Lumi United Technology Co., Ltd.

CE TEST REPORT

SCOPE OF WORK:
Article 3.1b of RE directive (2014/53/EU) – EMC report

Model:
HM1S-G02

REPORT NUMBER
220200836SHA-003

ISSUE DATE
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TEST REPORT

Report no. 220200836SHA-003

Applicant	:	Lumi United Technology Co., Ltd. Room 801-804, Building 1, Chongwen Park,Nanshan iPark,No.3370, Liuxian Ave, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China.
Manufacturer	:	Same as applicant
Manufacturing site	:	Same as applicant

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

PREPARED BY:	**REVIEWED BY:**
Project Engineer Stephanie Zhang	Reviewer Wakeyou Wang

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Revision History

Report No.	Version	Description	Issued Date
220200836SHA-003	Rev. 01	Initial issue of report	March 18, 2022

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Conducted emission on DC power input/output ports	NA	*There's no DC power ports*
Conducted emission on AC power input/output ports	Pass	
Conducted emission on wired network ports	NA	*There's no wired network ports*
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	*The product is not intended for vehicular use*

Notes: 1: NA =Not Applicable

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

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

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name	:	Hub M1S Gen 2
Type/Model	:	HM1S-G02
Description of EUT	:	It is a product with WiFi & Zigbee function, there is one model only.
Rating	:	100-240Vac, 50/60Hz,0.2A, Class II
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	:	2022.3.3
Date of test	:	2022.3.7-2022.3.9

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 CAB identifier.: CN0051 VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252 A2LA Accreditation Lab Certificate Number: 3309.02

Subcontractor

Name	:	Fangguang Inspection & Testing Co., Ltd.
Address	:	G9 Building, China Sensor Network International innovation Park, No.200, Linghu Avenue, Wuxi, Jiangsu, China
Telephone	:	0510-68790033
Telefax	:	0510-68790022

The test facility is recognized, certified, or accredited by these organizations	:	CNAS Accreditation Lab Registration No. CNAS L9092 FCC Accredited Lab Designation Number: CN5037 NVLAP Lab CODE: 600222-0

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 (2014) + A1 (2017): "Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test".

CENELEC EN 61000-4-6 (2014): "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 $\leqslant$ 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 $\leqslant$ 16 A per phase and not subject to conditional connection".

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

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

2.2 Mode of operation during the test

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

2.3 Test peripherals used

Item No	Description	Band and Model	S/No
1	Laptop computer	HP, 5480	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	15	51	NA
Conducted emission on wired network ports	NA	NA	NA
Radiation emission	15	51	NA
Harmonic current emission	15	51	NA
Voltage fluctuations and flicker	15	51	NA
Electrostatic discharge	15	51	101
Radio frequency electromagnetic field	15	51	NA
Fast transients, common mode	15	51	NA
Surges	15	51	NA
Radio frequency, common mode	15	51	NA
Voltage dips and interruptions	15	51	NA
Transients and surges in the vehicular environment	NA	NA	NA

Notes: NA =Not Applicable

2.5 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	EMI Receiver	R&S	ESR3	FWXGJC-2016-181	2022-05-30
☒	L.I.S.N	R&S	ENV216	FWXGJC-2016-182	2022-12-21
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	EMI Receiver	R&S	ESR26	FWXGJC-2016-267-01	2022-11-26
☒	Bi-Log Antenna	R&S	HL562E	FWXGJC-2016-267-06	2023-03-30
☒	Preamplifier	R&S	SCU-18D	FWXGJC-2016-267-05	2022-12-12
☒	Broadband Horn Antenna	R&S	HF907	FWXGJC-2016-267-07	2022-03-30
Harmonics/Flicker/Low-frequency immunity test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Harmonic analyzer	Ametek	100-CTS-230	FWXGJC-2016-176	2022-07-27
☒	Harmonic power supply	Ametek	5001ix-CTS-400-413-411	FWXGJC-2016-177	2022-05-17
ESD					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	ESD TESTER	3ctest	EDS 30T	FWXGDB-2016-129	2022-12-03
EFT/Surge/Voltage Dips					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	EFT Generator	3ctest	EFT 500T	FWXGDA-2016-130	2023-03-17
☒	Surge Generator	3ctest	CWS 600G	FWXGDA-2016-141	2022-04-26
☒	Harmonic analyzer	Ametek	100-CTS-230	FWXGJC-2016-176	2022-07-27
☒	Harmonic power supply	Ametek	5001ix-CTS-400-413-411	FWXGJC-2016-177	2022-05-17
Conducted Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Signal Generator	TESEQ	NSG 4070-35	FWXGJC-2016-188	2023-01-18

☒	Attenuator	TESEQ	ATN 6050	FWXGJC-2016-193	2022-12-21
☒	CDN	TESEQ	CDN M016	FWXGJC-2016-189	2022-12-12
Radiated Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Signal Generator	Keysight	N5171B-506	FWXGJC-2016-269-05	2022-12-12
☒	double-Logarithmic antenna	Frankonia	AXL-80	FWXGJC-2016-269-03	2022-03-30
☒	Rf power probe	Agilent	U2001A	FGZZ-2020-004	2022-04-29
☒	Rf power probe	Agilent	U2001A	FGZZ-2020-005	2022-04-29
☒	Amplifier	Frankonia	VLH-200B1	FWXGJC-2016-269-02	2022-12-21
☒	Horn Antenna	Frankonia	HAX-6	FWXGJC-2016-269-04	2022-03-30
☒	Power Amplifier	Frankonia	VLG-40/30G	FWXGJC-2016-269-01	2023-01-19
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2023-01-13
☒	Shielded room	Zhongyu	-	EC 2839	2023-01-13
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-06-31
☒	Fully-anechoic chamber	Albatross project	-	EC 3047	2023-06-31
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Spectrum analyzer	Agilent	E7402A	EC 2254	2023-07-14
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2023-03-10
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3481	2023-12-22
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2023-02-27
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2023-04-07
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2023-07-14

2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Continuous disturbance voltage at telecom ports	150kHz ~ 30MHz	3.64 dB
Continuous disturbance current at telecom ports	150kHz ~ 30MHz	2.62 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.90 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 dB
Harmonic current emission	-	3.90%
Voltage fluctuations and flicker	-	10.34%

3 Conducted emission on DC power input/output ports

Test result: NA

3.1 Limits

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

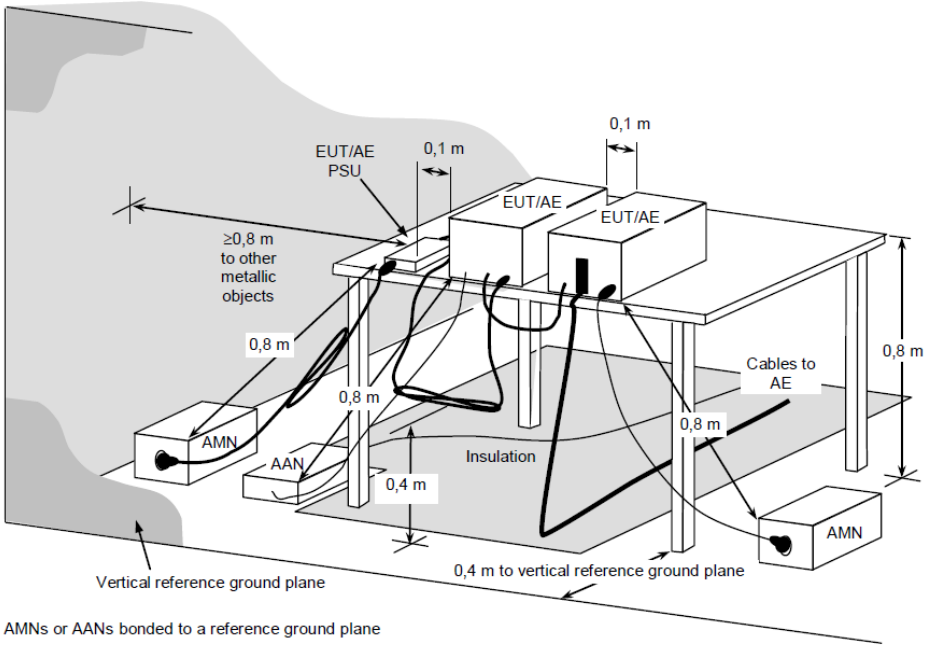
Frequency range (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver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

3.1.2 Limits of conducted emissions for other equipment

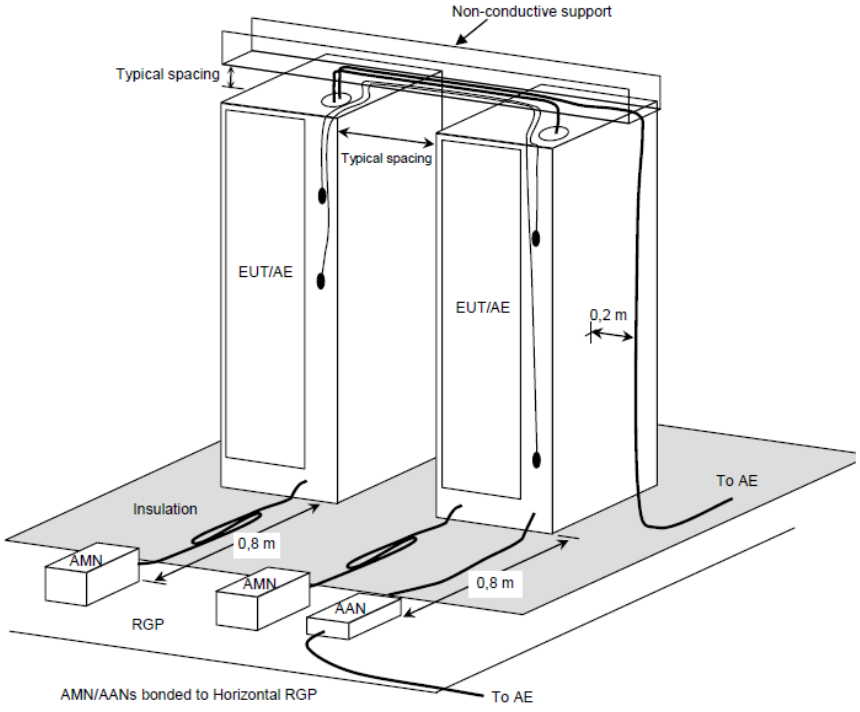
Frequency range (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when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

3.2 Test setup

For table-top equipment



For floor standing equipment



3.3 Test Procedure

Measurement was performed in shielded room, and instruments used were followed EN 301 489-1 clause 8.3.
Detailed test procedure and arrangement was followed EN 301 489-1 clause 8.3.
Frequency range 150kHz - 30MHz was checked and EMI receiver measurement bandwidth was set to 9kHz.

3.4 Test Result

Test Curve:

Test Data:

Frequency (MHz)	Quasi-peak			Average			Line
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	
Note: * means the emission level 20dB below the relevant limit.							

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.

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

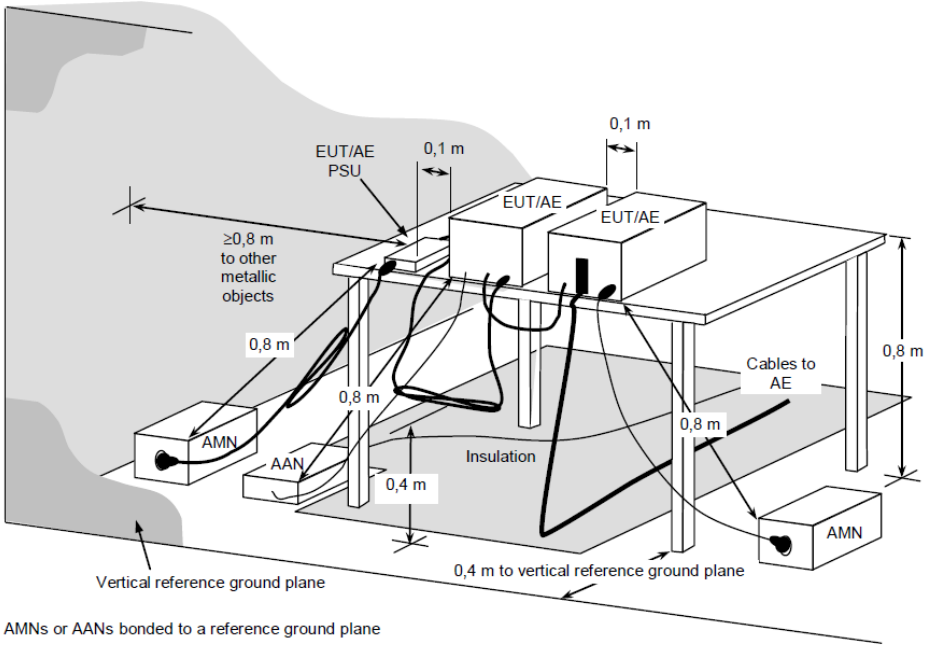
Frequency range (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver 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.		

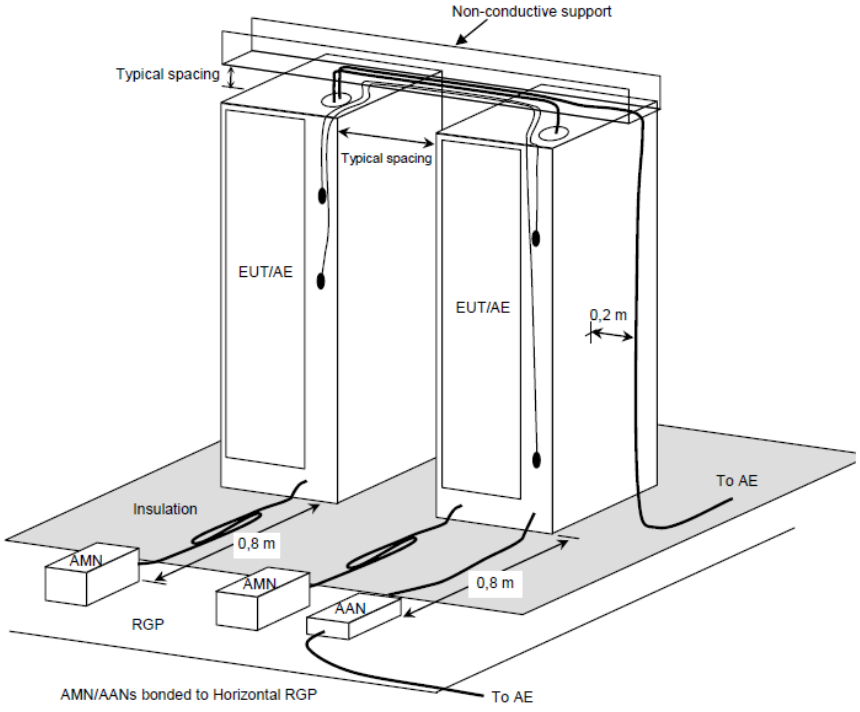
4.2 Test setup

For table-top equipment



AMNs or AANs bonded to a reference ground plane

For floor standing equipment

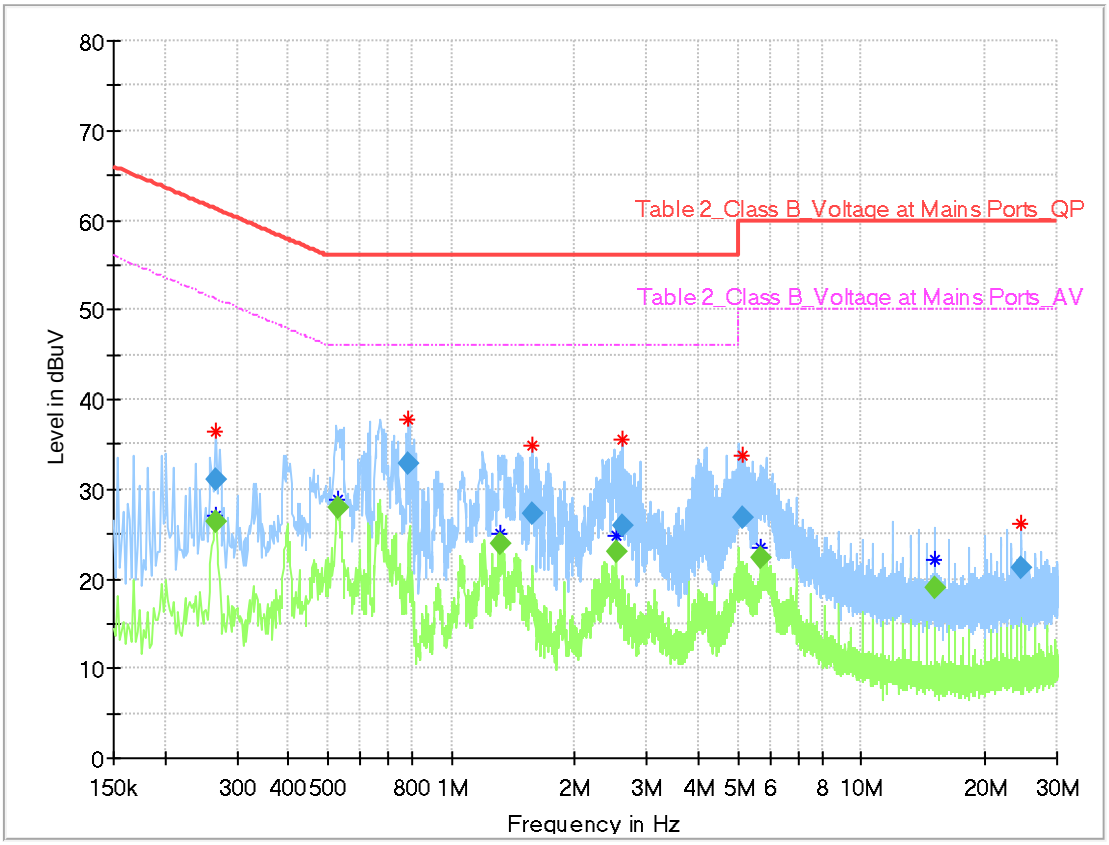


4.3 Test Procedure

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.

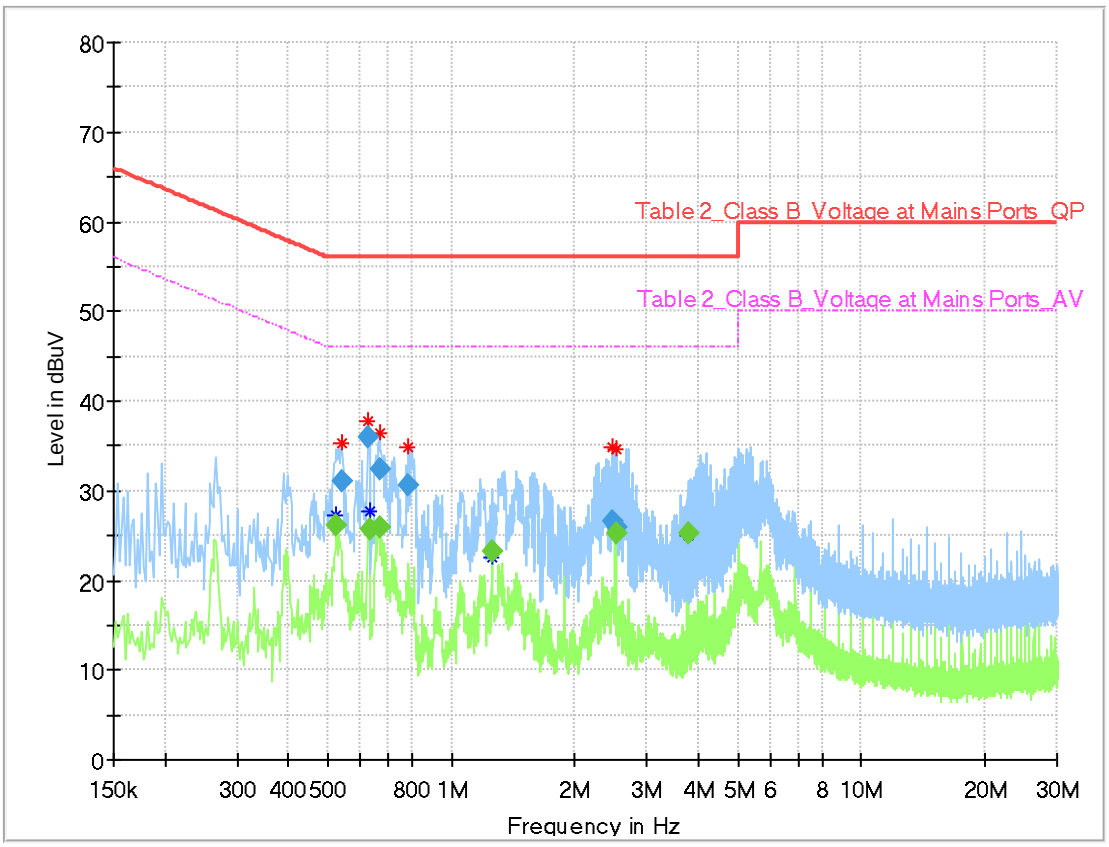
4.4 Test Result

Test Curve:



Test Data:

Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.266000	---	26.27	51.24	24.98	1000.	9.000	L1	ON	9.5
0.266000	31.03	---	61.24	30.22	1000.	9.000	L1	ON	9.5
0.530000	---	27.84	46.00	18.16	1000.	9.000	L1	ON	9.5
0.788000	32.77	---	56.00	23.23	1000.	9.000	L1	ON	9.5
1.308000	---	23.83	46.00	22.17	1000.	9.000	L1	ON	9.5
1.580000	27.31	---	56.00	28.69	1000.	9.000	L1	ON	9.5
2.516000	---	23.03	46.00	22.97	1000.	9.000	L1	ON	9.6
2.620000	26.01	---	56.00	29.99	1000.	9.000	L1	ON	9.6
5.140000	26.79	---	60.00	33.22	1000.	9.000	L1	ON	9.6
5.658000	---	22.24	50.00	27.76	1000.	9.000	L1	ON	9.6
15.082000	---	18.90	50.00	31.10	1000.	9.000	L1	ON	9.8
24.508000	21.12	---	60.00	38.88	1000.	9.000	L1	ON	9.8



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.524000	---	26.24	46.00	19.76	1000.	9.000	N	ON	9.5
0.538000	31.17	---	56.00	24.83	1000.	9.000	N	ON	9.5
0.628000	35.99	---	56.00	20.01	1000.	9.000	N	ON	9.5
0.630000	---	25.69	46.00	20.31	1000.	9.000	N	ON	9.5
0.666000	---	25.95	46.00	20.05	1000.	9.000	N	ON	9.5
0.666000	32.42	---	56.00	23.58	1000.	9.000	N	ON	9.5
0.784000	30.59	---	56.00	25.41	1000.	9.000	N	ON	9.5
1.256000	---	23.28	46.00	22.72	1000.	9.000	N	ON	9.5
2.464000	26.63	---	56.00	29.37	1000.	9.000	N	ON	9.6
2.512000	---	25.29	46.00	20.71	1000.	9.000	N	ON	9.6
2.516000	25.95	---	56.00	30.05	1000.	9.000	N	ON	9.6
3.766000	---	25.19	46.00	20.81	1000.	9.000	N	ON	9.6

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.

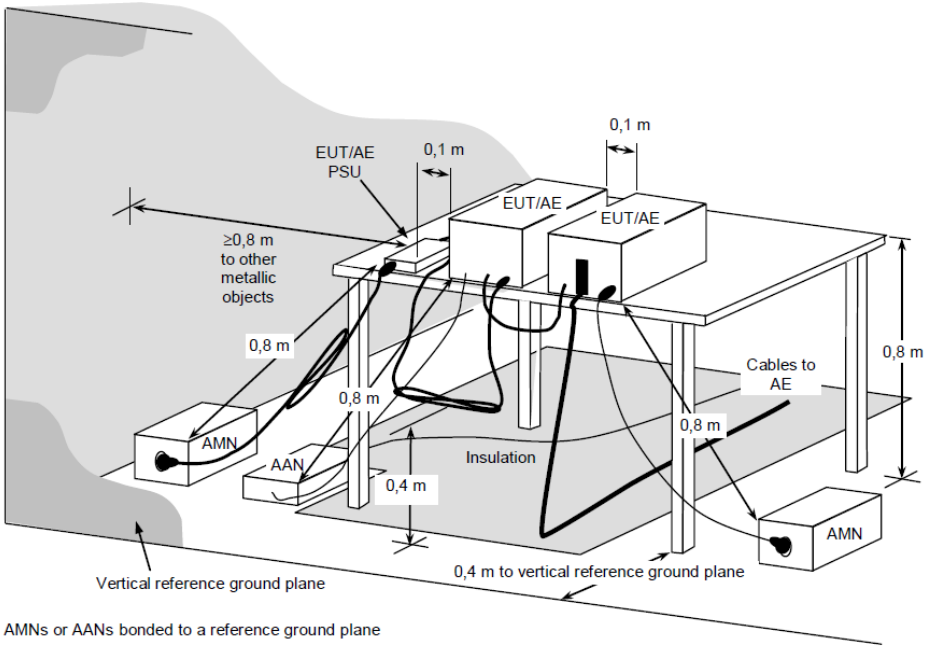
5.1.2 Limits of conducted emission for other equipment

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

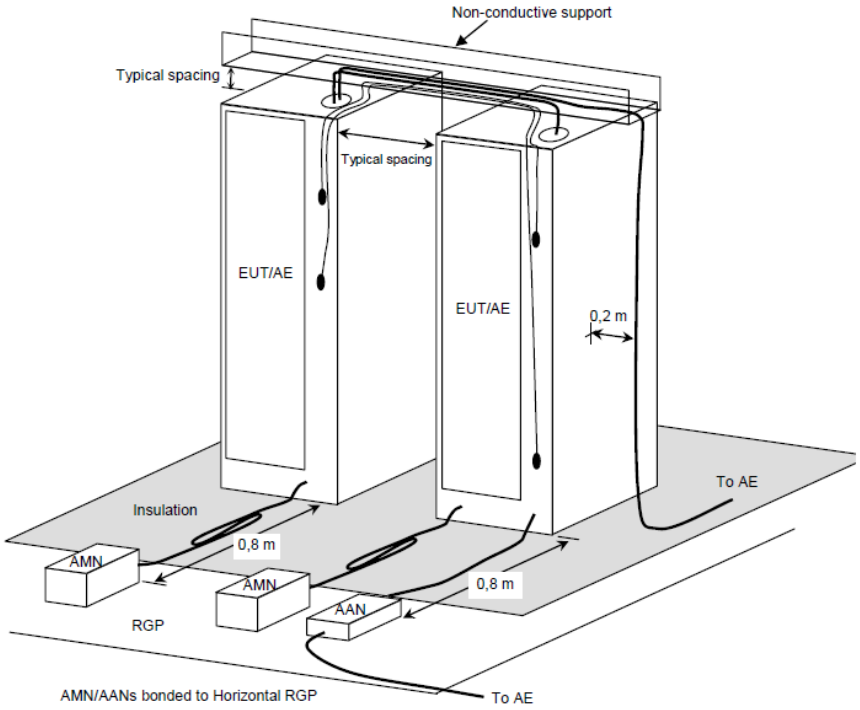
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the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

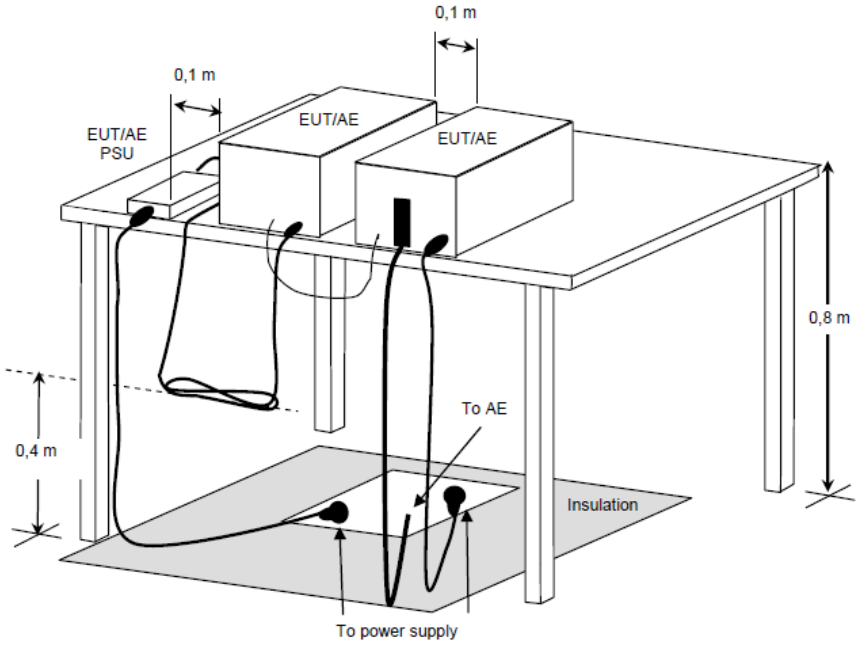
6.1.2 Limits of radiated emission for other ancillary equipment

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.		

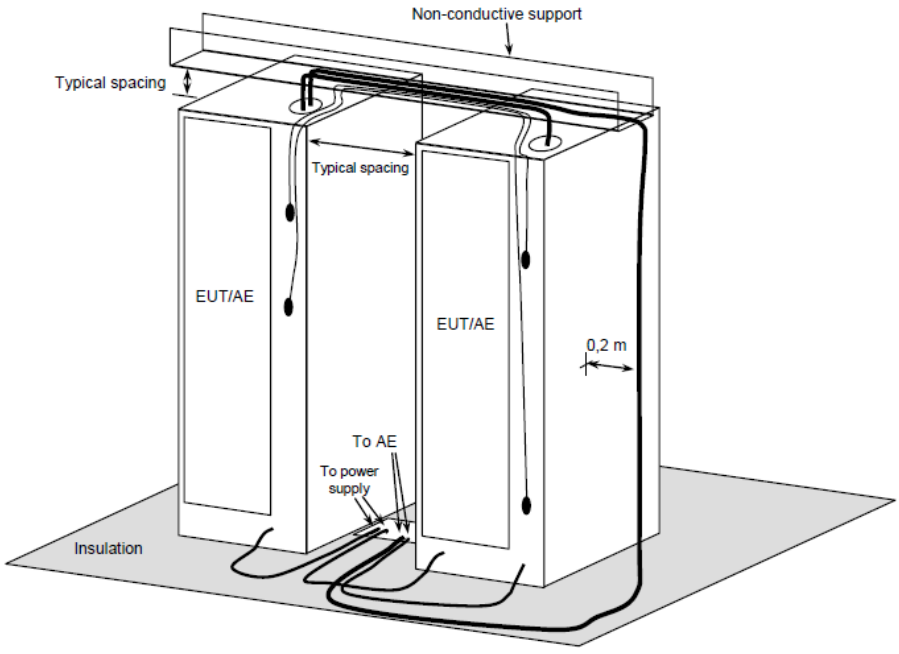
Frequency range GHz	Average limit in Measurement Distance 3m (dBuV/m)	Peak limit in Measurement Distance 3m (dBuV/m)
1 to 3	50	70
3 to 6	54	74
NOTE The lower limit applies at the transition frequency.		

6.2 Block diagram of test set up

For table-top equipment



For floor standing equipment

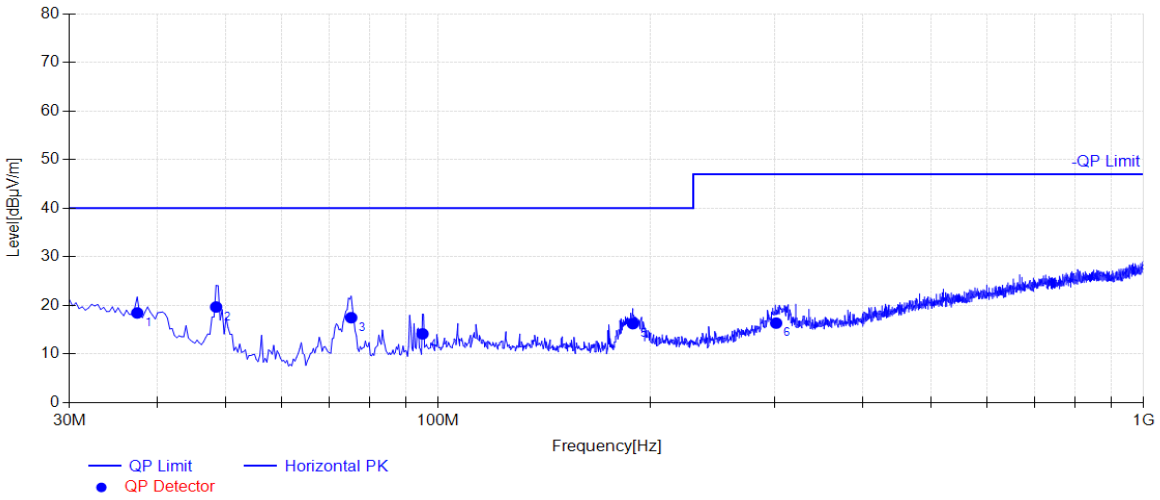


6.3 Test Procedure

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

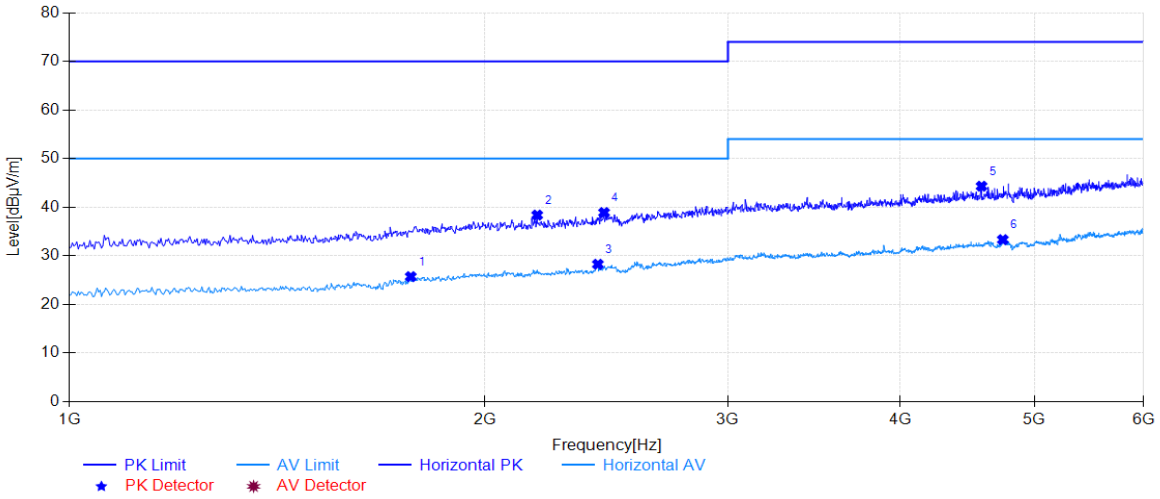
Test Curve: **Horizontal(30M-1G)**



Test data:

Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	37.4391	15.94	18.45	40.00	21.55	200	154	Horizontal
2	48.4361	10.32	19.68	40.00	20.32	200	266	Horizontal
3	75.2818	9.16	17.48	40.00	22.52	200	154	Horizontal
4	95.0117	10.61	14.15	40.00	25.85	100	278	Horizontal
5	188.8096	10.27	16.25	40.00	23.75	200	60	Horizontal
6	301.3671	13.78	16.36	47.00	30.64	100	264	Horizontal

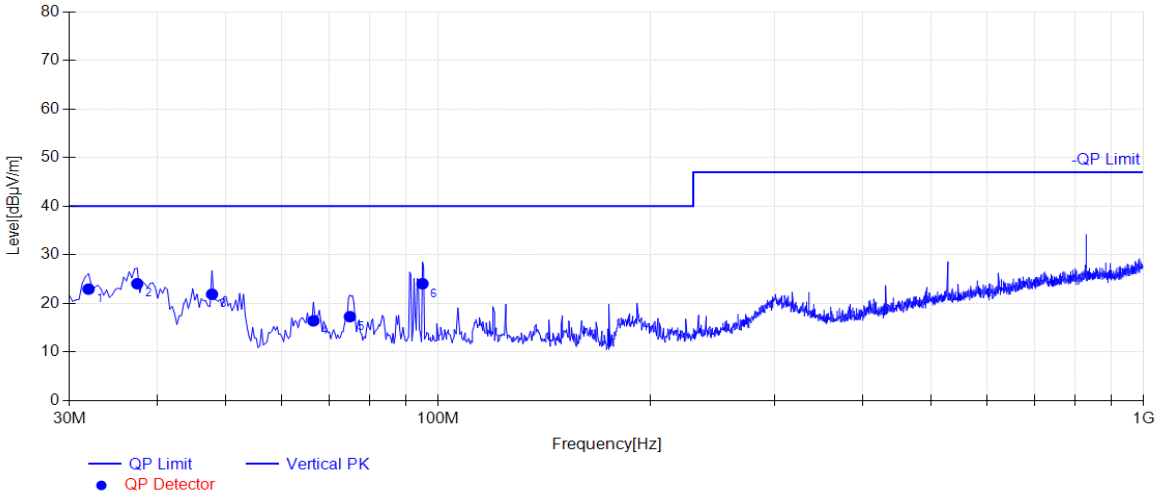
Horizontal(1G-6G)



Test data:

Suspected Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1767.5000	25.71	-2.57	50.00	24.29	100	192	Horizontal
2	2182.5000	38.37	-0.83	70.00	31.63	200	357	Horizontal
3	2415.0000	28.26	-0.15	50.00	21.74	200	4	Horizontal
4	2440.0000	38.89	-0.01	70.00	31.11	200	226	Horizontal
5	4580.0000	44.31	5.90	74.00	29.69	100	341	Horizontal
6	4745.0000	33.31	6.06	54.00	20.69	200	4	Horizontal

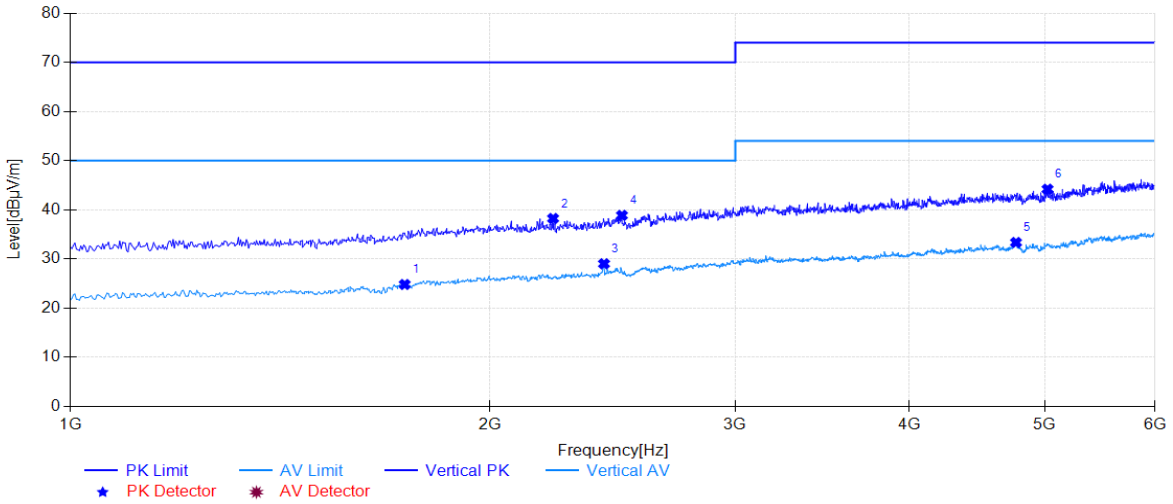
Test curve: **Vertical (30M-1G)**



Test data:

Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.9406	18.73	22.94	40.00	17.06	100	287	Vertical
2	37.4391	15.94	24.06	40.00	15.94	100	256	Vertical
3	47.7893	10.65	21.89	40.00	18.11	100	349	Vertical
4	66.5489	7.95	16.41	40.00	23.59	200	52	Vertical
5	74.9583	9.13	17.28	40.00	22.72	100	278	Vertical
6	95.0117	10.61	24.05	40.00	15.95	100	196	Vertical

Test curve： **Vertical (1G-6G)**



Suspected Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1737.5000	24.81	-2.91	50.00	25.19	100	234	Vertical
2	2220.0000	38.23	-0.77	70.00	31.77	200	357	Vertical
3	2415.0000	29.02	-0.15	50.00	20.98	200	166	Vertical
4	2487.5000	38.86	0.06	70.00	31.14	200	14	Vertical
5	4770.0000	33.35	6.15	54.00	20.65	200	357	Vertical
6	5025.0000	44.19	6.41	74.00	29.81	100	209	Vertical

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 currrent 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.	

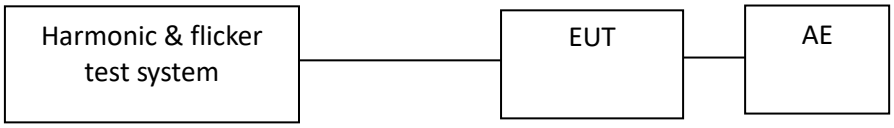
b) Active input power ⩽ 25 W

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

None

8 Voltage fluctuations and flicker

Test result: Pass

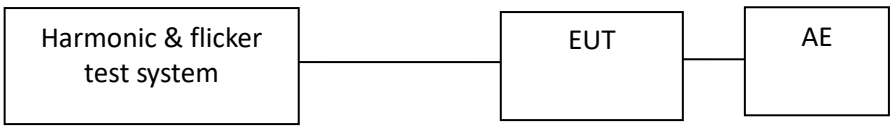
8.1 Limits

- 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, *d*c, 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.

Pst and Plt 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

Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.01			
T-max (mS):	0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.00	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000	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

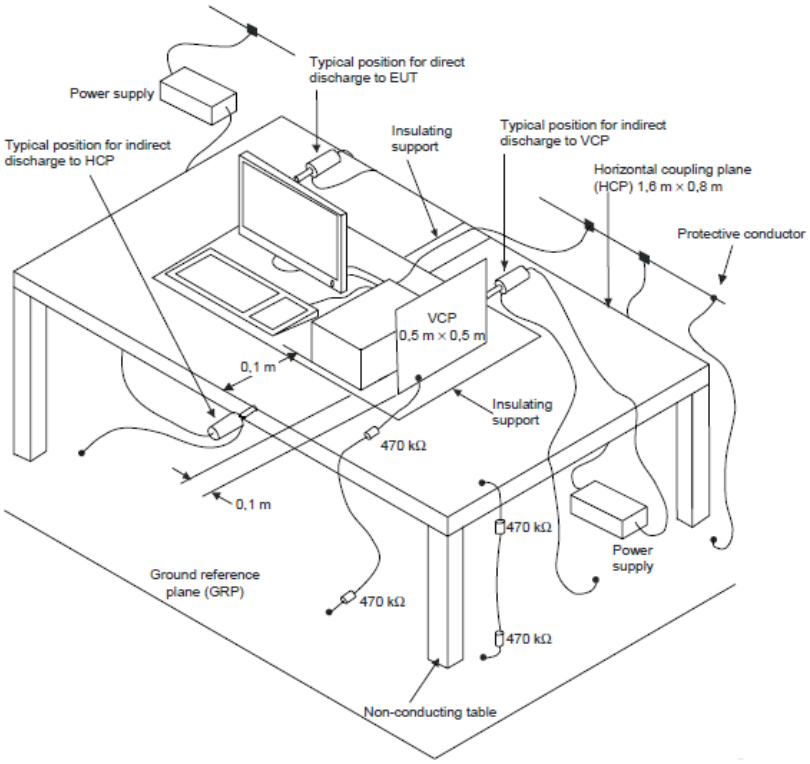
Notes: 1. “X” is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.
2. The gray rows were the selected test level.

9.1.2 Performance Criterion

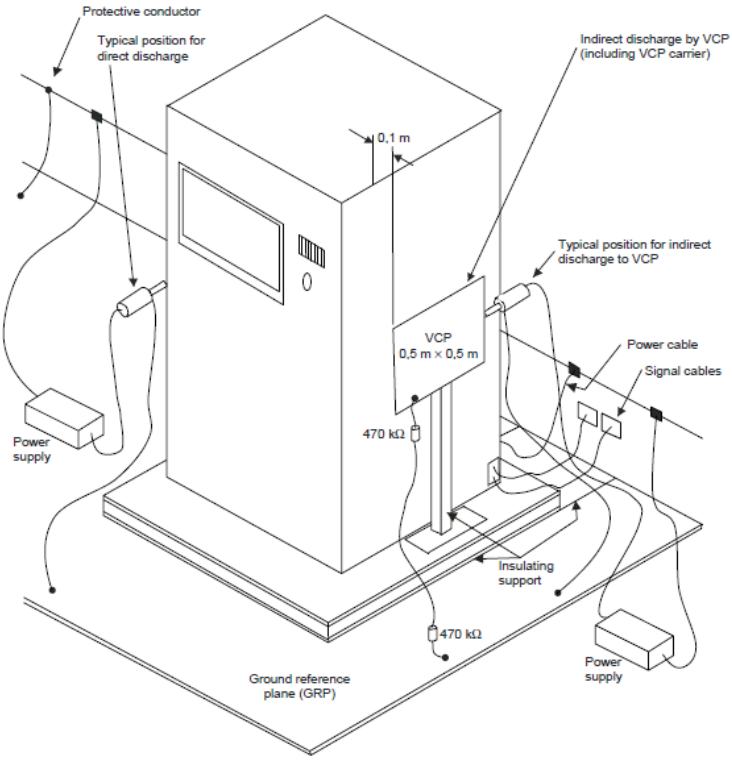
Criterion B

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

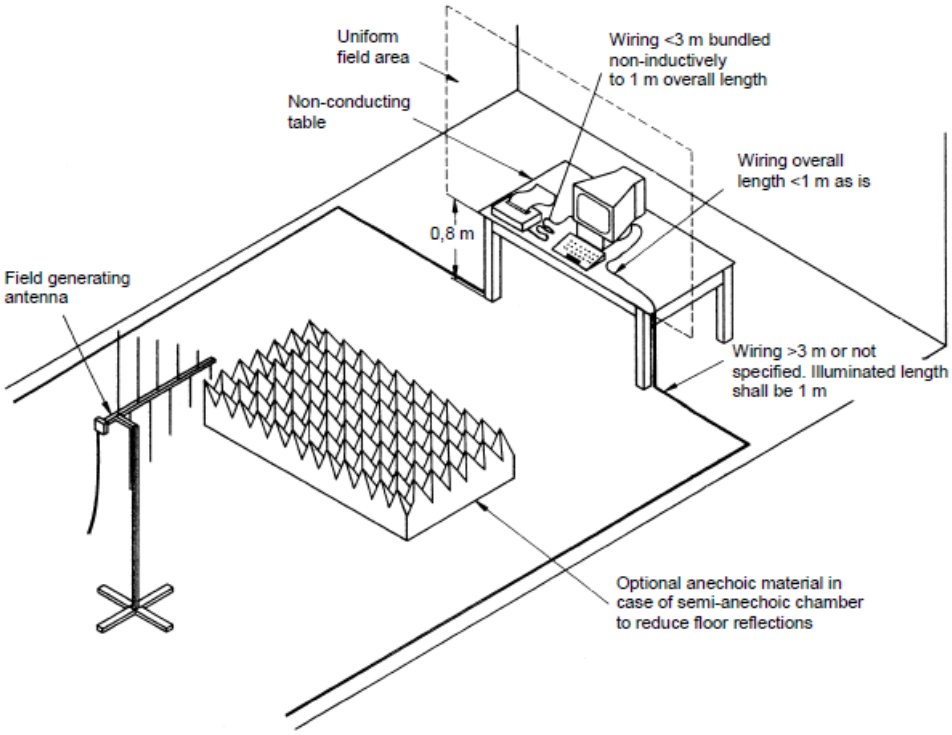
Note: 1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

10.1.2 Performance Criterion

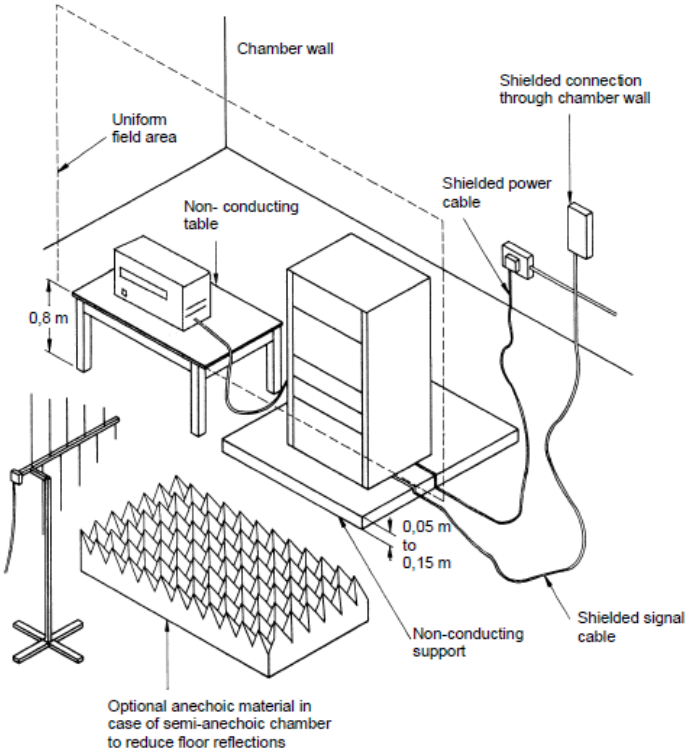
Criterion A

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

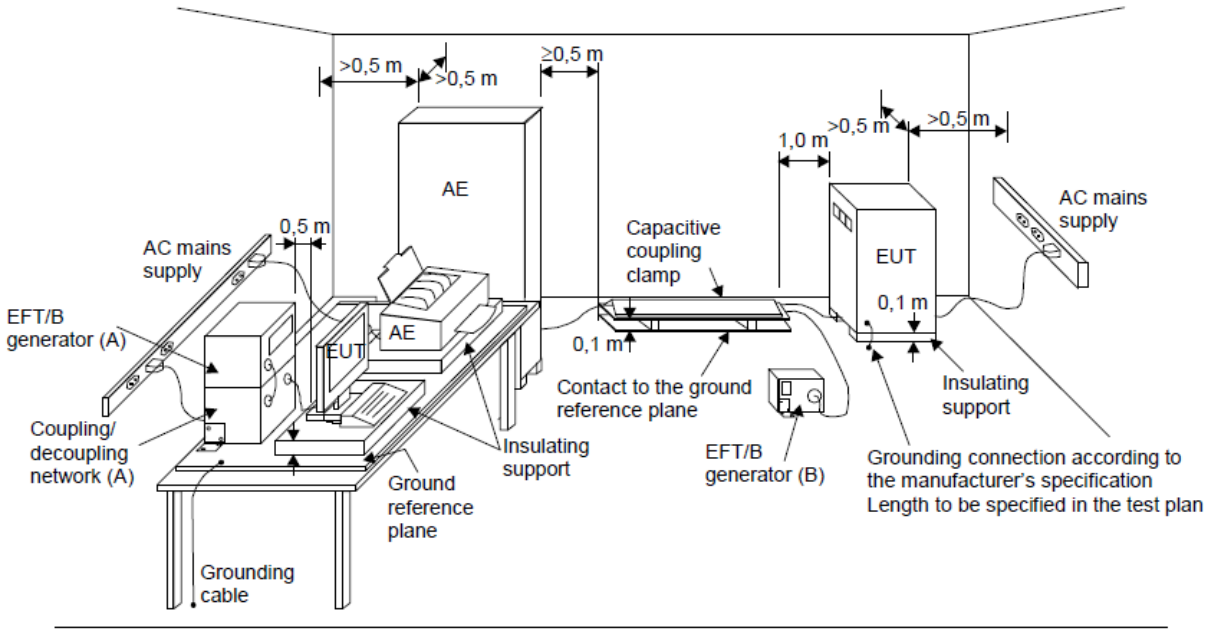
11.1.1 Test level

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

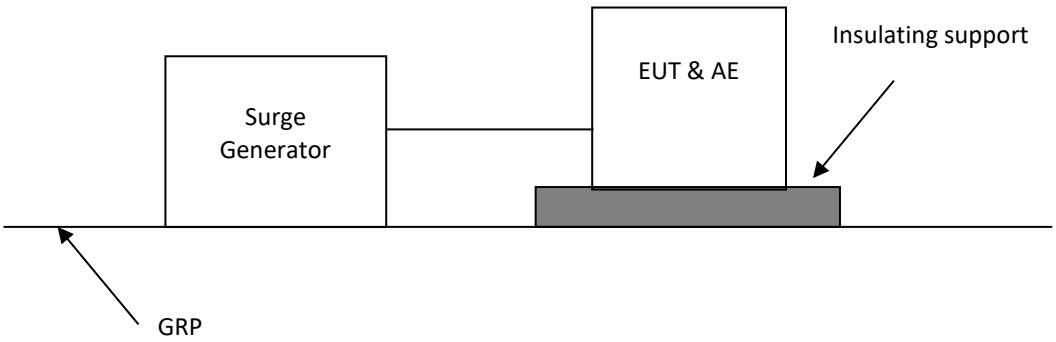
Level	Open-circuit test voltage (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

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

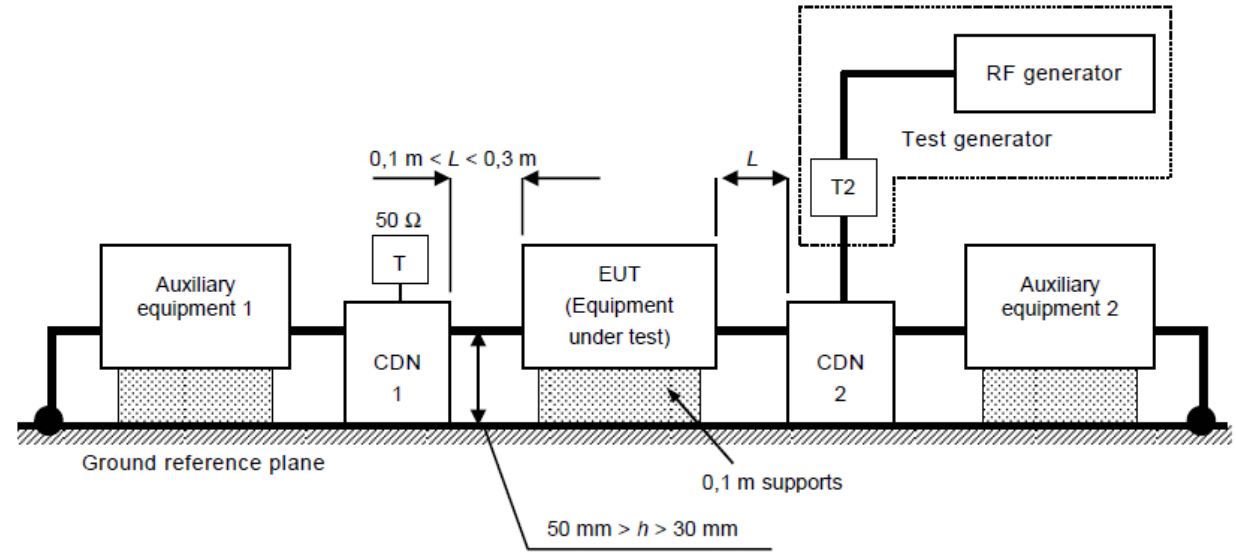
Frequency range 150kHz – 80MHz		
Level	Voltage level U0 (dBuV)	U0 (V)
1	120	1
2	130	3
3	140	10
X	Special	Special

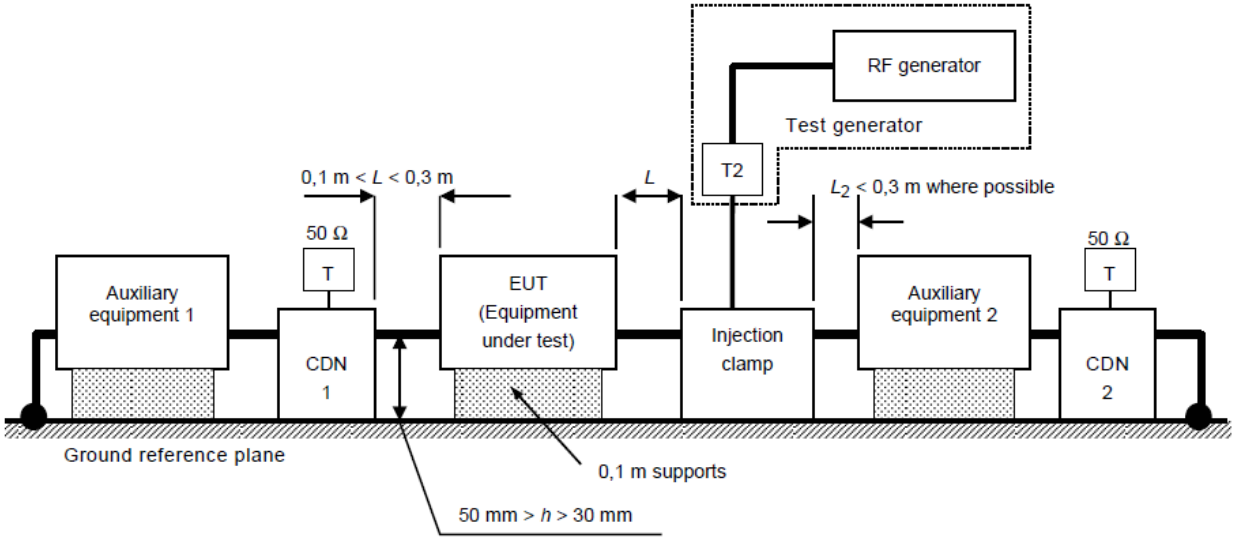
Notes: 1. “X” is an open level
2. The gray row is the selected test level.

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

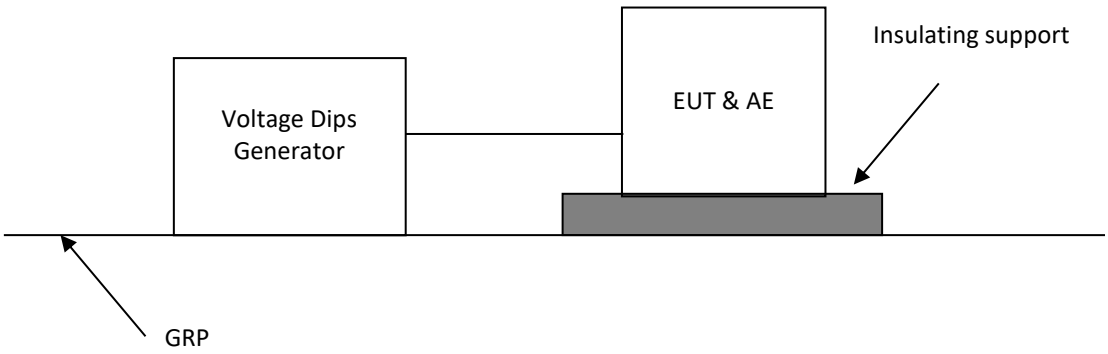
14.1.1 Test level

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: All the functions were operated as normal after test. The lights would go off during the test but could recovery automatically.
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

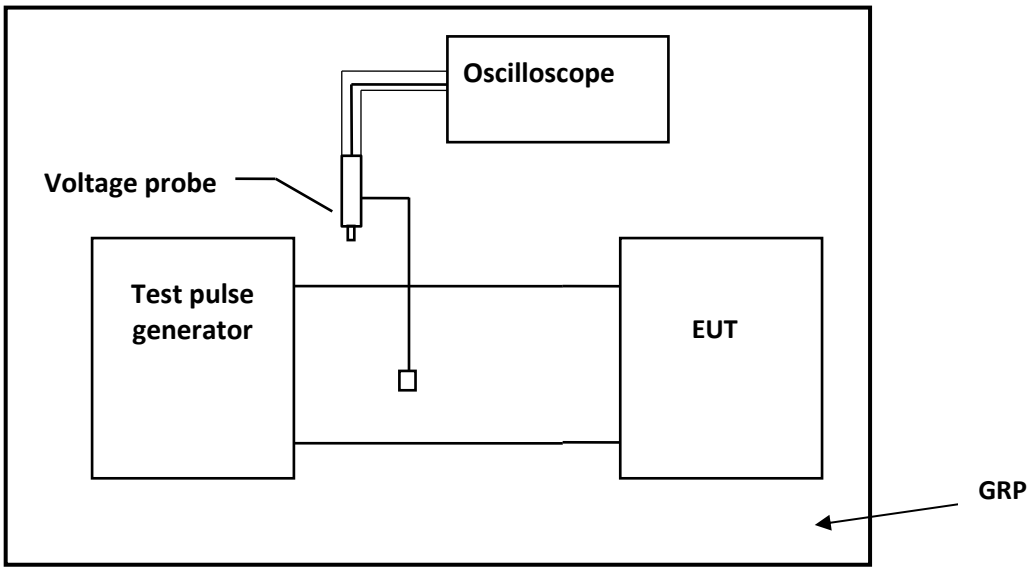
15.1.1 Test level

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.

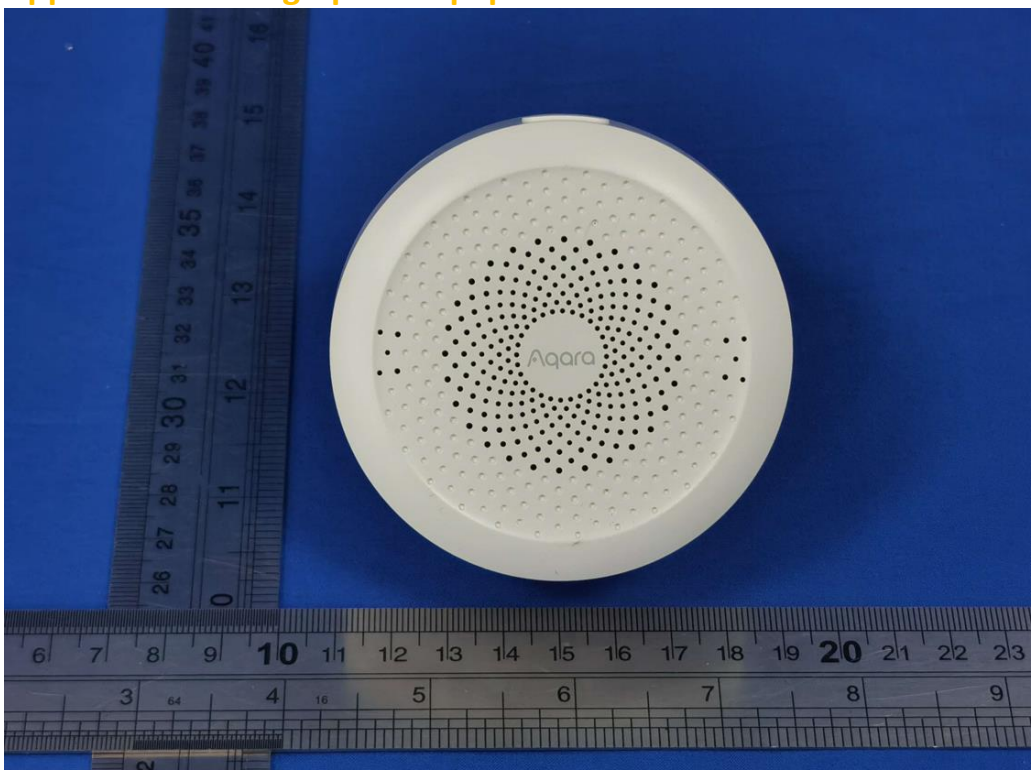
15.4 Test Result

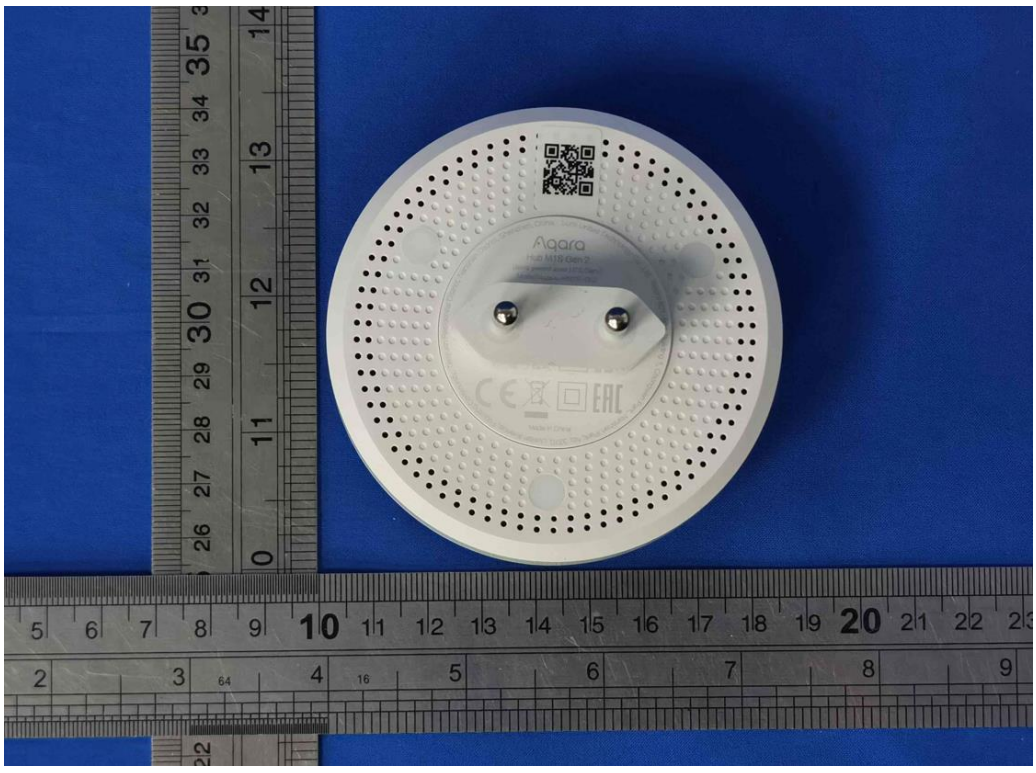
Pulse No.	Level	Number of Pulses or Application Time	Burst/pulse cycle time	Pass/Fail/NA
1	III	10 pulses	0,5 s	
2a	III	10 pulses	0,2 s	
2b	III	10 pulses	0,5 s	
3a	III	20 minutes	90 ms	
3b	III	20 minutes	90 ms	
4	III	10 pulses	1 min	

Observation:
Conclusion:

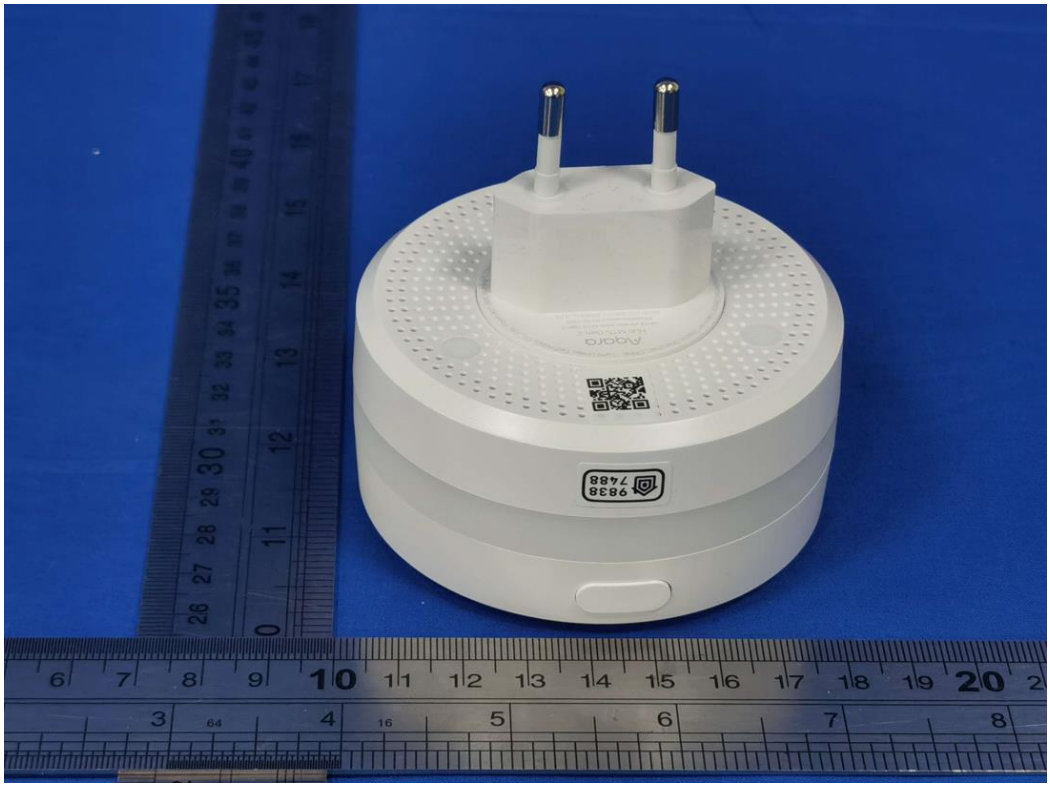
TEST REPORT

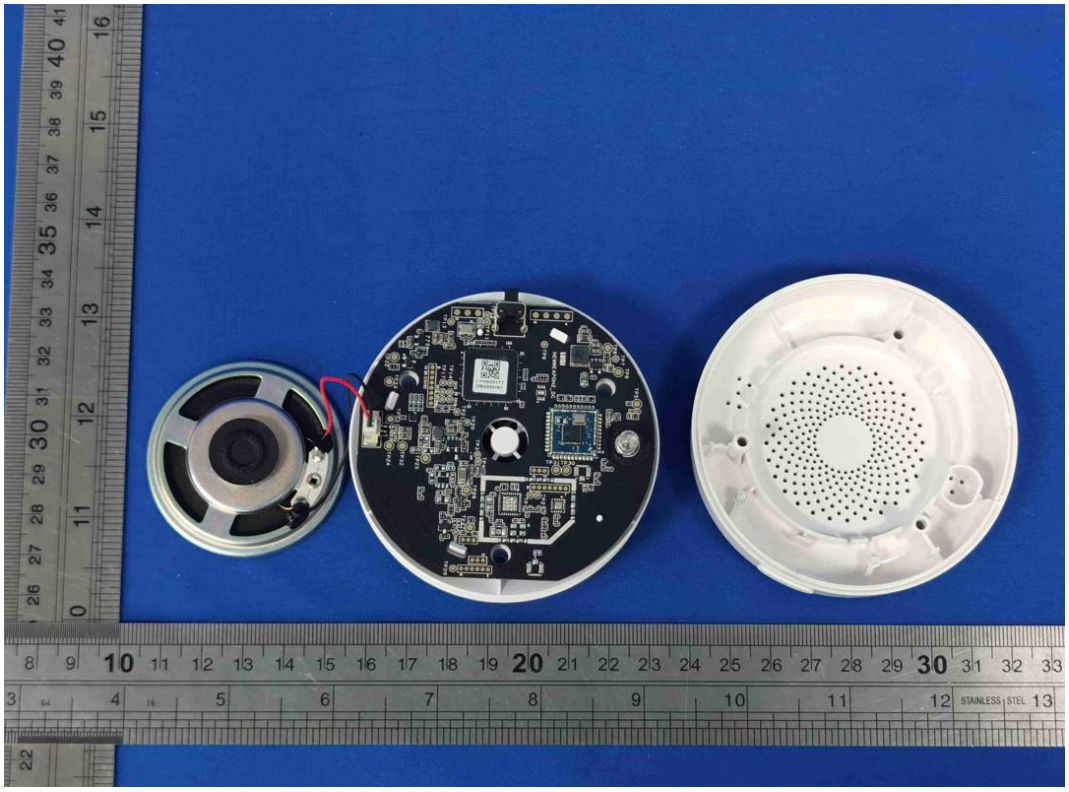
Appendix I: Photograph of equipment under test

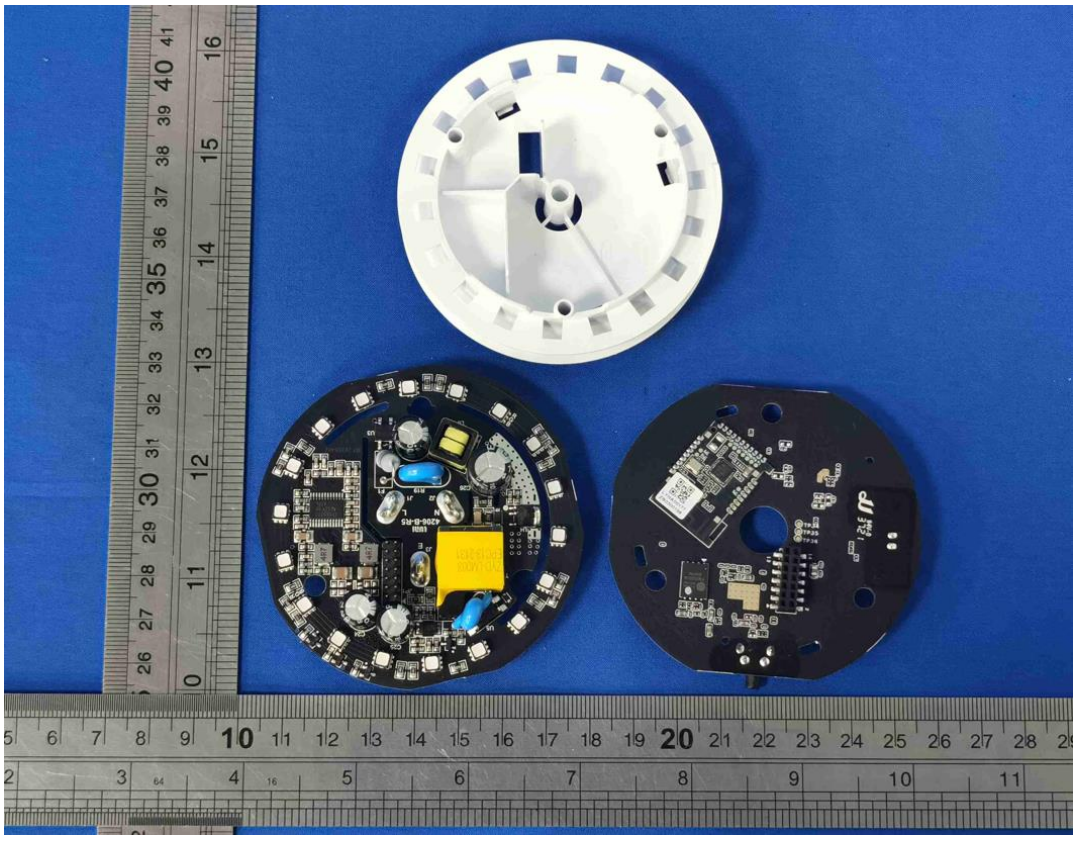


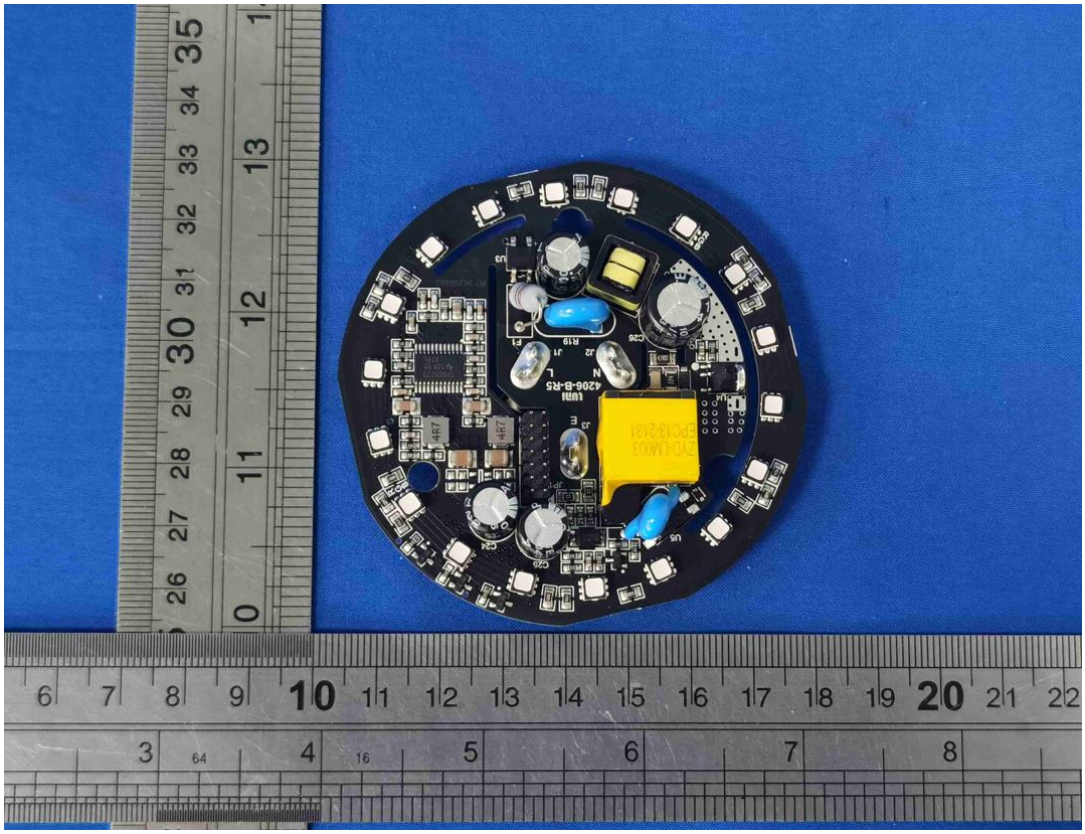


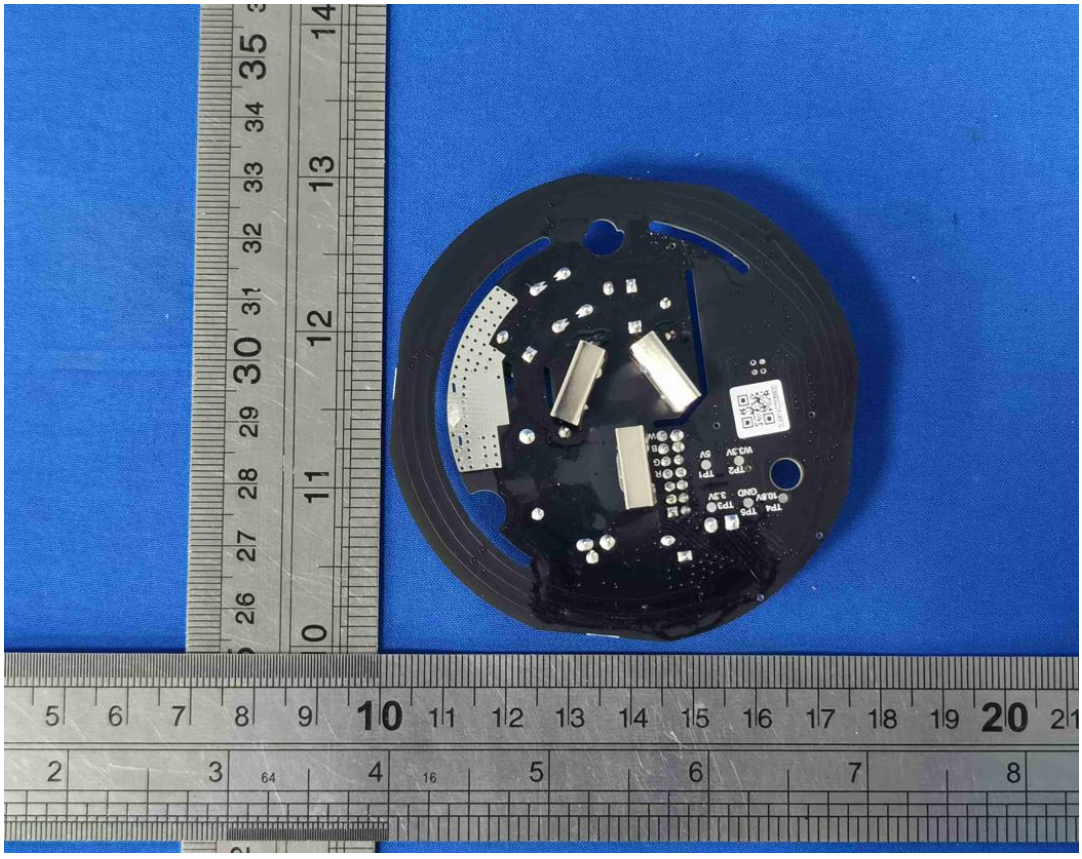
TEST REPORT

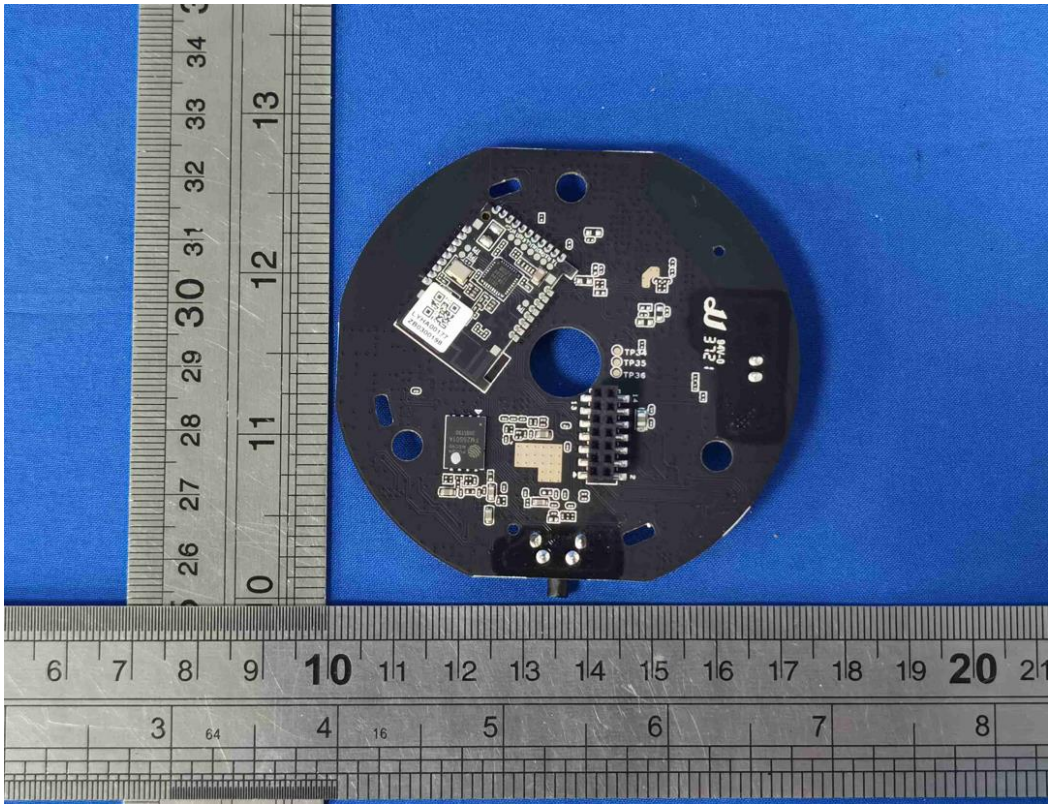


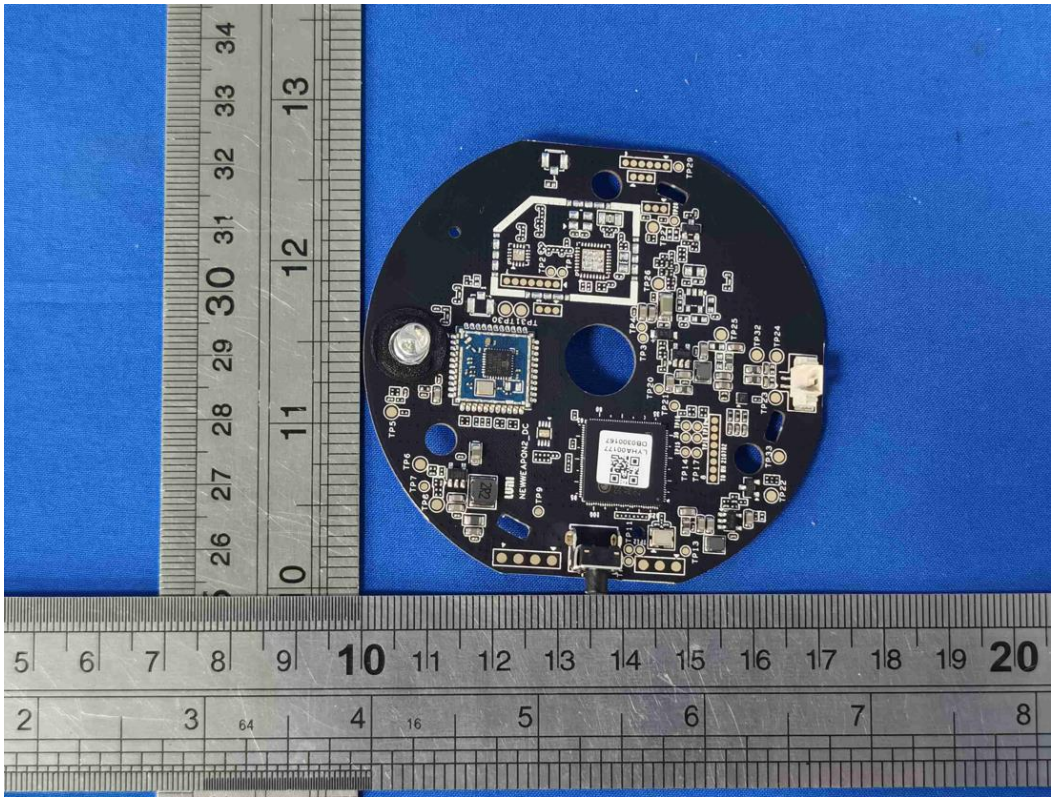












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