

ECOFLOW INC.

CE TEST REPORT

SCOPE OF WORK:

Article 3.1b of RE directive (2014/53/EU) – EMC report

Model:
EFG200

REPORT NUMBER
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Report no. 220500957HZH-003

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Manufacturing site : Chongqing Rato Technology Co., Ltd.
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Summary

The equipment complies with the requirements according to the following standard(s) or Specification:

EN 301 489-1 V2.2.3: ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility

EN 301 489-17 V3.2.4: ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility

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Revision History

Report No.	Version	Description	Issued Date
220500957HZH-003	Rev. 01	Initial issue of report	July 18, 2022

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Conducted emission on DC power input/output ports	NA	
Conducted emission on AC power input/output ports	NA	
Conducted emission on wired network ports	NA	<i>There's no wired network ports</i>
Radiation emission	Pass	
Harmonic current emission	NA	
Voltage fluctuations and flicker	NA	
Electrostatic discharge	Pass	
Radio frequency electromagnetic field	Pass	
Fast transients, common mode	Pass	
Surges	Pass	
Radio frequency, common mode	Pass	
Voltage dips and interruptions	NA	
Transients and surges in the vehicular environment	NA	<i>The product is not intended for vehicular use</i>

Notes: 1: NA =Not Applicable

2. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3. Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name	: Low Power Generating sets (Ecoflow Smart Generator Dual Fuel)
Type/Model	: EFG200
Description of EUT	: This machine is portable gasoline and LPG engine driven generator with AC 230V, 50Hz output and DC max. 58,8V output. The EUT include the WIFI module and Bluetooth module which can be controlled by App. We test it and the worst testing data is listed in the report as representative.
Rating	: 1,8kW(Gasoline)/1,6kW(LPG), Max. 1,9kW(Gasoline)/1,7kW(LPG), CosΦ=1,0 / DC42-58,8V, 32A
Brand name	: EcoFlow
EUT for	: <input type="checkbox"/> Fixed use <input type="checkbox"/> vehicular use <input checked="" type="checkbox"/> portable use
EUT used in	: <input type="checkbox"/> telecommunication centres and industrial environment <input checked="" type="checkbox"/> other environment
EUT type	: <input type="checkbox"/> Table-top <input checked="" type="checkbox"/> Floor standing
Hardware version	: /
Software version	: /
Port identification	: Input port and output port
Cable supplied	: Refer to the user's manual
Sample received date	: May 28, 2022
Date of test	: June 01-26, 2022

1.2 Description of Test Facility

Name : Intertek Testing Services Shanghai
Address : Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone : 86 21 61278200
Telefax : 86 21 54262353

The test facility is : CNAS Accreditation Lab
recognized, certified, Registration No. CNAS L0139
or accredited by these FCC Accredited Lab
organizations Designation Number: CN0175
IC Registration Lab
CAB identifier.: CN0051
VCCI Registration Lab
Registration No.: R-14243, G-10845, C-14723, T-12252
A2LA Accreditation Lab
Certificate Number: 3309.02



Name : Intertek Testing Services Zhejiang Ltd.
Address : Building No. 2, Juanhu Science and Technology Innovation Park,
No. 500 Shuiyueting East Road, Haining City, Zhejiang Province, China
Telephone : +86 573 8713 7201

The test facility is : CNAS Accreditation Lab
recognized, certified, Registration No. CNAS L13980
or accredited by these organizations

2 TEST SPECIFICATIONS

2.1 Normative references

CENELEC EN 55032 (2015): "Electromagnetic compatibility of multimedia equipment - Emission Requirements".

CENELEC EN 61000-4-2 (2009): "Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test".

CENELEC EN 61000-4-3 (2006), A1 (2008) and A2 (2010): "Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test".

CENELEC EN 61000-4-4 (2012): "Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test".

CENELEC EN 61000-4-5 (2006): "Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test".

CENELEC EN 61000-4-6 (2009): "Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields".

CENELEC EN 61000-4-11 (2004): "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests".

CENELEC EN 61000-3-2 (2014): "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)".

CENELEC EN 61000-3-3 (2013): "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection".

CISPR 25 (2nd Edition 2002) and COR1 (2004): "Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices - Limits and methods of measurement".

ISO 7637-2 (2004): "Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only".

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

2.3 Test peripherals used

Item No	Description	Band and Model	S/No
1	-	-	-

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)
Conducted emission on DC power input/output ports	NA	NA	/
Conducted emission on AC power input/output ports	NA	NA	/
Conducted emission on wired network ports	NA	NA	/
Radiation emission	25	52	/
Harmonic current emission	NA	NA	/
Voltage fluctuations and flicker	NA	NA	/
Electrostatic discharge	24	55	100.8
Radio frequency electromagnetic field	24	55	/
Fast transients, common mode	24	55	/
Surges	24	55	/
Radio frequency, common mode	24	55	/
Voltage dips and interruptions	NA	NA	/
Transients and surges in the vehicular environment	NA	NA	NA

Notes: NA =Not Applicable

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2.5 Instrument list

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal No.	Due Date
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde&Schwarz	ESR7	EZ6331-1	2023-02-21
<input checked="" type="checkbox"/>	Spectrum Analyzer	Rohde&Schwarz	FSV3044	EZ6331-2	2023-02-21
<input checked="" type="checkbox"/>	Bilog Antenna	ETS-Lindgren	3143B	EZ6331-4	2022-11-23
<input checked="" type="checkbox"/>	Horn Antenna	ETS-Lindgren	3117	EZ6331-5	2022-10-21
<input checked="" type="checkbox"/>	Pre-amplifier	SKET	LNPA_0108-25	EZ6331-6	2023-04-05
<input checked="" type="checkbox"/>	Filter Banks	SLET	RSEMU_BRF-LNPA08G	EZ6331-8	2023-04-05
ESD					
Used	Equipment	Manufacturer	Type	Internal No.	Due Date
<input checked="" type="checkbox"/>	ESD generator	KIKUSUI	KES4021	EZ6425	2023-06-09
EFT / Surge					
Used	Equipment	Manufacturer	Type	Internal No.	Due Date
<input checked="" type="checkbox"/>	Compact NX Generator	EM TEST	Compact NX5 bsp-1-300-16	EZ6334-1	2023-02-21
<input checked="" type="checkbox"/>	Automatic Transformer	EM TEST	Variac NX1-260-16	EZ6334-2	2023-02-21
Conducted Immunity					
Used	Equipment	Manufacturer	Type	Internal No.	Due Date
<input checked="" type="checkbox"/>	Conducted Disturbance Test System	SCHLÖDER	CDG-7000-75	EZ6333-1	2023-02-21
<input checked="" type="checkbox"/>	CDN	SCHLÖDER	CDN-M2+3	EZ6333-2	2023-02-21
<input checked="" type="checkbox"/>	Attenuator	SCHLÖDER	CDG 6050-100	EZ6333-3	2023-02-21
<input checked="" type="checkbox"/>	EM Clamp	Lüthi	EM 101	EZ6413	2023-06-03
<input type="checkbox"/>	Signal generator	EM TEST	CWS 500 C	EZ6410	2023-06-03
<input type="checkbox"/>	Attenuator	EM TEST	ATT6/75	EZ6411	2023-06-03
<input type="checkbox"/>	CDN	EM TEST	CDN M2/M3	EZ6412	2023-08-02
Radiated Immunity					
Used	Equipment	Manufacturer	Type	Internal No.	Due Date
<input checked="" type="checkbox"/>	Signal Generator	Keysight	N5171B	EZ6332-1	2023-04-05
<input checked="" type="checkbox"/>	Power Amplifier	Hanrui Microwave	HRCPA-0008010-54GA	EZ6332-2	2023-02-21
<input checked="" type="checkbox"/>	Power Amplifier	Hanrui Microwave	HRCPA-010060-50GL	EZ6332-3	2023-02-21
<input checked="" type="checkbox"/>	Log-period Antenna	Schwarzbeck	STLP 9129	EZ6332-4	2023-01-31
<input checked="" type="checkbox"/>	Power Meter	Keysight	N1914A	EZ6332-5	2023-04-05
<input checked="" type="checkbox"/>	Power Sensor	Keysight	E9301A	EZ6332-6	2023-04-05

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<input checked="" type="checkbox"/>	Power Sensor	Keysight	E9301A	EZ6332-7	2023-04-05
<input checked="" type="checkbox"/>	RF Matrix	CTE	CUS2035	EZ6332-9	2023-02-21
Tet Site					
Used	Equipment	Manufacturer	Type	Internal No.	Due Date
<input type="checkbox"/>	Shielded Room	SAEMC	MSR953	EZ6441	2025-11-21
<input checked="" type="checkbox"/>	Shielded Room	SAEMC	PSAC318-M	EZ6442	2025-12-09
<input checked="" type="checkbox"/>	Semi-anechoic Chamber	SAEMC	FSAC318	EZ6439	2025-11-21
<input checked="" type="checkbox"/>	Fully Anechoic Chamber	SAEMC	PSAC318	EZ6440	2025-12-09
Additional Instrument					
Used	Equipment	Manufacturer	Type	Internal No.	Due Date
<input checked="" type="checkbox"/>	Therom-Hygrograph	Shanghai Meteorological	ZJ 1-2A	EZ6453	2022-10-21
<input checked="" type="checkbox"/>	Therom-Hygrograph	Shanghai Meteorological	ZJ 1-2A	EZ6455	2022-10-21
<input checked="" type="checkbox"/>	Digital Therom-Hygrograph	TESTO	175H1	EZ1050	2022-10-21
<input checked="" type="checkbox"/>	Digital Therom-Hygrograph	TESTO	175H1	EZ1056	2022-10-21
<input type="checkbox"/>	Digital Therom-Hygrograph	TESTO	175H1	EZ1057	2022-10-21
<input checked="" type="checkbox"/>	Pressure Meter	Shanghai Fengyun	FYP-1	EZ6422	2023-04-24

2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.5 dB
	150kHz ~ 30MHz	3.2 dB
Continuous disturbance voltage at load terminal	150kHz ~ 30MHz	2.6 dB
Continuous disturbance voltage at control terminal	150kHz ~ 30MHz	3.7 dB
Mains terminal discontinuous disturbance voltage/click	-	3.8 dB
Continuous disturbance power	30MHz ~ 300MHz	4.2 dB
Radiated emissions up to 1 GHz	30MHz ~ 1GHz	5.0 dB
Radiated emissions above 1 GHz	1GHz ~ 6GHz	4.4 dB
	6GHz ~ 18GHz	5.2 dB
Harmonic current emission	-	3.1 %
Voltage fluctuations and flicker	-	11.7 %
ESD	-	6.7 %
Radiated susceptibility	80MHz ~ 1GHz	3.2 dB
	1GHz ~ 6GHz	3.3 dB
EFT test at main terminal	-	12.5 %
EFT test at signal/telecom terminal	-	12.5 %
Surge test at main terminal	-	11.6 %
Injected current test at main terminal	-	2.8 dB
Injected current test at unshielded signal terminal	-	2.8 dB
Voltage dips and interruption	-	6.1 %

3 Conducted emission on DC power input/output ports

Test result: NA

3.1 Limits

3.1.1 Limits of conducted emissions for equipment intended to be used in telecommunication centres and industrial environment

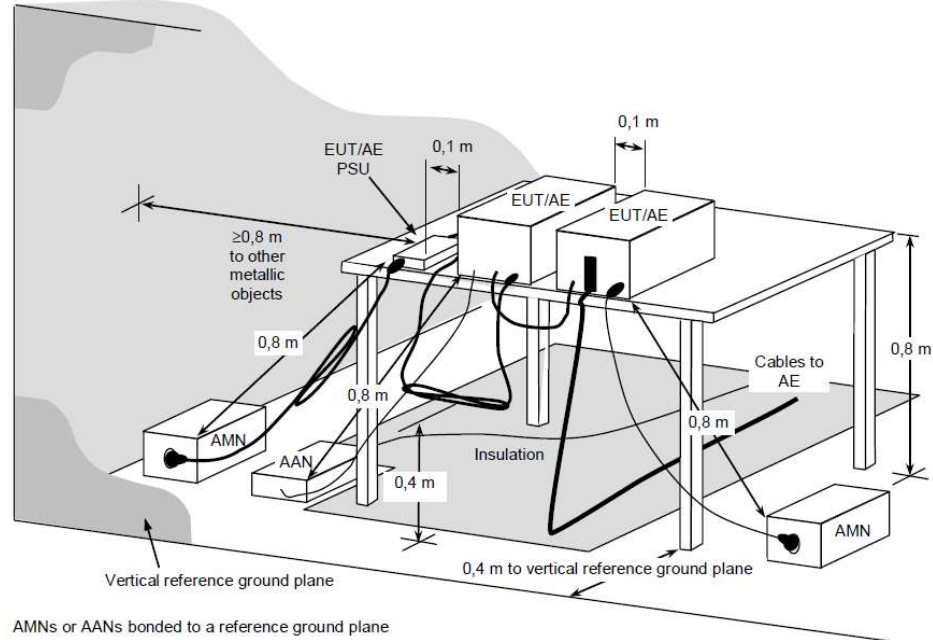
Frequency range (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.1.2 Limits of conducted emissions for other equipment

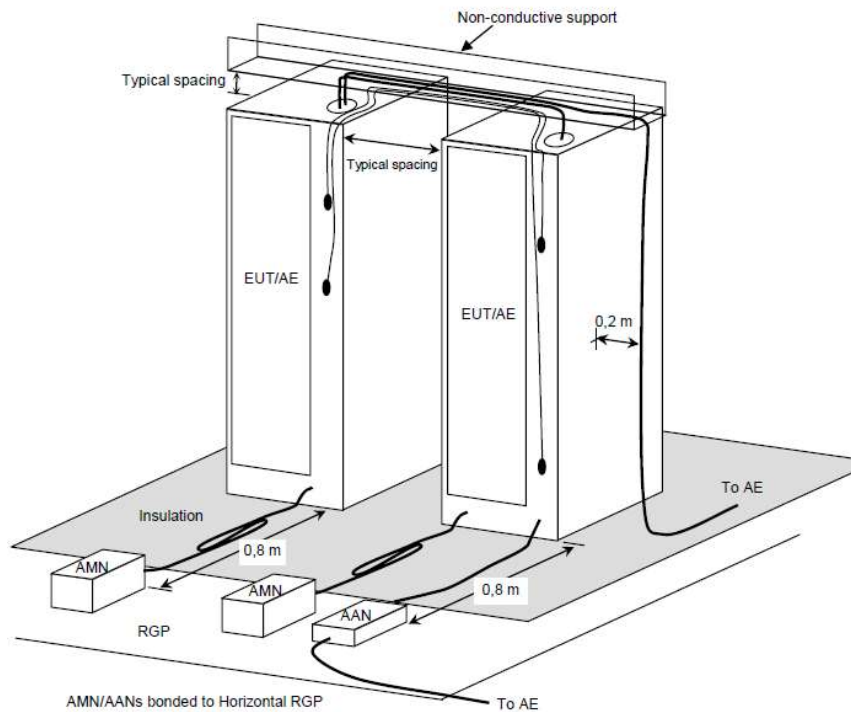
Frequency range (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.2 Test setup

For table-top equipment



For floor standing equipment



3.3 Test Procedure

Measurement was performed in shielded room, and instruments used were followed EN 301 489-1 clause 8.3.

Detailed test procedure and arrangement was followed EN 301 489-1 clause 8.3.

Frequency range 150kHz - 30MHz was checked and EMI receiver measurement bandwidth was set to 9kHz.

3.4 Test Result

None

4 Conducted emission on AC power input/output ports

Test result: NA

4.1 Limits

4.1.1 Limits of conducted emissions for equipment intended to be used in telecommunication centres and industrial environment

Frequency range (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

4.1.2 Limits of conducted emissions for other equipment

Frequency range (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3D schematic diagram of an EMC test setup for a table-top device. The setup includes a table with a 0.8 m height, a 0.1 m wide gap between EUT/AE units, and a 0.4 m distance to a vertical reference ground plane. Cables connect the EUT/AE units to AMNs (Antenna Measurement Nuts) and AANs (Antenna Attachment Nuts) on the ground plane. The ground plane is insulated from the table legs. Dimensions are given in meters.

3D schematic diagram of a two-channel EUT/AE test setup. Two vertical EUT/AE units are mounted on a horizontal RGP plate. They are connected to AMN and AAN blocks via insulated cables. Dimensions include 0.8 m spacing between units and 0.2 m between cables. Labels include 'Non-conductive support', 'Typical spacing', 'EUT/AE', 'Insulation', 'AMN', 'RGP', 'AAN', 'To AE', and 'AMN/AANs bonded to Horizontal RGP'.

4.3 Test Procedure

Measurement was performed in shielded room, and instruments used were followed EN 301 489-1 clause 8.4.

Detailed test procedure and arrangement was followed EN 301 489-1 clause 8.4.

Frequency range 150kHz - 30MHz was checked and EMI receiver measurement bandwidth was set to 9kHz.

4.4 Test Result

Test Curve:

L-Line

N-Line

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,

Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.

Then Correct Factor = 10.00 + 2.00 = 12.00dB;

Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;

Margin = 66.00dBuV – 22.00dBuV = 44.00dB.

5 Conducted Emission at wired network ports

Test result: NA

5.1 Limits

5.1.1 Limits of conducted emission for equipment intended to be used exclusively in an industrial environment or a telecommunication centre

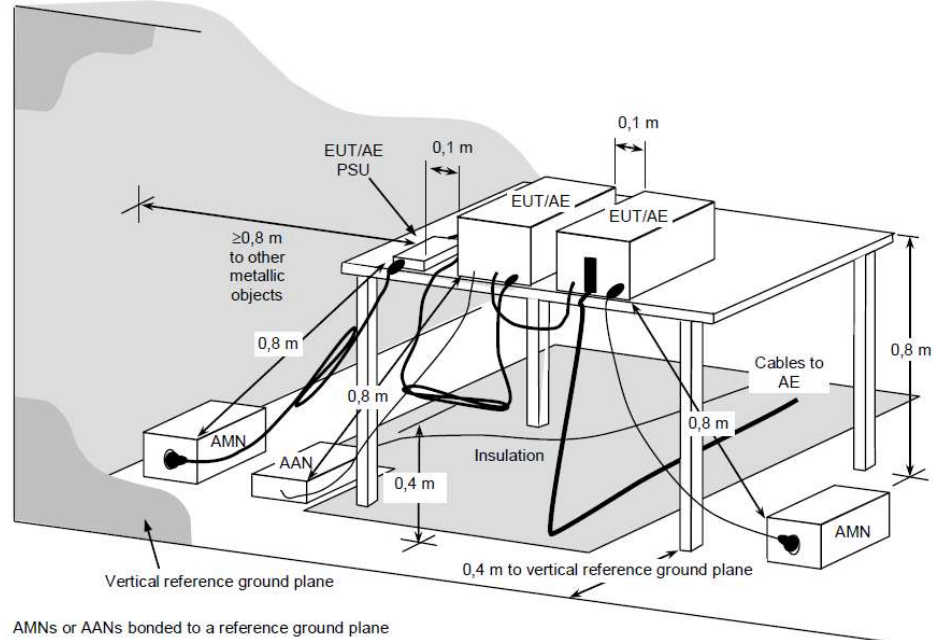
Frequency range (MHz)	Voltage Limits (dBuV)		Current limits (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	97 ~ 87	84 ~ 74	53 ~ 43	40 ~ 30
0.5 ~ 30	87	74	43	30
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.				

5.1.2 Limits of conducted emission for other equipment

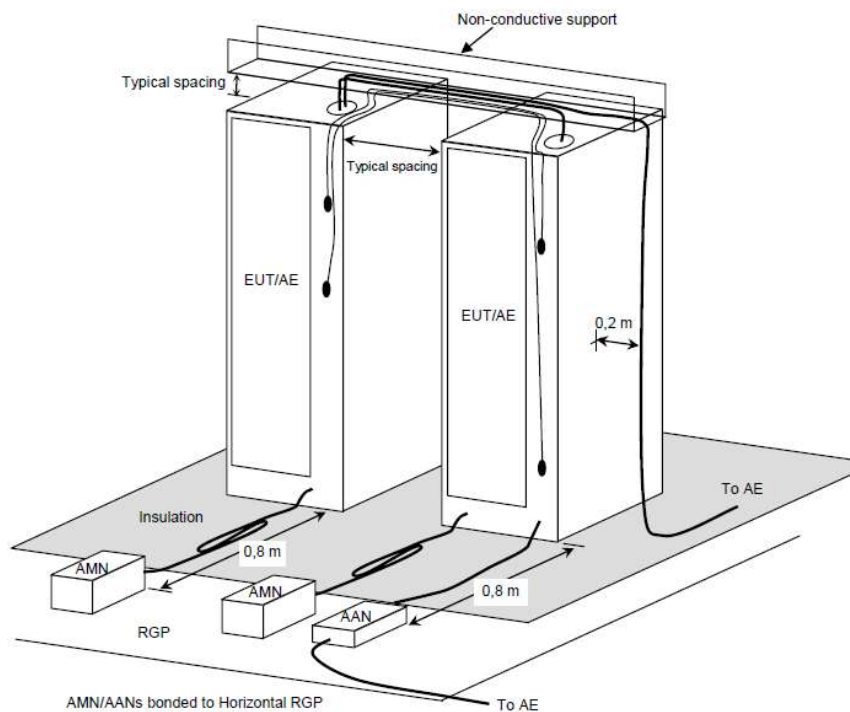
Frequency range (MHz)	Voltage Limits (dBuV)		Current limits (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	84 ~ 74	74 ~ 64	40 ~ 30	30 ~ 20
0.5 ~ 30	74	64	30	20
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.				

5.2 Test setup

For table-top equipment



For floor standing equipment



5.3 Test Procedure

Measurement was performed in shielded room, and instruments used were followed EN 301 489-1 clause 8.7.

Detailed test procedure and arrangement was followed EN 301 489-1 clause 8.7.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9kHz.

5.4 Test Result

None

6 Radiated emission

Test result: **PASS**

6.1 Limits

6.1.1 Limits of radiated emission for ancillary equipment intended to be used exclusively in an industrial environment or telecommunication centres

Frequency (MHz)	Quasi-peak limit in Measurement Distance 3m (dBuV/m)	Quasi-peak limit in Measurement Distance 10m (dBuV/m)
30-230	50	40
230-1000	57	47
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.		

Frequency range GHz	Average limit in Measurement Distance 3m (dBuV/m)	Peak limit in Measurement Distance 3m (dBuV/m)
1 to 3	56	76
3 to 6	60	80
NOTE The lower limit applies at the transition frequency.		

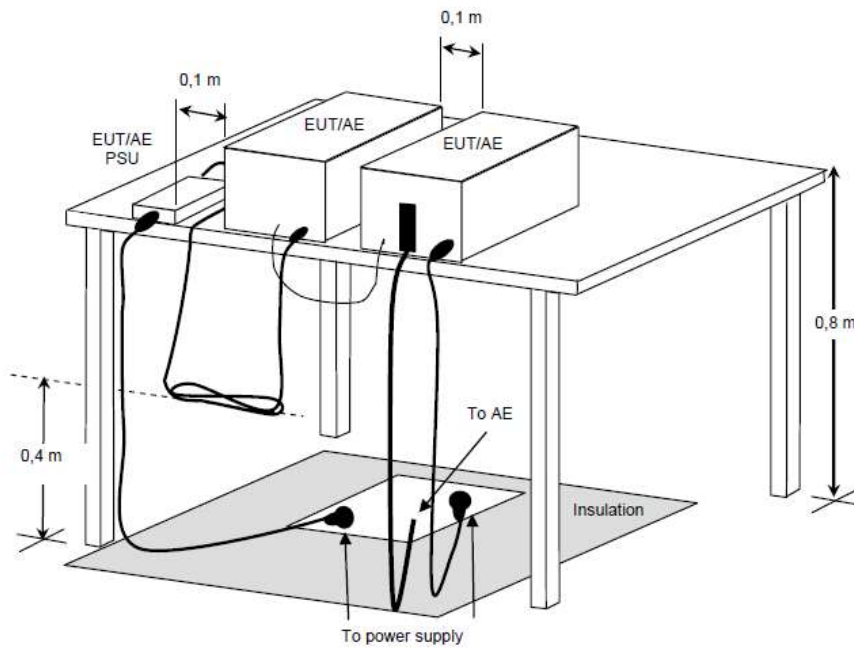
6.1.2 Limits of radiated emission for other ancillary equipment

Frequency (MHz)	Quasi-peak limit in Measurement Distance 3m (dBuV/m)	Quasi-peak limit in Measurement Distance 10m (dBuV/m)
30-230	40	30
230-1000	47	37
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.		

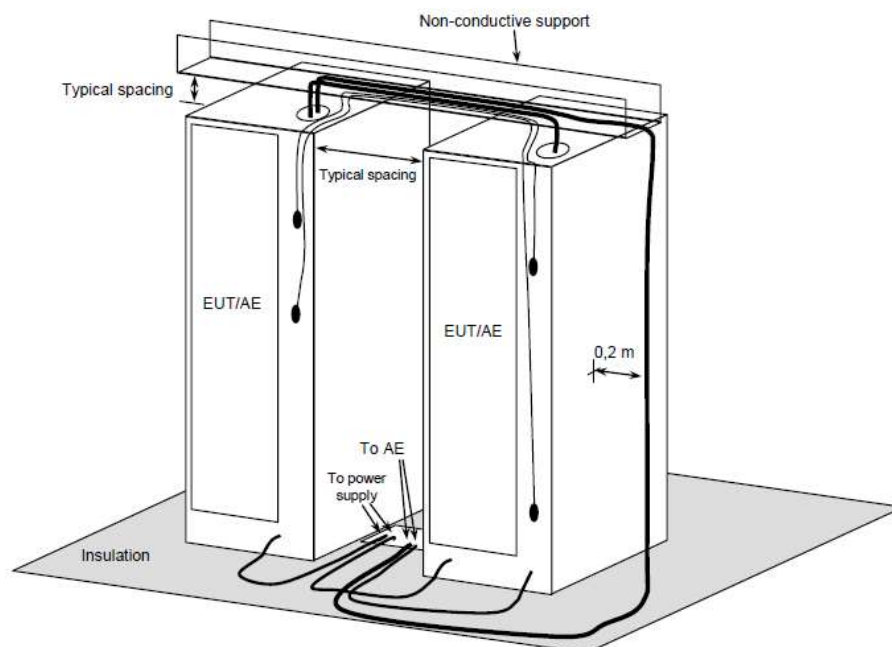
Frequency range GHz	Average limit in Measurement Distance 3m (dBuV/m)	Peak limit in Measurement Distance 3m (dBuV/m)
1 to 3	50	70
3 to 6	54	74
NOTE The lower limit applies at the transition frequency.		

6.2 Block diagram of test set up

For table-top equipment



For floor standing equipment



6.3 Test Procedure

The measurement was performed in a semi-anechoic chamber.

The distance from EUT to receiving antenna is 3 meters.

Measurement was performed according to EN 301 489-1 clause 8.2.

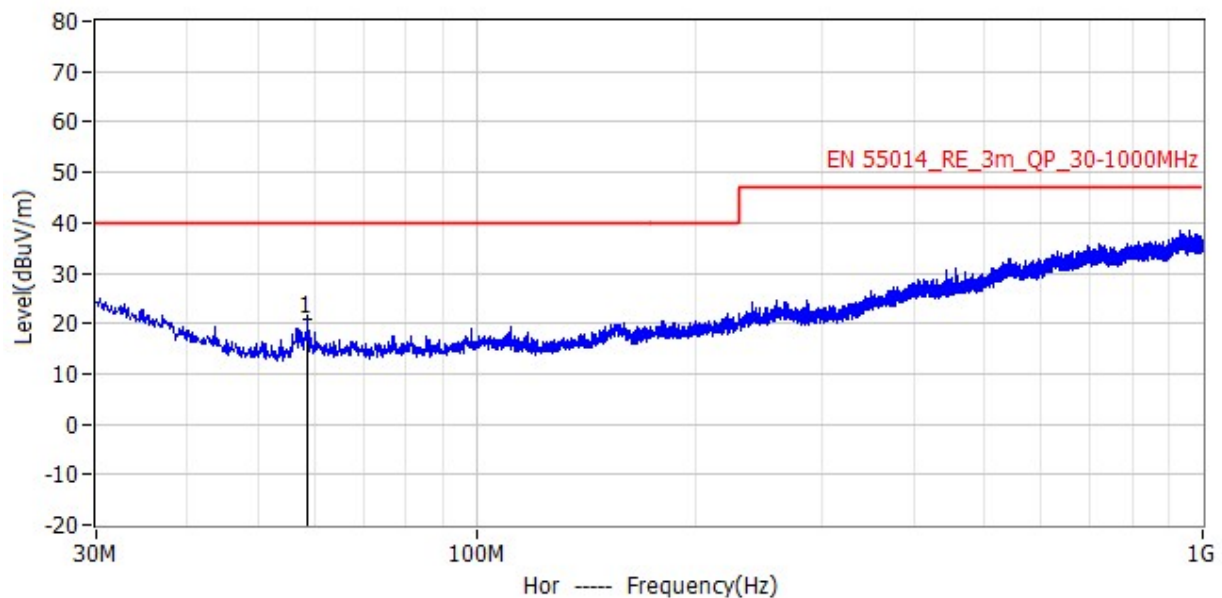
EUT arrangement and operate conditions were performed according to EN 301 489-1 clause 8.2.

6.4 Test Result

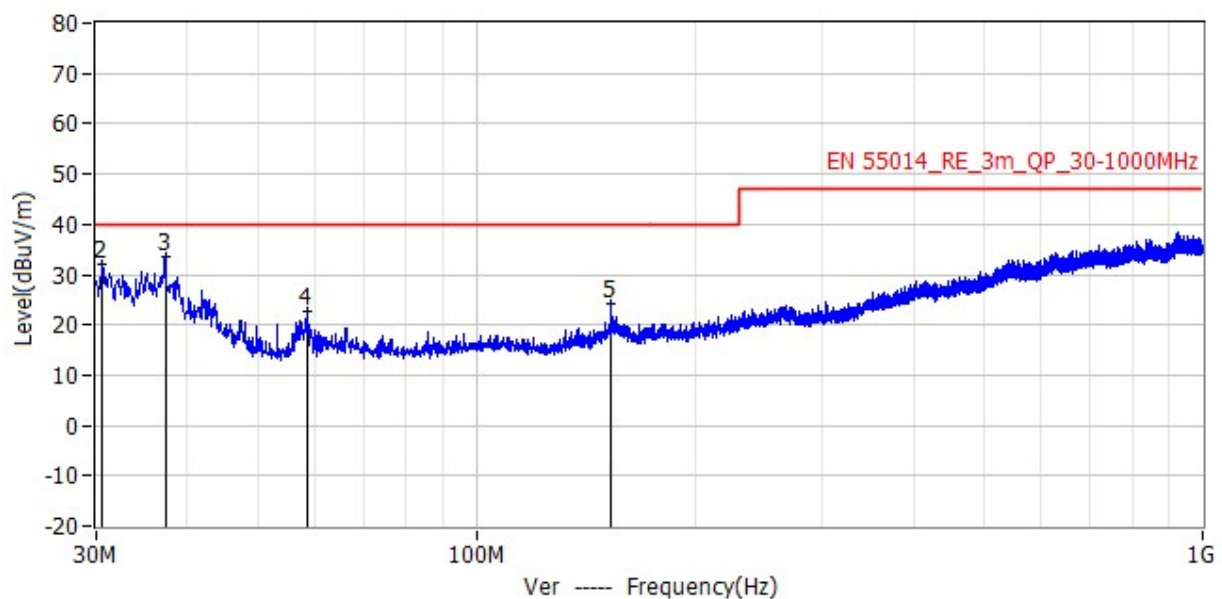
Key-on, Engine-off operating conditions:

30-1000Mhz

Horizontal



Vertical



TEST REPORT

Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Factor dB/m	Detector	Polar
58.615MHz	40.0	20.8	19.2	7.1	PK	Hor
30.582MHz	40.0	32.1	7.9	15.7	PK	Ver
37.372MHz	40.0	33.4	6.6	11.9	PK	Ver
58.615MHz	40.0	22.8	17.2	7.1	PK	Ver
153.578MHz	40.0	24.1	15.9	11.0	PK	Ver

- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

Above 1Ghz

Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Corrected Factor (dB/m)	Limits (dBuV/m)	Margin (dBuV/m)
Horizontal	1000~3000	<40.00	50.00	>10.00	AV
	3000~6000	<44.00	54.00	>10.00	AV
Vertical	1000~3000	<40.00	50.00	>10.00	AV
	3000~6000	<44.00	54.00	>10.00	AV

7 Harmonic current emission

Test result: NA

7.1 Limits

7.1.1 Limits for Class A equipment

Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
$15 \leq n \leq 39$	$0,15 \frac{15}{n}$
Even harmonics	
2	1,08
4	0,43
6	0,30
$8 \leq n \leq 40$	$0,23 \frac{8}{n}$

7.1.2 Limits for Class B equipment

For Class B equipment, the harmonics of the input current shall not exceed the values given in Class A limits multiplied by a factor of 1,5

7.1.3 Limits for Class C equipment

a) Active input power > 25 W

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda^a$
5	10
7	7
9	5
$11 \leq n \leq 39$ (odd harmonics only)	3
^a λ is the circuit power factor.	

b) Active input power ≤ 25 W

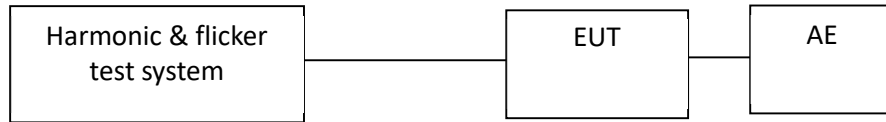
Discharge lighting equipment having an active input power smaller than or equal to 25 W shall comply with one of the following two sets of requirements:

- the harmonic currents shall not exceed the power-related limits of Class D equipment, column 2, or:
- the third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86 % and the fifth harmonic current shall not exceed 61 %.

7.1.4 Limits for Class D equipment

Harmonic order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3,4	2,30
5	1,9	1,14
7	1,0	0,77
9	0,5	0,40
11	0,35	0,33
$13 \leq n \leq 39$ (odd harmonics only)	$\frac{3,85}{n}$	See Table 1

7.2 Test Setup



7.3 Test Procedure

Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyzer which was integrated in the harmonic & flicker test system. The measurements were carried out under steady conditions.

For the following categories of equipment, limits are not specified in this standard:

- ☐ Equipment with a rated power of 75 W or less, other than lighting equipment.
- ☐ Professional equipment with a total rated power greater than 1 kW.
- ☐ Symmetrically controlled heating elements with a rated power less than or equal to 200 W.
- ☐ Independent dimmers for incandescent lamps with a rated power less than or equal to 1 kW.

7.4 Test Result

8 Voltage fluctuations and flicker

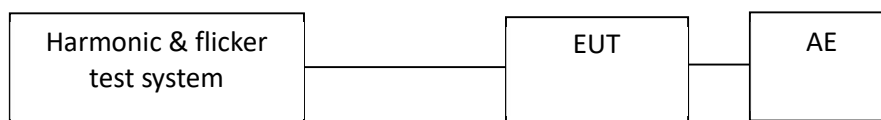
Test result: NA

8.1 Limits

- The value of P_{st} shall not be greater than 1,0;
- The value of P_{lt} shall not be greater than 0,65;
- T_{max} , the accumulated time value of $d(t)$ with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms;
- The maximum relative steady-state voltage change, dc , shall not exceed 3,3 %;
- The maximum relative voltage change d_{max} , shall not exceed:
 - a) 4 % without additional conditions;
 - b) 6 % for equipment which is:
 - switched manually, or
 - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.
 - c) 7 % for equipment which is:
 - attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
 - switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

P_{st} and P_{lt} requirements shall not be applied to voltage changes caused by manual switching.

8.2 Test Setup



8.3 Test Procedure

Voltage fluctuations and flicker were measured by a digital power meter with an analogue output and frequency analyzer which was integrated in the harmonic & flicker test system.

8.4 Test Result

- ☐ The EUT is unlikely to produce significant voltage fluctuations or flicker by technical analysis and evaluation. So it is deemed to fulfil the requirements without testing.

Immunity Test

Performance criteria

Performance criteria A for immunity tests with phenomena of a continuous nature;

Performance criteria B for immunity tests with phenomena of a transient nature;

Performance criteria C for immunity tests with power interruptions exceeding a certain time.

Criteria	During test	After test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).
<p>NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p>		

9 Electrostatic Discharge (ESD)

Test result **PASS**

9.1 Severity Level and Performance Criterion

9.1.1 Test level

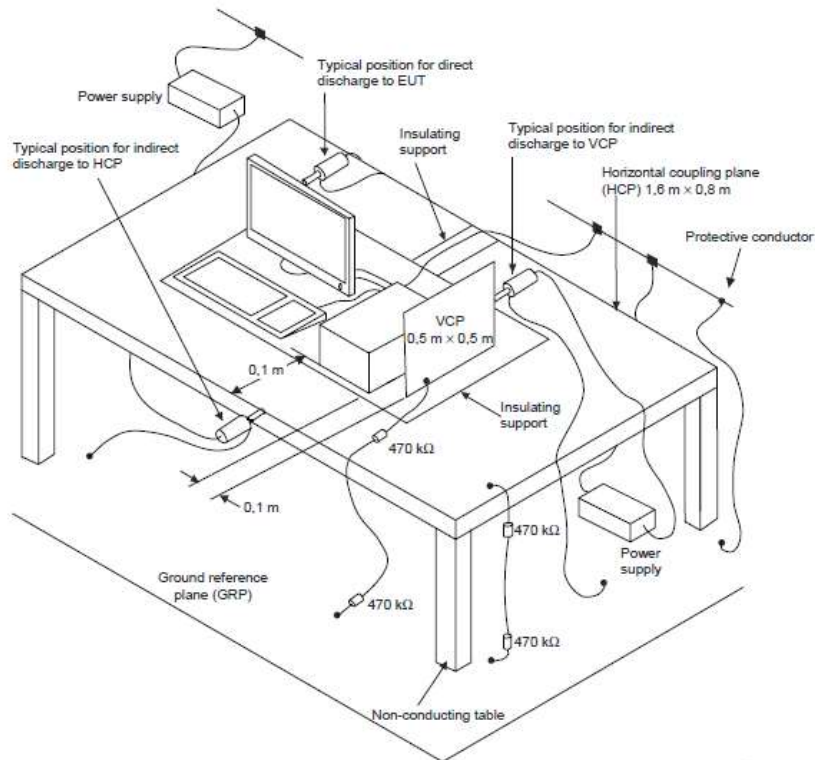
Contact discharge		Air discharge	
Level	Test voltage (kV)	Level	Test voltage (Kv)
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special
<p>Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.</p> <p>2. The orange rows were the selected test level.</p>			

9.1.2 Performance Criterion

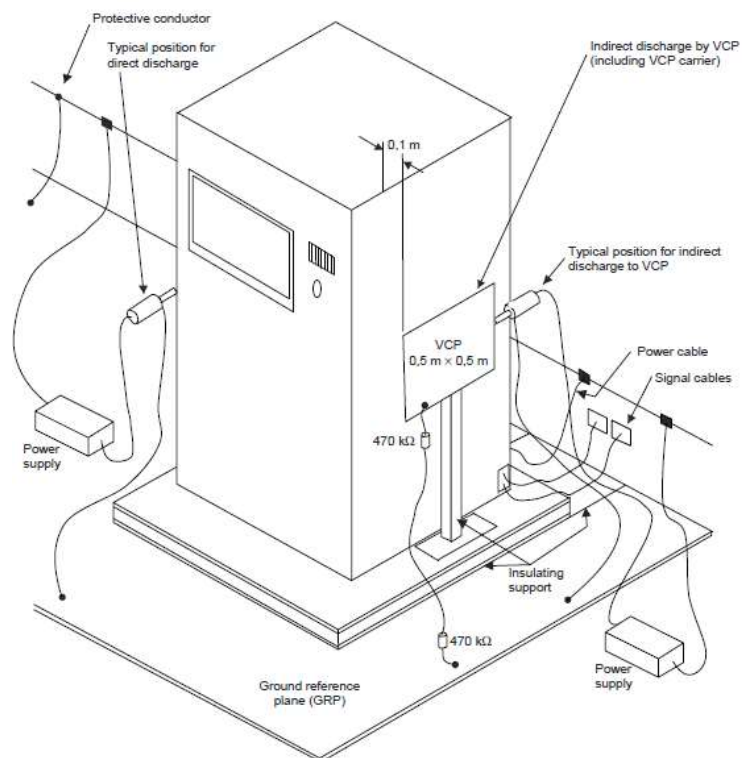
Criterion B

9.2 Test Setup

For table-top equipment



For floor standing equipment



TEST REPORT

9.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-2 clause 8.

The test method and equipment was specified by EN 61000-4-2.

9.4 Test Result

Direct discharges were applied at the following selected points:

Test level [kV]	Air/Contact	Polarity (+/-)	Pass/Fail/NA	Comment
2/4	Contact	+/-	Pass	Accessible metal parts of the EUT
2/4	Contact	+/-	Pass	All touchable screws of enclosure
2/4/8	Air	+/-	Pass	Air gap of the switch, button
2/4/8	Air	+/-	Pass	Slots around the EUT

Indirect contact discharges were applied to the VCP and the HCP at the following selected points:

For table-top equipment

Position	Description	Point	Pass/Fail/NA
HCP front	0,1m from the front of the EUT	Edge of centre on HCP	NA
HCP back	0,1m from the back of the EUT	Edge of centre on HCP	NA
HCP right	0,1m from the right side of the EUT	Edge of centre on HCP	NA
HCP left	0,1m from the left side of the EUT	Edge of centre on HCP	NA
VCP front	0,1m from the front of the EUT	Edge of centre on VCP	NA
VCP back	0,1m from the back of the EUT	Edge of centre on VCP	NA
VCP right	0,1m from the right of the EUT	Edge of centre on VCP	NA
VCP left	0,1m from the left of the EUT	Edge of centre on VCP	NA

For floor standing equipment

Position	Description	Point	Pass/Fail/NA
CP front	0,1m from the front of the EUT	Edge of centre on VCP	Pass
CP back	0,1m from the back of the EUT	Edge of centre on VCP	Pass
CP right	0,1m from the right of the EUT	Edge of centre on VCP	Pass
CP left	0,1m from the left of the EUT	Edge of centre on VCP	Pass

Observation: All the functions were operated as normal after the test.

Conclusion: The EUT can meet the requirement of Performance Criterion B.

10 Radio frequency electromagnetic field

Test result Pass

10.1 Severity Level and Performance Criterion

10.1.1 Test level

Level	Test field strength V/m
1	1
2	3
3	10
X	Special
<p>Note: 1. X is an open test level. This level may be given in the product specification. 2. The orange row is the selected test level.</p>	

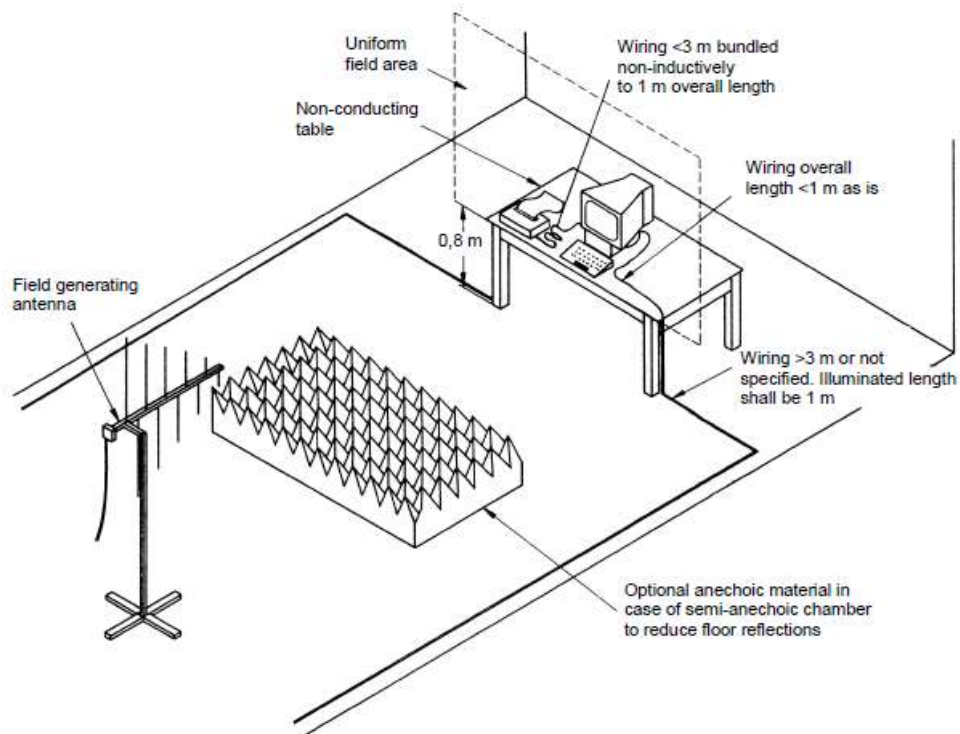
10.1.2 Performance Criterion

Criterion A

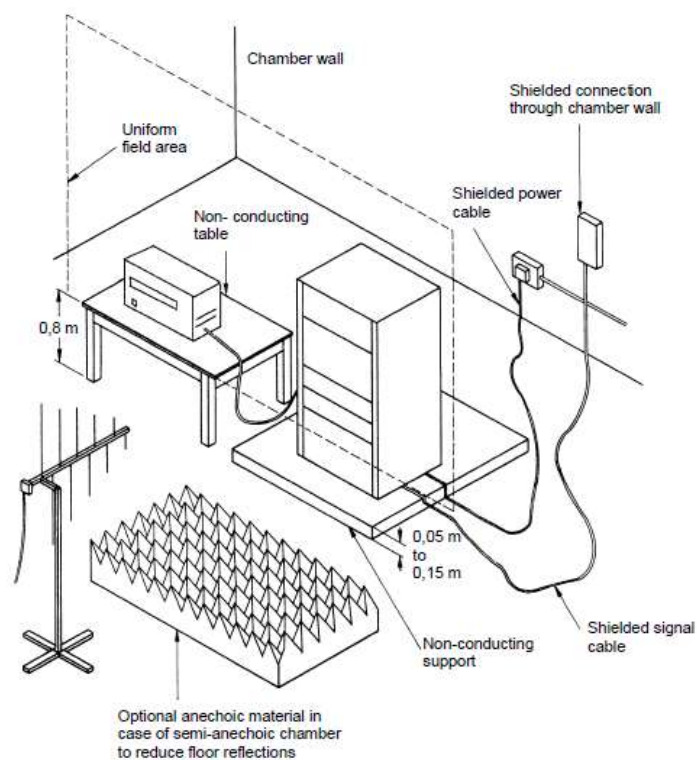
TEST REPORT

10.2 Test Setup

For table-top equipment



For floor standing equipment



10.3 Test Procedure

Measurement was performed in full-anechoic chamber.

Measurement procedure was applied according to EN 61000-4-3 clause 8.

The test method and equipment was specified by EN 61000-4-3.

10.4 Test Result

Test no.	Frequency (MHz)	Polarization	Test level (V/m)	Modulation	Exposed location	Pass/Fail/NA
1	80-1000	H & V	3	1 kHz, 80% AM 1 % increment	All sides	Pass
2	1000-6000	H & V	3	1 kHz, 80% AM 1 % increment	All sides	Pass

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT can meet the requirement of Performance Criterion A

11 Fast transients, common mode

Test result **PASS**

11.1 Severity Level and Performance Criterion

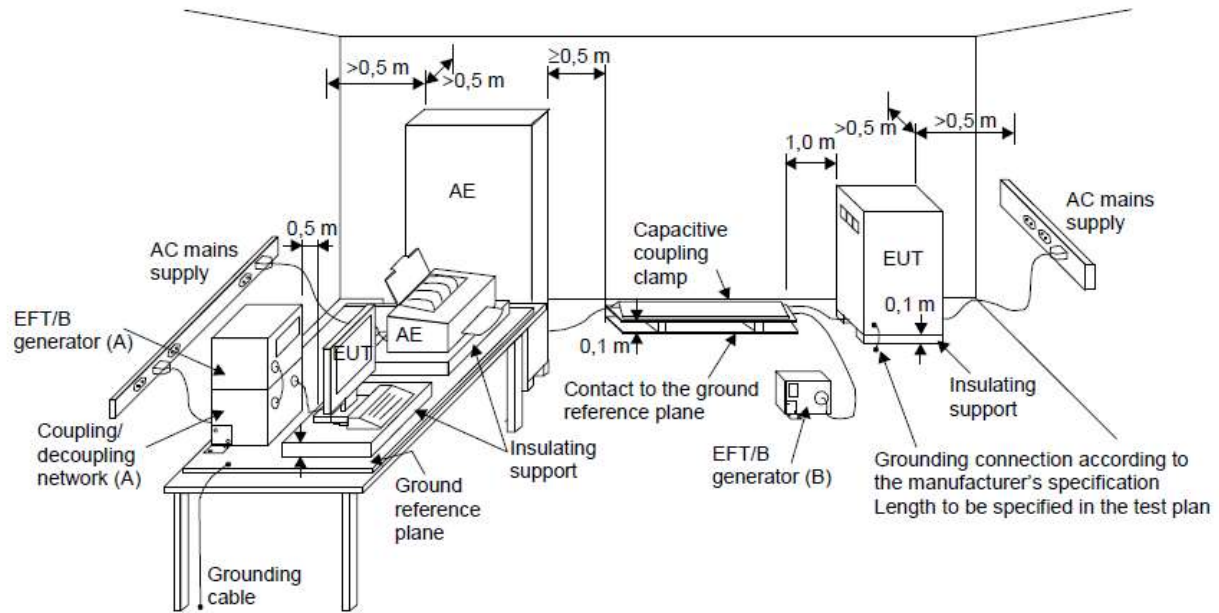
11.1.1 Test level

Open circuit output test voltage and repetition rate of the impulses				
Level	AC mains power input ports		Signal ports, wired network ports, control ports, DC power input ports	
	Voltage peak (kV)	Repetition rate (kHz)	Voltage peak (kV)	Repetition rate (kHz)
1	0.5	5	0.25	5/100
2	1	5	0.5	5/100
3	2	5	1	5/100
4	4	2.5	2	5/100
X	Special	Special	Special	Special
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification. 2. The orange rows were the selected test level.				

11.1.2 Performance Criterion

Criterion A

11.2 Test Setup



(A) location for supply line coupling

(B) location for signal lines coupling

11.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-4 clause 8.

The test method and equipment was specified by EN 61000-4-4.

11.4 Test Result

Test No.	Level (kV)	Polarity (+/-)	Line for test	Pass/Fail/NA
1	1	+/-	AC mains power input ports	Pass
2	0.5	+/-	DC power input ports	Pass
3	0.5	+/-	Wired network ports	NA
4	0.5	+/-	Signal/control ports	NA

Observation: All the functions were operated as normal after the test.

Conclusion: The EUT can meet the requirement of Performance Criterion A

12 Surges

Test result **PASS**

12.1 Severity Level and Performance Criterion

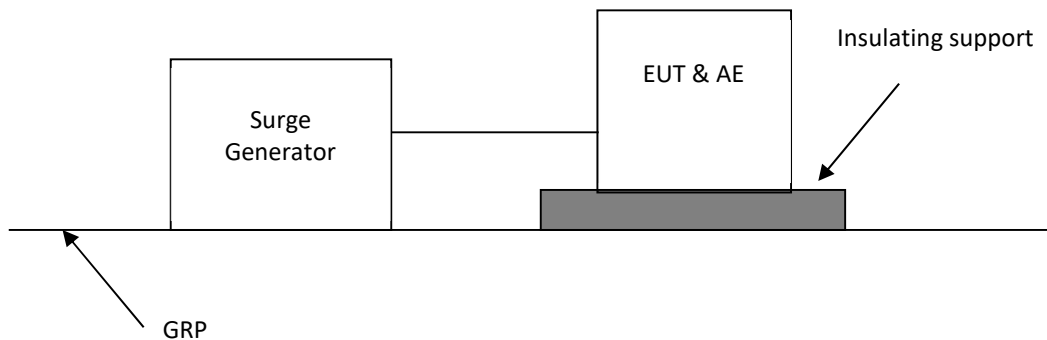
12.1.1 Test level

Level	Open-circuit test voltage (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special
Notes: 1. "X" is an open class. This level can be specified in the product specification 2. The orange rows are the selected level.	

12.1.2 Performance Criterion

Criterion B

12.2 Test Setup



12.3 Test Procedure

Measurement was performed in shielded room.
Measurement procedure was applied according to EN 61000-4-5 clause 8.
The test method and equipment was specified by EN 61000-4-5.

12.4 Test Result

Test No.	Level [kV]	Polarity +/-	Line for test	Pass/Fail/NA
1	0.5/1	+/-	AC mains power input port (line to line)	Pass
2	1/2	+/-	AC mains power input port (line to earth)	Pass
3	0.5	+/-	Wired network ports	NA

Observation: All the functions were operated as normal after the test.

Conclusion: The EUT can meet the requirement of Performance Criterion B

13 Radio frequency, common mode

Test result **PASS**

13.1 Severity Level and Performance Criterion

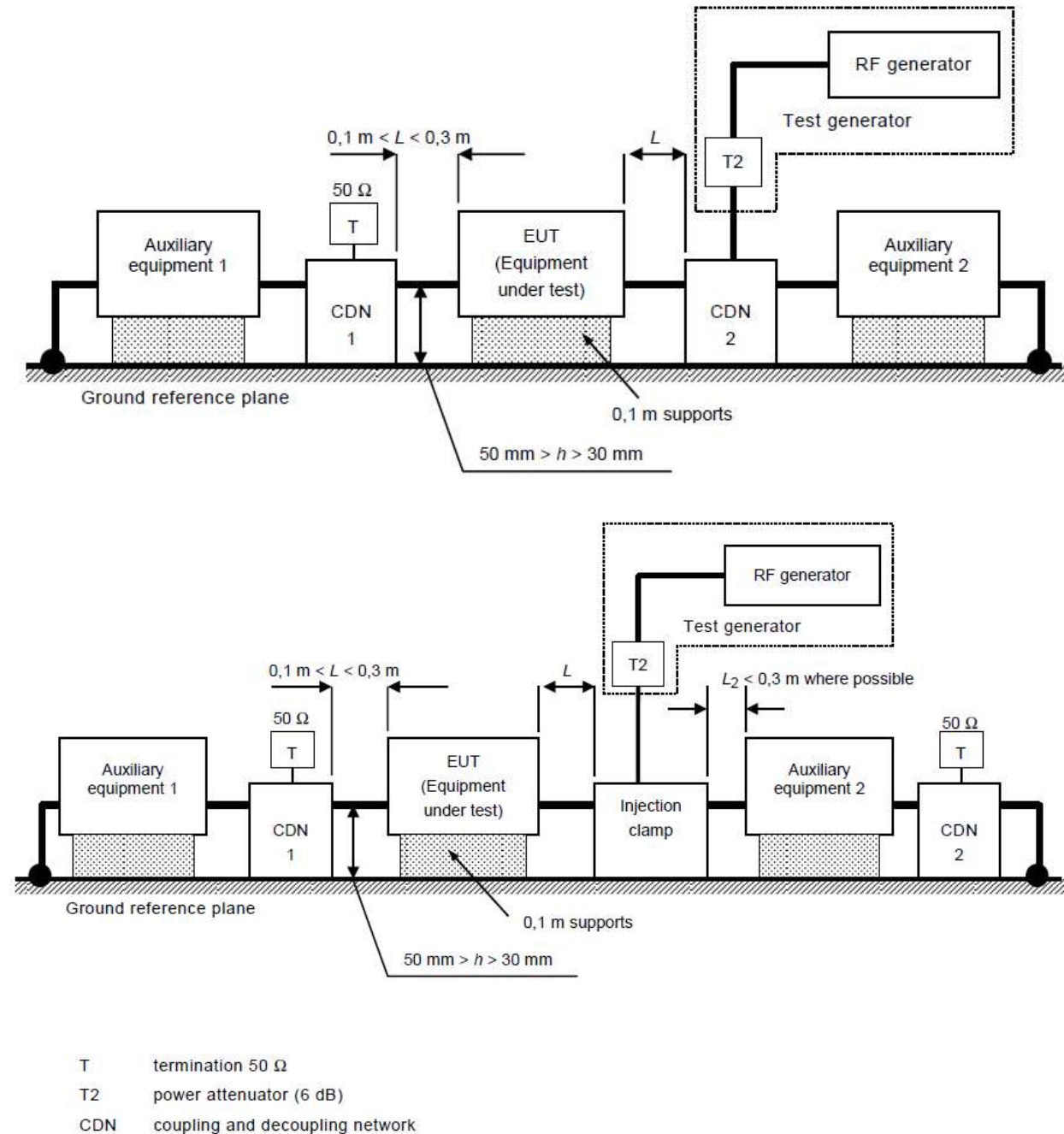
13.1.1 Test level

Frequency range 150kHz – 80MHz		
Level	Voltage level	
	U ₀ (dBuV)	U ₀ (V)
1	120	1
2	130	3
3	140	10
X	Special	Special
Notes: 1. "X" is an open level 2. The orange row is the selected test level.		

13.1.2 Performance Criterion

Criterion A

13.2 Block Diagram of Test Setup



13.3 Test Procedure

Measurement procedure was applied according to EN 61000-4-6 clause 8.
The test method and equipment was specified by EN 61000-4-6.

13.4 Test Result

Test No.	Frequency (MHz)	Level (V)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	3	80%, 1 kHz, AM	AC mains power port	Pass
2	0.15~80	3	80%, 1 kHz, AM	DC power port	Pass
3	0.15~80	3	80%, 1 kHz, AM	Wired network ports	NA
4	0.15~80	3	80%, 1 kHz, AM	Signal/control ports	NA

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT can meet the requirements of Performance Criterion A

14 Voltage dips and interruptions

Test result NA

14.1 Severity Level and Performance Criterion

14.1.1 Test level

Test level (% Ut)	Voltage dip and short interruptions (% Ut)	Duration (in period)
0	100	0.5
0	100	1
0	100	250
70	30	25

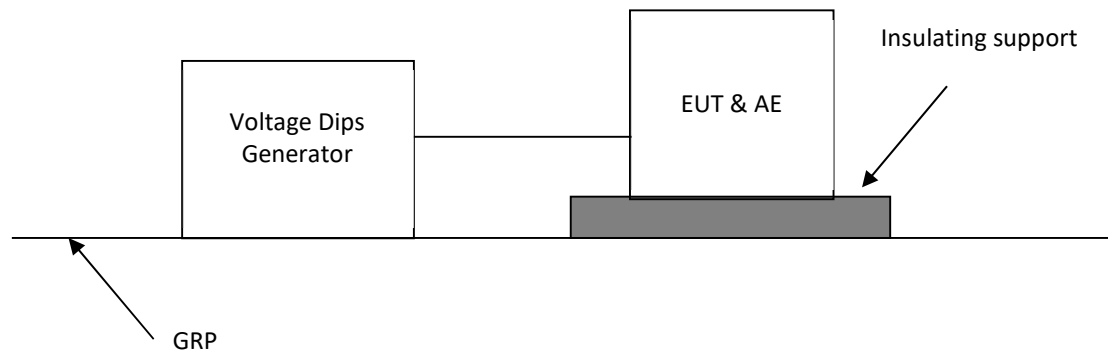
Notes: The orange rows are selected test level.

14.1.2 Performance Criterion

0% Ut / 250 period, Criterion C

Others, Criterion B

14.2 Test Setup



14.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-11 clause 8.

The test method and equipment was specified by EN 61000-4-11.

14.4 Test Result

Test no.	Dips to (% Ut)	Voltage dip and short interruptions (% Ut)	Duration (in periods)	Pass/Fail/NA
1	70	30%	25	-
2	0	100%	0.5	-
3	0	100%	1	-
4	0	100%	250	-

Observation: All the functions were operated as normal after test except test no.4; when test no.4 was performed on the EUTs, the EUTs restart.

Conclusion: The EUT can meet the requirements of the standard.

15 Transients and surges in the vehicular environment

Test result NA

15.1 Severity Level and Performance Criterion

15.1.1 Test level

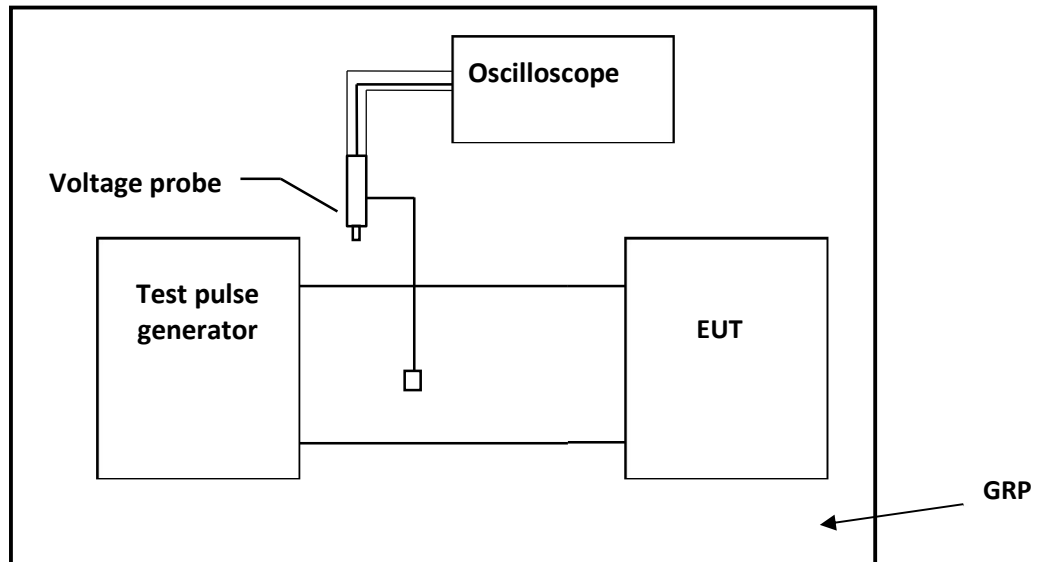
Pulse No.	Test Level III	Number of Pulses or Application Time	Burst/pulse cycle time	
			minimum	maximum
1	- 75V	10 pulses	0,5 s	5 s
2a	+ 37V	10 pulses	0,2 s	5 s
2b	+ 10V	10 pulses	0,5 s	5 s
3a	- 112V	20 minutes	90 ms	100 ms
3b	+ 75V	20 minutes	90 ms	100 ms
4	- 6V	10 pulses	1 min	-

15.1.2 Performance Criterion

Pulse 3a and 3b, Criterion A

Pulse 1, 2a, 2b, and 4, Criterion B

15.2 Test Setup



15.3 Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to ISO 7637-2 clause 4.4.

The test method and equipment was specified by ISO 7637-2 with additions and modifications by EN301 489-1 clause 9.6.

15.4 Test Result

Pulse No.	Level	Number of Pulses or Application Time	Burst/pulse cycle time	Pass/Fail/NA
1	III	10 pulses	0,5 s	-
2a	III	10 pulses	0,2 s	-
2b	III	10 pulses	0,5 s	-
3a	III	20 minutes	90 ms	-
3b	III	20 minutes	90 ms	-
4	III	10 pulses	1 min	-

Observation: -

Conclusion:-

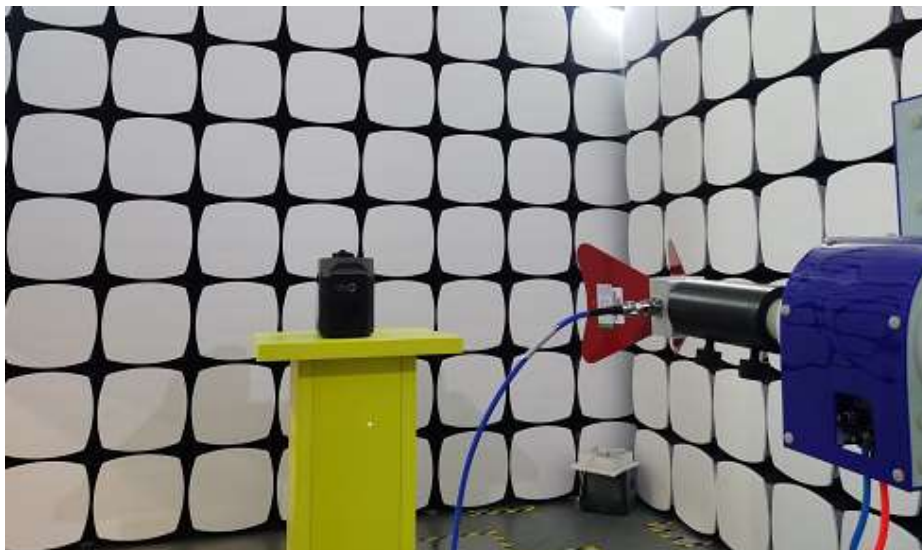
Appendix I: Photograph of Test setup

Radiation emission

RE<1GHZ



RE>1GHZ



Electrostatic discharge



Radio frequency electromagnetic field



Fast transients



Surges



Radio frequency, common mode



Appendix II: Photograph of equipment under test



Over view of EFG200



Over view of EFG200



Over view of EFG200



Over view of EFG200



Top view



Control panel



Grounding terminal



LPG inlet



Inner view

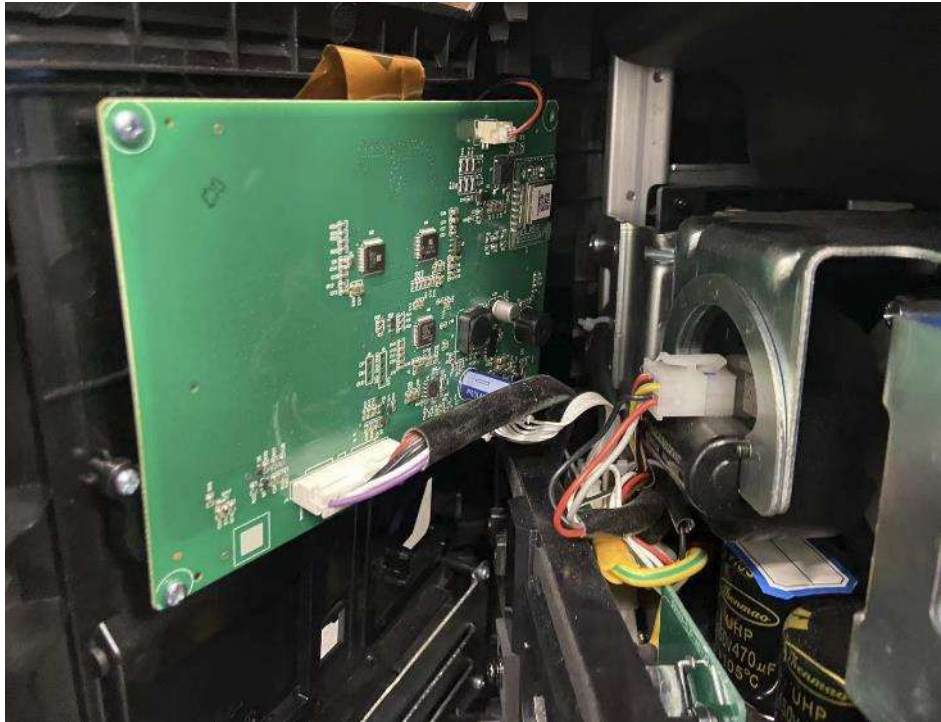


Inner view

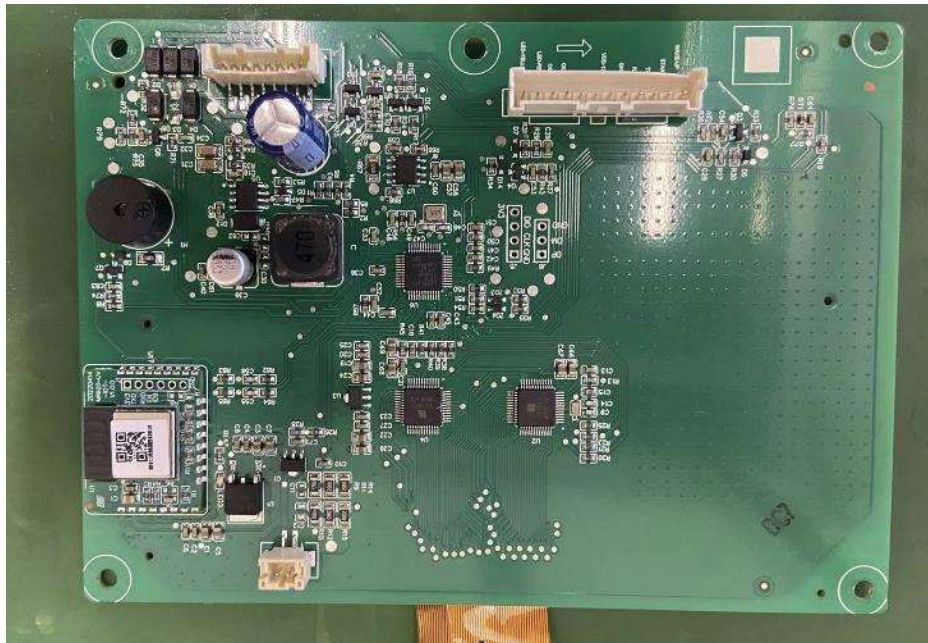


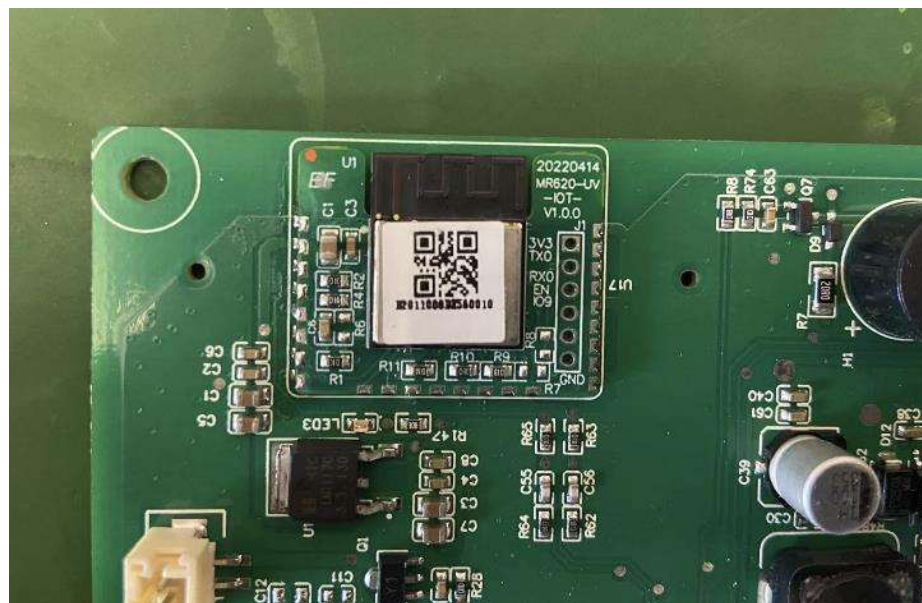
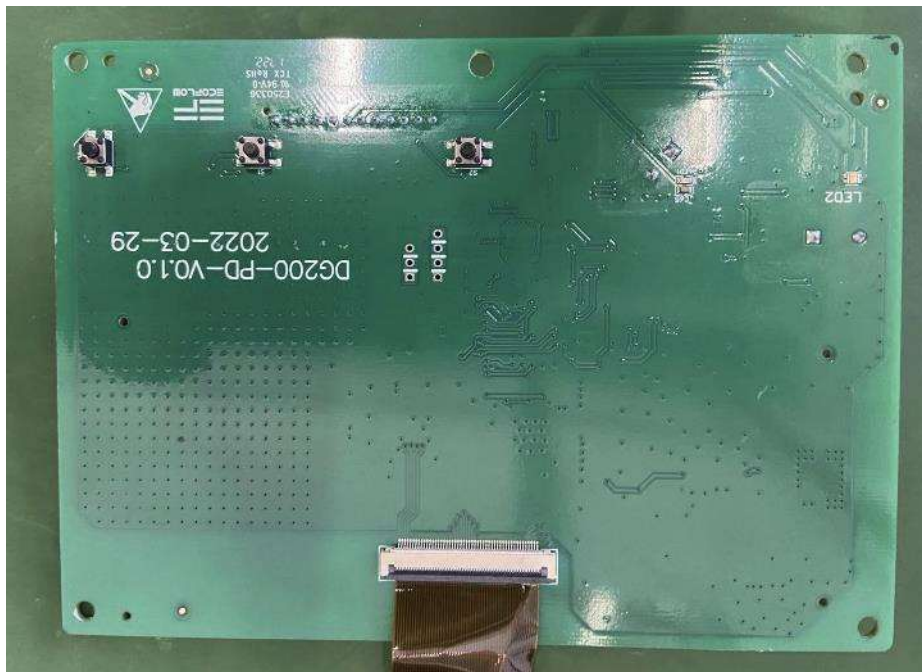
LPG regulator and hose

Interview



PCB





END of the report