



EMC TEST REPORT

Equipment : Industrial Router
Brand Name : Atop
Model Name : ER5805P/ER5805
Applicant : Atop Technologies, Inc.
1F, No. 30 R&D Rd. II, Science-Based Industrial Park,
Hsinchu 30076, Tawian , R.O.C.
Manufacturer : Atop Technologies, Inc.
1F, No. 30 R&D Rd. II, Science-Based Industrial Park,
Hsinchu 30076, Tawian , R.O.C.
Standard : EN 55032:2015+A11:2020 Class A
EN IEC 61000-3-2:2019
EN 61000-3-3:2013+A1:2019
EN 55024:2010+A1:2015
EN 55035:2017+A11:2020

The product was received on Aug. 23, 2022, and testing was started from Nov. 02, 2022 and completed on Nov. 08, 2022. We, Sporton International Inc. Hsinchu 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 test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.


Approved by: Sin Chang

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



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TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-M22_11 Ver1.3

Summary of Test Result

Report Clause	Ref Std. Clause	Test Standard	Test Items	Result (PASS/FAIL)	Remarks
4	8.3/8.4	EN 55032:2015+A11:2020	AC Power Port Conducted Emission	PASS	Under limit 12.96 dB at 654 kHz
4	8.7		Telecommunication Port Conducted Emission	PASS	Under limit 21.29 dB at 12.228 MHz
5	8.2		Radiated Emission below 1GHz	PASS	Under limit 9.51 dB at 64 MHz
5	8.2		Radiated Emission above 1GHz	PASS	Under limit 17.33 dB at 1.73 GHz
-	8.5	EN IEC 61000-3-2:2019	Harmonic Current Emission	N/A	Note1
-	8.6	EN 61000-3-3:2013+A1:2019	Voltage Fluctuations and Flicker	N/A	Note1



Applicable Standard: EN 55024:2010+A1:2015					
Report Clause	Ref Std. Clause (EN55024)	Test Standard	Test Items	Result (PASS/FAIL)	Remarks
10	4.2.1	IEC 61000-4-2:2008	ESD	PASS	-
9	4.2.3.2	IEC 61000-4-3:2006+A1:2007+A2:2010	RS	PASS	-
10	4.2.2	IEC 61000-4-4:2012	EFT	PASS	Note 1
11	4.2.5	IEC 61000-4-5:2014+A1:2017	Surges	PASS	Note 1 Note 2
12	4.2.3.3	IEC 61000-4-6:2013	CS	PASS	Note 1
13	4.2.4	IEC 61000-4-8:2009	PFMF	PASS	-
-	4.2.6	IEC 61000-4-11:2004+A1:2017	Voltage dips and Interruptions	N/A	-

Applicable Standard: EN 55035:2017+A11:2020					
Report Clause	Ref Std. Clause (EN55035)	Test Standard	Test Items	Result (PASS/FAIL)	Remarks
10	4.2.1	IEC 61000-4-2:2008	ESD	PASS	-
9	4.2.2.2	IEC 61000-4-3:2006+A1:2007+A2:2010	RS	PASS	-
10	4.2.4	IEC 61000-4-4:2012	EFT	PASS	Note 1
11	4.2.5	IEC 61000-4-5:2014+A1:2017	Surges	PASS	Note 1 Note 2
12	4.2.2.3	IEC 61000-4-6:2013	CS	PASS	Note 1
-	4.2.7	IEC 61000-4-6:2013	Broadband impulsive conducted disturbances	N/A	Note 3
13	4.2.3	IEC 61000-4-8:2009	PFMF	PASS	-
-	4.2.6	IEC 61000-4-11:2004+A1:2017	Voltage dips and Interruptions	N/A	Note 1

Note 1: The EUT was powered by PoE, and the PoE was for measurement only, would not be marketed.

Thus, it's not necessary to apply to Harmonic Current emission, Voltage Fluctuations, EFT (AC power port), Surge (AC power port), CS (AC power port) and DIP tests.

Note2: According to EN 55024 / EN 55035 Table 2 description, the surge test of telecommunication/signal cable test only for directly connect to outdoor cables, thus indoor telecommunication/signal port didn't necessary to be surge test.

Note 3: The EUT is without xDSL ports, so it's not necessary to apply to Broadband impulsive conducted disturbances test.

Declaration of Conformity:

- The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

- The test configuration, test mode and test software were written in this test report are declared by the manufacturer.
- The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sin Chang

Report Producer: Sandy Chuang

1. General Description of Equipment under Test

Product Detail	
Equipment Name	Industrial Router
Model Name	ER5805P/ER5805
Brand Name	Atop
Power Supply	From PoE or DC Power (12~48V)

1.1. Feature of Equipment under Test

1. The EUT's highest operating frequency is 1GHz.
2. Accessories: DC jack*1
3. Table for Multiple Listing

EUT	Model Name	PoE PD Function
1	ER5805P	V
2	ER5805	X

Note 1: From the above models, model: ER5805P (EUT 1) was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

4. 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. Test Mode

The following table is a list of the test modes shown in this test report.

Conducted Emissions	
Test Mode	Description
The DC Power and PoE were performed testing, After evaluation, PoE has been evaluated to be the worst case from Radiated Emissions below 1GHz, So the measurement for Conducted Emissions test will follow this same test configuration.	
1	Normal Link: EUT 1 + PoE

Disturbances at Telecommunication Ports	
Test Mode	Description
The DC Power and PoE were performed testing, After evaluation, PoE has been evaluated to be the worst case from Radiated Emissions below 1GHz, So the measurement for Disturbances at Telecommunication Ports test will follow this same test configuration.	
1	Normal Link: EUT 1 + PoE: WAN port / 1Gbps
2	Normal Link: EUT 1 + PoE: LAN 1 port / 1Gbps
3	Normal Link: EUT 1 + PoE: LAN 4 port / 1Gbps
Mode 1 and Mode 2 are worst test result among Mode 1 ~ Mode 3, and the test result of those two modes are selected to record in the test report.	

Radiated Emissions	
Test Mode	Description
1	Normal Link: EUT 1 in Y axis + DC Power
2	Normal Link: EUT 1 in Z axis + DC Power
Mode 2 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.	
3	Normal Link: EUT 1 in Z axis + PoE
<p>For Radiated Emission test below 1GHz:</p> <p>Mode 3 generated the worst test result, so it was recorded in this report.</p> <p>For Radiated Emission test above 1GHz:</p> <p>Mode 3 generated the worst test result for Radiated emission below 1GHz test, thus the measurement for Radiated emission above 1GHz test will follow this same test configuration.</p>	

ESD 、 RS 、 EFT 、 CS 、 PFMF	
Test Mode	Description
The DC Power and PoE were performed testing, After evaluation, PoE has been evaluated to be the worst case from Radiated Emissions below 1GHz, So the measurement for ESD 、 RS 、 EFT 、 CS 、 PFMF test will follow this same test configuration.	
1	Normal Link: EUT 1 + PoE

Surge	
Test Mode	Description
1	Normal Link: EUT 1 + DC Power

Note: The PoE below is for measurement only, would not be marketed. The PoE information as below:

Support Unit	Brand	Model Name
PoE	Atop	IJG7001

2.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

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For Conducted Emissions test:

No.	Support Unit	Brand	Model	FCC ID
A	PoE	Atop	IJG7001	N/A
B	Micro SD Card	Transcend	TS16GUSDHC10	N/A
C	POE IN NB	DELL	E6430	N/A
D	WAN NB	DELL	E6430	N/A
E	LAN1 NB	DELL	E6430	N/A

For Radiated Emissions test:

No.	Support Unit	Brand	Model	FCC ID
A	PoE	Atop	IJG7001	N/A
B	POE NB	DELL	E6430	N/A
C	WAN NB	DELL	E6430	N/A
D	Micro SD Card	Transcend	TS16GUSDHC10	N/A
E	LAN NB	DELL	E6430	N/A

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For ESD 、RS 、EFT 、CS 、PFMF test:

No.	Support Unit	Brand	Model	FCC ID
A	POE	ATOP	IJG7001	N/A
B	Micro SD Card	Transcend	TS16GUSDHC10	N/A
C	POE IN NB	DELL	E6430	N/A
D	WAN NB	DELL	E6430	N/A
E	LAN1 NB	DELL	E6430	N/A

For Surge test:

No.	Support Unit	Brand	Model	FCC ID
A	Power Supply	Advanced	LPS-305	N/A
B	Micro SD Card	Transcend	TS16GUSDHC10	N/A
C	LAN NB	DELL	E6430	N/A
D	WAN NB	DELL	E6430	N/A

2.3. EUT Operation Condition

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For AC Power Port Conducted emission and Radiated emission tests:

During the test, the following programs under Win 7 were executed:

The remote notebook executed "telnet" to link with the device to perform the read-write function from SD card.

The remote notebook executed "telnet" to enable WAN & LAN function by LAN.

The remote notebook executed "ping.exe" to link with the EUT to maintain the connection by LAN and WAN.

For Disturbances at Telecommunication Ports test:

At the same time, the remote notebook executed "Nuwin" to link with the EUT to traffic packet data generated software and keep maximum traffic load by LAN and WAN.

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During the test, the following programs under Win 7 were executed:

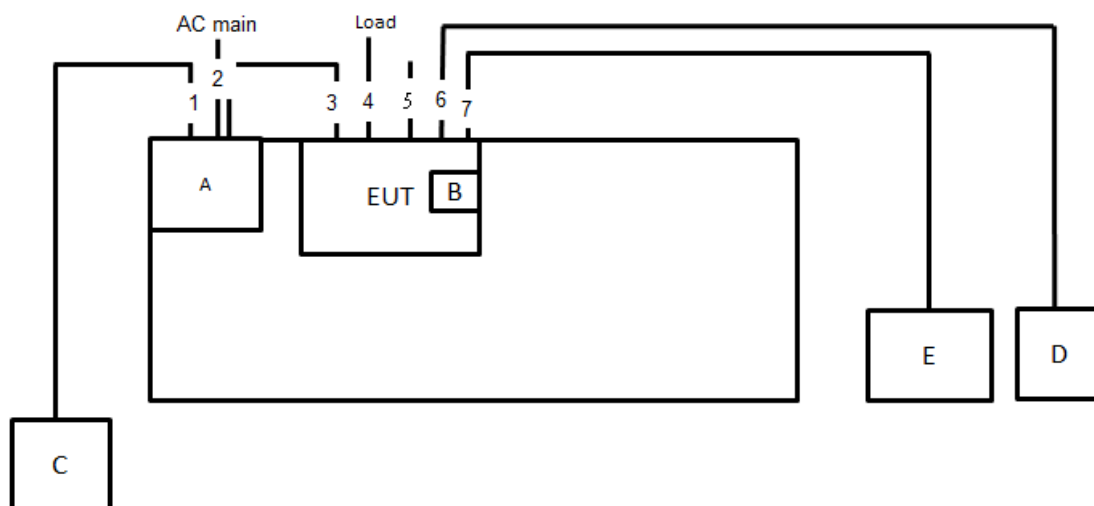
The remote notebook executed "telnet" to link with the device to perform the read-write function from SD card.

The remote notebook executed "telnet" to enable WAN & LAN function by LAN.

The remote notebook executed "ping.exe" to link with the EUT to maintain the connection by LAN and WAN.

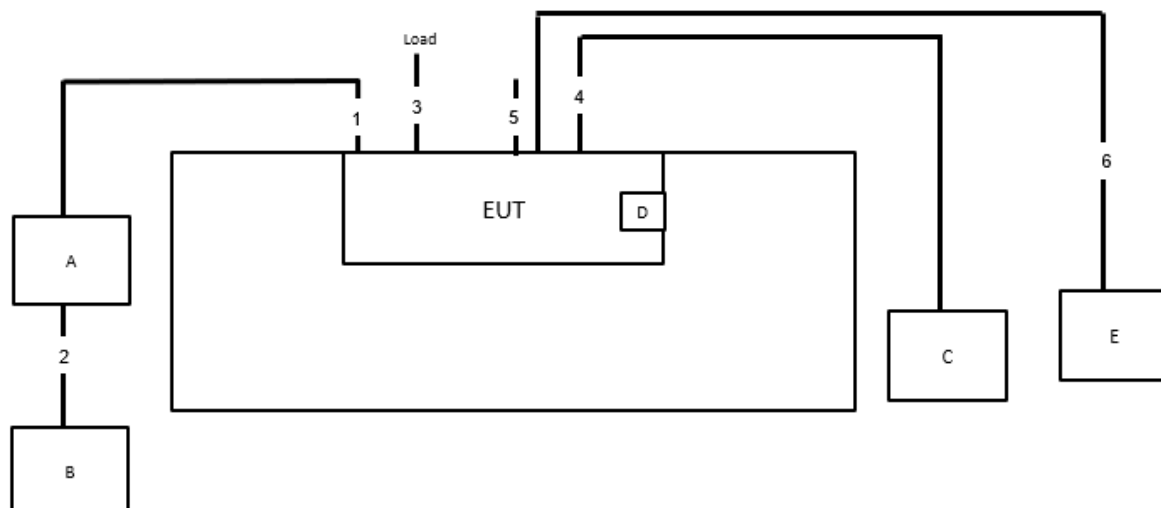
2.4. Connection Diagram of Test System

2.4.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	10m
3	RJ-45 cable	No	1m
4	RJ-45 cable*2	No	1.5m
5	Ground cable	No	1.8m
6	RJ-45 cable	No	10m
7	RJ-45 cable	No	10m

2.4.2. Radiation Emissions Test Configuration



Item	Connection	Shielded	Length
1	RJ-45 cable	No	10m
2	RJ-45 cable	No	3m
3	RJ-45 cable*3	No	1.5m
4	RJ-45 cable	No	10m
5	Ground cable	No	1.8m
6	RJ-45 cable	No	10m

3. General Information of Test

3.1. Test Facility

EMI/EMS		
Test Lab. : Sporton International Inc. Hsinchu Laboratory		
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)	
(TAF: 3787)	TEL: 886-3-656-9065	FAX: 886-3-656-9085

3.2. Test Environment

Test Items	Test Site No.	Test Engineer	Test Environment			Test Date	Remark
			Temp (°C)	Humidity (%)	Pressure (kPa)		
AC Power Port Conducted Emission	CO01-CB	Tim Chen	23~24	58~59	-	Nov. 02, 2022	-
Telecommunication Port Conducted Emission	CO01-CB	Tim Chen	23~24	58~59	-	Nov. 02, 2022	-
Radiated Emission below 1GHz	10CH01-CB	Ryan Huang	22~23	57~58	-	Nov. 02, 2022	-
Radiated Emission above 1GHz	10CH01-CB	Ryan Huang	22~23	57~58	-	Nov. 02, 2022	-
ESD	ES01-CB	Dean Chang	22~23	52~53	101	Nov. 08, 2022	-
RS	RS01-CB	Bob Chang	22~23	55~57	-	Nov. 07, 2022	-
EFT	EX02-CB	Allen Chung	23~25	55~57	-	Nov. 04, 2022	-
Surges	EX02-CB	Allen Chung	23~25	55~57	-	Nov. 08, 2022	-
CS	EX01-CB	Bob Chang	23~24	57~58	-	Nov. 03, 2022	-
PFMF	EX02-CB	Allen Chung	23~25	55~57	-	Nov. 04, 2022	-

3.3. Test Voltage

Power Type	Test Voltage
AC Power Supply	230 V / 50 Hz

3.4. Frequency Range Investigated

EMI Test Items	Frequency Range
Conducted emission test	150 kHz to 30 MHz
Radiated emission test	30 MHz to 6,000 MHz
EMS Test Items	Frequency Range
Radio frequency electromagnetic field immunity test	80 MHz to 6,000 MHz (Spot test: 1800 MHz / 2600 MHz / 3500 MHz / 5000 MHz)
Conducted immunity test	150 kHz to 80 MHz

3.5. Test Distance

Test Items	Test Distance
Radiated emission test below 1 GHz (30 MHz to 1,000 MHz)	10 m
Radiated emission test above 1 GHz (1,000 MHz to 6,000 MHz)	3 m
Radio frequency electromagnetic field immunity test	3 m

4. Test of Conducted Emission

4.1. Limit

4.1.1. Limit for AC power ports :

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	79	66
0.5~30	73	60

4.1.2. Limit for Telecommunication ports :

Frequency (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	QP	AV	QP	AV
0.15~0.5	97~87	84~74	53~43	40~30
0.5~30	87	74	43	30

4.2. Test Procedures

- The EUT was placed on a desk 0.8 meters 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 meters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- Connect Telecommunication port to ISN (Impedance Stabilization Network).
- All the support units are connect to the other LISN.
- The LISN provides 50 Ω coupling impedance for the measuring instrument.
- The CISPR states that a 50 Ω , 50 μ H LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

4.3. Measurement Results Calculation

The measured Level is calculated using:

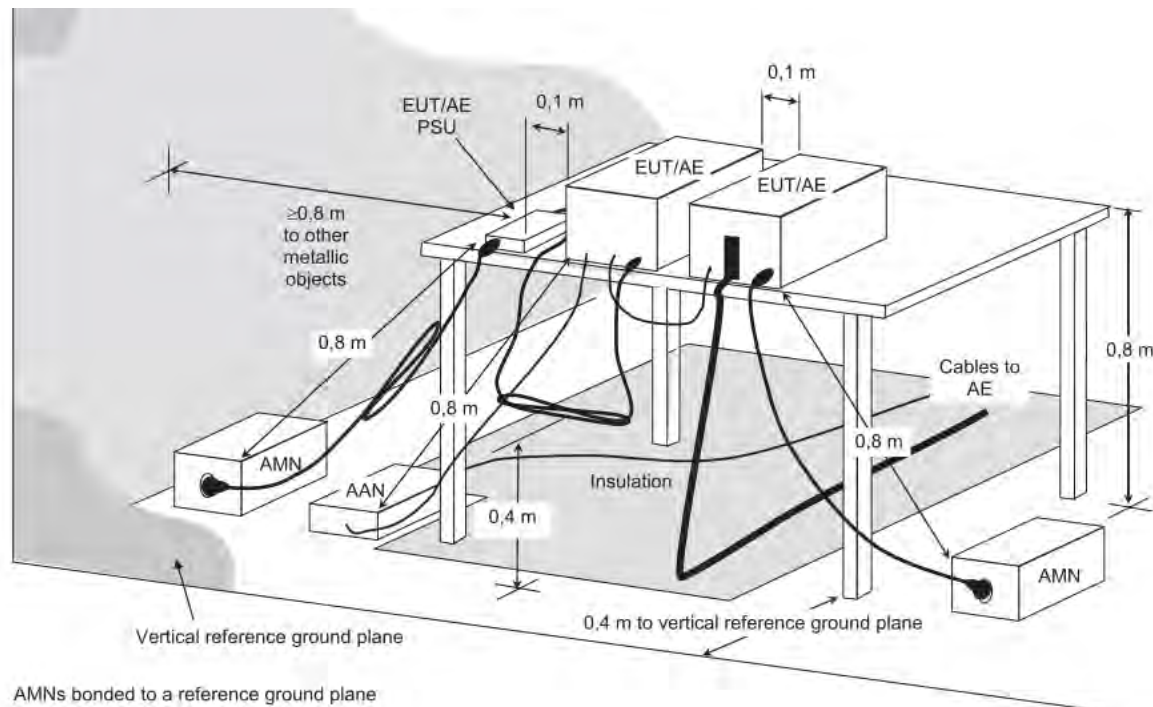
For AC Power Port Conducted Emission

- a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- b. Margin = -Limit + Level

For Telecommunication Port Conducted Emission

- a. Corrected Reading: ISN Factor (ISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- b. Margin = -Limit + Level
- c. For Current method Calculation : $\text{dB}\mu\text{A} + 20 \cdot \log_{10}(50\Omega) = \text{dBuV}$

4.4. Typical Test Setup Layout of Conducted Emission and disturbances at telecommunication ports



4.5. Test Result of AC Power Ports

Refer as Appendix A

4.6. Test Result of Telecommunication Ports

Refer as Appendix B

5. Test of Radiated Emission

5.1. Limit

Radiated Emission below 1 GHz test at 10 m:

Frequency (MHz)	QP (dBuV/m)
30~230	40
230~1,000	47

Radiated Emission above 1 GHz test at 3 m:

Frequency (MHz)	PK (dBuV/m)	AV (dBuV/m)
1,000~3,000	76	56
3,000~6,000	80	60

5.2. Test Procedures

<Below 1 GHz>:

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- 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.
- 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.
- Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- 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.

<Above 1 GHz>:

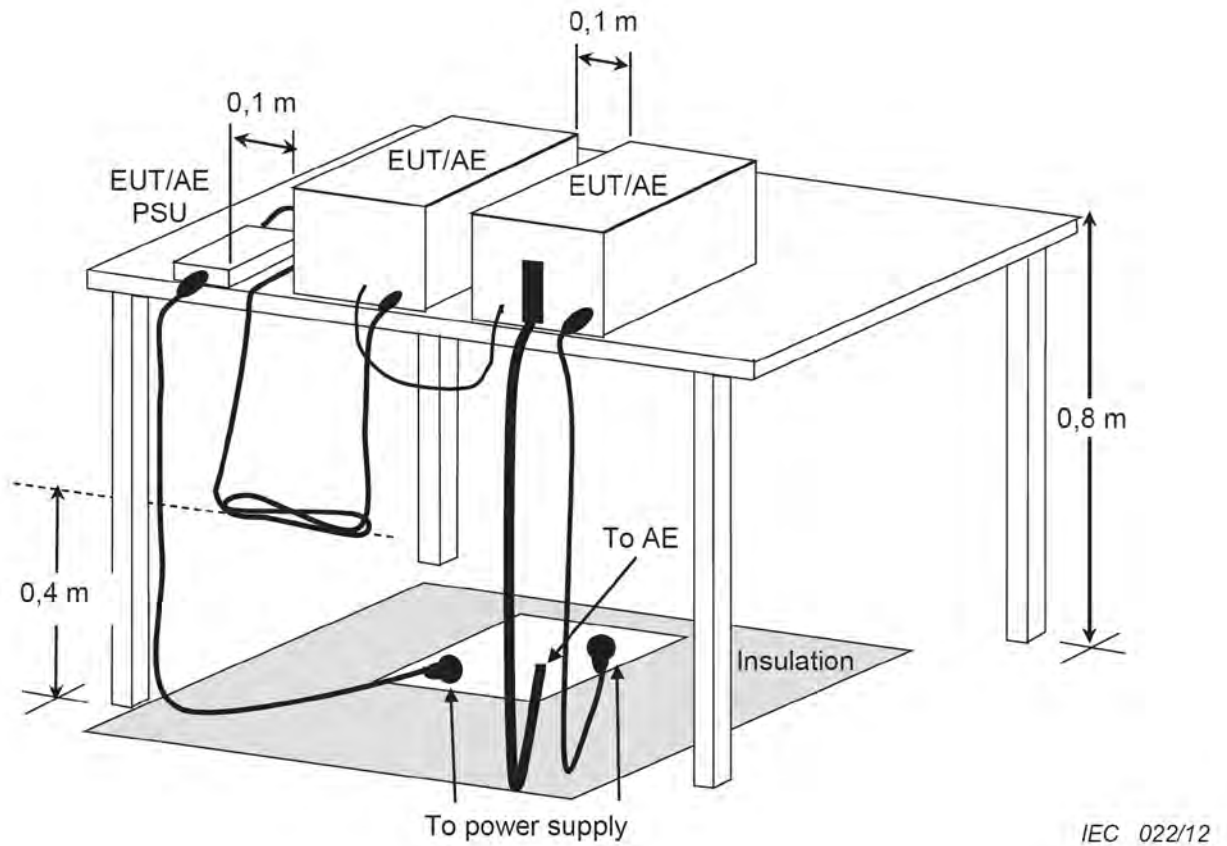
- a. Same test set up as below 1 GHz radiated testing.
- b. The EUT was set 3 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c. There should be absorber placed between the EUT and Antenna and its located size should let the test site meet CISPR16-1-4 requirement.
- d. The table was rotated 360 degrees to determine the position of the highest radiation.
- e. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- 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.
- g. When EUT locating on the turn-table, and its height is over 172 cm (Antenna's 3dB beam width of 6 GHz 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 20 dB 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.

5.3. Measurement Results Calculation

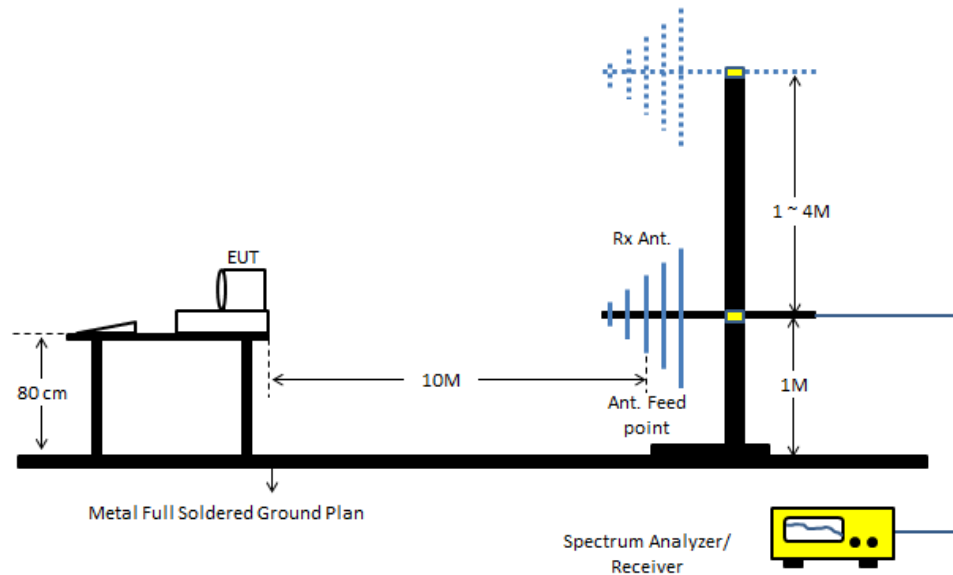
The measured Level is calculated using:

- a. Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA) = Level
- b. Margin = -Limit + Level

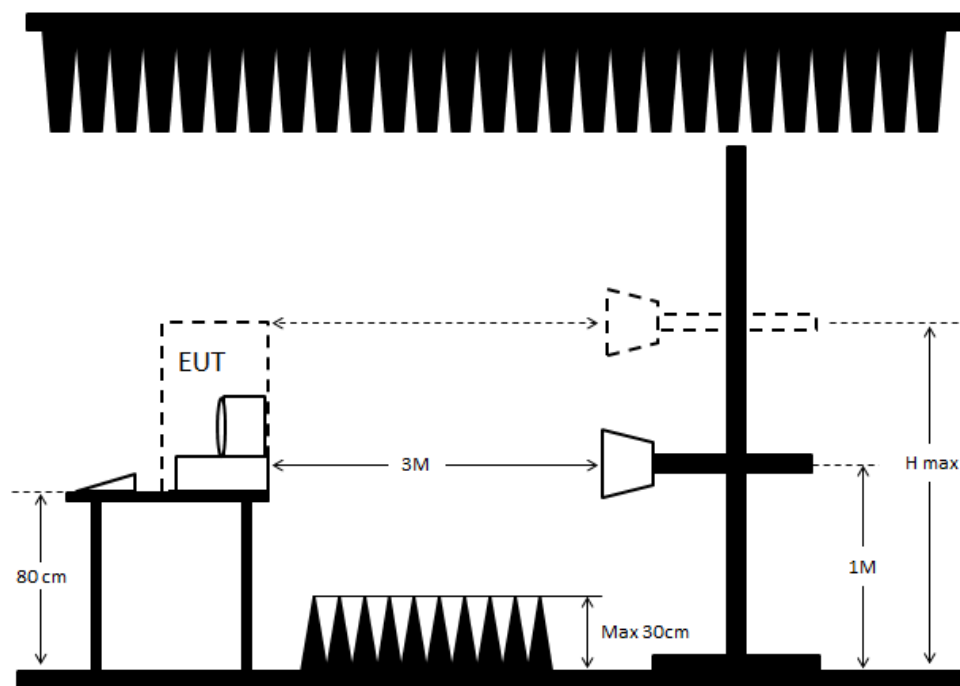
5.4. Typical Test Setup Layout of Radiated Emission



<Below 1 GHz>:



<Above 1 GHz>:



5.5. Test Result of Radiated Emission

Refer as Appendix C

6. General Performance Criteria Description of Immunity Test

For EN 55024

According to Clause 7.1 of EN 55024 standard, the following describes the general performance criteria.

Criterion A (Note 1)	<p>During and after the test the EUT shall continue to operate as intended without operator intervention.</p> <p>No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended.</p>
Criterion B (Note 2)	<p>During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.</p> <p>After the test, the equipment shall continue to operate as intended without operator intervention.</p> <p>For xDSL Terminal equipment:</p> <p>During the test shall not cause the system to lose the established connection or retrain.</p> <p>At the cessation of the test, the system shall operate in the condition established prior to the application of the test without user intervention.</p>
Criterion C	<p>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.</p> <p>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

Note 1 : 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 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.

Note 2 : After the application of the phenomenon 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. During the test, degradation of performance is allowed. However, no change of operating state if stored data is allowed to persist after the test. 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.

For EN 55035
According to Clause 8 of EN 55035 standard, the following describes the general performance criteria.

Criterion A (Note 1)	<p>During and after the test the EUT shall continue to operate as intended without operator intervention.</p> <p>No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended.</p> <p>Requirements for CPE containing xDSL ports :</p> <p>With the impulsive noise applied:</p> <p>The modem shall operate without retraining and without SES at the bit rate established prior to the application of the impulsive noise. No extra CRC errors shall occur due to the impulsive noise.</p>								
Criterion B (Note 2)	<p>During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.</p> <p>After the test, the equipment shall continue to operate as intended without operator intervention.</p> <p>For xDSL equipment :</p> <ul style="list-style-type: none"> - For EFT Test (xDSL or AC mains power port): the CRC error count shall not have increased by more than 600 when compared to the count prior to the application of the test. - Broadband impulse noise disturbances, isolated : During the test shall not cause the system to lose the established connection or retrain. At the cessation of the test, the system shall operate in the condition established prior to the application of the test without user intervention. <table border="1" data-bbox="456 1039 1474 1352"> <thead> <tr> <th>Impulse duration ms</th><th>Performance criteria</th></tr> </thead> <tbody> <tr> <td>0.24</td><td>The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.</td></tr> <tr> <td>10</td><td>The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.</td></tr> <tr> <td>300</td><td>The application of the impulse shall not cause the xDSL link to lose synchronisation.</td></tr> </tbody> </table>	Impulse duration ms	Performance criteria	0.24	The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.	10	The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.	300	The application of the impulse shall not cause the xDSL link to lose synchronisation.
Impulse duration ms	Performance criteria								
0.24	The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.								
10	The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.								
300	The application of the impulse shall not cause the xDSL link to lose synchronisation.								
Criterion C	<p>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.</p> <p>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>								
<p>Note 1 : 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 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.</p> <p>Note 2 : After the application of the phenomenon 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. During the test, degradation of performance is allowed. However, no change of operating state if stored data is allowed to persist after the test. 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.</p>									

7. EUT Performance Criteria

Applicable Standard: EN 55024:2010+A1:2015	
Test Type	Pass Criterion
Electrostatic discharge immunity test ± 2, 4 kV Contact Discharge ± 2, 4, 8 kV Air Discharge Standard Criterion B	A
Radiated immunity test Frequency Range : 80 MHz to 1,000 MHz Amplitude modulated : 80 % AM (1 kHz) Electromagnetic field : 3 V/m (unmodulated, r.m.s) Standard Criterion A	A
Electrical fast transient / burst immunity test I/O ports 5/50 ns, ± 0.5 kV, 5 kHz Standard Criterion B	A
Surge immunity test DC ports : ± 0.5 kV Standard Criterion B	A
Conducted immunity test Frequency Range : 150 kHz to 80 MHz Amplitude modulated : 80 % AM (1 kHz) Electromagnetic field : 3 V (unmodulated, r.m.s) Standard Criterion A	A
Power frequency magnetic field immunity test 1 A/m, 50 Hz Standard Criterion A	A
Voltage dips, short interruptions and voltage variations immunity tests 1. >95% reduction 10 ms (0.5 cycles) – Standard Criterion B	N/A
2. 30% reduction 500 ms (25 cycles) – Standard Criterion C	N/A
3. Interruption >95% reduction 5,000 ms (250 cycles) – Standard Criterion C	N/A

Applicable Standard: EN 55035:2017+A11:2020	
Test Type	Pass Criterion
Electrostatic discharge immunity test ± 2, 4 kV Contact Discharge ± 2, 4, 8 kV Air Discharge Standard Criterion B	A
Radiated immunity test Swept test Frequency Range : 80 MHz to 1,000 MHz Spot test 1,800 MHz / 2,600 MHz / 3,500 MHz / 5,000 MHz Electromagnetic field : 3 V/m (unmodulated, r.m.s) Amplitude modulated : 80 % AM (1 kHz) Standard Criterion A	A
Electrical fast transient / burst immunity test I/O ports 5/50 ns, ± 0.5 kV, 5 kHz Standard Criterion B	A
Surge immunity test DC ports : ± 0.5 kV Standard Criterion B	A
Conducted Immunity test Frequency Range / Electromagnetic field : 150 kHz to 10 MHz / 3 V (unmodulated, r.m.s) 10 MHz to 30 MHz / 3 to 1 V (unmodulated, r.m.s) 30 MHz to 80 MHz / 1 V (unmodulated, r.m.s) Amplitude modulated : 80 % AM (1 kHz) Standard Criterion A	A
Broadband impulse noise disturbances, repetitive Impulse frequency / Test level 0.15 MHz to 0.5 MHz / 107 dBuV 0.5 MHz to 10 MHz / 107 dBuV to 36 dBuV 10 MHz to 30 MHz / 36 dBuV to 30 dBuV Burst duration, Burst period 0.70 ms, 10 ms Standard Criterion A	N/A
Broadband impulse noise disturbances, isolated Impulse frequency / Test level 0.15 MHz to 30 MHz / 110 dBuV Burst duration 0.24 ms, 10 ms, 300 ms Standard Criterion B	N/A



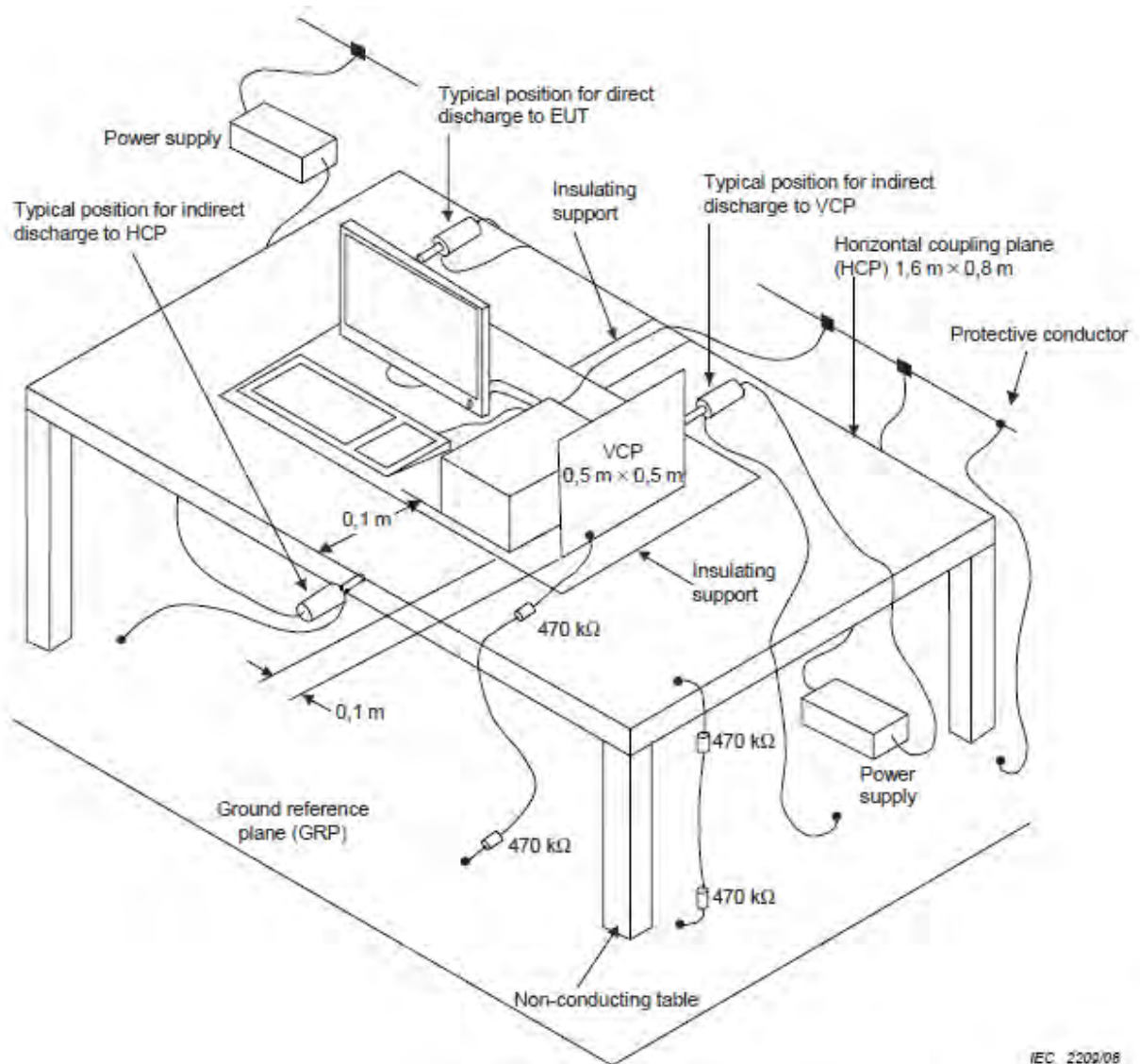
Power frequency magnetic field immunity test 1 A/m, 50 Hz Standard Criterion A	A
Voltage dips, short interruptions and voltage variations immunity tests 1. Residual < 5% 10 ms (0.5 cycles) – Standard Criterion B	N/A
2. Residual 70% 500 ms (25 cycles) – Standard Criterion C	N/A
3. Residual < 5% 5,000 ms (250 cycles) – Standard Criterion C	N/A

8. Electrostatic Discharge Immunity Test (ESD)

8.1. Test Specification

Reference Standard	EN 61000-4-2 / IEC 61000-4-2	
Discharge Impedance	330 ohm / 150 pF	
Contact Discharge	$\pm 2, 4$ kV	
Air Discharge	$\pm 2, 4, 8$ kV	
Rise Time	0.8 ns ± 25 %	
Current at 30 ns	± 30 %	
Current at 60 ns	± 30 %	
Polarity	Positive / Negative	
Number of Discharge	For EN 55035	Air Discharge 20 times at each test point
		Contact Discharge 20 times at each test point
	For EN 55024	Air Discharge 20 times at each test point
		Contact Discharge 50 times at each test point
Single Discharge Mode	1 discharge per 1s	

8.2. 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 follow manner:

- CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- 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.

8.3. 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 1m 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 0.2m 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, 0.8m 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.

8.4. ESD 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.

8.5. Test Result

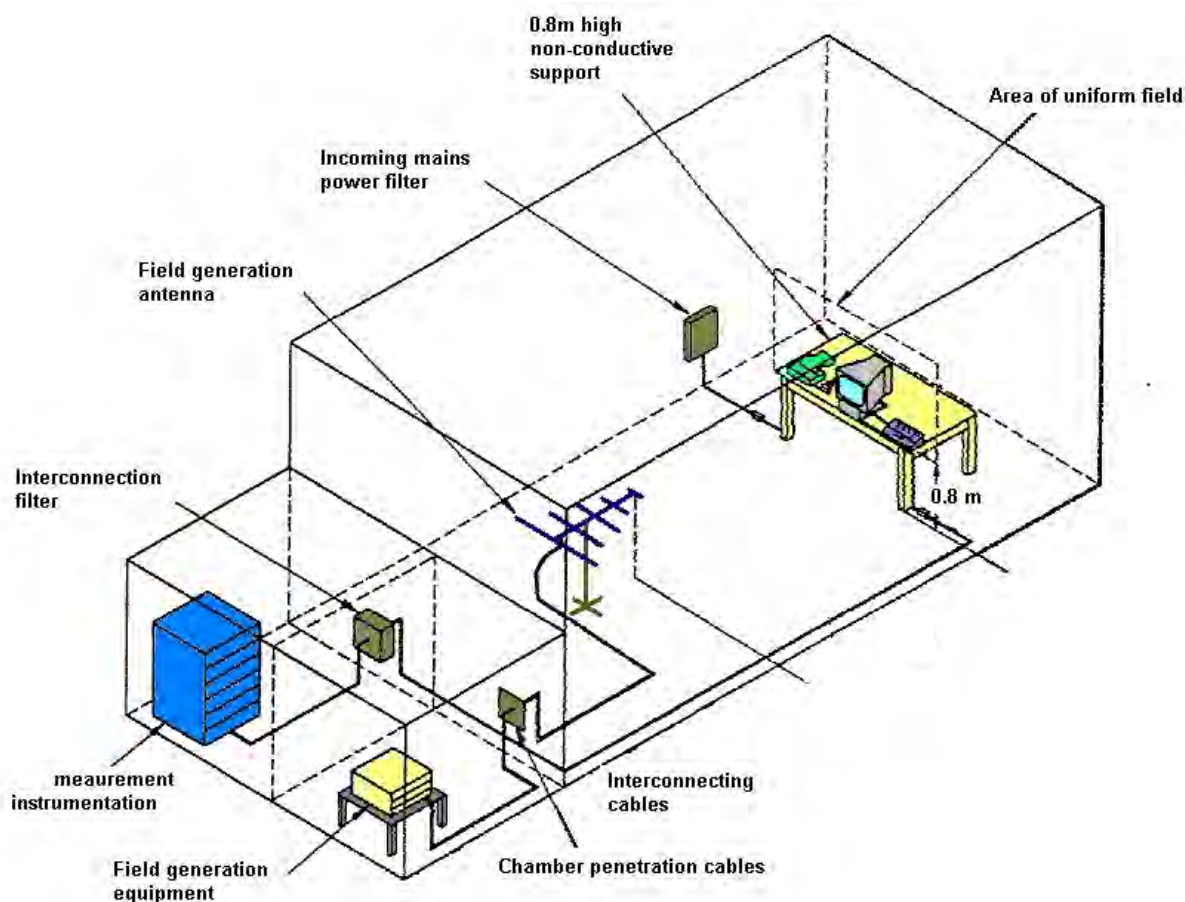
Refer as Appendix D

9. Radio Frequency Electromagnetic Field Immunity Test (RS)

9.1. Test Specification

Reference Standard	EN 61000-4-3 / IEC 61000-4-3
Frequency Range	For EN 55024: 80 MHz to 1,000 MHz
	For EN 55035:
	Swept test : 80 MHz to 1,000 MHz Spot test : 1800 MHz / 2600 MHz / 3500 MHz / 5000 MHz
Field Strength	3 V/m (un-modulated, r.m.s) 80% AM (1 kHz)
Frequency Step	1 %
Dwell Time	2.9 sec
Antenna Polarity	Vertical / Horizontal

9.2. Test Setup



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.

9.3. 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 below 1GHz / above 1GHz 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. At each of the above conditions, the frequency range is swept 80-6,000 MHz (Spot test: 1800 MHz / 2600 MHz / 3500 MHz / 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 1.5×10^{-3} decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.
- e. If need to use the exclusion band, for different equipment should be referenced as below:

The exclusion band for 2.4 GHz equipment was from 2280 MHz to 2603.5 MHz.

The exclusion band for 5 GHz equipment was from 4880 MHz to 5995 MHz.

The exclusion band for 5.8 GHz equipment was from 5455 MHz to 6000 MHz.

9.4. Test Result

Refer as Appendix D

10. Electrical Fast Transient/Burst Immunity Test (EFT/BURST)

10.1. Test Specification

Reference Standard	EN 61000-4-4 / IEC 61000-4-4
Test Voltage	Telecommunication/Signal Line: ± 0.5 kV
Polarity	Positive / Negative
Rise time of the pulses	5 ns
Impulse duration	50 ns
Burst duration	15 ms for 5 kHz
Burst period	300 ms
Impulse Frequency	For EN 55035: Telecommunication/Signal: 5 kHz (Except xDSL port)
	For EN 55024: Telecommunication/Signal: 5 kHz (Except xDSL equipment)
Duration	1 min

10.3. Test Procedure

- a. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
 - ambient temperature: 15°C to 35°C;
 - relative humidity : 45% to 75%;
 - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).
- b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.
- c. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.
- d. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria :
 - Normal performance within the specification limits.
 - Temporary degradation or loss of function or performance which is self-recoverable.
 - Temporary degradation or loss of function or performance which requires operator intervention or system reset.
 - Degradation or loss of function which is not recoverable due to damage of equipment (components).

10.4. Test Result

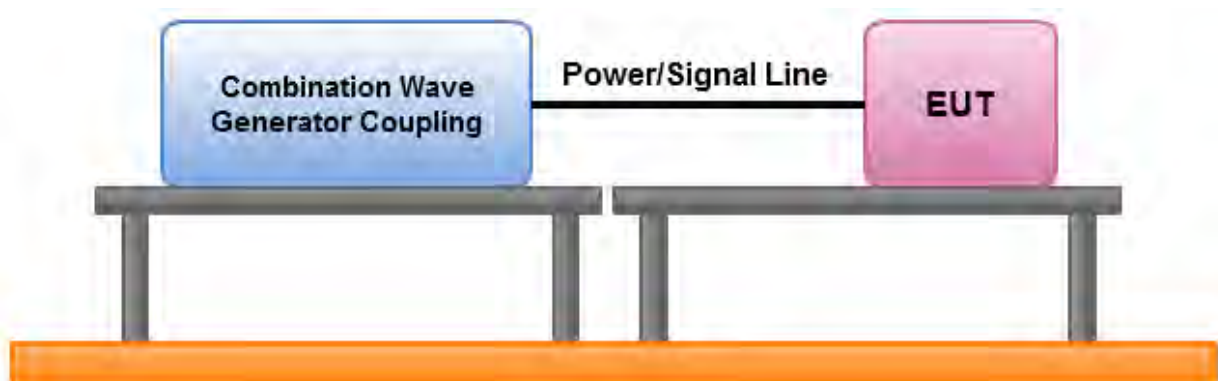
Refer as Appendix D

11. Surge Immunity Test

11.1. Test Specification

Reference Standard	EN 61000-4-5 / IEC 61000-4-5
Test Voltage	DC Power Port: ± 0.5 kV
Polarity	Positive / Negative
Wave Shape	Power Port: 1.2/50 μ s Open-circuit voltage 8/20 μ s Short-circuit current
Phase Angle	0°, 90°, 180°, 270°
Time between successive pulses	60 sec.
Number of test	5 positive and 5 negative

11.2. Test Setup



11.3. Test Procedure

a. Climatic conditions

The climatic conditions shall comply with the following requirements :

- ambient temperature : 15 °C to 35 °C
- relative humidity : 10 % to 75 %
- atmospheric pressure : 86 kPa to 106 kPa (860 mbar to 1060 mbar)

b. Electromagnetic conditions

The electromagnetic environment of the laboratory shall not influence the test results.

c. The test shall be performed according the test plan that shall specify the test set-up with

- generator and other equipment utilized;
- test level (voltage/current);
- generator source impedance;
- internal or external generator trigger;
- number of tests: at least five positive and five negative at the selected points;
- repetition rate: maximum 1/min.
- inputs and outputs to be tested;
- representative operating conditions of the EUT;
- sequence of application of the surge to the circuit;
- phase angle in the case of a.c. power supply;
- actual installation conditions, for example :
 - AC : neutral earthed,
 - DC : (+) or (-) earthed to simulated the actual earthing conditions.

d. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).

e. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.

f. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.

g. If the actual operating signal sources are not available, they may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according to the test plan.

h. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test a previously unstressed equipment shall be used to the protection devices shall be replaced.

11.4. Test Result

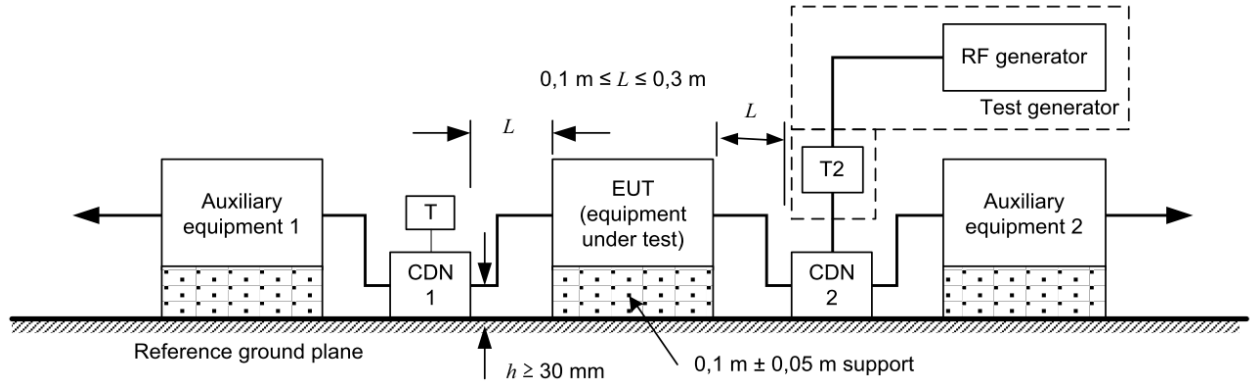
Refer as Appendix D

12. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test (CS)

12.1. Test Specification

Reference Standard	EN 61000-4-6 / IEC 61000-4-6
Frequency Range / Field Strength	For EN 55024: 150 kHz to 80 MHz / 3 V (unmodulated, r.m.s) Amplitude modulated : 80 % AM (1 kHz) For EN 55035: 150 kHz to 10 MHz / 3 V (unmodulated, r.m.s) 10 MHz to 30 MHz / 3 to 1 V (unmodulated, r.m.s) 30 MHz to 80 MHz / 1 V (unmodulated, r.m.s) Amplitude modulated : 80 % AM (1 kHz)
Frequency Step	1 %
Dwell Time	2.9 sec
Coupling mode	CDN T8-10, CDN T800

12.2. Test Setup



12.3. Test Procedure

- a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- b. This test method test can be performed without using a self-shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.
- c. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- d. The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1kHz sinewave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- e. 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.
- f. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.
- g. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.
- h. The use of special exercising programs is recommended.
- i. Testing shall be performed according to a Test Plan, which shall be included in the test report.
- j. It may be necessary to carry out some investigatory testing in order to establish some aspects of the test plan.

12.4. Test Result

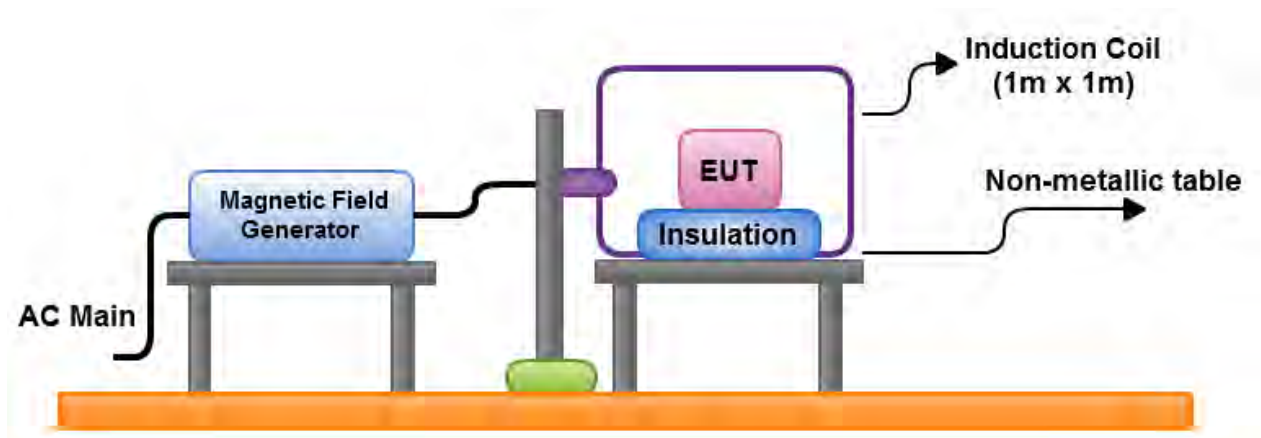
Refer as Appendix D

13. Power Frequency Magnetic Field Immunity Tests

13.1. Test Specification

Reference Standard	IEC 61000-4-8
Power Frequency	50 Hz
Field Strength	1 A/m
Observation type	1 min
Inductance Coil	1 m x 1 m

13.2. Test Setup



13.3. 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.

13.4. Test Result

Refer as Appendix D

14. List of Measuring Equipment Used

<EMI>

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 22, 2022	Feb. 21, 2023	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Feb. 09, 2022	Feb. 08, 2023	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Apr. 12, 2022	Apr. 11, 2023	Conduction (CO01-CB)
Impedance Stabilization Network	Teseq	ISN T800	24557	150kHz ~ 230MHz	Jan. 11, 2022	Jan. 10, 2023	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Feb. 10, 2022	Feb. 09, 2023	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	Oct. 18, 2022	Oct. 17, 2023	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
10m Semi Anechoic Chamber NSA	TDK	SAC-10M	10CH01-CB	30MHz~1GHz 10m,3m	Jan. 27, 2022	Jan. 26, 2023	Radiation (10CH01-CB)
10m Semi Anechoic Chamber VSWR	TDK	SAC-10M	10CH01-CB	1GHz ~18GHz 3m	Mar. 11, 2022	Mar. 10, 2023	Radiation (10CH01-CB)
Amplifier	Agilent	8447D	2944A10783	9kHz ~ 1.3GHz	Mar. 11, 2022	Mar. 10, 2023	Radiation (10CH01-CB)
Amplifier	Agilent	8447D	2944A10784	9kHz ~ 1.3GHz	Mar. 11, 2022	Mar. 10, 2023	Radiation (10CH01-CB)
Low Cable	Woken	SUCOFLEX 104	low cable-01	25MHz ~ 1GHz	Oct. 18, 2022	Oct. 17, 2023	Radiation (10CH01-CB)
Low Cable	Woken	SUCOFLEX 104	low cable-02	25MHz ~ 1GHz	Oct. 18, 2022	Oct. 17, 2023	Radiation (10CH01-CB)
Biconical Antenna	Schwarzbeck	VHBB 9124	324	30MHz ~ 200MHz	Jun. 11, 2022	Jun. 10, 2023	Radiation (10CH01-CB)
Log Antenna	Schwarzbeck	VUSLP 9111	247	200MHz ~ 1GHz	Jun. 11, 2022	Jun. 10, 2023	Radiation (10CH01-CB)
EMI Test Receiver	Rohde&Schwarz	ESCI	100186	9kHz ~ 3GHz	Jul. 11, 2022	Jul. 10, 2023	Radiation (10CH01-CB)
Spectrum Analyzer	Rohde&Schwarz	FSV30	101026	9kHz ~ 30GHz	Apr. 22, 2022	Apr. 21, 2023	Radiation (10CH01-CB)
Horn Antenna	ESCO	3117	00081283	1GHz ~ 18GHz	Nov. 25, 2021	Nov. 24, 2022	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02660	1GHz ~ 26.5GHz	May 19, 2022	May 18, 2023	Radiation (10CH01-CB)



High Cable	TITAN	T318E	high cable-02	1GHz ~ 18GHz	Mar. 16, 2022	Mar. 15, 2023	Radiation (10CH01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (10CH01-CB)

※ Calibration Interval of instruments listed above is one year.

※ N.C.R. means Non-Calibration required.

<EMS>

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
ESD Simulator	Teseq QG	NSG 437	1053	Air: 0 kV ~ 30 kV, Contact: 0 kV ~ 30kV	Oct. 26, 2022	Oct. 25, 2023	ESD
Log-Periodic Antenna	AR	AT1080	0323130	80MHz ~ 1GHz	N.C.R.	N.C.R.	RS
Horn Antenna	SCHWARZBECK	ZBECK STLP 9149	00538	9kHz ~ 6GHz	N.C.R.	N.C.R.	RS
Signal generator	R&S	SMB100A	180647	100kHz ~ 20GHz	Dec. 09, 2021	Dec. 08, 2022	RS
RF Power Amplifier	TESEQ	CBA 1G-300B	W2290-0518	80MHz ~ 1GHz 300W	N.C.R.	N.C.R.	RS
RF Power Amplifier	MILMEGA	AS0860B-50/50	1080740	1GHz ~ 6GHz 50W	N.C.R.	N.C.R.	RS
EPM Series Power Meter	Keysight	N1914A	MY57390002	9 kHz ~ 110 GHz	Dec. 13, 2021	Dec. 12, 2022	RS
Avg Power Sensor	Keysight	E9304A	MY57380004	9 kHz ~ 6 GHz	Dec. 13, 2021	Dec. 12, 2022	RS
Avg Power Sensor	Keysight	E9304A	MY57370003	9 kHz ~ 6 GHz	Dec. 13, 2021	Dec. 12, 2022	RS
RF-SWITCH NETWORK	TESEQ	RFB 2000	46748	N/A	N.C.R.	N.C.R.	RS
Dual Directional Couplers	AR	DC 6180A	0322837	80MHz ~ 1GHz	N.C.R.	N.C.R.	RS
Dual Directional Couplers	WERLATONE	C10117-10	114253	1GHz ~ 6GHz	N.C.R.	N.C.R.	RS
Software	Audix	i2	Version:5	N/A	N.C.R.	N.C.R.	RS
Surge/EFT Generator	Teseq AG	NSG 3060	1534, 831, 1440,1538	Surge 0 ~ 6kV EFT 0 kV ~ 4.4 kV Dip 100~240V/ 50Hz /60Hz	Apr. 07, 2022	Apr. 06, 2023	Surge EFT
Burst/EFT Dataline Coupling Clamp	Teseq AG	CDN 3425	1776	0.25kV~4kV	Apr. 07, 2022	Apr. 06, 2023	EFT
Software	Teseq AG	NSG3000	-	-	N.C.R.	N.C.R.	Surge EFT
RF-Generator	Teseq GmbH	NSG 4070B-30	035084	150kHz~230MHz	May 18, 2022	May 17, 2023	CS
Attenuator	TESEQ	ATN 6050	34879	150kHz~230MHz	May 12, 2022	May 11, 2023	CS
Coupling decoupling network	Teseq GmbH	CDN T800	34369	150kHz~230MHz	May 08, 2022	May 07 2023	CS
Coupling decoupling network	Teseq GmbH	CDN T8-10	46729	150kHz~230MHz	Jun. 01, 2022	May 31, 2023	CS
Software	Teseq	NSG4070-30	035084.V2.30	-	N.C.R.	N.C.R.	CS



EMC TEST REPORT

Report No. : EC282309-01

Magnetic field Immunity Loop	FCC	F-1000-4-8-G- 125A,F-1000- 4-8/9/10-L-1M	04014,04017	30A//CONTINUOUS , 100A/2Hrs, 230A/30SEC	Jul. 18, 2022	Jul. 17, 2023	Magnetic
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※ Calibration Interval of instruments listed above is one year.

※ N.C.R. means Non-Calibration required.



15. Uncertainty of Test Site

Test Items	Uncertainty	Remark
Conducted Emissions	3.4 dB	Confidence levels of 95%
Radiated Emissions below 1GHz	4.9 dB	Confidence levels of 95%
Radiated Emissions above 1GHz	4.0 dB	Confidence levels of 95%



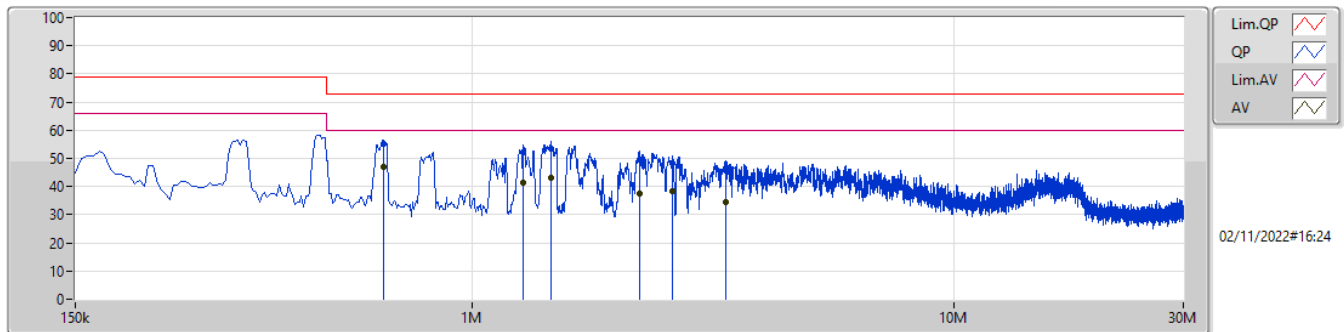
Conducted Emissions at Powerline

Appendix A

Summary

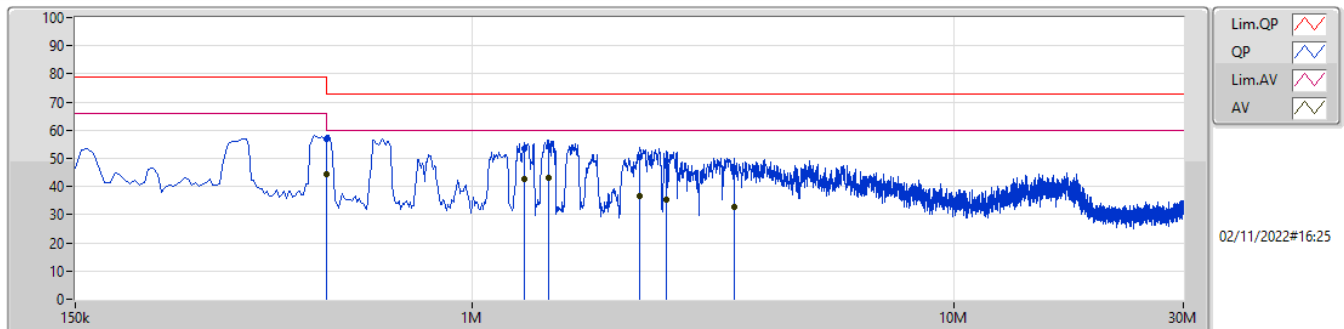
Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	654k	47.04	60.00	-12.96	Line

Mode 1



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)						
QP	654k	55.03	73.00	-17.97	10.01	Line	-	45.02	0.07	0.05	9.89						
AV	654k	47.04	60.00	-12.96	10.01	Line	"Worst"	37.03	0.07	0.05	9.89						
QP	1.28M	52.12	73.00	-20.88	10.03	Line	-	42.09	0.08	0.06	9.89						
AV	1.28M	41.19	60.00	-18.81	10.03	Line	-	31.16	0.08	0.06	9.89						
QP	1.46M	53.34	73.00	-19.66	10.04	Line	-	43.30	0.08	0.07	9.89						
AV	1.46M	43.01	60.00	-16.99	10.04	Line	-	32.97	0.08	0.07	9.89						
QP	2.225M	49.62	73.00	-23.38	10.07	Line	-	39.55	0.09	0.09	9.89						
AV	2.225M	37.33	60.00	-22.67	10.07	Line	-	27.26	0.09	0.09	9.89						
QP	2.612M	48.45	73.00	-24.55	10.08	Line	-	38.37	0.10	0.09	9.89						
AV	2.612M	38.51	60.00	-21.49	10.08	Line	-	28.43	0.10	0.09	9.89						
QP	3.359M	45.57	73.00	-27.43	10.10	Line	-	35.47	0.11	0.10	9.89						
AV	3.359M	34.37	60.00	-25.63	10.10	Line	-	24.27	0.11	0.10	9.89						

Mode 1

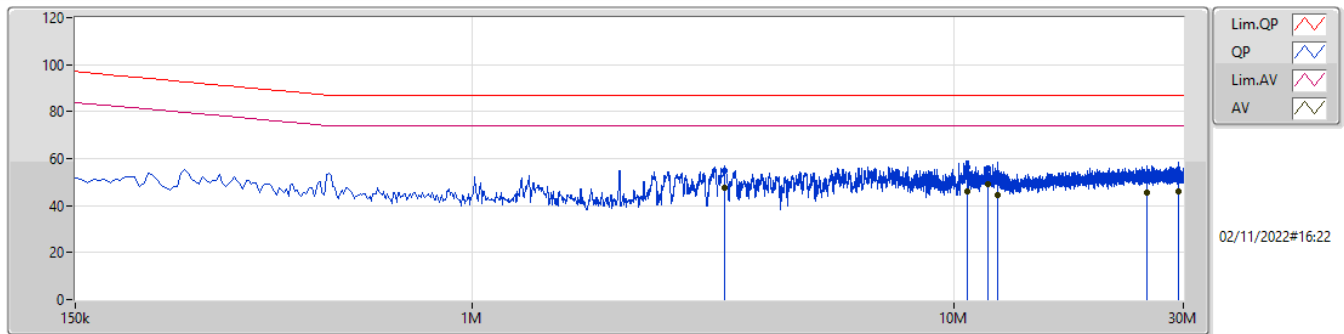


Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)						
QP	500k	56.95	73.00	-16.05	10.02	Neutral	-	46.93	0.07	0.06	9.89						
AV	500k	44.33	60.00	-15.67	10.02	Neutral	"Worst"	34.31	0.07	0.06	9.89						
QP	1.284M	53.41	73.00	-19.59	10.04	Neutral	-	43.37	0.09	0.06	9.89						
AV	1.284M	42.73	60.00	-17.27	10.04	Neutral	-	32.69	0.09	0.06	9.89						
QP	1.442M	54.18	73.00	-18.82	10.05	Neutral	-	44.13	0.09	0.07	9.89						
AV	1.442M	43.09	60.00	-16.91	10.05	Neutral	-	33.04	0.09	0.07	9.89						
QP	2.234M	50.52	73.00	-22.48	10.08	Neutral	-	40.44	0.10	0.09	9.89						
AV	2.234M	36.65	60.00	-23.35	10.08	Neutral	-	26.57	0.10	0.09	9.89						
QP	2.531M	48.98	73.00	-24.02	10.09	Neutral	-	38.89	0.11	0.09	9.89						
AV	2.531M	35.37	60.00	-24.63	10.09	Neutral	-	25.28	0.11	0.09	9.89						
QP	3.498M	45.14	73.00	-27.86	10.11	Neutral	-	35.03	0.12	0.10	9.89						
AV	3.498M	32.75	60.00	-27.25	10.11	Neutral	-	22.64	0.12	0.10	9.89						

Summary

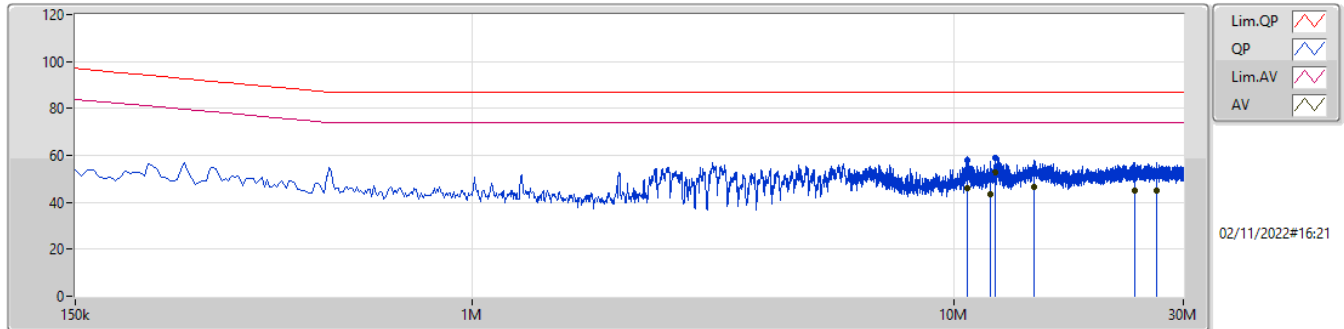
Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	11.801M	49.14	74.00	-24.86	ISN
Mode 2	Pass	AV	12.228M	52.71	74.00	-21.29	ISN

Mode 1



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	ISN (dB)	CL (dB)	AT (dB)						
QP	3.345M	54.68	87.00	-32.32	19.50	ISN	-	35.18	9.51	0.10	9.89						
AV	3.345M	47.78	74.00	-26.22	19.50	ISN	-	28.28	9.51	0.10	9.89						
QP	10.707M	56.33	87.00	-30.67	19.58	ISN	-	36.75	9.50	0.16	9.92						
AV	10.707M	45.94	74.00	-28.06	19.58	ISN	-	26.36	9.50	0.16	9.92						
QP	11.801M	55.94	87.00	-31.06	19.61	ISN	-	36.33	9.53	0.16	9.92						
AV	11.801M	49.14	74.00	-24.86	19.61	ISN	"Worst"	29.53	9.53	0.16	9.92						
QP	12.377M	53.13	87.00	-33.87	19.65	ISN	-	33.48	9.55	0.17	9.93						
AV	12.377M	44.71	74.00	-29.29	19.65	ISN	-	25.06	9.55	0.17	9.93						
QP	25.152M	52.05	87.00	-34.95	20.17	ISN	-	31.88	9.92	0.28	9.97						
AV	25.152M	45.38	74.00	-28.62	20.17	ISN	-	25.21	9.92	0.28	9.97						
QP	29.382M	53.16	87.00	-33.84	20.41	ISN	-	32.75	10.07	0.33	10.01						
AV	29.382M	46.09	74.00	-27.91	20.41	ISN	-	25.68	10.07	0.33	10.01						

Mode 2



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	ISN (dB)	CL (dB)	AT (dB)						
QP	10.653M	57.94	87.00	-29.06	19.57	ISN	-	38.37	9.50	0.16	9.91						
AV	10.653M	45.96	74.00	-28.04	19.57	ISN	-	26.39	9.50	0.16	9.91						
QP	11.9M	51.74	87.00	-35.26	19.62	ISN	-	32.12	9.54	0.16	9.92						
AV	11.9M	43.55	74.00	-30.45	19.62	ISN	-	23.93	9.54	0.16	9.92						
QP	12.228M	58.91	87.00	-28.09	19.62	ISN	-	39.29	9.54	0.16	9.92						
AV	12.228M	52.71	74.00	-21.29	19.62	ISN	"Worst"	33.09	9.54	0.16	9.92						
QP	14.663M	53.61	87.00	-33.39	19.71	ISN	-	33.90	9.60	0.17	9.94						
AV	14.663M	46.30	74.00	-27.70	19.71	ISN	-	26.59	9.60	0.17	9.94						
QP	23.793M	51.87	87.00	-35.13	20.11	ISN	-	31.76	9.87	0.27	9.97						
AV	23.793M	45.11	74.00	-28.89	20.11	ISN	-	25.00	9.87	0.27	9.97						
QP	26.412M	51.80	87.00	-35.20	20.26	ISN	-	31.54	9.97	0.30	9.99						
AV	26.412M	45.13	74.00	-28.87	20.26	ISN	-	24.87	9.97	0.30	9.99						



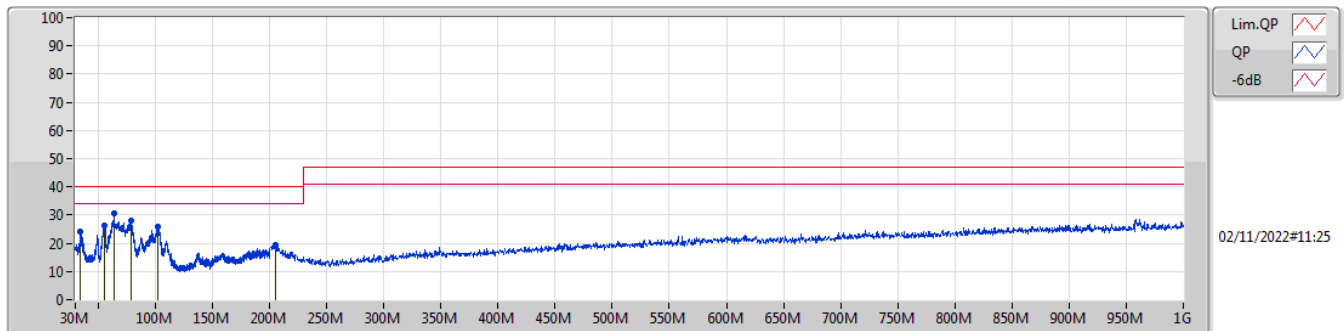
Radiated Emissions below 1GHz

Appendix C.1

Summary

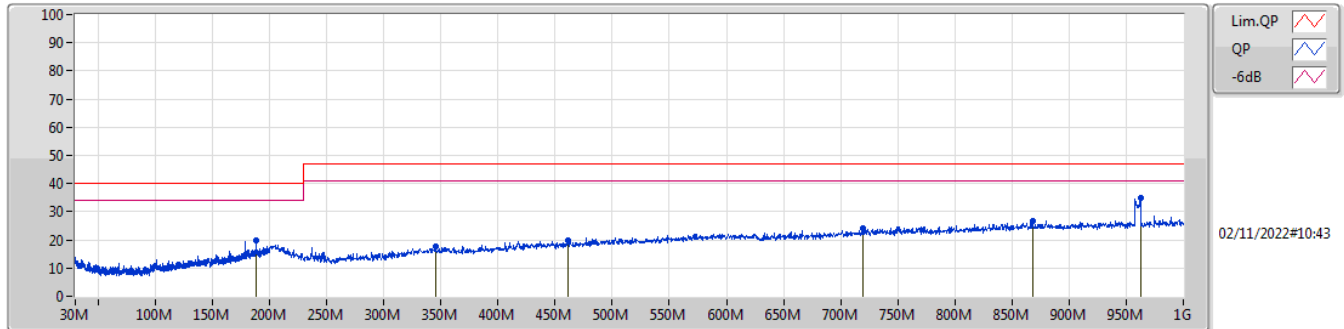
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 3	Pass	PK	64M	30.49	40.00	-9.51	Vertical

Mode 3



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)		
PK	34.68M	24.22	40.00	-15.78	-15.26	10	Vertical	5	1.00	-	39.48	12.61	0.89	28.76		
PK	55.5M	26.46	40.00	-13.54	-17.62	10	Vertical	39	2.00	-	44.08	9.98	1.08	28.68		
PK	64M	30.49	40.00	-9.51	-17.76	10	Vertical	0	3.00	"Worst"	48.25	9.50	1.40	28.66		
PK	78.62M	28.16	40.00	-11.84	-17.76	10	Vertical	0	1.00	-	45.92	9.11	1.75	28.62		
PK	102.59M	26.03	40.00	-13.97	-16.74	10	Vertical	302	4.00	-	42.77	9.84	2.05	28.63		
PK	204.8M	19.61	40.00	-20.39	-7.19	10	Vertical	0	1.00	-	26.80	17.12	3.06	27.37		

Mode 3



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)		
PK	188.02M	19.98	40.00	-20.02	-10.53	10	Horizontal	176	2.00	-	30.51	14.10	3.30	27.93		
PK	345.2M	17.58	47.00	-29.42	-8.23	10	Horizontal	230	2.00	-	25.81	15.42	4.01	27.66		
PK	461.6M	19.62	47.00	-27.38	-6.75	10	Horizontal	264	2.00	-	26.37	17.17	4.47	28.39		
PK	719.2M	24.23	47.00	-22.77	-1.89	10	Horizontal	360	1.00	-	26.12	20.90	5.69	28.48		
PK	868M	26.87	47.00	-20.13	0.59	10	Horizontal	304	1.00	-	26.28	21.70	6.52	27.63		
PK	962.4M	35.01	47.00	-11.99	1.79	10	Horizontal	44	1.00	"Worst"	33.22	22.40	6.69	27.30		



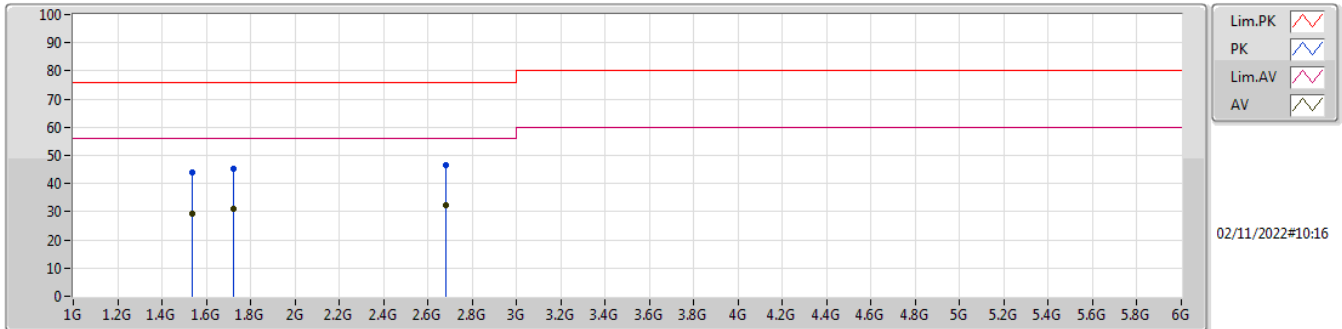
Radiated Emissions above 1GHz

Appendix C.2

Summary

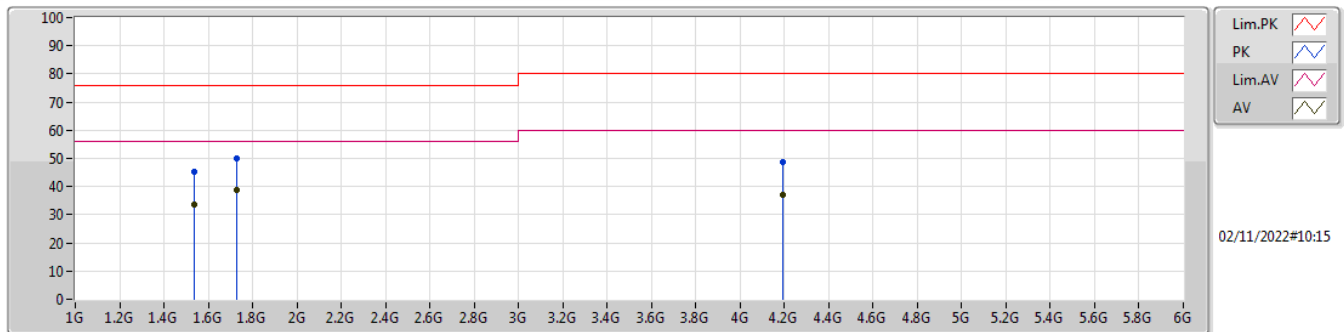
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 3	Pass	AV	1.73G	38.67	56.00	-17.33	Horizontal

Mode 3



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)		
PK	1.535G	44.08	76.00	-31.92	-1.87	3	Vertical	215	1.00	-	45.95	28.11	5.60	35.58		
AV	1.535G	29.48	56.00	-26.52	-1.87	3	Vertical	215	1.00	-	31.35	28.11	5.60	35.58		
PK	1.725G	45.30	76.00	-30.70	0.74	3	Vertical	257	1.00	-	44.56	30.25	5.92	35.43		
AV	1.725G	31.01	56.00	-24.99	0.74	3	Vertical	257	1.00	-	30.27	30.25	5.92	35.43		
PK	2.6825G	46.50	76.00	-29.50	4.23	3	Vertical	78	1.00	-	42.27	32.44	7.81	36.02		
AV	2.6825G	32.36	56.00	-23.64	4.23	3	Vertical	78	1.00	"Worst"	28.13	32.44	7.81	36.02		

Mode 3



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)		
PK	1.535G	45.42	76.00	-30.58	-1.87	3	Horizontal	133	1.00	-	47.29	28.11	5.60	35.58		
AV	1.535G	33.50	56.00	-22.50	-1.87	3	Horizontal	133	1.00	-	35.37	28.11	5.60	35.58		
PK	1.73G	50.09	76.00	-25.91	0.82	3	Horizontal	0	1.00	-	49.27	30.32	5.93	35.43		
AV	1.73G	38.67	56.00	-17.33	0.82	3	Horizontal	0	1.00	"Worst"	37.85	30.32	5.93	35.43		
PK	4.195G	48.62	80.00	-31.38	8.55	3	Horizontal	308	1.00	-	40.07	33.69	10.30	35.44		
AV	4.195G	37.22	60.00	-22.78	8.55	3	Horizontal	308	1.00	-	28.67	33.69	10.30	35.44		

1 Test Result of ESD Immunity

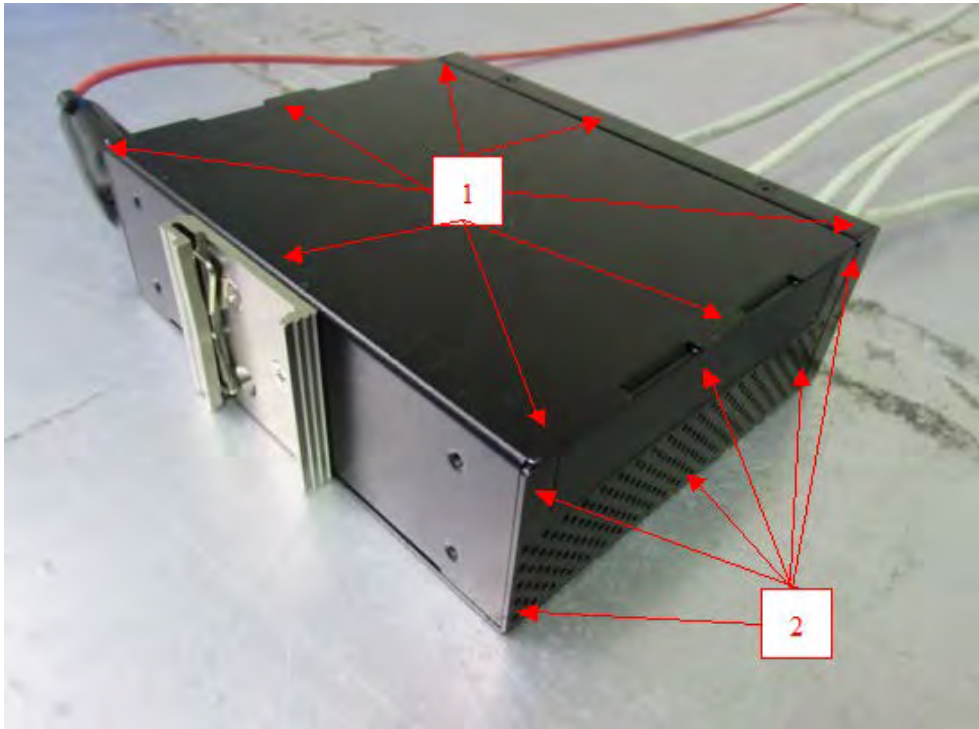
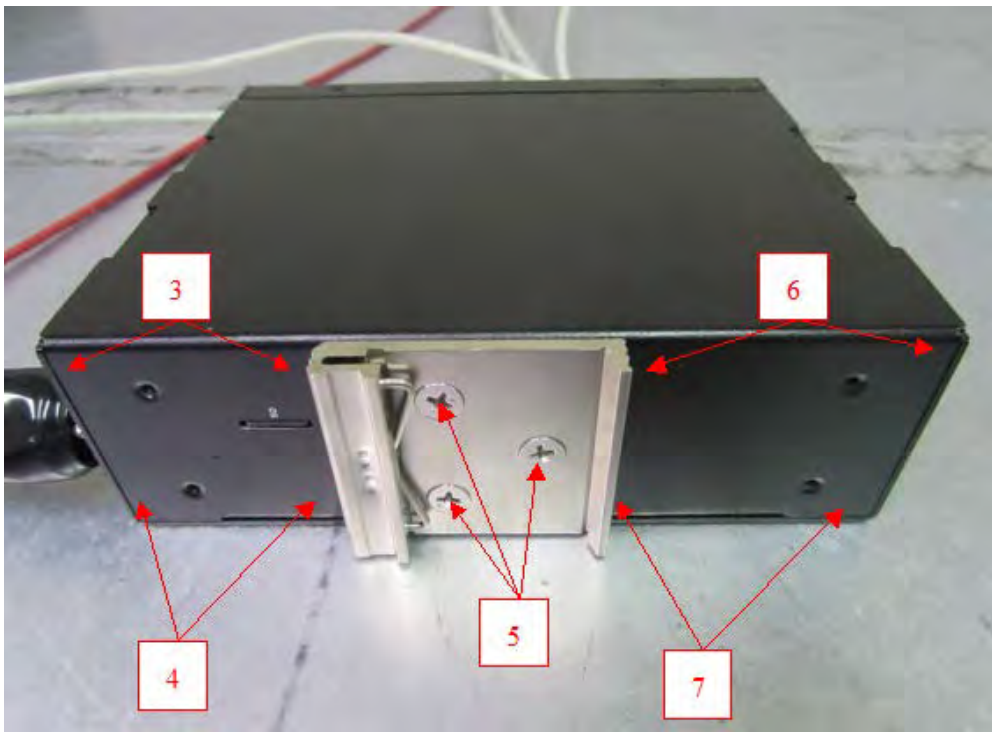
Test Mode	Mode 1
Standard	Required Criteria B
Test Standard	EN 55024 EN 55035
Test Recorded	There was no abnormal situation during the test compared with initial operation.

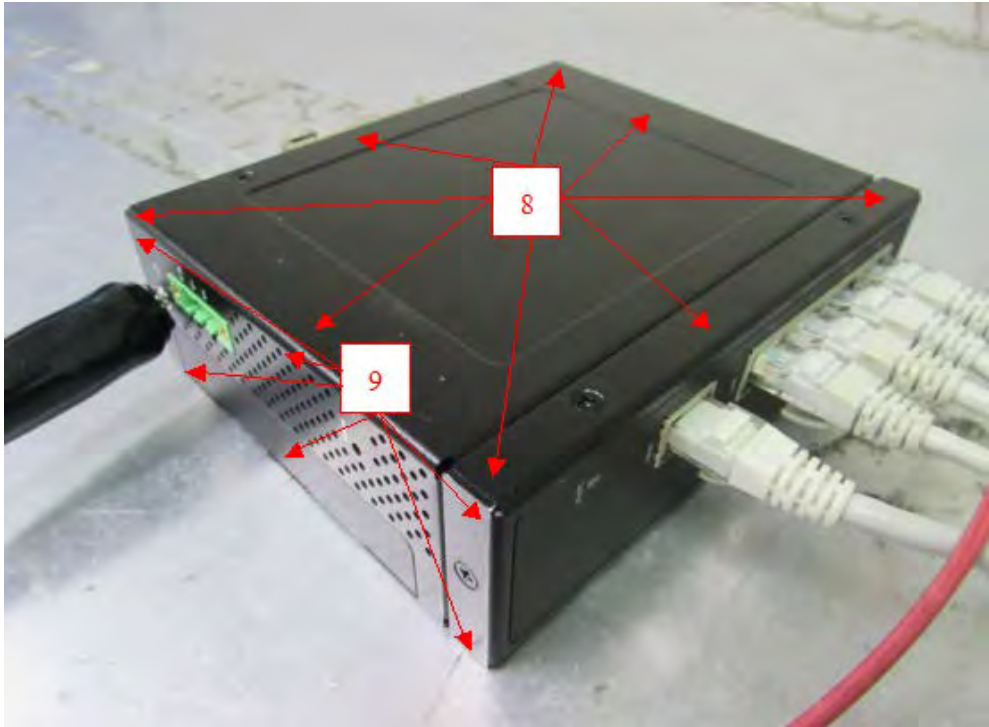
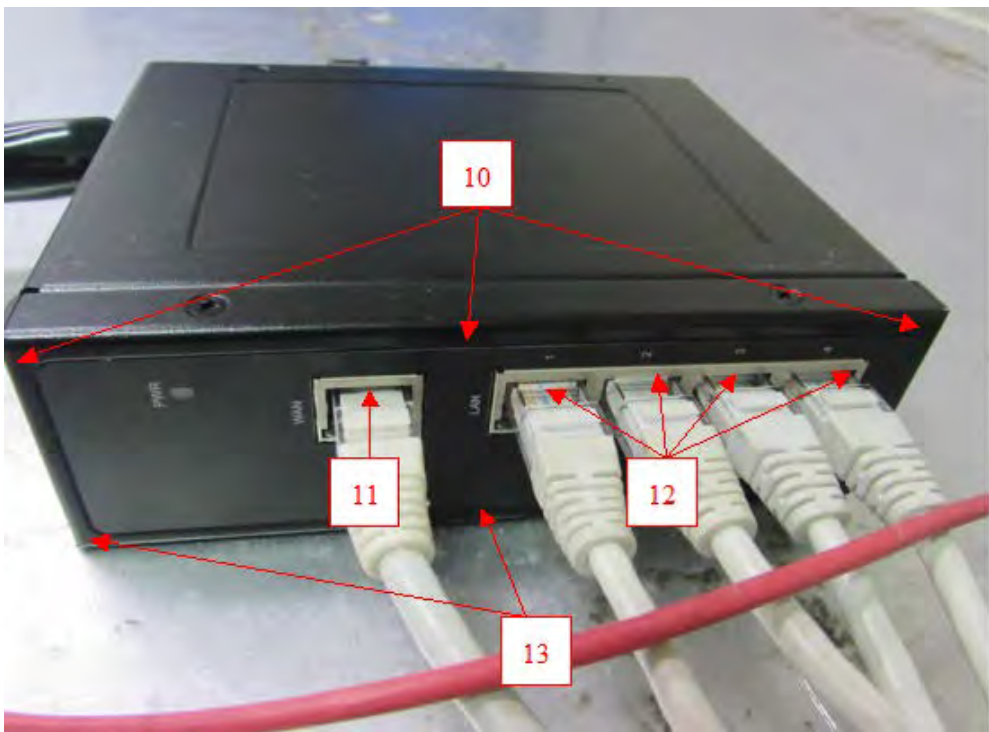
Direct Application :

Test Point	Tested Voltage (kV)	Contact Discharge (Performance Criteria)	Air Discharge (Performance Criteria)
1~13	±2,4	A	-

Indirect Application :

Coupling Plan	Coupling Side	Test Voltage (kV)	Performance Criteria
HCP	Front / Rear / Right / Left	±2,4	A
VCP	Front / Rear / Right / Left	±2,4	A

Test Points	
<p>Air Discharge (BLUE color)</p> <p>Contact Discharge (RED color)</p>	
Test Points	
<p>Air Discharge (BLUE color)</p> <p>Contact Discharge (RED color)</p>	

Test Points	
<p>Air Discharge (BLUE color)</p> <p>Contact Discharge (RED color)</p>	
Test Points	
<p>Air Discharge (BLUE color)</p> <p>Contact Discharge (RED color)</p>	

2 Test Result of RS Immunity

Test Mode	Mode 1
Standard	Required Criteria A
Test Standard	EN 55024
Test Recorded	There was no abnormal situation during the test compared with initial operation.

Frequency Range MHz	Field V/m	Antenna Polarization	EUT Face Exposed	Performance Criteria
80~1000	3	Vertical	Front/Back/Right/Left	A
80~1000	3	Horizontal	Front/Back/Right/Left	A

Test Mode	Mode 1
Standard	Required Criteria A
Test Standard	EN 55035
Test Recorded	There was no abnormal situation during the test compared with initial operation.

Frequency Range MHz	Field V/m	Antenna Polarization	EUT Face Exposed	Performance Criteria
80~1,000	3	Vertical	Front/Back/Right/Left	A
80~1,000	3	Horizontal	Front/Back/Right/Left	A
1800	3	Vertical	Front/Back/Right/Left	A
1800	3	Horizontal	Front/Back/Right/Left	A
2600	3	Vertical	Front/Back/Right/Left	A
2600	3	Horizontal	Front/Back/Right/Left	A
3500	3	Vertical	Front/Back/Right/Left	A
3500	3	Horizontal	Front/Back/Right/Left	A
5000	3	Vertical	Front/Back/Right/Left	A
5000	3	Horizontal	Front/Back/Right/Left	A

3 Test Result of EFT

Test Mode	Mode 1
Standard	Required Criteria B
Test Standard	EN 55024 EN 55035
Test Recorded	There was no abnormal situation during the test compared with initial operation.

Telecommunication Port :

Telecommunication Port	Test Voltage (kV)
	± 0.5 kV
WAN port	A
LAN port1	A
LAN port4	A

4 Test Result of Surge

Test Mode	Mode 1
Standard	Required Criteria B
Test Standard	EN 55024 EN 55035
Test Recorded	There was no abnormal situation during the test compared with initial operation.

DC Power Port:

Voltage (kV)	Test Location	Polarity	Performance Criteria
0.5	P - N	+	A
		—	A

5 Test Result of CS Immunity

Test Mode	Mode 1
Standard	Required Criteria A
Test Standard	EN 55024
Test Recorded	There was no abnormal situation during the test compared with initial operation.

Frequency Range MHz	V (r.m.s)	CDN	Coupling port	Performance Criteria
0.15 ~ 80	3	T8-10	WAN port_1Gbps	A
0.15 ~ 80	3	T8-10	LAN port1_1Gbps	A
0.15 ~ 80	3	T8-10	LAN port4_1Gbps	A

Test Mode	Mode 1
Standard	Required Criteria A
Test Standard	EN 55035
Test Recorded	There was no abnormal situation during the test compared with initial operation.

Frequency Range MHz	V (r.m.s)	CDN	Coupling port	Performance Criteria
0.15 ~ 10	3	T8-10	WAN port_1Gbps	A
10 ~ 30	3 - 1			A
30 ~ 80	1			A
0.15 ~ 10	3	T8-10	LAN port1_1Gbps	A
10 ~ 30	3 - 1			A
30 ~ 80	1			A
0.15 ~ 10	3	T8-10	LAN port4_1Gbps	A
10 ~ 30	3 - 1			A
30 ~ 80	1			A

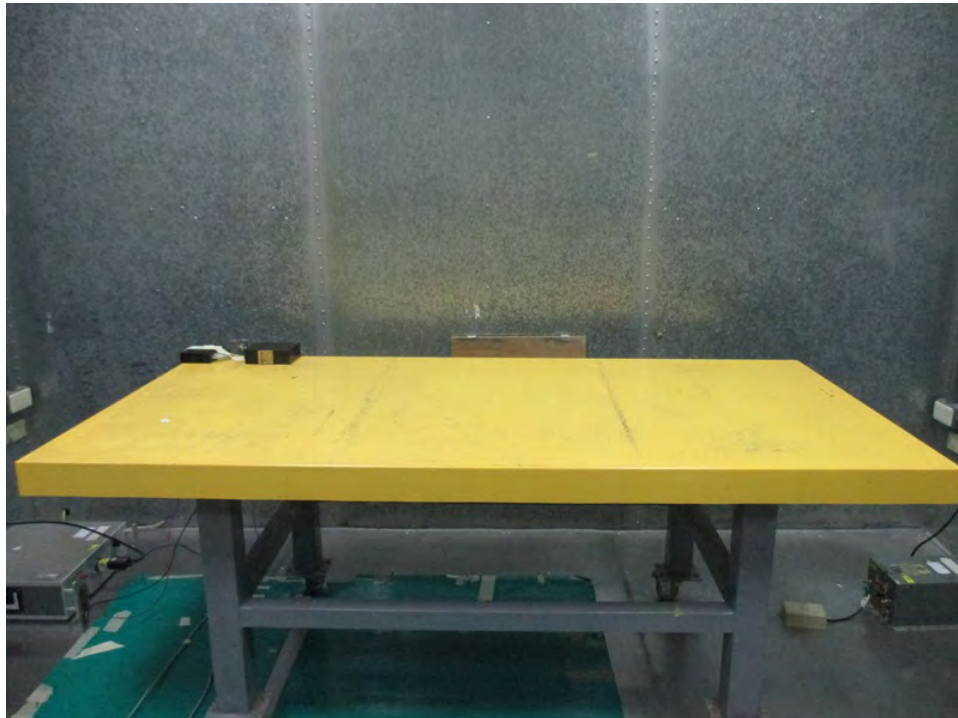
6 Test Result of MF Immunity

Test Mode	Mode 1
Standard	Required Criteria A
Test Standard	EN 55024 EN 55035
Test Recorded	There was no abnormal situation during the test compared with initial operation.

Power Frequency Magnetic Field	Testing duration	Coil Orientation	Performance Criteria
50 Hz, 1 A/m	1.0 Min	X-axis	A
50 Hz, 1 A/m	1.0 Min	Y-axis	A
50 Hz, 1 A/m	1.0 Min	Z-axis	A

1. Photographs of Conducted Emissions Test Configuration

FRONT VIEW



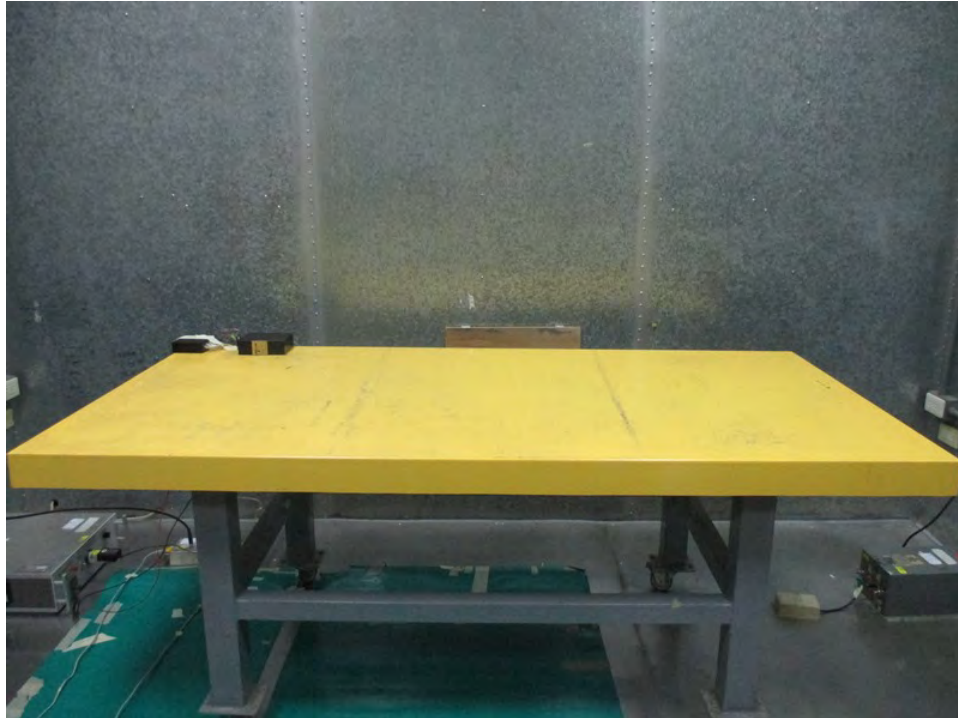
REAR VIEW



2. Photographs of Telecommunication Line Conducted Emissions Test Configuration

Test Mode: Mode 1 and Mode 2

FRONT VIEW



REAR VIEW



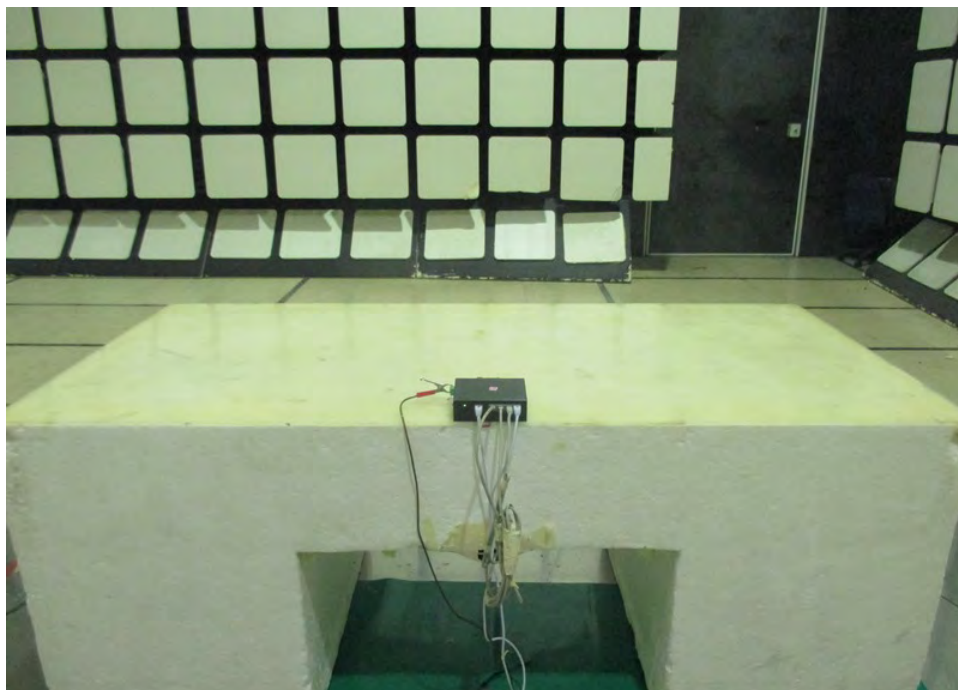
3. Photographs of Radiated Emissions Test Configuration

Test Configuration: 30MHz~1GHz / Test Mode: Mode 3

FRONT VIEW



REAR VIEW

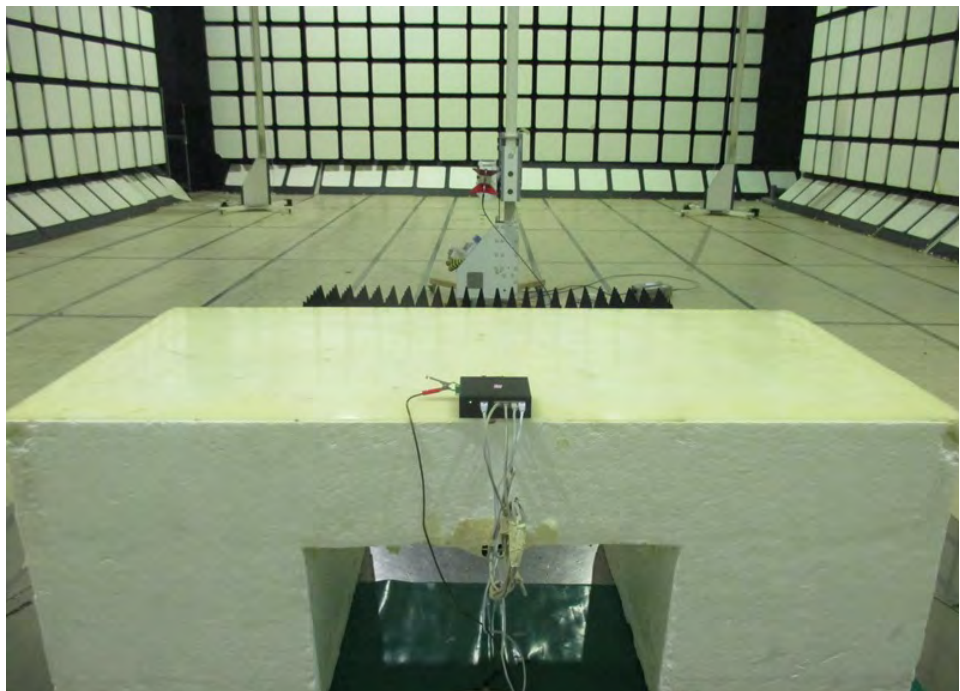


Test Configuration: Above 1GHz / Test Mode: Mode 3

FRONT VIEW

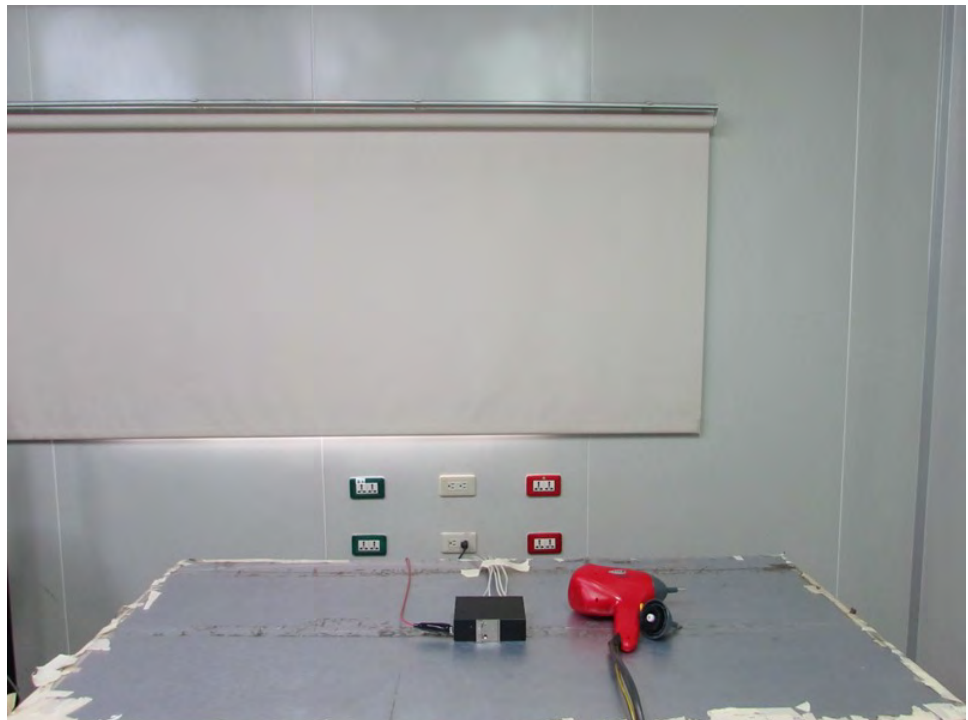


REAR VIEW

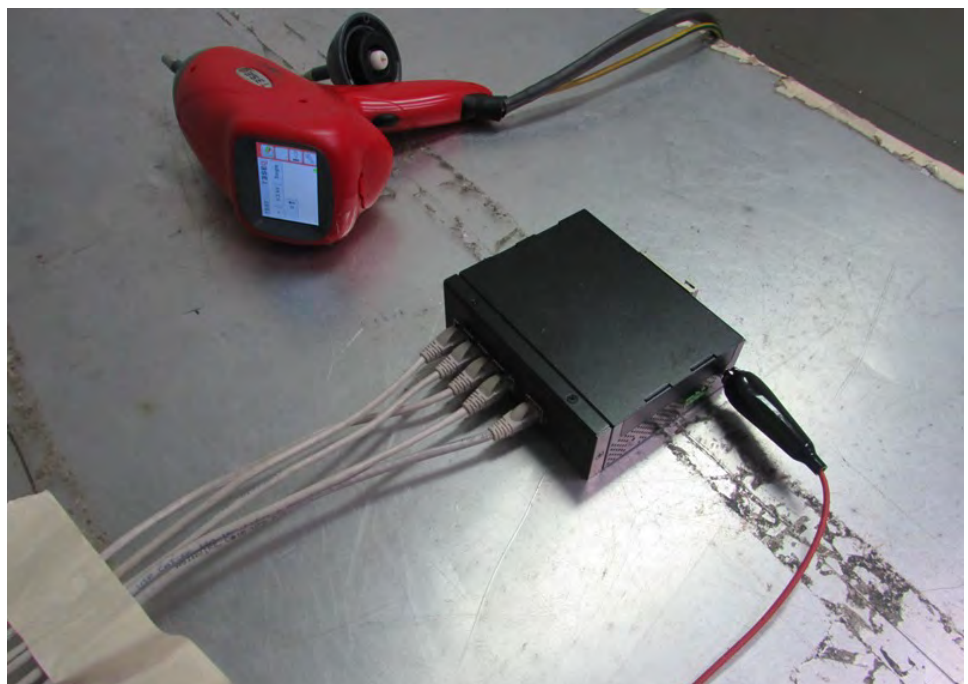


4. Photographs of ESD Immunity Test Configuration

FRONT VIEW

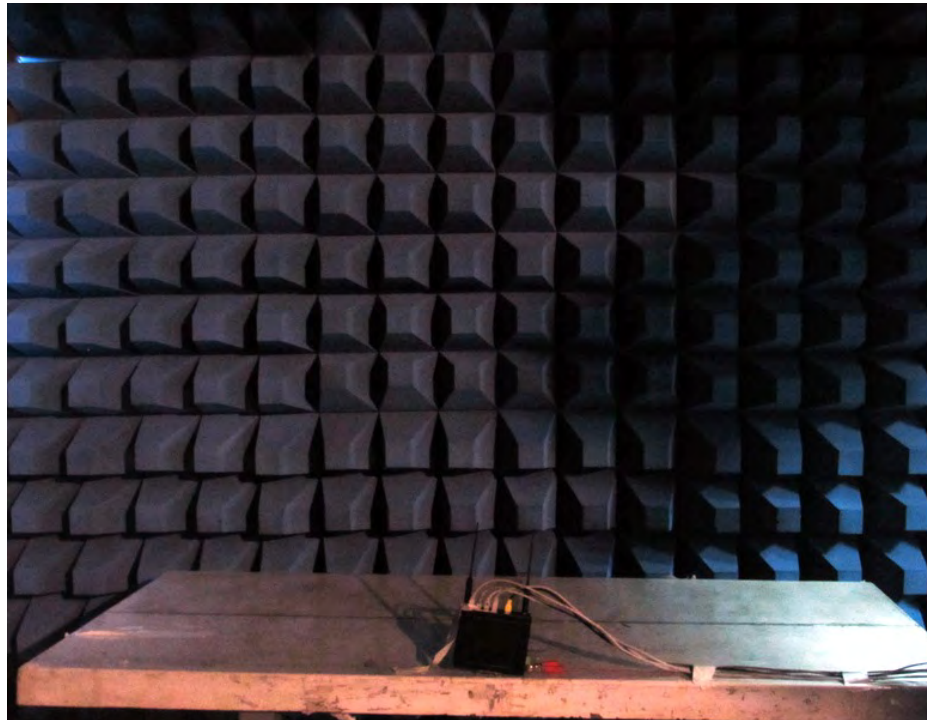


REAR VIEW

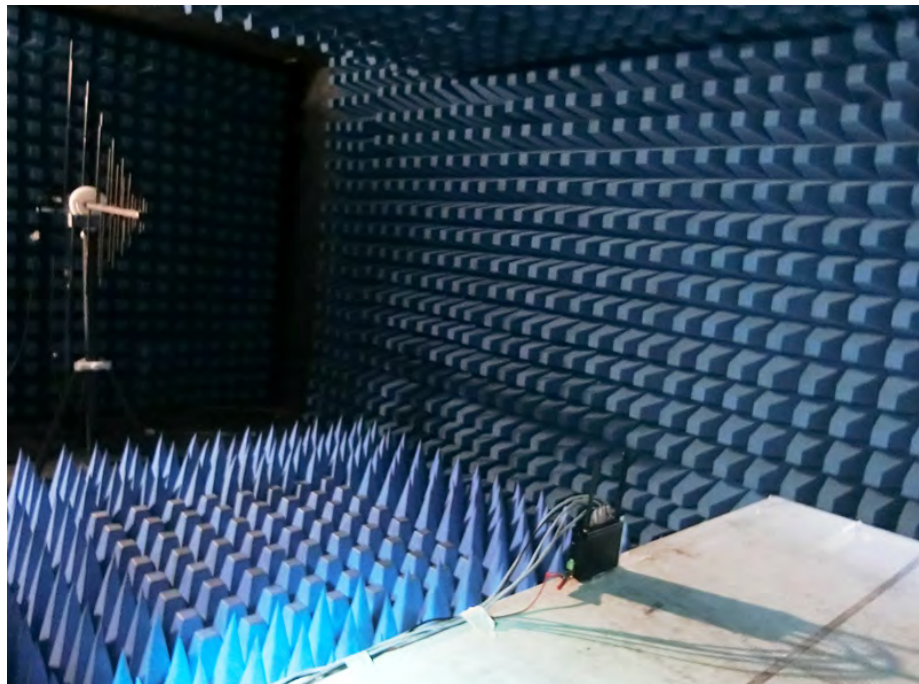


5. Photographs of RS Immunity Test Configuration

FRONT VIEW

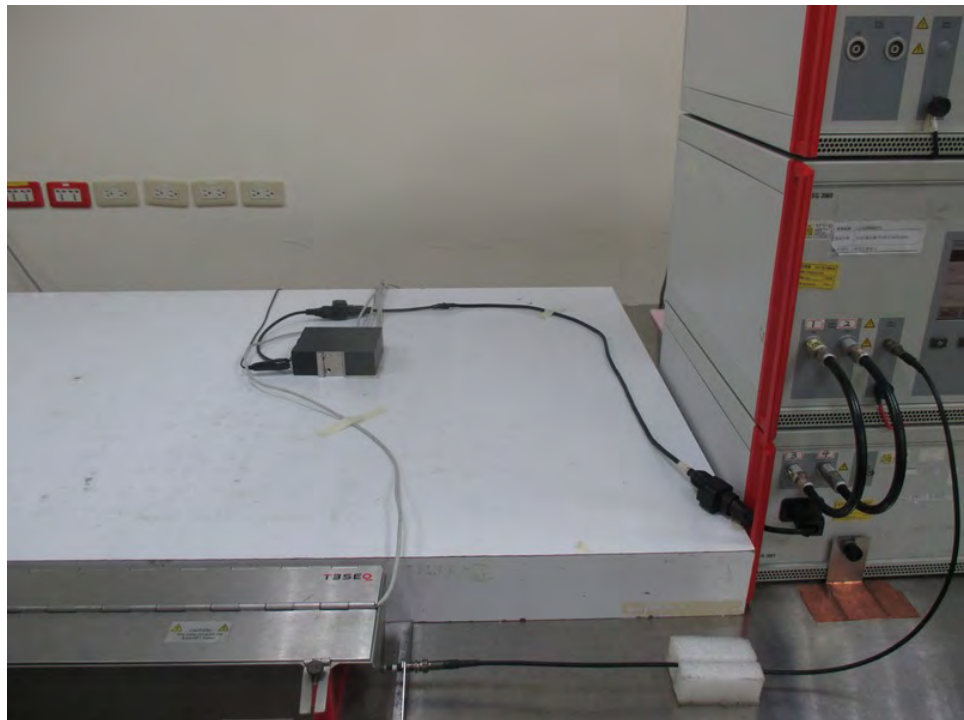


REAR VIEW

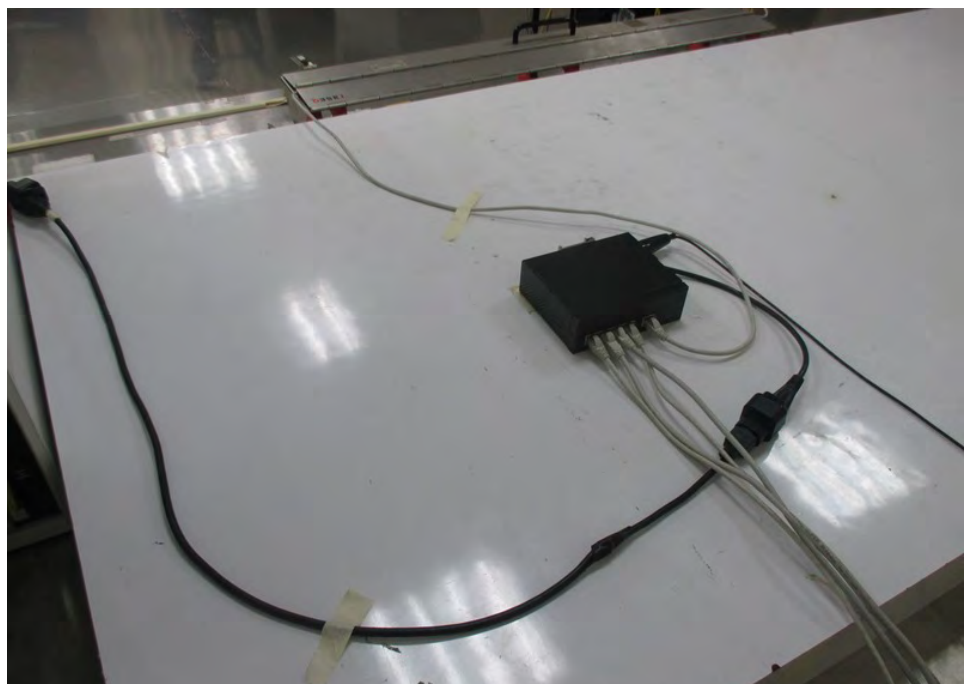


7. Photographs of EFT Test Configuration

FRONT VIEW

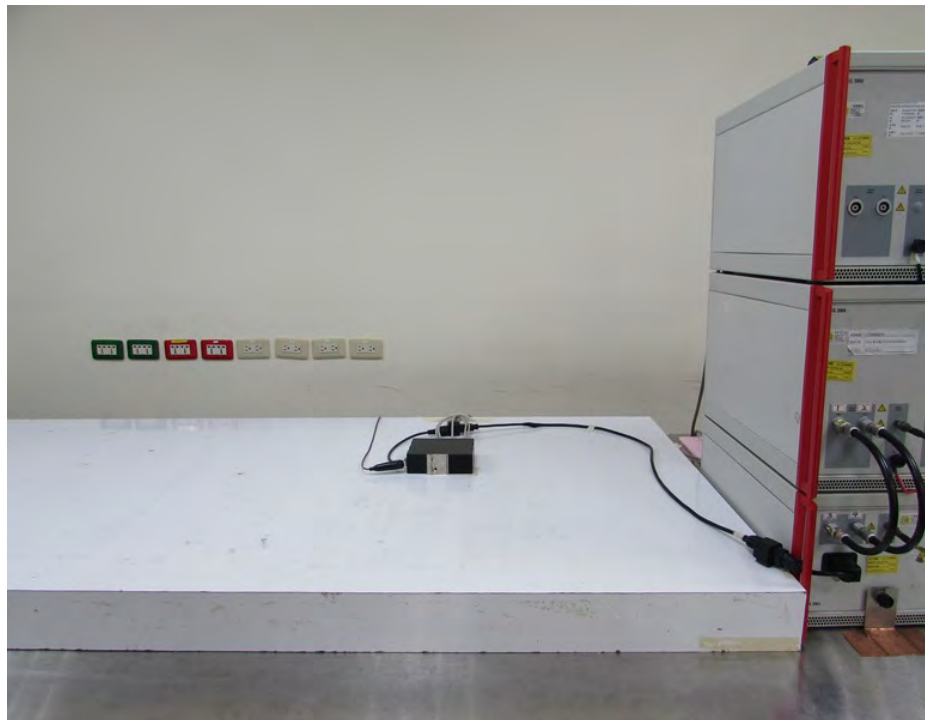


REAR VIEW



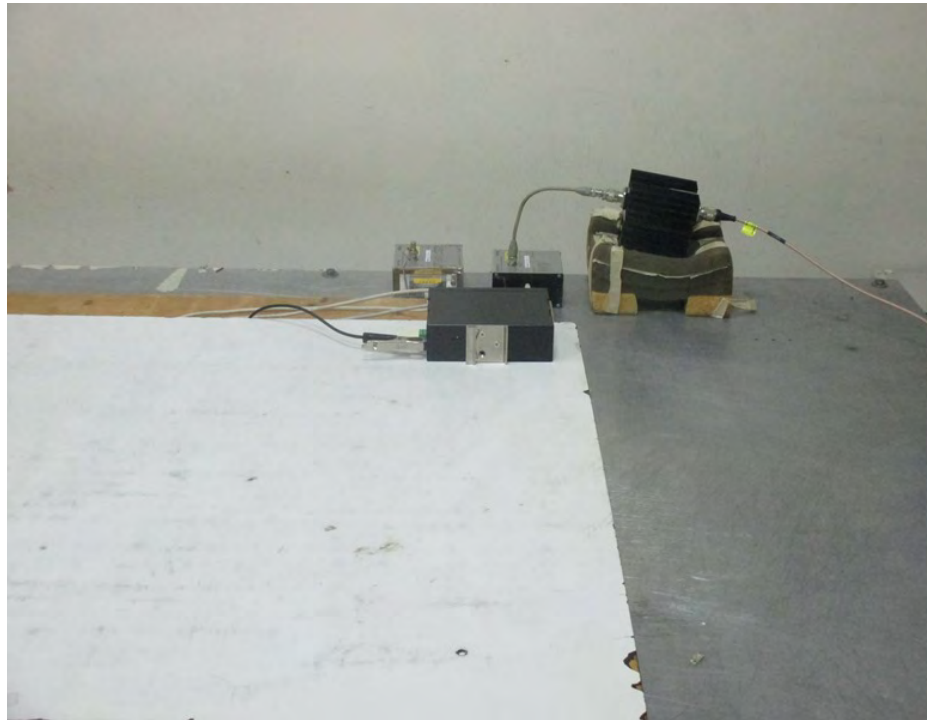
9. Photographs of Surge Test Configuration

FRONT VIEW

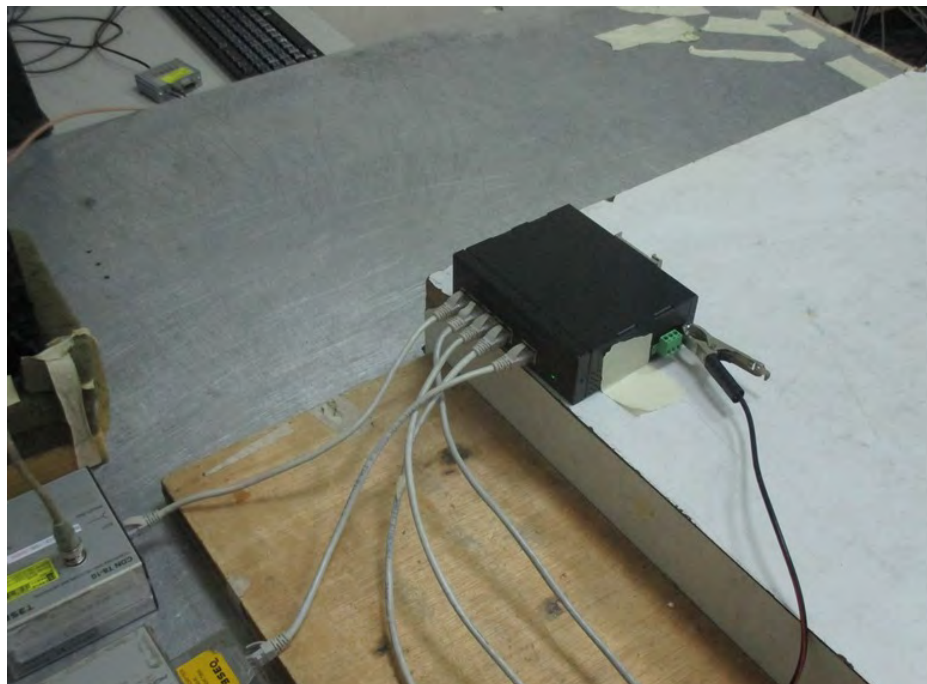


10. Photographs of CS Immunity Test Configuration

FRONT VIEW

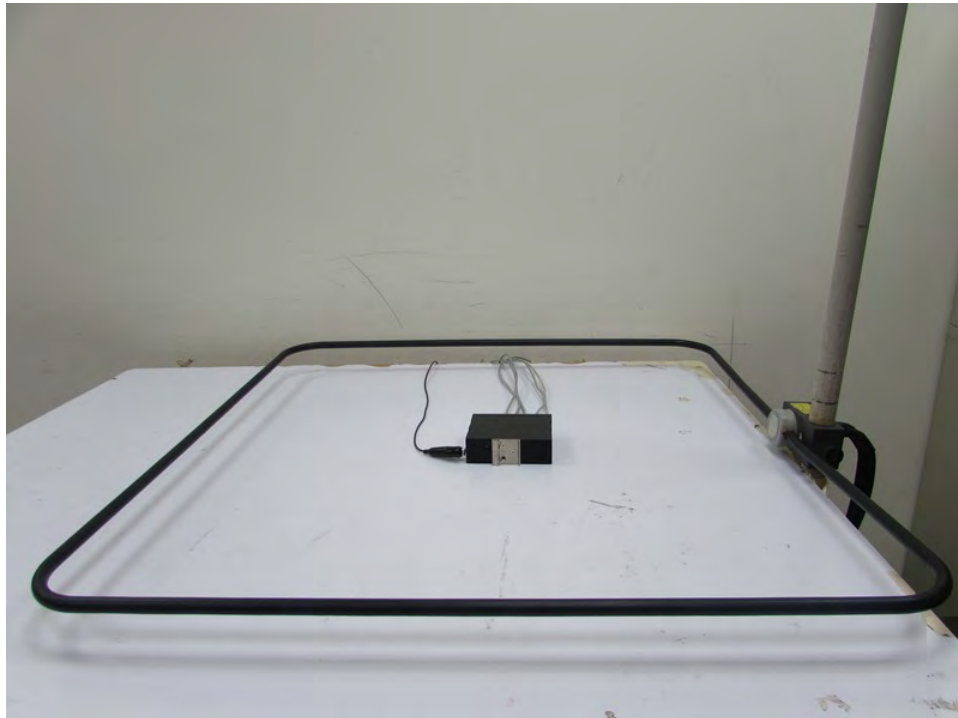


REAR VIEW



11. Photographs of MF Immunity Test Configuration

FRONT VIEW



——THE END——