



## TEST REPORT

FOR

DC to DC CONVERTER

BRAND : 

MODEL : THM 60-2415WI

SERIES MODEL : Refer to item 5.1 for more details

REPORT NUMBER : 4790064632A-EN-E1-V0

ISSUE DATE: Sep. 28, 2021

Prepared for

TRACO ELECTRONIC AG

Sihlbruggstrasse 111 CH-6340 Baar Switzerland

Prepared by

Underwriters Laboratories Taiwan Co., Ltd.,

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township,  
Hsinchu County, Taiwan

Tel: +886.2.2896.7790

Fax: +886.3.583.7948

Website: [www.ul.com](http://www.ul.com)



The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

**Revision History**

<b>Rev.</b>	<b>Issue Date</b>	<b>Revisions</b>	<b>Revised By</b>
--	Sep. 28, 2021	Initial Issue	Cindy Hsin

Summary of Test Results				
EMISSION (EN 60601-1-2:2015 standards)				
Standard	Test Item	Limit	Result	Remark
CISPR 11: 2015 Ed 5.1 EN55011: 2009+A1 :2010	Conducted disturbance at mains terminals ports	Class B	N/A	Note 1
	Patient-coupled cable conducted emission	24dBuA	N/A	Note 2
	Radiated disturbance below 1GHz	Class B	PASS	Note 4 Note 5
	Radiated disturbance above 1 GHz	Class B	N/A	Note 3
IEC 61000-3-2:2018 EN IEC 61000-3-2: 2019	Harmonic current disturbance	Class A	N/A	Note 1
IEC 61000-3-3:2013 /A1: 2017 EN 61000-3-3:2013/A1: 2019	Voltage Fluctuations & Flicker	Refer to chapter 6.4.1	N/A	Note 1

**Note:** (1) Since the EUT does not connect to mains power network directly, the test is unnecessary.

**Note:** (2) There is no patient-coupled cable, so the test is unnecessary.

**Note:** (3) For Group 1, in the frequency range 1 to 18GHz limits are not specified.

**Note:** (4) Customers add countermeasure components to the fixture board. For the corresponding components, please refer to the appendix III.

**Note:** (5) All test data are copied from 4789918302A-EN-E1-V0 report.

Summary of Test Results				
IMMUNITY (EN 60601-1-2:2015 standards)				
Home healthcare facility environment				
Basic Standard	Test Item	Test Level	Criteria	Result
IEC 61000-4-2:2008 EN 61000-4-2: 2009	Electrostatic discharge immunity	Contact $\pm 8$ kV Air $\pm 15$ kV	Clause 7.1	PASS (Note 6)
IEC 61000-4-3: 2006+ A1:2007+A2:2010 EN 61000-4-3: 2006+ A1: 2008 +A2: 2010	Radiated, radio frequency electromagnetic field immunity	3V/m 80%, 1kHz, AM 80MHz~2.7GHz	Clause 7.1	PASS (Note 6)
	Proximity fields from RF wireless communications equipment	See page 6	Clause 7.1	PASS (Note 6)
IEC 61000-4-4:2012 EN 61000-4-4:2012	Electrical fast transient/burst immunity	2.0kV(AC Mains / DC Port) 1kV(Signal Lines) 5/50ns, 100kHz	Clause 7.1	PASS (Note 5, 6)
IEC 61000-4-5: 2014 /A1: 2017 EN 61000-4-5 : 2014 /A1 : 2017	Surge immunity	2.0kV(Common) 1.0kV(Differential) 1.2/50us	Clause 7.1	PASS (Note 5, 6)
IEC 61000-4-6: 2013+ COR1: 2015 EN 61000-4-6 : 2014/ AC : 2015	Immunity to conducted disturbances, induced by radio-frequency fields	3V(rms) 80%, 1kHz AM. 0.15MHz~80MHz 6 V(rms) in ISM bands between 0,15 MHz and 80 MHz.(Note1)	Clause 7.1	PASS (Note 6)
IEC 61000-4-8:2009 EN 61000-4-8: 2010	Power frequency magnetic field immunity	50Hz, 30 A/m	Clause 7.1	PASS (Note 6)
IEC 61000-4-11:2020 EN IEC 61000-4-11: 2020	Voltage dips, short interruptions and voltage variations immunity	Voltage dips, 0% residual for 0.5 cycle (Note 3)	Clause 7.1	N/A (Note 4)
		Voltage dips, 0% residual for 1 cycle (Note 3)	Clause 7.1	
		Voltage dips, 70% residual for 25/30 cycle (Note 2,3)	Clause 7.1	
		Voltage interruptions For 250/300 cycle (Note 2,3)	Clause 7.1	

**Note:** (1) The ISM (industrial, scientific and medical) bands between 0,15 MHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz. The amateur radio bands between 0,15 MHz and 80 MHz are 1,8 MHz to 2,0 MHz, 3,5 MHz to 4,0 MHz, 5,3 MHz to 5,4 MHz, 7 MHz to 7,3 MHz, 10,1 MHz to 10,15 MHz, 14 MHz to 14,2 MHz, 18,07 MHz to 18,17 MHz, 21,0 MHz to 21,4 MHz, 24,89 MHz to 24,99 MHz, 28,0 MHz to 29,7 MHz and 50,0 MHz to 54,0 MHz.

**Note:** (2) 25/30 or 250/300 means 25 or 250 periods at 50 Hz or 30 or 300 periods at 60 Hz.

**Note:** (3) For ME EQUIPMENT and ME SYSTEMS that have multiple voltage settings or auto ranging voltage capability, the test shall be performed at the minimum and maximum RATED input voltage. ME EQUIPMENT and ME SYSTEMS with a RATED input voltage range of less than 25 % of the highest RATED input voltage shall be tested at one RATED input voltage within the range.

**Note:** (4) Since the EUT does not connect to mains power network directly, the test is unnecessary.

**Note:** (5) Customers add countermeasure components to the fixture board. For the corresponding components, please refer to the appendix III.

**Note:** (6) All test data are copied from 4789918302A-EN-E1-V0 report.

Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment						
Test frequency	Band	Service	Modulation	Maximum power	Distance	IMMUNITY TEST LEVEL
385	380 –390	TETRA 400	Pulse modulation 18 Hz	1,8	0,3	27
450	430 – 470	GMRS 460, FRS 460	FM ± 5 kHz deviation 1 kHz sine	2	0,3	28
710	704 – 787	LTE Band 13, 17	Pulse modulation 217 Hz	0,2	0,3	9
745						
780						
810	800 – 960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	2	0,3	28
870						
930						
1720	1700 – 1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation 217 Hz	2	0,3	28
1845						
1970						
2450	2400 – 2570	Bluetooth, WLAN,802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	2	0,3	28
5240	5100 – 5800	WLAN 802.11 a/n	Pulse Modulation 217 Hz	0,2	0,3	9
5500						
5785						
NOTE: If necessary to achieve the IMMUNITY TEST LEVEL, the distance between the transmitting antenna and the ME EQUIPMENT or ME SYSTEM may be reduced to 1 m. The 1 m test distance is permitted by IEC 61000-4-3.						

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>9</b>
<b>2. TEST METHODOLOGY .....</b>	<b>10</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>10</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>11</b>
4.1. Measuring Instrument Calibration .....	11
4.2. Measurement Uncertainty .....	11
<b>5. EQUIPMENT UNDER TEST .....</b>	<b>12</b>
5.1. Description of EUT .....	12
5.2. Test Mode .....	13
5.3. EUT Configuration Test Setup .....	13
5.4. Monitoring of EUT for All Immunity Test .....	13
5.5. Accessory .....	13
5.6. Block diagram showing the configuration of system tested .....	14
5.7. Description of support units .....	16
5.8. Measuring Instrument List .....	17
<b>6. EMISSION TEST .....</b>	<b>20</b>
6.1. Radiated Disturbance Measurement .....	20
6.1.1. Limits of radiated disturbance measurement .....	20
6.1.2. Test Procedure .....	22
6.1.3. Test Setup and Configuration .....	23
6.1.4. Test Result .....	24
<b>7. IMMUNITY TEST .....</b>	<b>26</b>
7.1. Performance Criteria .....	26
7.2. Electrostatic Discharge Immunity Test .....	27
7.2.1. Test Specification .....	27
7.2.2. Test Procedure .....	27
7.2.3. Test Setup and Configuration .....	28
7.2.4. Test Result .....	29
7.3. Radio Frequency Electromagnetic Field Immunity Test .....	36
7.3.1. Test Specification .....	36
7.3.2. Test Procedure .....	36
7.3.3. Test Setup and Configuration .....	37
7.3.4. RS proximity fields from RF Wireless Communication Test Specification .....	38
7.3.5. Test Procedure .....	38
7.3.6. Test Setup and Configuration .....	38
7.3.7. Test Result .....	39

7.4.	Electrical Fast Transient/Burst Immunity Test .....	40
7.4.1.	Test Specification .....	40
7.4.2.	Test Procedure .....	40
7.4.3.	Test Setup and Configuration .....	41
7.4.4.	Test Result .....	42
7.5.	Surge Immunity Test.....	43
7.5.1.	Test Specification .....	43
7.5.2.	Test Procedure .....	43
7.5.3.	Test Setup and Configuration .....	44
7.5.4.	Test Result .....	45
7.6.	Immunity to Conducted Disturbances Induced by RF Fields .....	46
7.6.1.	Test Specification .....	46
7.6.2.	Test Procedure .....	46
7.6.3.	Test Setup and Configuration .....	47
7.6.4.	Test Result .....	48
7.7.	Power frequency magnetic field immunity Test .....	49
7.7.1.	Test Specification .....	49
7.7.2.	Test Procedure .....	49
7.7.3.	Test Setup and Configuration .....	50
7.7.4.	Test Results.....	51
<b>Appendix I: Photographs of EMC Test Configuration.....</b>		<b>52</b>
<b>Appendix II: Photographs of the EUT.....</b>		<b>59</b>
<b>Appendix III: Countermeasure file for EMI, EFT and Surge .....</b>		<b>60</b>
<b>Appendix IV: Preliminary Test Raw Data .....</b>		<b>61</b>



## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** TRACO ELECTRONIC AG  
Sihlbruggstrasse 111 CH-6340 Baar Switzerland

**MANUFACTURER:** TRACO ELECTRONIC AG  
Sihlbruggstrasse 111 CH-6340 Baar Switzerland

**EUT DESCRIPTION:** DC to DC CONVERTER

**BRAND :**



**MODEL:** THM 60-2415WI

**SERIES MODEL:** Refer to item 5.1 for more details

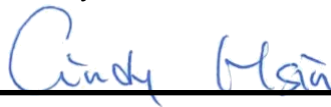
**DATE of TESTED:** Jun. 23, 2021 ~ Jul. 13, 2021

APPLICABLE STANDARDS	
STANDARDS	TEST RESULTS
EN 60601-1-2:2015	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.


**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

  
Cindy Hsin  
Project Handler

Date : Sep. 28, 2021

Approved and Authorized By:

  
Roy Chen  
Operations Manager

Date : Sep. 28, 2021

## 2. TEST METHODOLOGY

All tests were performed in accordance with the procedures documented in the reference standards listed in summary of test results page 3 and page 4.

## 3. FACILITIES AND ACCREDITATION

Test Location	Underwriters Laboratories Taiwan Co., Ltd.,
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Description	All measurement facilities use to collect the measurement data are located at Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. Measuring Instrument Calibration

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Electromagnetic interference:

Test Item	Measurement Frequency Range	K	U(dB)
966-1 Test Site			
Radiated disturbance below 1 GHz	30MHz ~ 1000MHz	2	5.3

Electromagnetic sensitivity:

Test Item	Measurement Frequency Range	K	U(dB)
Radiated, radio frequency electromagnetic field immunity	80MHz ~ 6000MHz	2	1.8
Immunity to conducted disturbances, induced by radio-frequency fields (CDN)	0.15MHz ~ 80MHz	2	2.4

Test Item	K	Voltage(%)	Rise Time(%)	First Peak Current (%)	Current @ 30ns (%)	Current @ 60ns (%)
Electrostatic discharge immunity	2	2.8	7.1	4.2	4.0	4.5


Test Item	K	Peak Voltage(%)	Rise Time(%)	Pulse width(%)	Burst Period (%)	Burst duration (%)	Repetition rate (%)
Electrical fast transient/burst immunity	2	1.1	1.5	1.7	0.94	0.41	0.29

Test Item	K	Phase Shifting (%)	Voltage (%)	Current (%)	Front Time (For waveform of the surge voltage)(%)	Duration (For waveform of the surge voltage)(%)	Front Time (For waveform of the surge current)(%)	Duration (For waveform of the surge current)(%)
Surge immunity	2	0.98	3.6	2.7	1.2	0.43	5.9	0.79

Test Item	K	Magnetic field Strength(%)
Power Frequency Magnetic Field Immunity Test	2	10.0

## 5. EQUIPMENT UNDER TEST

### 5.1. Description of EUT

<b>EUT Name:</b>	DC to DC CONVERTER
<b>Brand:</b>	
<b>Model:</b>	THM 60-2415WI
<b>Series Model:</b>	THM 60-2411WI, THM 60-2412WI, THM 60-2413WI, THM 60-2422WI, THM 60-2423WI, THM 60-4811WI, THM 60-4812WI, THM 60-4813WI, THM 60-4815WI, THM 60-4822WI, THM 60-4823WI
<b>Power Rating :</b>	24Vdc from DC source
<b>Group :</b>	Group 1
<b>Condition of EUT:</b>	Pre-Production
<b>Environments:</b>	Home healthcare Environment
<b>DATE of Sample Received:</b>	Jun. 7, 2021

Note :

1. This report was issued base on original report which report number is 4789918302A-EN-E1-V0, the differences were only change models' name and the applicant. There is no additional test shall be verified. For the test data, copied from original report 4789918302A-EN-E1-V0 show on this report.
2. The models difference table as below:

Model Number	Input Range	Output Voltage
	VDC	VDC
THM 60-2411WI	9 ~ 36	5.1
THM 60-2412WI	9 ~ 36	12
THM 60-2413WI	9 ~ 36	15
THM 60-2415WI	9 ~ 36	24
THM 60-2422WI	9 ~ 36	±12
THM 60-2423WI	9 ~ 36	±15
THM 60-4811WI	18 ~ 75	5.1
THM 60-4812WI	18 ~ 75	12
THM 60-4813WI	18 ~ 75	15
THM 60-4815WI	18 ~ 75	24
THM 60-4822WI	18 ~ 75	±12
THM 60-4823WI	18 ~ 75	±15

Note : The customer only provided THM 60-4815WI, THM 60-2415WI for the EMI pretest and choose the worst mode do the EMI and EMS final test.

## 5.2. Test Mode

The Pre-test modes:

Mode	Description	Radiated Emission
Mode 1	Full Load (THM 60-2415WI)	v
Mode 2	Full Load (THM 60-4815WI)	v

After pre-testing, the final test mode was displayed as below table.

Test Items		Test Mode
<b>Emission</b>	Radiated Emission	Mode 1
<b>Immunity</b>	Electrostatic Discharge	Mode 1
	Radio Frequency Electromagnetic Field	Mode 1
	Electrical Fast Transient	Mode 1
	Surge Immunity	Mode 1
	Immunity to conducted disturbances, induced by radio-frequency fields	Mode 1
	Power frequency magnetic field immunity	Mode 1

## 5.3. EUT Configuration Test Setup

For Emission test :

- The EUT was linked to resistance load with full load during the testing.
- Power on the EUT and run test.

For Immunity test :

- The EUT was linked to resistance load with full load and the resistance load was connected with a meter during the testing.
- Power on the EUT and run test.

## 5.4. Monitoring of EUT for All Immunity Test

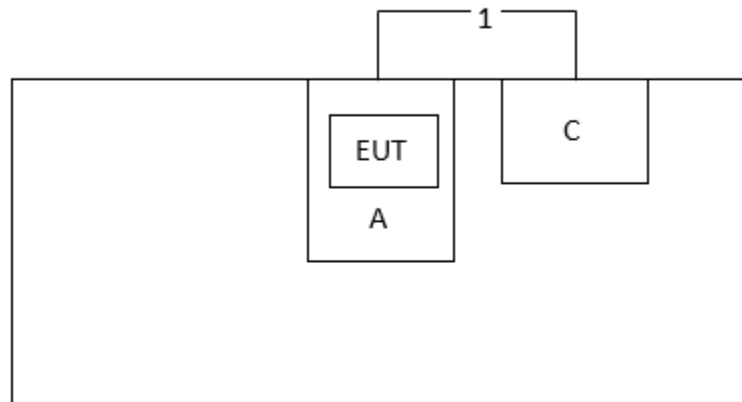
<b>Audio</b>	N/A
<b>Visual</b>	Monitor the output voltage through the meter.

## 5.5. Accessory

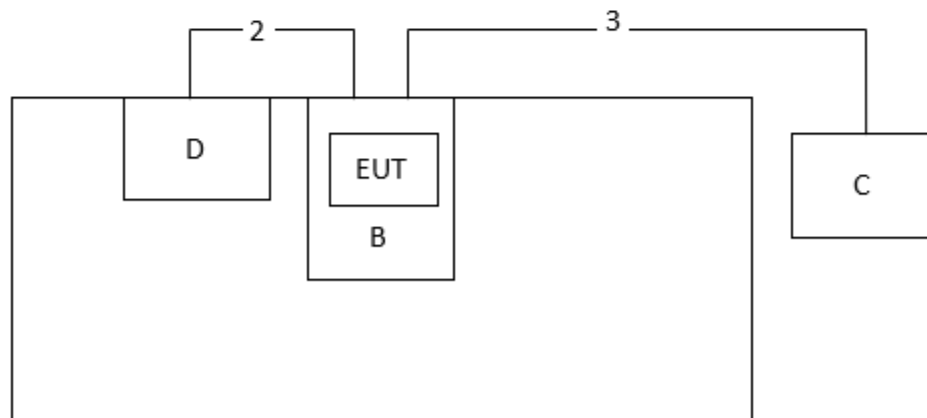
N/A

## 5.6. Block diagram showing the configuration of system tested

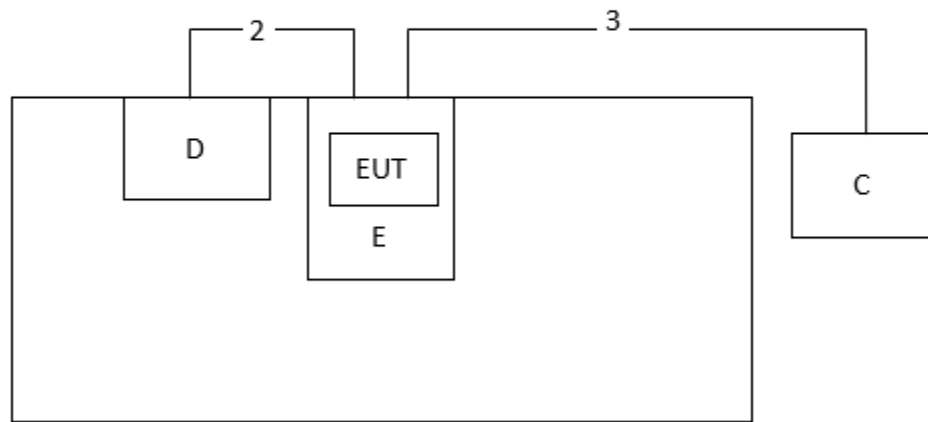
For Emission test :



For Immunity – ESD, RS, CS, PFMF test :



For Immunity – EFT, Surge, test :



## 5.7. 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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	FCC ID	Note
A	Fixture board-1	N/A	N/A	N/A	N/A	Provide by customer
B	Fixture board-2	N/A	N/A	N/A	N/A	Provide by customer
C	Power supply	GW Instek	GPD-2303S	GEQ902325	N/A	N/A
D	Meter	CNSCKJ	C85C17-V	N/A	N/A	N/A
E	Fixture board-3	N/A	N/A	N/A	N/A	Provide by customer

Item	Connection	Shielded Type	Note
1	Power Wire *2	Non-shielded	N/A
2	Power Wire *2	Non-shielded	N/A
3	Power Wire *2	Non-shielded	N/A



## 5.8. Measuring Instrument List

Instrument					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Expired date
Radiated Disturbance					
966-1					
EMI Test Receiver	Rohde & Schwarz	ESR7	101755	2020/12/4	2021/12/3
Loop Antenna	ETS Lindgren	6502	00213440	2020/12/25	2021/12/24
Trilog-Broadband Antena with 5dB Attenuator	SCHWARZBECK	VULB 9168 & N-6-05	774 & AT-N0538	2021/1/13	2022/1/12
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	1686	2020/12/23	2021/12/22
Preamplifier	EMC Instrument	EMC330E	980404	2021/6/3	2022/6/2
Preamplifier	EMC Instrument	EMC051835BE	980407	2021/1/20	2022/1/19
Cables	UltraPhase&EMC Instrument	A1K50-UP0358-A1K50-1500&EMC106-NM-SM-2500/8000	170111-3&170104/170223	2021/2/3	2022/2/2
Measurement Software	Farad	EZ-EMC Ver: UL-3A1	N/A	N/A	N/A

Instrument					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Expired date
<b>Electrostatic discharge</b>					
ESD Generator	TESEQ	NSG 437	1125	2020/12/3	2021/12/2
Barometer	TFA	DIVA PLUS	35.1078.10.IT	2021/6/4	2022/6/3
<b>Radio frequency electromagnetic field immunity</b>					
RF and Microwave Signal Generator	Rohde & Schwarz	SMB100A	113793	2021/2/20	2022/2/19
Power amplifier	Milmega	80RF1000-300	1077558	N/A	N/A
Directional coupler	Werlatone	C8719-20	111759	N/A	N/A
Antenna	AR	ATR80M6G	346008	N/A	N/A
Antenna	SCHWARZBECK	STLP 9149	00441	N/A	N/A
RF switch	OSP	OSP	N/A	N/A	N/A
Power Meter	Rohde & Schwarz	NRP2	105524	2020/9/16	2021/9/15
Power Sensor	Rohde & Schwarz	NRP-Z91	103732	2020/9/16	2021/9/15
Power Sensor	Rohde & Schwarz	NRP-Z91	103733	2020/9/16	2021/9/15
Measurement Software	Rohde & Schwarz	EMC32, VER.10.20.01	N/A	N/A	N/A
<b>Electrical fast transient</b>					
Ultra Compact Simulator	EM TEST	UCS 500N7	P1628180275	2020/12/2	2021/12/1
Capacitive Coupling Clamp	EM TEST	HFK	P1642185790	2020/11/19	2021/11/18
Measurement Software	TESEQ	IEC.control, VER.7.1.5	N/A	N/A	N/A
<b>Surge</b>					
Ultra Compact Simulator	EM TEST	UCS 500N7	P1628180275	2020/12/2	2021/12/1
Telecom Surge Generator	EM TEST	TSurge7	P1620180015	2020/12/4	2021/12/3
Coupling and Decoupling Network	EM TEST	CNV 508T5	P1637184038	2020/12/7	2021/12/6
Coupling and Decoupling Network	TESEQ	CDN HSS-2	45091	2020/12/7	2021/12/6
Measurement Software	TESEQ	IEC.control, VER.7.1.5	N/A	N/A	N/A

Instrument					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Expired date
<b>Immunity to conducted disturbances, induced by radio-frequency fields</b>					
Signal Generator	Rohde & Schwarz	SMC100A	105811	2020/10/6	2021/10/5
Power amplifier	Rohde & Schwarz	BBA150-A125B125	102340	N/A	N/A
Coupling and Decoupling Network	TESEQ	CDN M016	45073	2021/3/19	2022/3/18
Coupling and Decoupling Network	TESEQ	CDN T2-10	45003	2021/3/19	2022/3/18
Coupling and Decoupling Network	TESEQ	CDN T4-10	44939	2021/3/19	2022/3/18
Coupling and Decoupling Network	TESEQ	CDN T8-10	49203	2020/12/14	2021/12/13
EM Injection Clamp	TESEQ	CAL 801A & KEMZ 801A	75454.1, 75454.2 & 45181	2021/3/23	2022/3/22
Current injection Probe	TESEQ	CIP 9136A	44618	2020/10/25	2021/10/24
Power - Sensor	Rohde & Schwarz	NRP-Z91	103730	2020/12/9	2021/12/8
Power - Sensor	Rohde & Schwarz	NRP-Z91	103731	2020/12/9	2021/12/8
Measurement Software	Rohde & Schwarz	EMC32, VER.10.20.01	N/A	N/A	N/A
<b>Power frequency magnetic field immunity</b>					
Ultra Compact Simulator	EM TEST	UCS 500N7	P1628180275	2020/12/2	2021/12/1
Current Transformer	EM TEST	MC 2630	P1644186773	2020/9/4	2021/9/3
Magnetic Field Test Antena	EM TEST	MS 100N	P1627181324	2020/9/4	2021/9/3

## 6. EMISSION TEST

### 6.1. Radiated Disturbance Measurement

#### 6.1.1. Limits of radiated disturbance measurement

FREQUENCY (MHz)	<input type="checkbox"/> Group 1 Class A ≤ 20 kVA		<input checked="" type="checkbox"/> Group 1 Class B	
	<input type="checkbox"/> At 10m	<input type="checkbox"/> At 3m	<input type="checkbox"/> At 10m	<input checked="" type="checkbox"/> At 3m
	Quasi-peak dBμV/m	Quasi-peak dBμV/m	Quasi-peak dBμV/m	Quasi-peak dBμV/m
30 – 230	40	50	30	40
230 – 1000	47	57	37	47

FREQUENCY (MHz)	<input type="checkbox"/> Group 2 Class A ≤ 20 kVA		FREQUENCY (MHz)	<input type="checkbox"/> Group 2 Class B		
	<input type="checkbox"/> At 3m			<input type="checkbox"/> At 3m		
	Magnetic Field Quasi-peak* dBμA/m	Electric Field Quasi-peak* dBμV/m		Magnetic Field Quasi-peak* dBμA/m	Electric Field Quasi-peak* dBuV/m      Average* dBuV/m	
0.15 – 0.49	82	-	0.15 - 30	39 - 3	-	-
0.49 – 1.705	72	-				
1.705 – 2.194	77	-				
2.194 – 3.95	68	-				
3.95 – 11	43.5 – 28.5*	-				
11 – 20	28.5	-				
20 – 30	18.5	-				
30 - 47	-	78	30 – 80.872	-	40	35
47 – 53.91	-	60				
53.91 – 54.56	-	60				
54.56 – 68	-	60				
68 – 80.872	-	73				
80.872 – 81.848	-	88	80.872 – 81.848	-	60	55
81.848 – 87	-	73	81.848 – 134.786	-	40	35
87 – 134.786	-	70	134.786 – 136.414	-	60	55
134.786 – 136.414	-	80	136.414 – 230	-	40	35
136.414 – 156	-	70				
156 – 174	-	84				
174 – 188.7	-	60				
188.7 – 190.979	-	70				
190.979 – 230	-	60	230 - 1000	-	47	42
230 – 400	-	70				
400 – 470	-	73				
470 – 1000	-	70				

**NOTE:**

- (1) The limit for radiated test was performed according to EN55011.
- (2) The tighter limit applies at the band edges.
- (3) The test result calculated as following:  
Measurement Value = Reading Level + Correct Factor,  
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use),  
Margin Level = Measurement Value - Limit Value.
- (4) For Group 2 at 3m distance radiated magnetic field test, EUT shall be meet the small equipment requirement.
- (5) The average limits apply to magnetron driven equipment only. If magnetron driven equipment exceeds the quasi-peak limit at certain frequencies, then the measurement shall be repeated at these frequencies with the average detector, and the average limits specified in this table apply.
- (6) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

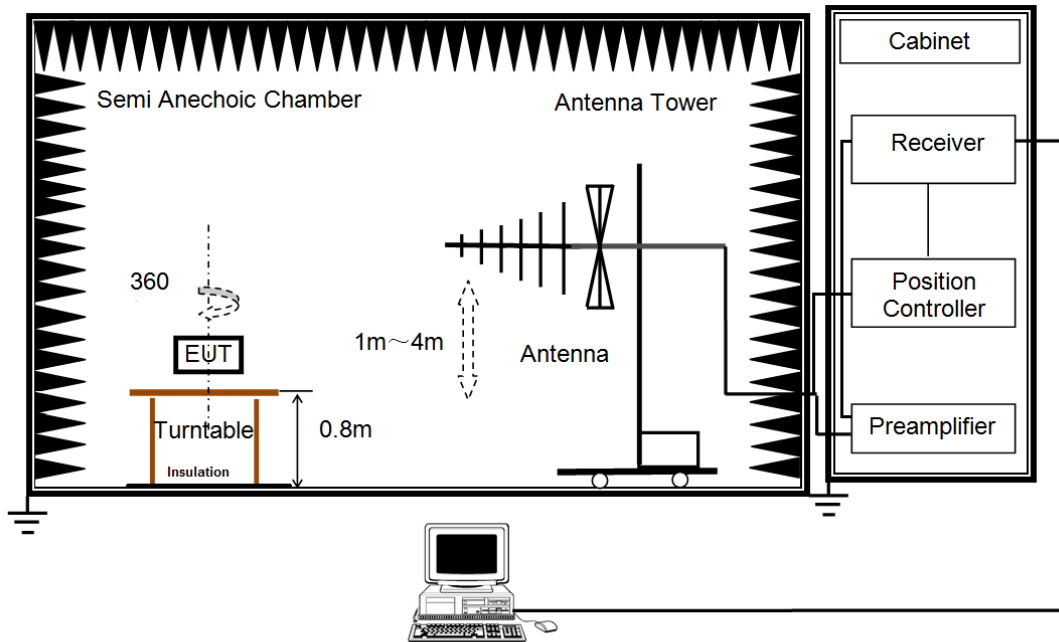
### **6.1.2. Test Procedure**

#### **30-1000MHz**

- a. The measuring distance of at 3m shall be used for measurements at frequency from 30 to 1000MHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment shall be set at 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item:EUT Test Photos.
- g. The Patient-coupled cable shall be separate connected to suitable simulator.

### 6.1.3. Test Setup and Configuration

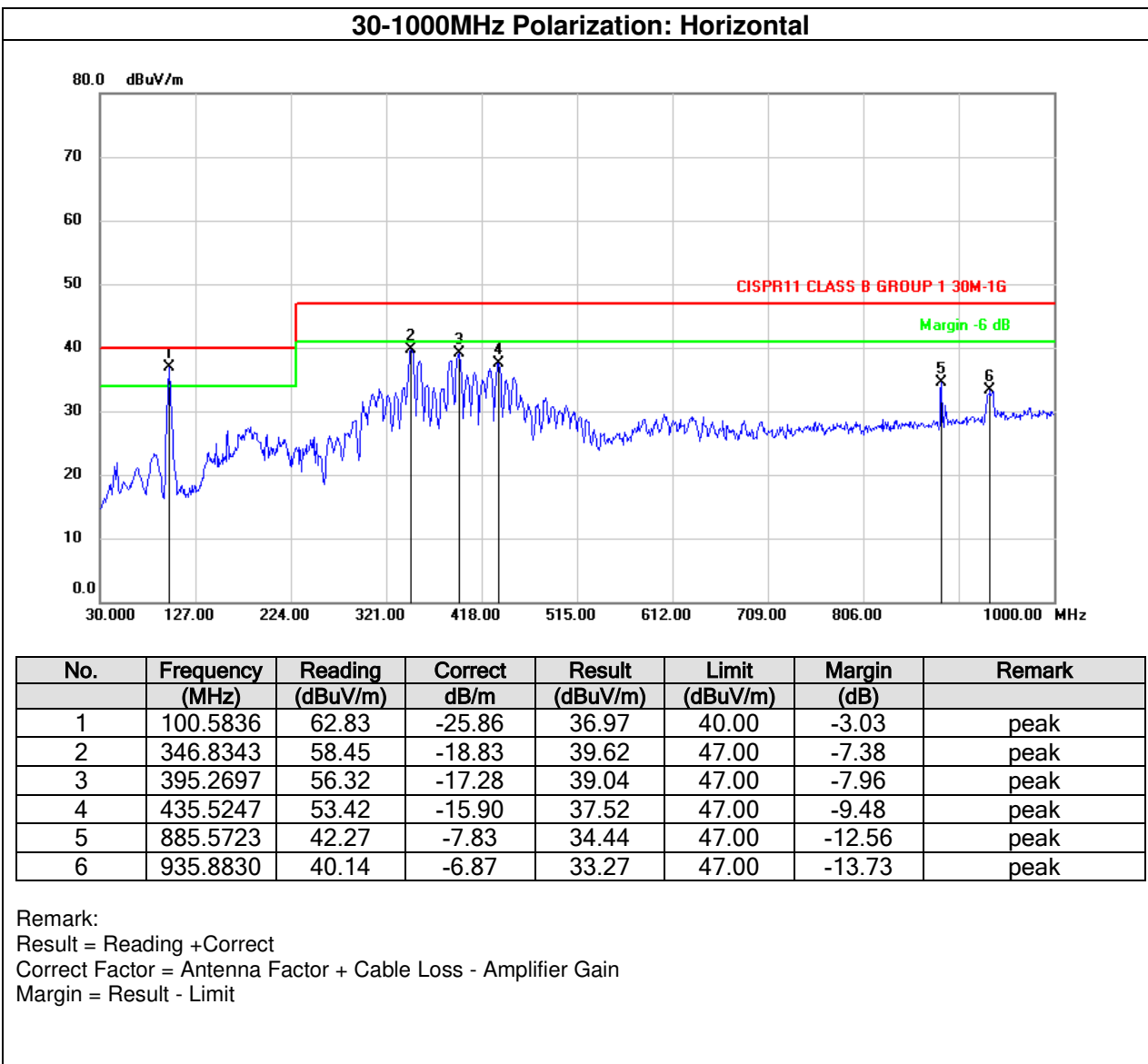
(30MHz-1000MHz)



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

#### 6.1.4. Test Result

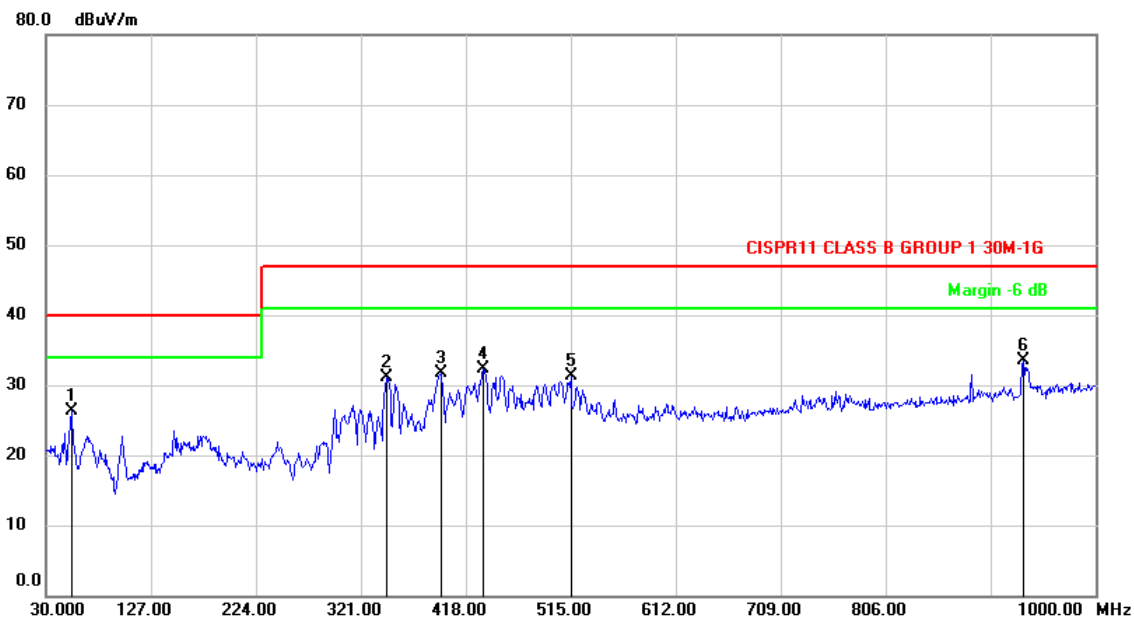
Test Mode:	Mode 1	Temperature:	23°C
Test Voltage:	24Vdc from DC source	Humidity:	63%RH
Tested By:	Rupert Huang	Test Date:	Jun. 23, 2021





Test Mode:	Mode 1	Temperature:	23°C
Test Voltage:	24Vdc from DC source	Humidity:	63%RH
Tested By:	Rupert Huang	Test Date:	Jun. 23, 2021

**30-1000MHz Polarization: Vertical**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	54.0560	47.88	-21.63	26.25	40.00	-13.75	peak
2	346.1230	50.03	-18.85	31.18	47.00	-15.82	peak
3	395.1727	48.98	-17.29	31.69	47.00	-15.31	peak
4	434.3930	48.30	-15.94	32.36	47.00	-14.64	peak
5	515.5173	45.15	-13.89	31.26	47.00	-15.74	peak
6	933.4903	40.57	-7.02	33.55	47.00	-13.45	peak

Remark:  
Result = Reading +Correct  
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain  
Margin = Result - Limit

## 7. IMMUNITY TEST

### 7.1. Performance Criteria

According to EN 60601-1-2 standard, the general performance criteria as following:

Type of test	Reaction of ME EQUIPMENT or ME SYSTEM during test	How to continue with testing
Transient(a)	The ME EQUIPMENT or ME SYSTEM is permanently damaged. However, BASIC SAFETY and ESSENTIAL PERFORMANCE continue to be provided.	The test sequence shall be repeated two times with this IMMUNITY TEST LEVEL and polarity. The ME EQUIPMENT or ME SYSTEM passes the test if it continues to provide its BASIC SAFETY and ESSENTIAL PERFORMANCE. If any equipment is damaged, it can continue to be used for the IMMUNITY test for this specific phenomenon, as long as it can be proven (e.g. by RISK MANAGEMENT, engineering analysis, experience, redundancy) that the ability of the ME EQUIPMENT or ME SYSTEM to provide its BASIC SAFETY and ESSENTIAL PERFORMANCE can still be determined while using the damaged equipment. If a PORT of the ME EQUIPMENT or ME SYSTEM is damaged and the ME EQUIPMENT or ME SYSTEM has multiple identical ports, the test shall not be repeated on any of the identical ports. To test the next non-identical PORT, the ME EQUIPMENT or ME SYSTEM shall be restored to normal operation. To continue with the IMMUNITY test of the next EM phenomenon, the ME EQUIPMENT or ME SYSTEM shall be restored to normal operation.
	The ME EQUIPMENT or ME SYSTEM is permanently damaged. BASIC SAFETY or ESSENTIAL PERFORMANCE does not continue to be provided.	The ME EQUIPMENT or ME SYSTEM has failed the test.
Continuous(b)	The ME EQUIPMENT or ME SYSTEM is permanently damaged. However, BASIC SAFETY and ESSENTIAL PERFORMANCE continue to be provided.	The test sequence shall be repeated two times with this IMMUNITY TEST LEVEL and polarity or frequency. BASIC SAFETY and ESSENTIAL PERFORMANCE shall continue to be provided. To continue with the next frequency step the ME EQUIPMENT or ME SYSTEM shall be restored to normal operation.
	The ME EQUIPMENT or ME SYSTEM is permanently damaged. BASIC SAFETY or ESSENTIAL PERFORMANCE does not continue to be provided.	The ME EQUIPMENT or ME SYSTEM has failed the test.
(a) Tests according to IEC 61000-4-2, IEC 61000-4-4, IEC 61000-4-5 and IEC 61000-4-11		
(b) Tests according to IEC 61000-4-3, IEC 61000-4-6 and IEC 61000-4-8		

## 7.2. Electrostatic Discharge Immunity Test

### 7.2.1. Test Specification

<b>Standard:</b>	IEC 60601-1-2、EN 60601-1-2 (refer to IEC 61000-4-2)
<b>Colleteral Standard:</b>	N/A
<b>Discharge Impedance:</b>	330(1±10%)Ω / 150(1±10%)pF
<b>Discharge Voltage:</b>	Air Discharge: ±2kV/±4kV/±8kV/±15kV (Direct)
<b>Polarity:</b>	Contact Discharge: ±2kV/±4kV/±8kV (Direct/Indirect)
	10 times each polarity
<b>Discharge mode of operation:</b>	Single discharges
<b>Discharge Period:</b>	1 second minimum
<b>Repeat test time:</b>	2 times

**Note:** (1) The test performed of laboratory was according to the client requirements.

### 7.2.2. Test Procedure

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT.

During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied. Test shall be performed at a maximum repetition rate of one discharge per second.

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

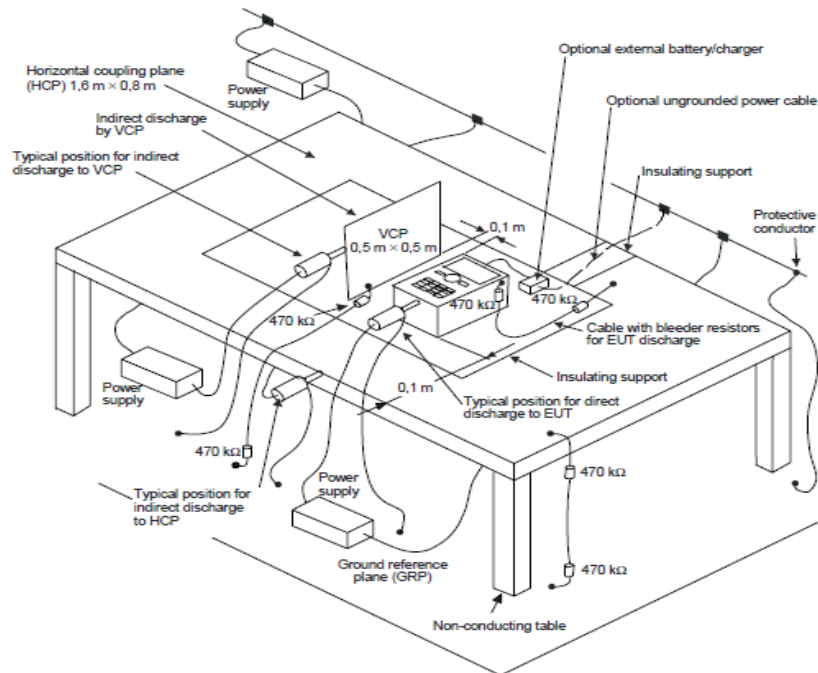
The four faces of the EUT will be performed with electrostatic discharge.

- b. Air discharges at insulation surfaces of the EUT.

It was at least ten single discharges with positive and negative at the same selected point.

- c. For the actual test configuration, please refer to the related Item :EUT Test Photos.

### 7.2.3. Test Setup and Configuration



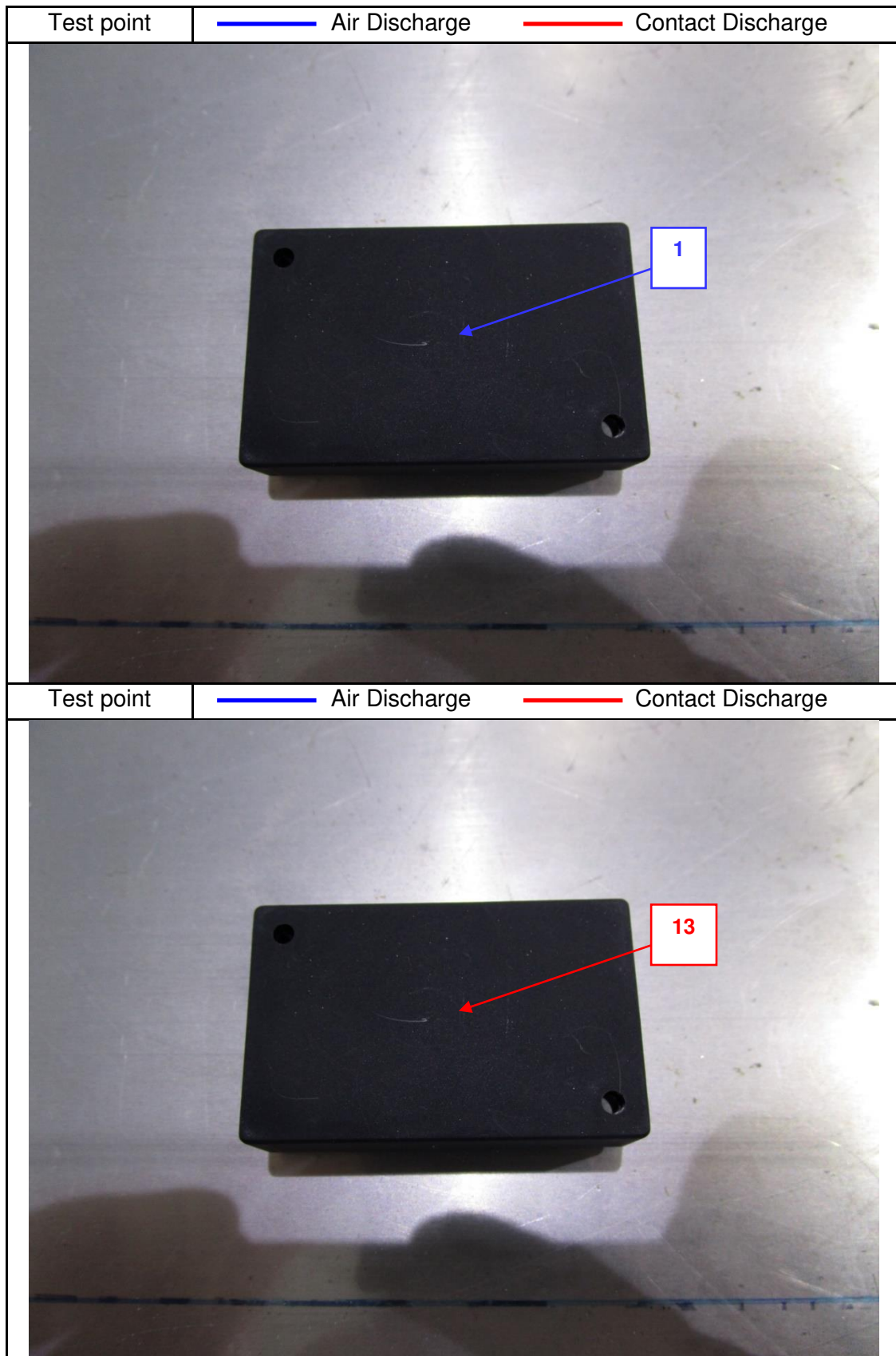
For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

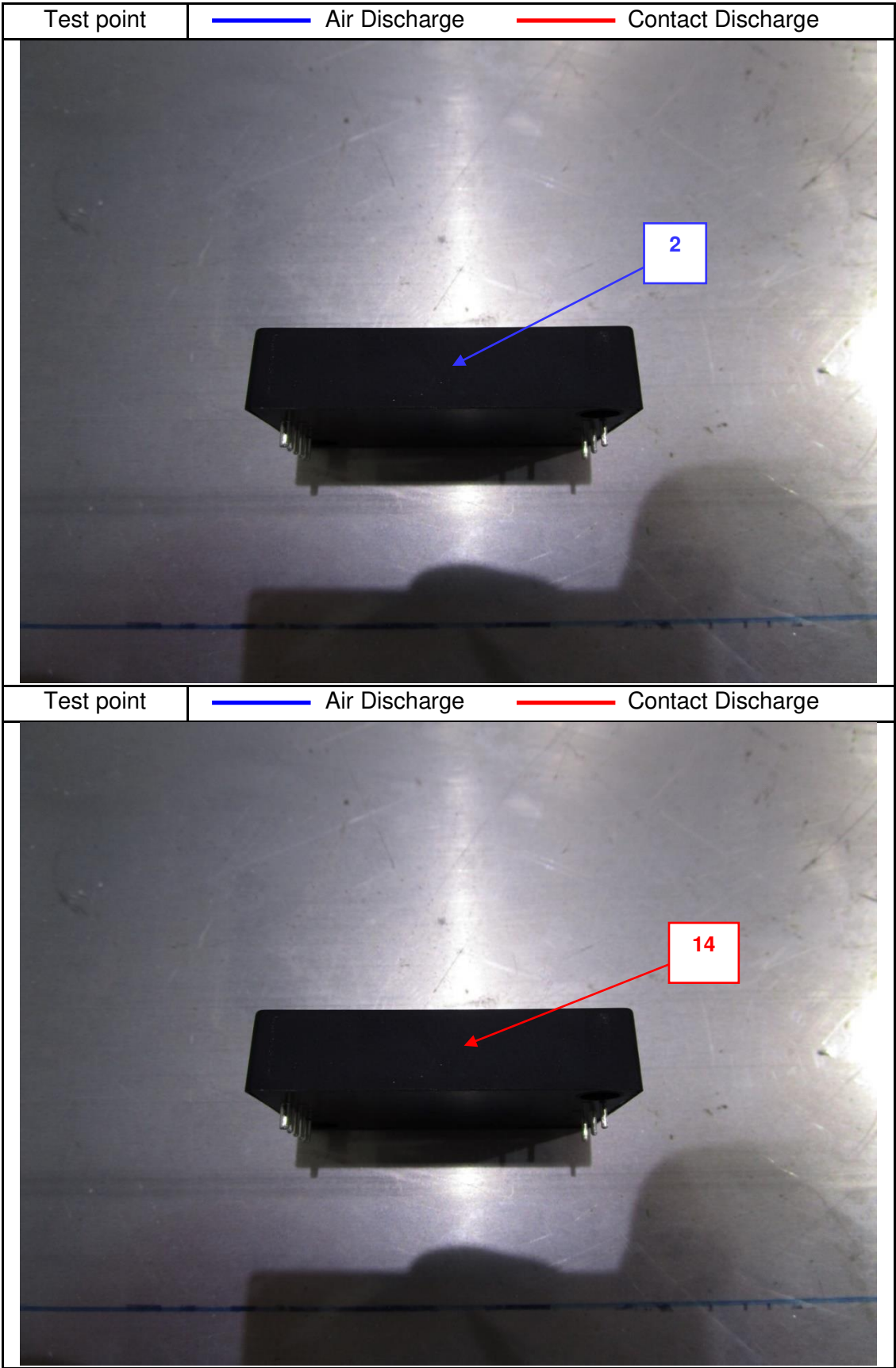
## 7.2.4. Test Result

Test Mode:	Mode 1	Temperature:	22°C
Test Voltage:	24Vdc from DC source	Humidity:	50%RH
Discharge of times:	Air: 10 times Contact: 10 times	ATM pressure:	1020 hpa
Tested By:	Eric T. Fan	Test Date:	Jul. 13, 2021

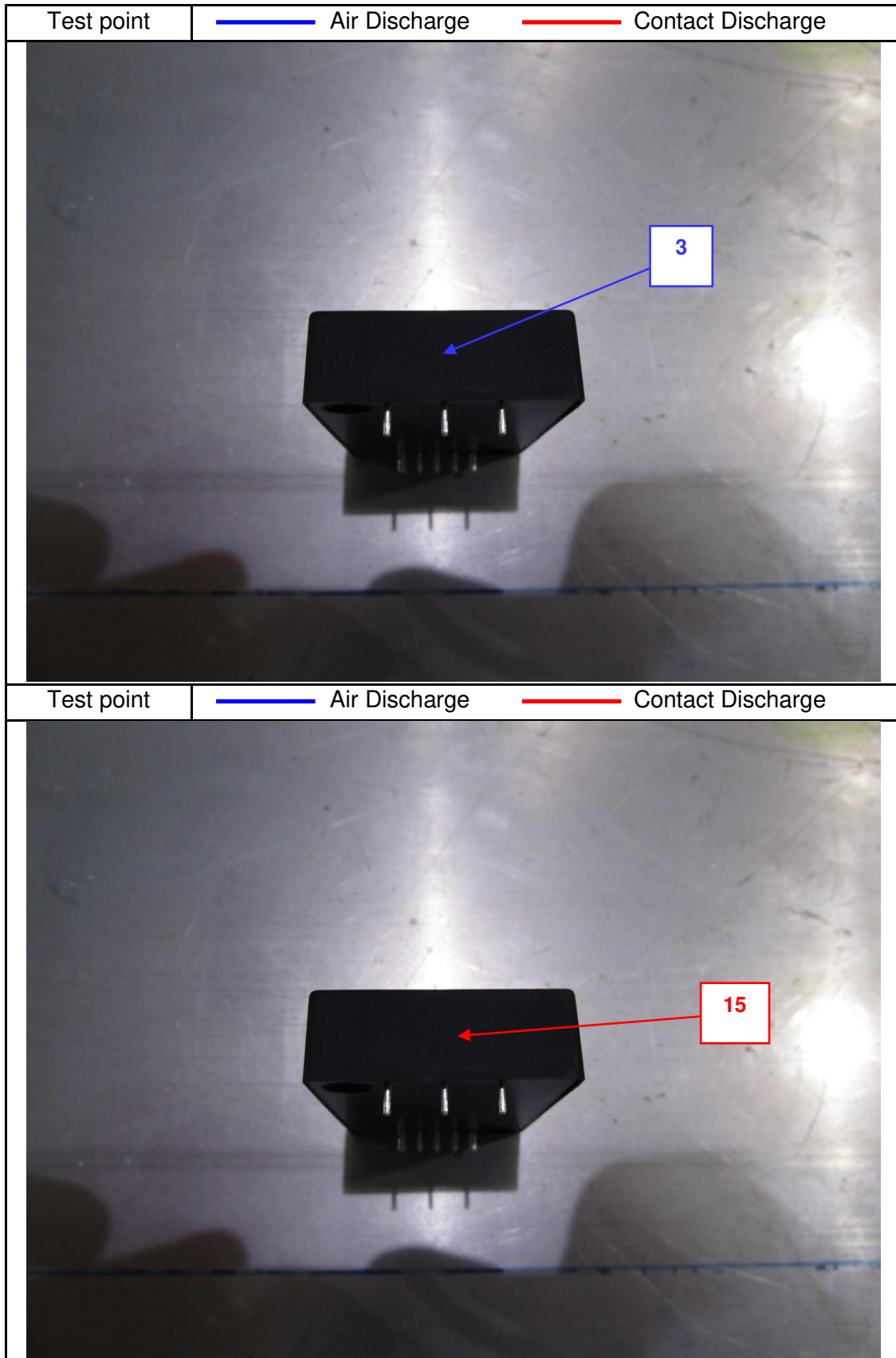
Mode	Air Discharge								Contact Discharge							
	2kV		4kV		8kV		15kV		2kV		4kV		8kV		-kV	
Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	-	-
1~12	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	-	-	-	-	-	-	-	-
13~24	-	-	-	-	-	-	-	-	PASS	PASS	PASS	PASS	PASS	PASS	-	-
Criteria	Please refer to 7.1															
Results	PASS															
Note	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.															

Mode	HCP Discharge								VCP Discharge							
	2kV		4kV		8kV		-kV		2kV		4kV		8kV		-kV	
Location	+	-	+	-	+	-	-	-	+	-	+	-	+	-	-	-
front	PASS	PASS	PASS	PASS	PASS	PASS	-	-	PASS	PASS	PASS	PASS	PASS	PASS	-	-
rear	PASS	PASS	PASS	PASS	PASS	PASS	-	-	PASS	PASS	PASS	PASS	PASS	PASS	-	-
left	PASS	PASS	PASS	PASS	PASS	PASS	-	-	PASS	PASS	PASS	PASS	PASS	PASS	-	-
right	PASS	PASS	PASS	PASS	PASS	PASS	-	-	PASS	PASS	PASS	PASS	PASS	PASS	-	-
Criteria	Please refer to 7.1															
Results	PASS															
Note	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.															

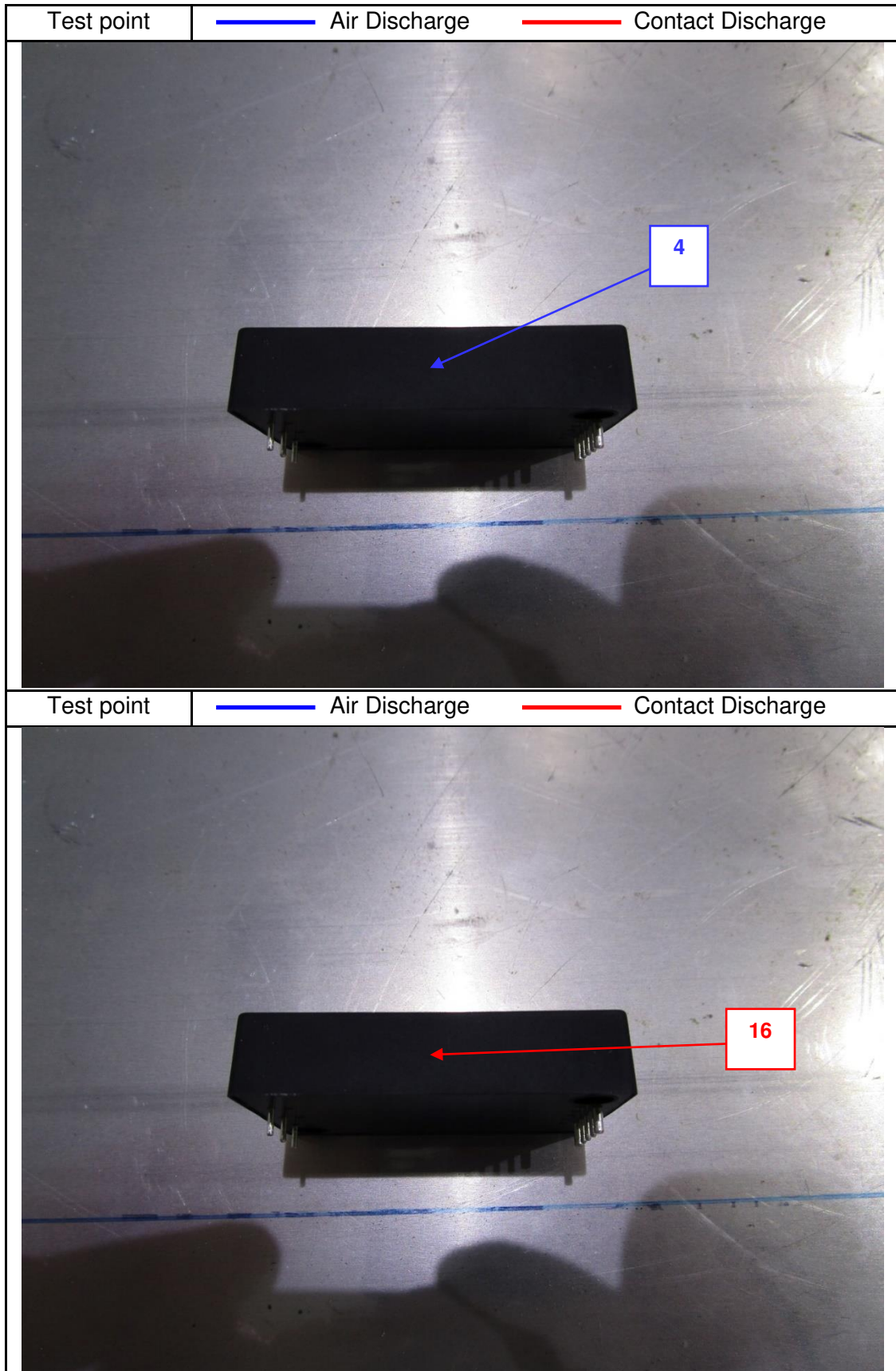


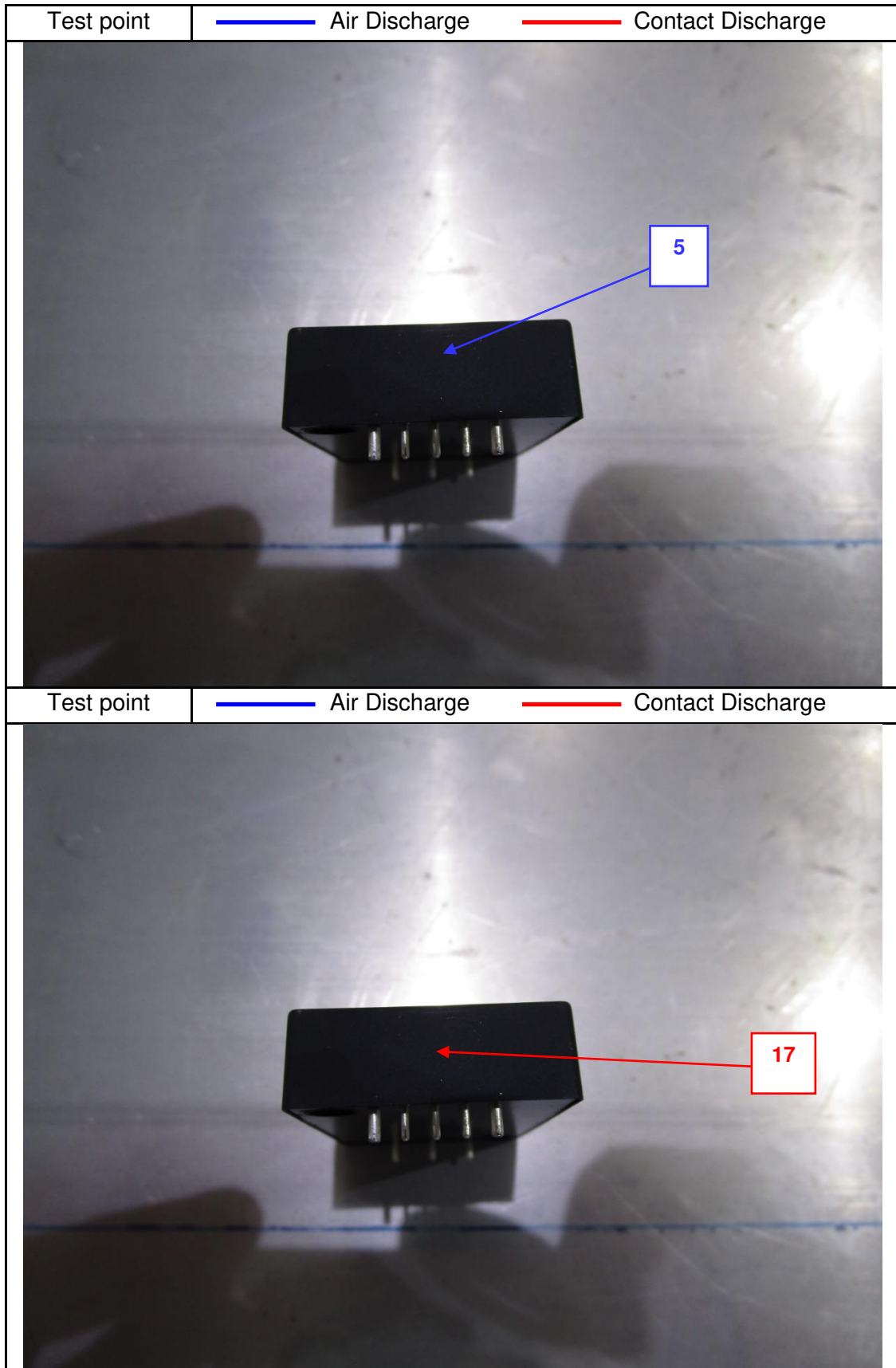


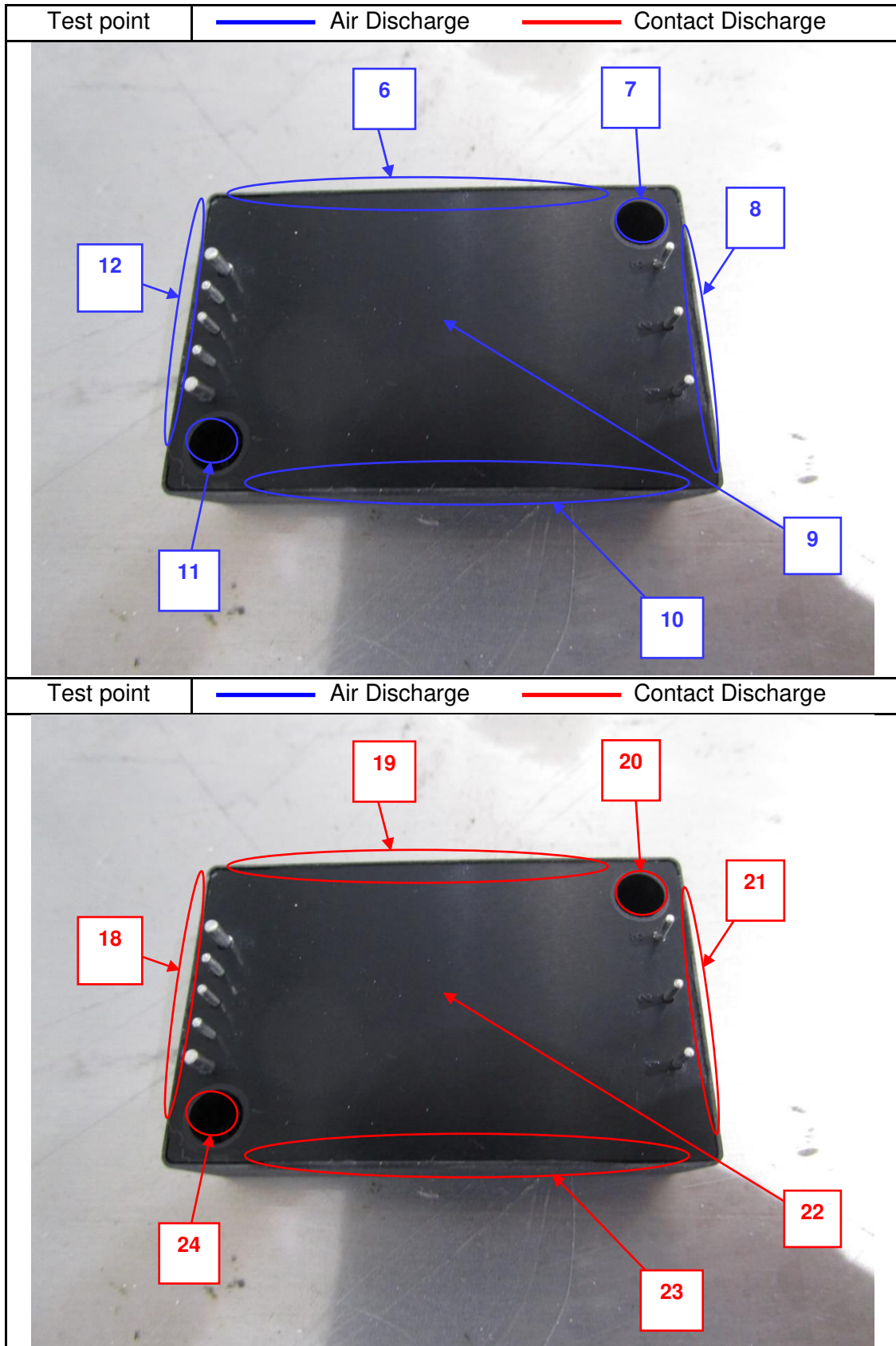












## 7.3. Radio Frequency Electromagnetic Field Immunity Test

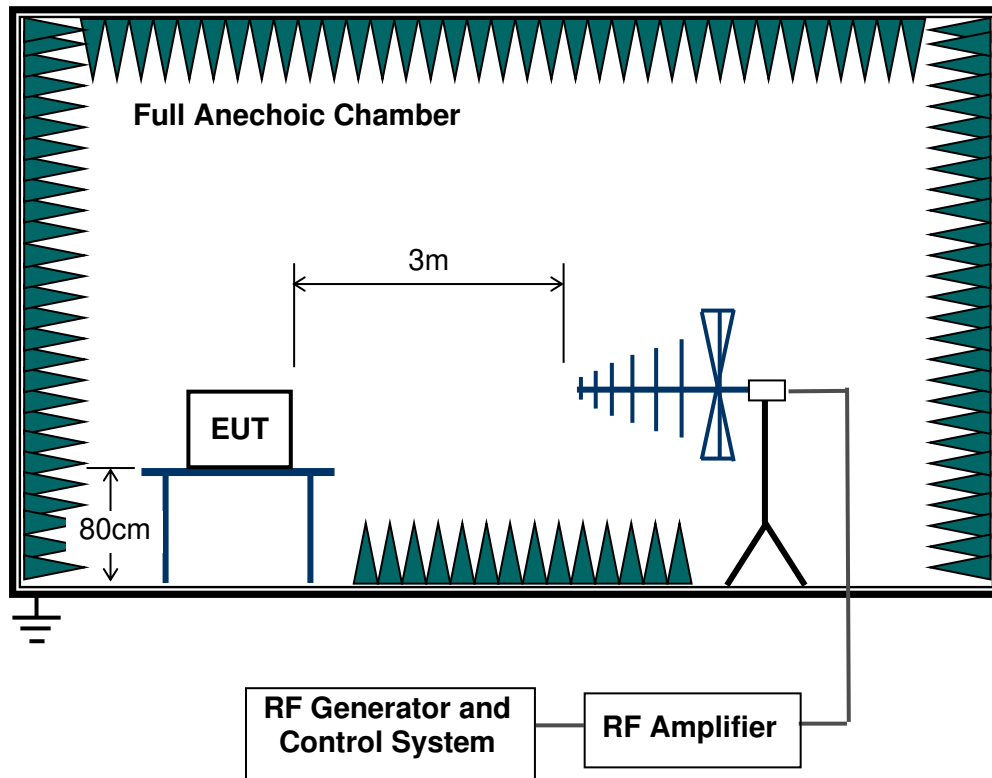
### 7.3.1. Test Specification

<b>Standard:</b>	IEC 60601-1-2、EN 60601-1-2 (refer to IEC 61000-4-3)
<b>Colleteral Standard:</b>	N/A
<b>Frequency Range:</b>	80 MHz to 2700MHz
<b>Field Strength:</b>	10V/m (unmodulated)
<b>Modulation:</b>	80%, AM(1 KHz)
<b>Frequency Step:</b>	1% of fundamental
<b>Polarity of Antenna</b>	Vertical and Horizontal
<b>Test Distance:</b>	3 meters
<b>Antenna Height:</b>	1.55 meters
<b>Dwell Time:</b>	3 s
<b>Repeat test time:</b>	2 times

### 7.3.2. Test Procedure

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The frequency range is swept from 80 MHz to 2700MHz with the signal 80% amplitude modulated with a 1 KHz sine wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The field strength level 80 MHz to 2700MHz was 3V/m for Professional healthcare facility environment ,80MHz to 2700MHz was 10V/m for Home healthcare environment.
- The Patient-coupled cable shall be separate connected to suitable simulator.

### 7.3.3. Test Setup and Configuration



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

#### 7.3.4. RS proximity fields from RF Wireless Communication Test Specification

<b>Standard:</b>	IEC 60601-1-2、EN 60601-1-2 (refer to IEC 61000-4-3)
<b>Colleteral Standard:</b>	N/A
<b>Frequency Range:</b>	See page 6
<b>Field Strength:</b>	
<b>Modulation:</b>	
<b>Polarity of Antenna</b>	Vertical and Horizontal
<b>Test Distance:</b>	3 meters
<b>Dwell Time:</b>	3 s

**Note:** (1) The test performed of laboratory was according to the client requirements.

#### 7.3.5. Test Procedure

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The field strength and modulation was according to Page 6 table.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

#### 7.3.6. Test Setup and Configuration

Please refer to Clause 7.3.3.

### 7.3.7. Test Result

Test Mode:	Mode 1	Temperature:	22°C
Test Voltage:	24Vdc from DC source	Humidity:	52%RH
Tested By:	Rupert Huang	Test Date:	Jul. 13, 2021

Freq. Range (MHz)	Position ( Face )	Polarity (H & V)	Field Strength (V/m)	Criteria	Results
80~2700	Front	H&V	10V/m	Please refer to 7.1	PASS
80~2700	Left	H&V	10V/m	Please refer to 7.1	PASS
80~2700	Rear	H&V	10V/m	Please refer to 7.1	PASS
80~2700	Right	H&V	10V/m	Please refer to 7.1	PASS
385	Front/ Left/ Rear/ Right	H&V	27V/m	Please refer to 7.1	PASS
450	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
710	Front/ Left/ Rear/ Right	H&V	9V/m	Please refer to 7.1	PASS
745	Front/ Left/ Rear/ Right	H&V	9V/m	Please refer to 7.1	PASS
780	Front/ Left/ Rear/ Right	H&V	9V/m	Please refer to 7.1	PASS
810	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
870	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
930	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
1720	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
1845	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
1970	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
2450	Front/ Left/ Rear/ Right	H&V	28V/m	Please refer to 7.1	PASS
5240	Front/ Left/ Rear/ Right	H&V	9V/m	Please refer to 7.1	PASS
5500	Front/ Left/ Rear/ Right	H&V	9V/m	Please refer to 7.1	PASS
5785	Front/ Left/ Rear/ Right	H&V	9V/m	Please refer to 7.1	PASS
Note	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.				



## 7.4. Electrical Fast Transient/Burst Immunity Test

### 7.4.1. Test Specification

<b>Standard:</b>	IEC 60601-1-2、EN 60601-1-2 (refer to IEC 61000-4-4)
<b>Colleteral Standard:</b>	N/A
<b>Test Voltage:</b>	2 kV for AC Mains and DC port, 1kV for signal
<b>Polarity:</b>	Positive and Negative
<b>Impulse Frequency:</b>	100 KHz
<b>Impulse wave shape:</b>	5/50 Tr/Th ns
<b>Burst Duration:</b>	0.75ms
<b>Burst Period:</b>	300ms
<b>Test Duration:</b>	1 Minute
<b>Repeat test time:</b>	2 times

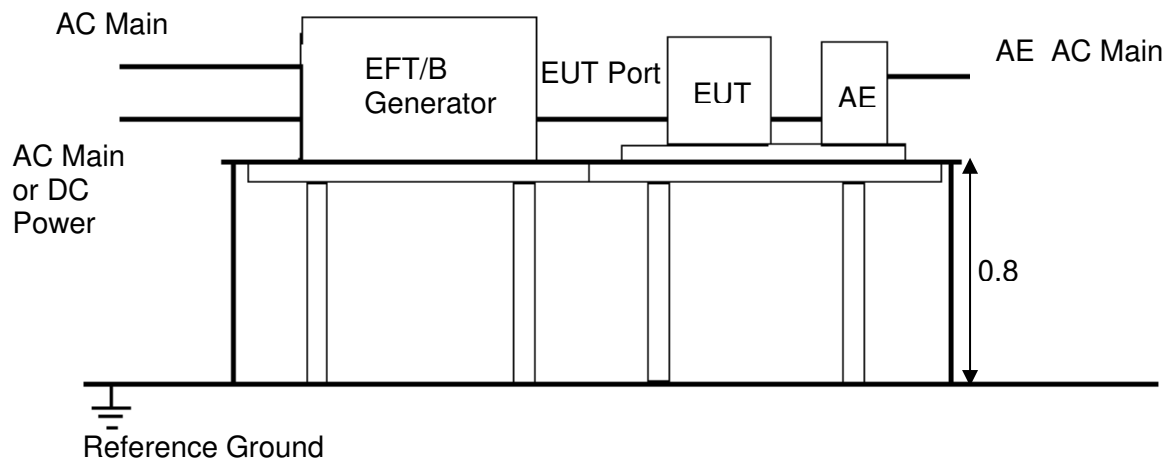
**Note:** (1) The test performed of laboratory was according to the client requirements.

### 7.4.2. Test Procedure

- The EUT was tested with 2000 volt discharges to the AC power input leads, 1000 volt discharges to the signal/control ports.
- Both positive and negative polarity discharges were applied.
- Table-top equipment and equipment normally mounted on ceilings or walls as well as built-in equipment shall be tested with the EUT located ( $0,1 \pm 0,01$ ) m above the ground reference plane.
- The EUT and the auxiliary equipment were placed on a table of 0.8 m heights above a metal ground reference plane. The size of ground plane is greater than 0.8m×1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 0.5 meters (provided by the manufacturer), The minimum distance between the EUT and all other conductive structures (including the generator, AE and the walls of a shielded room), except the ground reference plane, shall be more than 0,5 m.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.
- The patient-couple cable specified greater than 3m shall be used capacitive clamp do the test.



### 7.4.3. Test Setup and Configuration



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

#### 7.4.4. Test Result

Test Mode:	Mode 1	Temperature:	23°C
Test Voltage:	24Vdc from DC source	Humidity:	62%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 9, 2021

Test Port		Test Levels (kV)						Criteria	Results
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0		
DC Power Port	+	-	-	-	-	PASS	PASS	Please refer to 7.1	PASS
	-	-	-	-	-	PASS	PASS	Please refer to 7.1	PASS
	+ & -	-	-	-	-	PASS	PASS	Please refer to 7.1	PASS
Note		There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.							

## 7.5. Surge Immunity Test

### 7.5.1. Test Specification

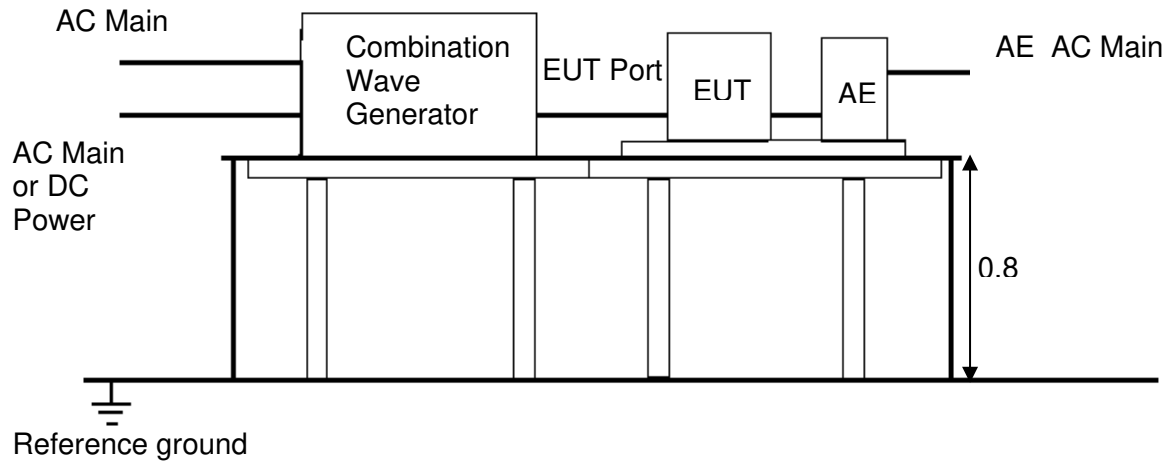
<b>Standard:</b>	IEC 60601-1-2、EN 60601-1-2 (refer to IEC 61000-4-5)
<b>Colleteral Standard:</b>	N/A
<b>Waveform:</b>	1.2/50 (8/20) Tr/Th $\mu$ s
<b>Test Voltage:</b>	0.5, 1, 2 kV
<b>Polarity:</b>	Positive and Negative
<b>Phase Angle:</b>	0°/90°/180°/270°
<b>Repetition Rate:</b>	1 per minute
<b>Discharge Times:</b>	5
<b>Repeat test time:</b>	2 times

**Note:** (1) The test performed of laboratory was according to the client requirements.

### 7.5.2. Test Procedure

- The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m×1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 2 meters (provided by the manufacturer).
- The EUT was connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
- The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

### 7.5.3. Test Setup and Configuration



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

#### 7.5.4. Test Result

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	24Vdc from DC source	Humidity:	52%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 12, 2021

Wave Form EUT Ports Tested	1.2/50(8/20)Ti/Th us						Criteria	Results
	Polarity	Phase	Voltage					
			0.5kV	1kV	2kV	-kV		
DC Power Port + to -	+	--	PASS	PASS	-	-	Please refer to 7.1	PASS
	-	--	PASS	PASS	-	-		
Note	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.							

#### Customer request:

Wave Form EUT Ports Tested	1.2/50(8/20)Ti/Th us						Criteria	Results
	Polarity	Phase	Voltage					
			0.5kV	1kV	2kV	-kV		
DC Power Port + to -	+	--	-	-	PASS	-	Please refer to 7.1	PASS
	-	--	-	-	PASS	-		
Note	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.							

## 7.6. Immunity to Conducted Disturbances Induced by RF Fields

### 7.6.1. Test Specification

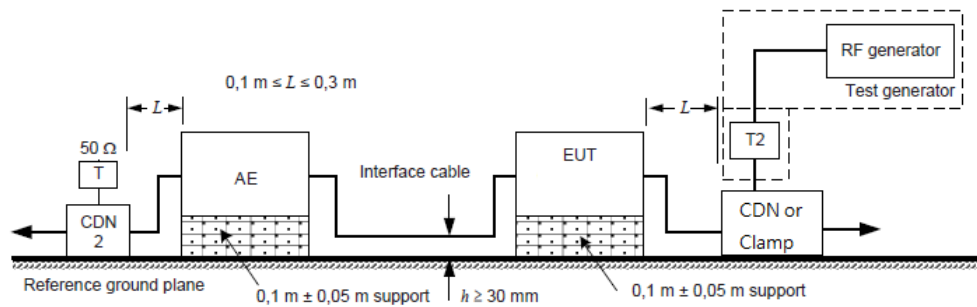
<b>Standard:</b>	IEC 60601-1-2、EN 60601-1-2 (refer to IEC 61000-4-6)
<b>Colleteral Standard:</b>	N/A
<b>Frequency Range:</b>	0.15-80MHz
<b>Field Strength:</b>	3V, 6V (unmodulated, r.m.s.)
<b>Modulation:</b>	80% AM (1 kHz)
<b>Frequency Step:</b>	1% of fundamental
<b>Dwell Time:</b>	3 s
<b>Repeat test time:</b>	2 times

**Note:** (1) The test performed of laboratory was according to the client requirements.

### 7.6.2. Test Procedure

- The EUT shall be tested within its intended operating and climatic conditions.
- 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.
- The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate shall not exceed  $1.5 \times 10^{-3}$  decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.
- 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 such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.
- Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

### 7.6.3. Test Setup and Configuration



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

#### 7.6.4. Test Result

Test Mode:	Mode 1	Temperature:	22°C
Test Voltage:	24Vdc from DC source	Humidity:	65%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 9, 2021

Test Ports (Mode)	Freq. Range (MHz)	Field Strength	CDN	Criteria	Results
DC Power Port	0.15 ---80	3V	M016(M2)	Please refer to 7.1	PASS
DC Power Port	ISM bands	6V	M016(M2)	Please refer to 7.1	PASS
Note	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.				

#### Customer Request:

Test Ports (Mode)	Freq. Range (MHz)	Field Strength	CDN	Criteria	Results
DC Power Port	0.15 ---80	10V	M016(M2)	Please refer to 7.1	PASS
Note	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.				



## 7.7. Power frequency magnetic field immunity Test

### 7.7.1. Test Specification

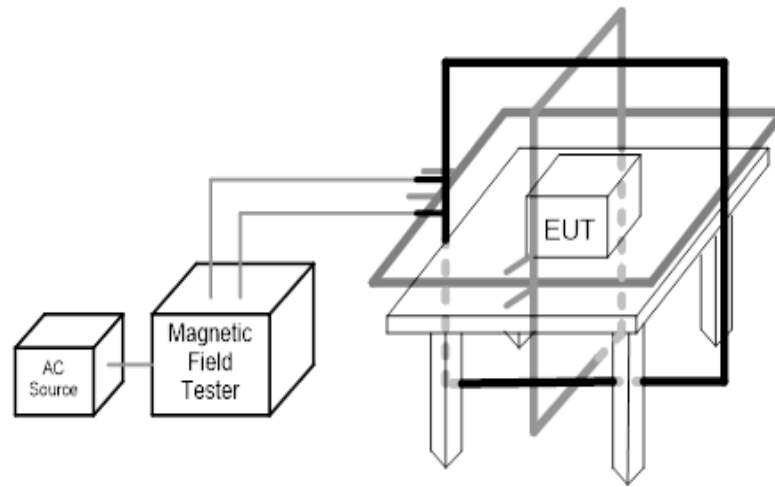
<b>Standard:</b>	IEC 60601-1-2、EN 60601-1-2 (refer to IEC 61000-4-8)
<b>Collateral Standard:</b>	N/A
<b>Frequency Range:</b>	50 Hz
<b>Field Strength:</b>	30 A/m 100 A/m for Continuous (Client request) 1000 A/m for short duration (Client request)
<b>Axis:</b>	X, Y, Z
<b>Observation Time:</b>	1 minute 1s for short duration
<b>Inductance Coil:</b>	Rectangular type, 1mx1m
<b>Repeat test time:</b>	2 times

**Note:** (1) The test performed of laboratory was according to the client requirements.

### 7.7.2. Test Procedure

- The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m\*1m min. and 0.65mm thick min.
- The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- 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.
- The EUT with coil shall be leave all magnetic material and wall 1m away in any axis during the test.
- The cable length from generator to coil shall be less than 2m
- The background noise shall be 20db less than test field strength.
- Test shall be applied to three axis X, Y, Z and disturbance over 1 minute.
- All cables shall be exposed to the magnetic field for 1m of their length.

### 7.7.3. Test Setup and Configuration



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

#### 7.7.4. Test Results

Test Mode:	Mode 1	Temperature:	22°C
Test Voltage:	24Vdc from DC source	Humidity:	65%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 13, 2021

Level	Magnetic Field Strength (A/m)	Criteria	Results		
			X	Y	Z
1	1	-	-	-	-
2	3	-	-	-	-
3	10	-	-	-	-
4	30	Please refer to 7.1	PASS	PASS	PASS
5	100	-	-	-	-
X	Special	-	-	-	-
Note:	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.				

#### Customer Request:

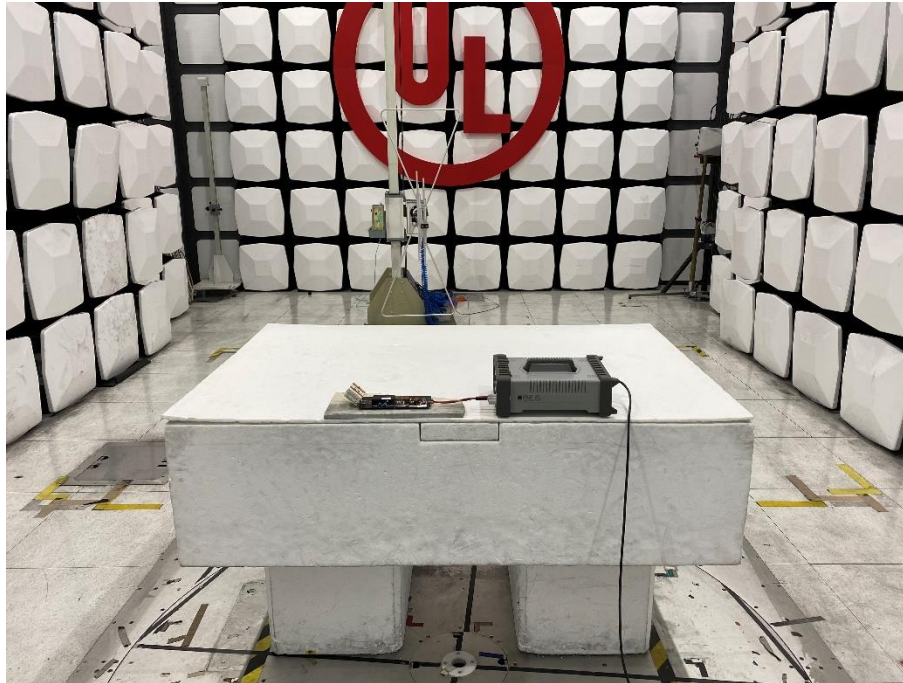
Level	Magnetic Field Strength (A/m)	Criteria	Results		
			X	Y	Z
1	1	-	-	-	-
2	3	-	-	-	-
3	10	-	-	-	-
4	30	-	-	-	-
5	100	Please refer to 7.1	PASS	PASS	PASS
X	Special	-	-	-	-
Note:	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.				

#### (Short Term: 1s):

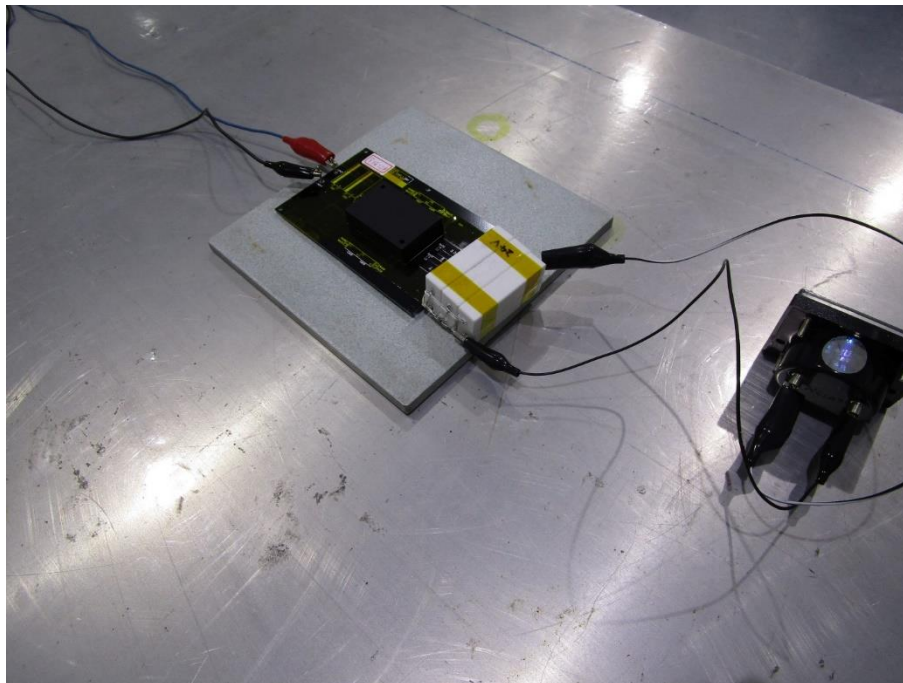
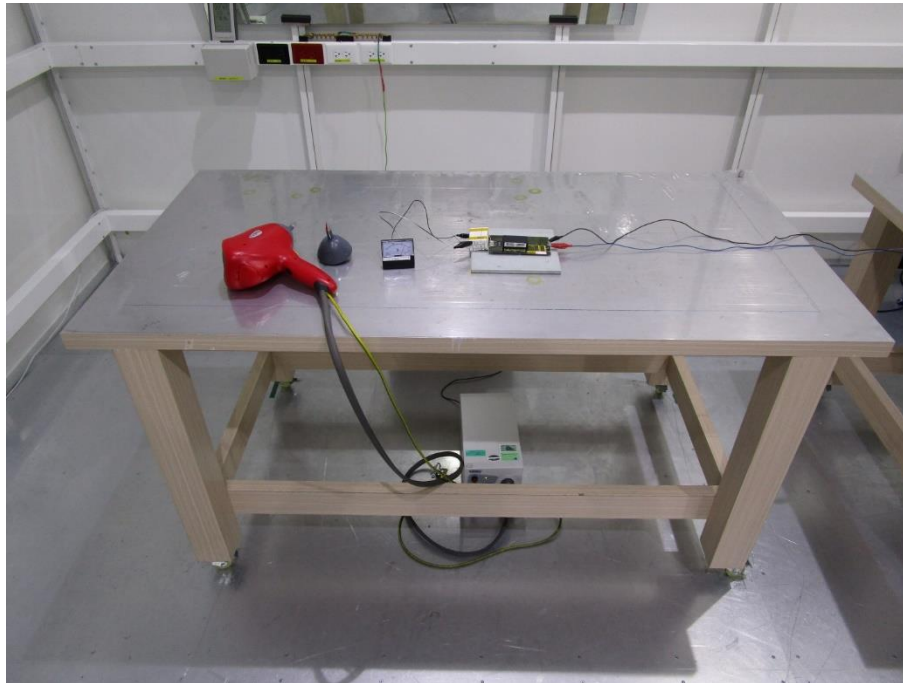
Level	Magnetic Field Strength (A/m)	Criteria	Results		
			X	Y	Z
4	300	-	-	-	-
5	1000	Please refer to 7.1	PASS	PASS	PASS
X	Special	-	-	-	-
Note:	There was no abnormal situation during the test compared with initial operation. Pass means that the test performance meet Criteria A which identical with EN 55035.				

## Appendix I: Photographs of EMC Test Configuration

Radiated Disturbance  
Below 1GHz

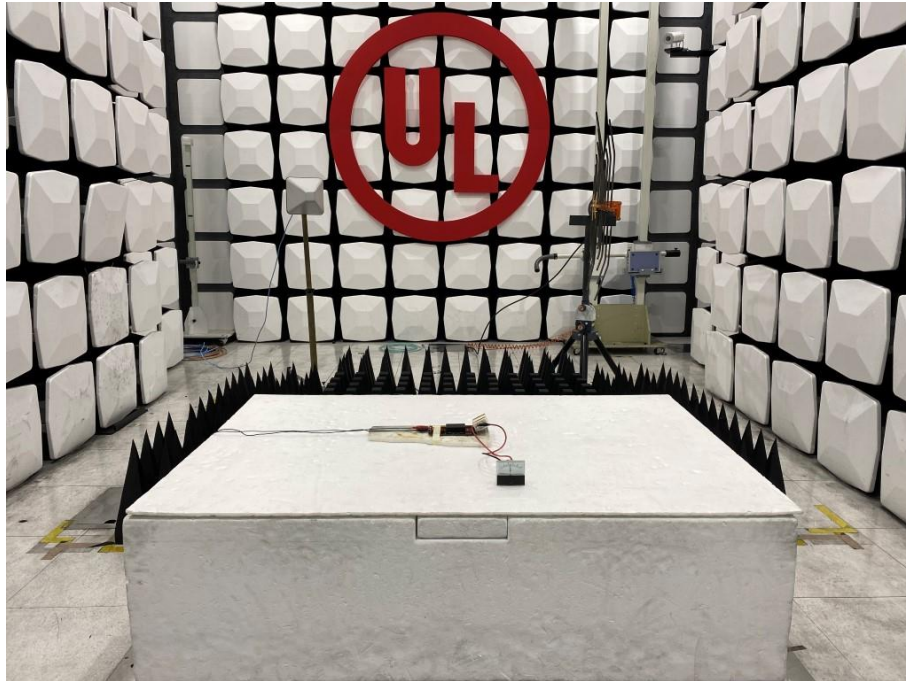


### Electrostatic Discharge Immunity

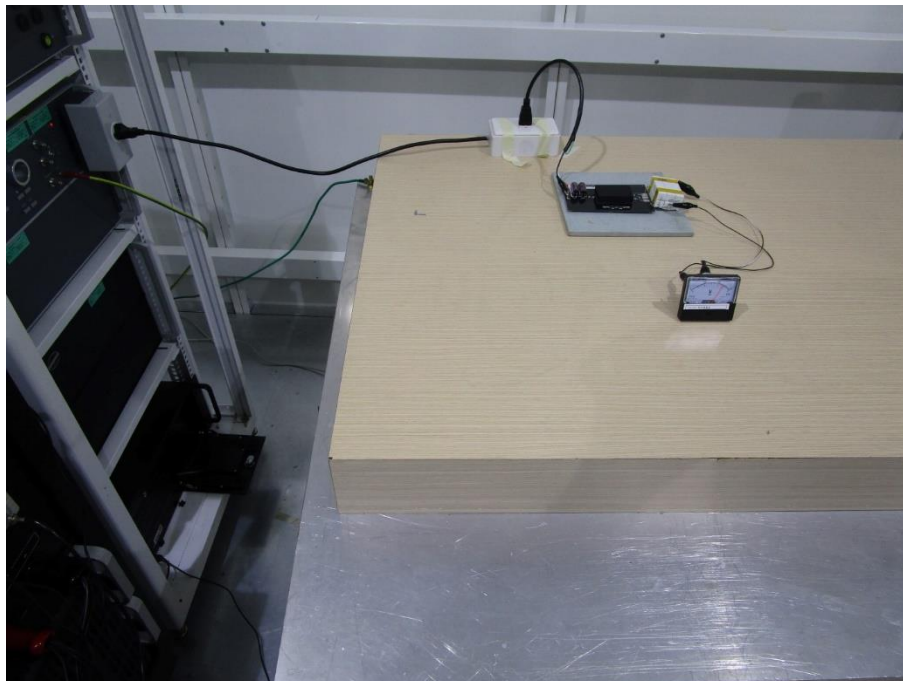




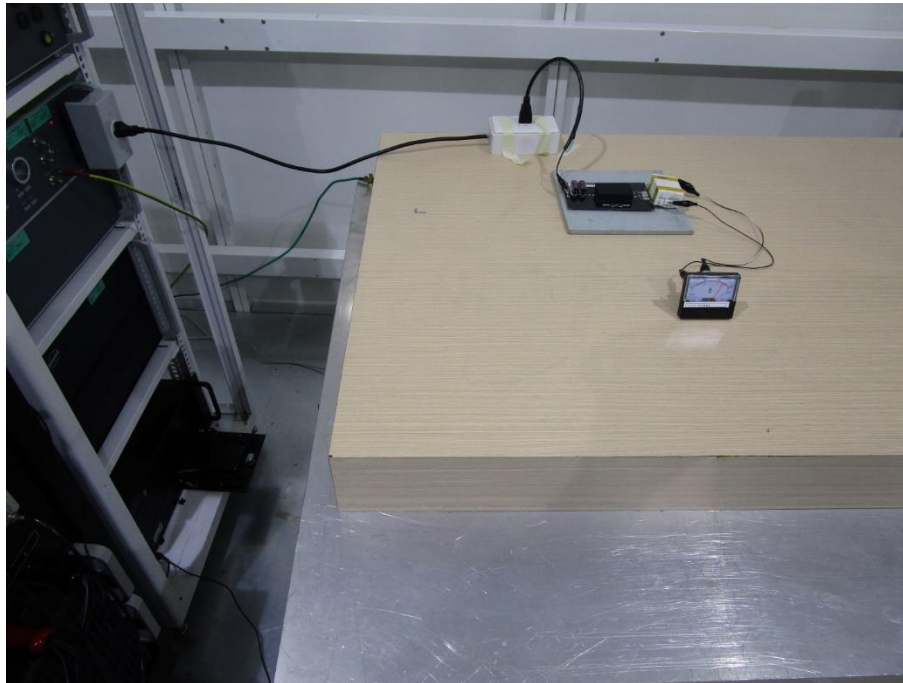
### Radio Frequency Electromagnetic Field Immunity



### Electrical Fast Transient Immunity

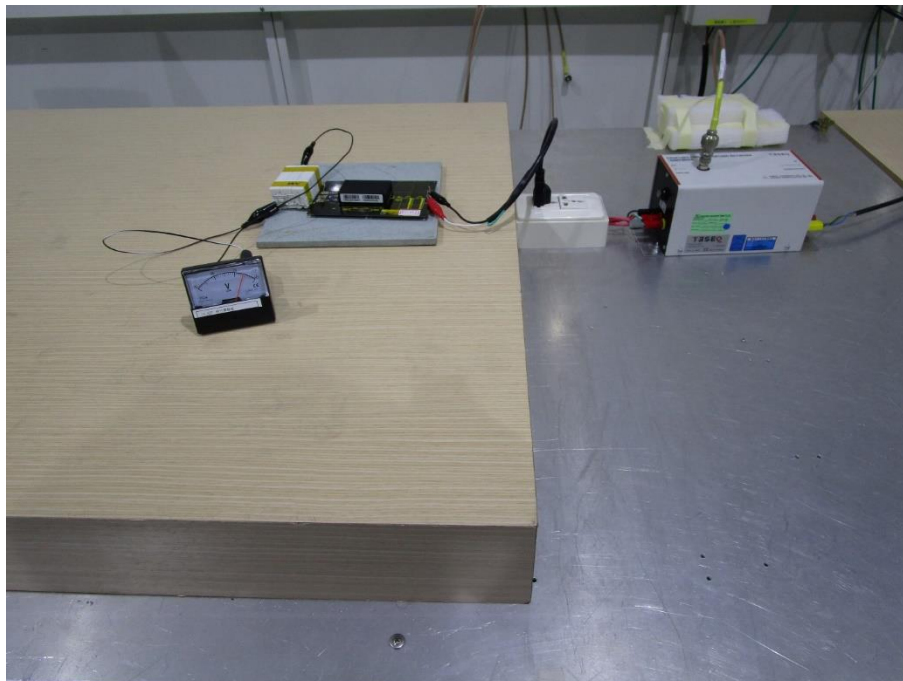


### Surge Immunity

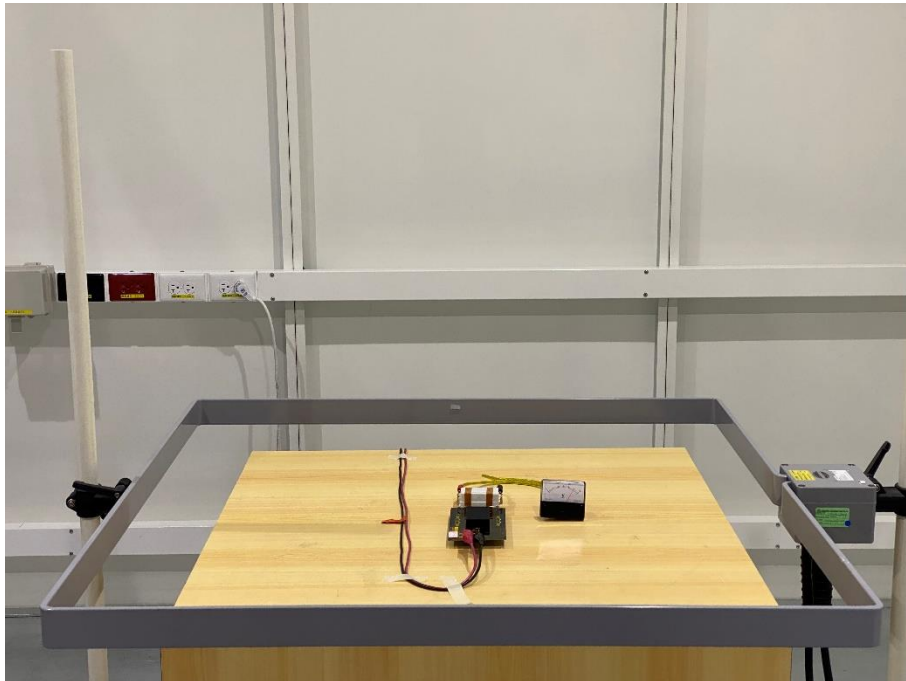
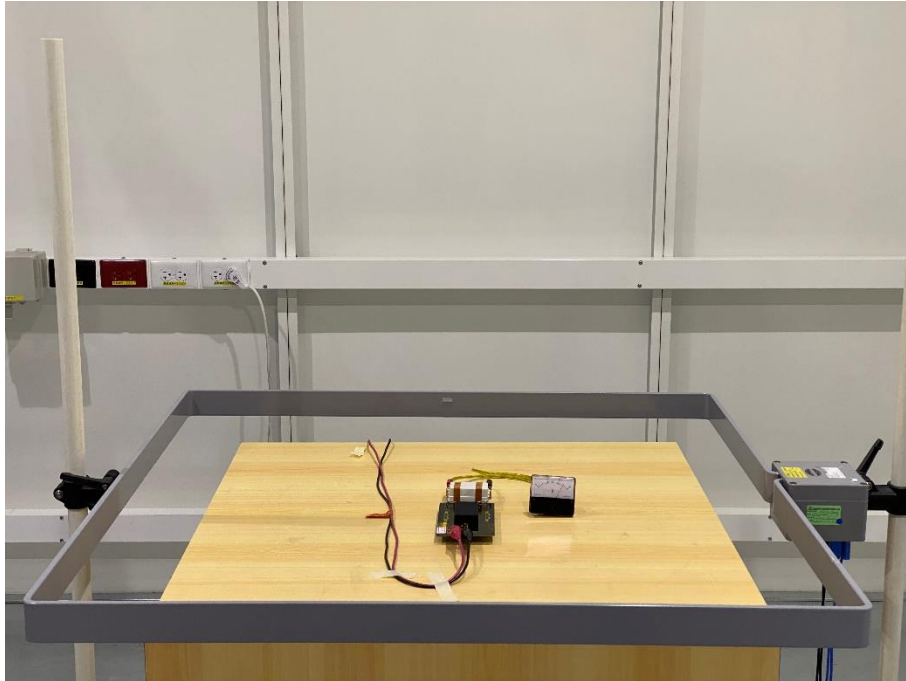




Immunity to conducted disturbances induced by RF fields



### Power frequency magnetic field immunity



## **Appendix II: Photographs of the EUT**

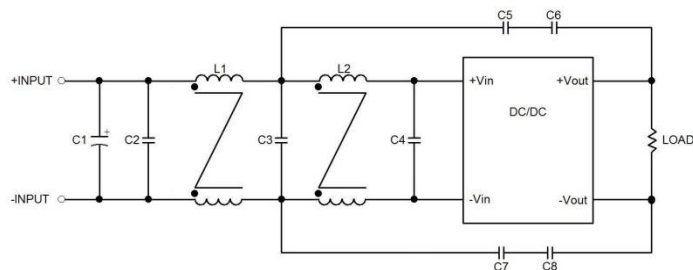
Please see the photographs of EUT in the test report no.: 4790064632-EP.

---

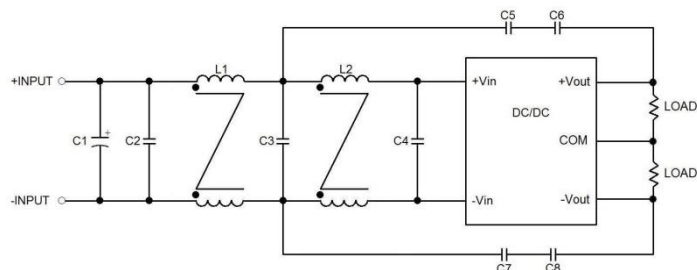
**END OF REPORT**

## Appendix III: Countermeasure file for EMI, EFT and Surge

### For EMI test requirements/Class B



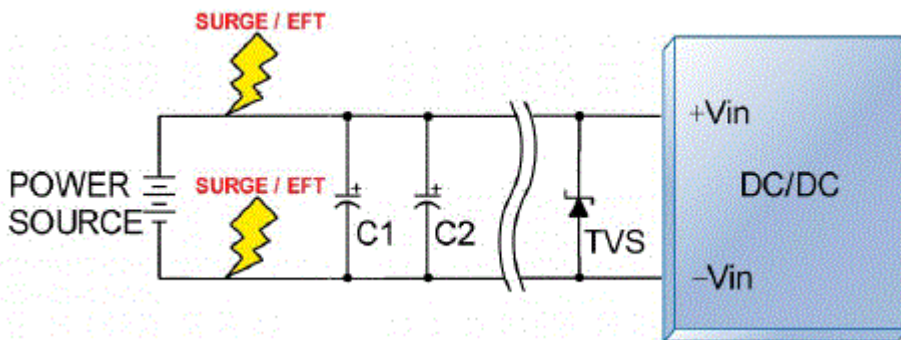
Single Output



Dual Output

Model	C1	C2, C3, C4	C5, C6	C7, C8	L1, L2
THM 60-24□□WI THM 60-48□□WI	100μF/100V Al Cap. (lie down) Rubycon ZLH	2.2μF/100V 1210 MLCC	47pF/Y1 TDK CD45 series	33pF/Y1 TDK CD45 series	285μH TCK-103

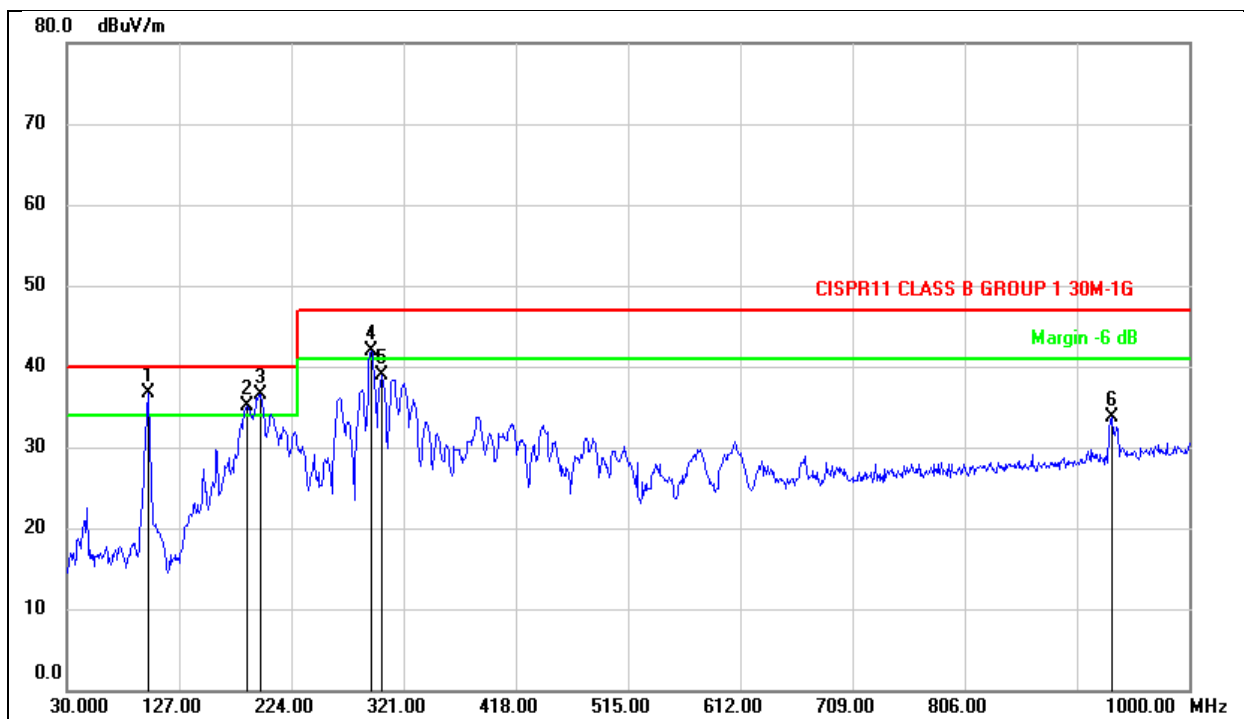
### For Electrical Fast transient & Surge Immunity test requirements



Model	Component	Specification	Reference
THM 60-24□□WI	C1, C2	220μF/100V	Nippon Chemi-con KY series
	TVS	58V/3000W	SMDJ58A
THM 60-48□□WI	C1, C2	220μF/100V	Nippon Chemi-con KXJ series
	TVS	120V/3000W	SMDJ120A

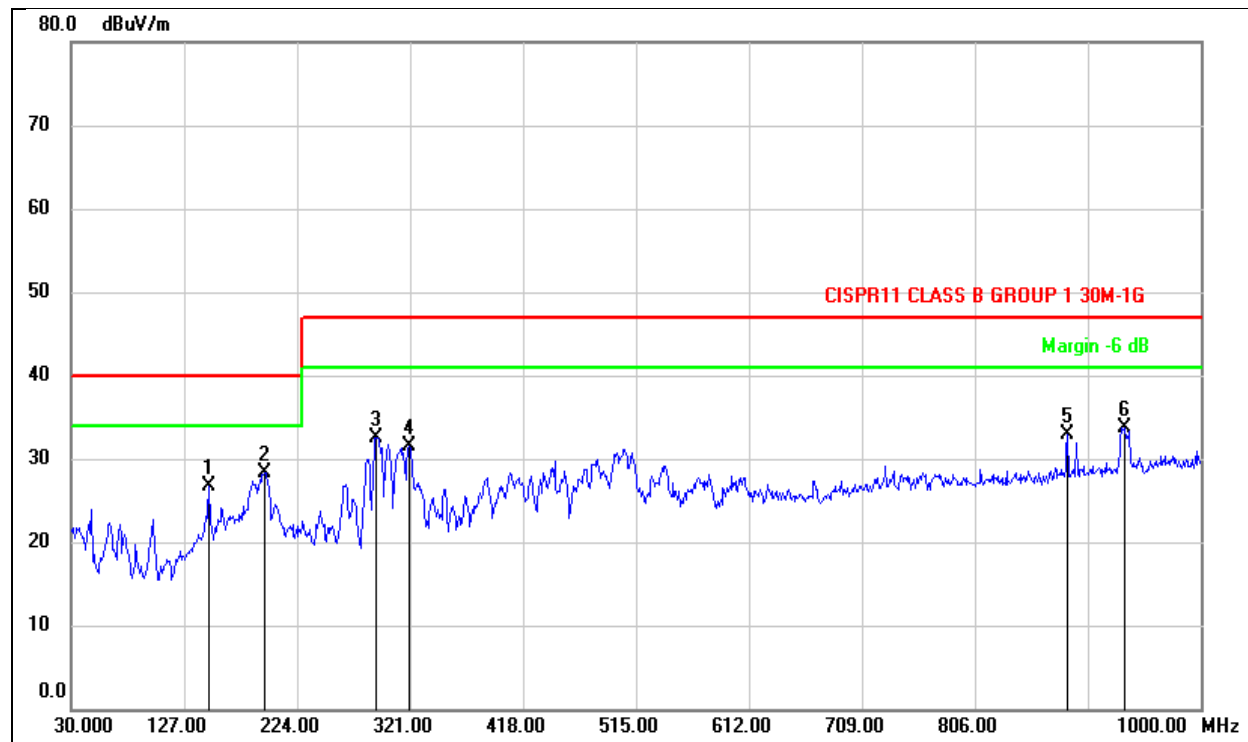
## Appendix IV: Preliminary Test Raw Data

Project No.:	4790064632	Polarization:	Horizontal
Standard:	CISPR11 CLASS B GROUP 1 30M-1G	Power Source:	DC 48V
Test item:	Radiation Test	Date:	6/23/2021
Temp./Hum.(%RH):	23(C)/63%RH	Time:	6:59:26 PM
EUT:	DC to DC Converter	Test By:	Rupert Huang
Model:	THM 60-4815WI	Distance:	3m
Mode:	Mode 2		
Note:			



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	100.4543	62.65	-25.86	36.79	40.00	-3.21	peak
2	186.7843	58.21	-23.12	35.09	40.00	-4.91	peak
3	196.0317	60.46	-23.89	36.57	40.00	-3.43	peak
4	293.4520	62.05	-20.19	41.86	47.00	-5.14	peak
5	302.1820	59.02	-20.08	38.94	47.00	-8.06	peak
6	933.3287	40.67	-7.03	33.64	47.00	-13.36	peak

Project No.:	4790064632	Polarization:	Vertical
Standard:	CISPR11 CLASS B GROUP 1 30M-1G	Power Source:	DC 48V
Test item:	Radiation Test	Date:	6/23/2021
Temp./Hum.(%RH):	23(C)/63%RH	Time:	7:00:54 PM
EUT:	DC to DC Converter	Test By:	Rupert Huang
Model:	THM 60-4815WI	Distance:	3m
Mode:	Mode 2		
Note:			

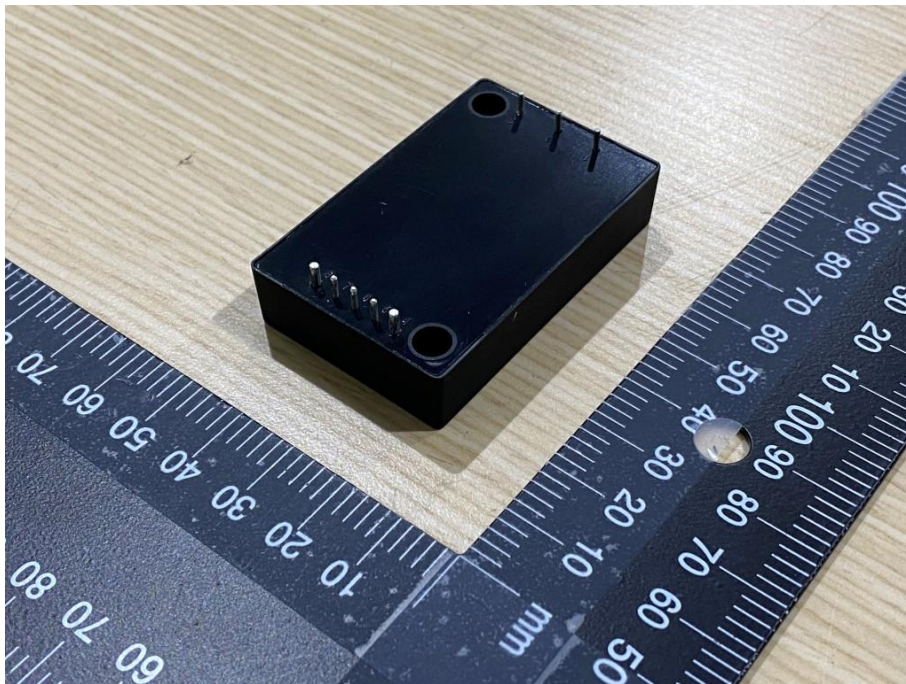
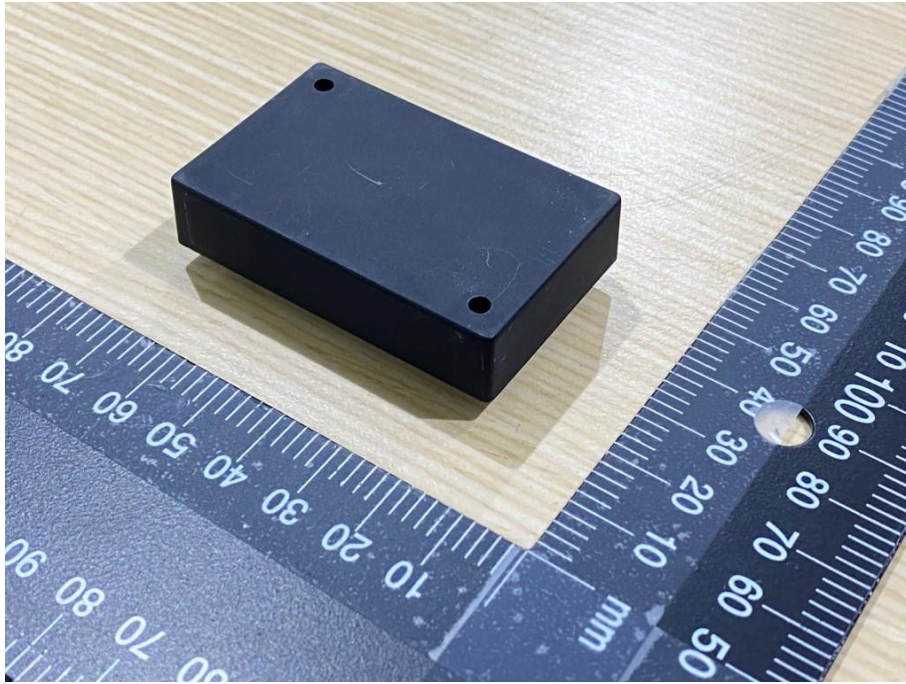


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	148.4693	47.80	-21.01	26.79	40.00	-13.21	peak
2	196.1287	52.22	-23.88	28.34	40.00	-11.66	peak
3	292.8377	52.79	-20.20	32.59	47.00	-14.41	peak
4	320.9677	50.79	-19.37	31.42	47.00	-15.58	peak
5	885.5723	40.80	-7.83	32.97	47.00	-14.03	peak
6	935.7213	40.52	-6.88	33.64	47.00	-13.36	peak



## Product Photos

### External Photos



### Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948



**Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone : +886-2-7737-3000  
Facsimile (FAX) : +886-3-583-7948