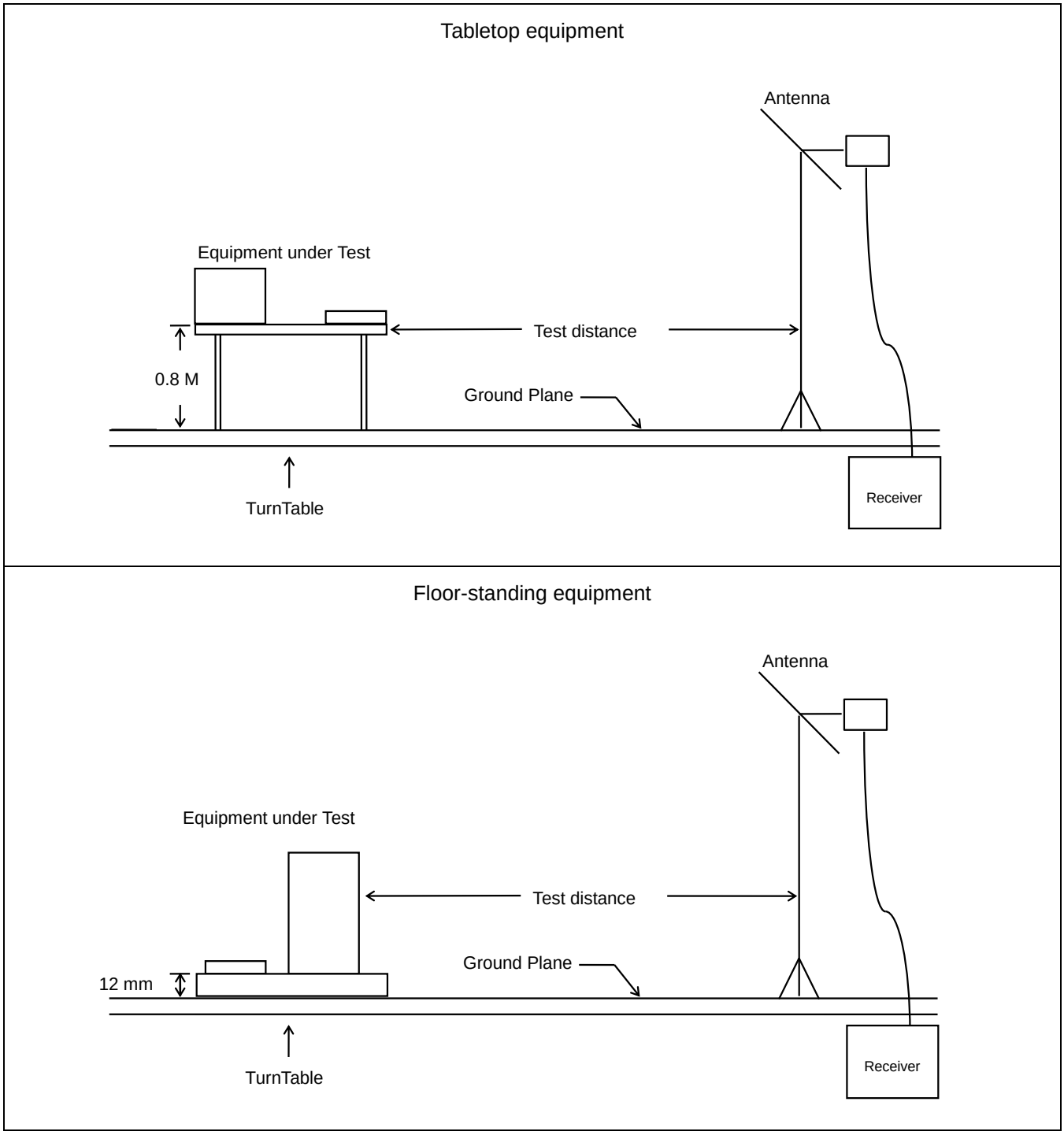
Floor-standing equipment:

a). The EUT was placed on the horizontal ground reference plane, 12 mm 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). If the EUT is having a Wireless modular, can choose to install the filter at the input connector of test-receiver system.

5.1.3. Measurement Results Calculation

The measured 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.

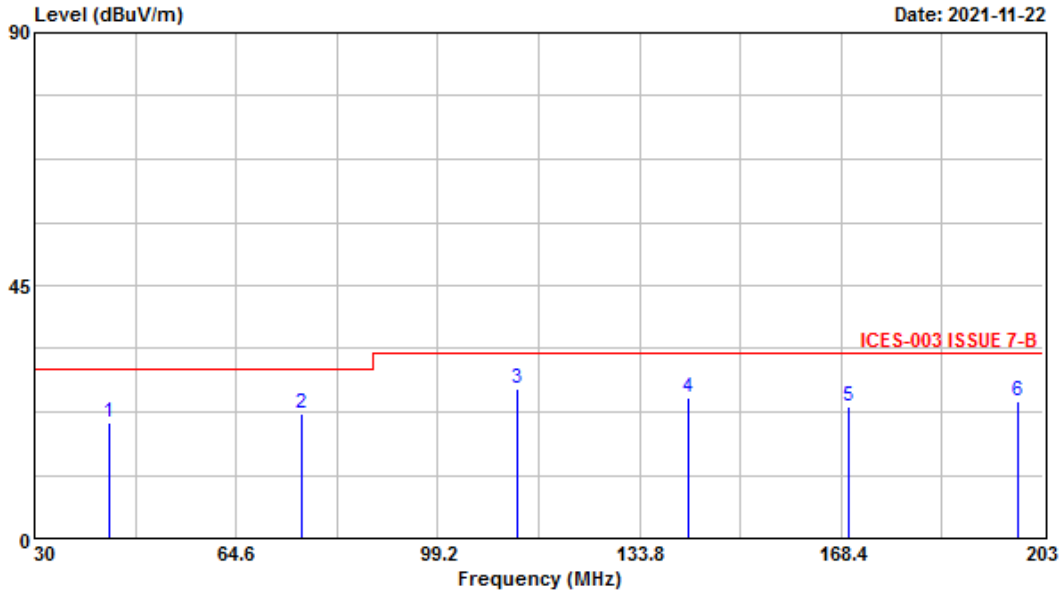
5.1.4. Typical Test Setup Layout



5.1.5. Test Result

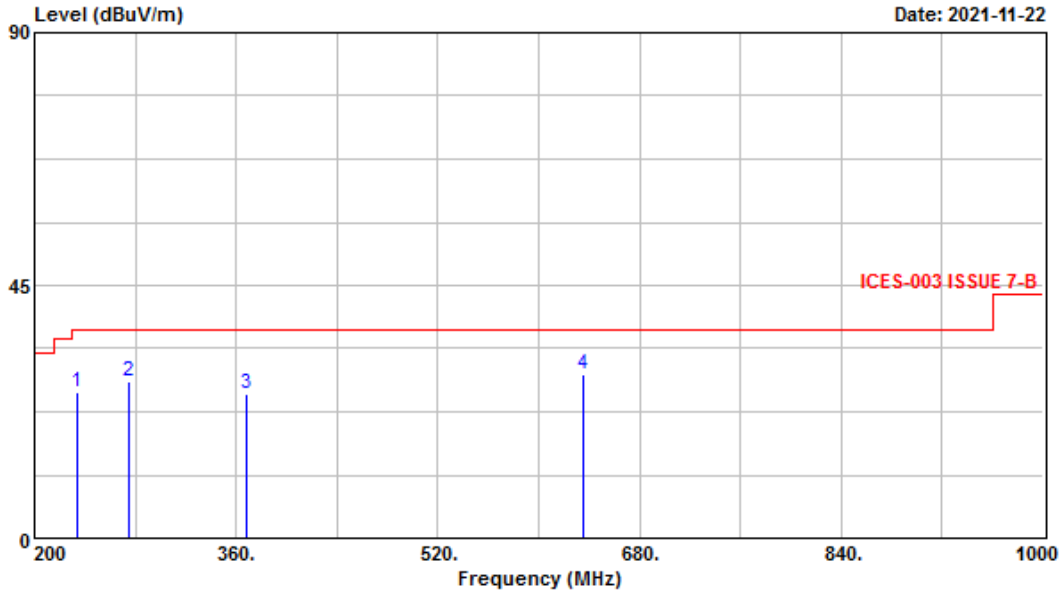
Test mode	Mode 1		
Test frequency	30 MHz ~ 1000 MHz	Test Voltage	AC 120V / 60Hz
■ The test was passed at the minimum margin that marked by the frame in the following data			

Vertical



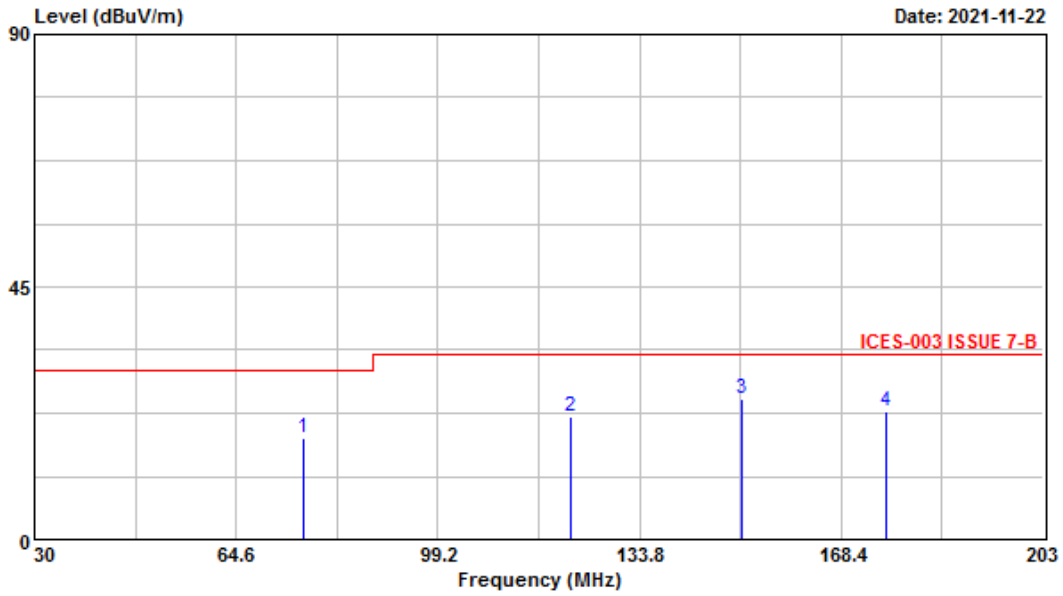
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	42.800	20.59	-9.41	30.00	31.90	16.06	1.10	28.47	Peak	---	---
2	75.850	22.30	-7.70	30.00	37.48	11.63	1.62	28.43	Peak	---	---
3	112.690	26.48	-6.62	33.10	35.60	17.29	1.92	28.33	QP	100	178
4	142.100	25.06	-8.04	33.10	34.91	16.15	2.23	28.23	Peak	---	---
5	169.610	23.54	-9.56	33.10	34.40	14.84	2.45	28.15	Peak	---	---
6	198.680	24.44	-8.66	33.10	35.26	14.48	2.69	27.99	Peak	---	---

Vertical



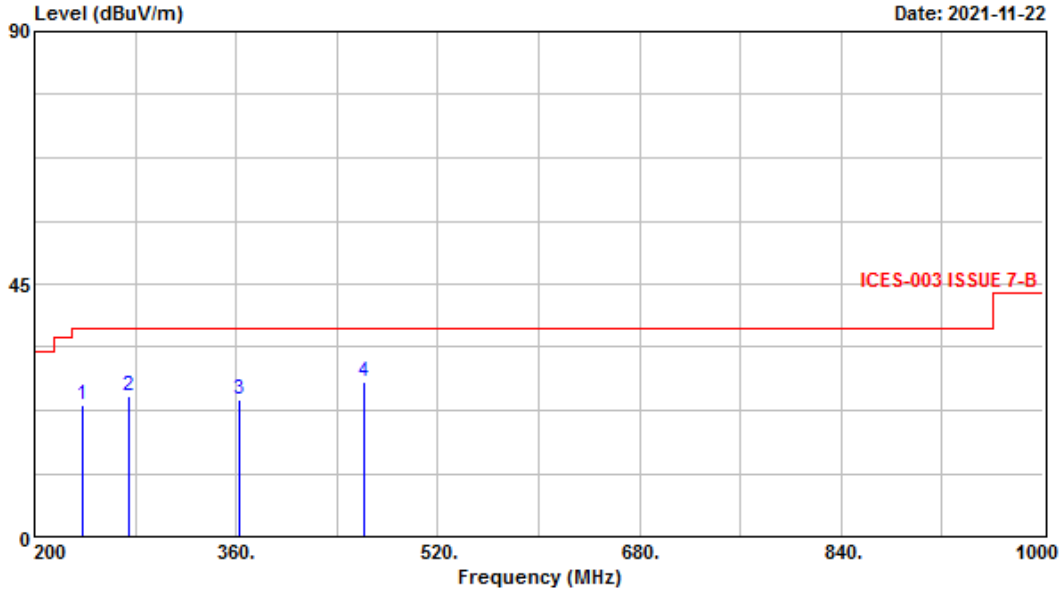
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	233.600	25.90	-11.10	37.00	34.94	15.77	3.04	27.85	Peak	---	---
2	275.200	27.83	-9.17	37.00	34.50	17.90	3.25	27.82	Peak	---	---
3	368.000	25.60	-11.40	37.00	30.00	19.85	4.00	28.25	Peak	---	---
4	635.200	29.26	-7.74	37.00	28.96	23.97	5.51	29.18	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	76.020	18.01	-11.99	30.00	33.19	11.63	1.62	28.43	Peak	---	---
2	122.040	21.76	-11.34	33.10	30.17	17.87	2.02	28.30	Peak	---	---
3	151.270	25.08	-8.02	33.10	35.24	15.74	2.31	28.21	Peak	---	---
4	176.190	22.96	-10.14	33.10	33.89	14.71	2.48	28.12	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	237.600	23.54	-13.46	37.00	32.07	16.23	3.08	27.84	Peak	---	---
2	275.200	24.91	-12.09	37.00	31.58	17.90	3.25	27.82	Peak	---	---
3	362.400	24.54	-12.46	37.00	29.00	19.75	4.00	28.21	Peak	---	---
4	460.800	27.69	-9.31	37.00	30.06	22.28	4.26	28.91	Peak	---	---

5.2. Radiated Emission above 1GHz

5.2.1. Limit

radiated emissions at frequencies above 1 GHz for Class A equipment			
Frequency range GHz	**Measurement**		**Class A limits**
	Distance (m)	**Detector type / bandwidth**	**dB(μV/m)**
1 – 18	3	Average / 1 MHz	60
1 – 18		Peak / 1 MHz	80
18 – 40	1	Average / 1 MHz	69.54
18 – 40		Peak / 1 MHz	89.54
radiated emissions at frequencies above 1 GHz for Class B equipment			
Frequency range GHz	**Measurement**		**Class B limits**
	Distance (m)	**Detector type / bandwidth**	**dB(μV/m)**
1 – 18	3	Average / 1 MHz	54
1 – 18		Peak / 1 MHz	74
18 – 40	1	Average / 1 MHz	63.54
18 – 40		Peak / 1 MHz	83.54

1. The measurement bandwidth shall be 1 MHz or greater.
2. These limit levels apply for a measurement distance of 3 m. If using a different measurement distance, the measured levels shall be extrapolated to the 3 m limit distance using a factor of 20 dB per decade of distance. The measurement distance shall place the measurement antenna in the far field of the ITE or digital apparatus under test.
3. The test site shall have been validated at the distance used for radiated emission measurements on the ITE or digital apparatus under test.

Remark: It should be noted that the field strength is inversely proportional to distance, so the field strength at 3m is 1/3 the strength at 1m, i.e. L3m/Lx = X/3.
Ex. L3m dB-Lx dB = 20log(3/x); L1m dB = 60 + 20log (3/1) = 69.54 dB(μV/m)
Ex. L3m dB-Lx dB = 20log(3/x); L1m dB = 54 + 20log (3/1) = 63.54 dB(μV/m)

Required highest measurement frequency for radiated emissions	
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
Note: FX is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.	

5.2.2. Test Procedures

Tabletop equipment:

a). Same test set up as below 1GHz radiated testing.
b). The EUT was set 3m (1 – 18GHz) / 1m (18 – 40GHz) 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, can choose to 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 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, while keeping the antenna in the cone of radiation from that area and pointed at the area both in azimuth and elevation, then turning around the turn-table to get the maximum noise reading of the Horizontal and Vertical polarity separately.
i). If emission level of the EUT in peak mode was 23dB 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.

Floor-standing equipment:

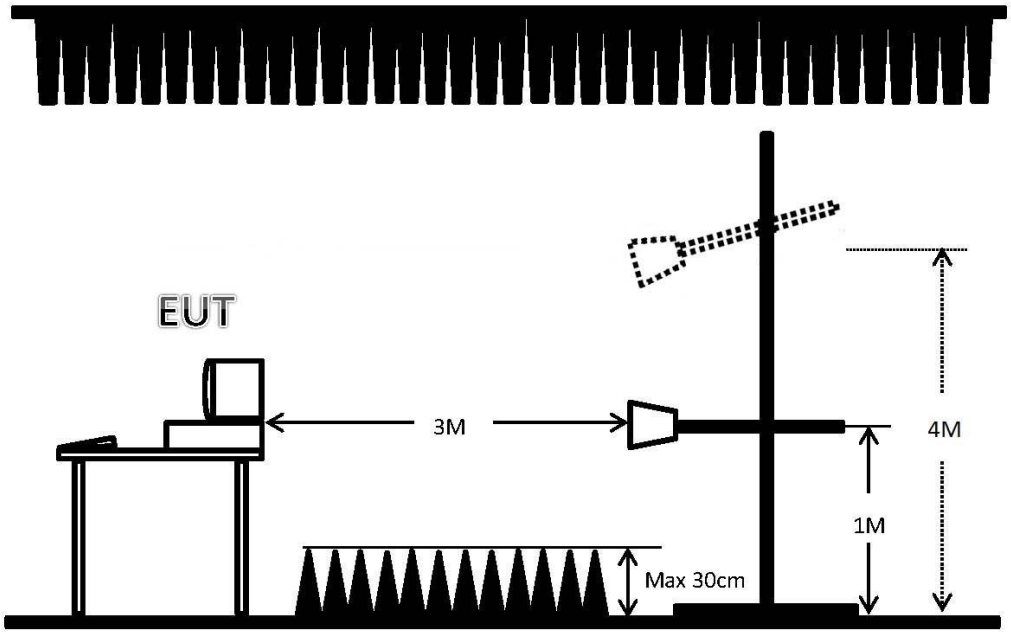
a). Same test set up as below 1GHz radiated testing.
b). The EUT was set 3m (1 – 18GHz) / 1m (18 – 40GHz) from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
c). There should be absorber placed between the EUT and Antenna and its located size should 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, can choose to 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 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, while keeping the antenna in the cone of radiation from that area and pointed at the area both in azimuth and elevation, then turning around the turn-table to get the maximum noise reading of the Horizontal and Vertical polarity separately.
i). If emission level of the EUT in peak mode was 23dB 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

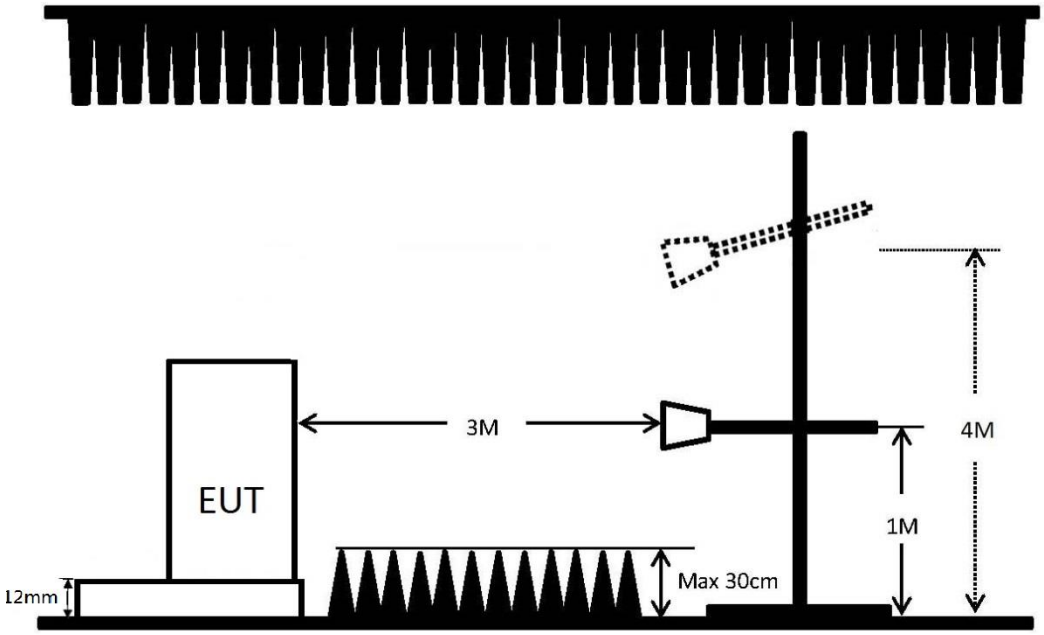
The measured Level is calculated using:
Corrected Reading (dBμV/m) = Raw(Read Level)+AF(Antenna Factor)+CL(Cable Loss)-PA(Preamp Factor)
For example at 1980 MHz if the Antenna Factor is 26.19 dB/m, the cable loss is 4.08 dB, the measured voltage is 51.30 dBμV and the Preamp Factor is 33.34 dB, the signal 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
Note: If a Band reject filter is used, this factor will be added to the sum of the factors.

5.2.4. Typical Test Setup Layout

Tabletop equipment



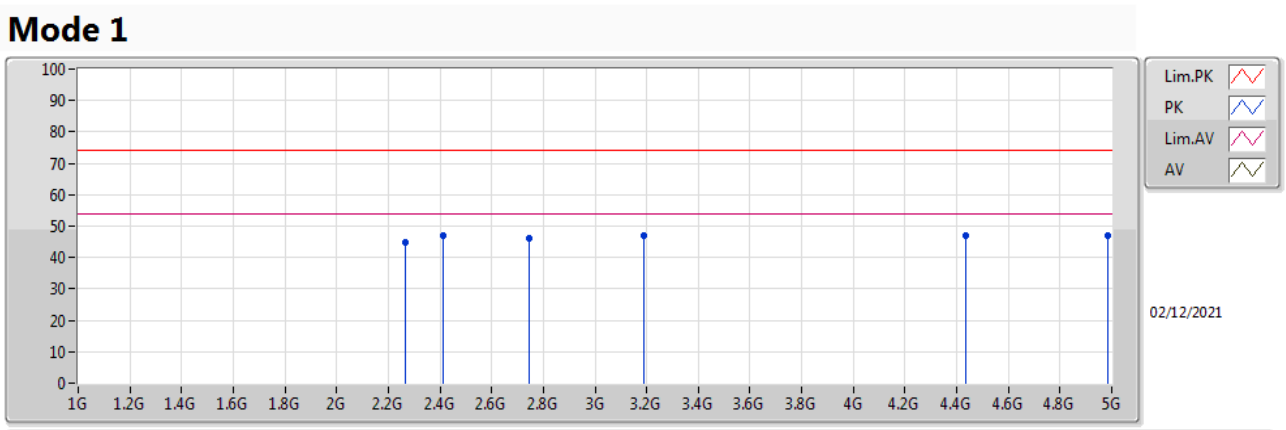
Floor-standing equipment



5.2.5. Test Result

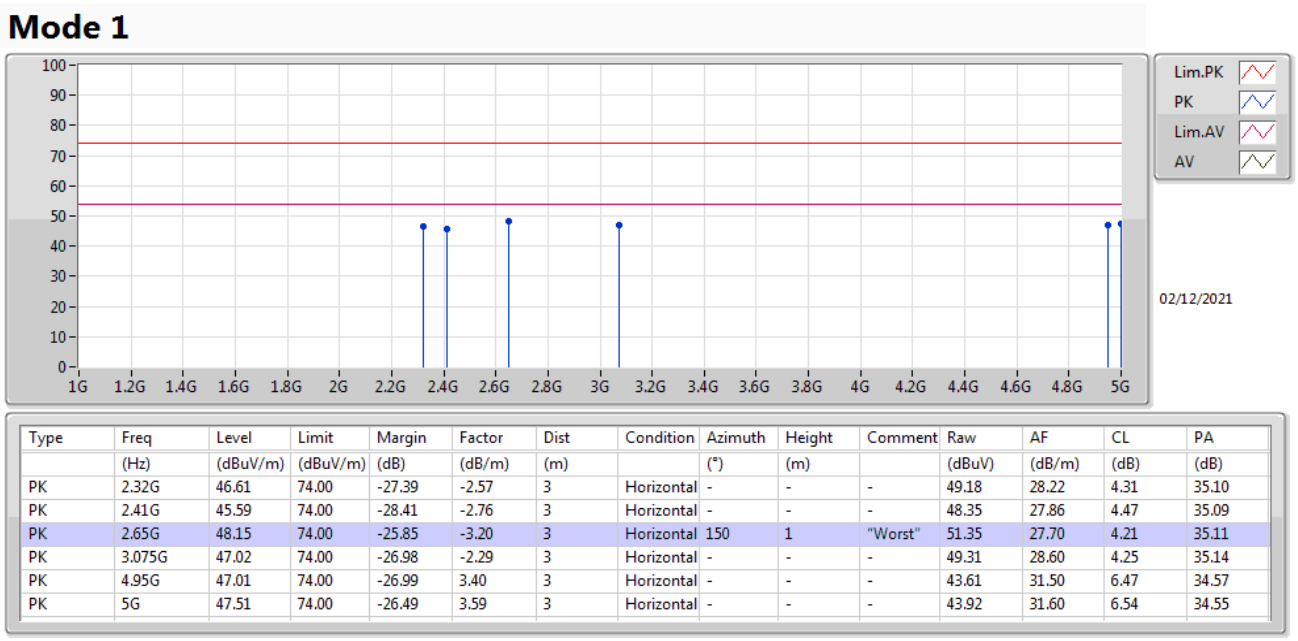
Test mode	Mode 1		
Test frequency	Above 1GHz	Test Voltage	AC 120V / 60Hz
■ The test was passed at the minimum margin that marked by the frame in the following data			

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)		(°)	(m)		(dBuV)	(dB/m)	(dB)	(dB)
PK	2.265G	44.98	74.00	-29.02	-2.40	3	Vertical	-	-	-	47.38	28.51	4.19	35.10
PK	2.41G	46.86	74.00	-27.14	-2.76	3	Vertical	-	-	-	49.62	27.86	4.47	35.09
PK	2.745G	46.04	74.00	-27.96	-2.79	3	Vertical	-	-	-	48.83	28.09	4.25	35.13
PK	3.19G	47.18	74.00	-26.82	-1.93	3	Vertical	340	1	"Worst"	49.11	29.08	4.08	35.09
PK	4.435G	47.15	74.00	-26.85	2.49	3	Vertical	-	-	-	44.66	30.57	6.73	34.81
PK	4.985G	47.05	74.00	-26.95	3.53	3	Vertical	-	-	-	43.52	31.57	6.52	34.56

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)		(°)	(m)		(dBuV)	(dB/m)	(dB)	(dB)
PK	2.32G	46.61	74.00	-27.39	-2.57	3	Horizontal	-	-	-	49.18	28.22	4.31	35.10
PK	2.41G	45.59	74.00	-28.41	-2.76	3	Horizontal	-	-	-	48.35	27.86	4.47	35.09
PK	2.65G	48.15	74.00	-25.85	-3.20	3	Horizontal	150	1	"Worst"	51.35	27.70	4.21	35.11
PK	3.075G	47.02	74.00	-26.98	-2.29	3	Horizontal	-	-	-	49.31	28.60	4.25	35.14
PK	4.95G	47.01	74.00	-26.99	3.40	3	Horizontal	-	-	-	43.61	31.50	6.47	34.57
PK	5G	47.51	74.00	-26.49	3.59	3	Horizontal	-	-	-	43.92	31.60	6.54	34.55

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	2.66 dB
Radiated Emissions below 1GHz	OS03-NH	5.07 dB
Radiated Emissions above 1GHz	03CH04-HY	3.53 dB

7. List of Measuring Equipment Used

Conducted Emission - Test Date: 19/Nov/2021

Instrument	Manufacturer/ Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	R&S	ESR	102318	9kHz - 3.6 GHz	26/Jul/2021	25/Jul/2022	Conduction (CO01-NH)
LISN	SCHAFFNER	NNB41	06/10024	9kHz - 30MHz	28/Dec/2020	27/Dec/2021	Conduction (CO01-NH)
LISN (Support Unit)	MessTec	NNB-2/16Z	99079	9kHz - 30MHz	03/Feb/2021	02/Feb/2022	Conduction (CO01-NH)
Power Filter	CORCOM	MR12030	N/A	30A*2	NCR	NCR	Conduction (CO01-NH)
RF Cable-CON	Suhner Switzerland	RG223/U	CB004	9kHz - 30MHz	25/Dec/2020	24/Dec/2021	Conduction (CO01-NH)
software	Audix	E3	6.12160806	-	NCR	NCR	Conduction (CO01-NH)

NCR: No Calibration Required

Radiated Emission below 1GHz - Test Date: 22/Nov/2021

Instrument	Manufacturer/ Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Open Area Test Site	SPORTON	OATS-10	OS03-NH	30 MHz - 1 GHz 10m, 3m	16/Oct/2021	15/Oct/2022	Radiation (OS03-NH)
Amplifier	HP	8447D	2944A08292	0.1 MHz - 1.3 GHz	02/Jul/2021	01/Jul/2022	Radiation (OS03-NH)
Spectrum Analyzer	R&S	FSP7	838858/038	9 kHz - 7GHz	21/Jun/2021	20/Jun/2022	Radiation (OS03-NH)
Receiver	R&S	ESCS30	100357	9 kHz - 2.75 GHz	07/May/2021	06/May/2022	Radiation (OS03-NH)
Bilog Antenna With 5dB Attenuator	CHASE	CBL6112D	25234	30 MHz - 2 GHz	24/Apr/2021	23/Apr/2022	Radiation (OS03-NH)
Turn Table	EMCO	2080	9805-2065	0 - 360 degree	NCR	NCR	Radiation (OS03-NH)
Antenna Mast	EMCO	2075	9804-2151	1 m - 4 m	NCR	NCR	Radiation (OS03-NH)
RF Cable-R10m	HSCN	RG213U	2X11N	30 MHz - 1 GHz	13/Jul/2021	12/Jul/2022	Radiation (OS03-NH)
Software	Audix	E3	Ver.4	-	NCR	NCR	Radiation (OS03-NH)

NCR: No Calibration Required

Radiated Emission above 1GHz - Test Date: 02/Dec/2021

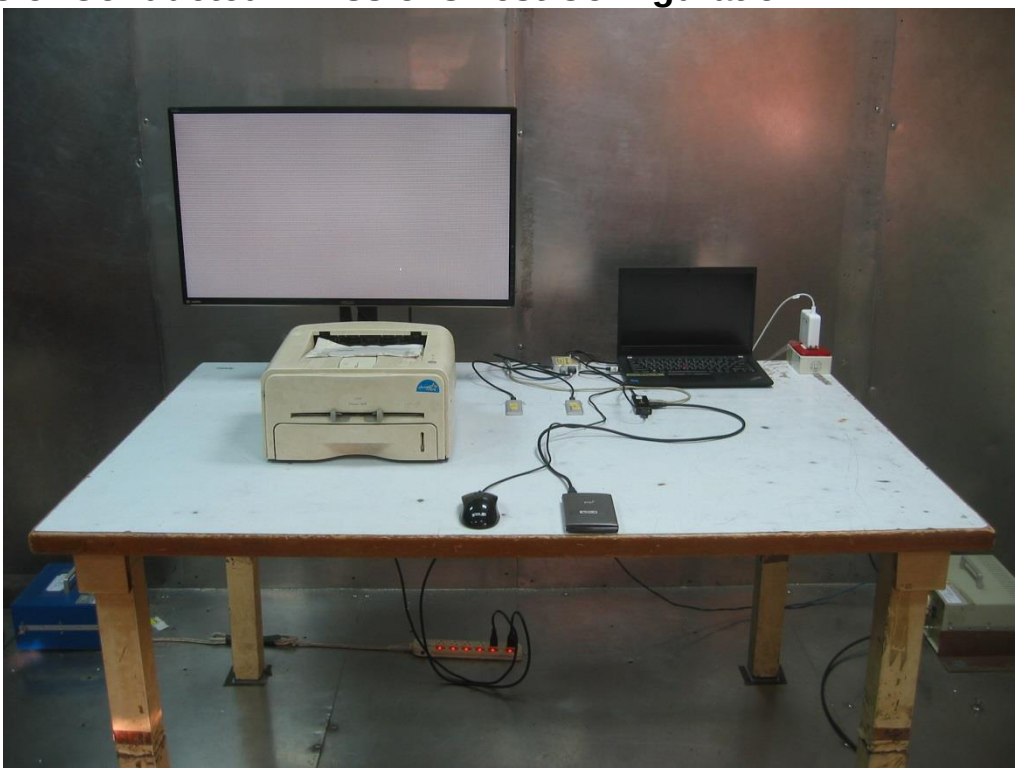
Instrument	Manufacturer/ Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Test Receiver	R&S	ESU-26	100422	20Hz ~ 26.5GHz	05/Nov/2021	04/Nov/2022	Radiation (03CH04-HY)
3m Semi Anechoic Chamber (Site V.S.W.R)	RIKEN	3m SAC	03CH04-HY	1 GHz ~ 18 GHz 3m	19/Feb/2021	18/Feb/2022	Radiation (03CH04-HY)
Microwave Preamplifier	Agilent	8449B	3008A02602	1GHz~26.5GHz	19/Mar/2021	18/Mar/2022	Radiation (03CH04-HY)
Horn Antenna	SCHWARZBECK	BBHA9120	BBHA9120D01834	1 GHz ~ 18 GHz	23/Feb/2021	22/Feb/2022	Radiation (03CH04-HY)
RF Cable	SUHNER	SUCOFLEX 104	CB001-03CH01	30MHz~18GHz	25/Feb/2021	24/Feb/2022	Radiation (03CH04-HY)
Turn Table	Chaintek	3000	MF7802056	0 ~ 360 degree	NCR	NCR	Radiation (03CH04-HY)
Antenna Mast	MF	MFA-515BSN	MF780208193	1 ~ 4 m	NCR	NCR	Radiation (03CH04-HY)
Software	Sporton	SENSE-EMI	V5.10.7	-	NCR	NCR	Radiation (03CH04-HY)

NCR: No Calibration Required

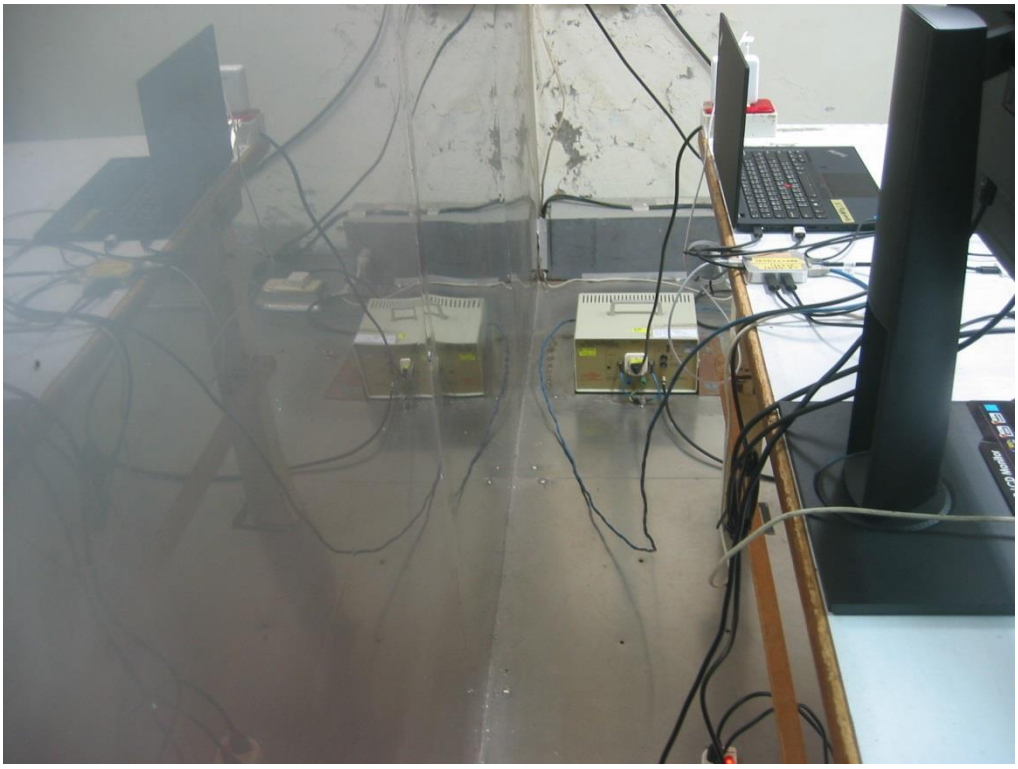
Appendix A. Test Photos

1. Photographs of Conducted Emissions Test Configuration

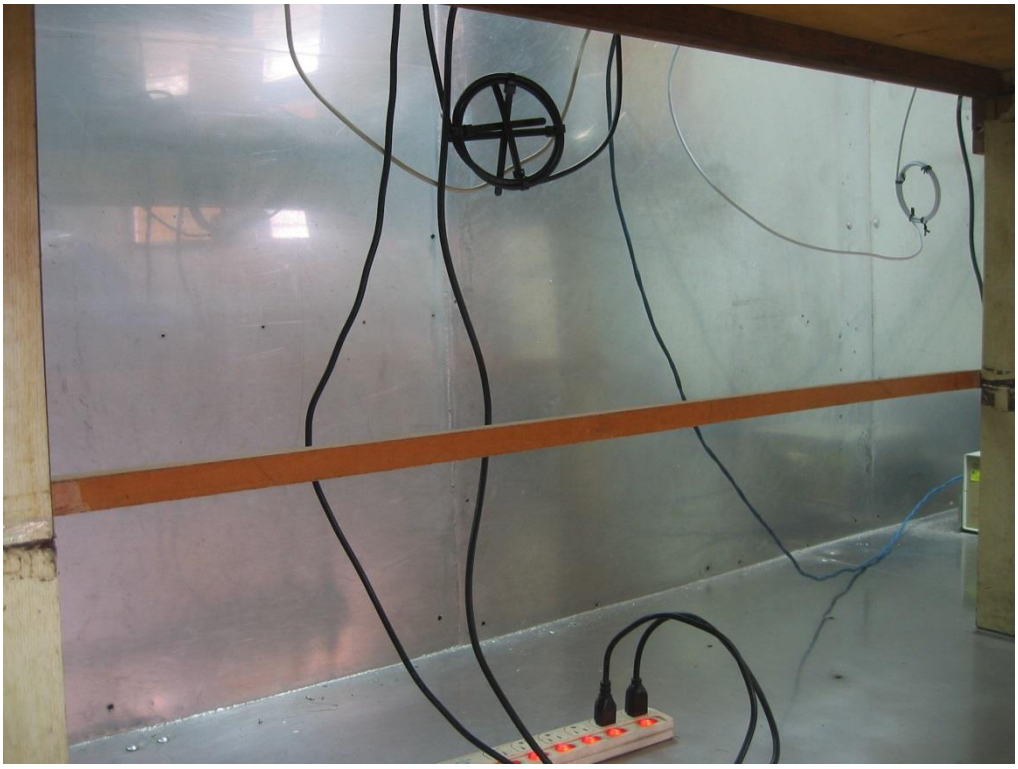
Front View



Side View



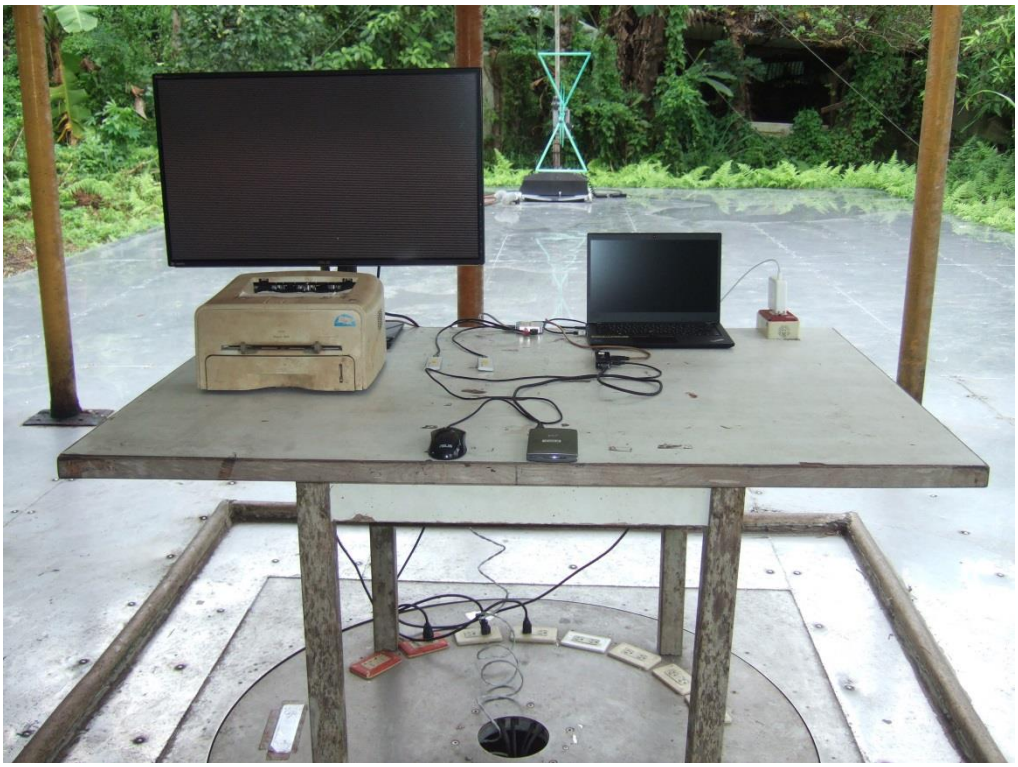
Under Table View



2. Photographs of Radiated Emissions Test Configuration

For radiated emissions below 1GHz

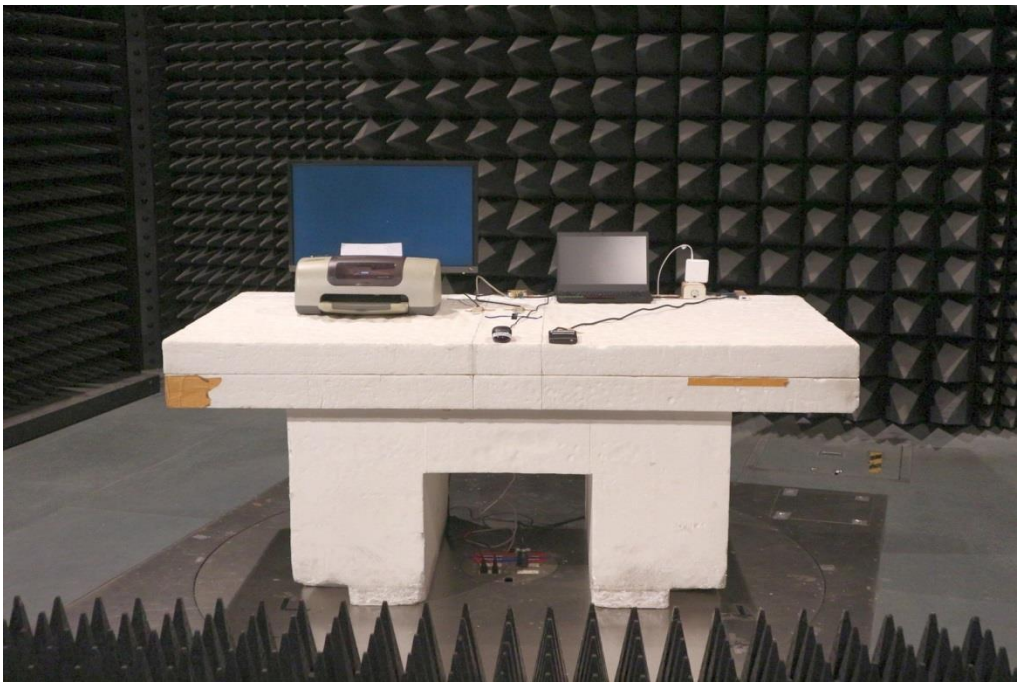
Front View



Rear View

For radiated emissions above 1GHz

Front View



Rear View

———THE END———