

Lumi United Technology Co., Ltd.

CE TEST REPORT

SCOPE OF WORK:

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

Model:

HM1S-G01

REPORT NUMBER

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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

Draft EN 301 489-17 V3.2.2: 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
200702409SHA-003	Rev. 01	Initial issue of report	August 31, 2020

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 : EUT is a Hub, it supports zigbee and wifi functions. There is one model, We test it and list the worst data in this report.

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 : July 11, 2020

Date of test : July 11~July 28, 2020

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:

<input checked="" type="checkbox"/>	Name	Waltek Services Testing Group Limited
	Address	2/F,2nd Building, Sunlink International Machinery City, Chencun Town, Shunde District, Foshan 528313, Guangdong, China
	Telephone	+86-757-23811398
	CNAS No	L3110

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

Conducted Emission						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	EMI Test Receiver	R&S	ESCI	100947	2019-09-17	2020-09-16
2	LISN	R&S	ENV216	100115	2019-09-17	2020-09-16
3	Cable	Top	TYPE16(3.5M)	-	2019-09-17	2020-09-16
3m Semi-anechoic Chamber for Radiation						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	Spectrum Analyzer	R&S	FSP30	100091	2020-04-20	2021-04-19
2	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2020-04-25	2021-04-24
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2020-04-20	2021-04-19
4	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2020-04-20	2021-04-19
5	Test Receiver	R&S	ESCI	101296	2020-04-20	2021-04-19
6	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2020-04-25	2021-04-24
7	Amplifier	ANRITSU	MH648A	M43381	2020-04-20	2021-04-19
8	Cable	HUBER+SUHNER	CBL2	525178	2020-04-20	2021-04-19
Flicker Measuring System						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	Digital Power Analyzer	SCHAFFNER	CCN 1000-1	72625	2020-04-20	2021-04-19
2	Power Source	SCHAFFNER	NSG 1007	58477	2020-04-20	2021-04-19
Electrostatic Discharge						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	Electrostatic Discharge Simulator	SCHLODER	SESD 216	606144	2020-04-24	2021-04-23
Radio-frequency electromagnetic fields						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	Signal Generator	R&S	SMB100A	105942	2019-09-17	2020-09-16
2	RF Power Amplifier	BONN Elektronik	BLWA0830-160/100/40D	128740	2019-09-17	2020-09-16
3	Gestockte Breitband (S tacked) Log.-per.Antenna	SCHWARZBECK	STLP9128D	043	2019-09-17	2020-09-16
4	Power Meter	R&S	NRP2	102031	2020-04-20	2021-04-19

5	Amplifier	NJNT	NTWPAS-2560025	2560025	2020-04-20	2021-04-19
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2020-04-28	2021-04-27
Surge, EFT, Voltage dips and Interruption						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	All Modules Generator	SCHAFFNER	6150	34579	2019-09-17	2020-9-16
2	Capacitive Coupling Clamp	SCHAFFNER	CDN 8014	25311	2019-09-17	2020-9-16
3	Signal and Data Line Coupling Network	SCHAFFNER	CDN 117	25627	2019-09-17	2020-9-16
4	AC Power Supply	HENGYUAN	DTDGC-4	-	2019-09-17	2020-9-16
Conducted Immunity						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	RF Generator	TESEQ	NSG4070	25781	2019-09-17	2020-9-16
2	CDN M-Type	TESEQ	CDN M016	25112	2019-09-17	2020-9-16
3	EM-Clamp	TESEQ	KEMZ 801	25453	2019-09-17	2020-9-16
4	Attenuator 6dB	TESEQ	ATN6050	25376	2019-09-17	2020-9-16
RF Test						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Valid
1	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2020-04-20	2021-04-19
2	ESG VECTOR SIGNAL GENERATOR	Malaysia Keysight	E4438C	MY45092536	2020-04-20	2021-04-19
3	EXG Analog Signal Generator	Malaysia Keysight	N5171B	MY53050845	2019-09-17	2020-09-16
4	Signal Generator	Agilent	N5182A	MY46240814	2019-09-17	2020-09-16
5	USB Wideband Power Sensor	Malaysia Keysight	U2021XA	SG54400003	2019-09-17	2020-09-16
6	Universal Radio Communication Tester	R&S	CMW500	116543	2019-09-17	2020-09-16

2.6 Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5dB
Power Spectral Density, conducted	±3dB
Unwanted Emissions, conducted	±3dB
All emissions, radiated	±6dB
Time	±5%
Duty Cycle	±5%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~18GHz)	±5.47dB

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.

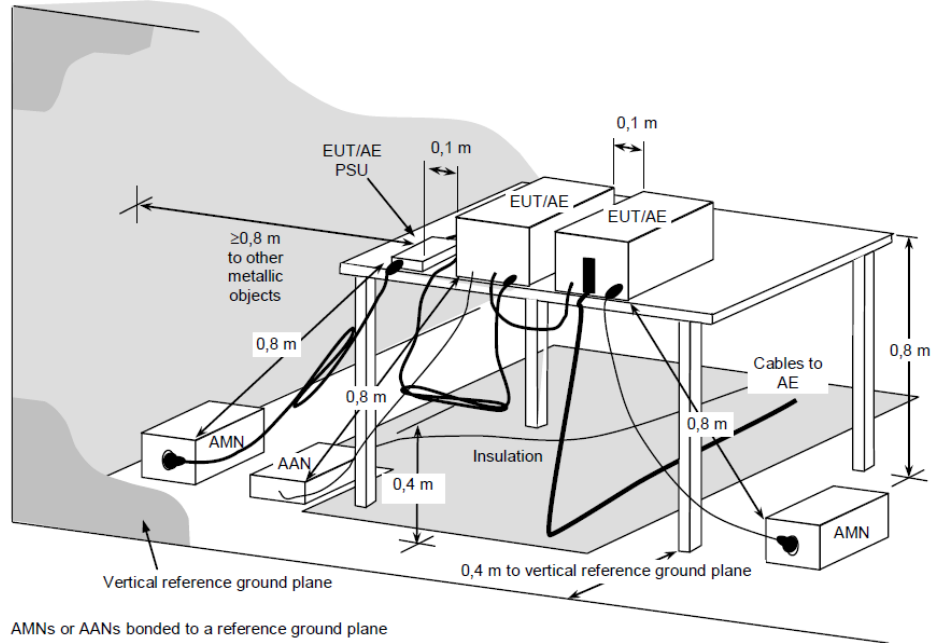
3.1.2 Limits of conducted emissions for other equipment

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

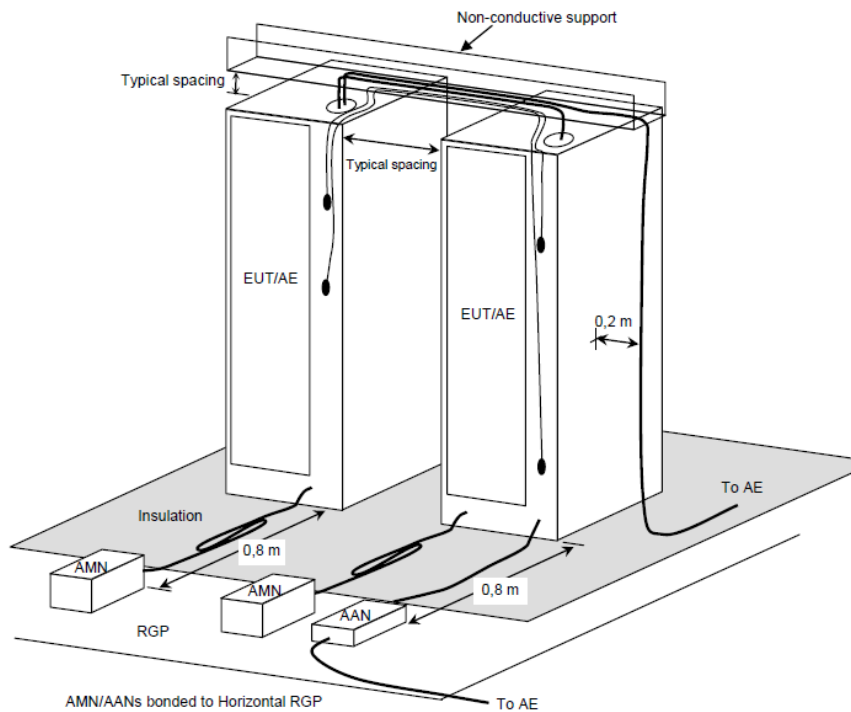
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the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

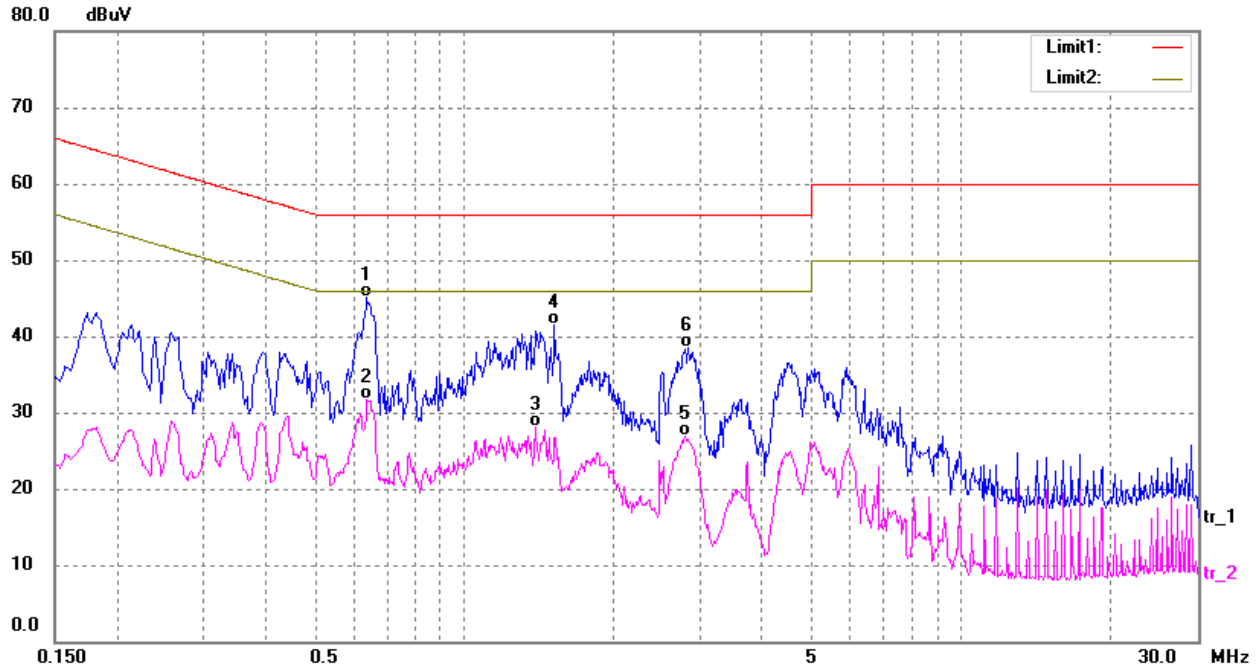
Detailed test procedure and arrangement was followed EN 301 489-1 clause 8.4.

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

4.4 Test Result

Test Curve of 230VAC:

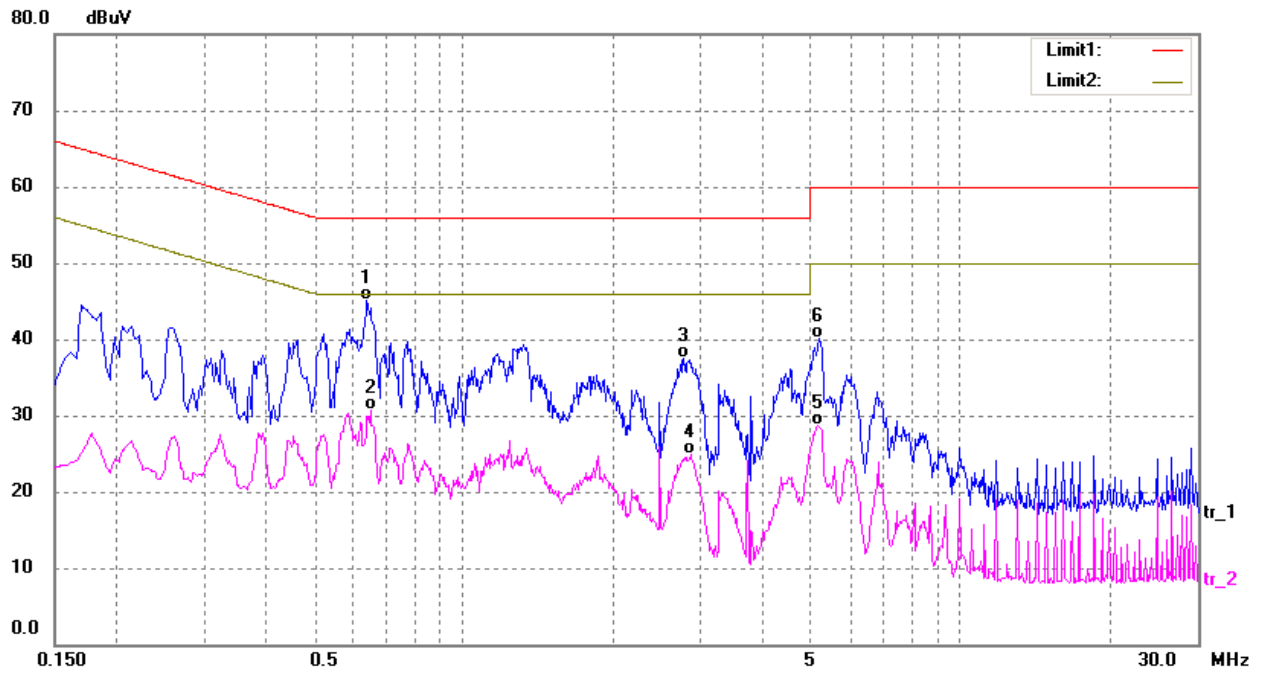
L-Line



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

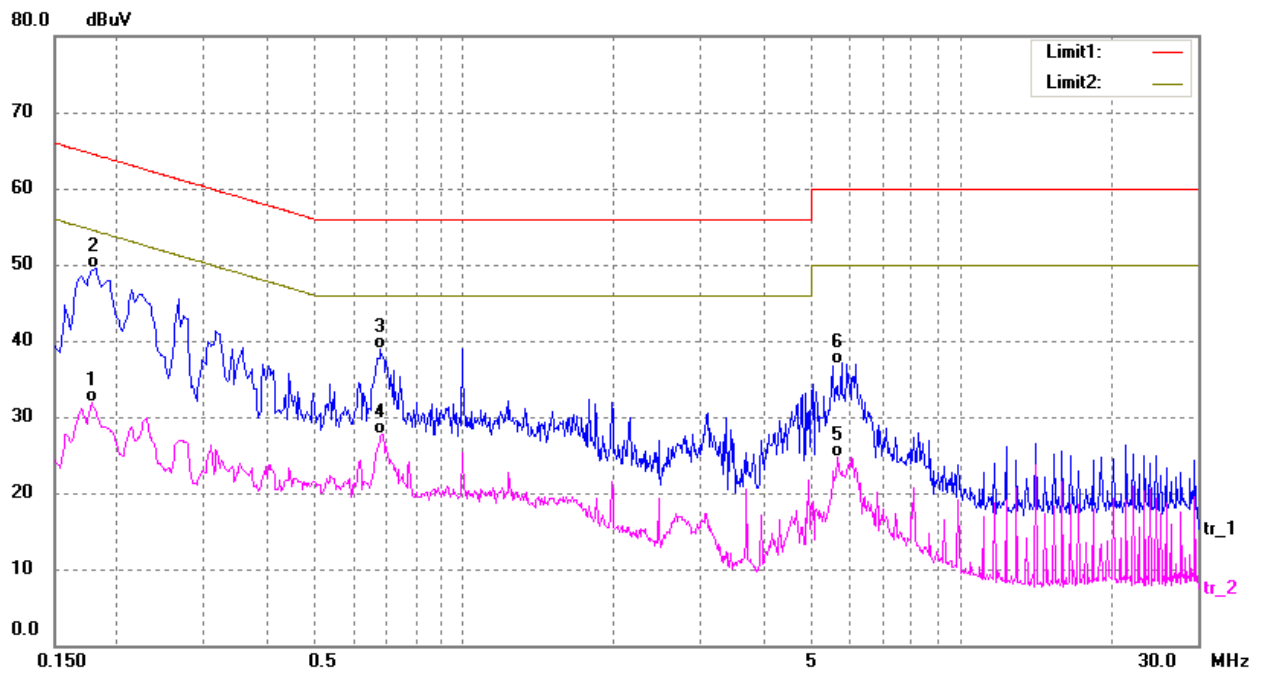


Test Data:

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

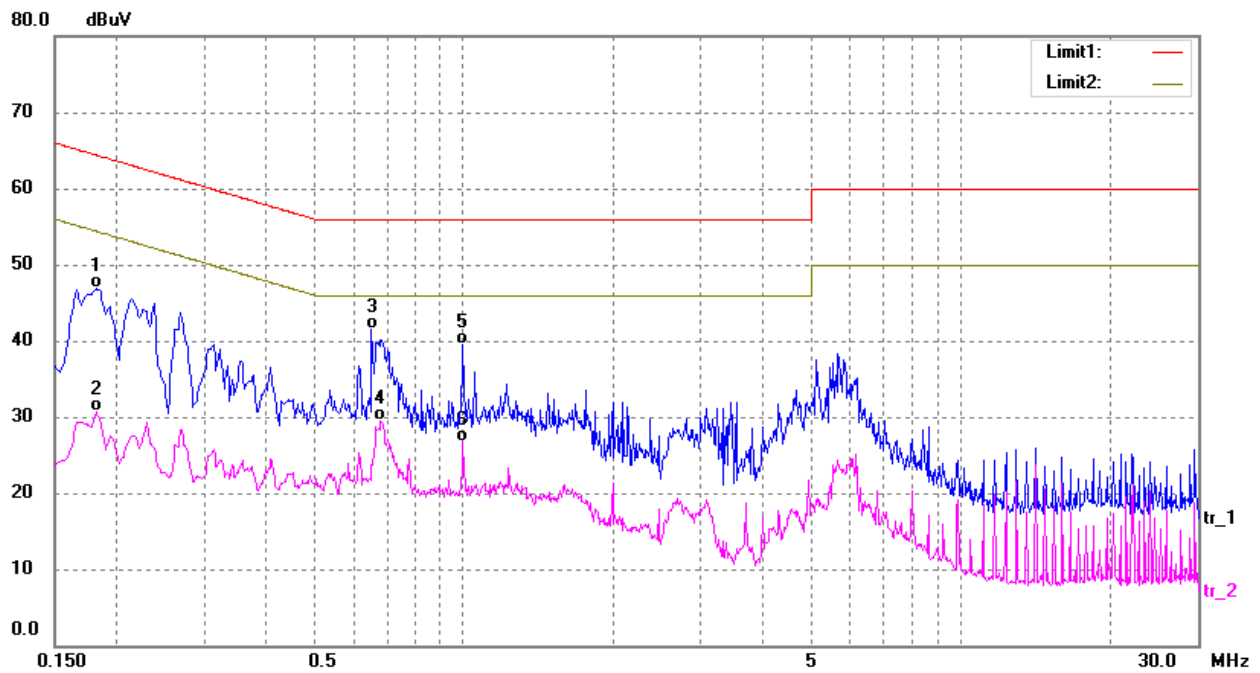
Test Curve of 120VAC:

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.

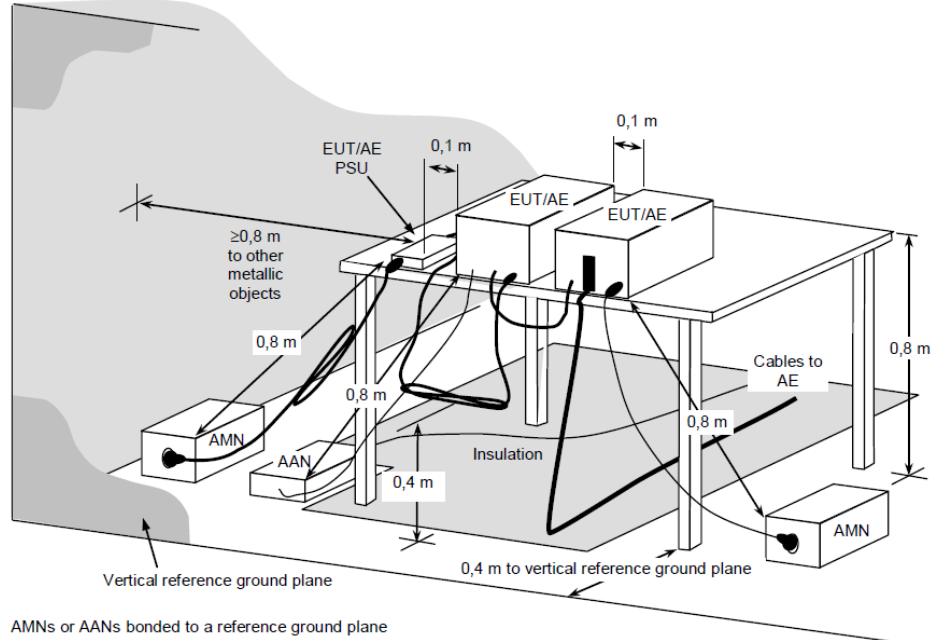
5.1.2 Limits of conducted emission for other equipment

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

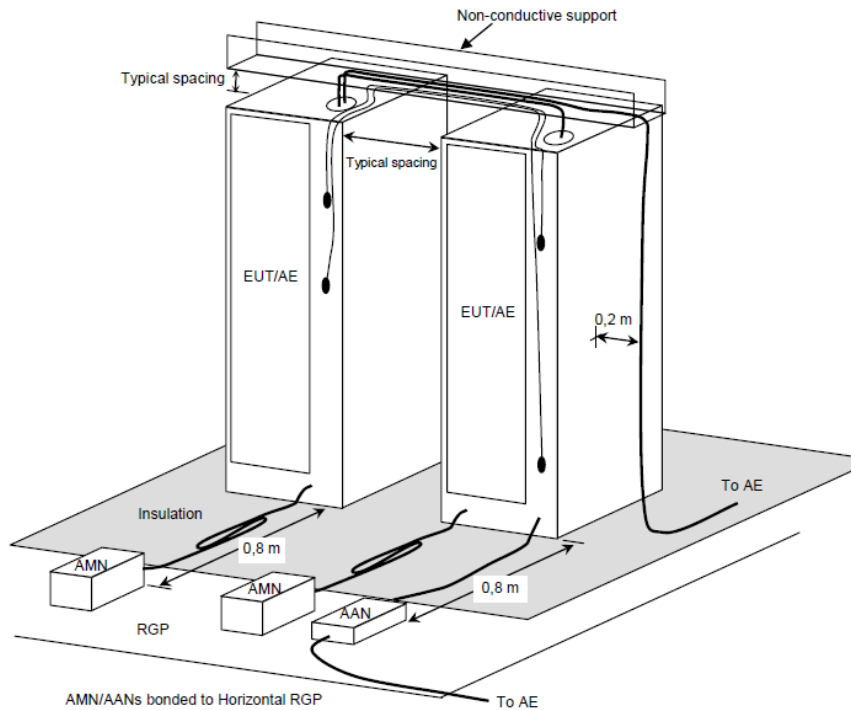
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the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

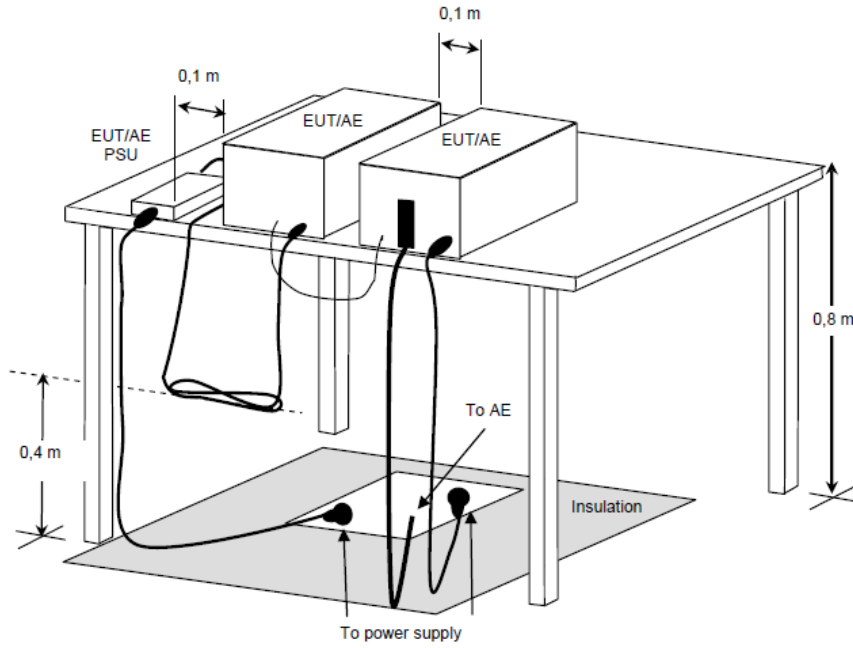
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

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

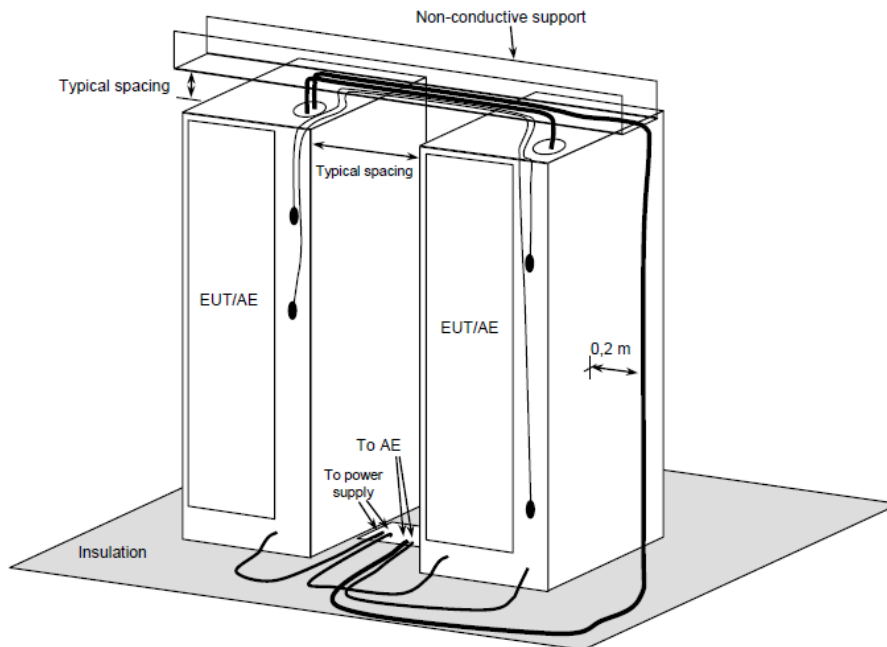
NOTE The lower limit applies at the transition frequency.

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.

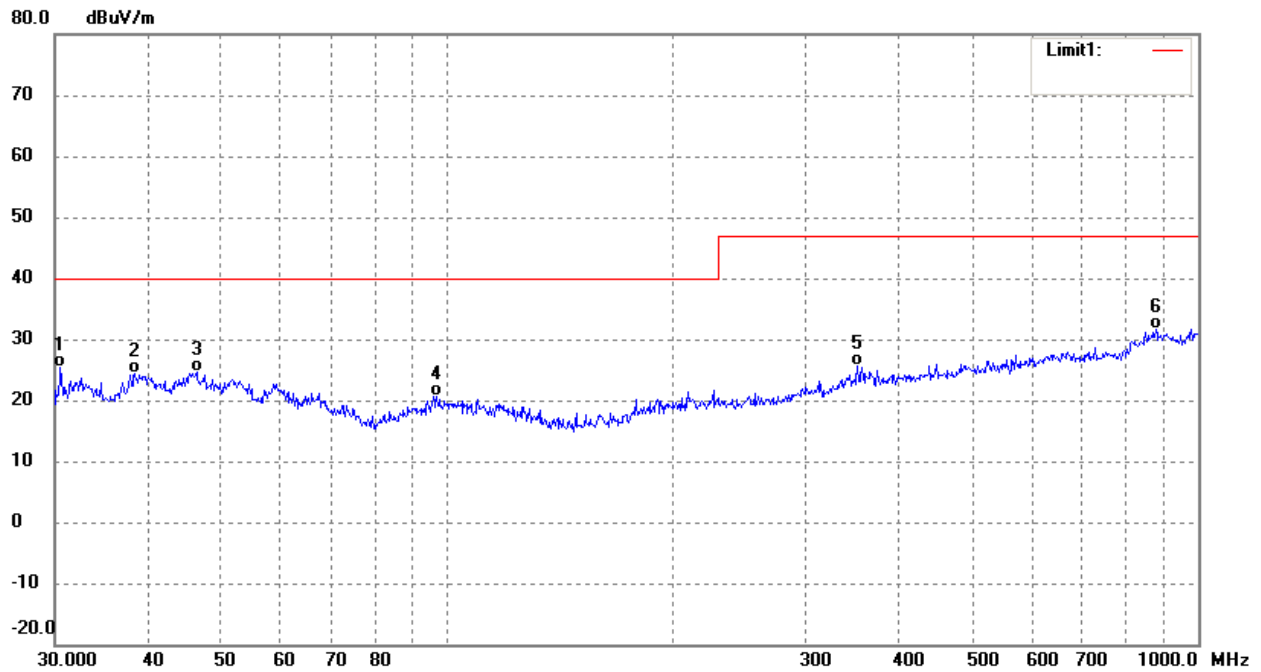
The distance from EUT to receiving antenna is 3 meters.

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.

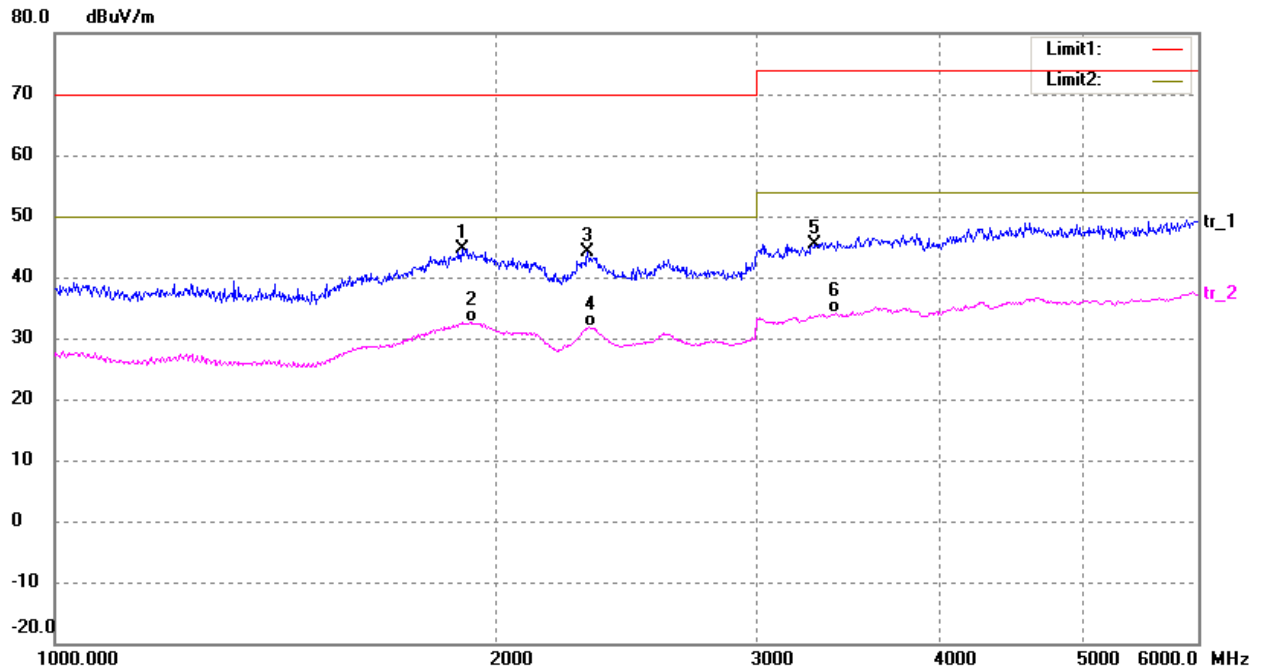
6.4 Test Result of 230VAC

Horizontal



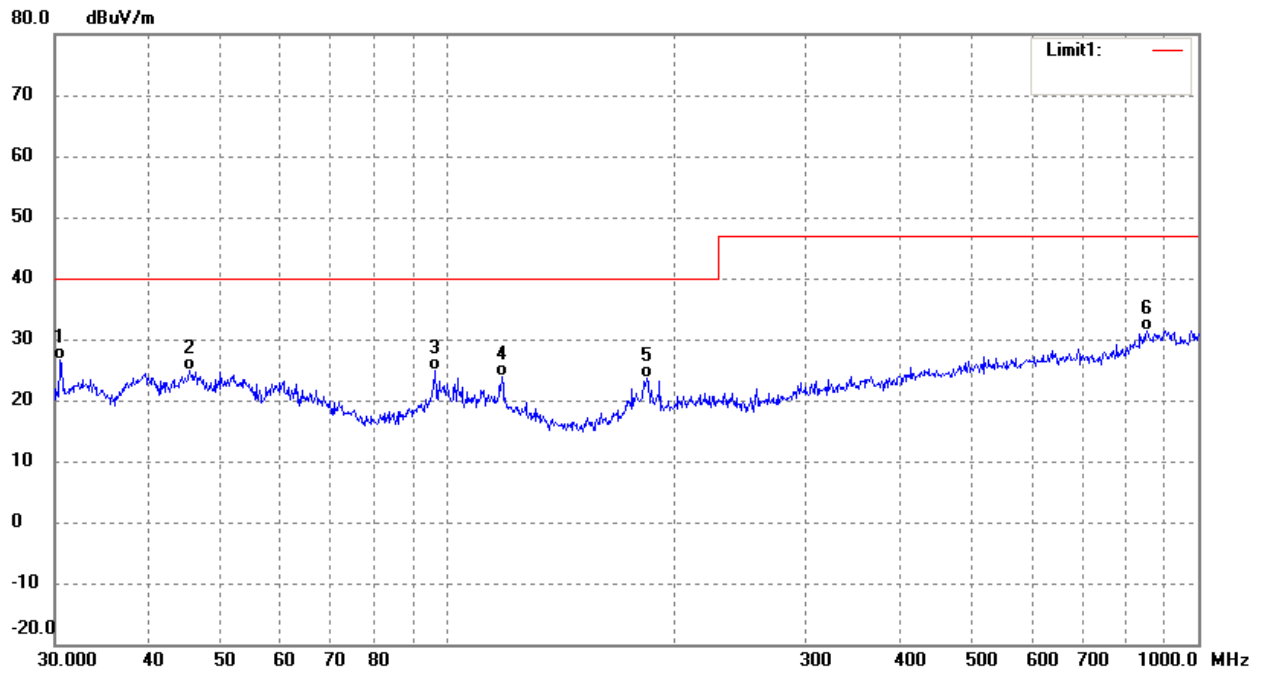
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.5306	39.43	-14.12	25.31	40.00	-14.69	QP
2	38.3462	36.92	-12.61	24.31	40.00	-15.69	QP
3	46.3402	36.45	-11.73	24.72	40.00	-15.28	QP
4	96.7749	34.51	-13.86	20.65	40.00	-19.35	QP
5	351.7079	32.98	-7.41	25.57	47.00	-21.43	QP
6	878.3214	30.91	0.67	31.58	47.00	-15.42	QP

TEST REPORT



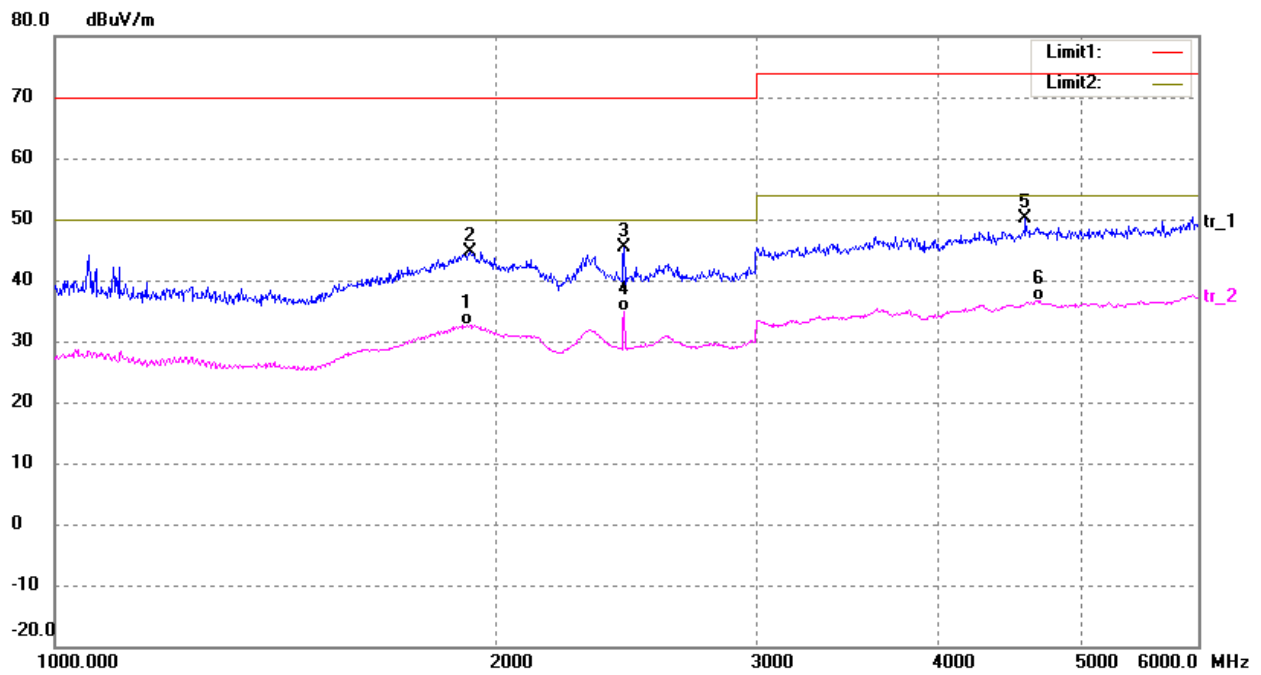
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1892.439	53.33	-8.63	44.70	70.00	-25.30	peak
2	1919.761	41.58	-8.89	32.69	50.00	-17.31	AVG
3	2304.722	53.71	-9.68	44.03	70.00	-25.97	peak
4	2308.855	41.50	-9.67	31.83	50.00	-18.17	AVG
5	3292.081	53.29	-7.80	45.49	74.00	-28.51	peak
6	3399.987	41.51	-7.49	34.02	54.00	-19.98	AVG

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.5306	40.77	-14.12	26.65	40.00	-13.35	QP
2	45.3755	36.55	-11.78	24.77	40.00	-15.23	QP
3	96.4362	38.87	-13.91	24.96	40.00	-15.04	QP
4	118.1862	37.98	-14.12	23.86	40.00	-16.14	QP
5	184.4898	37.34	-13.78	23.56	40.00	-16.44	QP
6	854.0247	31.13	0.36	31.49	47.00	-15.51	QP

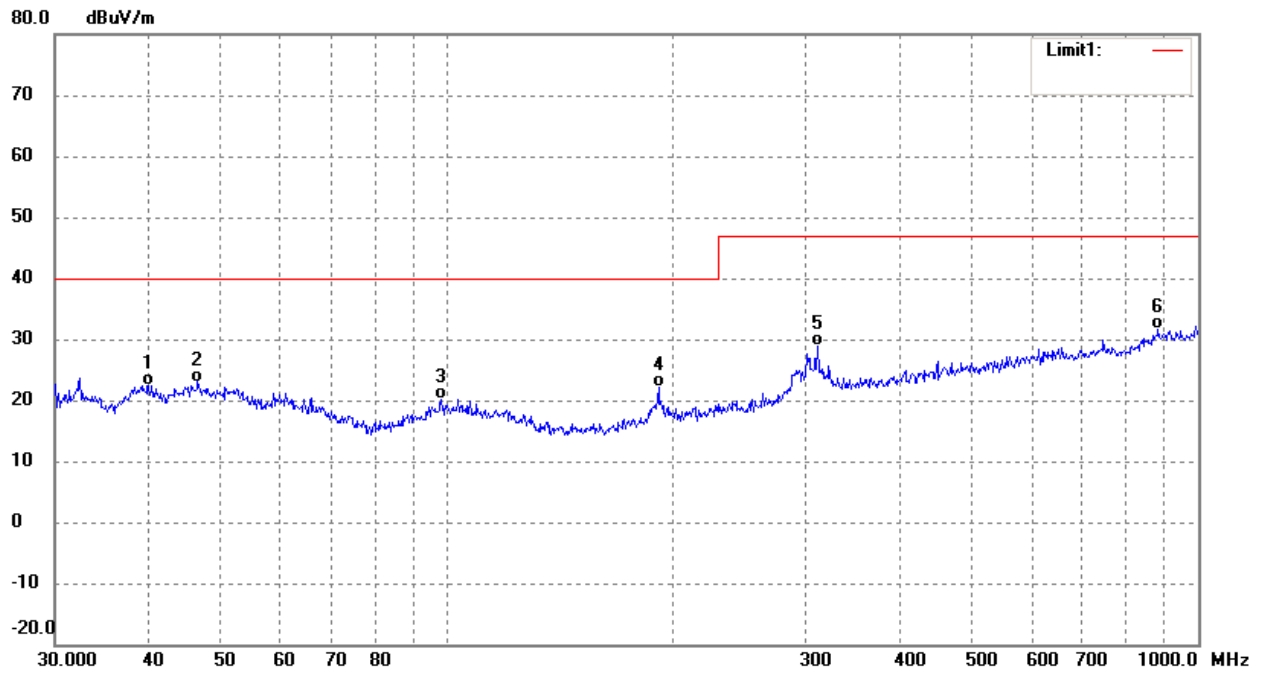
TEST REPORT



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1906.051	41.25	-8.65	32.60	50.00	-17.40	AVG
2	1916.324	53.53	-8.83	44.70	70.00	-25.30	peak
3	2440.728	54.78	-9.40	45.38	70.00	-24.62	peak
4	2440.728	44.37	-9.40	34.97	50.00	-15.03	AVG
5	4577.733	54.74	-4.66	50.08	74.00	-23.92	peak
6	4668.852	41.19	-4.60	36.59	54.00	-17.41	AVG

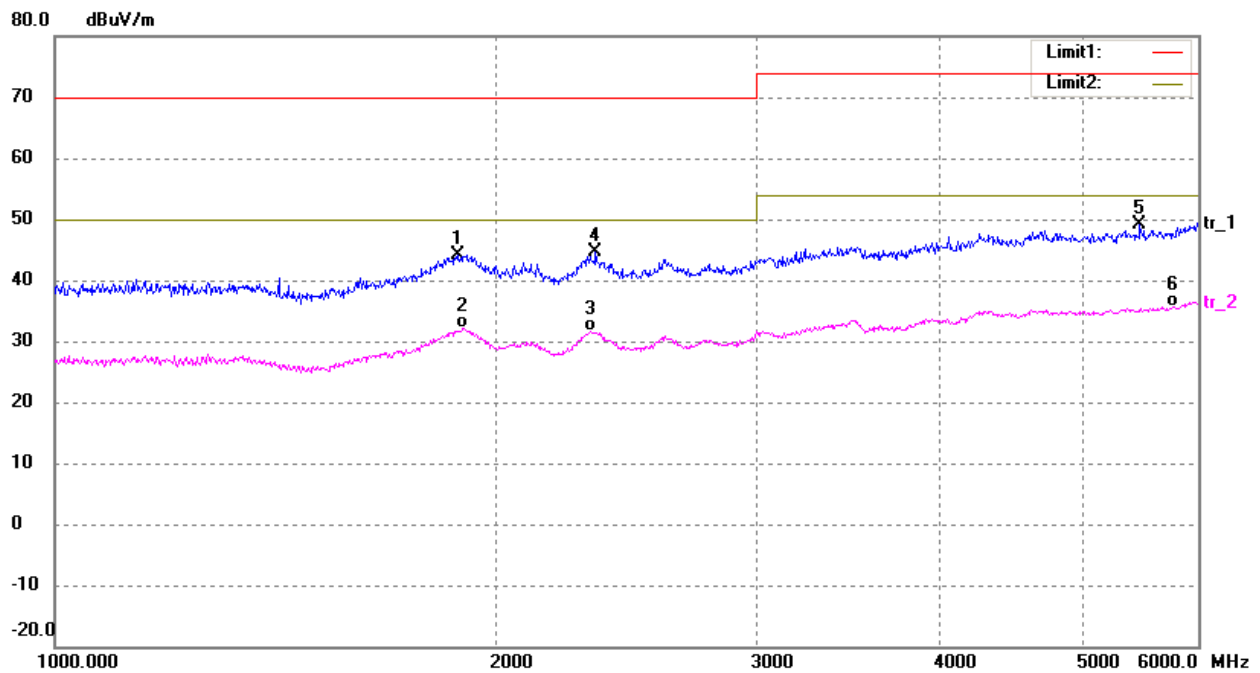
Test Result of 120VAC

Horizontal



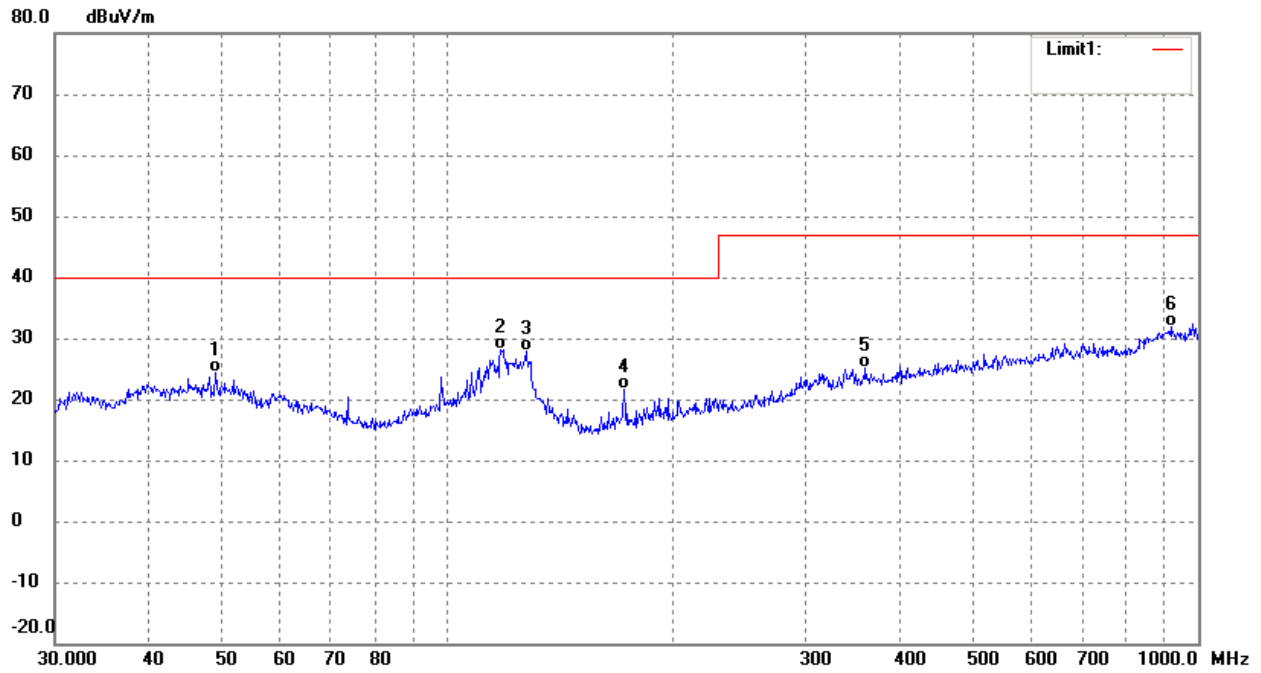
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	39.9942	34.44	-11.98	22.46	40.00	-17.54	QP
2	46.5030	34.72	-11.72	23.00	40.00	-17.00	QP
3	98.1419	33.83	-13.62	20.21	40.00	-19.79	QP
4	191.0738	35.21	-13.05	22.16	40.00	-17.84	QP
5	311.0867	37.84	-8.93	28.91	47.00	-18.09	QP
6	884.5029	30.67	0.92	31.59	47.00	-15.41	QP

TEST REPORT

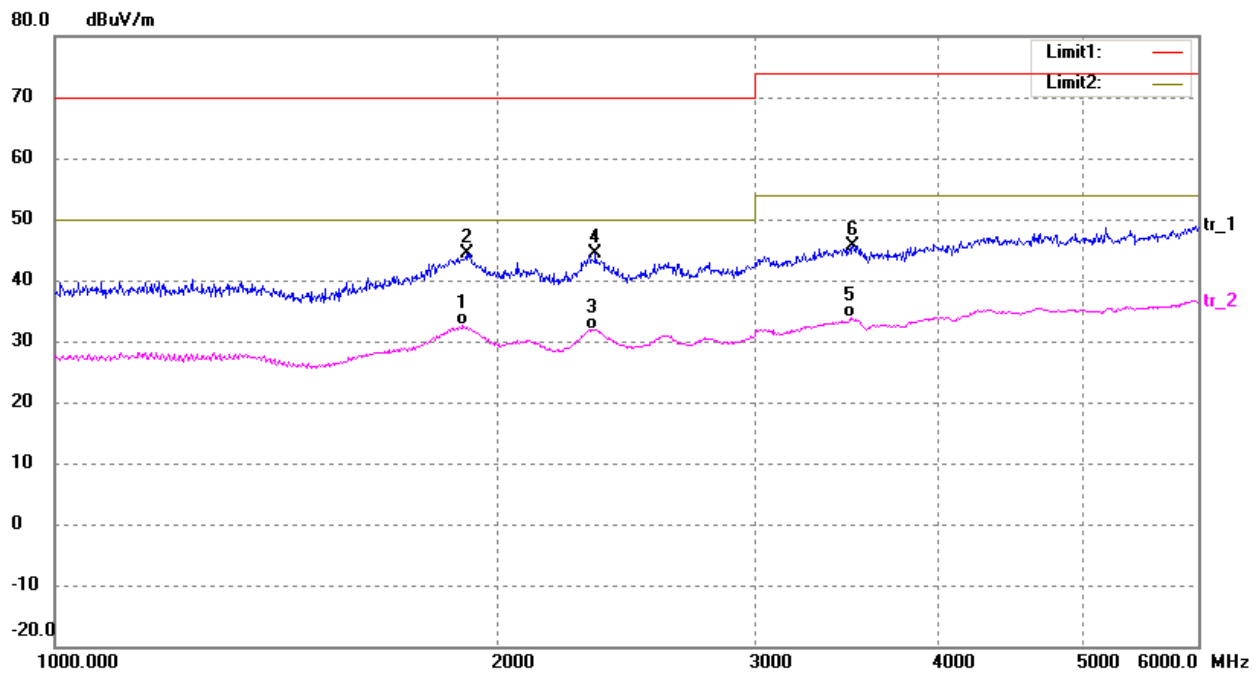


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1882.294	52.91	-8.71	44.20	70.00	-25.80	peak
2	1895.833	40.83	-8.60	32.23	50.00	-17.77	AVG
3	2312.995	41.28	-9.67	31.61	50.00	-18.39	AVG
4	2333.810	54.25	-9.61	44.64	70.00	-25.36	peak
5	5476.026	53.28	-4.15	49.13	74.00	-24.87	peak
6	5768.089	39.21	-3.53	35.68	54.00	-18.32	AVG

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	49.1866	35.96	-11.58	24.38	40.00	-15.62	QP
2	117.7725	42.28	-14.07	28.21	40.00	-11.79	QP
3	127.2176	44.09	-16.22	27.87	40.00	-12.13	QP
4	171.9946	36.56	-14.88	21.68	40.00	-18.32	QP
5	360.4477	32.45	-7.34	25.11	47.00	-21.89	QP
6	919.2866	30.06	1.78	31.84	47.00	-15.16	QP



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1895.833	41.21	-8.60	32.61	50.00	-17.39	AVG
2	1906.051	53.12	-8.65	44.47	70.00	-25.53	peak
3	2321.299	41.48	-9.63	31.85	50.00	-18.15	AVG
4	2333.810	53.99	-9.61	44.38	70.00	-25.62	peak
5	3480.112	41.02	-7.25	33.77	54.00	-20.23	AVG
6	3492.606	52.78	-7.22	45.56	74.00	-28.44	peak

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 Pre-amplifier = 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

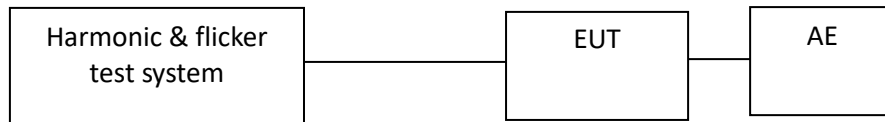
Discharge lighting equipment having an active input power smaller than or equal to 25 W shall comply with one of the following two sets of requirements:

- 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

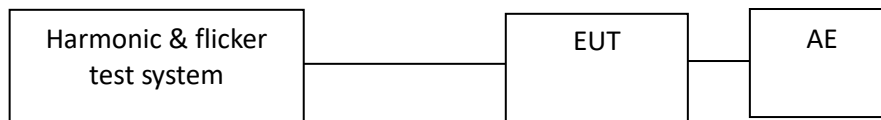
Test result: Pass

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

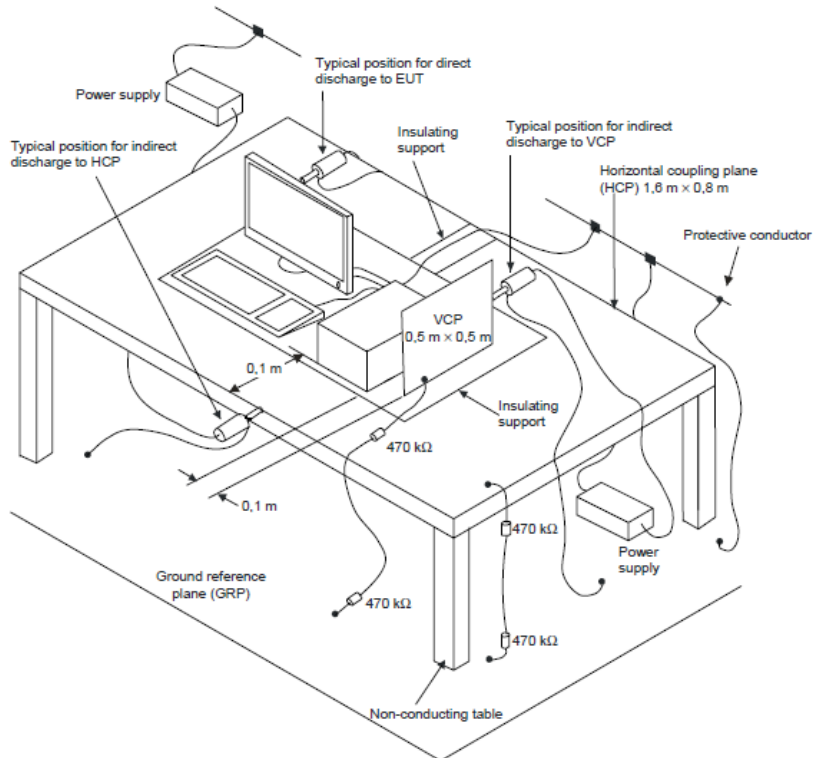
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification.
 If higher voltages than those shown are specified, special test equipment may be needed.
 2. The gray rows were the selected test level.

9.1.2 Performance Criterion

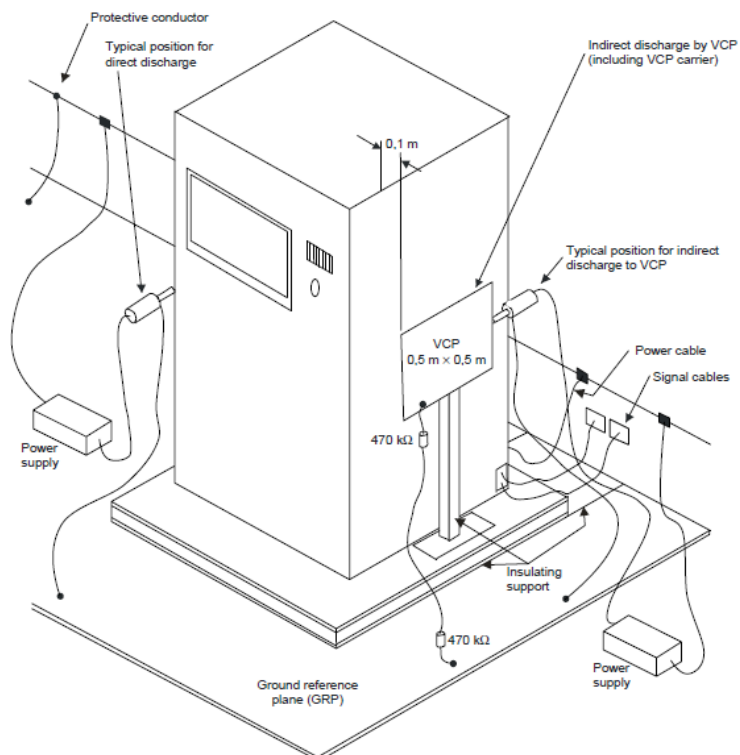
Criterion B

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

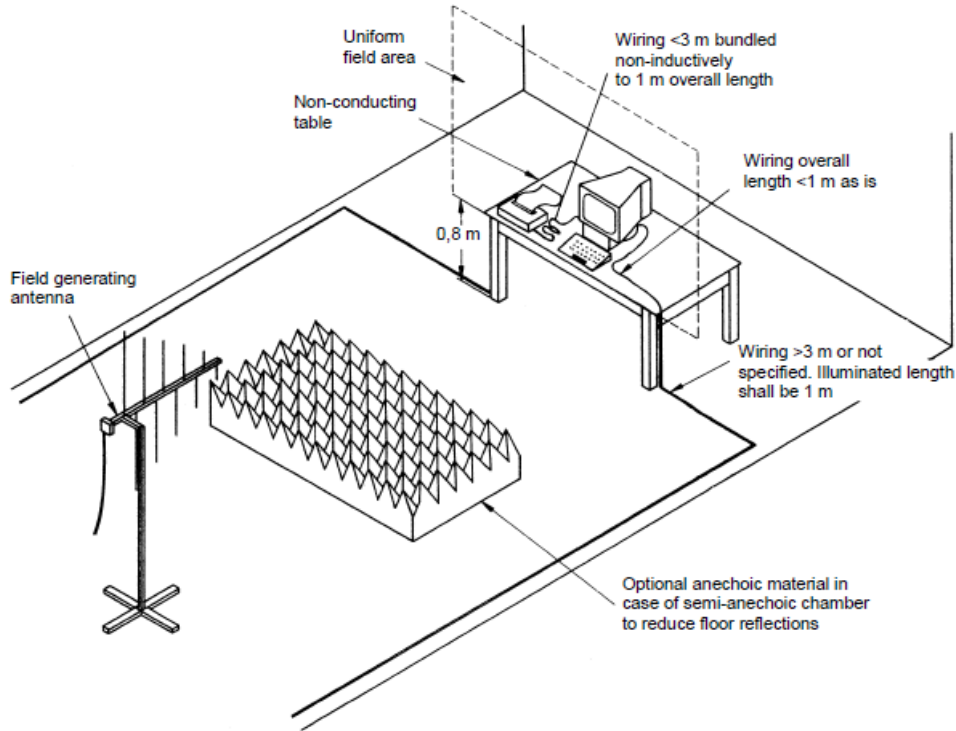
Note: 1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

10.1.2 Performance Criterion

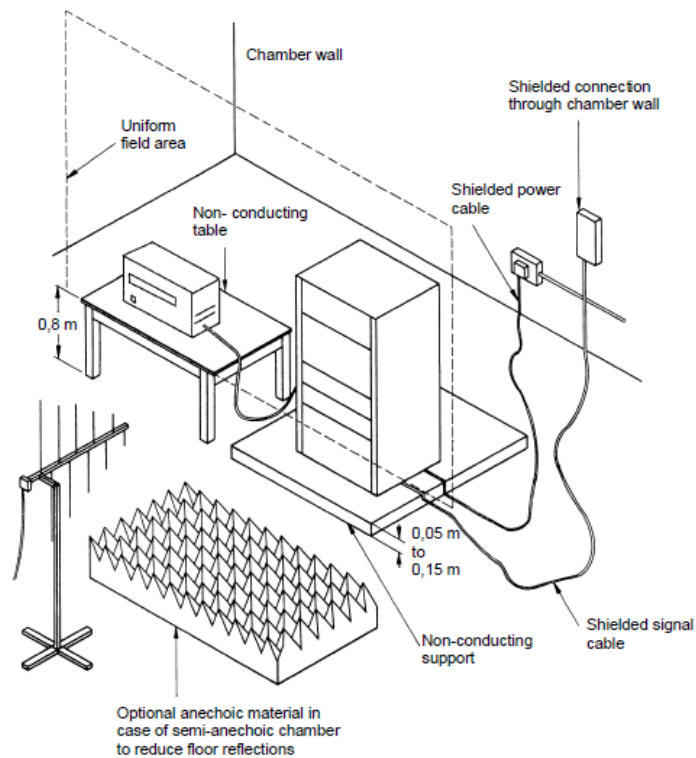
Criterion A

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

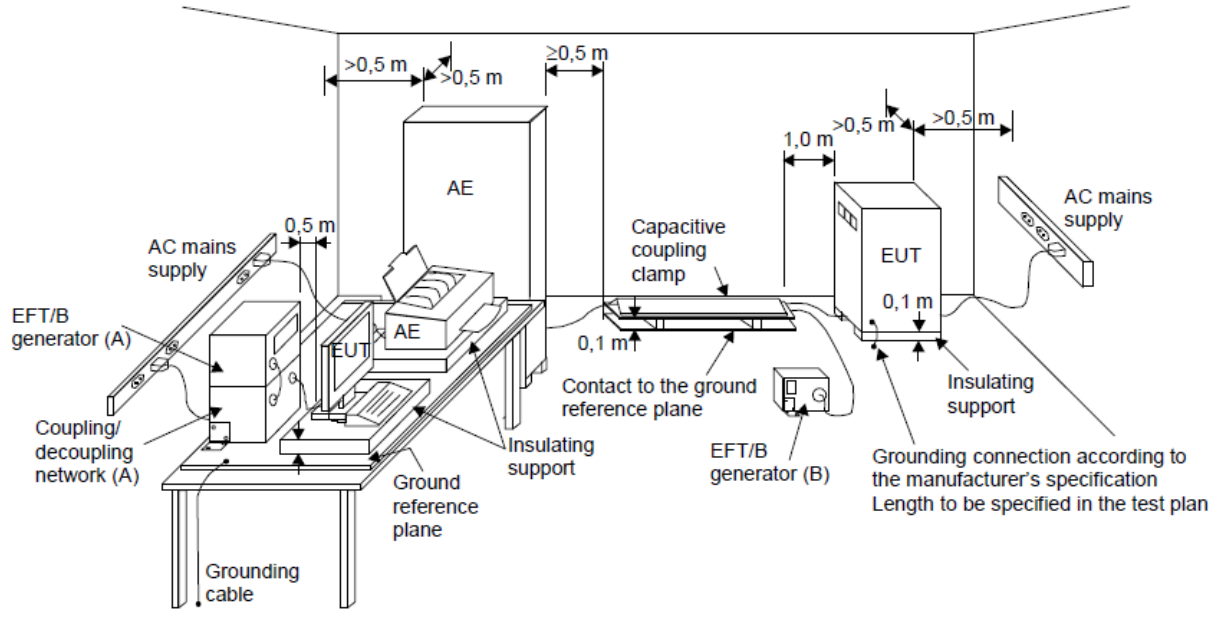
Open circuit output test voltage and repetition rate of the impulses				
Level	AC mains power input ports		Signal ports, wired network ports, control ports, DC power input ports	
	Voltage peak (kV)	Repetition rate (kHz)	Voltage peak (kV)	Repetition rate (kHz)
1	0.5	5	0.25	5/100
2	1	5	0.5	5/100
3	2	5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

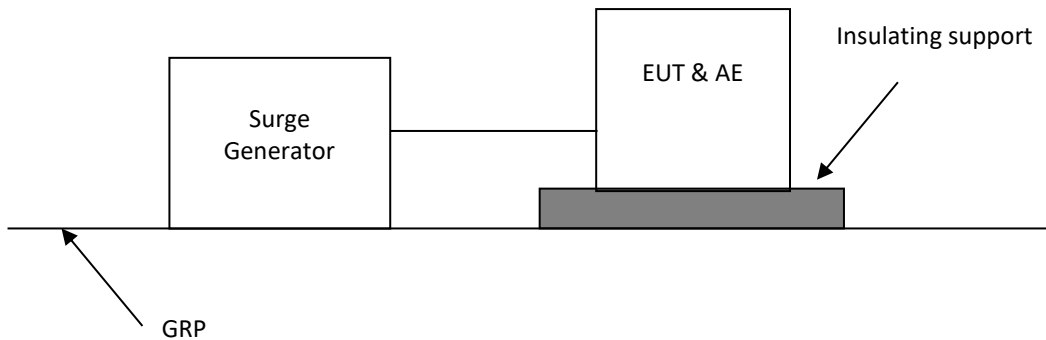
Level	Open-circuit test voltage (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

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

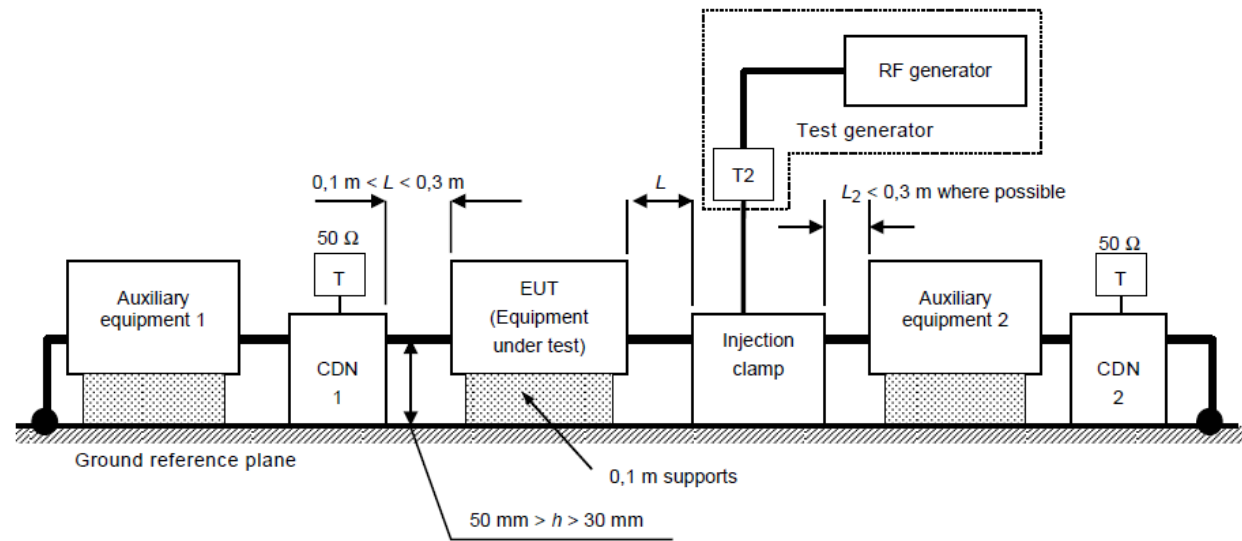
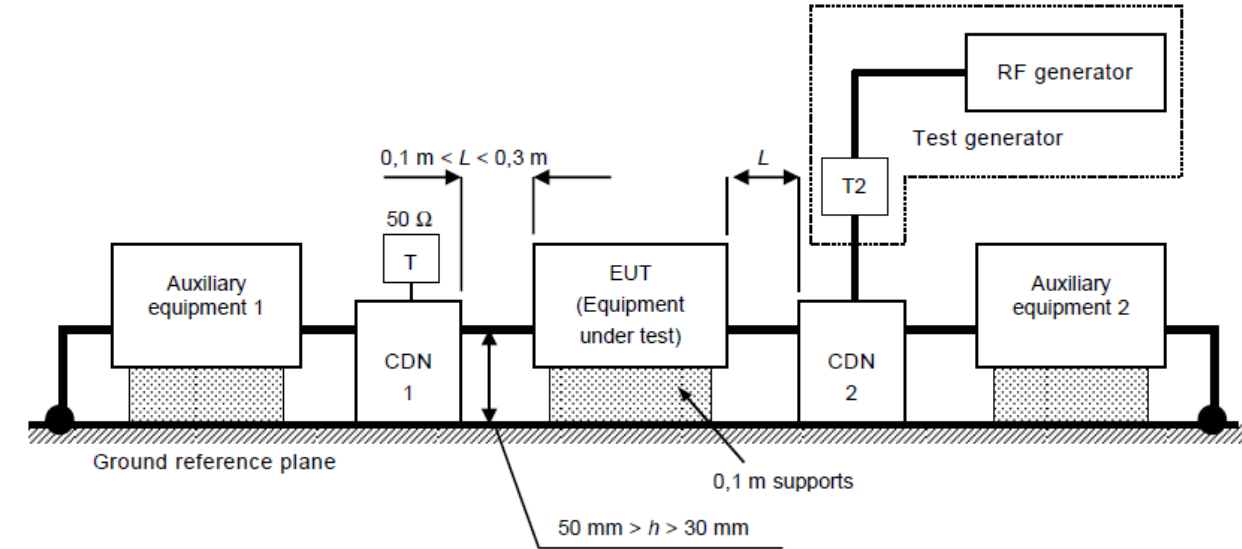
Frequency range 150kHz – 80MHz		
Level	Voltage level	
	U ₀ (dBuV)	U ₀ (V)
1	120	1
2	130	3
3	140	10
X	Special	Special

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

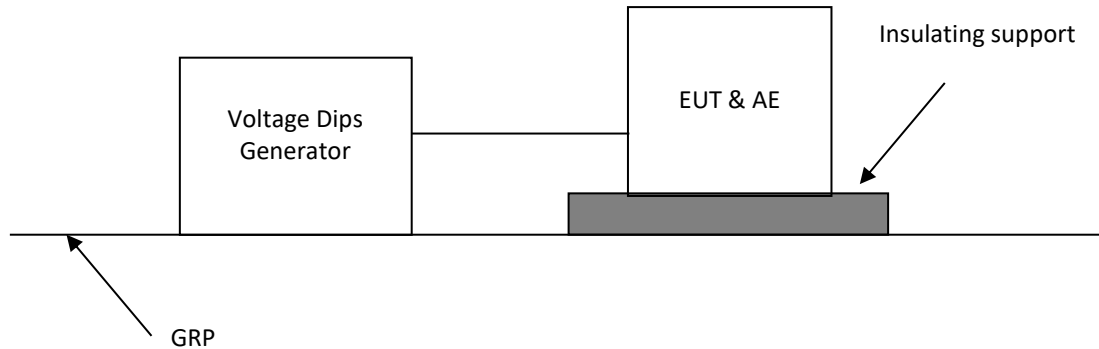
Notes: The gray rows are selected test level.

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.

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

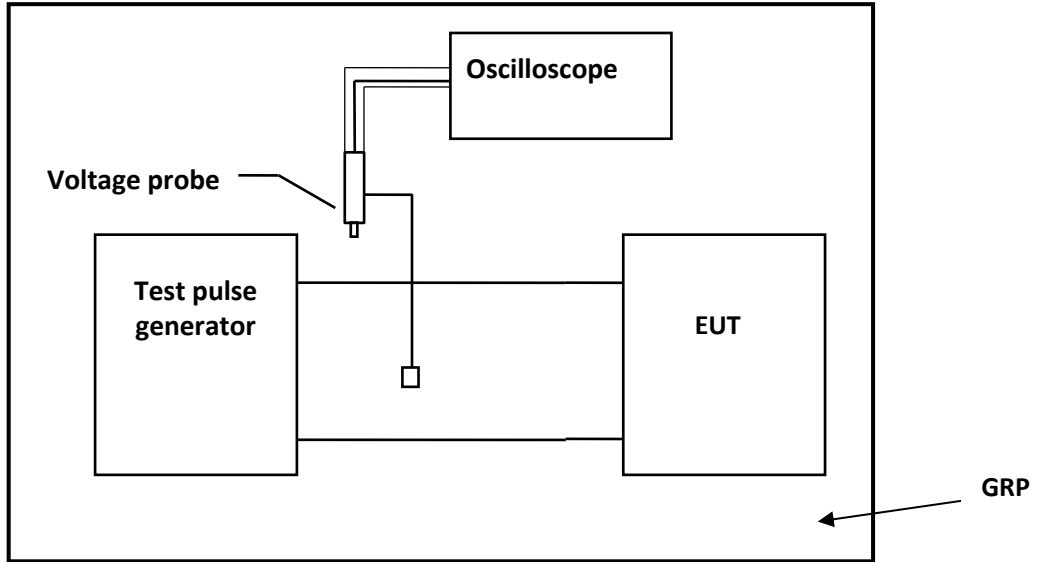
Pulse No.	Test Level III	Number of Pulses or Application Time	Burst/pulse cycle time	
			minimum	maximum
1	- 75V	10 pulses	0,5 s	5 s
2a	+ 37V	10 pulses	0,2 s	5 s
2b	+ 10V	10 pulses	0,5 s	5 s
3a	- 112V	20 minutes	90 ms	100 ms
3b	+ 75V	20 minutes	90 ms	100 ms
4	- 6V	10 pulses	1 min	-

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.

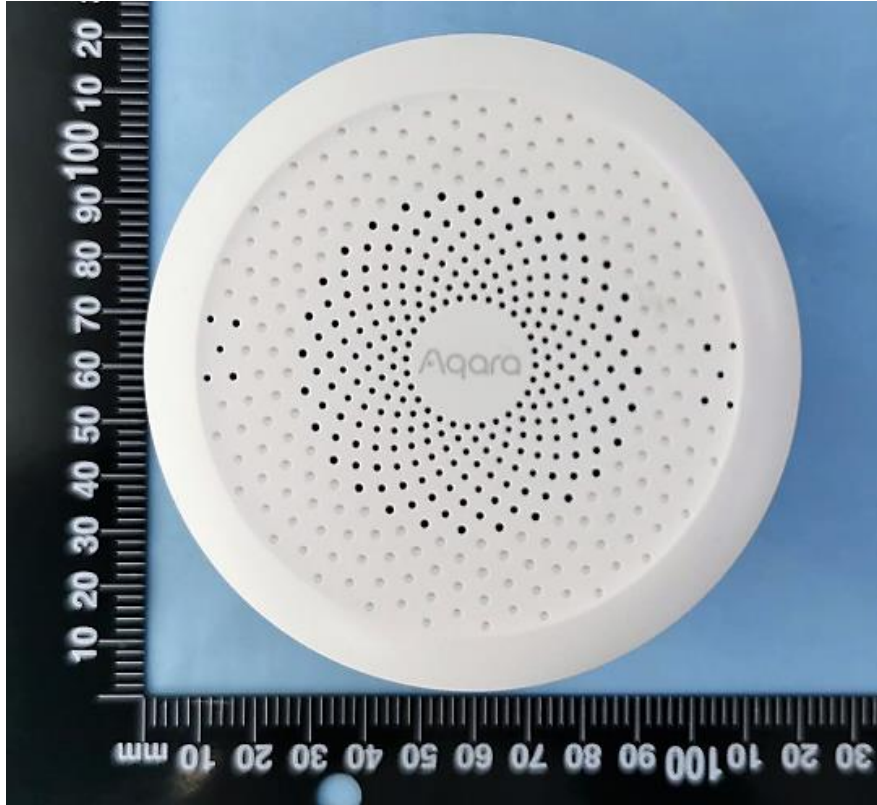
15.4 Test Result

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:

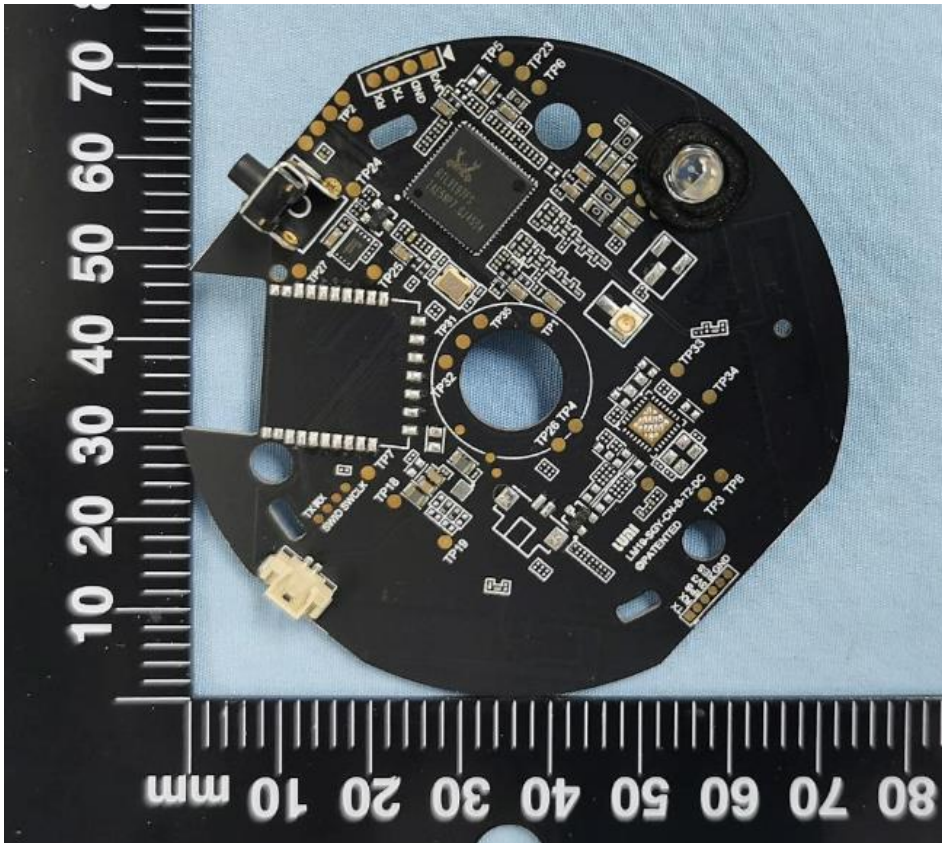
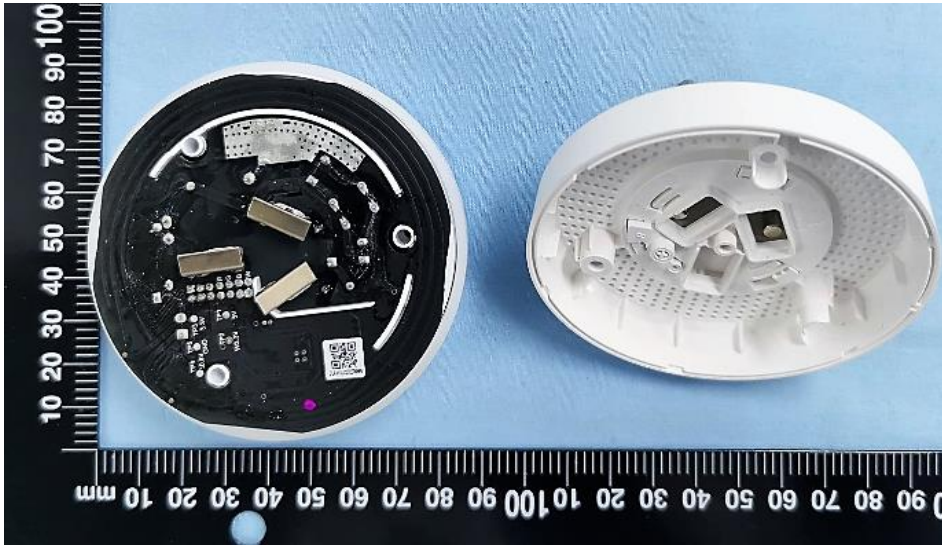
Conclusion:

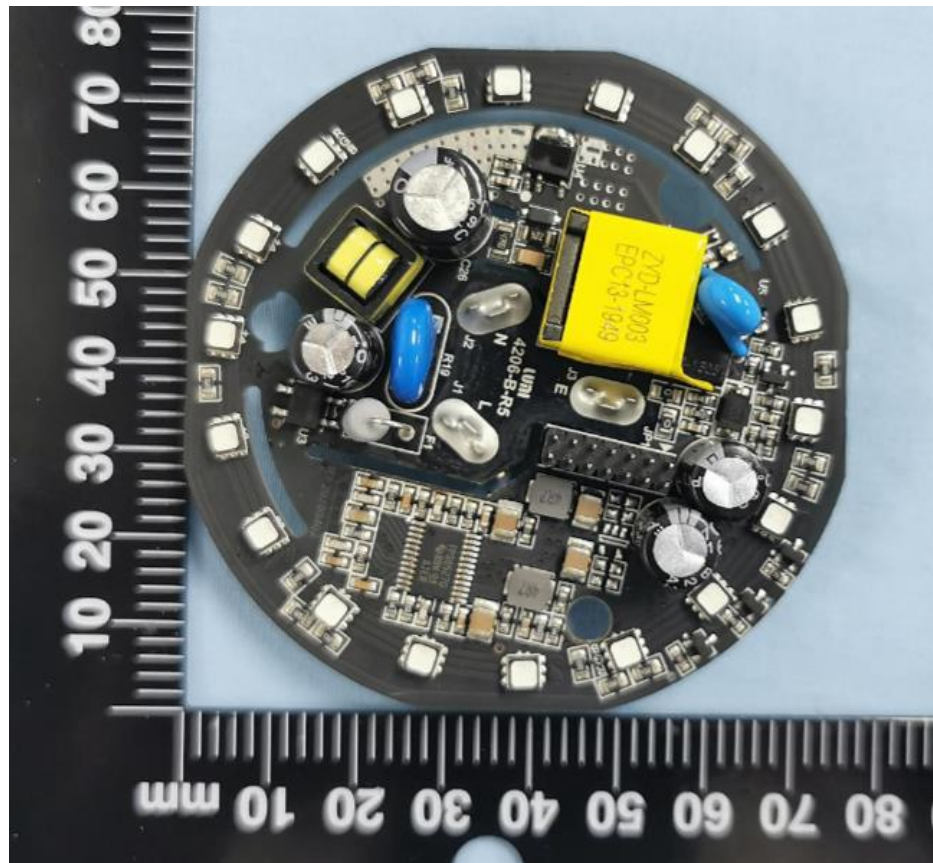
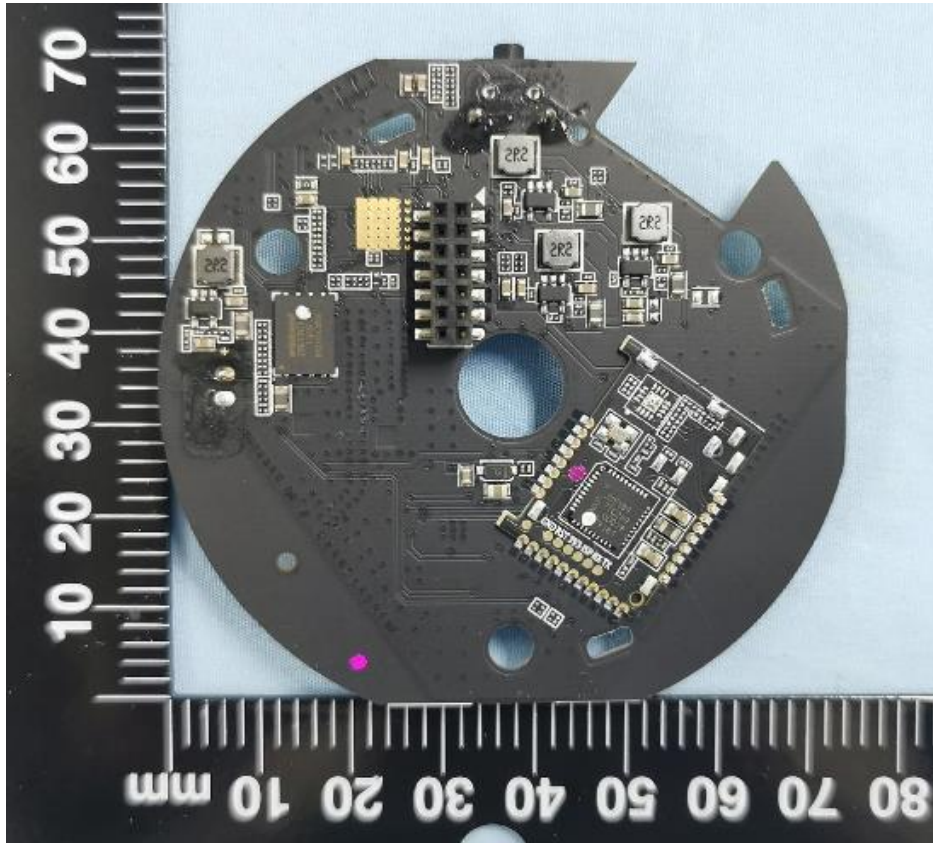
Appendix I: Photograph of equipment under test

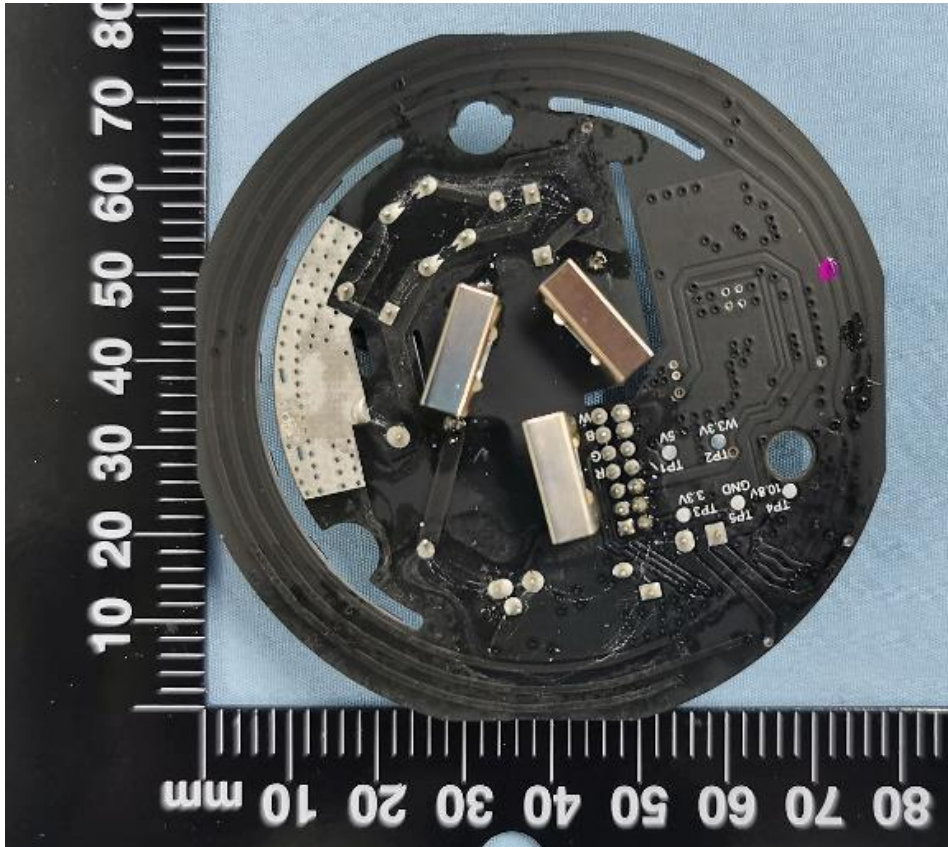












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