Verification

Issue Date: May 10, 2019
Ref. Report No. ISL-19LE156CE50155-MA

Product Name	:	TEP- CMF Series
Model(s)	:	TEP 200-7218WIR-CMF; TEP 75-bcWIzzzzzzzz; TEP a-bcWIRzzzzzzzz; Where "a" = 100, 160 or 200; "b" = 24, 48 or 72; "c" = 10, 11, 12, 13, 15, 16, 18 "z" can be -CMF or any alphanumeric or dash or blank or slash for marketing purpose only
Applicant	:	TRACO ELECTRONIC AG
Brand	:	TRACO
Address	:	Sihlbruggstrasse 111 CH-6340 Baar Switzerland

We, **International Standards Laboratory Corp.**, hereby certify that:

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report. And Our laboratories is the accredited laboratories and are approved according to ISO/IEC 17025. The device was passed the test performed according to:

Standards:
EN 50155:2017 for EMC, Environmental and Characteristic
EN 50121-3-2:2016 for EMC
EN 60068-2-1:2007 for Environmental
EN 60068-2-2:2007 for Environmental
EN 60068-2-30:2005 for Environmental
EN 61373:2010 for Environmental

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Bert Chen

Bert Chen / Director

International Standards Laboratory Corp.
☒ **LT LAB:**
No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan
Tel: 886-3-407-1718; Fax: 886-3-4 07-1738

TEST REPORT

of

EN 50155
(EMC, Characteristic, Environmental Test)

Product : **TEP- CMF Series**

Model: **TEP 200-7218WIR-CMF;**
TEP 75-bcWIzzzzzzzz; TEP a-bcWIRzzzzzzzz;
Where "a" = 100, 160 or 200;
"b" = 24, 48 or 72;
"c" = 10, 11, 12, 13, 15, 16, 18
"z" can be -CMF or any alphanumeric or dash or blank or slash for marketing purpose only

Brand: **TRACO**

Applicant: **TRACO ELECTRONIC AG**

Address: **Sihlbruggstrasse 111 CH-6340 Baar Switzerland**

Test Performed by:

International Standards Laboratory Corp.
<LT LAB>
*Address:
No. 120, Lane 180, Hsin Ho Rd.,
Lung-Tan Dist., Tao Yuan City 325, Taiwan
*Tel: 886-3-407-1718; Fax: 886-3-407-1738

Report No.:**ISL-19LE156CE50155-MA**
Issue Date :**May 10, 2019**

This report totally contains 77 pages including this cover page and contents page.

Contents of Report

1. General

1.1 Certification of Accuracy of Test Data

Standards:	Please refer to 1.2
Equipment Tested:	TEP- CMF Series
Model:	TEP 200-7218WIR-CMF; TEP 75-bcWIzzzzzzzz; TEP a-bcWIRzzzzzzzz; Where "a" = 100, 160 or 200; "b" = 24, 48 or 72; "c" = 10, 11, 12, 13, 15, 16, 18 "z" can be -CMF or any alphanumeric or dash or blank or slash for marketing purpose only
Brand:	TRACO
Applicant:	TRACO ELECTRONIC AG
Sample received Date:	December 5, 2018
Final test Date:	EMI: refer to the date of test data EMS: April 8, 2019
Test Site:	International Standards Laboratory Corp. Chamber 02; Conduction 03; Immunity 02
Test Distance:	10M (EMI test)
Temperature:	refer to each site test data
Humidity:	refer to each site test data
Input power:	Conduction input power: DC 110 V Radiation input power: DC 110 V Immunity input power: DC 110 V
Test Result:	**PASS**
Report Engineer:	Cheryl Tung
Test Engineer:	Hasan Yu Hasan Yu
Approved By:	Angus Chu Angus Chu / Director

1.2 Test Standards

The tests which this report describes were conducted by an independent electromagnetic compatibility consultant, International Standards Laboratory Corp. in accordance with the following

☒EN 50155: 2017 for EMC, Environmental and Characteristic
☒EN 50121-3-2: 2016 for EMC
☒EN 60068-2-1: 2007 for Environmental
☒EN 60068-2-2: 2007 for Environmental
☒EN 60068-2-30: 2005 for Environmental
☒EN 61373: 2010 for Environmental

Characteristic Test					
Report Clause	Performed Item	EN 50155 Reference Clause(s)	Reference Standard	Result	Location of Test
2.1	Visual Inspection	13.4.1	-	PASS	ISL LAB
2.2	Power Supply Test (Supply variations and Temporary supply dips)	13.4.3.2 13.4.3.3 5.1.1.2 5.1.1.3	-	PASS	ISL LAB
2.3	Power Supply Test (Interruptions of voltage supply)	13.4.3.4 5.1.1.4		PASS	ISL LAB
2.4	Power Supply Test (Supply charge-over)	13.4.3.5 5.1.3	-	PASS	ISL LAB
2.5	Insulation Test	13.4.9	-	PASS	ISL LAB

Electromagnetic Compatibility (EMC)					
Report Clause	Performed Item	EN 50155 Reference Clause(s)	Reference Standard	Result	Location of Test
3.1	Power Line Conducted Emission Measurement	13.4.8	EN 50121-3-2 EN 61000-6-4	PASS	ISL LAB
3.2	Radiated Emission Measurement	13.4.8	EN 50121-3-2 EN 61000-6-4	PASS	ISL LAB
3.3	Electrostatic Discharge Susceptibility Test	13.4.8	EN 50121-3-2 EN 61000-4-2	PASS	ISL LAB
3.4	Radio- Frequency interference (RFI) susceptibility Test	13.4.8	EN 50121-3-2 EN 61000-4-3	PASS	ISL LAB
3.5	Transient Burst Susceptibility Test	13.4.8	EN 50121-3-2 EN 61000-4-4	PASS	ISL LAB
3.6	Surges Test	13.4.8	EN 50121-3-2 EN 61000-4-5	PASS	ISL LAB
3.7	Radio- Frequency, Conducted Disturbances Immunity Test	13.4.8	EN 50121-3-2 EN 61000-4-6	PASS	ISL LAB

Environmental Tests					
Report Clause	Performed Item	EN 50155 Reference Clause(s)	Reference Standard	Result	Location of Test
4.1	Low temperature star-up test	13.4.4	EN 60068-2-1	PASS	ISL LAB
4.2	Dry Heat Test	13.4.5	EN 60068-2-2	PASS	ISL LAB
4.3	Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	PASS	ISL LAB
4.4	Random Vibration Test	12.2.11	EN 61373	PASS	GTTI LAB
4.5	Increased Random Vibration Test	12.2.11	EN 61373	PASS	GTTI LAB
4.6	Shock Test	12.2.11	EN 61373	PASS	GTTI LAB

GTTI LAB= GOLDEN-TECH TECHNOLOGIES INC.

1.2.1 Performance Criteria for Compliance

Performance criterion A:

The apparatus shall continue to operate as intended during and after the test/event. No degradation of performance or loss of function is allowed.
Changes of actual operating state or stored data are not allowed.
If agreed between the involved parties, the normal performance level (all functions are working as specified) can be replaced by a minimum performance level.

Performance criterion B:

The apparatus shall continue to operate as intended after the test/event.
During the test/event, degradation of performance is however allowed.
Changes of actual operating state or stored data are not allowed.

Performance criterion C:

During the test/event temporary loss of function is allowed. The equipment could:

- automatically restart. The normal performance shall be obtained within a maximum defined time.
  After this time the equipment shall retain the previous operating state and shall work as intended.
  The loss of significant data is not allowed; or
- manually restart or process controlled restart. In this case this shall be agreed between user and supplier and/or clearly defined in the user manual. In this case the user manual shall be available to the user at the tender stage.

NOTE Significant stored data are application dependent and stated into the Performance specifications.

1.2.2 Performance Criteria for Compliance: EN 50121-1 (only for EMC)

Performance criterion A: The apparatus shall continue to operate as intended during and 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. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance 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. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data are allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

1.3 Description of EUT

This report test data using the report number 19LE156CE50155

EUT

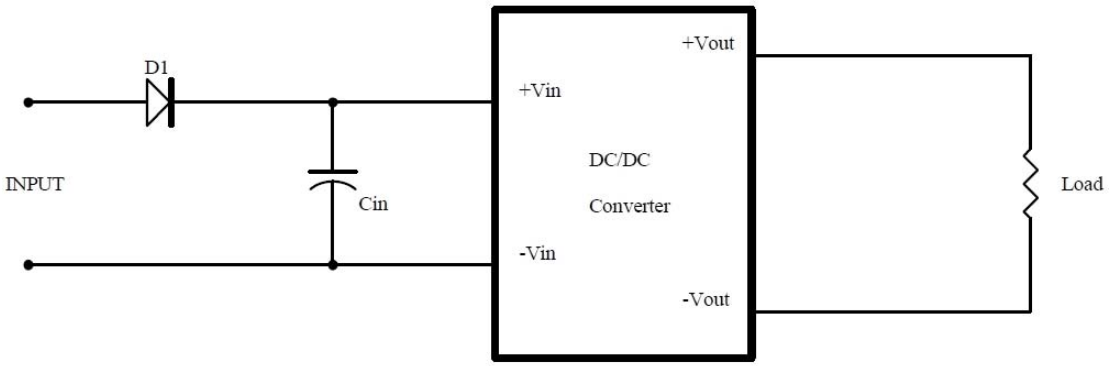
Description	TEP- CMF Series
Condition	Pre-Production
Model/Type reference	TEP 200-7218WIR-CMF; TEP 75-bcWIzzzzzzzz; TEP a-bcWIRzzzzzzzz; Where "a" = 100, 160 or 200; "b" = 24, 48 or 72; "c" = 10, 11, 12, 13, 15, 16, 18 "z" can be -CMF or any alphanumeric or dash or blank or slash for marketing purpose only
Brand	TRACO
Serial Number	N/A
Highest working frequency:	Less than 108 MHz
The radiation test should be tested till	1GHz

Test configuration:

Model Name	Input	Output	load
TEP 200-7218WIR-CMF	110VDC	48VDC	Full

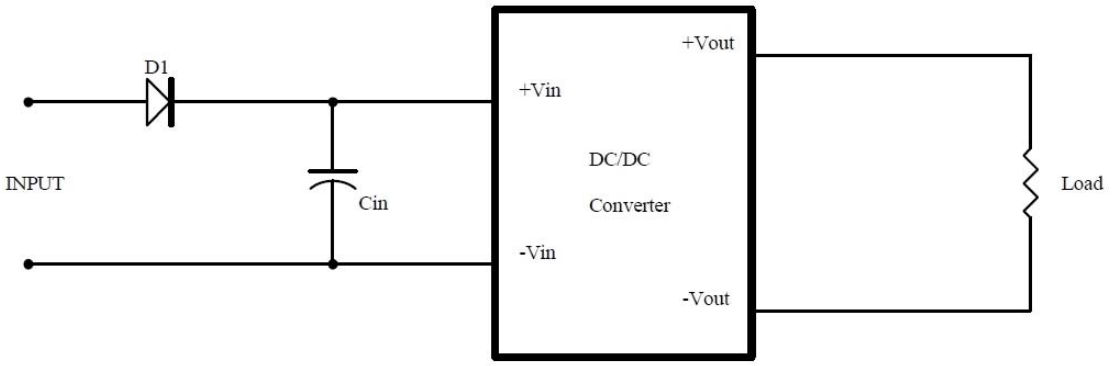
EMI Solution:
N/A

Recommended external capacitor for EN50155 Class S2



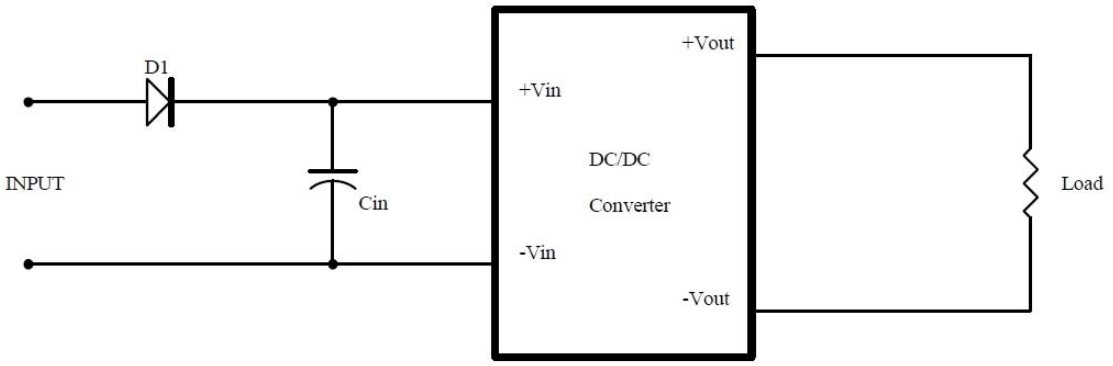
MODEL reference	D1	Cin
TEP 75-24cWIzzzzzzzz	C30T06Q (60V/30A)	5300μF /50V
TEP 75-48cWIzzzzzzzz	VB20100C (100V/20A)	1300μF /100V
TEP 75-72cWIzzzzzzzz	MBRB10200C (200V/10A)	240μF /200V
TEP 100-24cWIRzzzzzzzz	C30T06Q (60V/30A)	6600μF/50V
TEP 100-48cWIRzzzzzzzz	VB20100C (100V/20A)	1600μF/100V
TEP 100-72cWIRzzzzzzzz	MBRB10200C (200V/10A)	330μF /200V
TEP 160-24cWIRzzzzzzzz	VB60100C (100V/60A)	9500μF /50V
TEP 160-48cWIRzzzzzzzz	VB40100C (100V/40A)	2500μF /100V
TEP 160-72cWIRzzzzzzzz	VB30200C (200V/30A)	590μF /200V
TEP 200-24cWIRzzzzzzzz	VB60100C (100V/60A)	12100μF /50V
TEP 200-48cWIRzzzzzzzz	VB40100C (100V/40A)	3500μF /100V
TEP 200-72cWIRzzzzzzzz	VB30200C (200V/30A)	730μF /200V

Recommended external capacitor for EN50155 Class S3



MODEL reference	D1	Cin
TEP 75-24cWIzzzzzzzz	C30T06Q (60V/30A)	10700μF / 50V
TEP 75-48cWIzzzzzzzz	VB20100C (100V/20A)	2600μF / 100V
TEP 75-72cWIzzzzzzzz	MBRB10200C (200V/10A)	480μF / 200V
TEP 100-24cWIRzzzzzzzz	C30T06Q (60V/30A)	13300μF/50V
TEP 100-48cWIRzzzzzzzz	VB20100C (100V/20A)	3300μF/100V
TEP 100-72cWIRzzzzzzzz	MBRB10200C (200V/10A)	660μF/200V
TEP 160-24cWIRzzzzzzzz	VB60100C (100V/60A)	19000μF/50V
TEP 160-48cWIRzzzzzzzz	VB40100C (100V/40A)	5000μF/100V
TEP 160-72cWIRzzzzzzzz	VB30200C (200V/30A)	1100μF/200V
TEP 200-24cWIRzzzzzzzz	VB60100C (100V/60A)	24200μF /50V
TEP 200-48cWIRzzzzzzzz	VB40100C (100V/40A)	7000μF /100V
TEP 200-72cWIRzzzzzzzz	VB30200C (200V/30A)	1400μF /200V

Recommended external capacitor for EN50155 Class C2



MODEL reference	D1	Cin
TEP 75-24cWIzzzzzzzz	C30T06Q (60V/30A)	16000μF/50V
TEP 75-48cWIzzzzzzzz	VB20100C (100V/20A)	4000μF/100V
TEP 75-72cWIzzzzzzzz	MBRB10200C (200V/10A)	720μF/200V
TEP 100-24cWIRzzzzzzzz	C30T06Q (60V/30A)	20000μF/50V
TEP 100-48cWIRzzzzzzzz	VB20100C (100V/20A)	4900μF/100V
TEP 100-72cWIRzzzzzzzz	MBRB10200C (200V/10A)	990μF/200V
TEP 160-24cWIRzzzzzzzz	VB60100C (100V/60A)	28500μF/50V
TEP 160-48cWIRzzzzzzzz	VB40100C (100V/40A)	7600μF/100V
TEP 160-72cWIRzzzzzzzz	VB30200C (200V/30A)	1700μF/200V
TEP 200-24cWIRzzzzzzzz	VB60100C (100V/60A)	36300μF /50V
TEP 200-48cWIRzzzzzzzz	VB40100C (100V/40A)	10600μF /100V
TEP 200-72cWIRzzzzzzzz	VB30200C (200V/30A)	2200μF /200V

1.4 Description of Support Equipment

No	Unit	Model Serial No.	Brand	Power Cord	FCC ID
1	Programmable DC power supply	PSW 160-21.6 S/N: GEP152281	GWINSTEK	Non-shielded	N/A
2	Dummy Load	N/A S/N: N/A	N/A	N/A	N/A

2. Characteristic Test

2.1 Visual Inspection

2.1.1 Inspection Requirement:

The visual inspection shall be carried out to ensure that the equipment construction meets its specified requirements.

2.1.2 Test Procedure

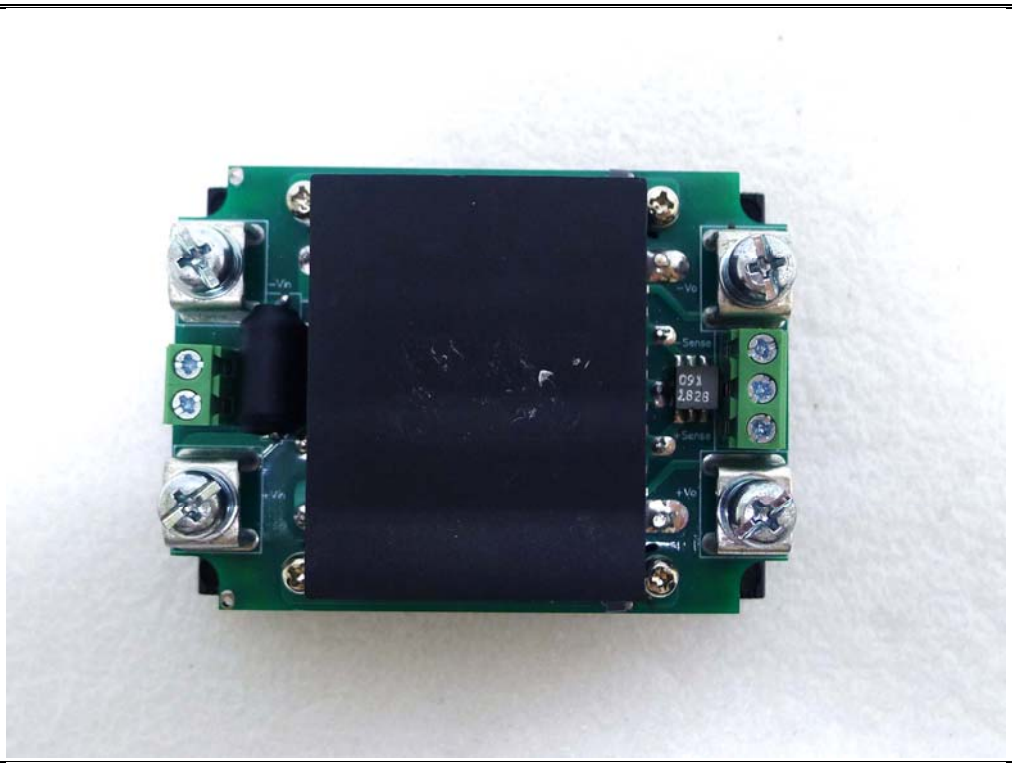
Test Procedures were referred to EN 50155 sub-clause 13.4.1

2.1.3 Inspection Result

Visual inspection requirement:	
The visual inspection shall be carried out to ensure that the equipment is of sound construction and, so far as can be ascertained, meets its specified requirements. A visual inspection shall also be carried out after a type test has been performed to check whether any damage or deterioration has occurred resulting from the tests.	
Inspection item	**Result**
EUT outside	OK
EUT function	OK

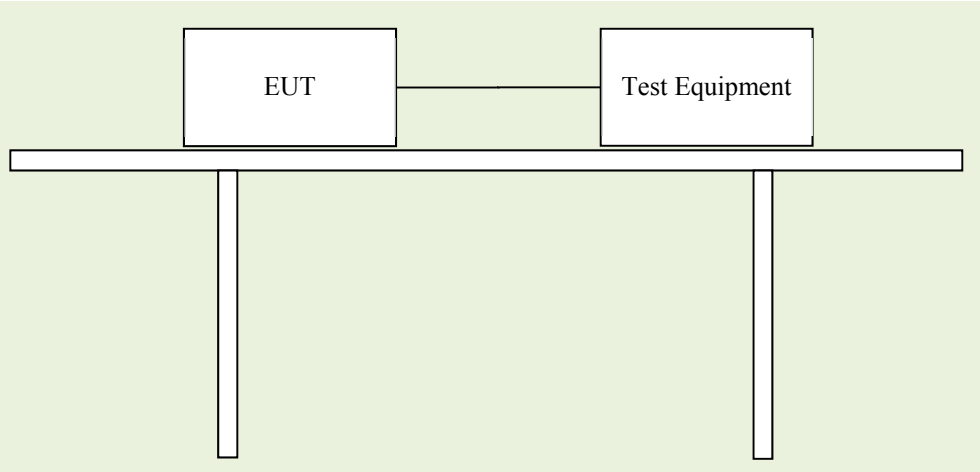
2.1.4 Photo of Inspection Sample (Before Test)

Before test：Ok



2.2 Power supply test (Supply variation and temporary supply dips)

2.2.1 Test Setup



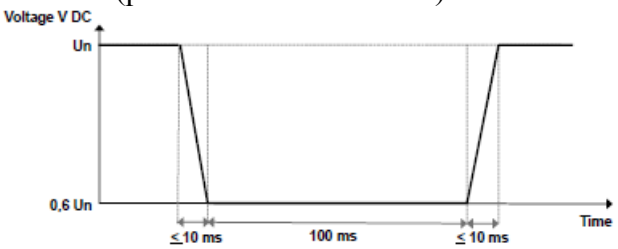
2.2.2 Test Procedure

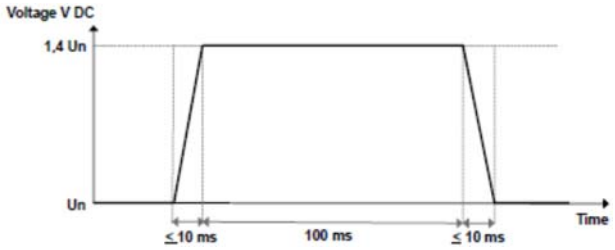
Test Procedures were referred to EN 50155 sub-clause 13.4.3.2, 13.4.3.3, 5.1.1.2 & 5.1.1.3

2.2.3 Test Requirement

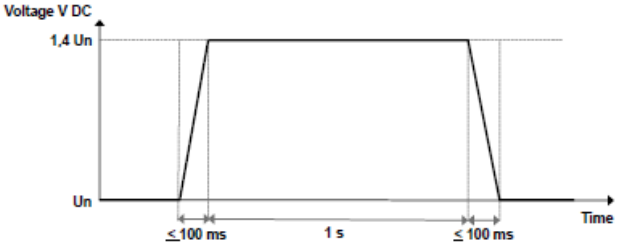
☒D.C. supplied equipment:
Test performed to prove correct functioning at nominal supply voltage and at the upper and lower limits of specified voltage as defined below:
Minimum Continuous voltage: 0.7 *Un* Maximum Continuous voltage: 1.25 *Un*

Voltage fluctuations (e.g. during start-up of auxiliary equipment or voltage oscillations of battery chargers) lying between 0.6 *Un* and 1.4 *Un* and not exceeding 0.1 s shall not cause deviation of function (performance criterion A).





For temporary supply overvoltages up to 1,4 *Un* lasting no more than 1 s the equipment shall fulfil performance criterion B.



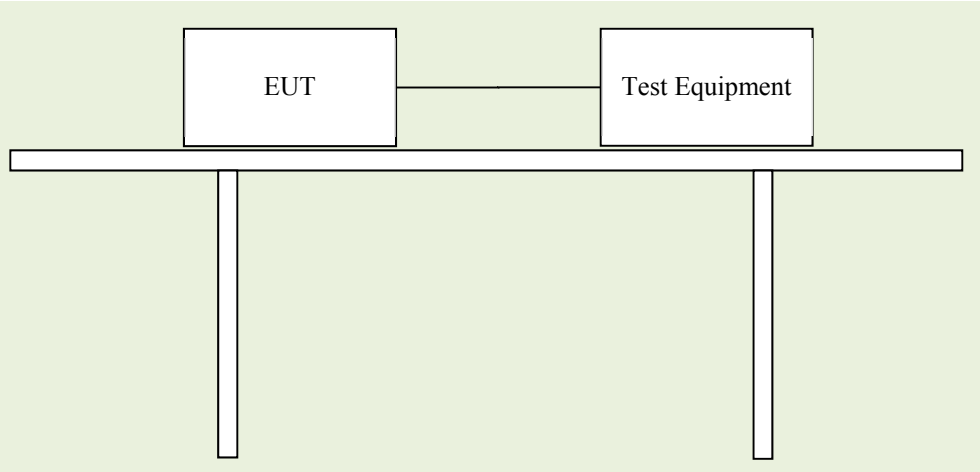
☐A.C. supplied equipment:
Test performed to prove correct functioning at:
Nominal voltage and frequency;
The upper and lower limits of voltage and frequency are in all combinations.

2.2.4 Test Result

Variations of Voltage supply	Level	Voltage	Test Time	EUT Status	Comments
Minimum voltage	0.7 Un	77Vdc	10 min	Pass	
Nominal voltage	Un	110Vdc	10 min	Pass	
Maximum voltage	1.25 Un	137.5Vdc	10 min	Pass	
Voltage fluctuations	Level	Voltage	Test Time	EUT Status	Comments
High voltage	1.4 Un	154Vdc	0.1 s	Pass	
Low voltage	0.6 Un	66Vdc	0.1 s	Pass	
High voltage	1.4 Un	154Vdc	1 s	Pass	

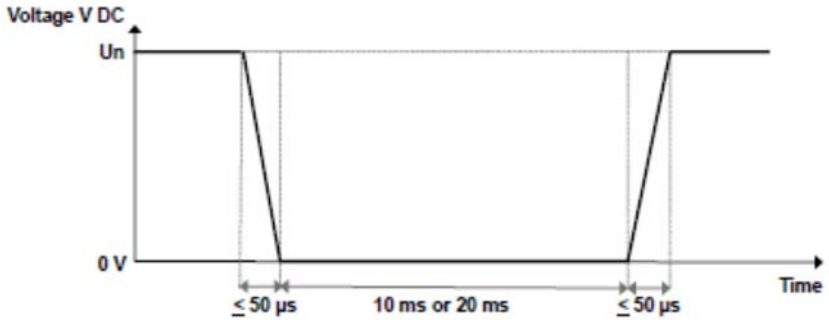
2.3 Power supply test (Interruptions of voltage supply)

2.3.1 Test Setup



2.3.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.3.4 & 5.1.1.2



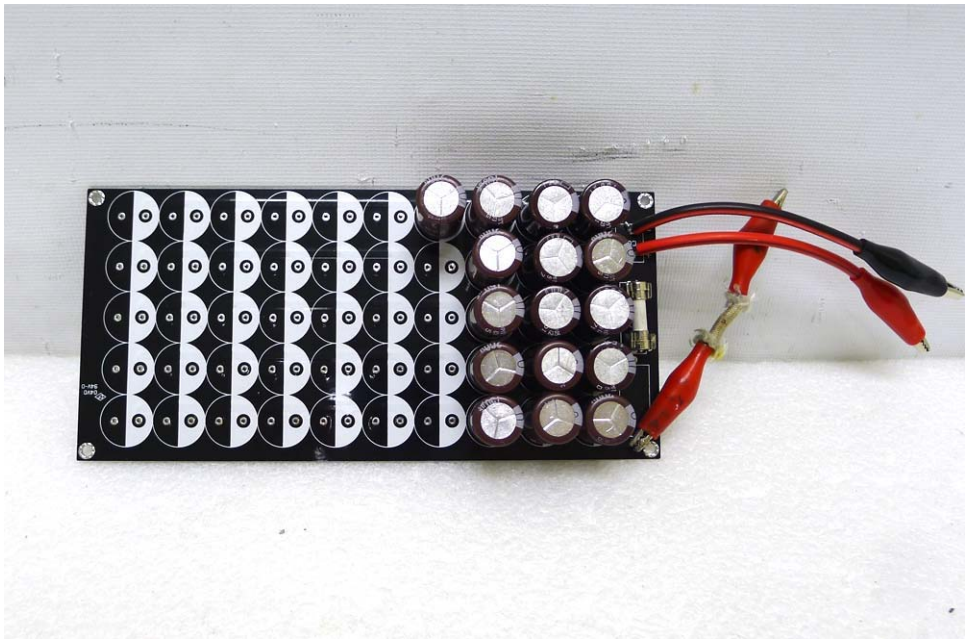
2.3.3 Test Requirement

Interruptions of input voltage as defined below:

Class	Requirements	Duration of the interruption time Tint
S1	No performance criterion is requested but the equipment shall continue to operate as specified after the voltage interruption.	This test is not required.
S2	The equipment shall behave according performance criterion A.	10 ms
S3	The equipment shall behave according performance criterion A.	20 ms

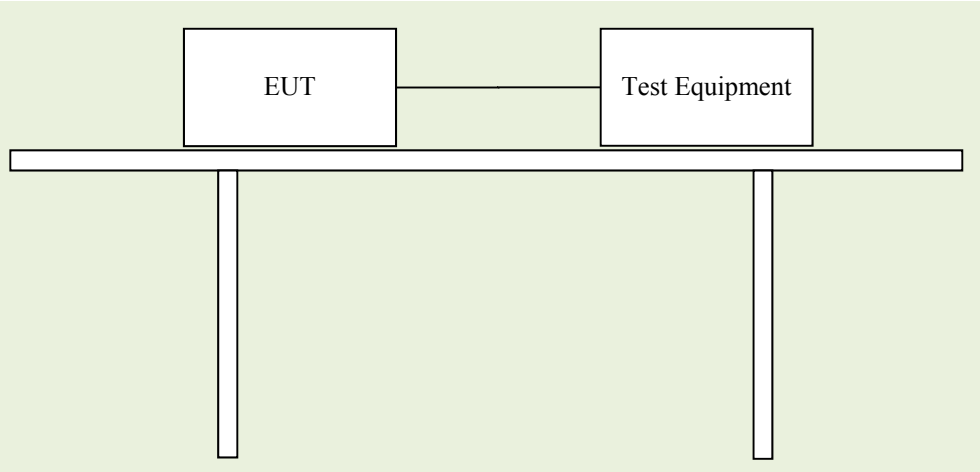
2.3.4 Test Result

Interruptions of voltage supply	Level	Voltage	INT time	EUT Status	Comments
Class S1:Voltage interruptions	Un	110Vdc	0 s	Pass	
Class S2:Voltage interruptions	0 Un	0Vdc	10ms	Pass	Note1
Class S3:Voltage interruptions	0 Un	0Vdc	20ms	Pass	Note2
Note1: With 5 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 150μF/100V)					
Note2: With 9 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 150μF/100V)					
The following photos					



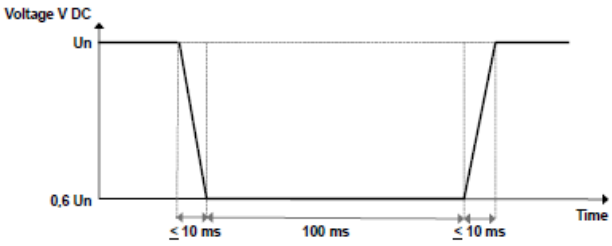
2.4 Power supply test (Supply Change Over)

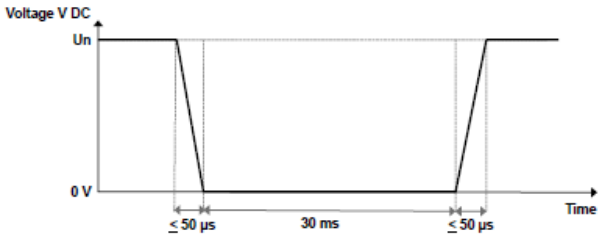
2.4.1 Test Setup



2.4.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.3.5 & 5.1.3



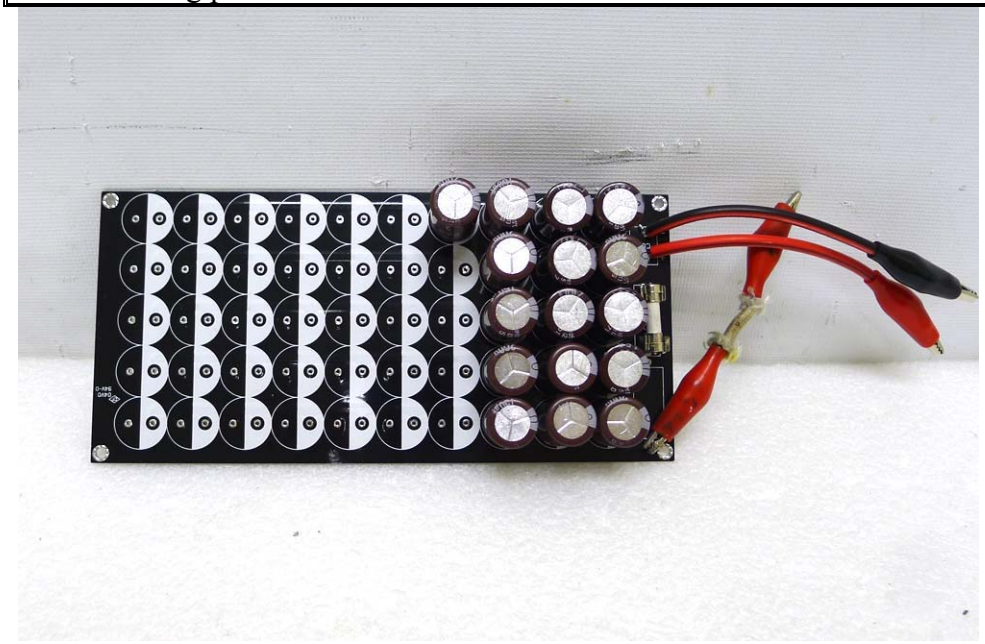


2.4.3 Test Requirement

- Class C1 at 0.6 *Un* during 100ms (without interruptions) **Performance criterion A;**
- Class C2: during a supply break of 30 ms starting at *Un* **Performance criterion B.**

2.4.4 Test Result

Supply change over	Level	Voltage	INT time	EUT Status	Comments
Class C1:60% residual voltage	0.6 Un	66Vdc	100ms	Pass	
Class C2:0% residual voltage	0 Un	0Vdc	30ms	Pass	Note
Note1: With 16 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 150μF/100V)					
The following photos					



2.5 Insulation Test

2.5.1 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.9

2.5.2 Test Requirement

☒**Insulation measurement Test: 500VDC**
The insulation resistance test carried out at 500 VDC and the values recorded.
The test repeated after the voltage withstand test.
Test acceptance requirements:
There shall be no fundamental deterioration from the initial measurement.

☒**Voltage withstand test:**
500 VAC or 750 VDC for nominal battery voltages below 72 V (or 50 VAC)
1000 VAC or 1500 VDC for nominal battery voltages from 72 V up to 125 V, (or from 50 to 90 VAC), and
1500 VAC or 2200 VDC for nominal battery voltages above 125 V and up to 315 V, (or from 90 to 225 VAC)
Test acceptance requirements:
Neither disruptive discharge nor flashover shall occur.

2.5.3 Test Result

Insulation Test Requirement (13.4.9):				
1.Insulation measurement Test :				
The insulation resistance test shall be carried out at 500 Vdc and the values recorded. The test shall then be repeated after the voltage withstand test. There shall be no fundamental deterioration from the initial measurement.				
Test item	Test Time	Insulation measurement test		Comments
		before withstand	after withstand	
Primary side to secondary side	1 min	50GΩ	50GΩ	Pass
2.Voltage Withstand test				
500Vac or 750Vdc for nominal battery voltages below 72 Vdc (or 50 Vac). 1000Vac or 1500Vdc for nominal battery voltage from 72Vdc up to 125Vdc, (or from 50 to 90 Vac), and 1500Vac or 2200Vdc for nominal battery voltage above 125Vdc and up to 315Vdc, (or from 90 to 225 Vac). Neither disruptive discharge nor flashover shall occur				
Test item	Test Voltage	Test Time	Result	Comments
Primary side to secondary side	1500Vdc	1 min	0.01mA	Pass

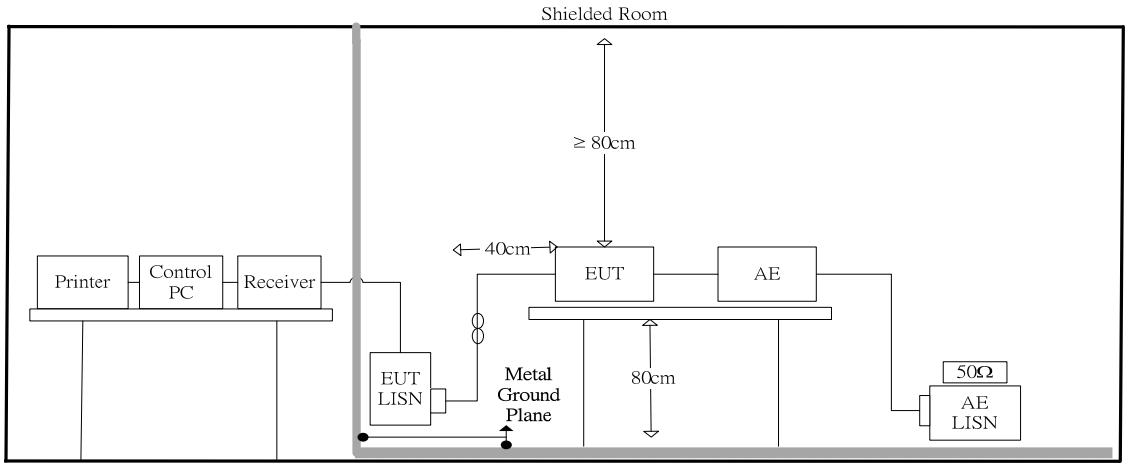
3. Electromagnetic Compatibility (EMC)

Test Procedures were referred to EN 50155 sub-clause 13.4.8.
All EMC tests of the electronic equipment shall be carried out according EN 50121-3-2.

3.1 Power Main Port Conducted Emissions

3.1.1 Test Setup and Procedure

3.1.2 Test Setup



3.1.3 Test Procedure

The measurements are performed in a shielded room site; The EUT was placed on non-conduction 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance (50ohm/50uH) vs. Frequency Characteristic in accordance with the standard. Powers to the LISNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second LISN through a ganged, metal power outlet box which is bonded to the ground plane at the LISN.

The interconnecting cables were arranged and moved to get the maximum measurement. Both the line of power cord, hot and neutral, were measured. All of the interface cables were manipulated according to EN 55016-2-1 / CISPR 16-2-1 requirements.

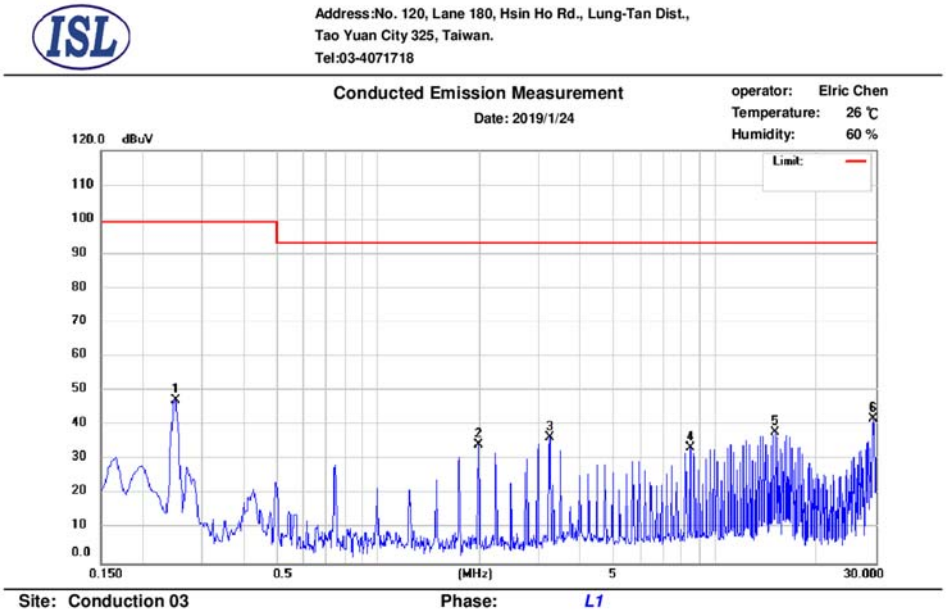
The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

3.1.4 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	150KHz--30MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth:	9KHz

3.2 Conduction Test Data: Configuration 1

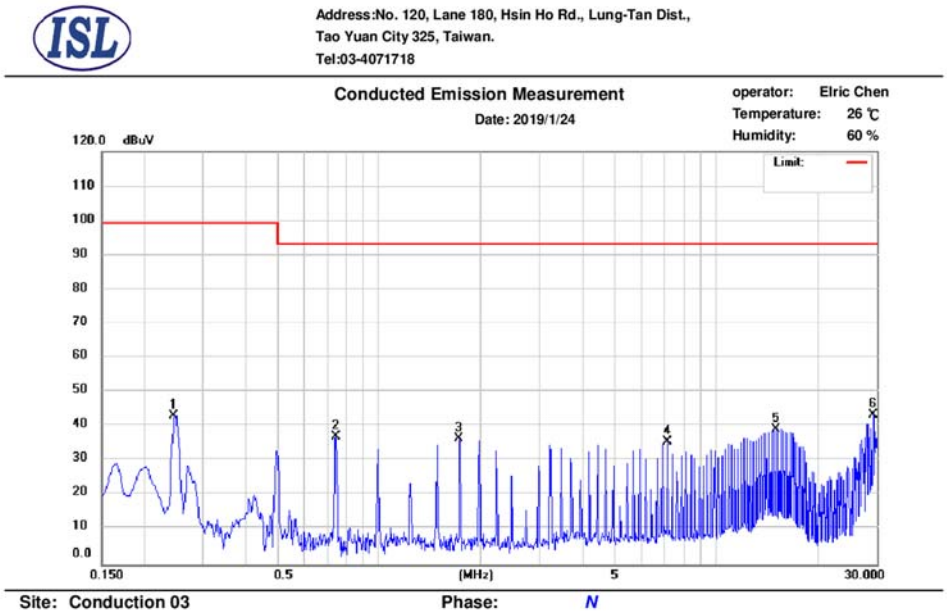
-Line



No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)
1	0.250	46.43	46.69	0.03	46.46	99.00	-52.54
2	1.986	33.25	33.51	0.09	33.34	93.00	-59.66
3	3.226	35.55	35.79	0.11	35.66	93.00	-57.34
4	8.434	33.36	33.57	0.18	33.54	93.00	-59.46
5	15.134	35.24	33.72	0.26	35.50	93.00	-57.50
6	29.522	35.93	30.90	0.36	36.29	93.00	-56.71

Note:
Margin = QP Emission – Limit
QP Emission = QP_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss

-Neutral



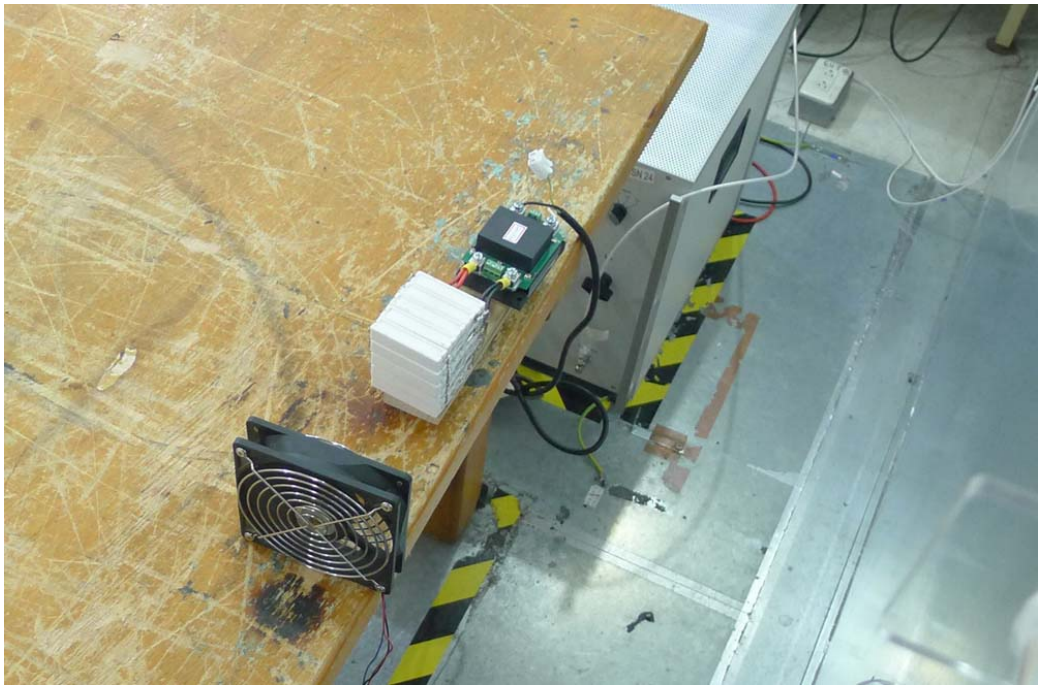
No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)
1	0.246	42.28	42.54	0.03	42.31	99.00	-56.69
2	0.746	35.28	35.56	0.06	35.34	93.00	-57.66
3	1.734	36.28	36.57	0.08	36.36	93.00	-56.64
4	7.190	33.52	33.29	0.17	33.69	93.00	-59.31
5	15.122	36.66	35.92	0.26	36.92	93.00	-56.08
6	29.250	36.62	31.52	0.36	36.98	93.00	-56.02

Note:
Margin = QP Emission – Limit
QP Emission = QP_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss

3.2.1 Test Setup Photo

Front View

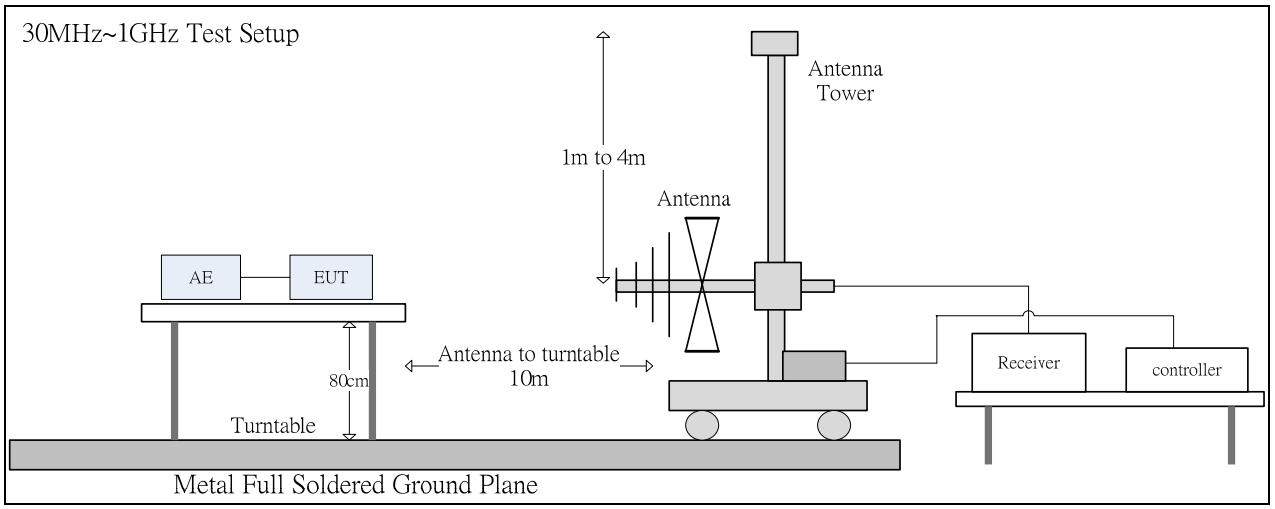
Back View

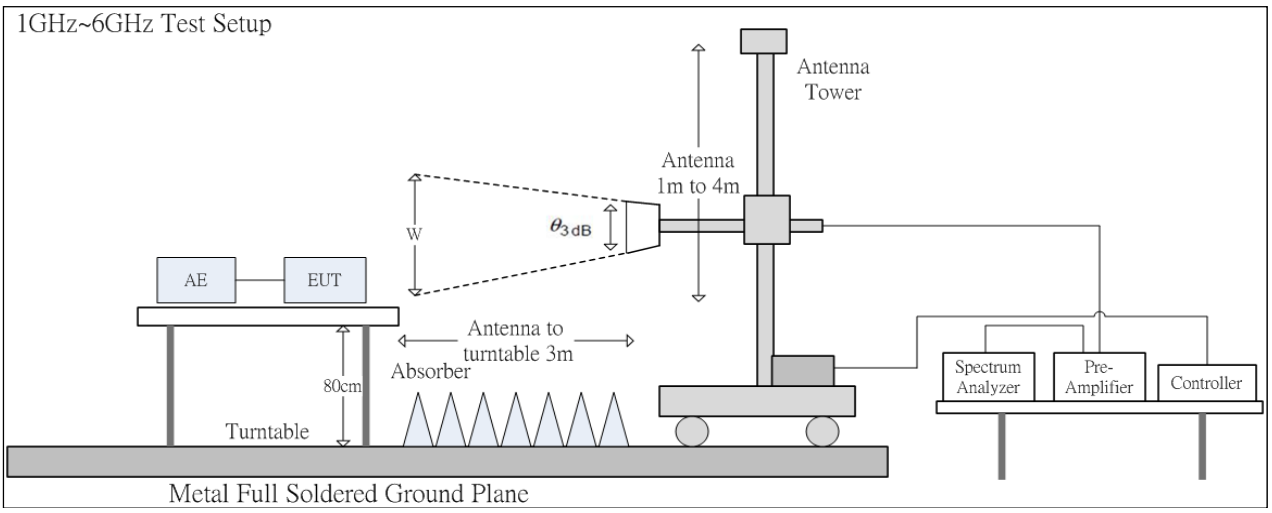


3.3 Radiated Disturbance Emissions

3.3.1 Test Setup and Procedure

3.3.2 Test Setup





The 3dB beam width of the horn antenna used for the test is as shown in the table below.

Frequency (GHz)	E-plane	H-plane	$\theta_{3\,dB}$(min)	d= 3 m
				w (m)
1	88°	147°	88°	5.79
2	68°	119°	68°	4.04
3	73°	92°	73°	4.44
4	70°	89°	70°	4.20
5	55°	60°	55°	3.12
6	63°	62°	62°	3.60

3.3.3 Test Procedure

The radiated emissions test will then be repeated on the open site or chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipment are set up on the turntable of one of 10 meter open field sites or 10 meter chamber. Desktop EUT are set up on a wooden stand 0.8 meter above the ground or floor-standing arrangement shall be placed on the horizontal ground reference plane. The test volume for a height of up to 30 cm may be obstructed by absorber placed on the ground plane.

For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. The highest emissions between 30 MHz to 1000 MHz were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The highest emissions between 1 GHz to 6 GHz were analyzed in details by operating the spectrum analyzer in peak and average mode to determine the precise amplitude of the emissions.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum measurement. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings. All of the interface cables were manipulated according to EN 61000-6-4 requirements.

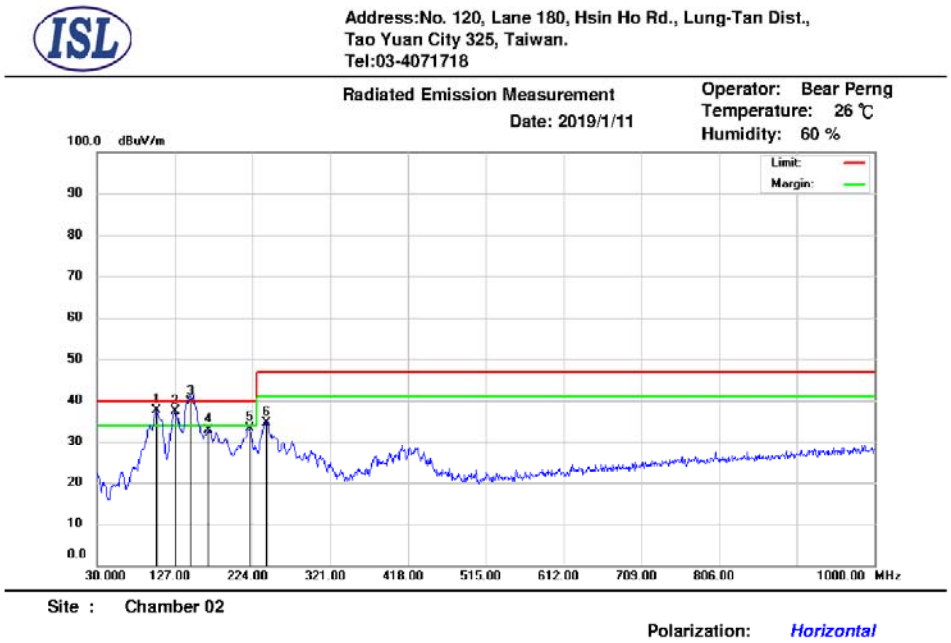
The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

3.3.4 Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	30MHz--1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth:	120KHz

Frequency Range:	Above 1 GHz to 6 GHz
Detector Function:	Peak / Average Mode
Resolution Bandwidth:	1MHz

3.4 Radiation Test Data: Configuration 1
-Horizontal

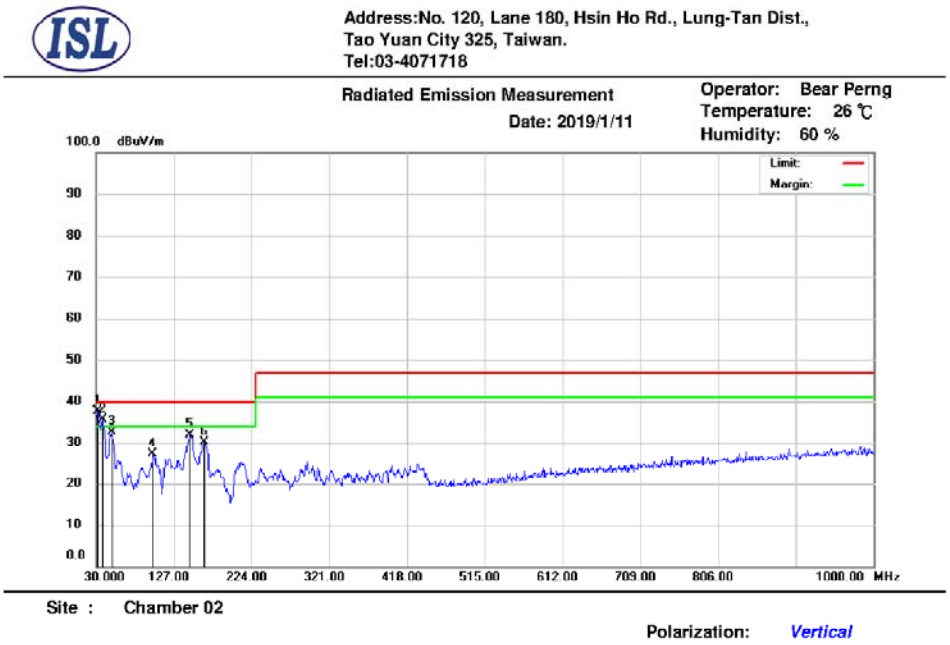


Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	103.72	58.04	-20.32	37.72	40.00	-2.28	400	204	peak
2	127.97	54.98	-17.61	37.37	40.00	-2.63	400	12	peak
3	146.40	55.82	-16.10	39.72	40.00	-0.28	399	360	QP
4	168.71	48.94	-15.95	32.99	40.00	-7.01	400	354	peak
5	220.12	52.20	-18.74	33.46	40.00	-6.54	400	4	peak
6	241.46	51.55	-16.84	34.71	47.00	-12.29	400	344	peak

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss

BILOG Antenna Distance: 10 meters

-Vertical



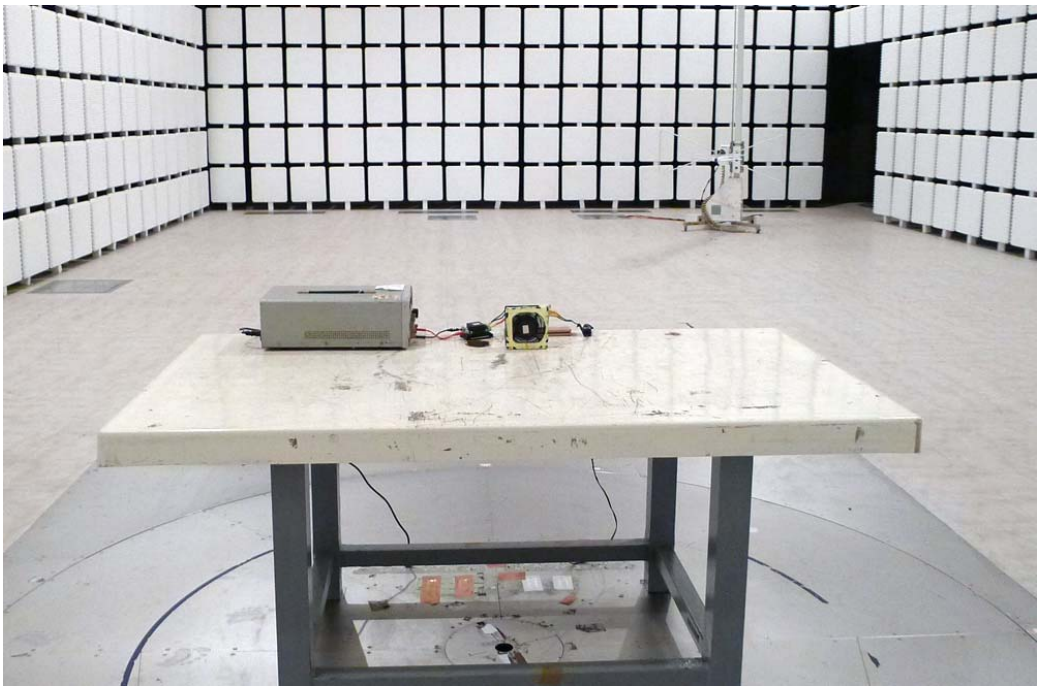
Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor(dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	31.94	56.27	-18.55	37.72	40.00	-2.28	300	284	peak
2	37.76	53.46	-17.94	35.52	40.00	-4.48	400	101	peak
3	49.40	49.56	-16.87	32.69	40.00	-7.31	100	89	peak
4	100.81	47.85	-20.80	27.05	40.00	-12.95	400	269	peak
5	147.37	47.93	-16.06	31.87	40.00	-8.13	100	231	peak
6	164.83	46.01	-15.80	30.21	40.00	-9.79	200	185	peak

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss

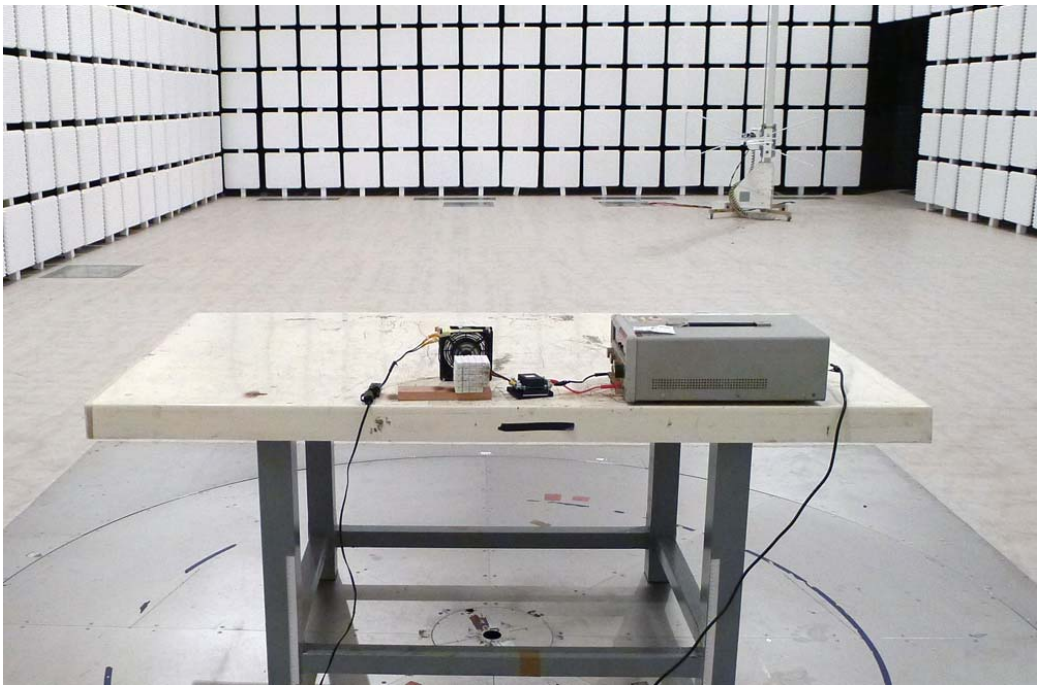
BILOG Antenna Distance: 10 meters

3.4.1 Test Setup Photo

Front View (30MHz~1GHz)



Back View (30MHz~1GHz)



3.5 Electrostatic discharge (ESD) immunity

3.5.1 Test Specification

Port:	Enclosure
Basic Standard:	EN 61000-4-2/ IEC EN61000-4-2 (details referred to Sec 1.2)
Test Level:	Air +/- 2 kV, +/- 4 kV, +/- 6 kV, +/- 8 kV Contact +/- 4 kV, +/- 6 kV
Criteria:	B
Test Procedure	refer to ISL QA -T4-E-S7

Selected Test Point

Air: discharges were applied to slots, aperture or insulating surfaces. 10 single air discharges were applied to each selected points.

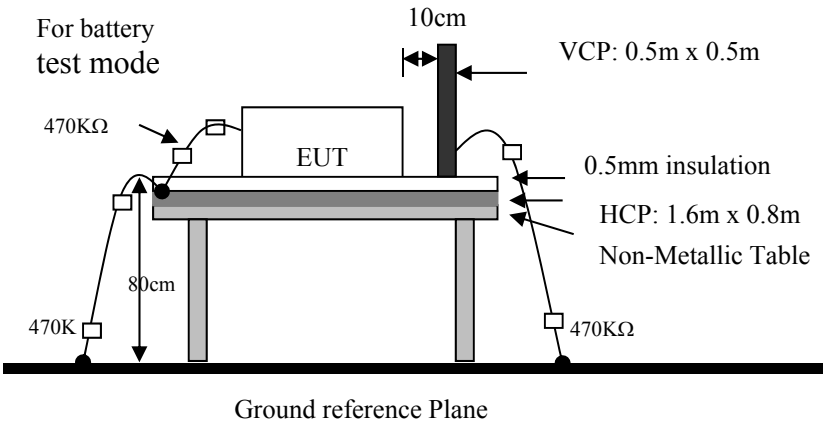
Contact: 10 discharges to the selected contact points.

Indirect Contact Points: 10 discharges were applied to center of one edge of VCP and each EUT side of HCP with 10 cm away from EUT.

Energy-Storage Capacitor:150 pF; Discharge Resistor:330 Ω

3.5.2 Test Setup

EUT is 1m from the wall and other metallic structure. When Battery test mode is needed, a cable with one 470KΩ resister at two rare ends is connected from metallic part of EUT and screwed to HCP.



3.5.3 Test Result

Performance of EUT complies with the given specification.

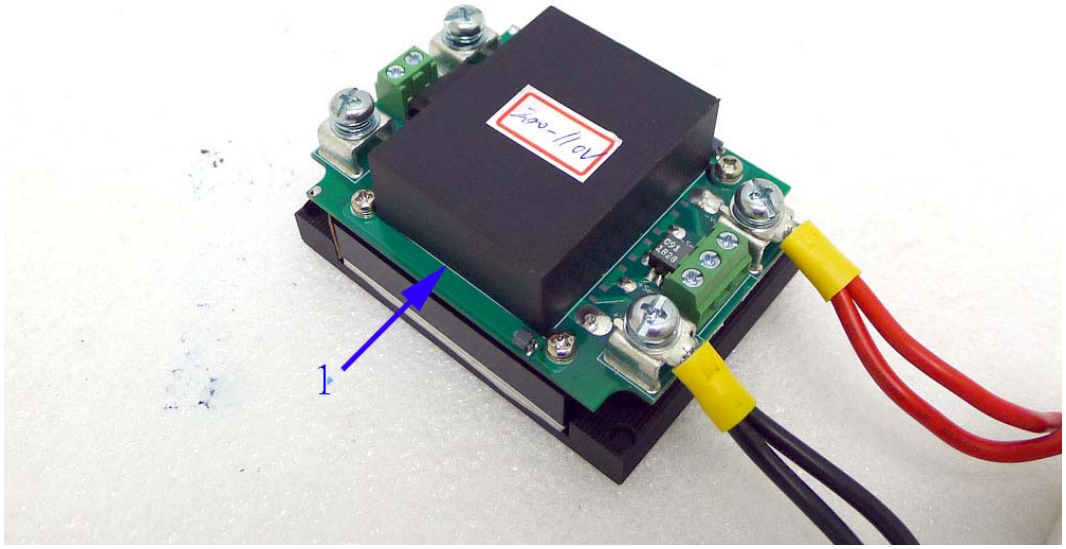
3.6 Test Data: Configuration1

Basic Standard	EN 61000-4-2									Date	
EUT Model Name	TEP 200-7218WIR-CMF									2019-02-22	
Power										Engineer	
Barometer Pressure	100.2kPa									Jeff Chou	
Temperature	21℃									Equipment & Test Site	
Humidity	40%									EM TEST(Model: Dito)	
Voltage/Freq.	110 Vdc									ESD 1F	
A=criteria A, B=criteria B, C=criteria C											
ND=No Discharge; Meets criteria but unable to obtain an electrostatic discharge (ESD) at this test point. **X=EUT DOES NOT meet the acceptance criteria** **A=criteria A, B=criteria B, C=criteria C**											
Air Discharge	Voltage kV 10 Discharge @ 1 PPS										
Test Location	+2	-2	+4	-4	+8	-8					Comments
1	ND	ND	ND	ND	ND	ND					
2	ND	ND	ND	ND	ND	ND					
Contact Discharge	Voltage kV 25 Discharge @ 1 PPS										
Test Location	+4	-4	+6	-6							
1	ND	ND	ND	ND							
2	ND	ND	ND	ND							
Indirect Discharge	Voltage kV 25 Discharge @ 1 PPS										
Test Location	+4	-4	+6	-6							Comments
VCP Front	A	A	A	A							
VCP Right	A	A	A	A							
VCP Left	A	A	A	A							
VCP Back	A	A	A	A							
Test Location	+4	-4	+6	-6							Comments
HCP Front	A	A	A	A							
HCP Right	A	A	A	A							
HCP Left	A	A	A	A							
HCP Back	A	A	A	A							
Additional Notes: A=criteria A, B=criteria B, C=criteria C											

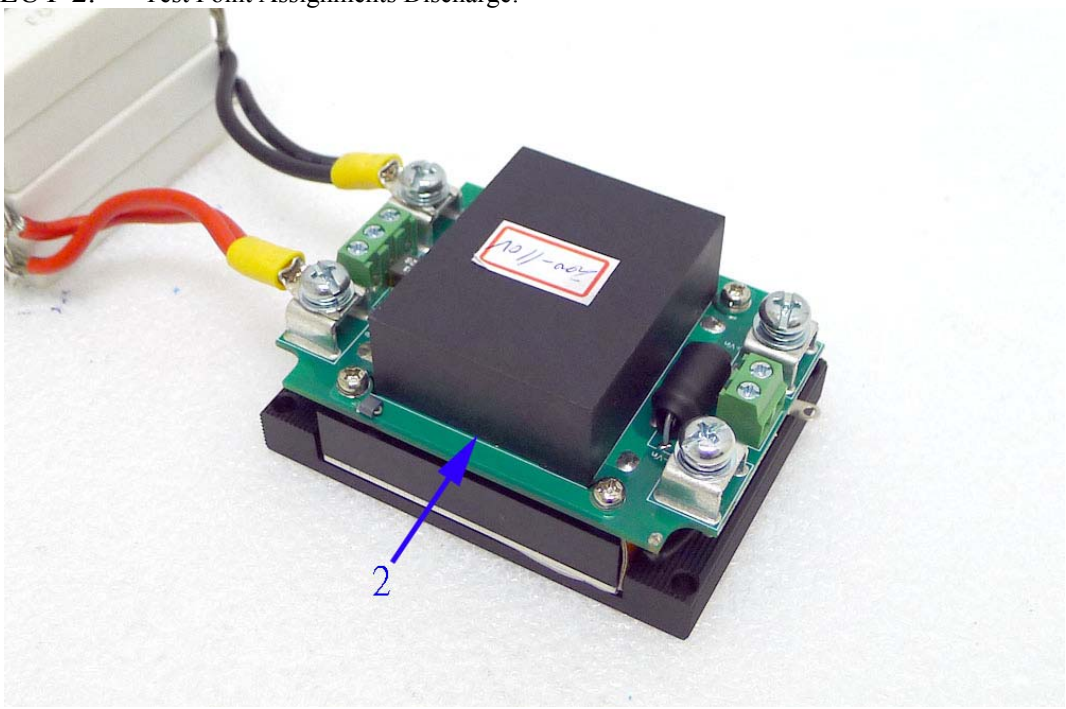
3.6.1 Test Point

Red arrow lines indicate the contact points, and blue arrow lines indicate the air points.

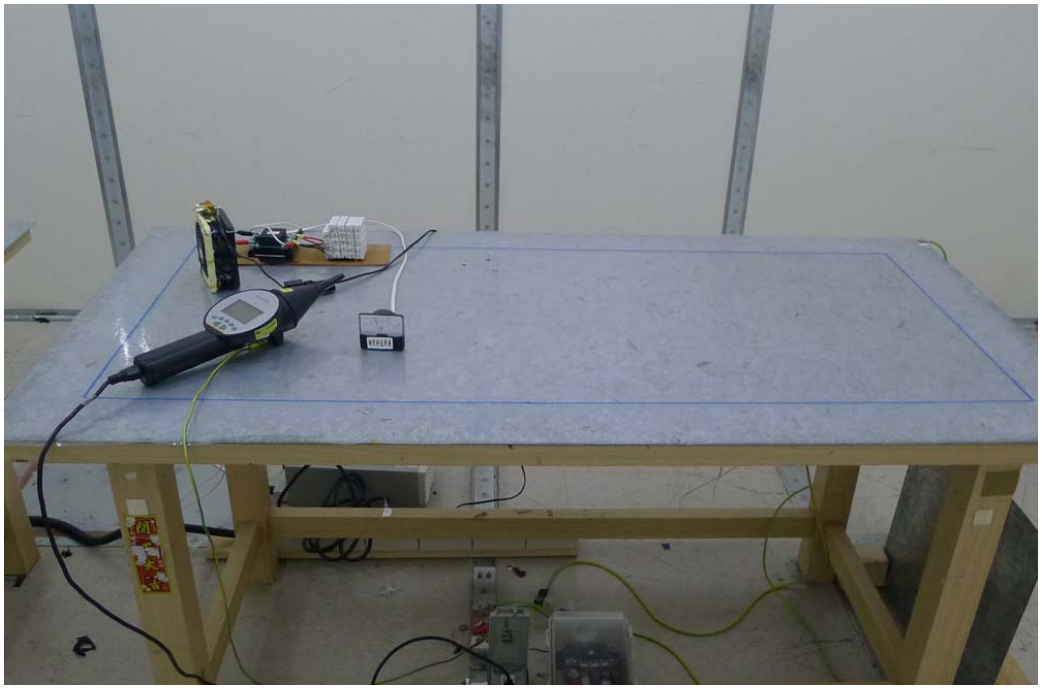
EUT-1. Test Point Assignments Discharge:



EUT-2. Test Point Assignments Discharge:



3.6.2 Test Setup Photo



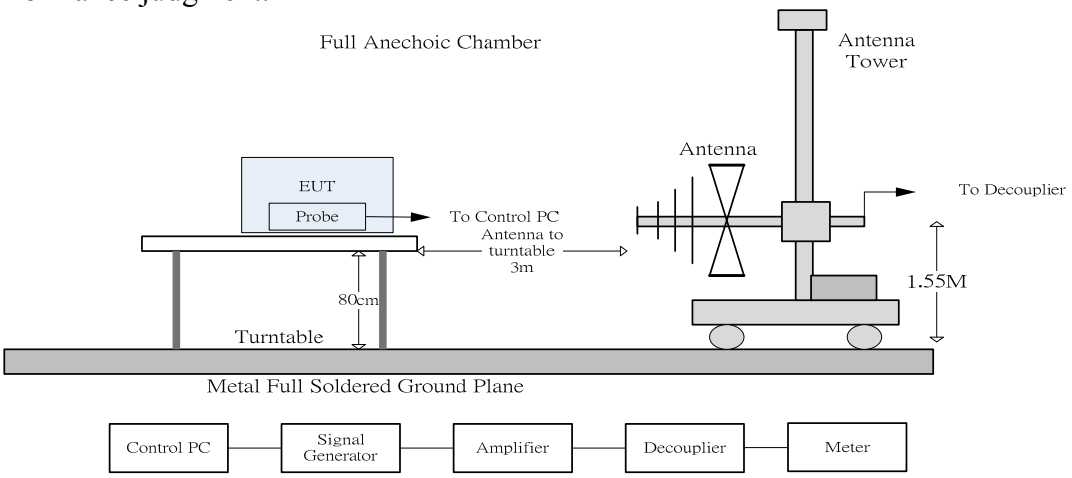
3.7 Radio-Frequency, Electromagnetic Field immunity

3.7.1 Test Specification

Port:	Enclosure
Basic Standard:	EN 61000-4-3/ IEC EN61000-4-3 (details referred to Sec 1.2)
Frequency range/Test Level:	80 MHz to 1000 MHz: 20 V/m 800 MHz to 1000 MHz: 20 V/m 1400 MHz to 2000 MHz: 10 V/m 2000 MHz to 2700 MHz: 5 V/m 5100 MHz to 6000 MHz: 3 V/m
Modulation:	AM 1KHz 80%
Frequency Step:	1% of last step frequency
Dwell time:	3s
Polarization:	Vertical and Horizontal
EUT Azimuth Angle	☒0° ☒90° ☒180° ☒270°
Criteria:	A
Test Procedure	refer to ISL QA -T4-E-S8

3.7.2 Test Setup

The field sensor is placed at one calibration grid point to check the intensity of the established fields on both polarizations. EUT is adjusted to have each side of EUT face coincident with the calibration plane. A CCD camera and speakers are used to monitor the condition of EUT for the performance judgment.



3.7.3 Test Result

Performance of EUT complies with the given specification.

3.8 Test Data: Configuration1

Basic Standard	EN 61000-4-3	Date	
EUT Model Name	TEP 200-7218WIR-CMF	2019-02-15	
Power		Engineer	
Barometer Pressure	100.3kPa	Hasan Yu	
Temperature	22℃	Equipment & Test Site	
Humidity	59%	Chamber 04	
Voltage/Freq.	110Vdc		

A=criteria A, B=criteria B, C=criteria C

EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0° (front)	80-1000	1	3s	80% @ 1KHz	20	Vertical	A	
90° (left)	80-1000	1	3s	80% @ 1KHz	20	Vertical	A	
180° (back)	80-1000	1	3s	80% @ 1KHz	20	Vertical	A	
270° (right)	80-1000	1	3s	80% @ 1KHz	20	Vertical	A	
0° (front)	80-1000	1	3s	80% @ 1KHz	20	Horizontal	A	
90° (left)	80-1000	1	3s	80% @ 1KHz	20	Horizontal	A	
180° (back)	80-1000	1	3s	80% @ 1KHz	20	Horizontal	A	
270° (right)	80-1000	1	3s	80% @ 1KHz	20	Horizontal	A	

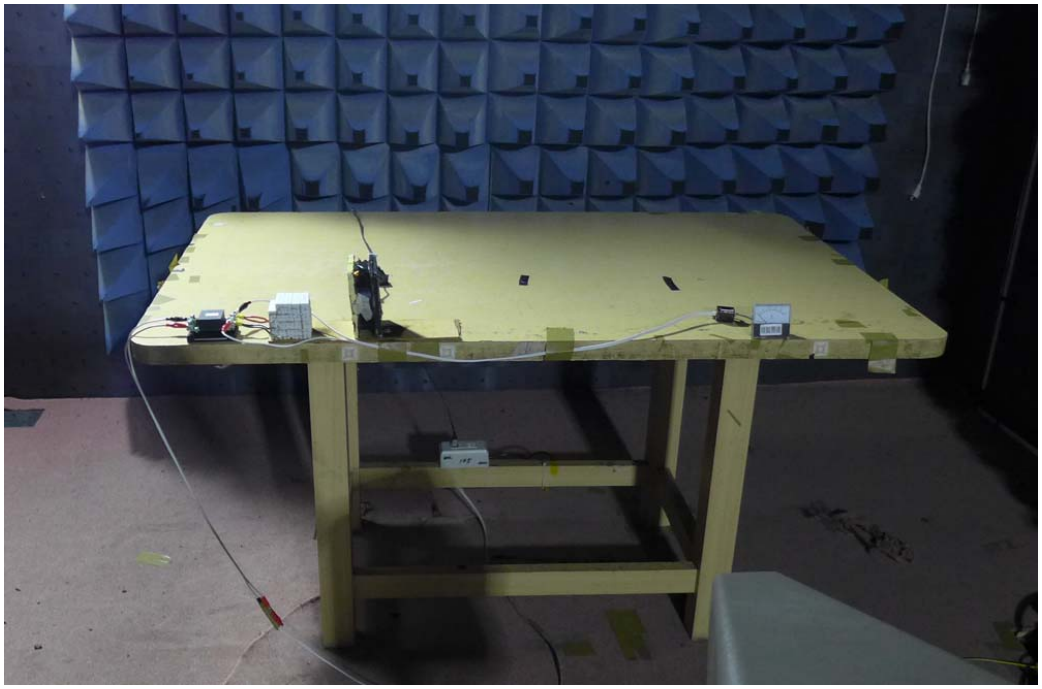
EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0° (front)	1400-2100	1	3s	80% @ 1KHz	10	Vertical	A	
90° (left)	1400-2100	1	3s	80% @ 1KHz	10	Vertical	A	
180° (back)	1400-2100	1	3s	80% @ 1KHz	10	Vertical	A	
270° (right)	1400-2100	1	3s	80% @ 1KHz	10	Vertical	A	
0° (front)	1400-2100	1	3s	80% @ 1KHz	10	Horizontal	A	
90° (left)	1400-2100	1	3s	80% @ 1KHz	10	Horizontal	A	
180° (back)	1400-2100	1	3s	80% @ 1KHz	10	Horizontal	A	
270° (right)	1400-2100	1	3s	80% @ 1KHz	10	Horizontal	A	

EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0° (front)	2000-2700	1	3s	80% @ 1KHz	5	Vertical	A	
90° (left)	2000-2700	1	3s	80% @ 1KHz	5	Vertical	A	
180° (back)	2000-2700	1	3s	80% @ 1KHz	5	Vertical	A	
270° (right)	2000-2700	1	3s	80% @ 1KHz	5	Vertical	A	
0° (front)	2000-2700	1	3s	80% @ 1KHz	5	Horizontal	A	
90° (left)	2000-2700	1	3s	80% @ 1KHz	5	Horizontal	A	
180° (back)	2000-2700	1	3s	80% @ 1KHz	5	Horizontal	A	
270° (right)	2000-2700	1	3s	80% @ 1KHz	5	Horizontal	A	

EUT Angle	Frequency		Dwell time	Modulation	Level (V/m)	Antenna Polarization	EUT Status	Comments
	Range (MHz)	Steps %						
0° (front)	5100-6000	1	3s	80% @ 1KHz	3	Vertical	A	
90° (left)	5100-6000	1	3s	80% @ 1KHz	3	Vertical	A	
180° (back)	5100-6000	1	3s	80% @ 1KHz	3	Vertical	A	
270° (right)	5100-6000	1	3s	80% @ 1KHz	3	Vertical	A	
0° (front)	5100-6000	1	3s	80% @ 1KHz	3	Horizontal	A	
90° (left)	5100-6000	1	3s	80% @ 1KHz	3	Horizontal	A	
180° (back)	5100-6000	1	3s	80% @ 1KHz	3	Horizontal	A	
270° (right)	5100-6000	1	3s	80% @ 1KHz	3	Horizontal	A	

Additional Notes: A=criteria A, B=criteria B, C=criteria C

3.8.1 Test Setup Photo



3.9 Electrical Fast transients/burst immunity

3.9.1 Test Specification

Basic Standard:	EN 61000-4-4/ IEC EN61000-4-4 (details referred to Sec 1.2)
Signal & communication, process measurement & control ports Test Level:	+/- 2 kV
Battery referenced ports (except at the output of energy sources) Auxiliary a.c. power input ports (rated voltage ≤ 400 V rms)	+/- 2 kV
Rise Time:	5ns
Hold Time:	50ns
Repetition Frequency:	5KHz
Criteria:	A
Test Procedure	refer to ISL QA -T4-E-S9

Test Procedure

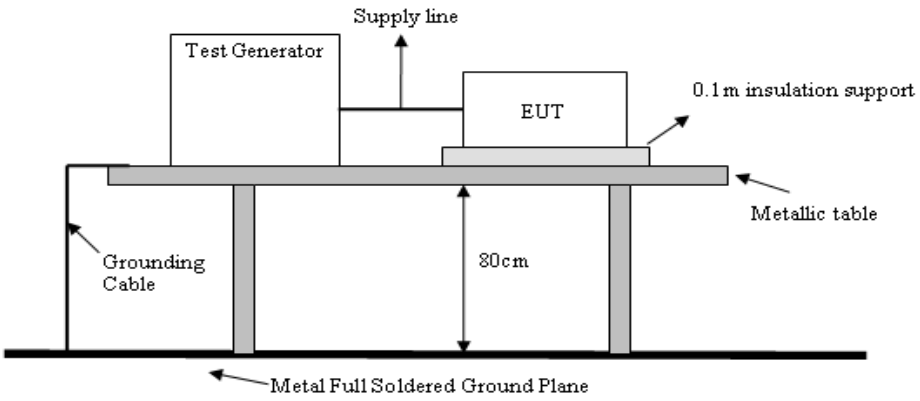
The EUT was setup on a nonconductive table 0.1 m above a reference ground plane.

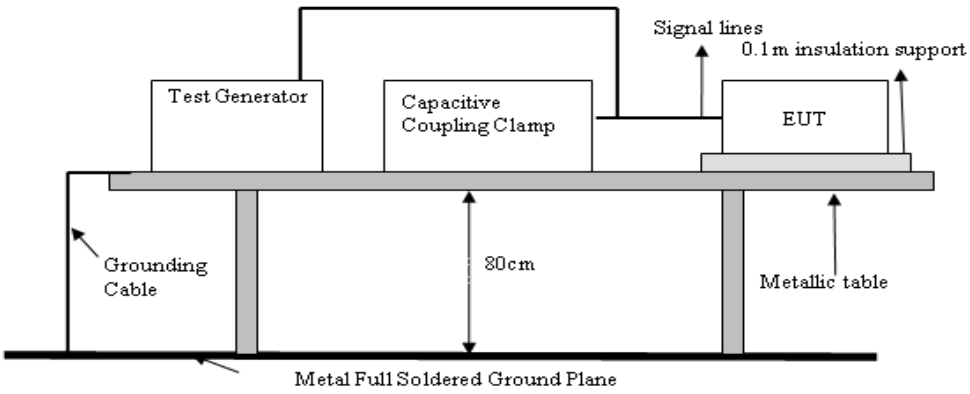
Test Points	Polarity	Result	Comment
Line	+	N	60 sec
	-	N	60 sec
Neutral	+	N	60 sec
	-	N	60 sec
Ground	+	N	60 sec
	-	N	60 sec
Line to Neutral	+	N	60 sec
	-	N	60 sec
Line to Ground	+	N	60 sec
	-	N	60 sec
Neutral to Ground	+	N	60 sec
	-	N	60 sec
Line to Neutral to Ground	+	N	60 sec
	-	N	60 sec
Capacitive coupling clamp	+	N	60 sec
	-	N	60 sec

Note: 'N' means normal, the EUT function is correct during the test.

3.9.2 Test Setup

EUT is at least 50cm from the conductive structure.





3.9.3 Test Result

Performance of EUT complies with the given specification.

3.10 Test Data: Configuration1

Basic Standard	EN 61000-4-4	Date
EUT Model Name	TEP 200-7218WIR-CMF	2019-02-15
Power		Engineer
Barometer Pressure	100.3kPa	Hasan Yu
Temperature	22℃	Equipment & Test Site
Humidity	59%	EM TEST (Model: UCS-500 M6B)
Voltage/Freq.	110Vdc	

A=criteria A, B=criteria B, C=criteria C

AC Power Port: ☐	DC Power Port: ☑	LAN Port: ☐	Telephone Port: ☐

DC Power Port

Line Under Test	Voltage Level	Severity Level	Pulse Polarity	Burst Repetition Rate	Test Duration	EUT Status	Comments
Line	2.0kV	3	+	300ms / 5.0kHz	1 Minutes	A	
Line	2.0kV	3	-	300ms / 5.0kHz	1 Minutes	A	
Neutral	2.0kV	3	+	300ms / 5.0kHz	1 Minutes	A	
Neutral	2.0kV	3	-	300ms / 5.0kHz	1 Minutes	A	
Line- Neutral	2.0kV	3	+	300ms / 5.0kHz	1 Minutes	A	
Line- Neutral	2.0kV	3	-	300ms / 5.0kHz	1 Minutes	A	

Additional Notes: A=criteria A, B=criteria B, C=criteria C

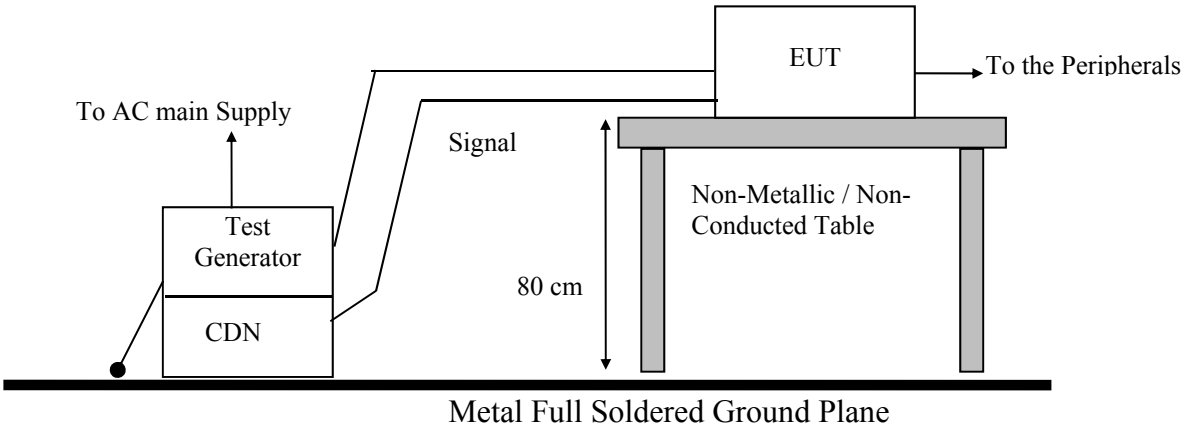
3.10.1 Test Setup Photo

3.11 Surge Immunity

3.11.1 Test Specification

Basic Standard:	EN 61000-4-5/ IEC EN61000-4-5 (details referred to Sec 1.2)
Battery referenced ports (except at the output of energy sources) Auxiliary a.c. power input ports (rated voltage ≤ 400 V rms)	Line to Line: 42 Ω, 0.5 μF +/- 0.5 kV, +/- 1 kV Line to Earth: 42 Ω, 0.5 μF +/- 0.5 kV, +/- 1 kV, +/- 2kV
Rise Time:	1.2us
Hold Time:	50us
Repetition Rate:	60 seconds, 5 time/each condition
Angle:	☒0° ☒90° ☒180° ☒270°
Criteria:	B
Test Procedure:	refer to ISL QA -T4-E-S10

3.11.2 Test Setup



3.11.3 Test Result

Performance of EUT complies with the given specification.

3.12 Test Data: Configuration1

Basic Standard	EN 61000-4-5	Date
EUT Model Name	TEP 200-7218WIR-CMF	2019-02-15
Power		Engineer
Barometer Pressure	100.3kPa	Hasan Yu
Temperature	22℃	Equipment & Test Site
Humidity	59%	EMC PARINER(Model:IMU-3000)
Voltage/Freq.	110Vdc	

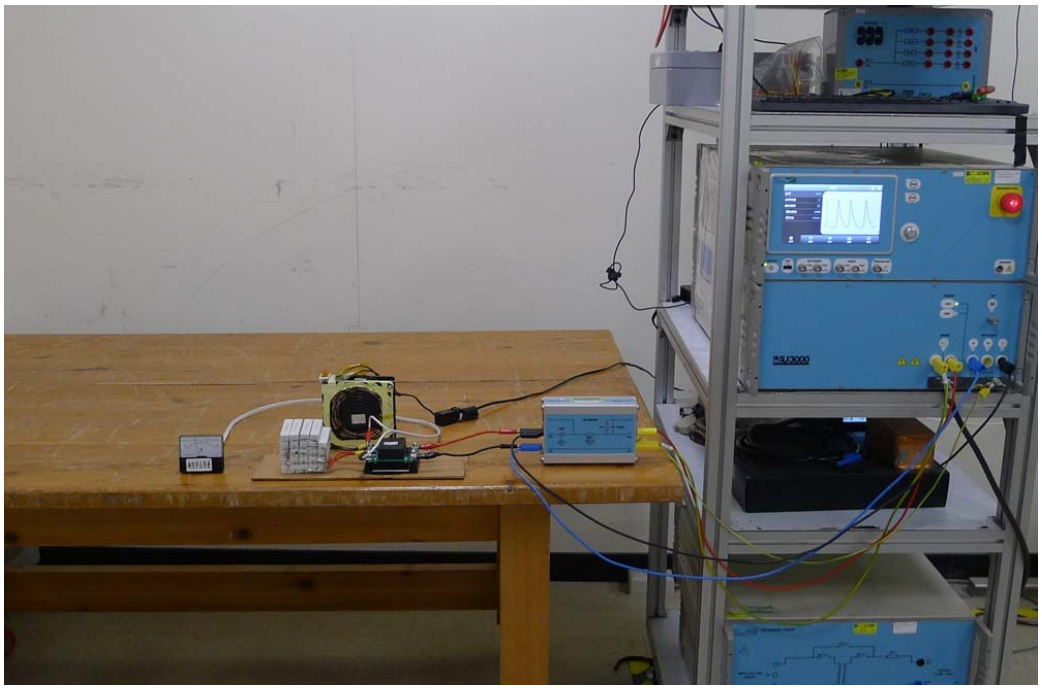
A=criteria A, B=criteria B, C=criteria C

AC Power Port: ☐	DC Power Port: ☑	LAN Port: ☐	Telephone Port: ☐

Line Under Test	Voltage	Level	Impedance	Repetition Rate	Cycle	Pulse Position	EUT Status	Comments
Line-Neutral	+ 0.5kV	1	42Ω	60 sec	5		A	
Line-Neutral	− 0.5kV	1	42Ω	60 sec	5		A	
Line- Neutral	+ 1.0kV	2	42Ω	60 sec	5		A	
Line- Neutral	− 1.0kV	2	42Ω	60 sec	5		A	
Line- Neutral	+ 2.0kV	2	42Ω	60 sec	5		A	
Line- Neutral	− 2.0kV	2	42Ω	60 sec	5		A	

Additional Notes: A=criteria A, B=criteria B, C=criteria C

3.12.1 Test Setup Photo

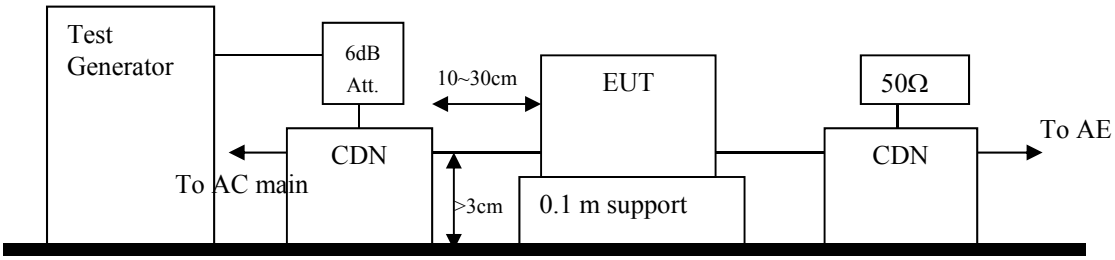


3.13 Immunity to Conductive Disturbance

3.13.1 Test Specification

Basic Standard:	EN 61000-4-6/ IEC EN61000-4-6 (details referred to Sec 1.2)
Battery referenced ports (except at the output of energy sources) Auxiliary a.c. power input ports (rated voltage ≤ 400 V rms)Test Level:	10 V
Signal & communication, process measurement & control ports Test Level:	10 V
Modulation:	AM 1KHz 80%
Frequency range:	0.15 MHz - 80MHz
Frequency Step:	1% of last Frequency
Dwell time:	3s
Criteria:	A
CDN Type:	CDN M2+M3, Clamp
Test Procedure	refer to ISL QA -T4-E-S11

3.13.2 Test Setup



3.13.3 Test Result

Performance of EUT complies with the given specification.

3.14 Test Data: Configuration1

Basic Standard	EN 61000-4-6				Date		
EUT Model Name	TEP 200-7218WIR-CMF				2019-02-15		
Power					Engineer		
Barometer Pressure	100.3kPa				Hasan Yu		
Temperature	22℃				Equipment & Test Site		
Humidity	59%				FRANKONIA (Model: CIT-10/75)		
Voltage/Freq.	110Vdc						
A=criteria A, B=criteria B, C=criteria C							
DC Power Port							
Line Under Test	Frequency		Level	Modulation	Dwell time	EUT Status	Comments
	Range (MHz)	Steps %					
DC Power Port	0.15 to 80	1	10V	80% @ 1kHz	3s	A	
Additional Notes: A=criteria A, B=criteria B, C=criteria C							

3.14.1 Test Setup Photo

4. Environmental Tests

4.1 Low temperature start-up test

4.1.1 Test Ambience

Temperature:25℃
Humidity: 53% ± 6%

4.1.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.4

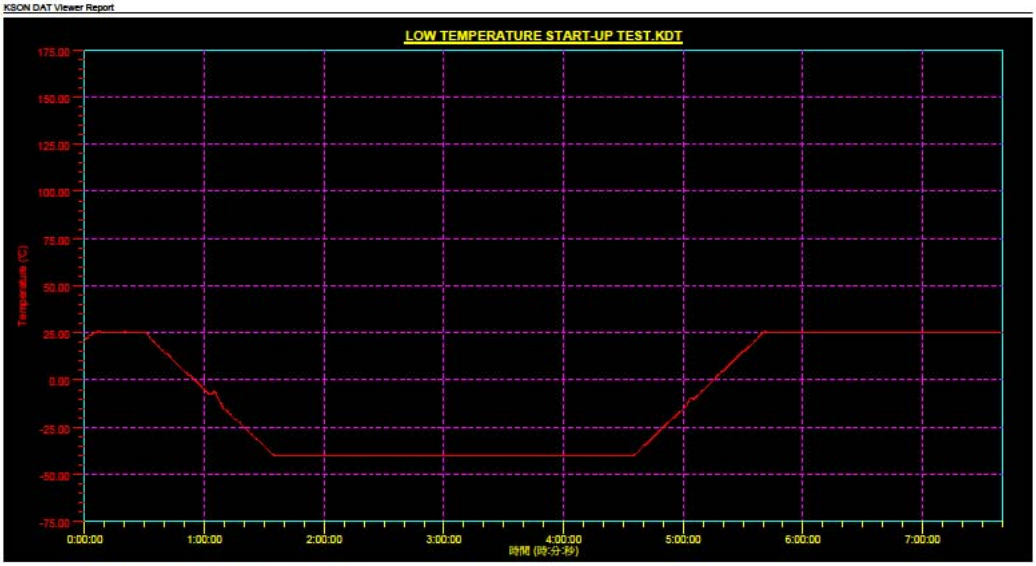
4.1.3 Test Condition

Temperature: -40℃, test 2 hours.
Performance Check: The performance check was carried out before and after the cooling test.

4.1.4 Test Result

A. Photo of test Setup was shown in 4.1.5
B. Testing data were shown as below
C. Test specimen was visually inspected after test. No physical damage occurred.
D. The function of specimen was normal during and after the cooling test.
E. According to test result, the specimen passed the EN 50155 sub-clause 13.4.4 Low temperature start-up test.

KSON DAT Viewer Report



檔案名稱: G:\Low temperature start-up test.kdt

時間範圍: 10:36:54 03/11/2019 - 18:16:54 03/11/2019
時間範圍: 0:00:00 - 7:40:00

Y軸:
Temperature('C) -75.000 ~ 175.000

曲線:
1. Temperature('C)

11:15:33 Wednesday, March 20, 2019 Page 1/1

4.1.5 Test Setup Photo

4.2 Dry Heat Test

4.2.1 Test Ambience

Temperature:25℃
Humidity: 53% ± 6%

4.2.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.5

4.2.3 Test Condition

Temperature: 70℃ at 6 hours and 70℃ at 6 hours + 85℃(70℃+15℃) at 10min
6 hours at 70℃ and rises 15 °C 10 min after 6 hours at 70℃.
Performance Check:
The performance check was carried out before, during and after the Dry Heat Test.

4.2.4 Test Result

A. Photo of test Setup was shown in 4.1.5.
B. The EN 50155 table 1/Class OT4 Dry heat testing data were shown in Figure 1.
C. The EN 50155 table2/Class ST1 Dry heat with switch-on extended operating temperature testing data were shown in Figure 2.
D. Test specimen was visually inspected after test. No physical damage occurred.
E. The function of specimen was normal during and after the Dry heat test.
F. According to test result, the specimen passed the EN 50155 sub-clause 13.4.5 Dry heat test.

Figure 1: Dry Heat Test Record

Figure 2: Dry Heat Test Record

4.3 Cyclic Damp Heat Test

4.3.1 Test Ambience

Temperature: 25℃
Humidity: 53% ± 6%

4.3.2 Test Procedure

Test Procedures were referred to EN 50155 sub-clause 13.4.7

4.3.3 Test Condition

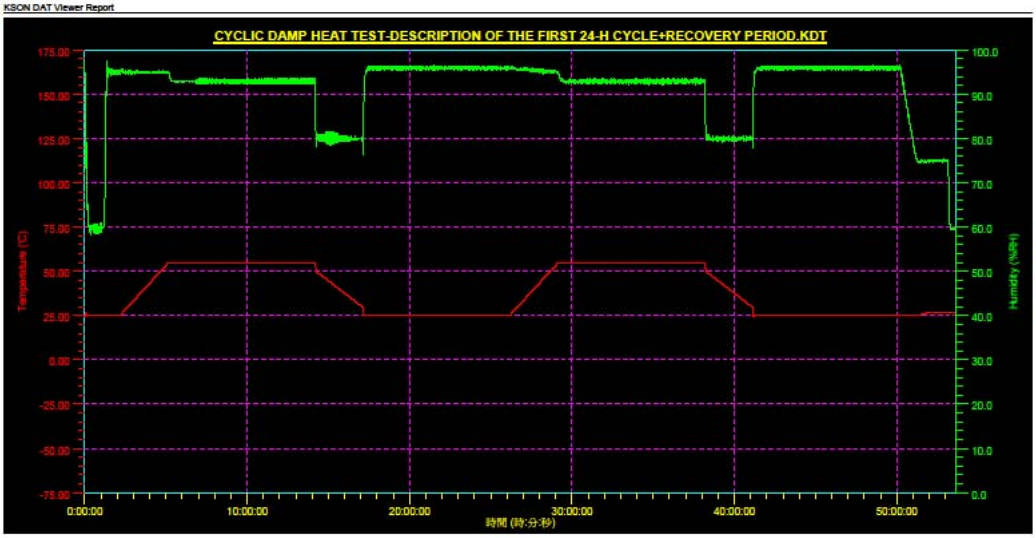
Temperature / Humidity:
55℃ and 25℃, 95%±5%RH without condensation, 48 hours.
Performance Check:
The performance check was carried out before and after the Damp Heat Test.

4.3.4 Test Result

A. Photo of test Setup was shown in 4.1.5.
B. The testing data were shown as below.
C. Test specimen was visually inspected after test. No physical damage occurred.
D. The function of specimen was normal during and after the Damp heat test.
E. According to test result, the specimen passed the EN 50155 ch.13.4.7 Cyclic damp heat test.

Dry Heat Test Record

KSON DAT Viewer Report



檔案名稱: G:\Cyclic damp heat test-Description of the first 24-h cycle+Recovery period.kdt

時間範圍: 05:00:01 03/14/2019 - 10:40:01 03/16/2019
時間範圍: 0:00:00 - 53:40:00

Y軸:
Temperature('C) -75.000 ~ 175.000
Humidity(%RH) 0.00 ~ 100.00

曲線:
1. Temperature('C)
2. Humidity(%RH)

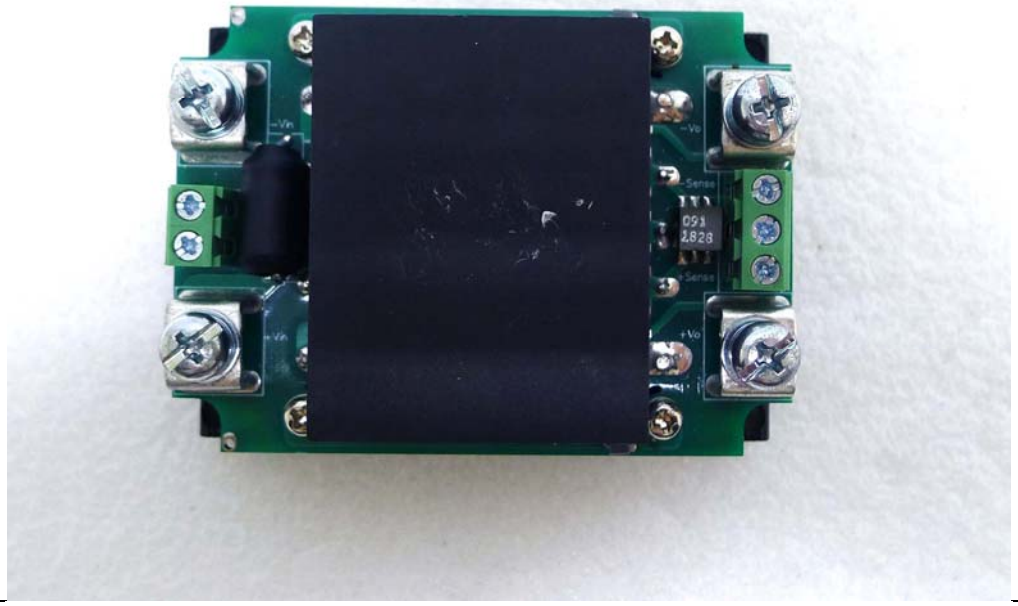
11:12:43 Wednesday, March 20, 2019 Page 1/1

Visual inspection requirement:

The visual inspection shall be carried out to ensure that the equipment is of sound construction and, so far as can be ascertained, meets its specified requirements.
A visual inspection shall also be carried out after a type test has been performed to check whether any damage or deterioration has occurred resulting from the tests.

Inspection item	Result
EUT outside	OK
EUT function	OK

After test：



Insulation Test Requirement after first run:

1.Insulation measurement Test :

The insulation resistance test shall be carried out at 500 Vdc and the values recorded.
The test shall then be repeated after the voltage withstand test.
There shall be no fundamental deterioration from the initial measurement.

Test item	Test Time	Insulation measurement test		Comments
		before withstand	after withstand	
Primary side to secondary side	1 min	50GΩ	50GΩ	Pass

2.Voltage Withstand test

500Vac or 750Vdc for nominal battery voltages below 72 Vdc (or 50 Vac).
1000Vac or 1500Vdc for nominal battery voltage from 72Vdc up to 125Vdc, (or from 50 to 90 Vac), and
1500Vac or 2200Vdc for nominal battery voltage above 125Vdc and up to 315Vdc, (or from 90 to 225 Vac).
Neither disruptive discharge nor flashover shall occur

Test item	Test Voltage	Test Time	Result	Comments
Primary side to secondary side	1500Vdc	1 min	0.01mA	Pass

Insulation Test Requirement after second run:

1.Insulation measurement Test :

The insulation resistance test shall be carried out at 500 Vdc and the values recorded.
The test shall then be repeated after the voltage withstand test.
There shall be no fundamental deterioration from the initial measurement.

Test item	Test Time	Insulation measurement test		Comments
		before withstand	after withstand	
Primary side to secondary side	1 min	49.3GΩ	37.6GΩ	Pass

2.Voltage Withstand test

500Vac or 750Vdc for nominal battery voltages below 72 Vdc (or 50 Vac).
1000Vac or 1500Vdc for nominal battery voltage from 72Vdc up to 125Vdc, (or from 50 to 90 Vac), and
1500Vac or 2200Vdc for nominal battery voltage above 125Vdc and up to 315Vdc, (or from 90 to 225 Vac).
Neither disruptive discharge nor flashover shall occur

Primary side to secondary side	1500Vdc	1 min	0.01mA	Pass

4.4 Functional random Vibration Test

4.4.1 Test Specification and / or standard:

EN61373:2010

4.4.2 Testing Equipment:

Vibration & Shock Environmental Equipment KD-9363EM-1000F2K-50N250
Max. force：1000 kgf-peak / 250 kgw Loading
Max. displacement：50 mm p-p
Max. acceleration：55 g
Frequency range：2 to 2000 Hz
Calibrate trace code：VS-CV-050930-02

4.4.3 Test Condition and procedure:

Test Condition:

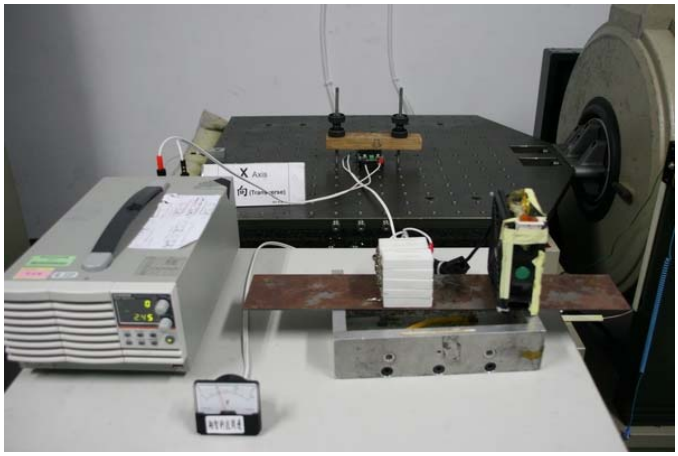
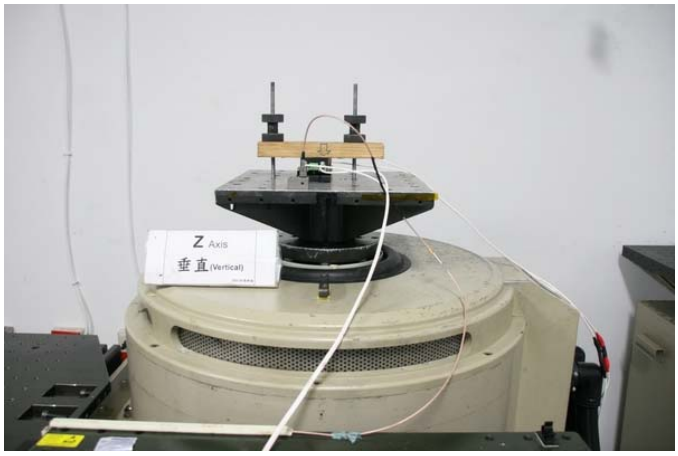
	Category	Orientation	RMS m/s^2
☐	1 Class A Body mounted	Vertical Transverse Longitudinal	0.75 0.37 0.5
☒	1 Class B Body mounted	Vertical Transverse Longitudinal	1.01 0.45 0.7
☐	2 Bogie mounted	Vertical Transverse Longitudinal	5.4 4.7 2.5
☐	3 Axle mounted	Vertical Transverse Longitudinal	38.0 34.0 17.0

Test Procedure:
A. Check out samples.
B. Place the test samples on the vibration table in its normal operating orientation and configuration.
C. Set test conditions and start to test.
D. Finish testing, check out samples and prepare final report.

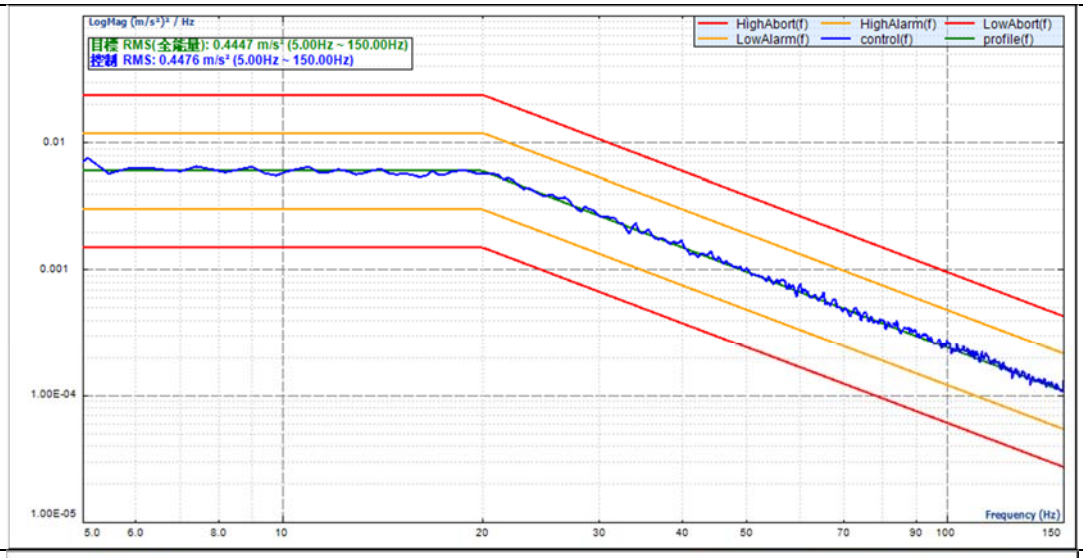
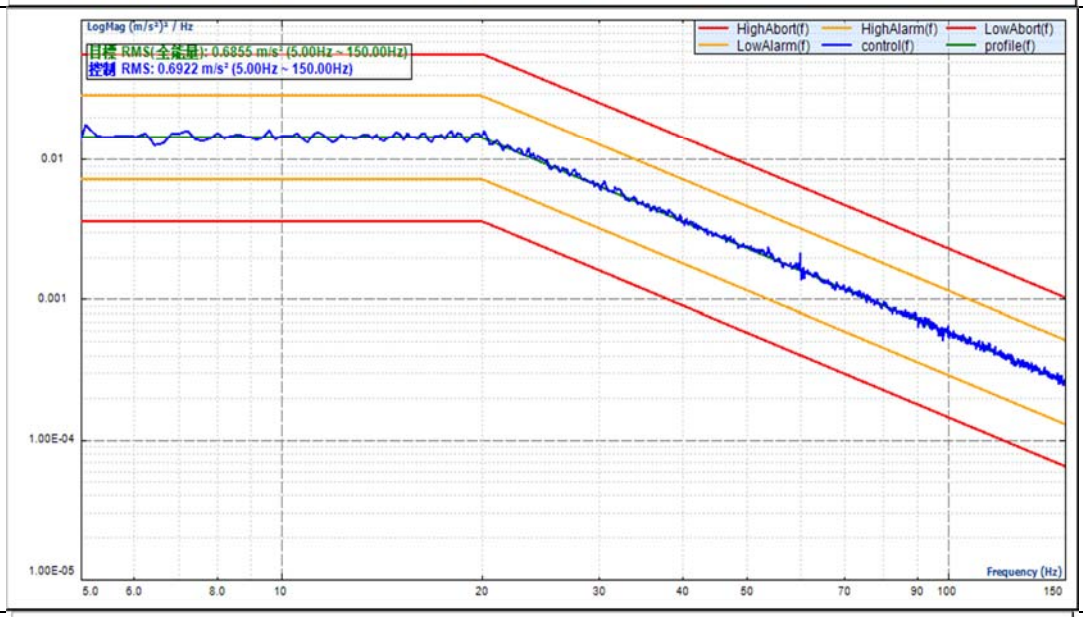
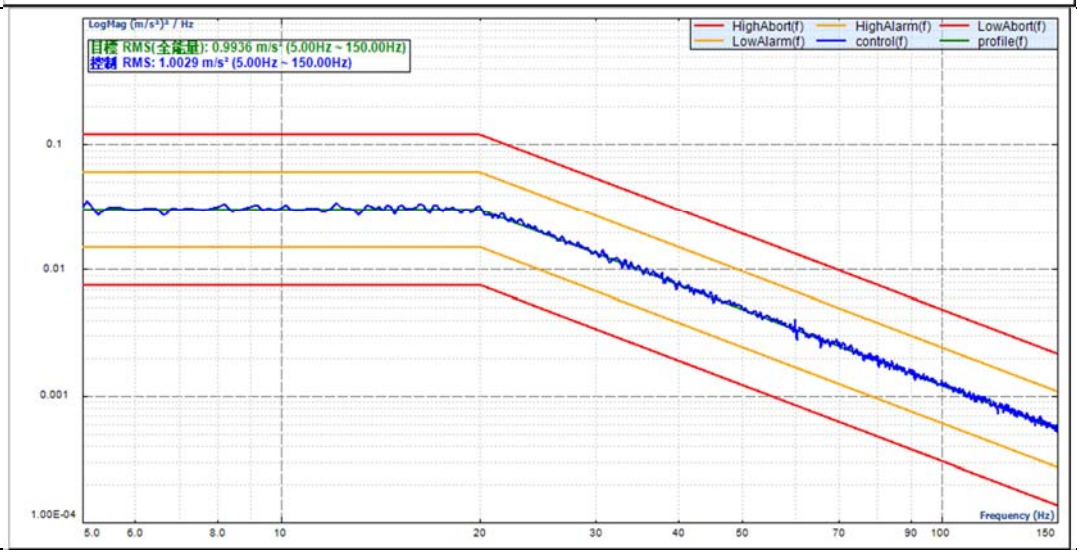
4.4.4 Test Result

Visual inspection and electrical measurement are to be done by customer.

4.4.5 Test Setup Photo

Transverse X Axis	Longitudinal Y Axis
	
Vertical **Z Axis**	
	

4.4.6 Test Profile:

XAxis	
YAxis	
ZAxis	

4.5 Simulated long-life testing at increased Random Vibration Test

4.5.1 Test Specification and/or standard:

EN61373:2010

4.5.2 Testing Equipment:

Vibration & Shock Environmental Equipment KD-9363EM-1000F2K-50N250
Max. force: 1000 kgf-peak / 250 kgw Loading
Max. displacement: 50 mm p-p
Max. acceleration: 55 g
Frequency range: 2 to 2000 Hz
Calibrate trace code：VS-CV-050930-02

4.5.3 Test Condition and procedure:

Test Condition:

	Category	Orientation	RMS 5 h test period m/s^2
☐	1 Class A Body mounted	Vertical Transverse Longitudinal	4.25 2.09 2.83
☒	1 Class B Body mounted	Vertical Transverse Longitudinal	5.72 2.55 3.96
☐	2 Bogie mounted	Vertical Transverse Longitudinal	30.6 26.6 14.2
☐	3 Axle mounted	Vertical Transverse Longitudinal	144 129 64.3

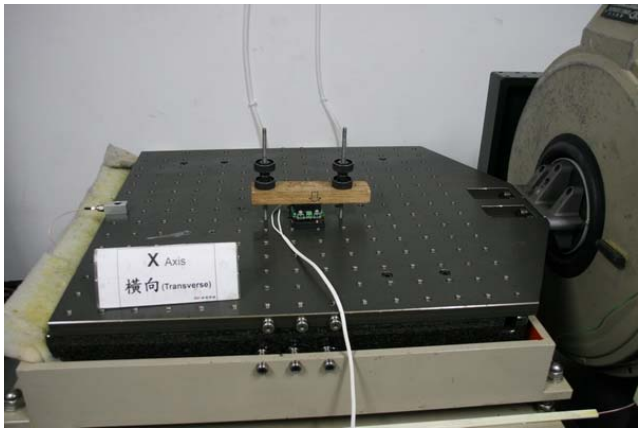
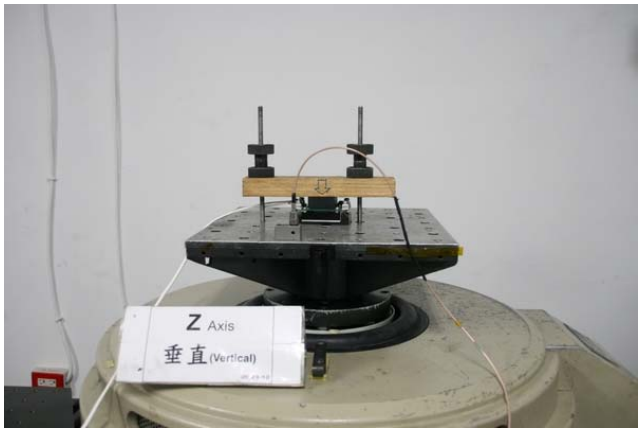
Test Procedure:

A. Check out samples.
B. Place the test samples on the vibration table in its normal operating orientation and configuration.
C. Set test conditions and start to test.
D. Finish testing, check out samples and prepare final report.

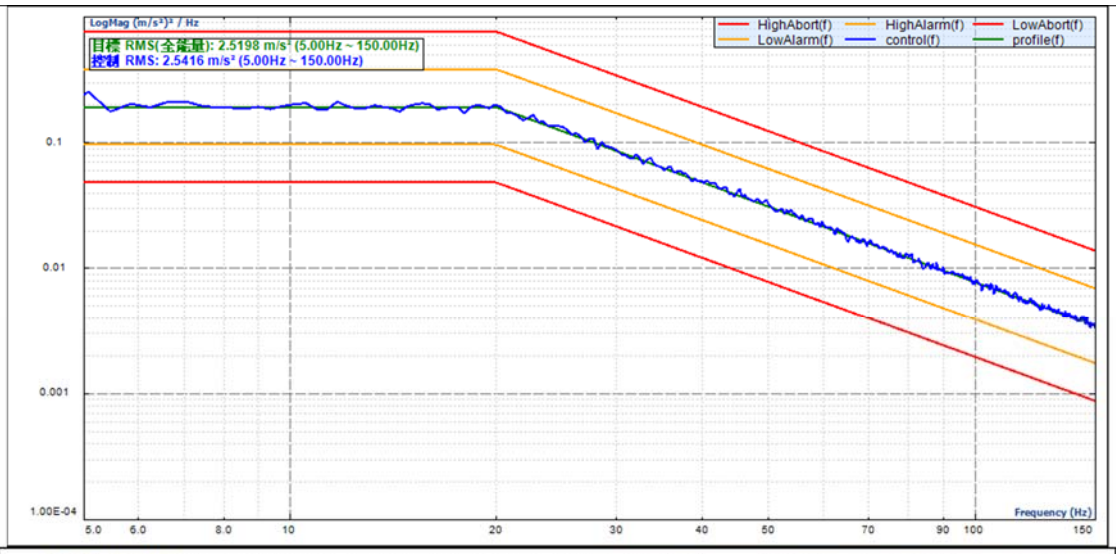
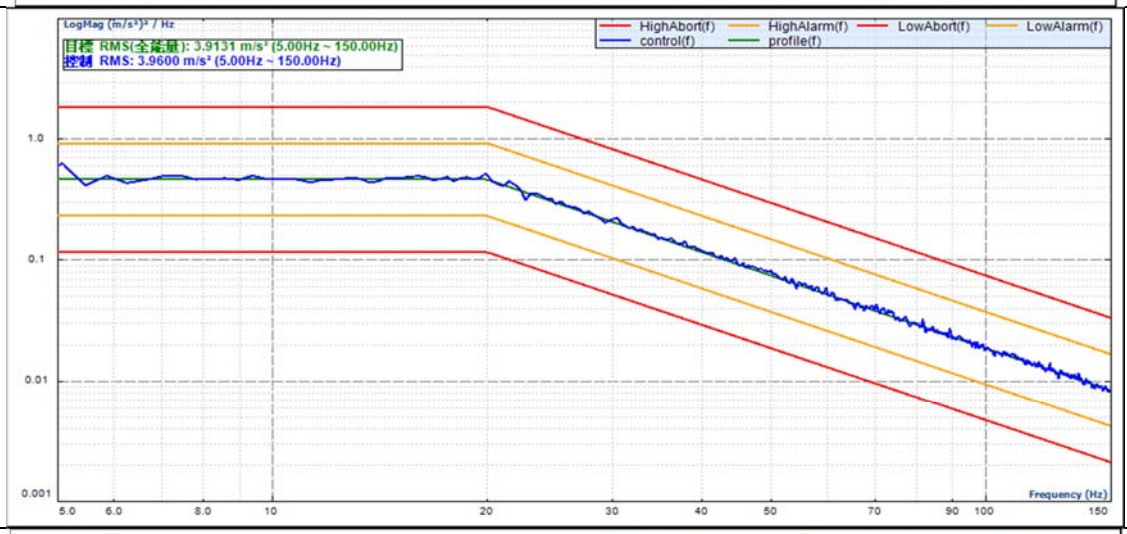
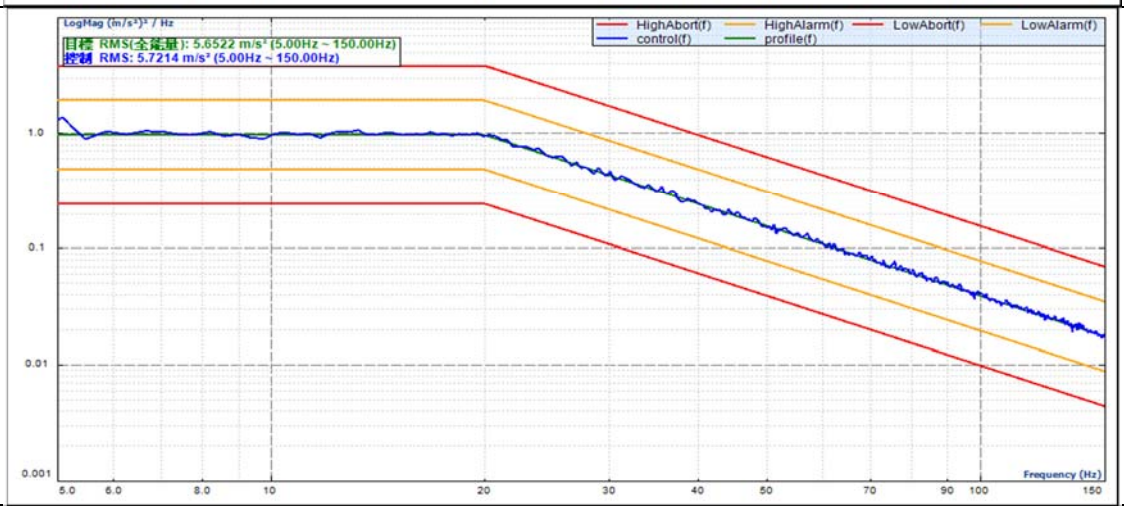
4.5.4 Test Result

Visual inspection and electrical measurement are to be done by customer.

4.5.5 Test Setup Photo

Transverse **X Axis**	
Longitudinal **Y Axis**	
Vertical **Z Axis**	

4.5.6 Test Profile:

X Axis	
Y Axis	
Z Axis	

4.6 Shock Test

4.6.1 Test Specification and/or standard:

EN61373:2010

4.6.2 Testing Equipment:

Vibration & Shock Environmental Equipment KD-9363EM-1000F2K-50N250
Max. force：1000 kgf-peak / 250 kgw Loading
Max. displacement：50 mm p-p
Max. acceleration：55 g
Frequency range：2 to 2000 Hz
Calibrate trace code：VS-CV-050930-02

4.6.3 Test Condition and procedure:

Test Condition:

	Category	Orientation	Peak acceleration A m/s^2	Nominal duration D ms
☒	1 Class A and Class B Body mounted	Vertical Transverse Longitudinal	30 30 50	30 30 30
☐	2 Bogie mounted	Vertical Transverse Longitudinal	300	18
☐	3 Axle mounted	Vertical Transverse Longitudinal	1000	6

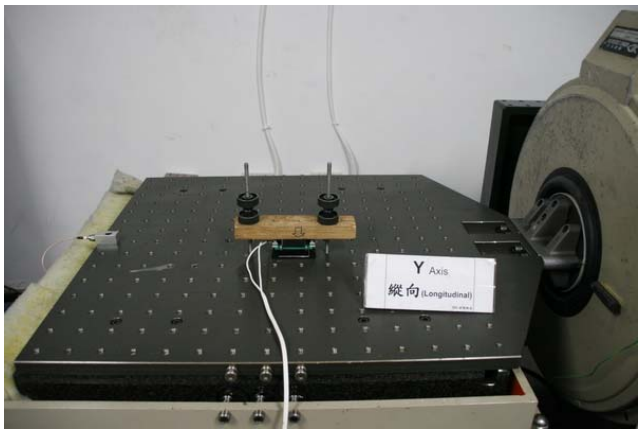
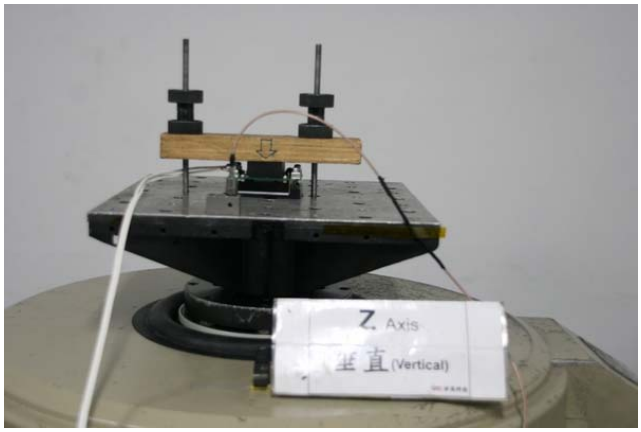
Test Procedure:

A. Check out samples.
B. Place the test samples on the vibration table in its normal operating Orientation and configuration.
C. Set test conditions and start to test.
D. Finish testing, check out samples and prepare final report.

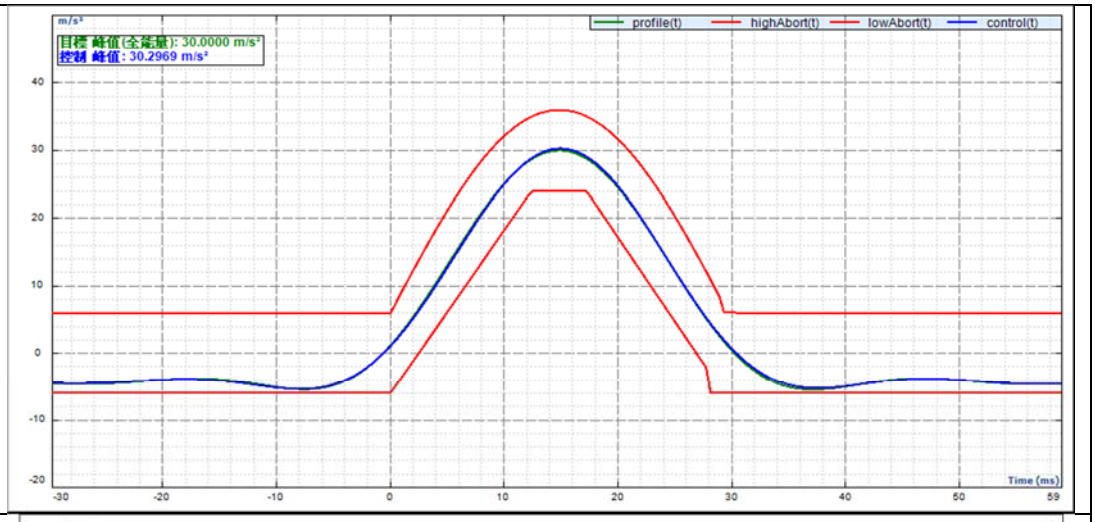
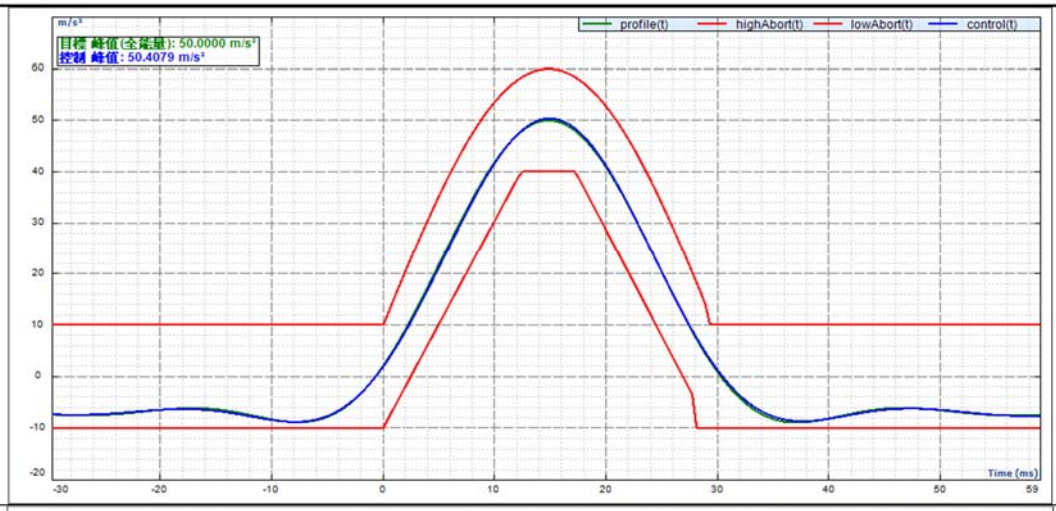
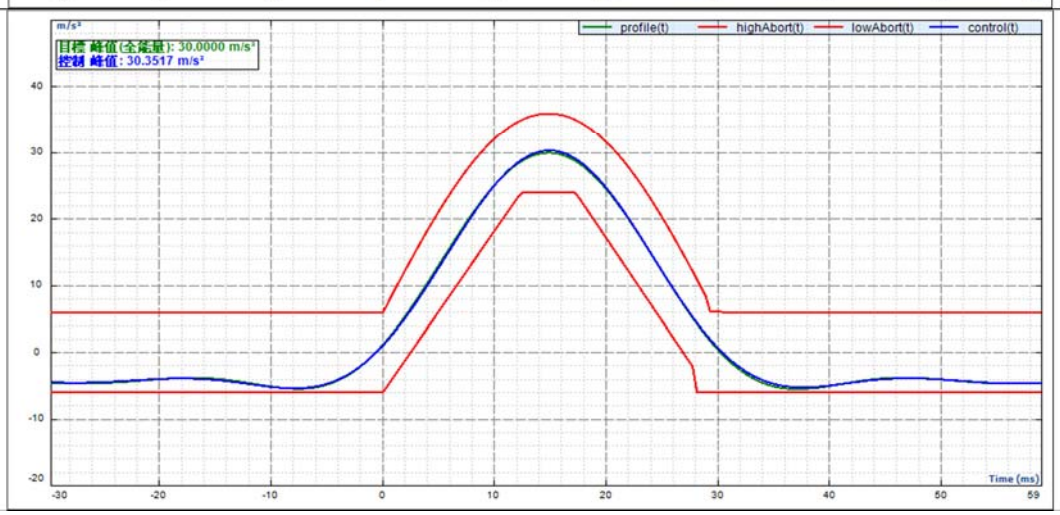
4.6.4 Test Result

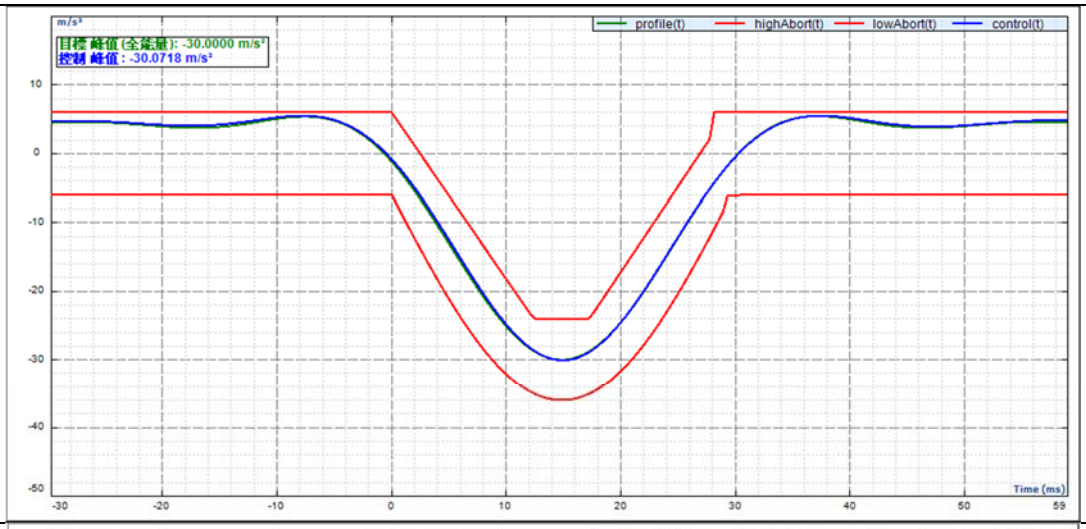
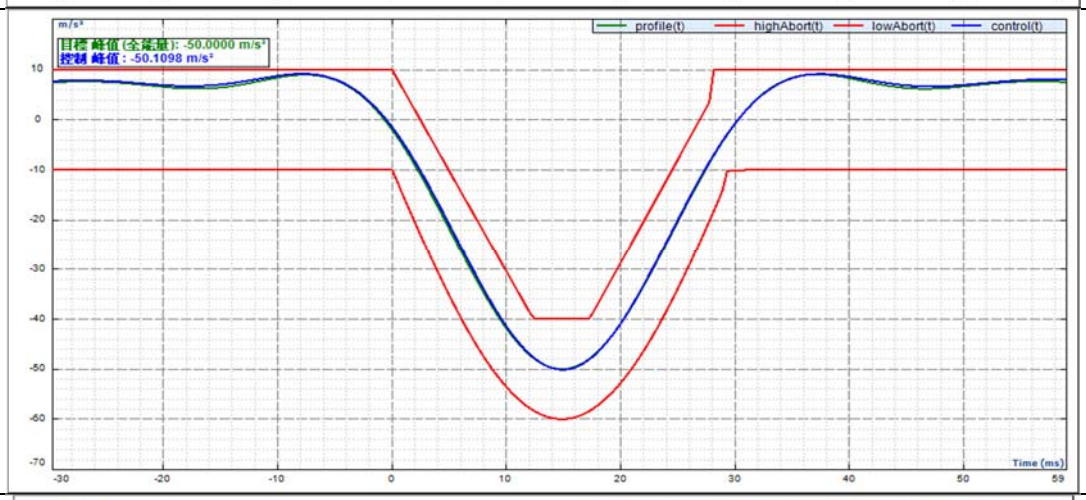
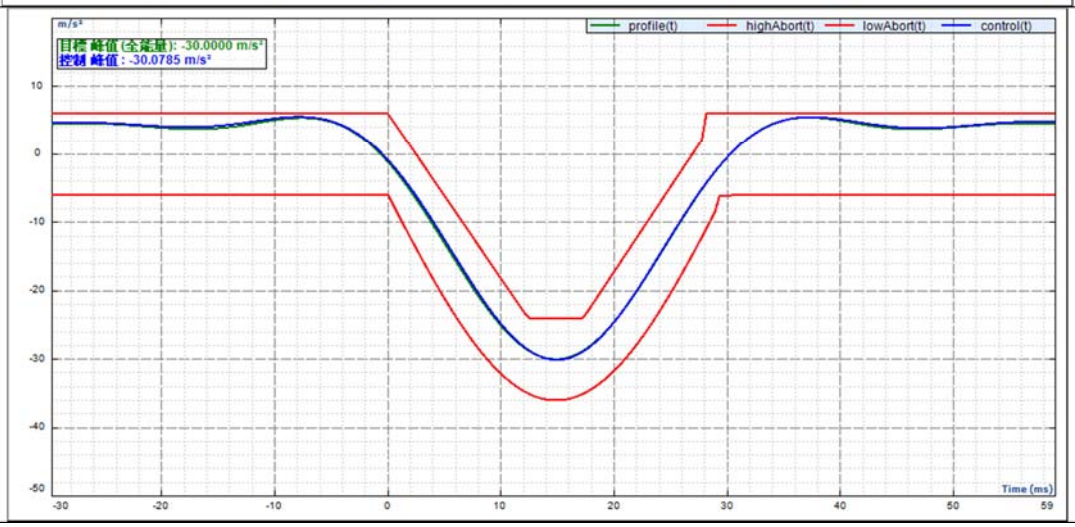
Visual inspection and electrical measurement are to be done by customer.

4.6.5 Test Setup Photo

Transverse **+/- X Axis**	
Longitudinal **+/- Y Axis**	
Vertical **+/- Z Axis**	

4.6.6 Test Profile

+X	
+Y	
+Z	

-X	 m/s² 目標 峰值(全能量): -30.0000 m/s² 控制 峰值 : -30.0718 m/s² profile(t) highAbort(t) lowAbort(t) control(t) Time (ms)
-Y	 m/s² 目標 峰值(全能量): -50.0000 m/s² 控制 峰值 : -50.1098 m/s² profile(t) highAbort(t) lowAbort(t) control(t) Time (ms)
-Z	 m/s² 目標 峰值(全能量): -30.0000 m/s² 控制 峰值 : -30.0785 m/s² profile(t) highAbort(t) lowAbort(t) control(t) Time (ms)

5. Appendix

5.1 Appendix A: Test Equipment

5.1.1 Test Equipment List

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
EN 50155 13.4.3	Power Source_01	EMTEST	Netwave 7-400	P1453146268	09/29/2017	03/29/2019
EN 50155 13.4.4	Temperature chamber	King San	THS-B4T-150	5290K	11/30/2018	11/30/2019
EN 50155 13.4.5	Temperature chamber	King San	THS-B4T-150	5290K	11/30/2018	11/30/2019
EN 50155 13.4.6	Temperature chamber	King San	THS-B4T-150	5290K	11/30/2018	11/30/2019
EN 50155 13.4.9	Programmable Auto safety tester	Chroma ATE INC.	9056	905600000072	08/07/2018	08/07/2019
EN 50155 13.4.11	Standard Electromagnetic Vibrator	KDI	KD-9363EM-1000F2K-50N250	KD-9363EM-1000F2K-50N250	04/11/2018	04/11/2019

Location Con03	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conduction 03	EMI Receiver 11	ROHDE & SCHWARZ	ESCI	100568	07/26/2018	07/26/2019
Conduction 03	ISN T4 06	Teseq GmbH	ISN T400A	28574	09/14/2018	09/14/2019
Conduction 03	ISNT8 09	Teseq GmbH	ISN T800	36190	09/14/2018	09/14/2019
Conduction 03	LISN 19	R&S	ENV216	101425	08/07/2018	08/07/2019
Conduction 03	LISN 08	FCC	FCC-LISN-50/250-25-2-01	07039	08/22/2018	08/22/2019
Conduction 03	Conduction 03 -1 Cable	WOKEN	CFD 300-NL	Conduction 03 -1	08/30/2018	08/30/2019
Conduction 03	Capacitive Voltage Probe	FCC	F-CVP-1	68	03/07/2018	03/07/2019
Conduction 03	Current Probe	SCHAFFNER	SMZ 11	18030	03/07/2018	03/07/2019

Location Chamber02	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Radiation (Chamber02)	BILOG Antenna 17	Schwarzbeck	Schwarzbeck VULB 9168+EMCI-N-6-05	645	03/02/2018	03/02/2019
Radiation (Chamber02)	Preamplifier 25	EMCI	EMC9135	980295	03/05/2018	03/05/2019
Radiation (Chamber02)	Coaxial Cable Chmb 02-10M-02	EMC	RG214U	Chmb 02-10M-02	08/30/2018	08/30/2019
Radiation (Chamber02)	EMI Receiver 12	ROHDE & SCHWARZ	ESCI	100804	08/21/2018	08/21/2019

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
EN61K-4-2	ESD Gun 12	EM TEST	Dito	P1650188689	04/27/2018	04/27/2019
EN61K-4-3	Broadband Log-Periodic Antenna	AR	AT1080	310698	N/A	N/A
EN61K-4-3	Horn Antenna RF-01	SCHWARZBACK	GSTL9194	9194-167	N/A	N/A
EN61K-4-3	Horn Antenna RF-01	AR	ATS700M11G	0335864	N/A	N/A
EN61K-4-3	Amplifier 80Mz~1GHz 750W	AR	750W1000	0344168	N/A	N/A
EN61K-4-3	Amplifier 1MHz~3.1GHz 50W	Teseq GmbH	CBA 3G-050	T44181	N/A	N/A
EN61K-4-3	Amplifier 4.0~8.0GHz 35W	AR	35S4G8AM1	0335752	N/A	N/A
EN61K-4-3	Broadband Coupler 80M~1GHz	Amplifier Research	DC6280AM1	0341831	N/A	N/A
EN61K-4-3	Coaxial Cable	INSULATED	NPS-4806-2360-NP3	108599.003.01.03	N/A	N/A
EN61K-4-3	Broadband Coupler 0.8G~4.26GHz	Mismatch Tolerant	C6187-10	98459	N/A	N/A
EN61K-4-3	Broadband Coupler 4G~8GHz	AR	DC7350A	0335817	N/A	N/A
EN61K-4-3	Signal Generator 07	ROHDE& SCHWARZ	SMB100A	107780	10/28/2018	10/28/2019
EN61K-4-4	EFT and SURGE Test System	EM TEST	UCS-500 M6B	V0728102674	02/06/2018	02/06/2019
EN61K-4-4	Capacitive Coupling Clamp	EM TEST	HFK	0907-106	02/06/2018	02/06/2019
EN61K-4-5	SURGE-TESTER	EMC Partner	IMU3000	1547	08/10/2017	02/10/2019
EN61K-4-6	CDN M2+M3 02	Frankonia	CDN M2+M3	A3011024	08/20/2018	08/20/2019
EN61K-4-6	Coaxial Cable 4-6 02-1			4-6 02-1	N/A	N/A
EN61K-4-6	Conducted Immunity Test System 02	Frankonia	CIT-10-75-DC	126B1301/2014	03/12/2018	03/12/2019

PS: N/A => The equipment does not need calibration.

**Software for Controlling Spectrum/Receiver and Calculating Test Data

Test Item	Filename	Version
EN61000-4-2	N/A	2.0
EN61000-4-3	i2	4.130102k
EN61000-4-4	EMC TEST	4.10
EN61000-4-5	EMC Partner	1.69
EN61000-4-6	FRANKONIA CD-LAB	V5.221

Site	Filename	Version	Issue Date
Conduction/Radiation	EZ EMC	ISL-03A2	3/6/2013

5.2 Appendix B: Uncertainty of Measurement

The measurement uncertainty refers to CISPR 16-4-2. The coverage factor k = 2 yields approximately a 95 % level of confidence.

<Conduction 03>
AMN: ±2.90dB
ISN T2: ±3.04dB
ISN T4: ±3.05dB
ISN T8: ±3.05dB
CVP: ±3.62dB
CP: ±2.88dB

<Chamber 02 (10M)>
Horizontal
30MHz~200MHz: ±4.69dB
200MHz~1000MHz: ±4.30dB
Vertical
30MHz~200MHz: ±4.65dB
200MHz~1000MHz: ±4.35dB

<Immunity 02>

Test item	Uncertainty
EN 61000-4-2 (ESD)	
Rise time tr	≦ 15%
Peak current Ip	≦ 6.3%
current at 30 ns	≦ 6.3%
current at 60 ns	≦ 6.3%
EN 61000-4-3 (RS)	± 2.19dB
EN 61000-4-4 (EFT)	
voltage rise time (tr)	± 6.2%
peak voltage value (VP)	± 8.6%
voltage pulse width (tw)	± 5.9%
EN 61000-4-5 (Surge)	
open-circuit voltage front time	±1.2μs
open-circuit voltage peak value	±8.6%
open-circuit voltage duration (Td)	±50.7μs
EN 61000-4-6 (CS)	
CDN	± 1.36dB
EM Clamp	± 3.19dB

5.3 Appendix C: Photographs of EUT

Please refer to the File of **ISL-*19LE156*P-MA**