

Lumi United Technology Co., Ltd.

CE TEST REPORT

SCOPE OF WORK:

EMC report

Model:

HM1S-G01

REPORT NUMBER

200702409SHA-003+A1

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516032, China

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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Contents

REVISION HISTORY	6
MEASUREMENT RESULT SUMMARY	7
1 GENERAL INFORMATION	8
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	8
1.2 DESCRIPTION OF TEST FACILITY	9
2 TEST SPECIFICATIONS	10
2.1 NORMATIVE REFERENCES	10
2.2 MODE OF OPERATION DURING THE TEST	11
2.3 TEST PERIPHERALS USED	11
2.4 RECORD OF CLIMATIC CONDITIONS	12
2.5 INSTRUMENT LIST	13
2.6 MEASUREMENT UNCERTAINTY	15
3 CONDUCTED EMISSION ON DC POWER INPUT/OUTPUT PORTS	16
3.1 LIMITS.....	16
3.1.1 <i>Limits of conducted emissions for equipment intended to be used in telecommunication centres and industrial environment</i>	16
3.1.2 <i>Limits of conducted emissions for other equipment</i>	16
3.2 TEST SETUP	17
3.3 TEST PROCEDURE	18
3.4 TEST RESULT.....	19
4 CONDUCTED EMISSION ON AC POWER INPUT/OUTPUT PORTS	20
4.1 LIMITS.....	20
4.1.1 <i>Limits of conducted emissions for equipment intended to be used in telecommunication centres and industrial environment</i>	20
4.1.2 <i>Limits of conducted emissions for other equipment</i>	20
4.2 TEST SETUP	21
4.3 TEST PROCEDURE	22
4.4 TEST RESULT.....	23
5 CONDUCTED EMISSION AT WIRED NETWORK PORTS	27
5.1 LIMITS.....	27
5.1.1 <i>Limits of conducted emission for equipment intended to be used exclusively in an industrial environment or a telecommunication centre</i>	27
5.1.2 <i>Limits of conducted emission for other equipment</i>	27
5.2 TEST SETUP	28
5.3 TEST PROCEDURE	29
5.4 TEST RESULT.....	30
6 RADIATED EMISSION	31
6.1 LIMITS.....	31
6.1.1 <i>Limits of radiated emission for ancillary equipment intended to be used exclusively in an industrial environment or telecommunication centres</i>	31
6.1.2 <i>Limits of radiated emission for other ancillary equipment</i>	31
6.2 BLOCK DIAGRAM OF TEST SET UP	32
6.3 TEST PROCEDURE	33
6.4 TEST RESULT.....	34

TEST REPORT

- 7 HARMONIC CURRENT EMISSION 42**
 - 7.1 LIMITS.....42
 - 7.1.1 *Limits for Class A equipment*.....42
 - 7.1.2 *Limits for Class B equipment*.....42
 - 7.1.3 *Limits for Class C equipment*.....42
 - 7.1.4 *Limits for Class D equipment*.....43
 - 7.2 TEST SETUP.....44
 - 7.3 TEST PROCEDURE.....44
 - 7.4 TEST RESULT.....44
- 8 VOLTAGE FLUCTUATIONS AND FLICKER 44**
 - 8.1 LIMITS.....45
 - 8.2 TEST SETUP.....45
 - 8.3 TEST PROCEDURE.....45
 - 8.4 TEST RESULT.....45
- IMMUNITY TEST 46**
- 9 ELECTROSTATIC DISCHARGE (ESD)..... 47**
 - 9.1 SEVERITY LEVEL AND PERFORMANCE CRITERION.....47
 - 9.1.1 *Test level*47
 - 9.1.2 *Performance Criterion*.....47
 - 9.2 TEST SETUP.....48
 - 9.3 TEST PROCEDURE.....49
 - 9.4 TEST RESULT.....49
- 10 RADIO FREQUENCY ELECTROMAGNETIC FIELD 50**
 - 10.1 SEVERITY LEVEL AND PERFORMANCE CRITERION50
 - 10.1.1 *Test level*.....50
 - 10.1.2 *Performance Criterion*.....50
 - 10.2 TEST SETUP51
 - 10.3 TEST PROCEDURE52
 - 10.4 TEST RESULT.....52
- 11 FAST TRANSIENTS, COMMON MODE 53**
 - 11.1 SEVERITY LEVEL AND PERFORMANCE CRITERION53
 - 11.1.1 *Test level*.....53
 - 11.1.2 *Performance Criterion*.....53
 - 11.2 TEST SETUP54
 - 11.3 TEST PROCEDURE54
 - 11.4 TEST RESULT.....54
- 12 SURGES..... 55**
 - 12.1 SEVERITY LEVEL AND PERFORMANCE CRITERION55
 - 12.1.1 *Test level*.....55
 - 12.1.2 *Performance Criterion*.....55
 - 12.2 TEST SETUP56
 - 12.3 TEST PROCEDURE56
 - 12.4 TEST RESULT.....56
- 13 RADIO FREQUENCY, COMMON MODE 57**
 - 13.1 SEVERITY LEVEL AND PERFORMANCE CRITERION57
 - 13.1.1 *Test level*.....57
 - 13.1.2 *Performance Criterion*.....57
 - 13.2 BLOCK DIAGRAM OF TEST SETUP58

TEST REPORT

- 13.3 TEST PROCEDURE 58
- 13.4 TEST RESULT 59
- 14 VOLTAGE DIPS AND INTERRUPTIONS 60**
 - 14.1 SEVERITY LEVEL AND PERFORMANCE CRITERION 60
 - 14.1.1 *Test level* 60
 - 14.1.2 *Performance Criterion* 60
 - 14.2 TEST SETUP 61
 - 14.3 TEST PROCEDURE 61
 - 14.4 TEST RESULT 61
- 15 TRANSIENTS AND SURGES IN THE VEHICULAR ENVIRONMENT 62**
 - 15.1 SEVERITY LEVEL AND PERFORMANCE CRITERION 62
 - 15.1.1 *Test level* 62
 - 15.1.2 *Performance Criterion* 62
 - 15.2 TEST SETUP 63
 - 15.3 TEST PROCEDURE 63
 - 15.4 TEST RESULT 63
- APPENDIX I: PHOTOGRAPH OF EQUIPMENT UNDER TEST 64**

Revision History

Report No.	Version	Description	Issued Date
200702409SHA-003+A1	Rev. 01	This report is based on the original report 200702409SHA-003 for amendment on 2021-07-20 to include the following changes: 1. Added one alternative source for plastic enclosure and plug holder 2. Added one alternative source for Transformer, 3. Added one alternative source for CM choke, 4. Added one alternative source for Y1 capacitor, 5. Changed design of ventilation openings, 6. Remove the HomeKit chip These changes have no effect on the RF function, only the EMC tests were conducted.	July 20, 2021

Measurement result summary

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

Notes: 1: NA =Not Applicable

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name : Hub M1S

Type/Model : HM1S-G01

Description of EUT : This report is based on the original report 200702409SHA-003 for amendment on 2021-07-20 to include the following changes:
1. Added one alternative source for plastic enclosure and plug holder
2. Added one alternative source for Transformer,
3. Added one alternative source for CM choke,
4. Added one alternative source for Y1 capacitor,
5. Changed design of ventilation openings,
These changes have no effect on the RF function, only the EMC tests were conducted.

Rating : 100-240V AC 50/60Hz 0.2A

EUT for : Fixed use
 vehicular use
 portable use

EUT used in : telecommunication centres and industrial environment
 other environment

EUT type : Table-top
 Floor standing

Hardware version : /

Software version : /

Port identification : Refer to the user's manual

Cable supplied : Refer to the user's manual

Sample received date : April 21, 2021

Date of test : April 25~April 28, 2021

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 recognized, certified, or accredited by these organizations :

- CNAS Accreditation Lab
Registration No. CNAS L0139
- FCC Accredited Lab
Designation Number: CN1175
- IC Registration Lab
Registration code No.: 2042B-1
- VCCI Registration Lab
Registration No.: R-4243, G-845, C-4723, T-2252
- A2LA Accreditation Lab
Certificate Number: 3309.02

Subcontractor:

Name : GRG Metrology & Test (Shenzhen) Co., Ltd.
Address : Room 402, Silver Star Hi-Tech Building, No. 1301, Guanguang Road, Xinlan Community, Guanlan Street, Longhua District, Shenzhen, China
Telephone : +86-755-61180008
CNAS No : L0446

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 are specified if used.

2.3 Test peripherals used

Item No	Description	Brand and Model	S/No
1	/	/	NA

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)
Conducted emission on DC power input/output ports	NA	NA	NA
Conducted emission on AC power input/output ports	24	53	NA
Conducted emission on wired network ports	NA	NA	NA
Radiation emission	25	51	NA
Harmonic current emission	NA	NA	NA
Voltage fluctuations and flicker	NA	NA	NA
Electrostatic discharge	25	54	101
Radio frequency electromagnetic field	25	54	NA
Fast transients, common mode	24	52	NA
Surges	24	52	NA
Radio frequency, common mode	24	52	NA
Voltage dips and interruptions	24	52	NA
Transients and surges in the vehicular environment	NA	NA	NA

Notes: NA =Not Applicable

2.5 Instrument list

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Conduction Emission				
EZ-EMC	EZ	CCS-3A1-CE	/	/
EMI Receiver	R&S	ESCI	100783	2021-10-08
LISN(EUT)	R&S	ENV216	101543	2022-02-25
Radiated Emission (Below 1GHz)				
Test S/W	EZ	CCS-2ANT	/	/
Test Receiver	R&S	ESCI	100145	2021-10-07
Preamplifier	EMEC	EM330	/	2022-03-21
Bi-log Antenna	TESEQ	CBL6143A	26039	2021-11-25
Radiated Emission (Above 1GHz)				
Test software	Tonscend	JS32-RE	/	/
Spectrum Analyzer	Agilent	N9010A	MY52221469	2021-05-16
Preamplifiers	Tonscend	TAP01018048	AP20E8060075	2021-06-28
Horn antenna	Schwarzbeck	BBHA 9120D	02143	2021-12-17
Voltage Fluctuation and Flicks				
Test S/W	/	CTS4	/	/
Power Source	SCHAFFNER	NSG1007	54789	2022-03-21
Harmonic & Flicker Tester	SCHAFFNER	CCN1000	72045	2021-11-15
Electrostatic discharge				
Dito ESD Simulator	EM Test	dito	V0809103493	2021-11-18
Radio-Frequency Electromagnetic Field				
Test S/W	Tonscend	JS35-RS	/	/
Signal generator	R&S	SMA100A	100434	2021-10-08
Switch	TOYO	BS5000	/	/
Power Amplifier	SCHAFFNER	CBA9433	3007	2021-12-22
Power Amplifier	TESEQ	CBA 3G-050	T44161	2021-05-22
Power Amplifier	Milmega	AS1860-50	1079232	2021-11-15

Dual directional Coupler	AR	DC 6180A	0328212	2021-10-08
Dual directional Coupler	AR	DC 7144A	327057	2021-10-08
Log-periodic broadband antenna	Schaffner	CBL6143	5082	2021-10-08
Microwave Log.-Per. Antenna	Schwarzbeck	STLP9149	9149-163	2021-10-09
Power Meter	Keysight	N1914A	MY57090009	2021-10-16
Power Probe	Keysight	E9301A	MY57060008	2021-10-08
Electrical fast transient/burst				
Test S/W	/	Win3025 Version 4.00	/	/
Fast Transients/Burst Generator	TESEQ	NSG 3025	26861	2021-10-16
Surge				
Surge simulator	3ctest	CWS 600G	ES0381813	2021-11-15
Lightning surge coupling decoupling network	3ctest	SPN 3618T	ES0941720	2021-11-15
Conducted radio frequency disturbances				
Test S/W	Tonscend	JS35-CS	/	/
Conduction and radiation immunity testing system	TESEQ	NSG4070	25807	2021-05-16
Attenuator	weinschel corp	40-6-34	QQ986	2021-10-08
Coupled decoupled network	Luthi	CDN801-M2	1897	2021-10-08
Voltage Dip & Voltage Interruptions				
Test S/W	AMETEK	AC Source CIGuiSII-500lix	2.0.0.7-No v.2006	/
Power Source	SCHAFFNER	NSG1007	54789	2022-03-21
current switchgear	TESEQ	NSG2200-1	A17820	2021-10-16

2.6 Measurement Uncertainty

Measurement	Frequency	Uncertainty
Conduction Emission	9 kHz ~ 150 kHz	2.2 dB
	150 kHz ~ 30 MHz	2.8 dB
Radiated Emission (10m)	30MHz~200MHz(H)	4.5 dB
	200MHz~1000MHz(H)	4.4 dB
	30MHz~200MHz(V)	4.4 dB
	200MHz~1000MHz(V)	4.5 dB
Radiated Emission (3m)	30MHz~200MHz(H)	4.3 dB
	200MHz~1000MHz(H)	4.5 dB
	30MHz~200MHz(V)	4.4 dB
	200MHz~1000MHz(V)	4.5 dB
	1GHz~6GHz(H)	4.5 dB
	1GHz~6GHz(V)	4.5 dB
Voltage Fluctuation and Flicks	/	1)
Electrostatic discharge	/	1)
Radio-Frequency Electromagnetic Field	/	1)
Electrical fast transient/burst	/	1)
Surge	/	1)
Conducted radio frequency disturbances	/	1)
Voltage Dip & Voltage Interruptions	/	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.

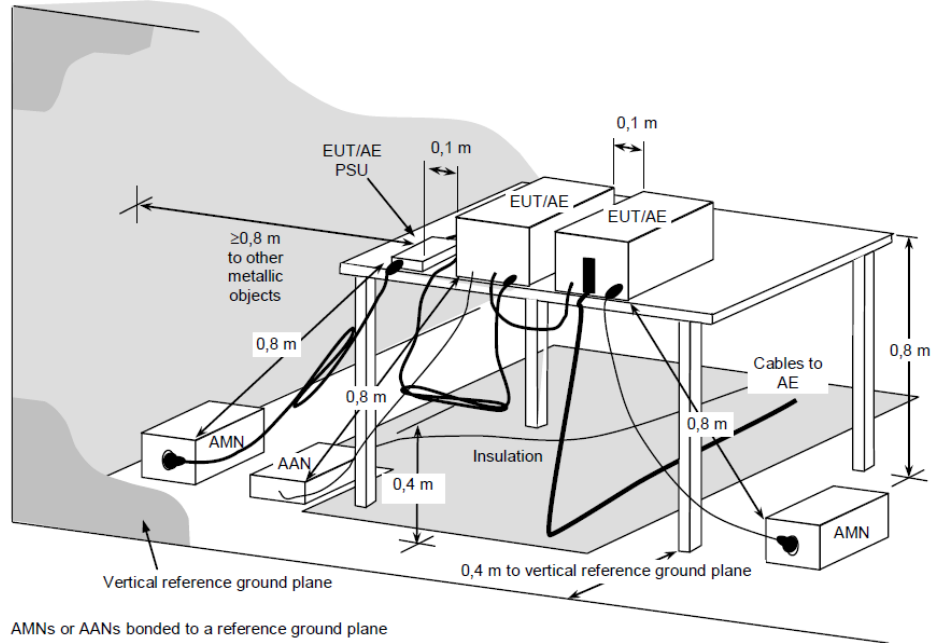
3.1.2 Limits of conducted emissions for other equipment

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

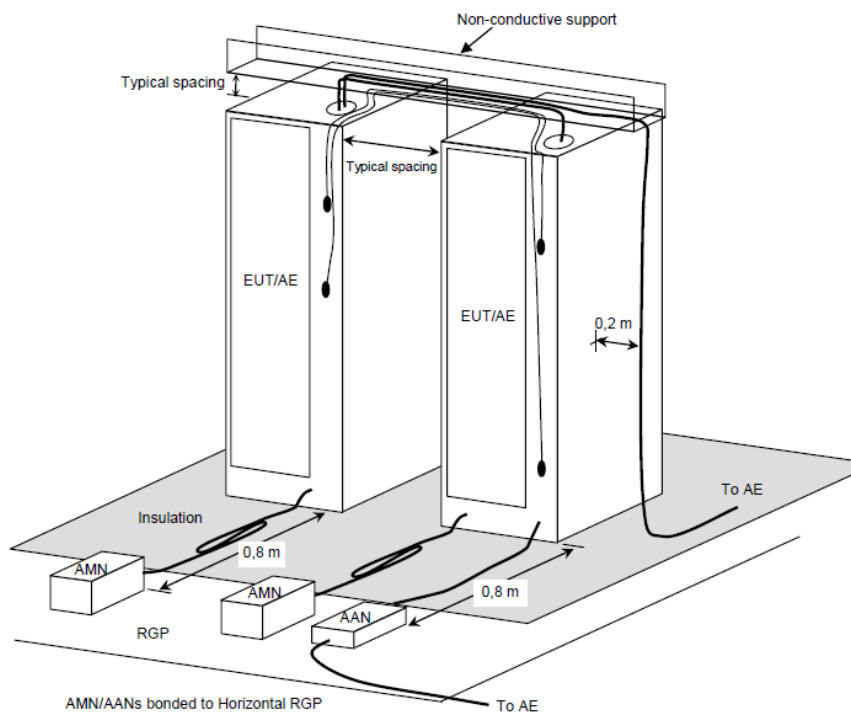
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the 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.

4 Conducted emission on AC power input/output ports

Test result: Pass

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.

4.3 Test Procedure

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

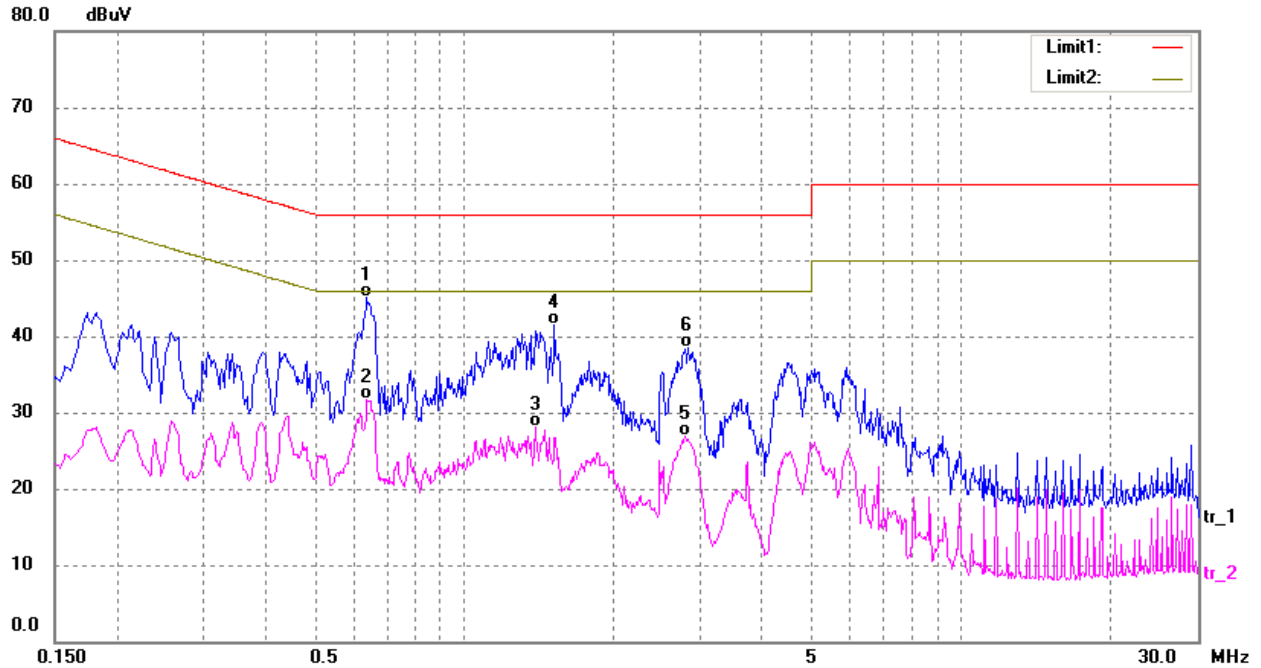
Detailed test procedure and arrangement was followed EN 301 489-1 clause 8.4.

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

4.4 Test Result

Test Curve of 230VAC:

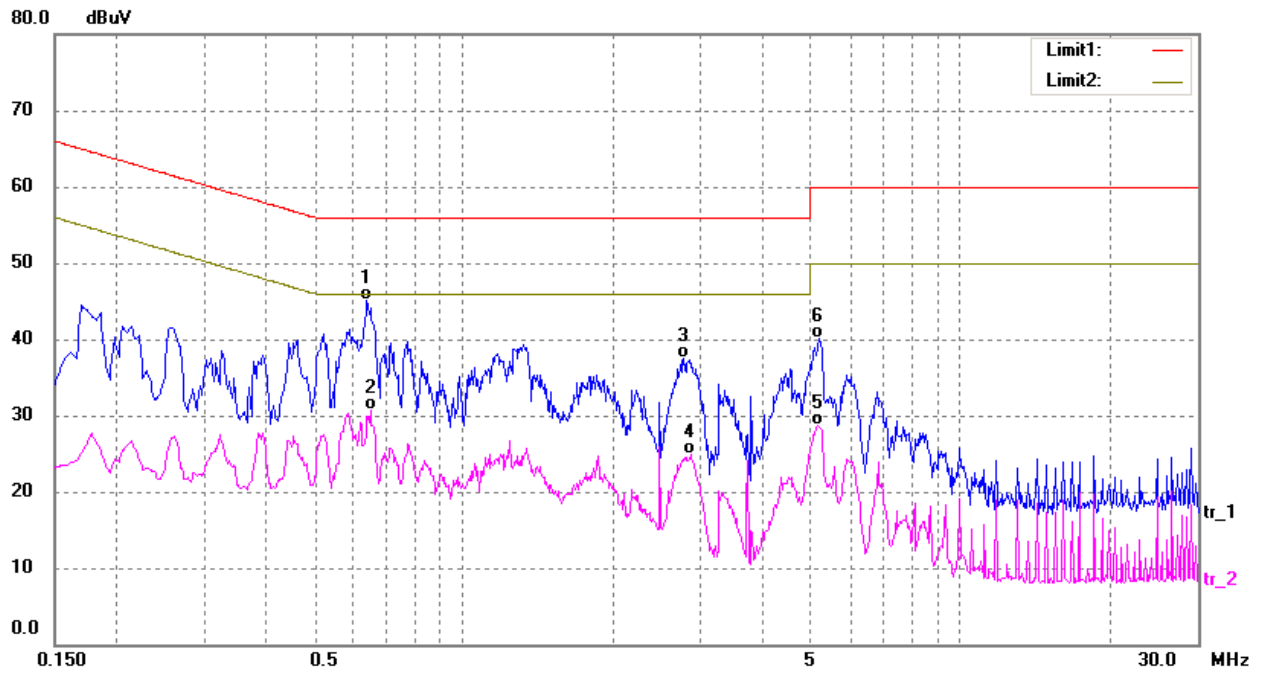
L-Line



Test Data:

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.6380	35.08	10.05	45.13	56.00	-10.87	QP
2	0.6380	21.70	10.05	31.75	46.00	-14.25	AVG
3	1.3940	17.82	10.37	28.19	46.00	-17.81	AVG
4	1.5260	31.11	10.37	41.48	56.00	-14.52	QP
5	2.7820	16.55	10.39	26.94	46.00	-19.06	AVG
6	2.8260	28.12	10.39	38.51	56.00	-17.49	QP

N-Line

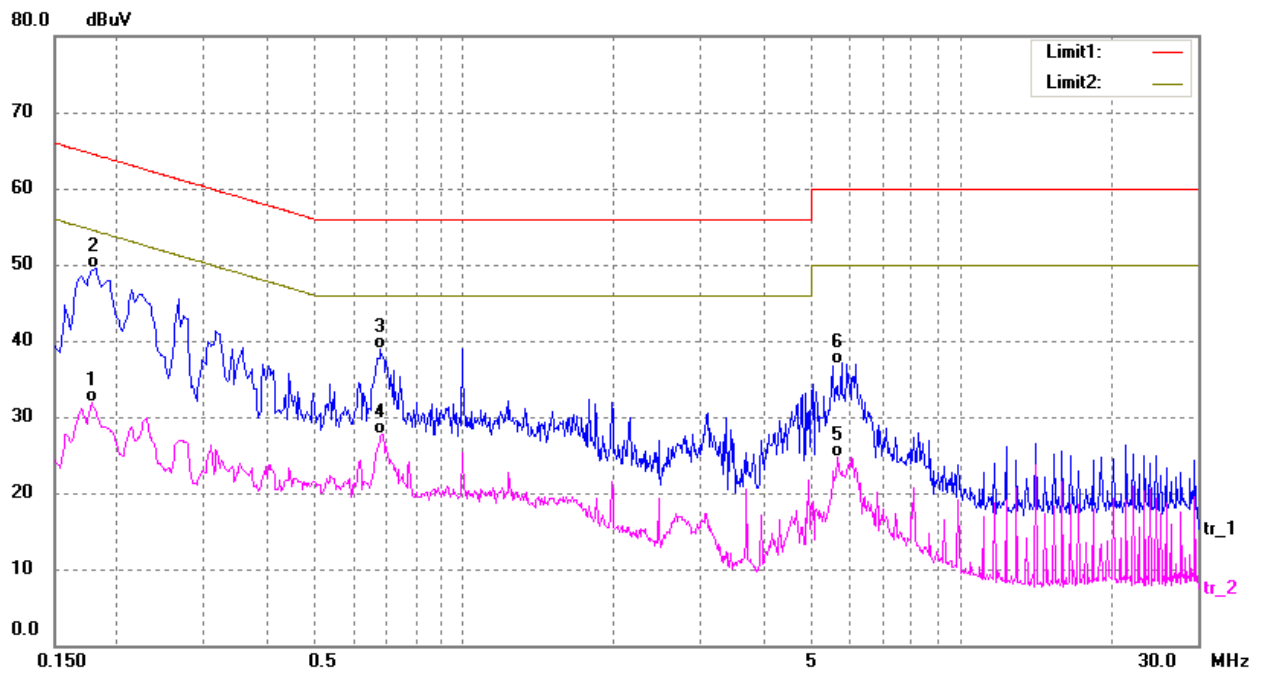


Test Data:

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.6380	35.00	10.05	45.05	56.00	-10.95	QP
2	0.6500	20.59	10.04	30.63	46.00	-15.37	AVG
3	2.7780	27.10	10.39	37.49	56.00	-18.51	QP
4	2.8580	14.51	10.39	24.90	46.00	-21.10	AVG
5	5.1500	18.24	10.39	28.63	50.00	-21.37	AVG
6	5.1700	29.78	10.39	40.17	60.00	-19.83	QP

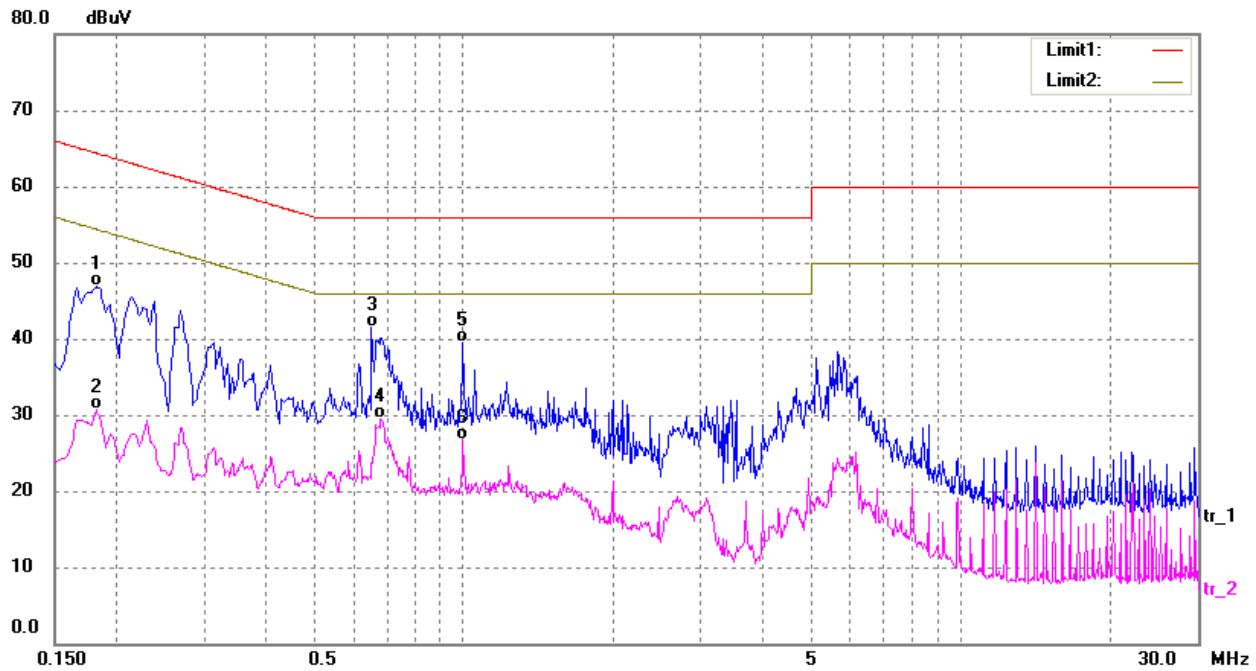
Test Curve of 120VAC:

L Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1780	21.64	10.26	31.90	54.57	-22.67	AVG
2*	0.1819	39.19	10.26	49.45	64.39	-14.94	QP
3	0.6820	28.73	10.17	38.90	56.00	-17.10	QP
4	0.6860	17.56	10.17	27.73	46.00	-18.27	AVG
5	5.6539	14.53	10.23	24.76	50.00	-25.24	AVG
6	5.7499	26.77	10.23	37.00	60.00	-23.00	QP

N Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1819	36.61	10.26	46.87	64.39	-17.52	QP
2	0.1819	20.49	10.26	30.75	54.39	-23.64	AVG
3*	0.6540	31.23	10.19	41.42	56.00	-14.58	QP
4	0.6820	19.37	10.17	29.54	46.00	-16.46	AVG
5	0.9980	29.24	10.20	39.44	56.00	-16.56	QP
6	0.9980	16.41	10.20	26.61	46.00	-19.39	AVG

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.

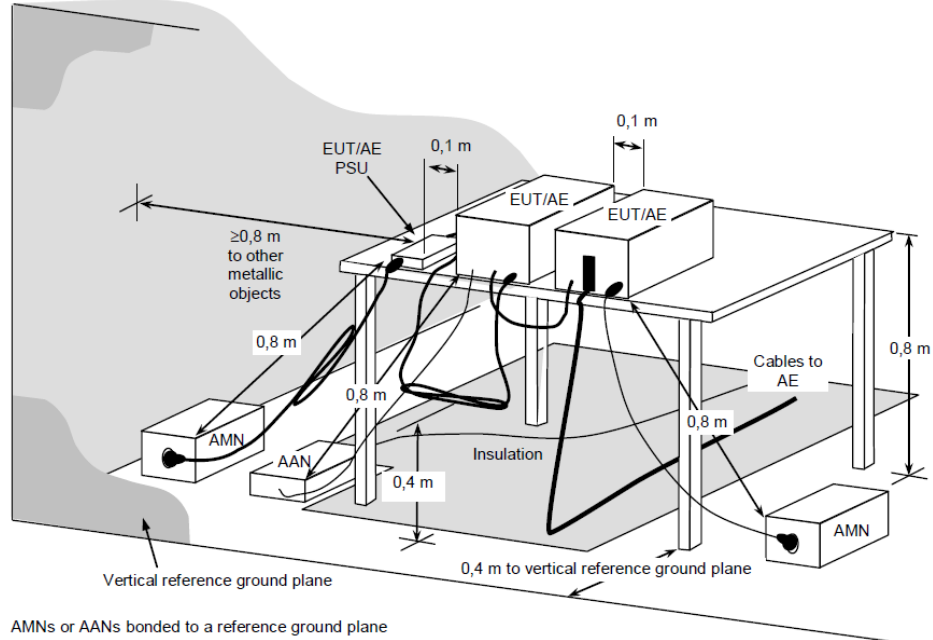
5.1.2 Limits of conducted emission for other equipment

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

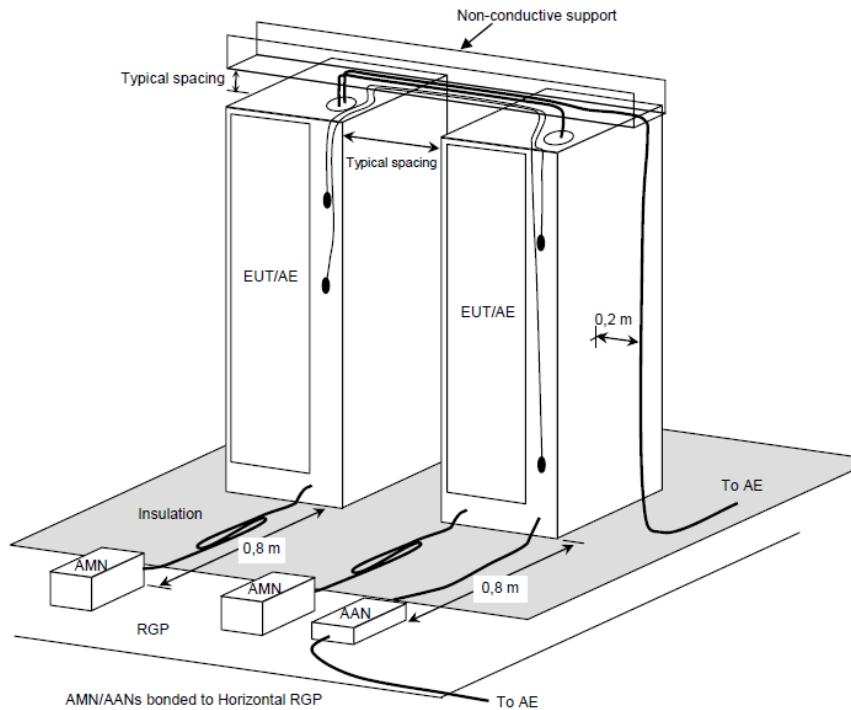
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the 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

Test Curve:

Test Data:

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)

- Remark: 1. Correct Factor = AAN 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 AAN Factor = 10.00dB, Cable Loss = 2.00dB,
 Original Receiver Reading = 10.00dBuV, Limit = 74.00dBuV.
 Then Correct Factor = 10.00 + 2.00 = 12.00dB;
 Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;
 Margin = 74.00dBuV – 22.00dBuV = 52.00dB.

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

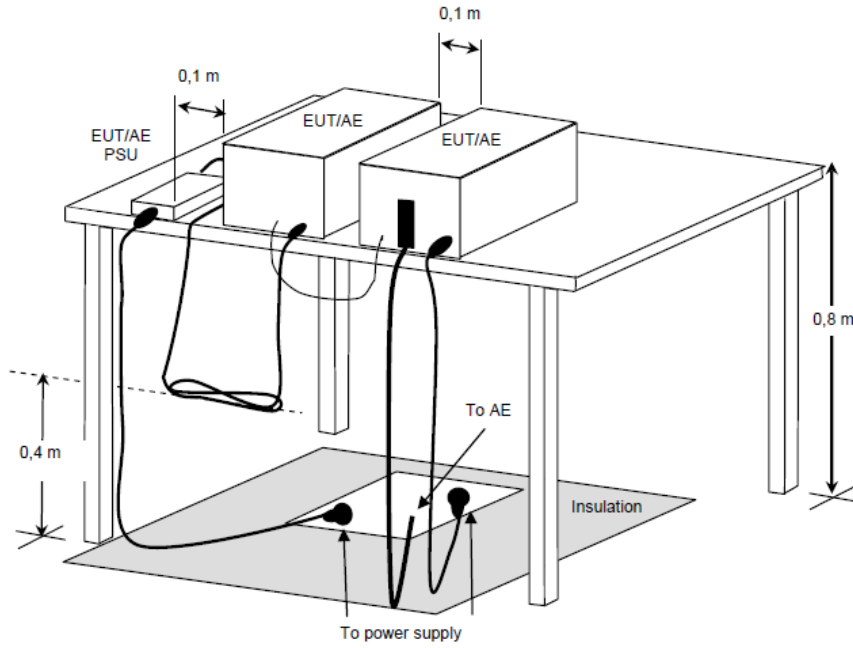
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

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

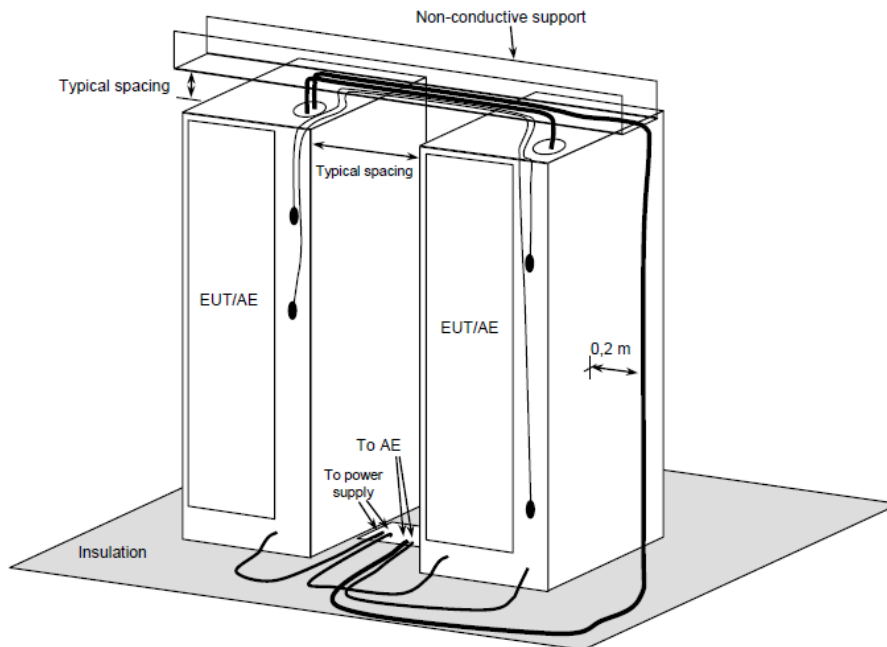
NOTE The lower limit applies at the transition frequency.

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.

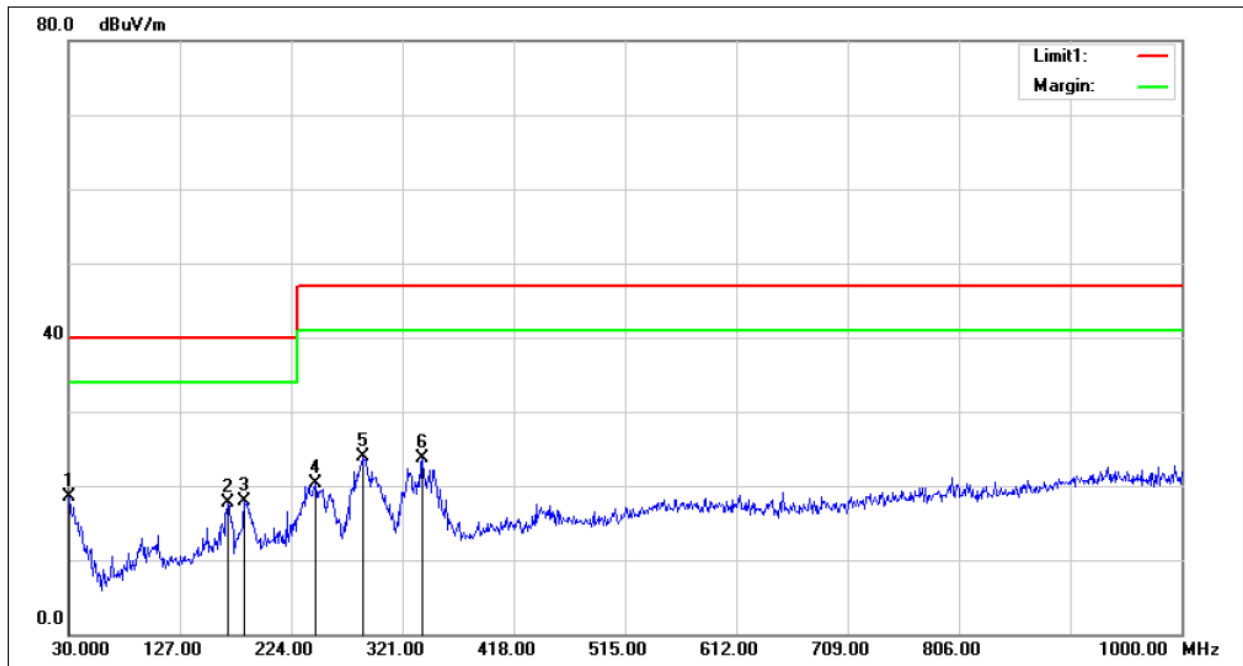
The distance from EUT to receiving antenna is 3 meters.

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.

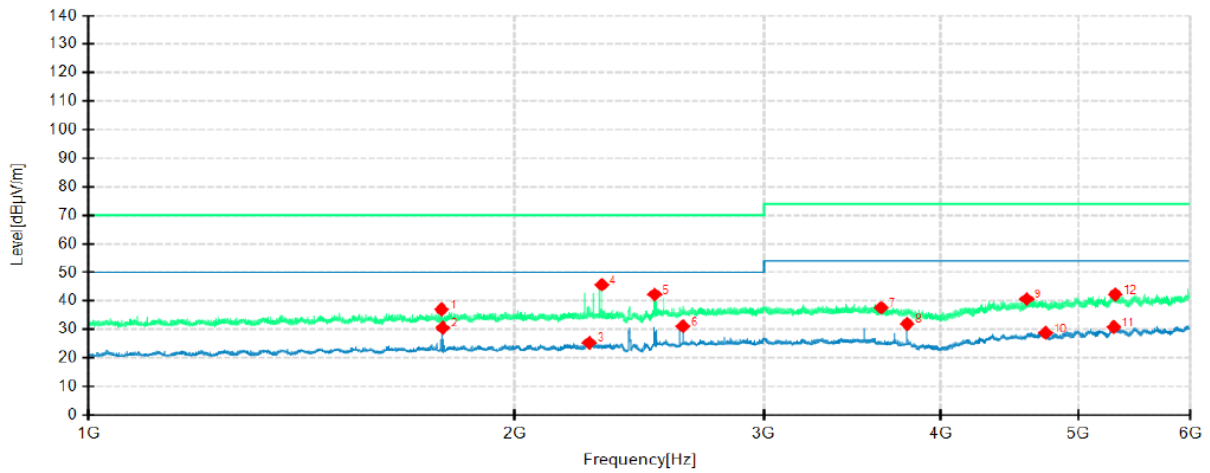
6.4 Test Result of 120VAC

Horizontal



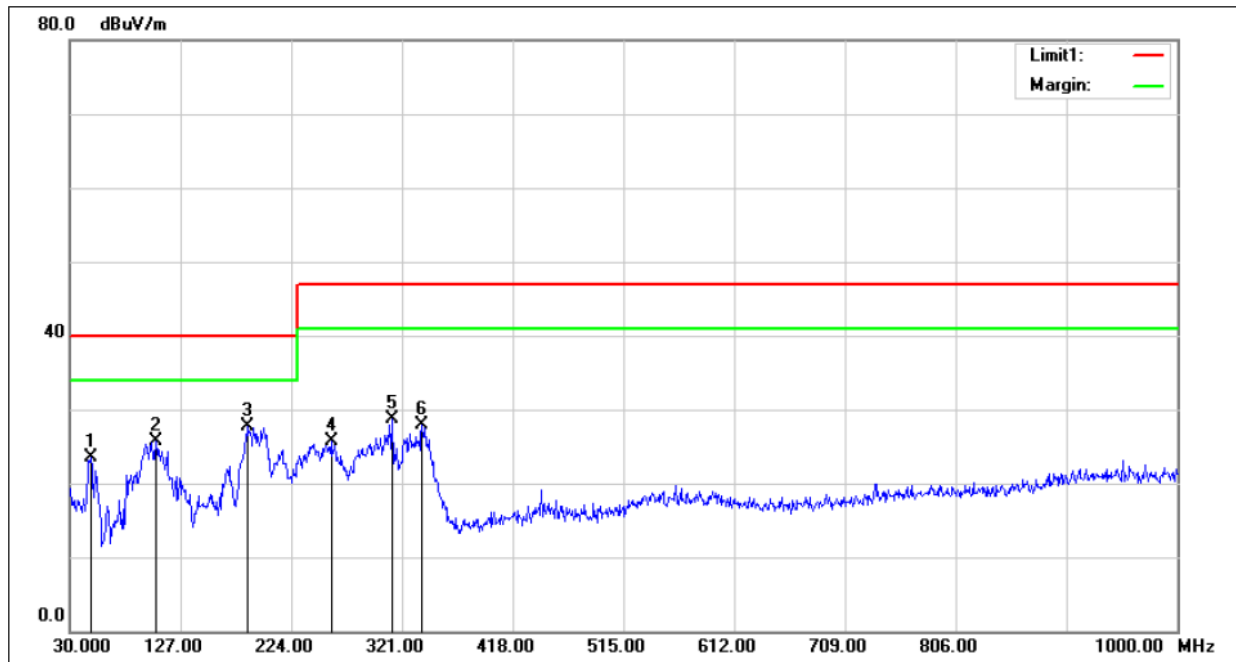
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg)	Remark
1*	30.9700	36.08	-17.52	18.56	40.00	-21.44	200	20	QP
2	168.7100	45.99	-28.34	17.65	40.00	-22.35	100	105	QP
3	183.2600	46.40	-28.44	17.96	40.00	-22.04	100	299	QP
4	245.3400	46.33	-26.08	20.25	47.00	-26.75	100	99	QP
5	287.0500	48.96	-25.12	23.84	47.00	-23.16	100	91	QP
6	338.4600	47.72	-23.93	23.79	47.00	-23.21	100	251	QP

Test Graph



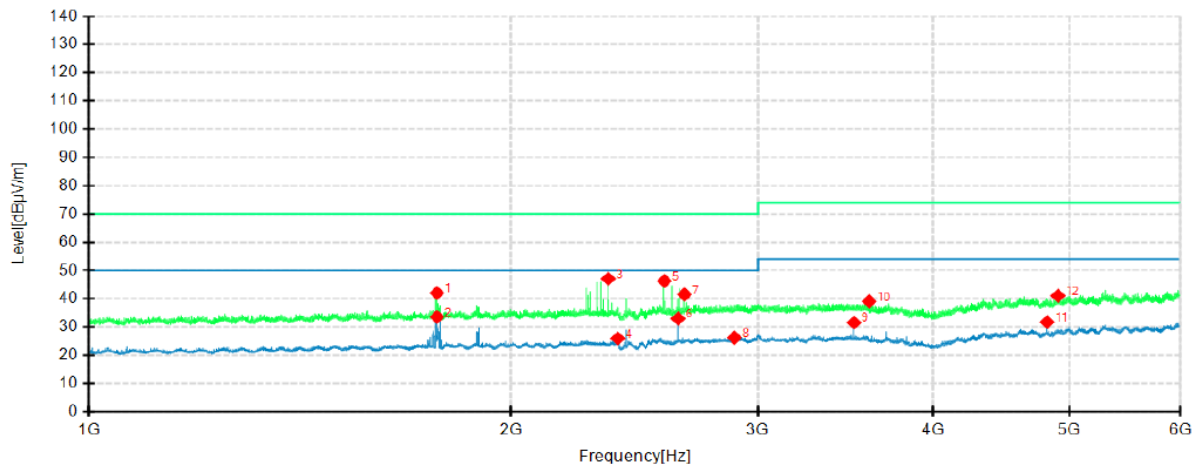
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1776.2000	59.32	36.99	-22.33	70.00	33.01	100	194	Horizontal
2	1779.6000	52.84	30.54	-22.30	50.00	19.46	100	261	Horizontal
3	2258.8000	46.21	25.37	-20.84	50.00	24.63	100	85	Horizontal
4	2305.0000	66.26	45.65	-20.61	70.00	24.35	100	68	Horizontal
5	2511.6000	62.46	42.27	-20.19	70.00	27.73	200	195	Horizontal
6	2630.2000	50.77	31.10	-19.67	50.00	18.90	100	160	Horizontal
7	3630.9000	53.07	37.60	-15.47	74.00	36.40	100	174	Horizontal
8	3787.5000	47.23	31.93	-15.30	54.00	22.07	100	350	Horizontal
9	4600.2000	52.63	40.66	-11.97	74.00	33.34	200	48	Horizontal
10	4744.5000	39.21	28.79	-10.42	54.00	25.21	100	15	Horizontal
11	5299.8000	41.23	30.79	-10.44	54.00	23.21	200	232	Horizontal
12	5312.7000	52.75	42.29	-10.46	74.00	31.71	100	23	Horizontal

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg)	Remark
1	48.4300	49.47	-25.94	23.53	40.00	-16.47	100	259	QP
2	105.6600	53.78	-28.03	25.75	40.00	-14.25	100	211	QP
3*	186.1700	56.04	-28.36	27.68	40.00	-12.32	100	125	QP
4	258.9200	51.19	-25.52	25.67	47.00	-21.33	100	131	QP
5	312.2700	52.93	-24.27	28.66	47.00	-18.34	100	299	QP
6	338.4600	51.93	-23.93	28.00	47.00	-19.00	100	302	QP

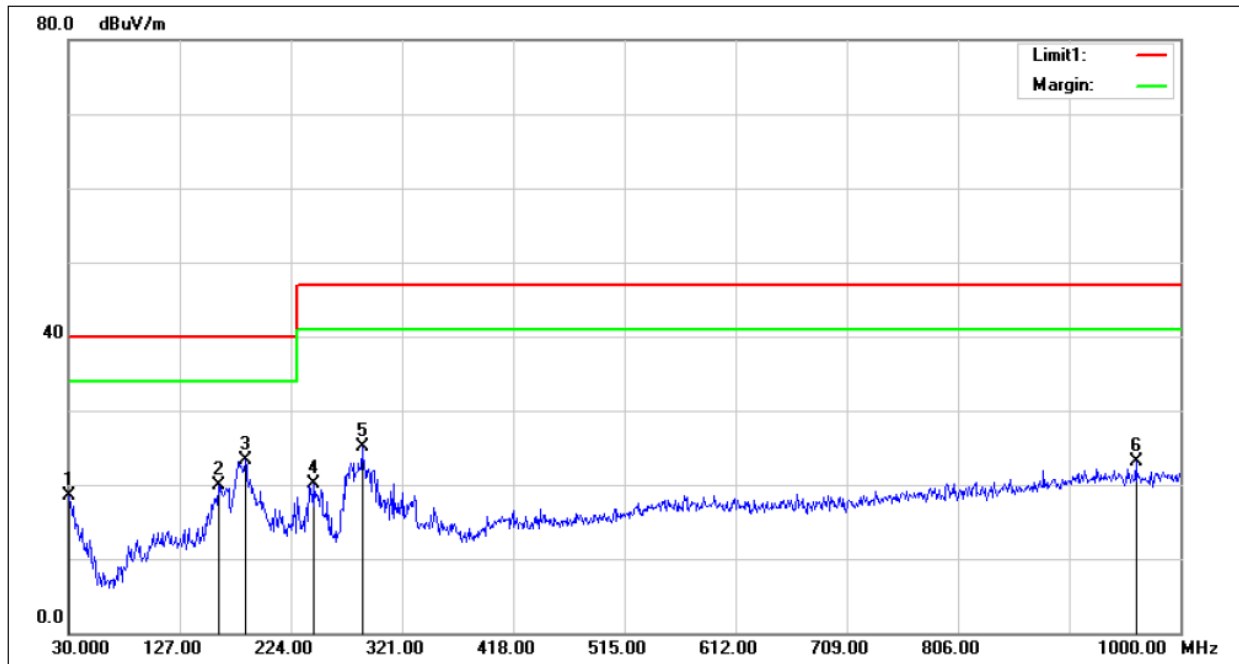
Test Graph



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1771.0000	64.45	42.08	-22.37	70.00	27.92	200	322	Vertical
2	1771.2000	55.96	33.59	-22.37	50.00	16.41	200	322	Vertical
3	2346.2000	68.12	47.11	-21.01	70.00	22.89	100	353	Vertical
4	2383.6000	46.71	26.00	-20.71	50.00	24.00	200	353	Vertical
5	2573.4000	66.16	46.33	-19.83	70.00	23.67	100	329	Vertical
6	2632.2000	52.65	33.01	-19.64	50.00	16.99	200	128	Vertical
7	2659.2000	60.91	41.57	-19.34	70.00	28.43	100	94	Vertical
8	2886.8000	44.95	26.28	-18.67	50.00	23.72	200	52	Vertical
9	3513.3000	48.04	31.59	-16.45	54.00	22.41	100	64	Vertical
10	3601.5000	54.32	39.12	-15.20	74.00	34.88	100	198	Vertical
11	4824.3000	42.44	31.80	-10.64	54.00	22.20	100	2	Vertical
12	4911.0000	52.08	41.09	-10.99	74.00	32.91	100	257	Vertical

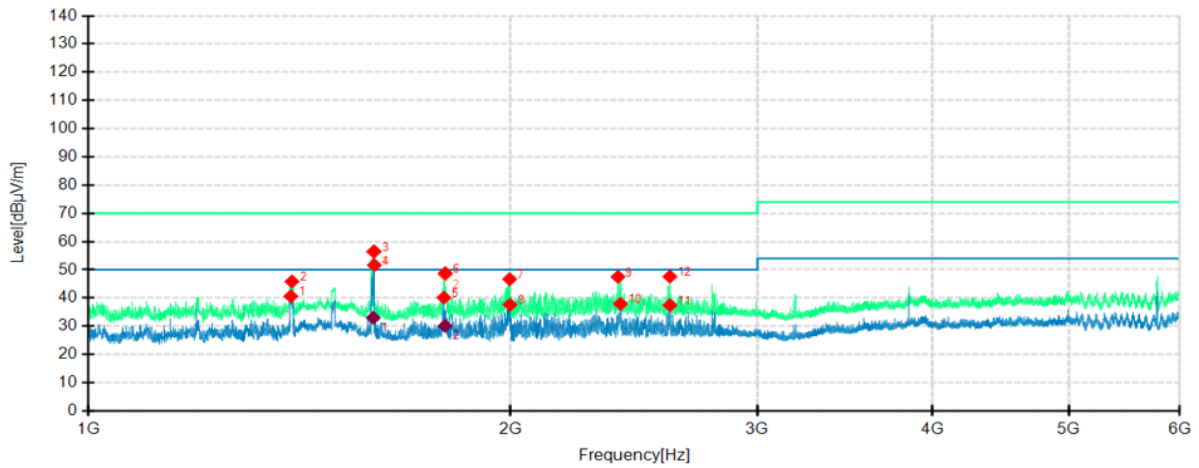
Test Result of 230VAC

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg)	Remark
1	30.0000	35.53	-17.05	18.48	40.00	-21.52	400	150	QP
2	160.9500	47.97	-28.04	19.93	40.00	-20.07	300	328	QP
3*	184.2300	51.66	-28.42	23.24	40.00	-16.76	200	126	QP
4	244.3700	46.31	-26.12	20.19	47.00	-26.81	197	0	QP
5	286.0800	50.21	-25.14	25.07	47.00	-21.93	100	134	QP
6	961.2000	37.73	-14.58	23.15	47.00	-23.85	400	78	QP

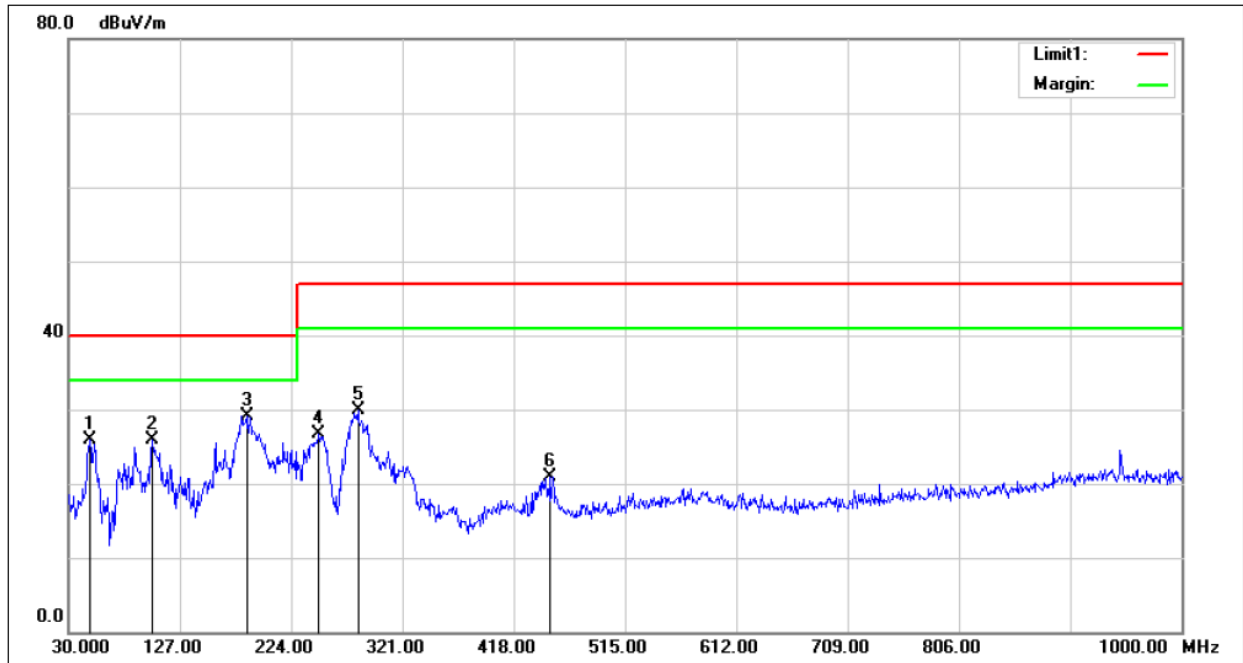
Test Graph



Test data:

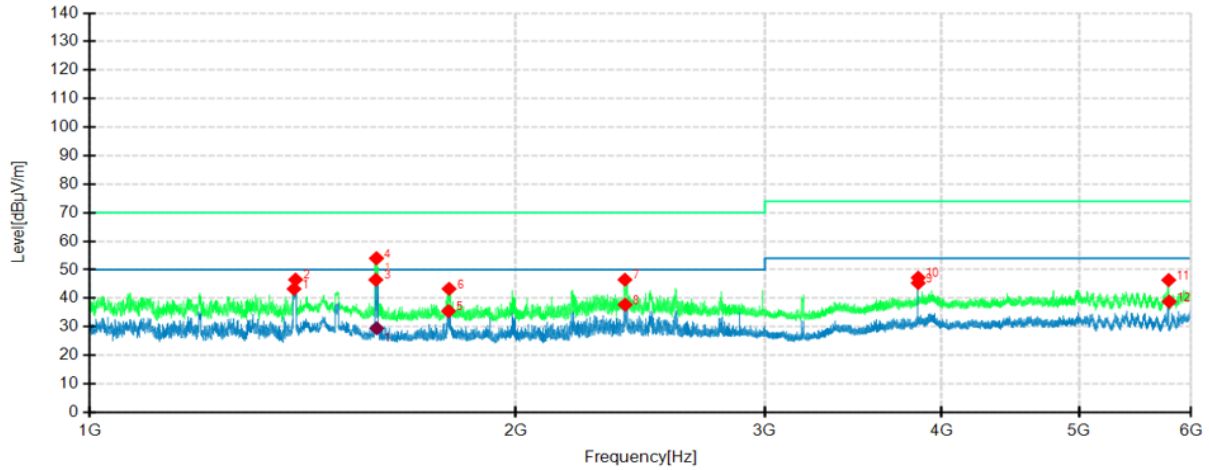
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1394.5000	64.30	40.62	-23.68	50.00	9.38	100	358	Horizontal
2	1397.0000	69.51	45.85	-23.66	70.00	24.15	100	184	Horizontal
3	1596.4896	79.47	56.39	-23.08	70.00	13.61	116	119	Horizontal
4	1596.4896	56.07	32.99	-23.08	50.00	17.01	116	119	Horizontal
5	1792.7500	62.32	40.12	-22.20	50.00	9.88	100	110	Horizontal
6	1797.0000	70.99	48.83	-22.16	70.00	21.17	100	289	Horizontal
7	1997.2500	68.26	46.69	-21.57	70.00	23.31	100	205	Horizontal
8	1998.5000	59.21	37.65	-21.56	50.00	12.35	100	89	Horizontal
9	2386.2500	68.18	47.49	-20.69	70.00	22.51	100	299	Horizontal
10	2396.0000	58.54	37.95	-20.59	50.00	12.05	100	299	Horizontal
11	2598.2500	57.56	37.45	-20.11	50.00	12.55	100	205	Horizontal
12	2598.5000	67.71	47.60	-20.11	70.00	22.40	100	205	Horizontal

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg)	Remark
1	48.4300	51.93	-25.94	25.99	40.00	-14.01	100	8	QP
2	102.7500	54.47	-28.50	25.97	40.00	-14.03	100	321	QP
3*	185.2000	57.55	-28.39	29.16	40.00	-10.84	100	90	QP
4	248.2500	52.66	-25.96	26.70	47.00	-20.30	100	106	QP
5	282.2000	55.22	-25.26	29.96	47.00	-17.04	100	223	QP
6	450.0100	41.69	-20.71	20.98	47.00	-26.02	100	342	QP

Test Graph



Test data:

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1394.5000	66.97	43.29	-23.68	50.00	6.71	100	360	Vertical
2	1398.0000	70.19	46.53	-23.66	70.00	23.47	100	353	Vertical
3	1595.4248	77.12	54.04	-23.07	70.00	15.96	190	210	Vertical
4	1595.4248	52.55	29.47	-23.07	50.00	20.53	190	210	Vertical
5	1793.2500	57.71	35.52	-22.19	50.00	14.48	200	354	Vertical
6	1794.5000	65.49	43.31	-22.18	70.00	26.69	100	332	Vertical
7	2389.0000	67.16	46.50	-20.66	70.00	23.50	200	196	Vertical
8	2390.0000	58.39	37.74	-20.65	50.00	12.26	100	195	Vertical
9	3850.0000	59.45	45.35	-14.10	54.00	8.65	100	343	Vertical
10	3850.0000	61.31	47.21	-14.10	74.00	26.79	100	332	Vertical
11	5787.2500	56.30	46.38	-9.92	74.00	27.62	100	131	Vertical
12	5791.5000	48.78	38.83	-9.95	54.00	15.17	200	61	Vertical

- 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.

7 Harmonic current emission

Test result: Pass

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

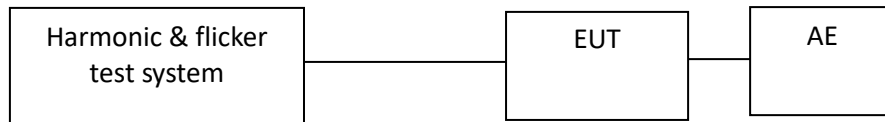
Discharge lighting equipment having an active input power smaller than or equal to 25 W shall comply with one of the following two sets of requirements:

- 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

Pass

8 Voltage fluctuations and flicker

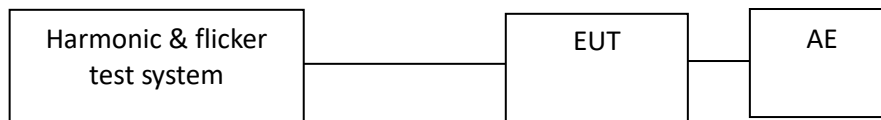
Test result: Pass

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.

- 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.

8.4 Test Result

Pass

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).

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.

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.

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.

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

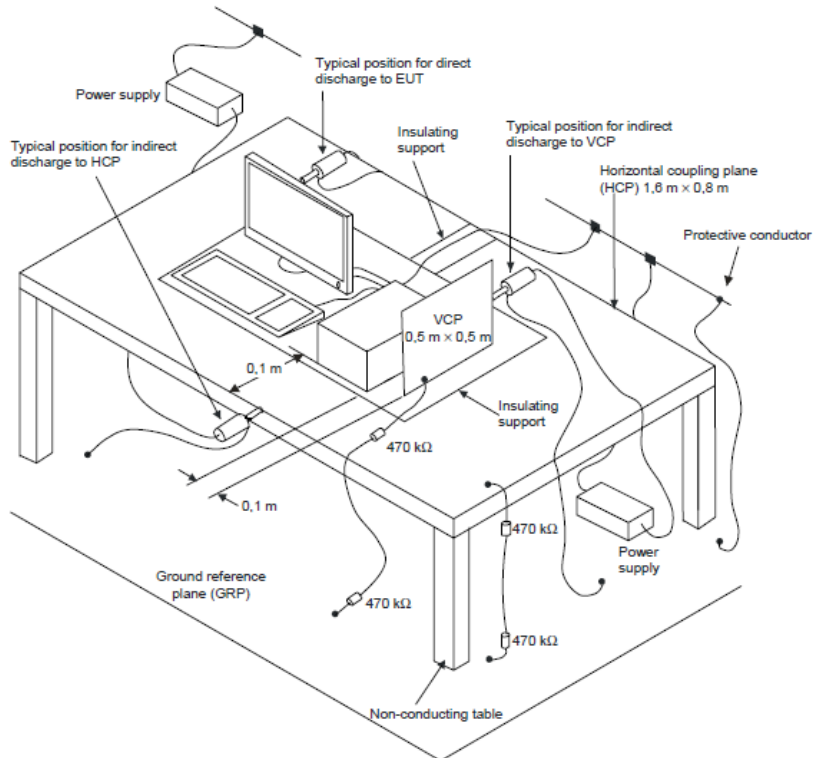
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification.
 If higher voltages than those shown are specified, special test equipment may be needed.
 2. The gray rows were the selected test level.

9.1.2 Performance Criterion

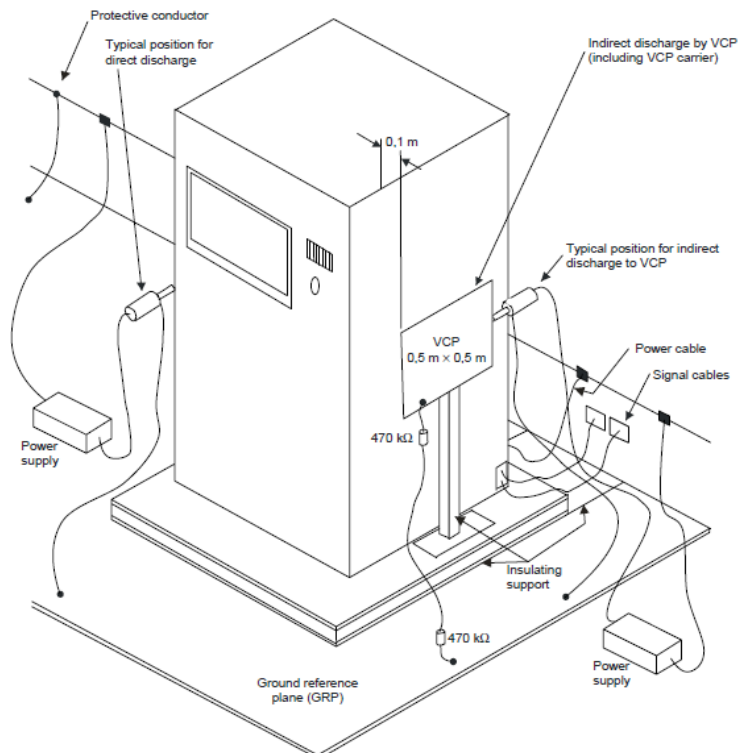
Criterion B

9.2 Test Setup

For table-top equipment



For floor standing equipment



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
4	Contact	+/-	Pass	Accessible metal parts of the EUT
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	Pass
HCP back	0,1m from the back of the EUT	Edge of centre on HCP	Pass
HCP right	0,1m from the right side of the EUT	Edge of centre on HCP	Pass
HCP left	0,1m from the left side of the EUT	Edge of centre on HCP	Pass
VCP front	0,1m from the front of the EUT	Edge of centre on VCP	Pass
VCP back	0,1m from the back of the EUT	Edge of centre on VCP	Pass
VCP right	0,1m from the right of the EUT	Edge of centre on VCP	Pass
VCP left	0,1m from the left of the EUT	Edge of centre on VCP	Pass

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	NA
CP back	0,1m from the back of the EUT	Edge of centre on VCP	NA
CP right	0,1m from the right of the EUT	Edge of centre on VCP	NA
CP left	0,1m from the left of the EUT	Edge of centre on VCP	NA

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

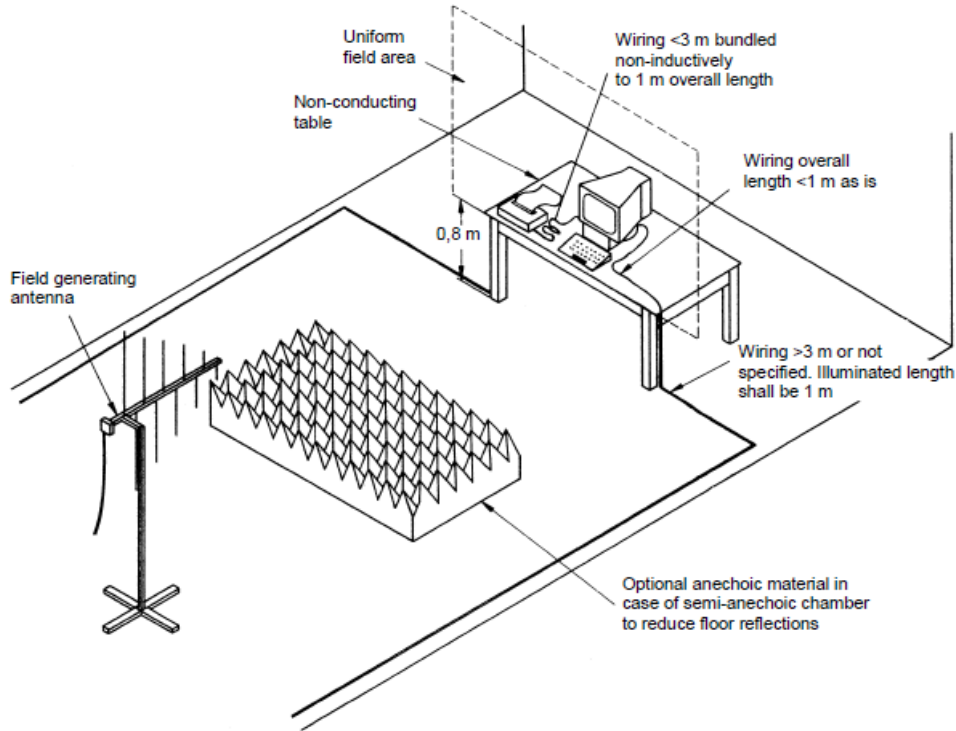
Note: 1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

10.1.2 Performance Criterion

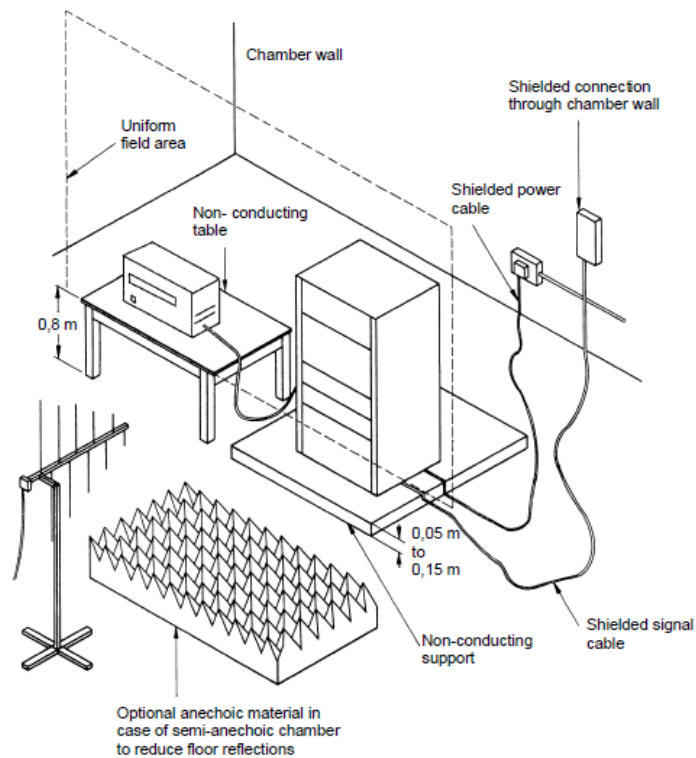
Criterion A

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

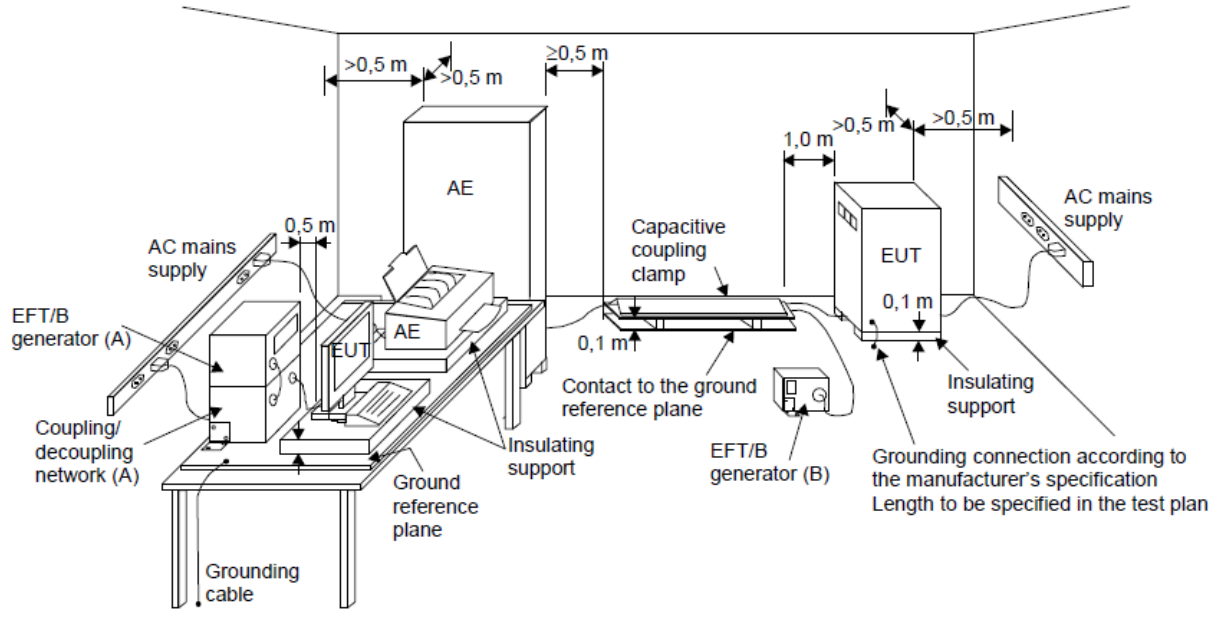
Open circuit output test voltage and repetition rate of the impulses				
Level	AC mains power input ports		Signal ports, wired network ports, control ports, DC power input ports	
	Voltage peak (kV)	Repetition rate (kHz)	Voltage peak (kV)	Repetition rate (kHz)
1	0.5	5	0.25	5/100
2	1	5	0.5	5/100
3	2	5	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 gray rows were the selected test level.

11.1.2 Performance Criterion

Criterion B

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	NA
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 B

12 Surges

Test result Pass

12.1 Severity Level and Performance Criterion

12.1.1 Test level

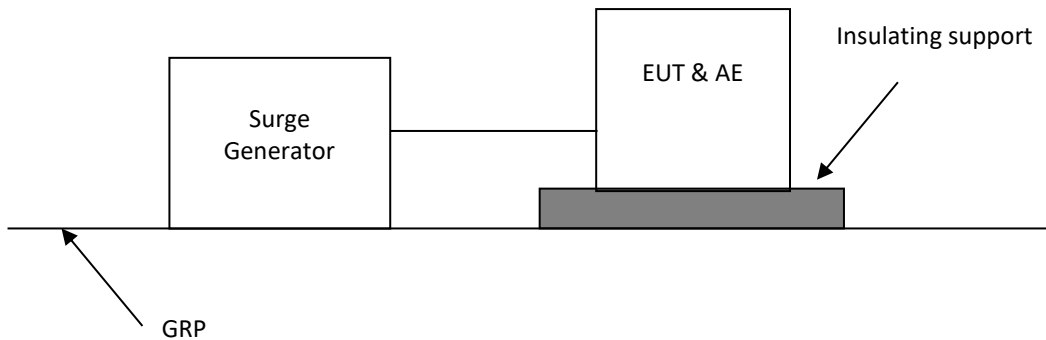
Level	Open-circuit test voltage (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

Notes: 1. "X" is an open class. This level can be specified in the product specification
 2. The gray 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	0.5/1/2	+/-	AC mains power input port (line to earth)	NA
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

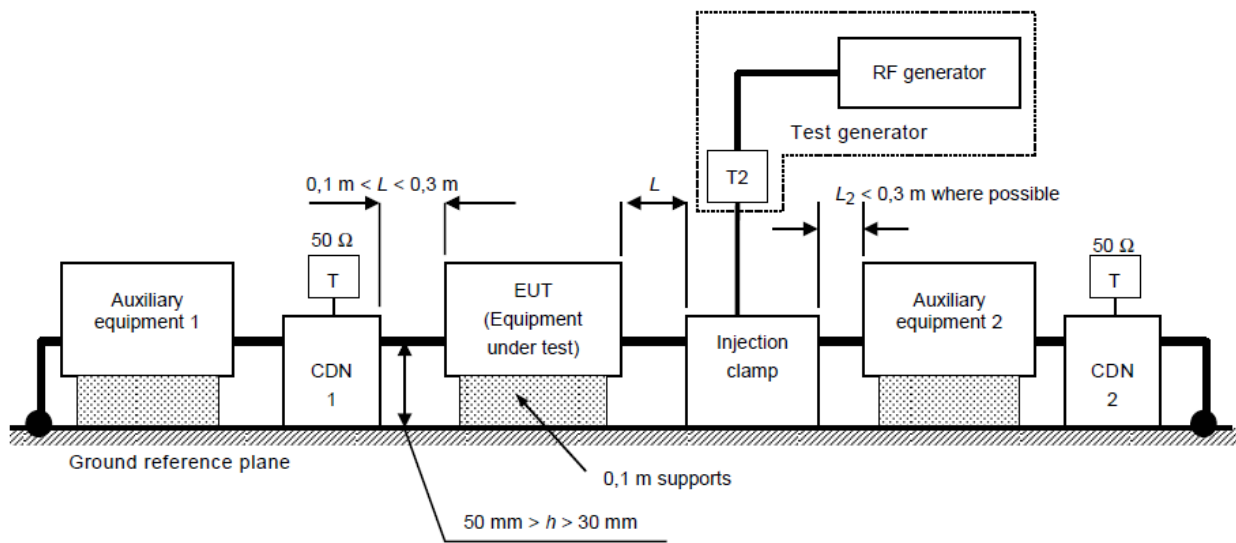
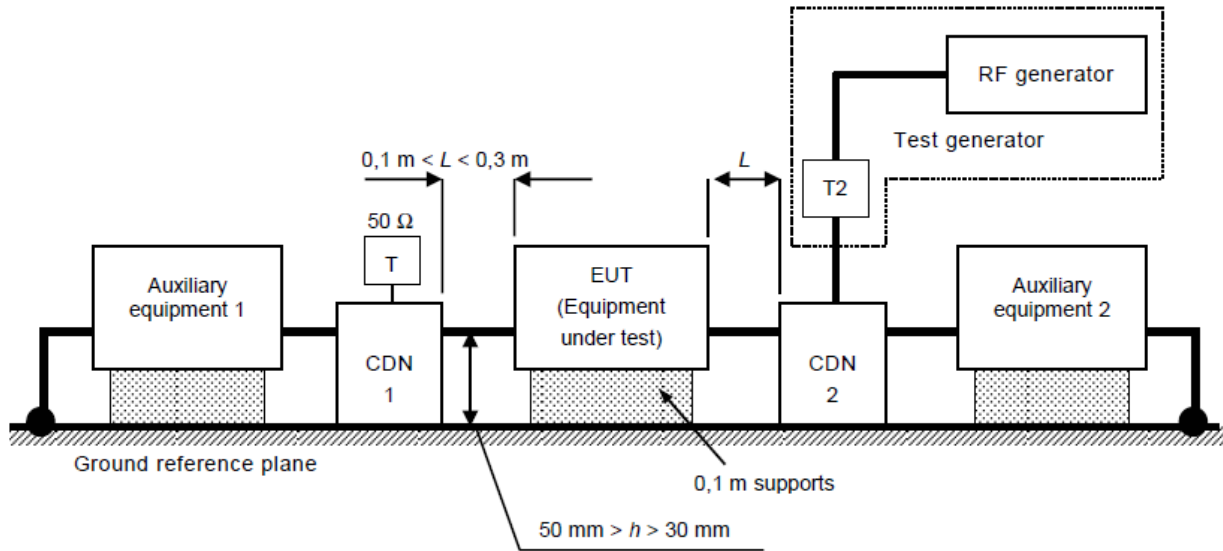
Frequency range 150kHz – 80MHz		
Level	Voltage level	
	U ₀ (dBuV)	U ₀ (V)
1	120	1
2	130	3
3	140	10
X	Special	Special

Notes: 1. "X" is an open level
2. The gray row is the selected test level.

13.1.2 Performance Criterion

Criterion A

13.2 Block Diagram of Test Setup



- T termination 50 Ω
- T2 power attenuator (6 dB)
- CDN coupling and decoupling network

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	NA
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 **Pass**

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

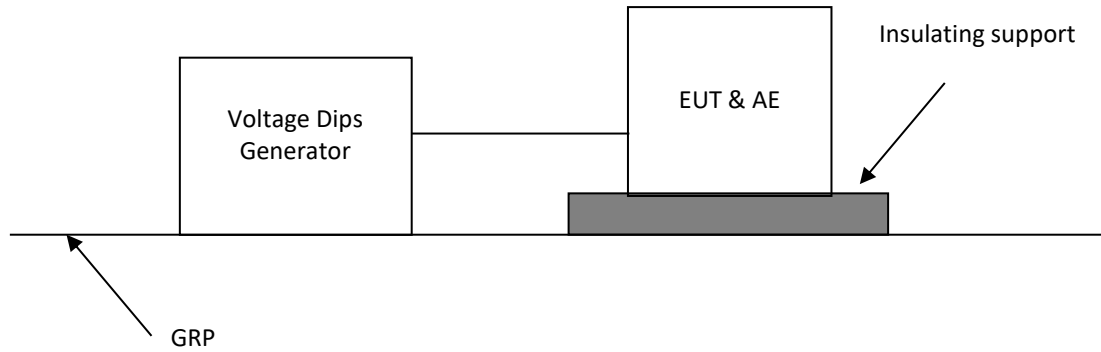
Notes: The gray rows are selected test level.

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	Pass
2	0	100%	0.5	Pass
3	0	100%	1	Pass
4	0	100%	250	Pass

Observation: During 0% 250 periods test, the EUT lights flash. After testing, it can recover normal state.
 All the functions were operated as normal after test.

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

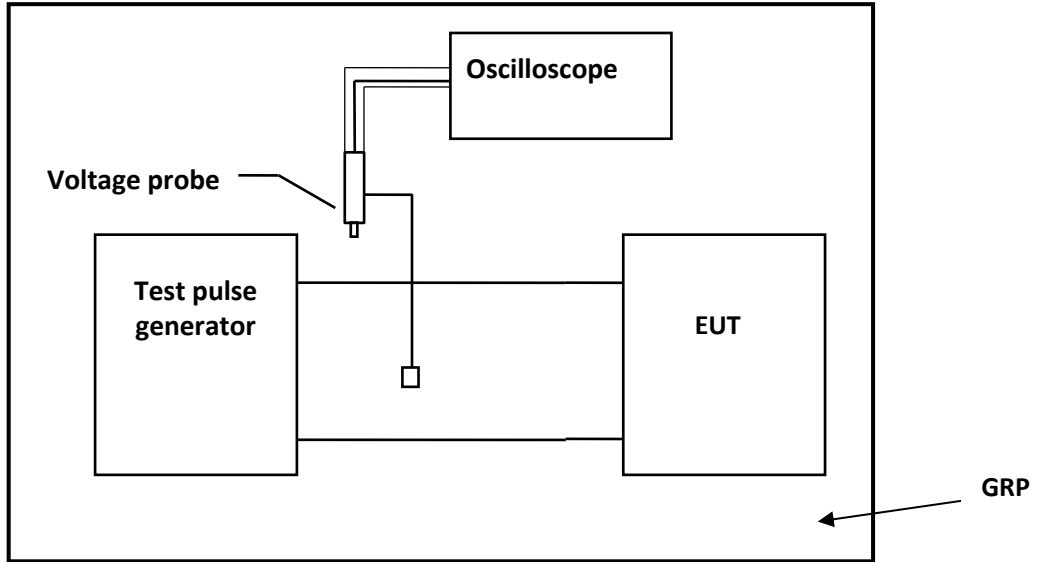
Pulse No.	Test Level III	Number of Pulses or Application Time	Burst/pulse cycle time	
			minimum	maximum
1	- 75V	10 pulses	0,5 s	5 s
2a	+ 37V	10 pulses	0,2 s	5 s
2b	+ 10V	10 pulses	0,5 s	5 s
3a	- 112V	20 minutes	90 ms	100 ms
3b	+ 75V	20 minutes	90 ms	100 ms
4	- 6V	10 pulses	1 min	-

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 equipment under test

Refer to Report No. 200702409SHA-001+A1 for EUT external and internal photos.

***** END *****