

TEST REPORT

Project No.: TM-2404000130P

Applicant: Traco Electronic AG

Address: Sihlbruggstrasse 111, CH-6340 Baar, Switzerland

Manufacturer: Traco Electronic AG

Address: Sihlbruggstrasse 111, CH-6340 Baar, Switzerland

Equipment Under Test (EUT):

Name: DC/DC Converter



Brand Name:

Model No.: TEC 3-24yUI# where «y» can be 10, 11, 12, 13, 21, 22 or 23 where «#» can be any alphanumeric character, - or blank

Added Model(s): N/A

Standards:

EN 55032: 2015 + A11: 2020 + A1: 2020, Class B	BS EN 55032: 2015 + A11: 2020 + A1: 2020
CISPR 32: 2015 + A1: 2019	
EN IEC 61000-3-2: 2019 + A1: 2021	BS EN IEC 61000-3-2: 2019 + A1: 2021
EN 61000-3-3: 2013 + A1: 2019 + A2: 2021	BS EN 61000-3-3: 2013 + A1: 2019 + A2: 2021
EN 55035: 2017 + A11: 2020	BS EN 55035: 2017 + A11: 2020
IEC 61000-4-2: 2008	IEC 61000-4-6: 2013 + COR1: 2015
IEC 61000-4-3: 2020 (Ed. 4.0)	IEC 61000-4-8: 2009
IEC 61000-4-4: 2012	IEC 61000-4-11: 2020 + COR1: 2020 + COR2: 2022 (Ed. 3.0)
IEC 61000-4-5: 2014 + A1: 2017	

Date of Sample Receipt : April 9, 2024

Date of Test : April 23, 2024 & April 25, 2024

Date of Issue : July 18, 2024

Remarks:

This test report can be used for CE and UKCA marking application which is based on equivalent requirements between UK and EU. It is appropriate using designated standards to provide presumption of conformity with GB law.

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Disclaimer

Variants information between/among model numbers / trademarks is provided by the applicant, test results of this test report are applicable to the sample EUT received of main test model name.

Approved By

Jason Lee (Section Manager)

Date

July 18, 2024



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Revision History			
Revision	Report Number	Description	Issue Date
00	TMXD2404001311DE	Original.	July 18, 2024

Note:

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1. General Description

1.1 General Description of EUT

Name of EUT	DC/DC Converter
Brand Name	TRACO POWER
Model No.(s)	TEC 3-24yUI# where «y» can be 10, 11, 12, 13, 21, 22 or 23 where «#» can be any alphanumeric character, - or blank
Added Model(s)	N/A

Variant Description

Model	Difference			Tested (Check)
	Input Voltage (V d.c.)	Output Voltage (V d.c.)	Output Current (mA)	
TEC 3-2410UI	9-75 Nom.24	3.3	700	<input checked="" type="checkbox"/>
TEC 3-2413UI		15	200	<input checked="" type="checkbox"/>
TEC 3-2421UI		+5	+300	<input checked="" type="checkbox"/>
		-5	-300	
TEC 3-24yUI#	1. For marketing purpose only. 2. where «y» can be 10, 11, 12, 13, 21, 22 or 23 where «#» can be any alphanumeric character, - or blank			<input type="checkbox"/>

1.2 Details of EUT

EUT Power Rating	Please see Variant Description
Highest internal frequency	400KHz

Accessories Cable List

Cable Type	Core	Length	Category	Shielding/Non-shielding

1.3 Description of Support Units

Peripherals Devices:

No.	PRODUCT	MANUFACTURER	MODEL NO.	SERIAL NO.
1	Load	N/A	N/A	N/A
2	Resistor	N/A	N/A	N/A
3	DC Power Supply	CHROMA	62024-80-60	N/A

Support Equipment Used in Tested Cable

No.	Cable Type	Core	Length	Shielding/Non-shielding
2	Power cable	N/A	0.07m	Non-shielding
3	Power cable	N/A	1.8m	Non-shielding

1.4 I/O Port Description

I/O Port Types	Q'TY

1.5 Decision of Test Mode

The test configuration/ modes are as the following:

Modes:

1	TEC 3-2410UI	Full Rating Load Mode
2	TEC 3-2413UI	
3	TEC 3-2421UI	

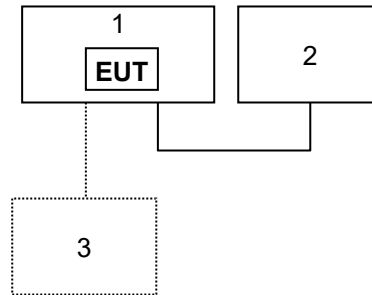
1.6 The Final Test Mode of the EUT

After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode	
Conducted Emission	Mode 3
ISN	N/A
Radiated Emission Below 1GHz	Mode 3
Radiated Emission Above 1GHz	N/A
Harmonics & Flicker	N/A
Immunity	Mode 3

Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.

1.7 Configuration of Tested System



1.8 Operation Procedure

1. To adjust resistor to test EUT.

1.9 Summary of Results

Emission		
Standard	Test Type	Result
EN 55032: 2015 + A11: 2020 + A1: 2020	Conducted Emission	PASS
BS EN 55032: 2015 + A11: 2020 + A1: 2020	ISN	N/A
CISPR 32: 2015 + A1: 2019	Radiated Emission	PASS
EN IEC 61000-3-2: 2019 + A1: 2021	Harmonic current emissions	N/A
BS EN IEC 61000-3-2: 2019 + A1: 2021		
EN 61000-3-3: 2013 + A1: 2019 + A2: 2021	Voltage changes, voltage fluctuations & flicker	N/A
BS EN 61000-3-3: 2013 + A1: 2019 + A2: 2021		

Immunity			
Standard	Test Type	Result	Performance Criteria
IEC 61000-4-2: 2008	ESD	PASS	B
IEC 61000-4-3: 2020 (Ed. 4.0)	RS	PASS	A
IEC 61000-4-4: 2012	EFT	PASS	B
IEC 61000-4-5: 2014 + A1: 2017	Surge	PASS	B
IEC 61000-4-6: 2013 + COR1: 2015	CS	PASS	A
IEC 61000-4-8: 2009	PFMF	PASS	A
IEC 61000-4-11: 2020 + COR1: 2020 + COR2: 2022 (Ed. 3.0)	DIP	N/A	C/C/B

1.10 Reporting Statements of Conformity

The conformity statement in this report is based solely on the test results, measurement uncertainty is excluded.

1.11 Deviation

No deviation from the mentioned test methods and applicable standards.

2.EMISSION

2.1 Limit

Maximum permissible level of Line Conducted Emission

FREQUENCY (MHz)	Class A(dBuV)		Class B(dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note: The lower limit shall apply at the transition frequency.

Maximum permissible level of Common Mode Conducted Emission (Asymmetric Mode)

Class A

FREQUENCY (MHz)	Voltage Limit(dBuV)		Current Limit(dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	97 - 87	84 - 74	53 - 43	40 - 30
0.5 - 30.0	87	74	43	30

Class B

FREQUENCY (MHz)	Voltage Limit(dBuV)		Current Limit(dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 - 74	74 - 64	40 - 30	30 - 20
0.5 - 30.0	74	64	30	20

Note: The lower limit shall apply at the transition frequency.

Maximum permissible level of Radiated Emission measured at 10 meter

FREQUENCY (MHz)	Class A(dBuV/m)	Class B(dBuV/m)
	Quasi - peak	Quasi - peak
30 - 230	40	30
230 - 1000	47	37

Note: The lower limit shall apply at the transition frequency.

Maximum permissible level of Radiated Emission measured at 3 meter

Frequency range (MHz)	Class A(dBuV/m)	Class B(dBuV/m)
	Quasi - peak	Quasi - peak
30 - 230	50	40
230 - 1000	57	47

Note: The lower limit shall apply at the transition frequency.

Limits above 1 GHz

Limits for radiated disturbance of Class A ITE at a measurement distance of 3m

Frequency range (GHz)	Average Limit dB(μV/m)	Peak Limit dB(μV/m)
1 - 3	60	80
3 - 6	60	80

Note: The lower limit applies at the transition frequency.

Limits for radiated disturbance of Class B ITE at a measurement distance of 3m

Frequency range (GHz)	Average Limit dB(μV/m)	Peak Limit dB(μV/m)
1 - 3	54	74
3 - 6	54	74

Note: The lower limit applies at the transition frequency.

Requirements for radiated emissions from FM receivers

Frequency range (MHz)	Measurement				Class B Limit dB(μV/m)
	Facility	Distance (m)	Detector type / Bandwidth	Fundamental	Harmonics
30 - 230	OATS/SAC	10	Quasi Peak / 120 kHz	50	42
230 - 300					42
300 - 1000					46
30 - 230	OATS/SAC	3	Quasi Peak / 120 kHz	60	52
230 - 300					52
300 - 1000					56

These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits

Note: SAC: Semi Anechoic Chamber

OATS: Open Area Test Site

2.2 Conducted Emission

2.2.1 Test Instruments

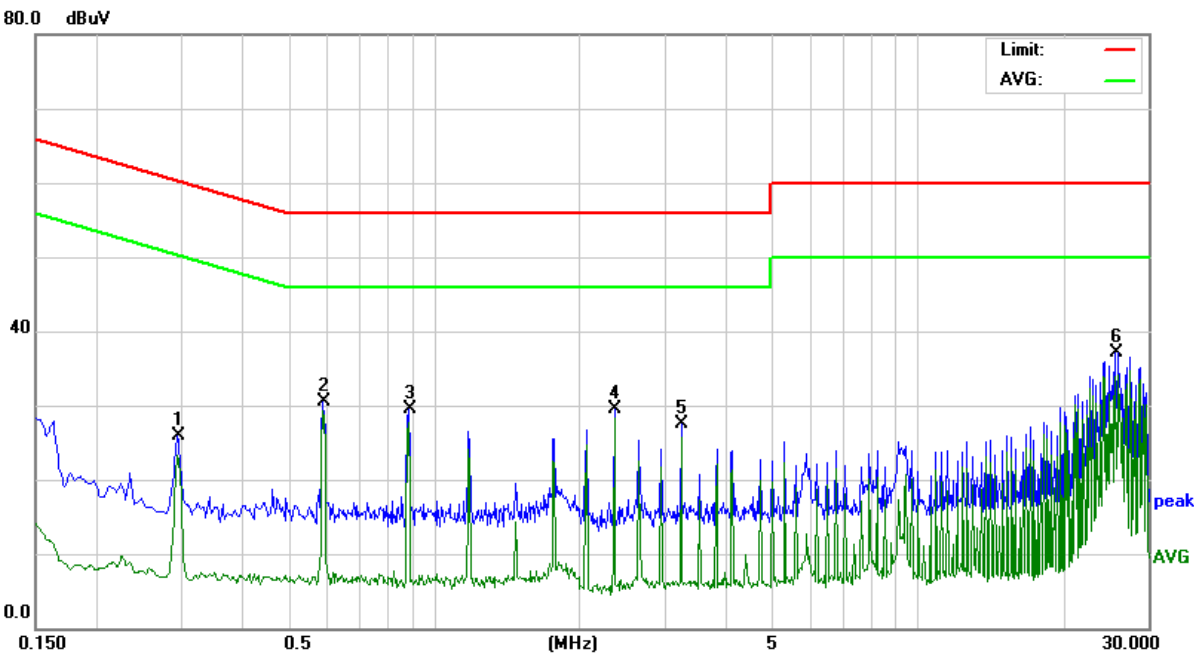
Conducted Emission Room # A					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Pulse Limiter	Schwarzbeck	VTSD 9561-F	BNC#211	03/18/2024	03/17/2025
BNC CABLE	EMEC	EMG178	BNC#A9	03/18/2024	03/17/2025
EMI Test Receiver	R&S	ESCI	101201	08/15/2023	08/14/2024
LISN	Schwarzbeck	NNLK 8129	8129-286	07/18/2023	07/17/2024
LISN(EUT)	Schwarzbeck	NSLK 8127	8127526	07/18/2023	07/17/2024
Thermo-Hygro Meter	Wisewind	201A	SD-R038	06/20/2023	06/19/2024
Test S/W	EZ-EMC Ver.CCS-03A1				
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					
Measurement Uncertainty of Conducted Emission					
Expanded uncertainty U _{lab} (k=2) of Conducted Emission is 2.8 dB.					
Expanded uncertainty U _{lab} (k=2) of ISN Conducted Emission is N/A dB					
Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Conducted Emission measurement is 3.8 dB.					
Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of ISN Conducted Emission measurement is 5.0 dB.					

2.2.2 Measurement Level Calculation

Factor = LISN insertion loss + Cable loss + Pulse Limiter insertion loss
 Measurement Level = Reading Level + Factor
 Over (Margin) = Measurement Level – Limit

2.2.3 Measurement Data (CE)

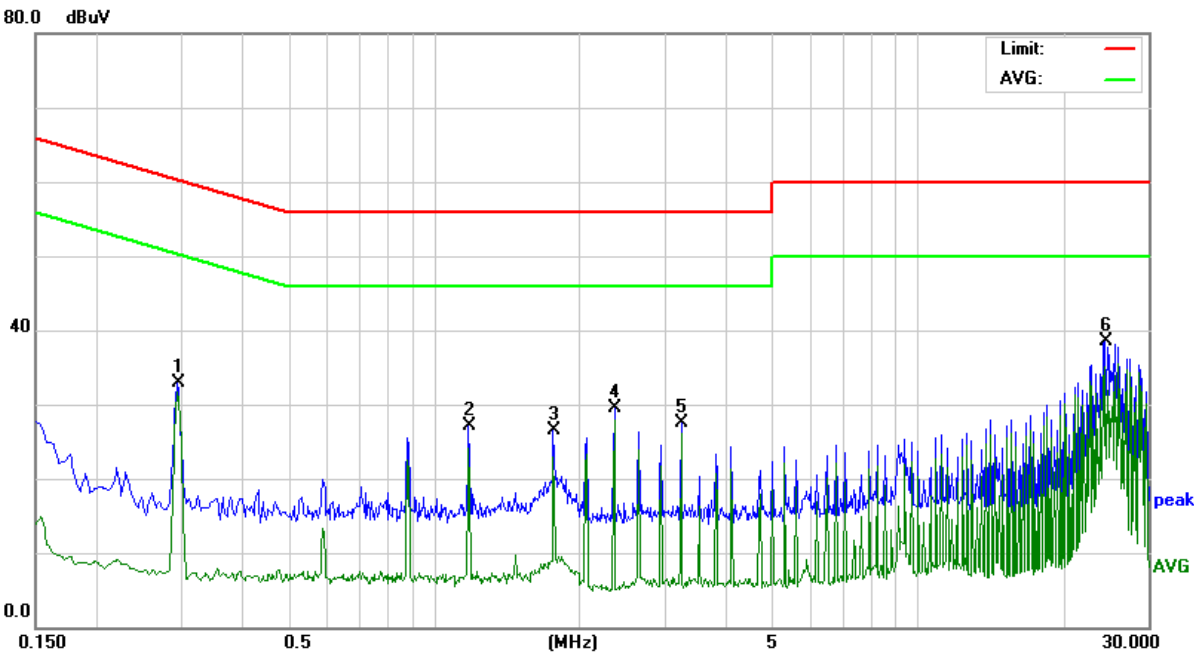
Model No.	TEC 3-2421UI	6dB Bandwidth	9 kHz
Environmental Conditions	24.5°C, 61% RH	Test Mode	Mode 3
Tested by	Richard Liang	Phase	L1
Standard	EN 55032 CLASS B	Test Date	2024/04/23



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.2940	15.84	10.09	25.93	60.41	-34.48	P	L1
0.5910	20.35	10.13	30.48	56.00	-25.52	P	L1
0.8880	19.34	10.19	29.53	56.00	-26.47	P	L1
2.3640	19.28	10.31	29.59	56.00	-26.41	P	L1
3.2505	17.10	10.36	27.46	56.00	-28.54	P	L1
25.6875	25.78	11.27	37.05	60.00	-22.95	P	L1

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

Model No.	TEC 3-2421UI	6dB Bandwidth	9 kHz
Environmental Conditions	24.5°C, 61% RH	Test Mode	Mode 3
Tested by	Richard Liang	Phase	L2
Standard	EN 55032 CLASS B	Test Date	2024/04/23



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.2940	22.90	10.08	32.98	60.41	-27.43	P	L2
1.1805	16.86	10.19	27.05	56.00	-28.95	P	L2
1.7700	16.27	10.26	26.53	56.00	-29.47	P	L2
2.3594	19.14	10.29	29.43	56.00	-26.57	P	L2
3.2460	17.13	10.33	27.46	56.00	-28.54	P	L2
24.4860	27.50	11.00	38.50	60.00	-21.50	P	L2

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

2.2.4 Measurement Data (ISN)

Model No.	N/A	6dB Bandwidth	N/A
Environmental Conditions	N/A	Test Mode	N/A
Tested by	N/A		

Note: No applicable, the EUT doesn't have LAN Port or Modem port.

2.3 Radiated Emission

2.3.1 Test Instruments

Below 1GHz

Open Area Test Site # I					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI	101387	11/09/2023	11/08/2024
Bilog Antenna	Teseq	CBL 6112D	63758	12/15/2023	12/14/2024
Pre-Amplifier	EMCI	EMC330	980022	03/18/2024	03/17/2025
Cable	EMEC	CFD400E-LW	SD-R083	04/12/2024	04/11/2025
Thermo-Hygro Meter	NDR.AV	GM-108A	SD-R091	06/20/2023	06/19/2024
Test S/W	EZ-EMC Ver.CCS-03A1				
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					
Measurement Uncertainty of Radiated Emission					
Expanded uncertainty Ulab (k=2) of Radiated Emission is 5.1 dB.(30MHz-1000MHz)					
Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Radiated Emission measurement is 5.2 dB.(30MHz-1000MHz)					

Above 1GHz

Chamber #					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Test S/W					
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					
Measurement Uncertainty of Radiated Emission					
Expanded uncertainty (k=2) of Radiated Emission measurement is N/A dB.(1-6GHz)					
Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Radiated Emission measurement is 5.5 dB.(1-18GHz)					

2.3.2 Measurement Level Calculation

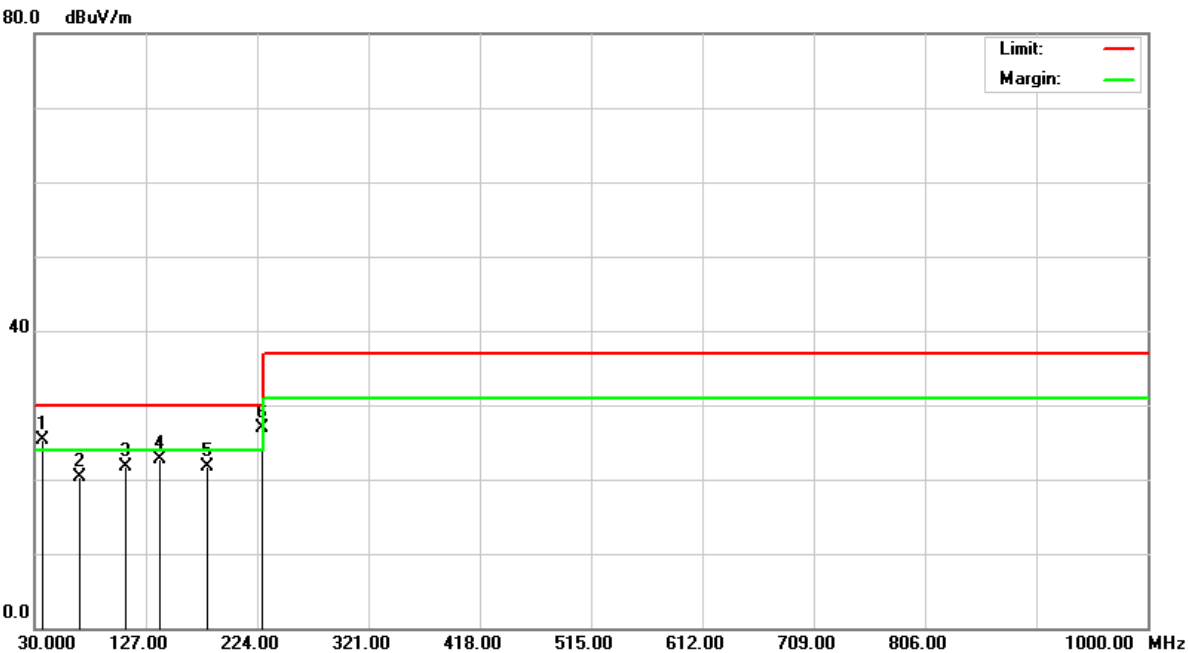
Correction Factor = Antenna Factor + Cable loss- Amplifier Gain

Measurement Level = Reading Level + Correction Factor

Over (Margin) = Measurement Level – Limit

2.3.3 Measurement Data
Below 1GHz

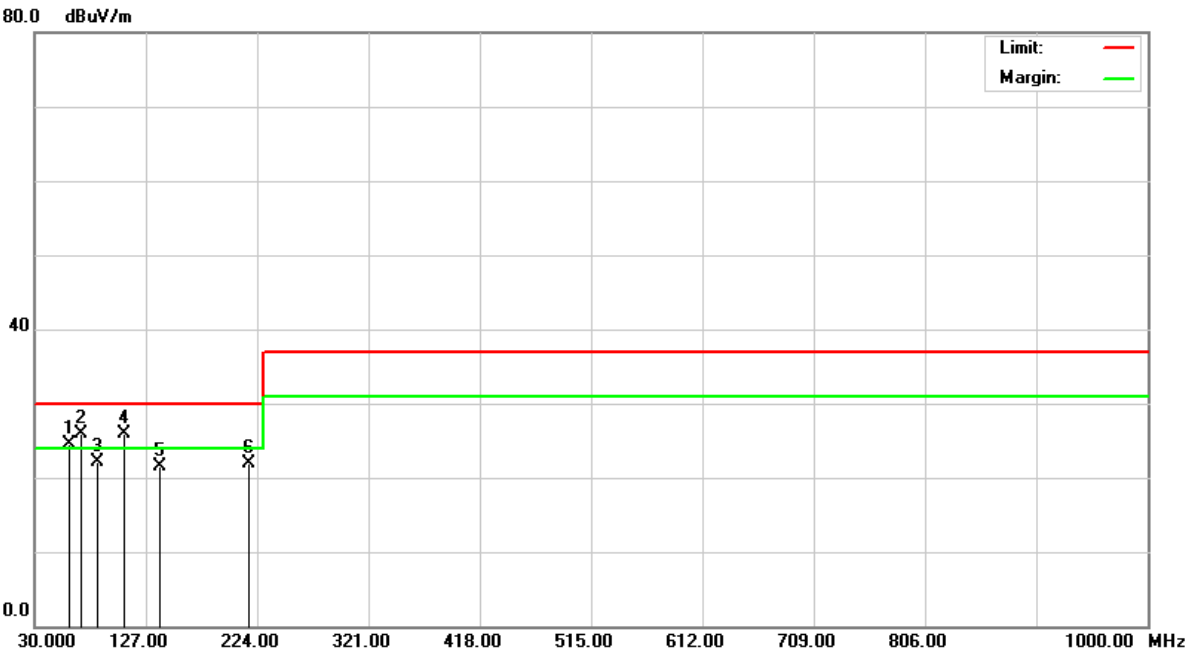
Model No.	TEC 3-2421UI	Test Mode	Mode 3
Environmental Conditions	25.6°C, 62% RH	6dB Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Richard Liang
Standard	EN 55032 CLASS B	Test Date	2024/04/23



Radiated Emission Readings									
Frequency Range Investigated					30 MHz to 1000 MHz at 10m				
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
37.0800	35.20	-9.81	25.39	30.00	-4.61	100	215	Q	V
68.9900	38.50	-18.10	20.40	30.00	-9.60	100	174	Q	V
109.5700	34.30	-12.58	21.72	30.00	-8.28	100	88	Q	V
138.8300	35.30	-12.57	22.73	30.00	-7.27	100	207	Q	V
180.4400	36.50	-14.85	21.65	30.00	-8.35	100	276	Q	V
228.4300	40.30	-13.37	26.93	30.00	-3.07	100	109	Q	V

Note: 1. P= Peak Reading; Q= Quasi-peak Reading.

Model No.	TEC 3-2421UI	Test Mode	Mode 3
Environmental Conditions	25.6°C, 62% RH	6dB Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Richard Liang
Standard	EN 55032 CLASS B	Test Date	2024/04/23



Radiated Emission Readings									
Frequency Range Investigated					30 MHz to 1000 MHz at 10m				
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
60.8300	42.80	-18.26	24.54	30.00	-5.46	400	355	Q	H
70.1900	44.00	-18.15	25.85	30.00	-4.15	400	271	Q	H
84.6000	38.50	-16.39	22.11	30.00	-7.89	400	38	Q	H
108.6000	38.70	-12.77	25.93	30.00	-4.07	400	148	Q	H
139.4400	34.10	-12.59	21.51	30.00	-8.49	400	176	Q	H
216.7300	36.10	-14.26	21.84	30.00	-8.16	400	311	Q	H

Note: 1. P= Peak Reading; Q= Quasi-peak Reading.

Above 1GHz

Model No.	TEC 3-2421UI	Test Mode	N/A
Environmental Conditions	N/A	6dB Bandwidth	N/A
Antenna Pole	N/A	Antenna Distance	N/A
Highest frequency generated or used	400KHz	Upper frequency	See note
Detector Function	N/A	Tested by	N/A

Note: No applicable, when the highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1 GHz.

3. Harmonics

3.1 Test Instruments

Immunity A					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
	Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan				

3.2 Measurement Data

Remark: N/A: The subject equipment is not intended to be connected to AC mains supply. Therefore, this test is not applicable.

4.Flicker

4.1 Test Instruments

Immunity A					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

4.2 Measurement Data

Remark: N/A: The subject equipment is not intended to be connected to AC mains supply. Therefore, this test is not applicable.

5. IMMUNITY

5.1 STANDARD PERFORMANCE CRITERIA DESCRIPTION

- Criterion A - The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
- Criterion B - The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
- Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

5.2 SPECIAL PERFORMANCE CRITERIA DESCRIPTION

5.2.1 Performance Criteria Description for Print function

- Criterion A - Apply criterion A as defined in 8.2. Additionally, the following shall not occur as a consequence of the application of the disturbance:
- change of operating state;
 - unintended pausing of the print operation;
 - a change of print quality or legibility, as appropriate to the test pattern;
 - change of character font;
 - unintended line feed;
 - unintended page feed;
 - paper feed failure.
- Criterion B - Apply criterion B as defined in 8.3 with the following specifics and additional limitations. Paper feed failures are allowed only if, after removal of the jammed sheets, the job is automatically recovered and there is no loss of printed information. Any low-quality print output caused by the application of the disturbance shall not continue beyond the sheet of media being printed, or beyond the typical length of a finished page or sheet printed from continuous roll media. False indicators are permitted during the test provided that a normal operator response to that false indicator is simple (such as pressing a button). False indicators are not acceptable if they would cause the user to discard printing supplies such as ink, toner or paper, when those supplies are actually not empty or faulty. Any false indicator shall either clear automatically or after the operator's response. After the disturbance, the print function may print the remainder of the print job at a quality level within the manufacturer's specifications. Alternately, the print function may halt processing of a print job as a result of the disturbance, but only if the operator is capable of reprinting the job (for example, a fax printing job where the image to be printed still resides in local memory). Automatically restarting the print job from the beginning is also acceptable. In any scenario, the pairing of front and back images during double-sided printing shall be correct.
- Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

5.2.2 Performance Criteria Description for Scan function

- Criterion A - Apply criterion A as defined in 8.2. Additionally, the following shall not occur as a consequence of the application of the test:
- change of settings, such as which side(s) of the page to be scanned, colour or monochrome, and resolution;
 - corruption of the image, for example stretching, compressing or change in colour;
 - paper feed failures;
 - errors in the reading of bar codes.
- Criterion B - Apply criterion B as defined in 8.3 with the following specifics and additional limitations.
- Document feed failures are allowed only if the original documents are undamaged and, after removal of the jammed sheets, the job is automatically recovered and there is no loss of scanned information.
 - During the test, the representation of the image shall not be degraded such that reading mistakes occur.
- Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

5.2.3 Performance Criteria Description for Display and display output function

- Criterion A - Apply criterion A as defined in 8.2. Additionally, an increase in any degradation greater than just perceptible by observation of the image shall not occur as a consequence of the application of the test. Examples of such degradations are:
- superimposed patterning;
 - positional disturbances due to synchronisation errors;
 - geometric distortion;
 - change of contrast or brightness;
 - picture artefacts;
 - freezing or disturbance of motion;
 - image loss;
 - video data or decoding errors.
- Criterion B - The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
- Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

5.2.4 Performance Criteria Description for Musical tone generating function

- Criterion A - Performance criterion A is subdivided according to the type of equipment and its use. Three subgroups corresponding to different equipment types are defined in Table E.1 and have corresponding performance criteria A1, A2 and A3. The relevant subgroup shall be selected by the manufacturer in accordance with the product specification. The description of criteria A1, A2 and A3 are presented in Table E.2.
- Criterion B - During the test, degradation of performance beyond that defined in criterion A1 of Table E.2 is allowed. However, sudden amplification of tone to a level that exceeds the expected level by more than 6 dB is not allowed. After the test, normal operation of the EUT shall be self-recovered. In the case of unintended tone holding caused by a MIDI protocol communication error, the EUT can be re-initialised by the operation of the controls by the user controls in accordance with the manufacturer's instructions. Due to the nature of the MIDI protocol, it is necessary to modify the performance criterion B to allow user intervention when the unintended tone holding is caused by a missing MIDI communication error (for example missing a 'NOTE OFF' message).
- Criterion C - Degradation of the performance beyond that defined in criterion A1 of Table E.2 is permitted provided that the normal operation of the EUT can be restored after the test by operator intervention. However, sudden amplification of tone to a level that exceeds the expected level by more than 6 dB is not allowed.

5.2.5 Performance Criteria Description for Networking function

Criterion A - Where relevant, during the application of the test the network function shall, as a minimum, operate ensuring that:

- established connections shall be maintained throughout the application of the test;
- no change of operational state or corruption of stored data occurs;
- no increase in error rate above the figure defined by the manufacturer occurs. The manufacturer should select the most appropriate performance measurement criteria for the product or system, for example bit error rate, block error rate;
- no request for retry above the figure defined by the manufacturer;.
- the data transmission rate does not reduce below the figure defined by the manufacturer;
- no protocol failure occurs;
- the audio noise level at a two-wire analogue interface (supporting telephony) shall satisfy the requirements of Table G.3. The audio level measurements shall be performed at the demodulated frequency of the disturbance using a narrowband filter with a 3 dB bandwidth of 100 Hz using the method defined in table clause G.1.4. See G.6.1. As described in the example given in J.3.5 the networking function is monitored during testing using direct functions specified elsewhere in this document. If needed to verify the operation of the protocol, the following functions shall be verified as described in Table H.1 when performing the additional spot frequency tests contained in Clause 5:
 - ability to establish a connection,
 - ability to clear a connection.

Where an EUT has supervisory functions they shall not be affected. Elements that should be monitored include, but are not limited to:

- alarms,
- signalling lamps,
- printer output errors,
- network traffic rates,
- network monitor errors,
- measured network parameters.

Criterion B - Established connections shall be maintained throughout the test, or shall self-recover in a way and timescale that is imperceptible to the user.

The error rate, request for retry and data transmission rates may be degraded during the application of the test. Degradation of the performance as described in criterion A is permitted, provided that the normal operation of the EUT is self-recoverable to the condition established prior to the application of the test. Where required, as defined in Clause 5, the acceptable operation of the function shall be verified at the completion of the test as described in Table H.1, by confirming the following:

- the EUT's ability to establish a connection,
- the EUT's ability to clear a connection.

During surge testing disconnection is allowed on the analogue/digital data port being tested. If the EUT is a supervisory equipment, it shall not impact the normal operation of the network being monitored. In addition, any supervisory functions impacted during the period of the test shall return to the state prior to the test. Elements to consider include:

- alarms,
- signalling lamps,
- printer output,
- network traffic rates,
- network monitoring. is used as intended.

Criterion C - Degradation of performance as described in criteria A and B is permitted provided that the normal operation of the EUT is self-recoverable to the condition immediately before the application of the test, or can be restored after the test by the operator.

5.2.6 Performance Criteria Description for Audio output function

- Criterion A - The interference ratio (electrical or acoustic) shall meet the limits in column 3; or,
the acoustic level of the demodulated audio shall be less than the limits in column 4; or,
the digitally coded level of demodulated audio shall be less than limits in column 5; or,
the analogue level of the demodulated audio shall be less than the limits in column 6.
- Criterion B - The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
- Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

5.2.7 Performance Criteria Description for Telephony function

Function to be exercised	Performance criteria		
	A	B	C
Establish new communication	At the additional spot frequency tests a, c	Performed before and after the application of the test or disturbance	Performed before and after the application of the test or disturbance
Maintain established communication	Yes In addition, the requirements of Annex G for the audio output function shall be satisfied c	Yes b	No
Terminate established communication	At the additional spot frequency tests a, c	Performed before and after the application of the test or disturbance	Performed before and after the application of the test or disturbance

Communication refers to a telephone call or other form of voice connection.

a Applicable to TTE with a dial function that provides dedicated emergency service/safety of life call capability. Where the EUT does not provide this functionality, this limitation shall be stated in the equipment user manual.

b Communication shall be established prior to the application of the disturbance, the communication shall be maintained and the quality of that communication (for example, volume setting, the level of background noise) shall be maintained after completion of the test or disturbance.

c Where defined in Clause 5 (for the tests in Table 1 to Table 4), these functional tests shall be performed during the additional spot frequency tests.

5.3 Test of IEC 61000-4-2

5.3.1 Test Instruments

Immunity Shielded Room					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Aneroid Barometer	SATO	7610-20	89090	07/24/2023	07/23/2024
ESD Simulator	Teseq	NSG 438	1581	07/09/2023	07/08/2024
Thermo-Hygro Meter	Wisewind	201A	SD-S041	12/12/2023	12/11/2024
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

5.3.2 EUT Operating Condition

Environment:

Temperature	Humidity	Air Pressure
21.3 °C	49 %RH	1008 hpa

5.3.3 Results of Electrostatic Discharge Test (ESD)

Model No.	: TEC 3-2421UI
Tested By	: Richard Liang
Tested Date	: April 25, 2024
Test Mode	: Mode 3
Basic Standard	: IEC 61000-4-2
Discharge Impedance	: 330 ohm / 150 pF
Discharge Voltage	: Air Discharge: $\pm 2, 4, 8$ kV Contact Discharge: $\pm 2, 4$ kV HCP/VCP: $\pm 2, 4$ kV
Polarity	: Positive/Negative
Number of Discharge	: 10 times at each test point
Discharge Mode	: Single Discharge
Discharge Period	: 1 second

A.Observations:

Test points: 1. Front side. 2. Back side. 3. Left side. 4. Right side.
5. Top side. 6. Bottom side

Direct Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
2, 4, 8 (Air.)	+/-	1~5	N/A	A
2, 4 (Cont.)	+/-	1~6	N/A	N/A

Remark: A: No discharge point.
N/A: Not Applicable.

B. Observations:

Test points: 1. Front side. 2. Back side. 3. Left side. 4. Right side.

Indirect Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
2, 4	+/-	1~4	A	A

Remark: A: No degradation of performance or loss of function.

5.4 Test of IEC 61000-4-3

5.4.1 Test Instruments

844 RS Chamber					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Electric Field Probe	AR	FL7006	0356656	03/06/2024	03/07/2025
Field of Calibration	CCS	Chamber#RS	80-1000MHz	02/16/2024	02/15/2025
RF Power Meter	Boonton	4242	17419	01/29/2024	01/28/2025
Power Sensor	Boonton	51011A-EMC	36833	01/29/2024	01/28/2025
Power Sensor	Boonton	51011A-EMC	36834	01/29/2024	01/28/2025
Thermo-Hygro Meter	Wisewind	N/A	SD-S019	09/21/2023	09/20/2024
Broadband Antenna	AR	AT1080	311819	N.C.R	N.C.R
Power Amplifier	Teseq	CBA1G-600D	1098099	N.C.R	N.C.R
Analog Signal Generator	Agilent	E8257D	MY48051214	06/05/2023	06/04/2024
Field of Calibration	CCS	Chamber#RS	1000-6000MHz	02/15/2024	02/14/2025
Microwave Antenna	Schwarzbeck	STLP 9149	767	N.C.R	N.C.R
Power Amplifier	Teseq	CBA6G-100D	1087370	N.C.R	N.C.R
Test Software	EmcwareVer. 2.6.0.16				
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

5.4.2 EUT Operating Condition

Environment:

Temperature	Humidity	Air Pressure
22.4 °C	49 %RH	1008 hpa

5.4.3 Results of Radiated Radio Frequency Electromagnetic (RS)

Model No. : TEC 3-2421UI
 Tested By : Richard Liang
 Tested Date : April 25, 2024
 Test Mode : Mode 3
 Basic Standard : IEC 61000-4-3
 Frequency range : 80 MHz - 1000 MHz
 Frequency range : 1800 MHz, 2600 MHz, 3500 MHz, 5000 MHz ($\pm 1\%$)
 Field strength : 3 V/m
 Modulation : 80% AM (1kHz)
 Frequency step : 1 % of the preceding frequency
 Polarity of Antenna : Horizontal and Vertical
 Dwell Time : 3 seconds
 Test distance : 3 m

No.	Frequency (MHz)	Antenna Orientation	Observation	EUT Orientation
1	80 - 1000	Vertical/Horizontal	A	0 degree
2	80 - 1000	Vertical/Horizontal	A	90 degree
3	80 - 1000	Vertical/Horizontal	A	180 degree
4	80 - 1000	Vertical/Horizontal	A	270 degree

Remark: A: No degradation of performance or loss of function.

No.	Frequency (MHz)	Antenna Orientation	Observation	EUT Orientation
1	1800, 2600, 3500, 5000 ($\pm 1\%$)	Vertical/Horizontal	A	0 degree
2	1800, 2600, 3500, 5000 ($\pm 1\%$)	Vertical/Horizontal	A	90 degree
3	1800, 2600, 3500, 5000 ($\pm 1\%$)	Vertical/Horizontal	A	180 degree
4	1800, 2600, 3500, 5000 ($\pm 1\%$)	Vertical/Horizontal	A	270 degree

Remark: A: No degradation of performance or loss of function.

5.5 Test of IEC 61000-4-4

5.5.1 Test Instruments

Immunity Shield Room					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Capacitive Clamp	EMC-Partner	CN-EFT1000	589	02/20/2024	02/19/2025
EMC Test System	Teseq	NSG 3060	1718	11/23/2023	11/22/2024
Software	WIN 3000Ver. 1.3.2				
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

5.5.2 EUT Operating Condition

Environment:

Temperature	Humidity	Air Pressure
21.3 °C	49 %RH	1008 hpa

5.5.3 Results of Electrical Fast Transient (EFT)

Model No. : TEC 3-2421UI
 Tested By : Richard Liang
 Tested Date : April 25, 2024
 Test Mode : Mode 3
 Basic Standard : IEC 61000-4-4
 Test Voltage : DC Input: ± 2 kV
 Signal/Comm. : N/A
 Polarity : Positive/Negative
 Impulse Frequency : 5 kHz
 Tr/Th : 5/50ns
 Burst : 15ms/300ms

Observation:

Test Point	Polarity	Test Level (kV)	Results
L	+/-	2	A
N	+/-	2	A
L-N	+/-	2	A

Remark: A: No degradation of performance or loss of function

5.6 Test of IEC 61000-4-5

5.6.1 Test Instruments

Immunity Shield Room					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
CDN	EMC-Partner	CDN-UTP8	1505	11/23/2023	11/22/2024
EMC Test System	Teseq	NSG 3060	1718	11/23/2023	11/22/2024
Software	WIN 3000Ver. 1.3.2				
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

5.6.2 EUT Operating Condition

Environment:

Temperature	Humidity	Air Pressure
21.3 °C	49 %RH	1008 hpa

5.6.3 Results of Surge Test

Model No. : TEC 3-2421UI
 Tested By : Richard Liang
 Tested Date : April 25, 2024
 Test Mode : Mode 3
 Basic Standard : IEC 61000-4-5
 Test Rate : 1 pulse every minute
 No. of Tests : 5 positive and 5 negative pulses
 Waveform : 1.2/50μs (8/20μs)

Observation Description

DC input line:

Test Point	Phase Angle (degree)	Polarity (+/-)	Test Level (kV)	Observation
L – N	0	+/-	2	A

Remark: A: No degradation of performance or loss of function.

5.7 Test of IEC 61000-4-6

5.7.1 Test Instruments

CS Room					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
CDN	Teseq	CDN S751A	46649	10/13/2023	10/12/2024
CDN	Teseq	CDN M016	35821	10/13/2023	10/12/2024
CDN	FCC	FCC-801-M3-25A	9973	10/13/2023	10/12/2024
Compact Immunity Test System	TESEQ	NSG 4070B-35	39581	10/12/2023	10/11/2024
Test Software	NSG 4070 Control Program V1.2.0				
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

5.7.2 EUT Operating Condition

Environment:

Temperature	Humidity	Air Pressure
21.8 °C	51 %RH	1008 hpa

5.7.3 Results of Immunity to Conducted Disturbances (CS)

Model No. : TEC 3-2421UI
 Tested By : Richard Liang
 Tested Date : April 25, 2024
 Test Mode : Mode 3
 Basic Standard : IEC 61000-4-6
 Frequency range : 0.15 MHz -10 MHz
 Field strength : 3 Vrms
 Frequency range : 10 MHz - 30 MHz
 Field strength : 3 V to 1Vrms
 Frequency range : 30 MHz - 80 MHz
 Field strength : 1 Vrms
 Modulation : 80% AM, 1 kHz Sinewave
 Frequency step : 1 % of the preceding frequency
 Dwell Time : 3 seconds
 Coupling Method : CDN-M2

Cable Description	Frequency (MHz)	Observation
DC input	0.15 – 80	A

Remark: A: No degradation of performance or loss of function.

5.8 Test of IEC 61000-4-8

5.8.1 Test Instruments

Immunity Shield Room					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
5kVA Power Source	Teseq	5001IX-208-SCH	1207A03643	02/23/2024	02/22/2025
AC/DC Clamp Meter	Fluke	353	33360025	06/09/2023	06/08/2024
Magnetic Field Coil	Teseq	INA 703 W/ 2141	1976 / 1413	02/23/2024	02/22/2025
Magnetic Field Meter	Sypris	4080	0247	11/14/2023	11/13/2024
Test Software	Win2120Ver. 5.0				
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

5.8.2 EUT Operating Condition

Environment:

Temperature	Humidity	Air Pressure
21.8 °C	51 %RH	1008 hpa

5.8.3 Result of Immunity to Power Frequency Magnetic Field

Model No. : TEC 3-2421UI
 Tested By : Richard Liang
 Tested Date : April 25, 2024
 Test Mode : Mode 3
 Basic Standard : IEC 61000-4-8
 Power Frequency : 50 Hz
 Magnetic Field : 1 A/m(r.m.s)
 Coil Orientation : X, Y, Z Axis
 Observation : A

Remark: A: No degradation of performance or loss of function.

5.9 Test of IEC 61000-4-11

5.9.1 Test Instruments

Immunity Shielded Room					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Testing Site : No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, Taiwan					

5.9.2 EUT Operating Condition

Environment:

Temperature	Humidity	Air Pressure
N/A	N/A	N/A

5.9.3 Results of Voltage Dips Immunity Test

Model No. : N/A
 Tested By : N/A
 Tested Date : N/A
 Test Mode : N/A
 Basic Standard : IEC 61000-4-11
 EUT Rated Voltage : 230 Volts.
 Reduction Voltage : 30, >95 % Ut
 Phase Angle : 0,180 degree
 Total events : 3 dropouts
 Event interval : 10 seconds

Test Power: 230Vac, 50Hz			
Environmental phenomena	Test specification (% reduction)	Duration (in periods of the rated frequency)	Observation
Voltage Interruptions	>95	250	N/A
Voltage dips	30	25	N/A
	>95	0.5	N/A

Test Power: 230Vac, 60Hz			
Environmental phenomena	Test specification (% reduction)	Duration (in periods of the rated frequency)	Observation
Voltage Interruptions	>95	300	N/A
Voltage dips	30	30	N/A

Remark: N/A: The subject equipment is not intended to be connected to AC mains supply. Therefore, this test is not applicable.

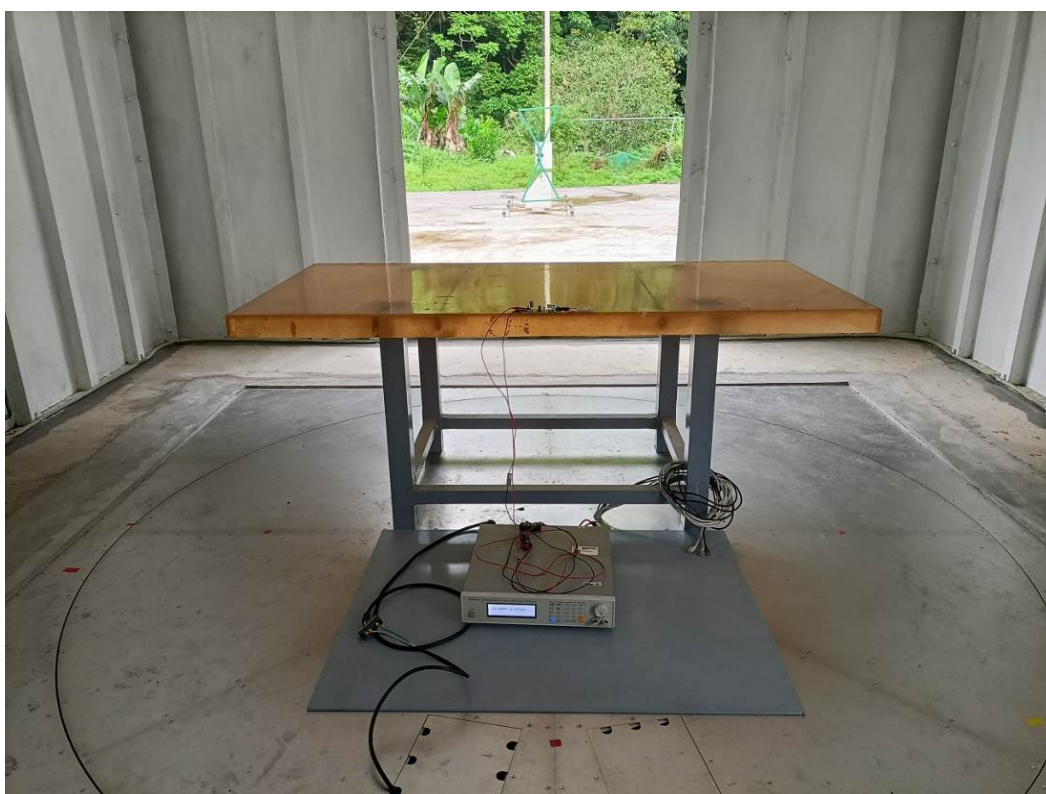
APPENDIX

Photograph of Testing General Set-up

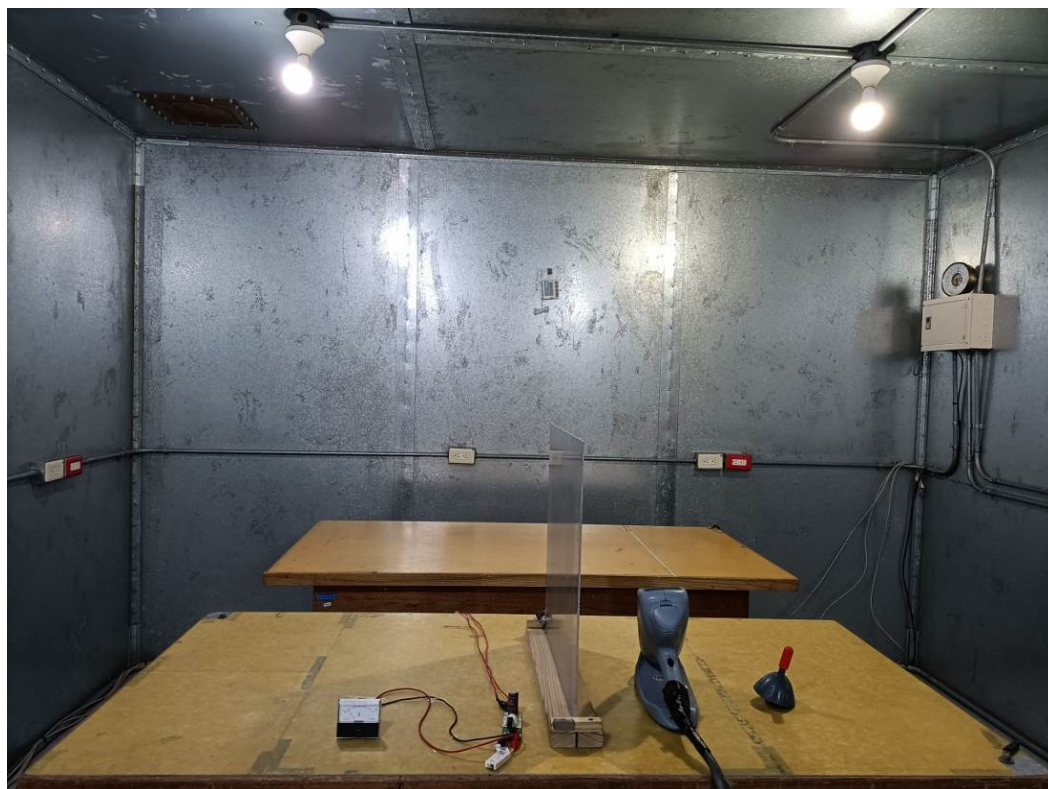
CE Testing Set-up



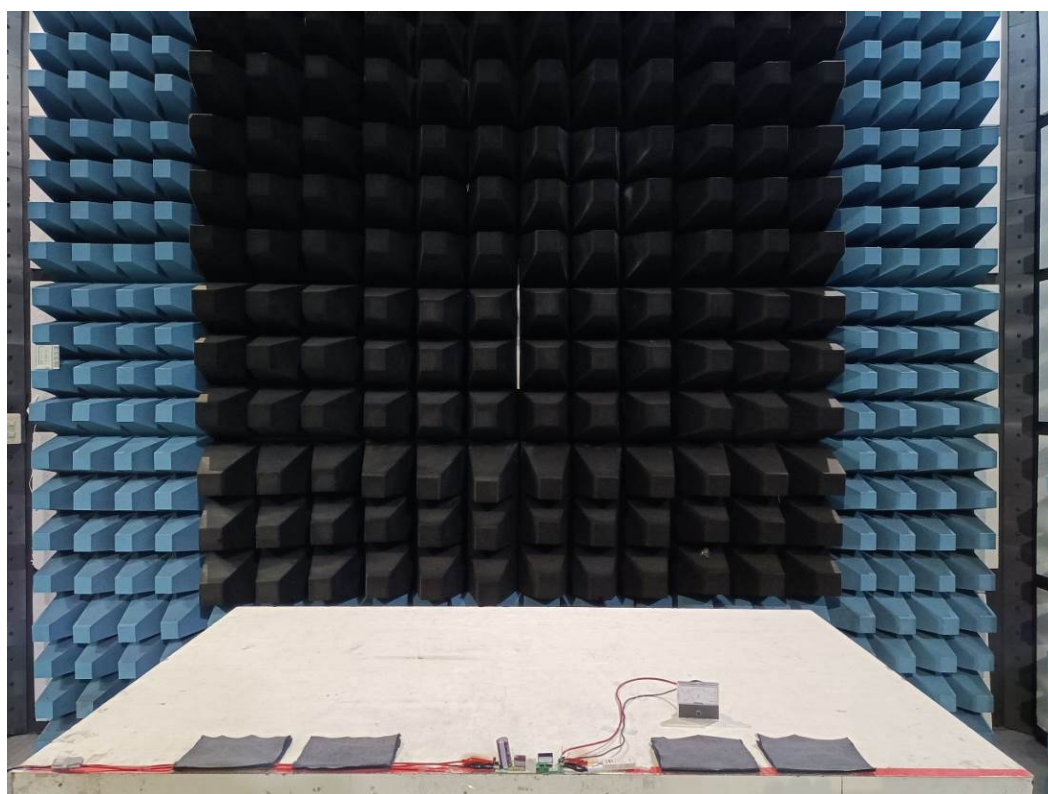
RE Testing Set-up Below 1GHz



ESD Testing Set-up



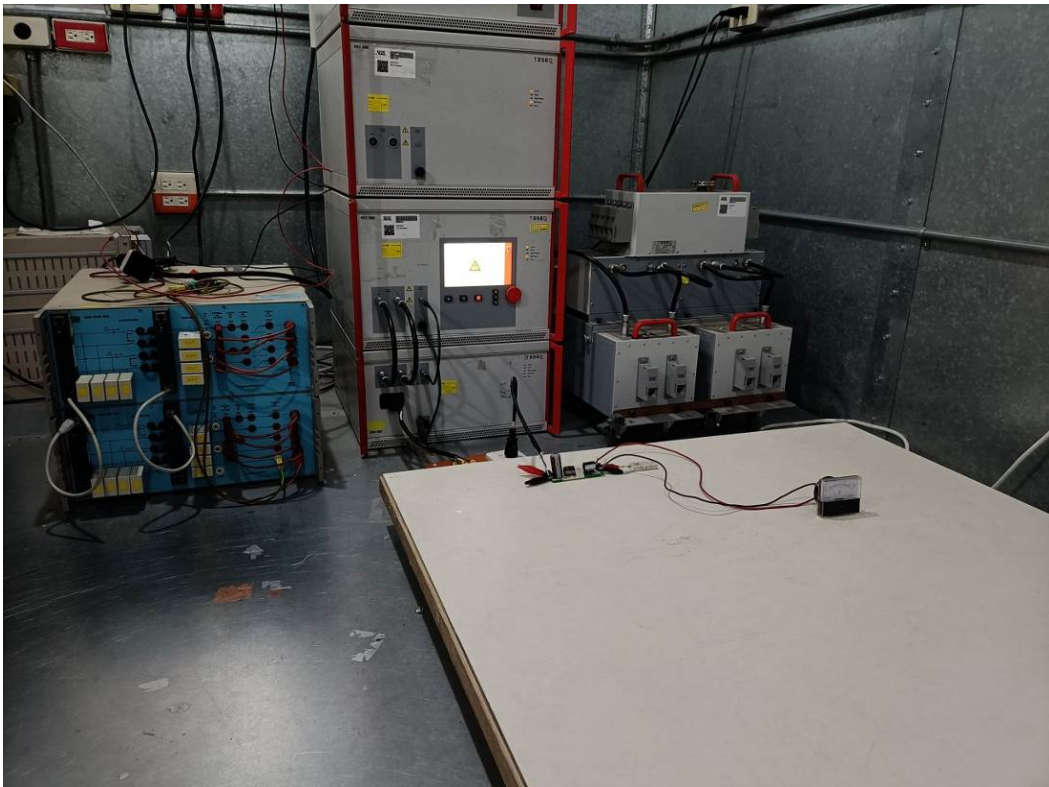
RS Testing Set-up



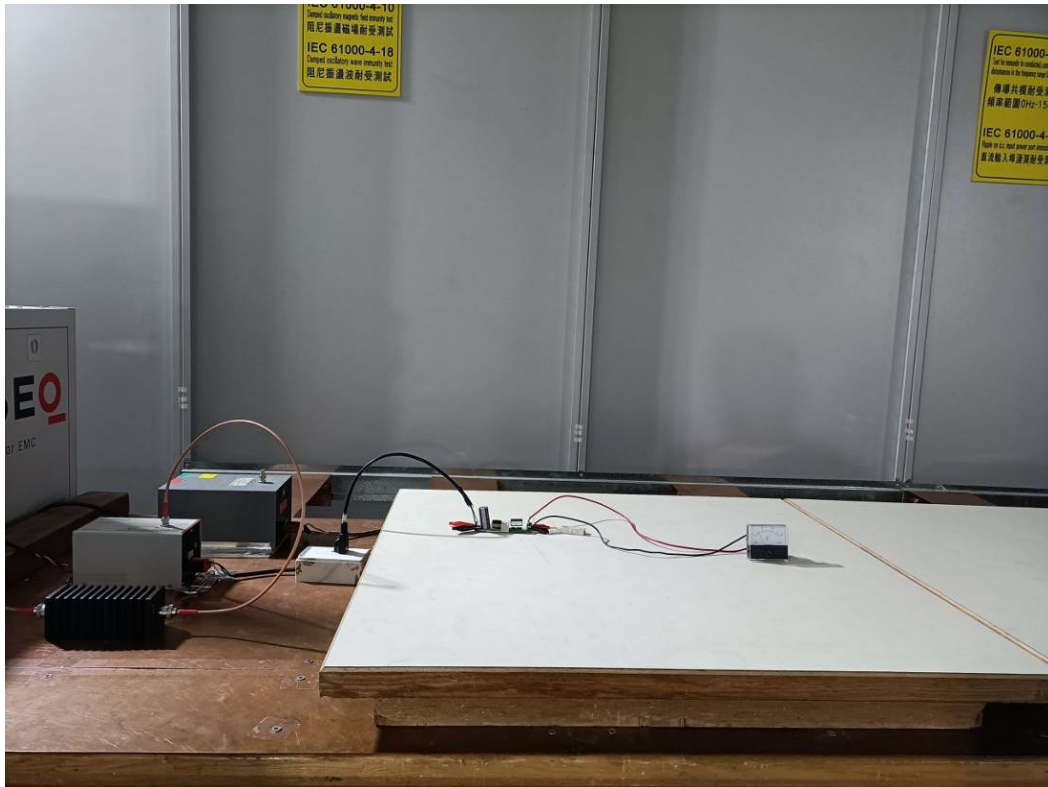
EFT Testing Set-up



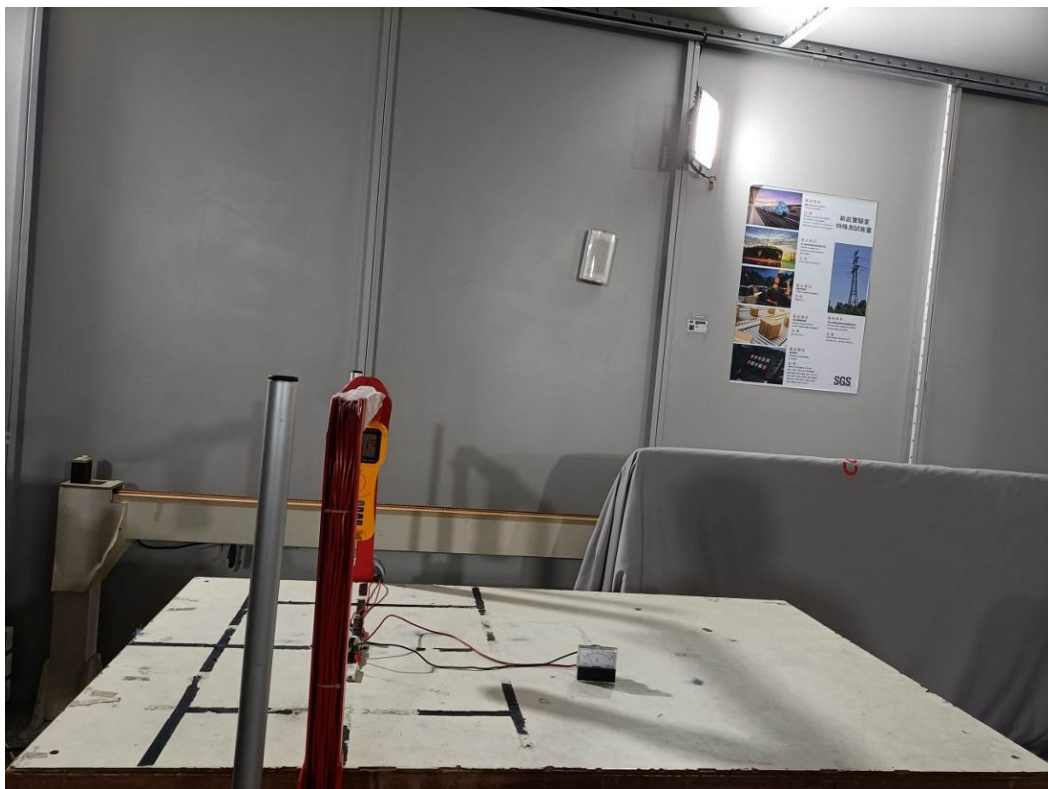
Surge Testing Set-up



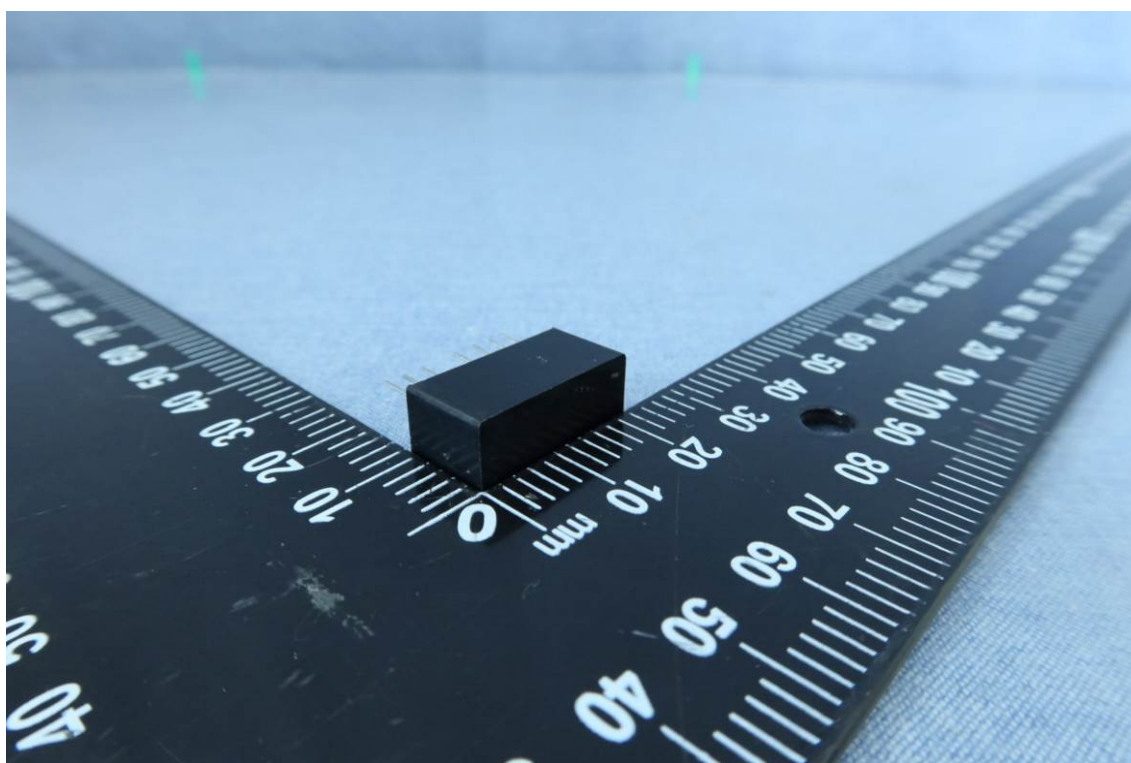
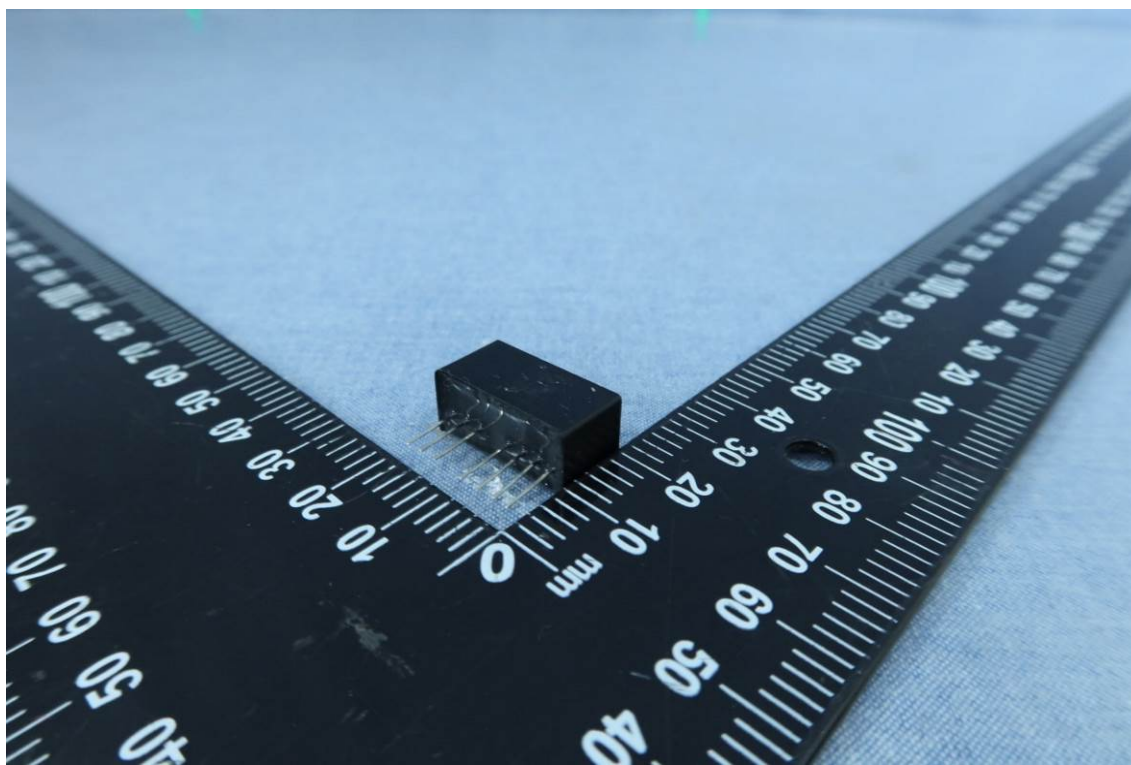
CS Testing Set-up



PFMF Testing Set-up



Photographs of EUT Unit Exterior



**** End of Report ****