CE EMC TEST REPORT

Report No.: DDT-B23041203-1E01

Applicant	:	TPV Electronics (Fujian) Co., Ltd.
Address	:	Rongqiao Economic and Technological Development Zone, Fuqing City, Fujian Province, P.R. China
Equipment under Test	:	LCD Monitor
Model No.	:	24E3QAF，**24E3******** ("*" = 0-9，A-Z，a-z，+，-，/，\ or blank)

Issued By: Tianjin Dongdian Testing Service Co., Ltd.

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REPORT

CONTENTS

1. Summary of Test Results 7
2. General Test Information 8
2.1 Description of EUT 8
2.2 Primary Function of EUT 8
2.3 Port of EUT 9
2.4 Accessories of EUT 9
2.5 Test peripherals 9
2.6 Block diagram EUT configuration for test 10
2.7 EUT operating mode(s) 10
2.8 Performance Criteria 11
2.9 Deviations of test standard 11
2.10 Test laboratory 12
2.11 Measurement uncertainty 12
3. Conducted Emission (mains power port) 13
3.1 General information 13
3.2 Test Equipment 13
3.3 Reference standard 13
3.4 Block diagram of test setup 13
3.5 Limits 14
3.6 Test procedure 14
3.7 Test result 16
4. Conducted Emission (Telecommunication Port) 17
4.1 General information 17
4.2 Test equipment 17
4.3 Reference standard 17
4.4 Block diagram of test setup 17
4.5 Limits for conducted disturbance at the telecommunication ports 18
4.6 Test procedure 18
4.7 Test result 18
5. Radiated Emissions (30MHz to 1GHz) 19
5.1 General information 19
5.2 Test equipment 19
5.3 Reference standard 19
5.4 Block diagram of test setup 20
5.5 Limits 20
5.6 Test procedure 21
5.7 Test result 23
6. Radiated Emissions (Above 1GHz) 24
6.1 General information 24
6.2 Test equipment 24
6.3 Reference standard 24
6.4 Block diagram of test setup 25
6.5 Limits 25
6.6 Test procedure 25
6.7 Test result 27
7. Harmonics current 28
7.1 General information 28
7.2 Test equipment 28
7.3 Reference standard 28
7.4 Block diagram of test setup 28
7.5 Limits 29
7.6 Test result 29
8. Voltage fluctuation & Flicker 31
8.1 General information 31
8.2 Test equipment 31
8.3 Reference standard 31
8.4 Block diagram of test setup 32

8.5 Limits....32
8.6 Test result....32
9. Electrostatic Discharge....34
9.1 General information....34
9.2 Test equipment....34
9.3 Test and reference standards....34
9.4 Block diagram of test setup....34
9.5 Test levels and performance criterion....35
9.6 Test procedure....35
9.7 Test result....36
10. Continuous Radio Frequency Disturbances....38
10.1 General information....38
10.2 Test equipment....38
10.3 Test and reference standards....38
10.4 Block diagram of test setup....38
10.5 Test levels and performance criterion....39
10.6 Test procedure....40
10.7 Test result....40
11. Electrical Fast Transients (EFT)....41
11.1 General information....41
11.2 Test equipment....41
11.3 Test and reference standards....41
11.4 Block diagram of test setup....41
11.5 Test levels and performance criterion....42
11.6 Test Procedure....42
11.7 Test result....43
12. Surges....44
12.1 General information....44
12.2 Test equipment....44
12.3 Test and reference standards....44
12.4 Block diagram of test setup....44
12.5 Test levels and performance criterion....45
12.6 Test Procedure....45
12.7 Test result....46
13. Continuous Conducted Disturbances....47
13.1 General information....47
13.2 Test Equipment....47
13.3 Test and reference standards....47
13.4 Block diagram of test setup....47
13.5 Test levels and performance criterion....48
13.6 Test procedure....49
13.7 Test result....49
14. Power-Frequency Magnetic Fields....50
14.1 General information....50
14.2 Test equipment....50
14.3 Test and reference standards....50
14.4 Block diagram of test setup....50
14.5 Test levels and performance criterion....51
14.6 Test procedure....51
14.7 Test result....51
15. Voltage Dips and Interruptions....52
15.1 General information....52
15.2 Test equipment....52
15.3 Test and reference standards....52
15.4 Block diagram of test setup....52
15.5 Test levels and performance criterion....52
15.6 Test procedure....53
15.7 Test result....53

Annex A Test Setup Photos.....54

Test Report Declare

Applicant	:	TPV Electronics (Fujian) Co., Ltd.
Address	:	Rongqiao Economic and Technological Development Zone, Fuqing City, Fujian Province, P.R. China
Equipment Under Test	:	LCD Monitor
Model No.	:	24E3QAF，**24E3******** (“*” = 0-9，A-Z，a-z，+，-，/，\ or blank)

Test Standard Used:
EN 55032:2015, EN 55032:2015/A11:2020, EN 55032:2015/A1:2020,
CISPR 32:2015/AMD1:2019, AS/NZS CISPR 32:2015 AMD 1:2020
BS EN 55032:2015, BS EN 55032:2015+A11:2020, BS EN 55032:2015+A1:2020
EN 55035:2017, EN 55035:2017/A11:2020, CISPR 35:2016, BS EN 55035:2017
BS EN 55035:2017+A11:2020
EN 61000-3-2:2014, EN IEC 61000-3-2:2019/A1:2021, BS EN 61000-3-2:2014, BS EN IEC 61000-3-2:2019+A1:2021
EN 61000-3-3:2013, EN 61000-3-3:2013/A1:2019, EN 61000-3-3:2013/A2:2021, BS EN 61000-3-3:2013, BS EN 61000-3-3:2013+A1:2019, BS EN 61000-3-3:2013/A2:2021

Test Procedure Used:
IEC 61000-4-2:2008, IEC 61000-4-3:2020, IEC 61000-4-4:2012,
IEC 61000-4-5:2014/AMD1:2017, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2020

We Declare:
The equipment described above is tested and assessed by Tianjin Dongdian Testing Service Co., Ltd. and in the configuration assessed the equipment complied with the standards specified above. The tested and assessed results are contained in this test report and Tianjin Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these assessments.
After test and evaluation, our opinion is that the equipment in accordance with above standards.

Report No.:	DDT-B23041203-1E01		
Date of Receipt:	Apr. 17, 2023	Date of Test:	Apr. 17, 2023 ~ Apr. 21, 2023

CE

Prepared By:

May Zhang

May Zhang/Engineer

Approved By:

Aaron Zhang

Aaron Zhang/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Tianjin Dongdian Testing Service Co., Ltd.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	May. 04, 2023	

1. Summary of Test Results

Emission		
Description of Test Item	**Standard**	**Result**
Conducted emission at AC mains terminals	EN 55032:2015, EN 55032:2015/A11:2020, EN 55032:2015/A1:2020,	PASS
Conducted emission at telecommunication port	EN 55032:2015, EN 55032:2015/A11:2020, EN 55032:2015/A1:2020,	N/A
Radiated emission	EN 55032:2015, EN 55032:2015/A11:2020, EN 55032:2015/A1:2020,	PASS
Harmonic current	EN 61000-3-2:2014, EN IEC 61000-3-2:2019/A1:2021	N/A
Voltage fluctuation & Flicker	EN 61000-3-3:2013, EN 61000-3-3:2013/A1:2019, EN 61000-3-3:2013/A2:2021	PASS

Immunity				
Description of Test Item	**Standard**	**Result**	**Performance Criteria**	
			Required	**Observation**
Electrostatic discharge (ESD)	EN 55035:2017, EN 55035:2017/A11:2020 IEC 61000-4-2:2008	Pass	B	B
Radiated, radio-frequency, electromagnetic field	EN 55035:2017, EN 55035:2017/A11:2020 IEC 61000-4-3:2020	Pass	A	A
Electrical fast transients (EFT)	EN 55035:2017, EN 55035:2017/A11:2020 IEC 61000-4-4:2012	Pass	B	B
Surges	EN 55035:2017, EN 55035:2017/A11:2020 IEC 61000-4-5:2014/AMD1:2017	Pass	B	A
Continuous conducted disturbances	EN 55035:2017, EN 55035:2017/A11:2020 IEC 61000-4-6:2013	Pass	A	A
Power frequency magnetic field	EN 55035:2017, EN 55035:2017/A11:2020 IEC 61000-4-8:2009	Pass	A	A
Voltage dips, < 5%	EN 55035:2017, EN 55035:2017/A11:2020 IEC 61000-4-11:2020	Pass	B	A
Voltage dips, 70%		Pass	C	A
Voltage interruptions		Pass	C	B
Note: N/A is an abbreviation for Not Applicable.				

2. General Test Information

2.1 Description of EUT

EUT* Name	:	LCD Monitor
Model Number	:	24E3QAF，**24E3******** ("*" = 0-9，A-Z，a-z，+，-，/，\ or blank)
Model Differences	:	All models difference is in sale marketing.
Test Model	:	24E3QAF
Serial Number	:	N/A
EUT function description	:	Please refer to user manual of this device
Power supply	:	100-240V 50/60Hz
EUT Class	:	Class B
Maximum work frequency	:	175.4 MHz

Note: EUT is the abbreviation of equipment under test.

2.2 Primary Function of EUT

Function	Description
☒Broadcast reception function	N/A
☒Print	N/A
☒Scan	N/A
☑Display or display output	Display
☒Musical tone generating	N/A
☒Networking	N/A
☑Audio output	Audio output function (internal speaker & audio output port)
☒Telephony	N/A
☒Bluetooth	N/A
☒Other:	N/A
Note: "☒" means the product does not have this function, "☑" means the product has this function, N/A means not applicable	

2.3 Port of EUT

Port	Description
☑AC mains power port	AC Main Port
☒DC network power port	N/A
☒Wired network port	N/A
☑Signal data/control port	One HDMI in Port, One DP in Port, One VGA in Port, One Audio in Port
☒Antenna port	N/A
☒Broadcast receiver tuner port	N/A
☑Audio output port	One Audio out Port, Two Speakers
☒Video output port	N/A
☒Other:	N/A
Note: "☒" means the product does not have this port, "☑" means the product has this port, N/A means not applicable	

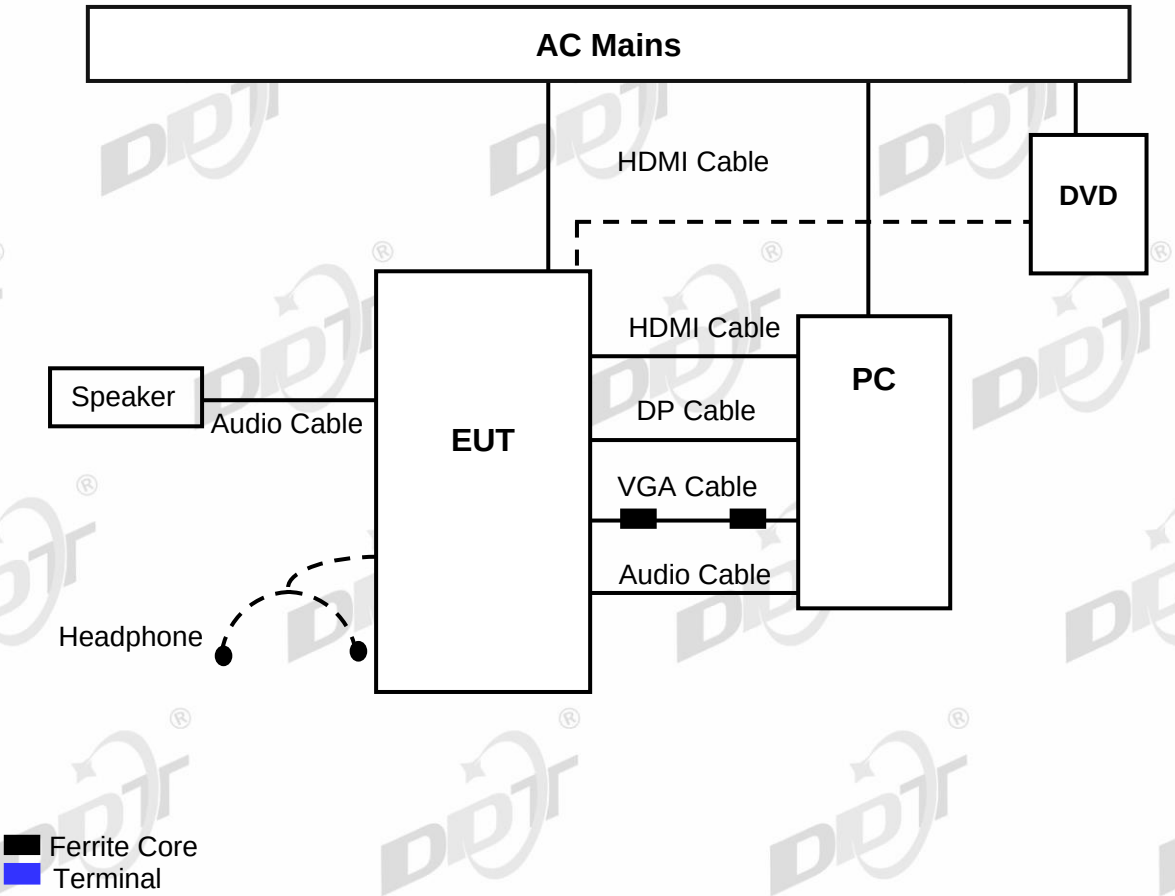
2.4 Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Remark
AC Cable	N/A	N/A	Length: 1.5m/1.8m, Unshielded	N/A
HDMI Cable	N/A	N/A	Length: 1.2m/1.5m/1.8m, Shielded	N/A
DP Cable	N/A	N/A	Length: 1.2m/1.5m/1.8m, Shielded	N/A
VGA Cable	N/A	N/A	Length: 1.2m/1.5m/1.8m, Shielded	N/A
AUDIO Cable	N/A	N/A	Length: 1.2m/1.5m/1.8m, Shielded	N/A

2.5 Test peripherals

Device	Manufacturer	Model No.	Serial No.	Remark
Desktop PC	HP	TPC-W058-MT	8CG0321Q58	N/A
Desktop PC	Samsung	DM700T6A-A99	JVTG98EJ2C004QX	N/A
Desktop PC	Samsung	DM700T6A-A99	JVTG98EJ2C0087L	N/A
Keyboard	DELL	N/A	N/A	N/A
Mouse	DELL	N/A	N/A	N/A
DVD	PHILIPS	TAEP200/93	HCPE2025000750	N/A
Headphone	N/A	N/A	N/A	N/A
Speaker	JBL	GO2+	N/A	N/A

2.6 Block diagram EUT configuration for test



2.7 EUT operating mode(s)

Mode1: HDMI	Connect HDMI cable from PC's HDMI port to EUT's HDMI Port. The test signal is color bars with moving picture element according to ITU-R BT 471-1.
Mode2: DP	Connect DP cable from PC's DP port to EUT's DP Port. The test signal is color bars with moving picture element according to ITU-R BT 471-1.
Mode3: VGA	Connect VGA cable from PC's VGA port to EUT's VGA Port. The test signal is color bars with moving picture element according to ITU-R BT 471-1.

2.8 Performance Criteria

During and/or after immunity testing for EN55035:2017, the EUT was monitored to the following performance criterion.

Criterion	Operating mode(s)	Description
A	1,2,3	No noticeable degradation or loss of function is allowed during the test. The EUT shall continue to operate as intended without operator intervention. The product conforms with the requirements of clause 8 of EN55035:2017. The product conforms with the requirements of Annex of EN55035:2017. ☐ Annex A ☐ Annex B ☐ Annex C ☒ Annex D ☐ Annex E ☐ Annex F ☒ Annex G
B	1,2,3	No noticeable degradation or loss of function is allowed after the test. The EUT shall continue to operate as intended without operator intervention. During the test, degradation of performance is allowed. No change of operating state or stored data is allowed to persist after the test. The product conforms with the requirements of clause 8 of EN55035:2017. The product conforms with the requirements of Annex of EN55035:2017. ☐ Annex A ☐ Annex B ☐ Annex C ☒ Annex D ☐ Annex E ☐ Annex F ☒ Annex G
C	1,2,3	Loss of function is allowed, provided that the function is self recoverable. or can be restored by the operation of the controls by the user. The product conforms with the requirements of clause 8 of EN55035:2017. The product conforms with the requirements of Annex of EN55035:2017. ☐ Annex A ☐ Annex B ☐ Annex C ☒ Annex D ☐ Annex E ☐ Annex F ☒ Annex G

2.9 Deviations of test standard

[Standard deviation 1] Radiated,radio-frequency,electromagnetic field immunity test was done according to IEC 61000-4-3:2020 instead of IEC 61000-4-3:2006/AMD2:2010.
[Standard deviation 2] Surge immunity test was done according to IEC 61000-4-5:2014 + A1:2017 instead of IEC 61000-4-5:2005.
[Standard deviation 3] Radio-frequency conducted immunity test was done according to IEC 61000-4-6:2013 instead of IEC 61000-4-6:2008.
[Standard deviation 4] Voltage dips, short interruptions and voltage variations immunity test was done according to IEC 61000-4-11:2020 instead of IEC 61000-4-11:2004.

2.10 Test laboratory

Tianjin Dongdian Testing Service Co., Ltd.
Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China.
Tel: +86-22-58038033, http://www.ddttest.com, Email: ddt@dgddt.com
NVLAP (National Voluntary Laboratory Accreditation Program) CODE: 500036-0
CNAS (China National Accreditation Service for Conformity Assessment) CODE: L13402
FCC Designation Number: CN5004; FCC Test Firm Registration Number: 368676
ISED (Innovation, Science and Economic Development Canada) Company Number: 27768
Conformity Assessment Body Identifier: CN0125
VCCI Facility Registration Number: C-20089, T-20093, R-20125, G-20122

2.11 Measurement uncertainty

Test Item		Uncertainty
Conducted emission	Main terminal	3.4dB (150KHz-30MHz)
	Telecommunication (ISN T800)	4.59dB
	Telecommunication (ISN ST08)	3.5dB
Uncertainty for 10m Radiation Emission test (30MHz-1GHz)		5.2 dB (Antenna Polarize: H)
		5.2 dB (Antenna Polarize: V)
Uncertainty for Radiation disturbance test (1GHz to 6GHz)		5.0dB
Harmonics current		3.1 %
Voltage fluctuation & Flicker		1.7 %
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. We have conducted the Electrostatic discharge, Electrical fast transient/burst, Surge, Voltage dips, short interruptions and voltage variations tests to check the uncertainty. Radiated, radio-frequency, electromagnetic field 5.4dB. Conducted disturbances, induced by radio-frequency fields 1.1dB.		

3. Conducted Emission (mains power port)

3.1 General information

Test date	Apr. 17, 2023	Test engineer	Freya	
Climate condition	Ambient temperature	23.9±1℃	Relative humidity	21±1%
	Atmospheric pressure	100.4±0.2 kPa		
Test place	Shield Room 2#			

3.2 Test Equipment

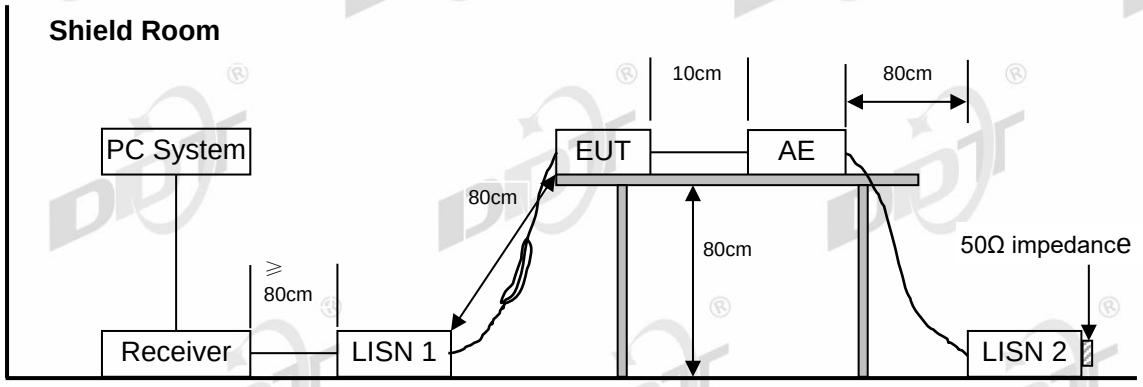
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Test Receiver	R&S	ESCI	101397	Feb. 15, 2023	1 Year
LISN 1	R&S	ENV216	101122	Feb. 15, 2023	1 Year
LISN 2	R&S	ENV216	101254	Feb. 15, 2023	1 Year
Test software	TOYO	EP5/CE	V 5.4.40	N/A	N/A

3.3 Reference standard

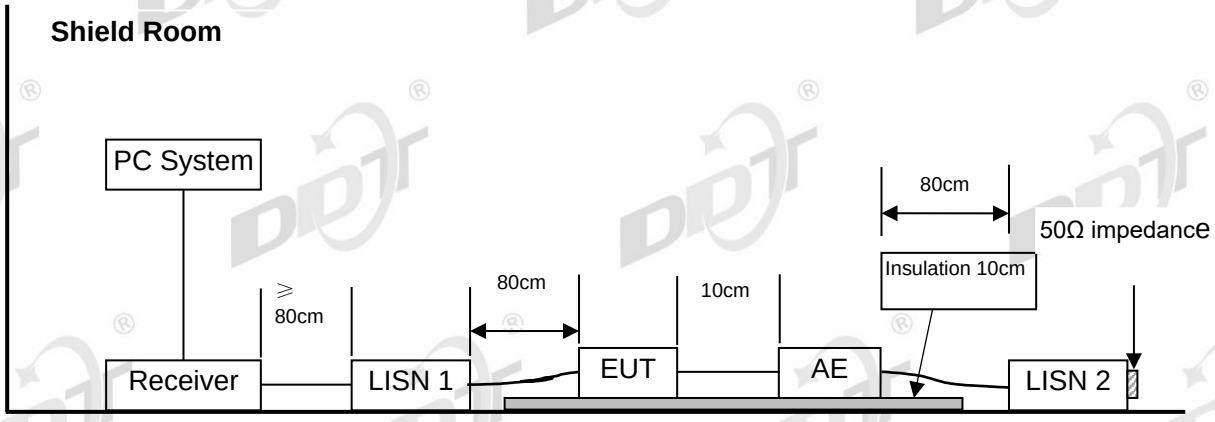
EN 55032:2015, (Class B)
EN 55032:2015/A11:2020
EN 55032:2015/A1:2020

3.4 Block diagram of test setup

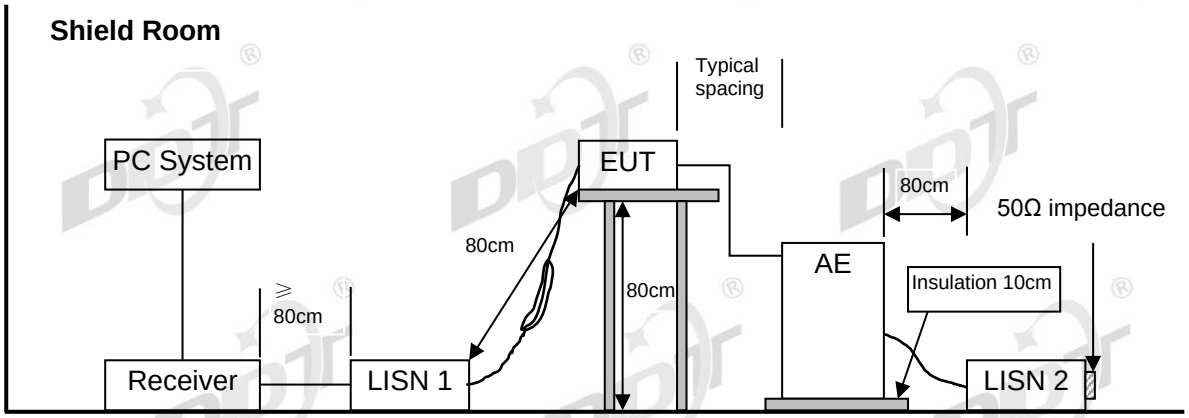
For table-top equipment



For floor standing equipment



For combinations equipment



3.5 Limits

Class A

Frequency			Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz	~	500kHz	79	66
500kHz	~	30MHz	73	60

Class B

Frequency			Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz	~	500kHz	66 ~ 56*	56 ~ 46*
500kHz	~	5MHz	56	46
5MHz	~	30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

3.6 Test procedure

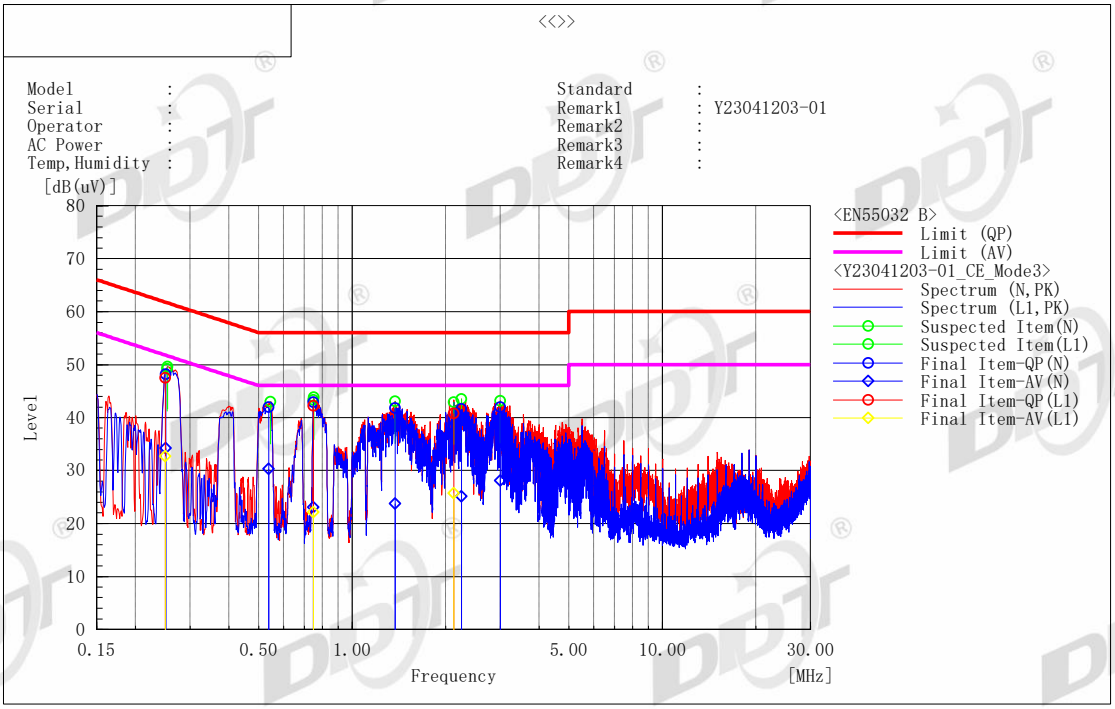
(1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
(2) The EUT's power adapter was connected to the power mains through a line impedance stabilization network (L.I.S.N). which this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted disturbance. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to EN 55032 on conducted disturbance emission test.
(3) The bandwidth of test receiver is set at 9 kHz.
(4) The frequency range from 150 kHz to 30MHz is checked.
(5) Pre-scan measurements were performed in all operating mode or resolution.
But final measurements were performed in worst cases based on pre-scan measurements.

The EUT with following test modes were pre-tested:

No.	Test Voltage	Operation Mode	Cable Length	Resolution	Rotation	Audio	Stand Position
1.	230V 50Hz	Mode 1 HDMI	1.8m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
2.			1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
3.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
4.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
5.			1.5m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
6.			1.2m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
7.		HDMI	1.8m	DVD	Landscape	External Speaker	HAS Stand-up
8.		Mode 2 DP	1.8m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
9.			1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
10.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
11.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
12.			1.5m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
13.			1.2m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
14. *		Mode 3 VGA	1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
15.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
16.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
17.			1.5m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
18.			1.2m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
19.		VGA 1920*1080@60Hz with 1.8m power cord			Landscape	Headphone	HAS Stand-up
20.		VGA 1920*1080@60Hz with 1.5m power cord			Landscape	External Speaker	HAS Stand-up
21.		VGA 1920*1080@60Hz with 1.8m power cord			Portrait (-90 degree)	External Speaker	HAS Stand-up
22.		VGA 1920*1080@60Hz with 1.8m power cord			Portrait (-270 degree)	External Speaker	HAS Stand-up
23.		VGA 1920*1080@60Hz with 1.8m power cord			Landscape	External Speaker	HAS Stand-down
24.		VGA 1920*1080@60Hz with 1.8m power cord			Landscape	Internal Speaker	HAS Stand-up
25.	110V 60Hz	VGA 1920*1080@60Hz			Landscape	External Speaker	HAS Stand-up
* Means the worst test mode.							

3.7 Test result

Operating Mode 3: VGA IN



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]	Remark
1	0.25019	38.3	24.4	9.8	48.1	34.2	61.8	51.8	13.7	17.6	
2	0.53852	32.2	20.5	9.8	42.0	30.3	56.0	46.0	14.0	15.7	
3	0.75041	33.1	13.3	9.8	42.9	23.1	56.0	46.0	13.1	22.9	
4	1.37581	31.9	13.9	9.9	41.8	23.8	56.0	46.0	14.2	22.2	
5	2.25007	31.7	15.2	9.9	41.6	25.1	56.0	46.0	14.4	20.9	
6	2.99978	32.0	18.0	10.0	42.0	28.0	56.0	46.0	14.0	18.0	

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]	Remark
1	0.24952	37.7	22.9	9.8	47.5	32.7	61.8	51.8	14.3	19.1	
2	0.75004	32.4	12.3	9.8	42.2	22.1	56.0	46.0	13.8	23.9	
3	2.12439	30.9	15.8	9.9	40.8	25.7	56.0	46.0	15.2	20.3	

Note1) Level (Quasi-Peak and/or C/Average) = Meter Reading + Factor
Note2) Line = Polarity of input power (Live or Neutral)
N : Abbreviation of Neutral Polarity, L1 : Abbreviation of Live Polarity,
Note3) Factor = LISN Insertion Loss + Cable Loss
Note4) Margin = Limit – Level (Quasi-Peak and/or C/Average)
Note5) C/Average : Abbreviation of CISPR Average

4. Conducted Emission (Telecommunication Port)

4.1 General information

Test date	N/A	**Test engineer**	N/A	
Climate condition	**Ambient temperature**	N/A	**Relative humidity**	N/A
	Atmospheric pressure	N/A		
Test place	Shield Room 2#			

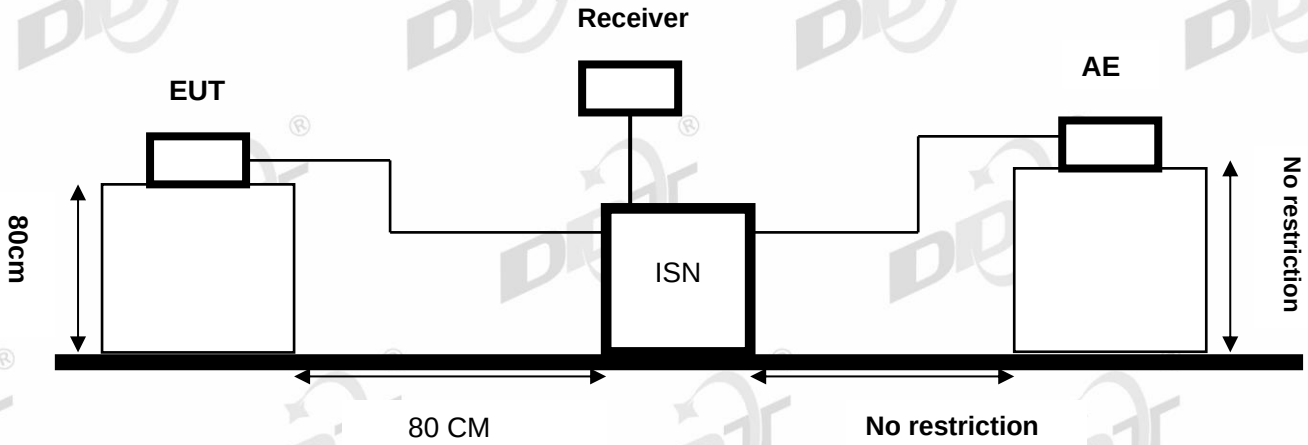
4.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Test Receiver	R&S	ESCI	101397	Feb. 15, 2023	1 Year
ISN	TESEQ	T800	30844	Nov. 17, 2022	1 Year
Test software	TOYO	EP5/CE	V 5.4.40	N/A	N/A

4.3 Reference standard

EN 55032:2015, (Class B)
EN 55032:2015/A11:2020
EN 55032:2015/A1:2020

4.4 Block diagram of test setup



EUT means Equipment Under Test
AE means Associated Equipment.

4.5 Limits for conducted disturbance at the telecommunication ports

Class A

Frequency			Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz	~	500kHz	97 ~ 87*	84 ~ 74*
5MHz	~	30MHz	87	74

Class B

Frequency			Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz	~	500kHz	84 ~ 74*	74 ~ 64*
5MHz	~	30MHz	74	64

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

4.6 Test procedure

The EUT was placed on a 0.8m high non-metallic table in shielded room.
Connect ISN directly to reference ground plane.
The measured voltage at the measurement port of the ISN should correct the reading by adding the voltage division factor of the ISN, and compare to the voltage limit.

For Local Area Network (LAN) device, in order to make reliable emission measurements representative of high LAN utilization it is only necessary to create a condition of LAN utilization in excess of 10 % and sustain that level for a minimum of 250 ms. The content of the test traffic should consist of both periodic and pseudo-random messages in order to emulate realistic types of data transmission (e.g. random: files compressed or encrypted; periodic: uncompressed graphic files, memory dumps, screen updates, disk images). If the LAN maintains transmission during idle periods measurements shall also be made during idle periods.

When disturbance voltage measurements are performed on a single unscreened balanced pair, an adequate ISN for two wires shall be used; when performed on unscreened cables containing two balanced pairs, an adequate ISN for four wires shall be used.

4.7 Test result

Not applicable: This product does not have a communication port.

5. Radiated Emissions (30MHz to 1GHz)

5.1 General information

Test date	Apr. 21, 2023	**Test engineer**	Jason	
Climate condition	**Ambient temperature**	21.1±1℃	**Relative humidity**	34±1%
	Atmospheric pressure	102.6±0.2kPa		
Test place	10m Chamber			

5.2 Test equipment

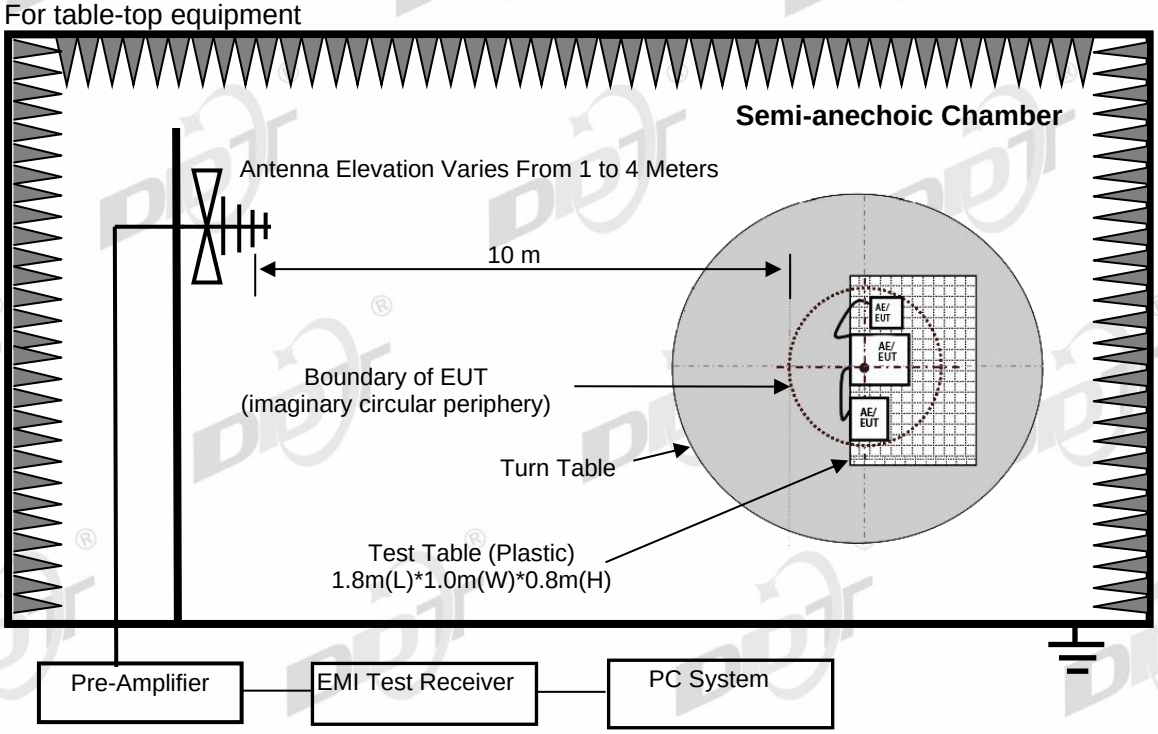
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	R&S	ESCI	101024	Feb. 15, 2023	1 Year
EMI Test Receiver	R&S	ESCI	101030	Feb. 15, 2023	1 Year
Bilog Antenna	TESEQ	CBL6112D	29068	Oct. 10, 2022	2 Year
Bilog Antenna	TESEQ	CBL6112D	29069	Oct. 10, 2022	2 Year
Amplifier	Sonoma	310N	300913	Feb. 15, 2023	1 Year
Amplifier	Sonoma	310N	334532	Feb. 16, 2023	1 Year
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector1	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector2	N/A	N/A
Test software	TOYO	EP5/RE	V 5.7.10	N/A	N/A
Notes. N/A means Not applicable.					

5.3 Reference standard

EN 55032:2015, (Class B)
EN 55032:2015/A11:2020
EN 55032:2015/A1:2020

5.4 Block diagram of test setup

Below 1GHz
For table-top equipment



5.5 Limits

Class A

Equipment	Frequency	Field Strengths Limits at 10m measuring distance dB(μV)/m	Field Strengths Limits at 3m measuring distance dB(μV)/m
Class A Equipment	30MHz to 230MHz	40	50
	230MHz to 1000MHz	47	57

Class B

Equipment	Frequency	Field Strengths Limits at 10m measuring distance dB(μV)/m	Field Strengths Limits at 3m measuring distance dB(μV)/m
Class B Equipment	30MHz to 230MHz	30	40
	230MHz to 1000MHz	37	47

Note: (1) The smaller limit shall apply at the cross point between two frequency bands.
(2) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

5.6 Test procedure

For Radiated emissions:

(1) The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.

(2) Test antenna was located ☐3m / ☒10m (see note) from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to EN 55032 on radiated emission test.

(3) Spectrum frequency from 30MHz to☒1GHz /☐2GHz was investigated.

(4) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to EN 55032 on Radiated Emission test.

(5) For emissions from 30MHz to 1GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 kHz.

(6) Final measurements consisted of 3 steps.
First step, frequency fine tuning to find exact emission frequency.
Second step, rechecking to search for maximum height and azimuth for interference from EUT In final step, there are conducted measuring with quasi-peak detector for points which are detected from 1st step & 2nd step. Results checked manually and points close to the limit line were re-measured.

(7) Pre-scan measurements were performed in all operating mode or resolution. But final measurements were performed in worst cases based on pre-scan measurements.

The EUT with following test modes were pre-tested:

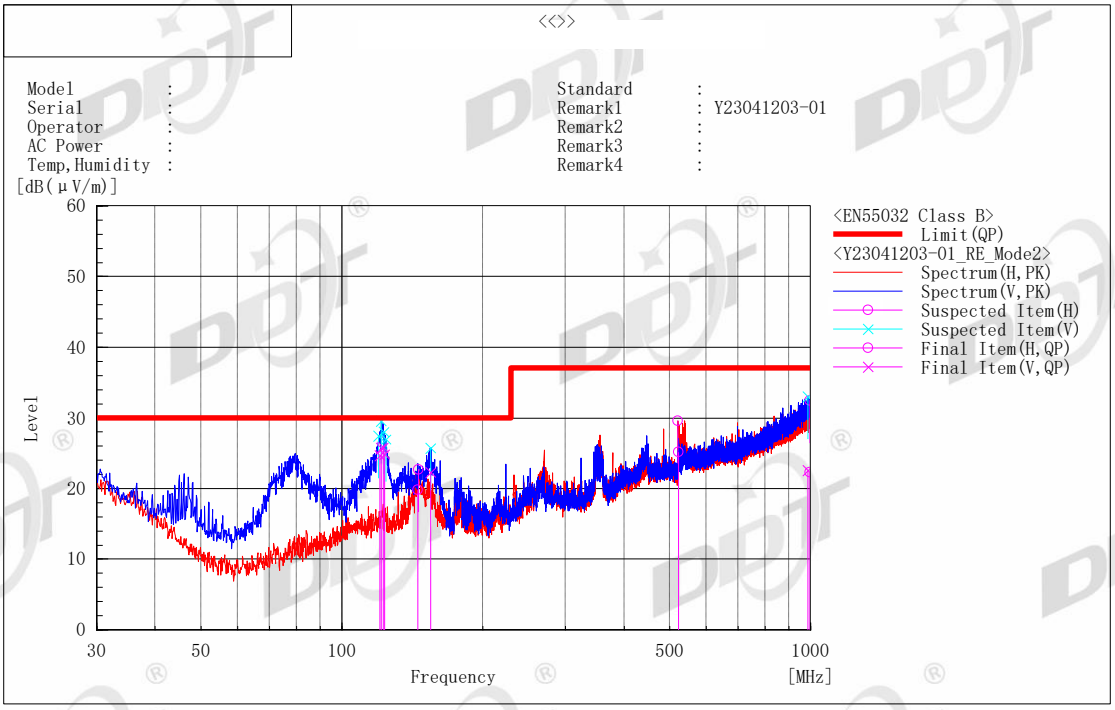
No.	Test Voltage	Operation Mode	Cable Length	Resolution	Rotation	Audio	Stand Position
1.	230V 50Hz	Mode 1 HDMI	1.8m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
2.			1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
3.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
4.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
5.			1.5m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
6.			1.2m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
7.		HDMI	1.8m	DVD	Landscape	External Speaker	HAS Stand-up
8. *		Mode 2 DP	1.8m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
9.			1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
10.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
11.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
12.			1.5m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
13.			1.2m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
14.		Mode 3 VGA	1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
15.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
16.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
17.			1.5m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
18.			1.2m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
19.		DP 1920*1080@75Hz with 1.8m power cord			Landscape	Headphone	HAS Stand-up
20.		DP 1920*1080@75Hz with 1.5m power cord			Landscape	External Speaker	HAS Stand-up
21.		DP 1920*1080@75Hz with 1.8m power cord			Portrait (-90 degree)	External Speaker	HAS Stand-up
22.		DP 1920*1080@75Hz with 1.8m power cord			Portrait (-270 degree)	External Speaker	HAS Stand-up
23.		DP 1920*1080@75Hz with 1.8m power cord			Landscape	External Speaker	HAS Stand-down
24.		DP 1920*1080@75Hz with 1.8m power cord			Landscape	Internal Speaker	HAS Stand-up
25.	110V 60Hz	DP 1920*1080@75Hz			Landscape	External Speaker	HAS Stand-up
26.	230V 50Hz	DP 1920*1080@60Hz with 1.8m power cord			Landscape	Headphone	HAS Stand-up
27.		DP 1920*1080@60Hz with 1.8m power cord			Landscape	Without Headphone	HAS Stand-up
* Means the worst test mode.							

5.7 Test result

PASS. (See below detailed test result)

Note: All emissions not reported below are too low against the prescribed limits.

Operating Mode 2: DP IN



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]	System	Remark
1	145.182	H	31.4	-11.6	19.8	30.0	10.2	378.0	131.6	1	
2	521.929	H	27.5	-2.3	25.2	37.0	11.8	136.0	189.0	1	
3	997.111	H	16.2	6.1	22.3	37.0	14.7	211.0	298.3	1	
4	120.604	V	35.9	-11.2	24.7	30.0	5.3	103.0	115.2	2	
5	121.370	V	36.8	-11.1	25.7	30.0	4.3	106.0	72.2	2	
6	122.345	V	36.8	-11.0	25.8	30.0	4.2	112.0	66.9	2	
7	123.312	V	36.0	-11.1	24.9	30.0	5.1	102.0	123.5	2	
8	154.567	V	34.5	-12.2	22.3	30.0	7.7	251.0	269.4	2	
9	985.577	V	15.5	7.1	22.6	37.0	14.4	393.0	349.1	2	

Note) Receiving antenna polarization : Horizontal and/or Vertical
Test Distance : 10 m, Antenna Height : 1 m to 4 m
Level QP (Quasi-Peak) = Reading QP + Factor (Antenna Factor + Cable Loss - Amp. Gain)
Margin QP (Quasi-Peak) = Limit – Level QP

6. Radiated Emissions (Above 1GHz)

6.1 General information

Test date	Apr. 18, 2023	**Test engineer**	Jason	
Climate condition	**Ambient temperature**	20.3±1℃	**Relative humidity**	31±1%
	Atmospheric pressure	101.4±0.2kPa		
Test place	10m Chamber			

6.2 Test equipment

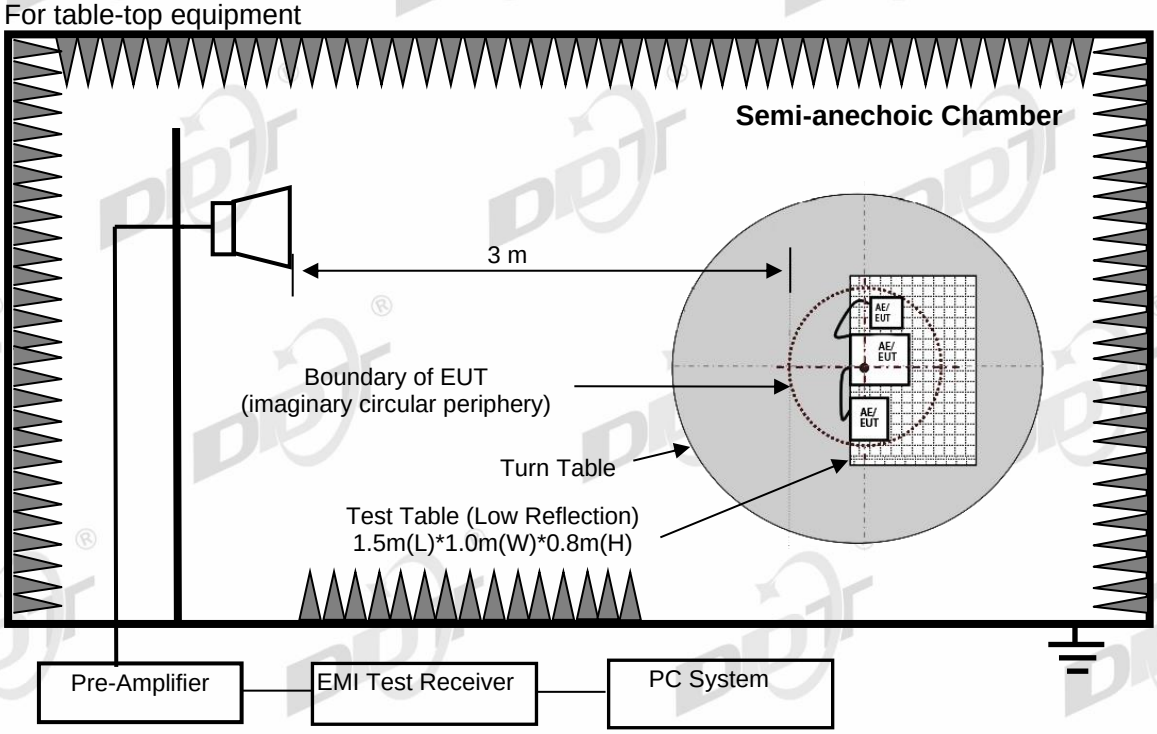
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	R&S	ESU26	100244	Feb. 16, 2023	1 Year
Double Ridged Horn Antenna	TESEQ	BHA 9118	31754	Oct. 12, 2021	2 Year
Pre-amplifier	N/A	DPA8 1000 18000-1012	09211739	Feb. 16, 2023	1 Year
Test software	TOYO	EP5/RE	V 5.7.10	N/A	N/A
Notes. N/A means Not applicable.					

6.3 Reference standard

EN 55032:2015, (Class B)
EN 55032:2015/A11:2020
EN 55032:2015/A1:2020

6.4 Block diagram of test setup

Above 1GHz
For table-top equipment



6.5 Limits

Frequency range Limits (GHz)	Limits of Class A, dB(μV/m)		Limits of Class B, dB(μV/m)	
	Peak	C/Average	Peak	C/Average
1 ~ 3	76	56	70	50
3 ~ 6	80	60	74	54
Note: The lower limit shall apply at the transition frequency				

6.6 Test procedure

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.
If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.
If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.
If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.
If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.
For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz.
Measurements within 20 dB of the limit were then maximized by adjusting turntable position.
Final measurements were made using an C/Average detector.
Results checked manually and points close to the limit line were re-measured.

Pre-scan measurements were performed in all operating mode or resolution. But final measurements were performed in worst cases based on pre-scan measurements.

The EUT with following test modes were pre-tested:

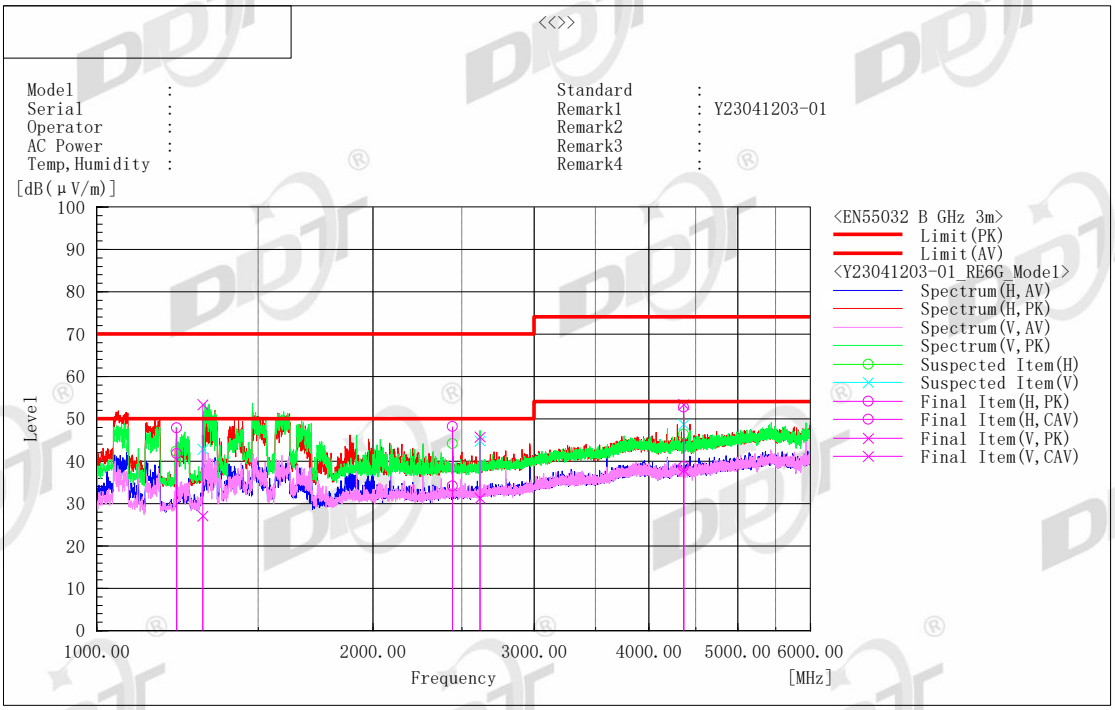
No.	Test Voltage	Operation Mode	Cable Length	Resolution	Rotation	Audio	Stand Position
1. *	230V 50Hz	Mode 1 HDMI	1.8m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
2.			1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
3.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
4.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
5.			1.5m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
6.			1.2m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
7.		HDMI	1.8m	DVD	Landscape	External Speaker	HAS Stand-up
8.		Mode 2 DP	1.8m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
9.			1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
10.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
11.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
12.			1.5m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
13.			1.2m	1920*1080@75Hz	Landscape	External Speaker	HAS Stand-up
14.		Mode 3 VGA	1.8m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
15.			1.8m	1280*720@60Hz	Landscape	External Speaker	HAS Stand-up
16.			1.8m	800*600@60Hz	Landscape	External Speaker	HAS Stand-up
17.			1.5m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
18.			1.2m	1920*1080@60Hz	Landscape	External Speaker	HAS Stand-up
19.		HDMI 1920*1080@75Hz with 1.8m power cord			Landscape	Headphone	HAS Stand-up
20.		HDMI 1920*1080@75Hz with 1.5m power cord			Landscape	External Speaker	HAS Stand-up
21.		HDMI 1920*1080@75Hz with 1.8m power cord			Portrait (-90 degree)	External Speaker	HAS Stand-up
22.		HDMI 1920*1080@75Hz with 1.8m power cord			Portrait (-270 degree)	External Speaker	HAS Stand-up
23.		HDMI 1920*1080@75Hz with 1.8m power cord			Landscape	External Speaker	HAS Stand-down
24.		HDMI 1920*1080@75Hz with 1.8m power cord			Landscape	Internal Speaker	HAS Stand-up
25.	110V 60Hz	HDMI 1920*1080@75Hz			Landscape	External Speaker	HAS Stand-up
26.	230V 50Hz	HDMI 1920*1080@60Hz with 1.8m power cord			Landscape	Headphone	HAS Stand-up
27.		HDMI 1920*1080@60Hz with 1.8m power cord			Landscape	Without Headphone	HAS Stand-up
* Means the worst test mode.							

6.7 Test result

PASS. (See below detailed test result)

Note: All emissions not reported below are too low against the prescribed limits.

Operating Mode 1: HDMI IN



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	1221.490	H	72.8	66.7	-24.9	47.9	41.8	70.0	50.0	22.1	8.2	122.0	249.7
2	2443.028	H	69.9	55.8	-21.7	48.2	34.1	70.0	50.0	21.8	15.9	106.0	214.9
3	4362.544	H	69.2	55.1	-16.4	52.8	38.7	74.0	54.0	21.2	15.3	110.0	129.1
4	1305.009	V	78.1	51.8	-24.7	53.4	27.1	70.0	50.0	16.6	22.9	169.0	152.3
5	2617.519	V	67.1	52.7	-21.4	45.7	31.3	70.0	50.0	24.3	18.7	132.0	218.4
6	4362.482	V	69.8	54.3	-16.4	53.4	37.9	74.0	54.0	20.6	16.1	105.0	164.5

Note1) (P) : Abbreviation of Antenna Polarity
Note2) Reading PK / C/AV : Received raw Peak / C/Average signal
Note3) Factor = Antenna factor + Cable loss – Amplifier gain
Note4) Level PK / C/AV = Reading PK / C/AV + Factor, Real signal Peak / C/Average level
Note5) Margin PK / C/AV = Limit – Level PK / C/AV
PK : Abbreviation of Peak
C/AV : Abbreviation of CISPR Average

7. Harmonics current

7.1 General information

Test date	Apr. 17, 2023	**Test engineer**	Freya	
Climate condition	**Ambient temperature**	23.9±1℃	**Relative humidity**	21±1%
	Atmospheric pressure	100.4±0.2 kPa		
Test place	Shield Room 2#			

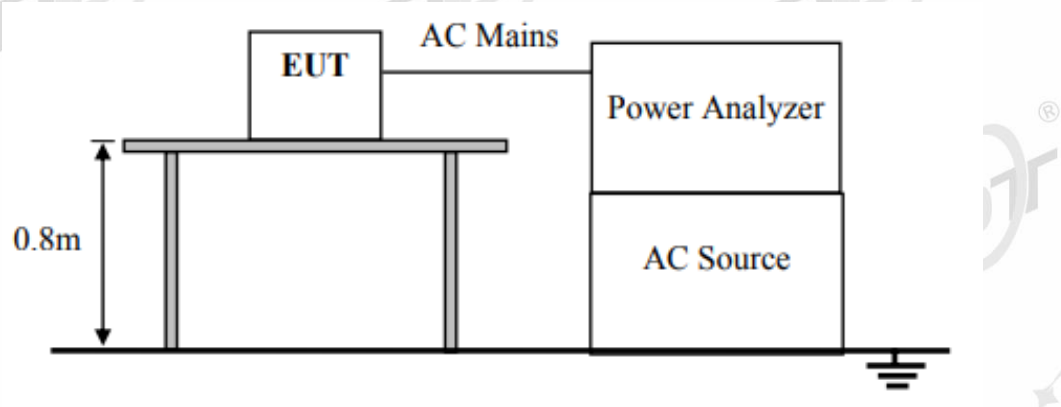
7.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Power Analyzer	N4L	PPA5511	162-04584	Nov. 17, 2022	1 year
Reference Impedance Network	Voltech	IEC61000-3	IG164/2021	Nov. 17, 2022	1 year
AC Power Source	Pacific	360-AMX	1235	Feb. 15, 2023	1 year
Notes. N/A means Not applicable.					

7.3 Reference standard

EN 61000-3-2:2014 (Class D)
EN IEC 61000-3-2:2019/A1:2021

7.4 Block diagram of test setup



7.5 Limits

Limits for Class A equipment

Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3 5 7 9 11 13 15 ≤ n ≤ 39 (odd harmonics only)	2.30 1.14 0.77 0.40 0.33 0.21 0.15 15/n
Even harmonics	
2 4 6 8 ≤ n ≤ 40	1.08 0.43 0.30 0.23 8/n

Limits for Class D equipment

Harmonic order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3 5 7 9 11 13 ≤ n ≤ 39 (odd harmonics only)	3.4 1.9 1.0 0.5 0.35 3.85/n	2.30 1.14 0.77 0.40 0.33 See Table 1

7.6 Test result

N/A. Rated Power < 75W (See below detailed test result)

Operating Mode 1: HDMI IN

17th April 2023 - 15:19:46	Page	IEC Soft V2.4e

IEC61000-3-2:2014
Fluctuating Harmonics

Instrument Details	
Instrument Model	PPA5511
Instrument Serial	162-04584
Instrument Firmware	2.17
Instrument Version	Low Current
Test Settings	
Class	Class D
Mode	Measure
Equipment Under Test	
Brand	N/A
Model	Y23041203-01
Serial	N/A
Impedance Network ID	N/A

Test Conditions	User Entered	Measured
Rated Voltage	230.000 V	231.198 V
Rated Current	N/A	175.968 mA
Rated Frequency	50.000 Hz	50.000 Hz
Rated Power	N/A	17.786 W

Additional Test Information	
Measured Power Factor	0.4372
Max Current THD	180.90%
Max THC	0.1539A
Max Power	17.806 W
Max F.Current	85.669 mA
Average F.Current	85.386 mA
Minimum Current	100mA
Test Duration	2.5 minutes
Additional Test Details	
Operator	N/A
Lab Name	N/A
Location	N/A
Notes	
Signature	

Results	Test - N/A. Rated Power < 75W

8. Voltage fluctuation & Flicker

8.1 General information

Test date	Apr. 17, 2023	Test engineer	Freya	
Climate condition	Ambient temperature	23.9±1℃	Relative humidity	21±1%
	Atmospheric pressure	100.4±0.2 kPa		
Test place	Shield Room 2#			

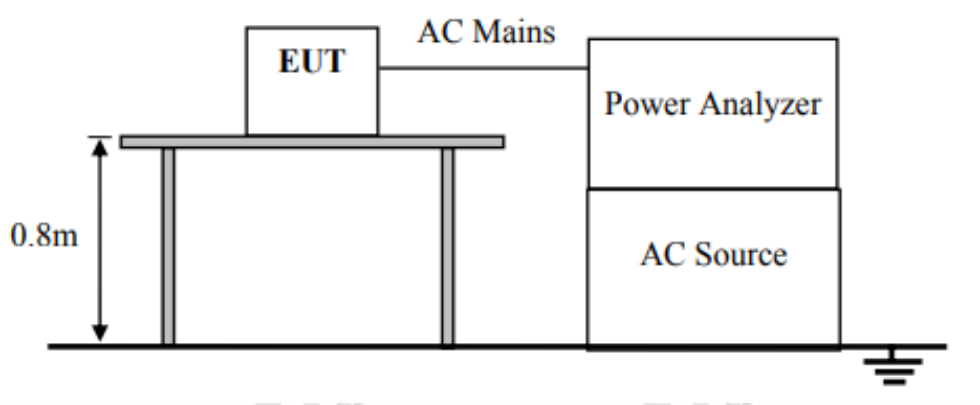
8.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Power Analyzer	N4L	PPA5511	162-04584	Nov. 17, 2022	1 year
Reference Impedance Network	Voltech	IEC61000-3	IG164/2021	Nov. 17, 2022	1 year
AC Power Source	Pacific	360-AMX	1235	Feb. 15, 2023	1 year
Notes. N/A means Not applicable.					

8.3 Reference standard

EN 61000-3-3:2013,
EN 61000-3-3:2013/A1:2019,
EN 61000-3-3:2013/A2:2021

8.4 Block diagram of test setup



8.5 Limits

short-term flicker indicator, Pst	the relative steady-state voltage change, dc	the value of d(t) during a voltage change, d(t) >3.3 %	the maximum relative voltage change, dmax
1.0	3.3 %	500 ms	4 %

8.6 Test result

PASS. (See below detailed test result)

Operating Mode 1: HDMI IN

17th April 2023 - 15:33:03	Page 1/3	IEC Soft V2.4e

IEC61000-3-3:2013 Ed.3.0
Flickermeter

Instrument Details	
Instrument Model	PPA5511
Instrument Serial	162-04584
Instrument Firmware	2.17
Instrument Version	Low Current
Test Settings	
Class	Voltage
Mode	Normal - 4%
Minimum Current	300mA
PST	10.00 minutes
PLT	1 PSTs
Equipment Under Test	
Brand	N/A
Model	Y23041203-01
Serial	N/A
Impedance Network ID	N/A

Test Conditions	User Entered	Measured
Rated Voltage	230.000 V	231.179 V
Rated Current	N/A	N/A
Rated Frequency	50.000 Hz	50.000 Hz
Rated Power	N/A	N/A
D max	0.0632% (Limit: 4%)	
T max	0.0000 s (Limit: 0.5 s)	
DC max	0.0061% (Limit: 3.3%)	
Additional Test Details		
Operator	N/A	
Lab Name	N/A	
Location	N/A	
Notes		
Signature		
Results	Phase1: PASS	

9. Electrostatic Discharge

9.1 General information

Test date	Apr. 18, 2023	**Test engineer**	Oliver	
Climate condition	**Ambient temperature**	22.8±1℃	**Relative humidity**	38±1%
	Atmospheric pressure	101.1±0.2kPa		
Test place	Shield Room 3#			

9.2 Test equipment

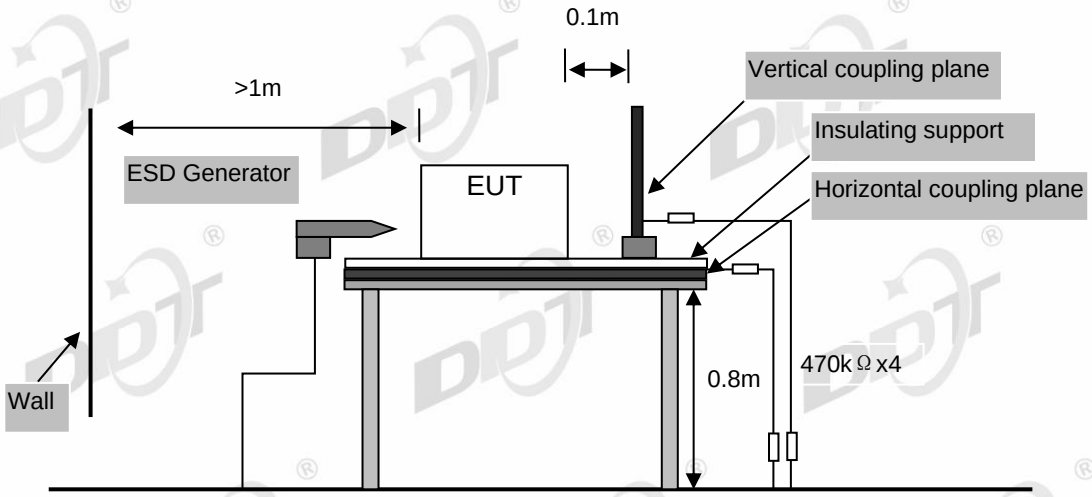
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ESD Generator	TESEQ	NSG 438	1040	Oct. 14, 2022	1 Year

9.3 Test and reference standards

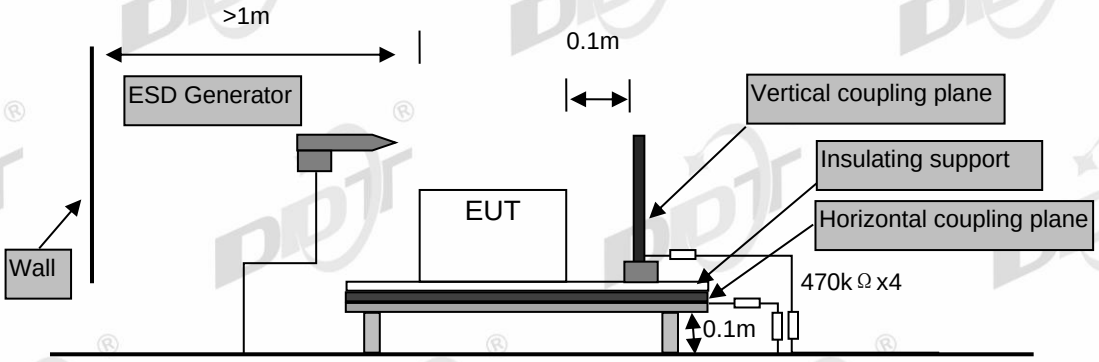
EN 55035:2017, EN 55035:2017/A11:2020, IEC 61000-4-2:2008

9.4 Block diagram of test setup

Table-top equipment



Floor-standing equipment



9.5 Test levels and performance criterion

Test Level		Performance Criteria
Air Discharge	±2kV, ±4kV and ±8kV	B
Contact Discharge	±4kV	

Performance criteria B description: During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended.

9.6 Test procedure

Air Discharge:
The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 20 times for each pre-selected test point. This procedure was repeated until all the air discharge completed.

Contact Discharge:
All the procedure was same as air discharge. Except that the generator was re-triggered for a new single discharge. The tip of the discharge electrode was touching the EUT before the discharge switch was operated.

Indirect discharge for horizontal coupling plane:
At least 20 single discharges were applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

Indirect discharge for vertical coupling plane:
At least 20 single discharges were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

9.7 Test result

Test Times: 20 times at each point for contact discharge; 20 times at each point for air discharge.

Operation Mode	Type of discharge	Test Level	Test Point	Performance		Result
				Required	Observation	(Pass/Fail)
Mode 2	Contact to EUT	±4kV	6,7,8	B	B	Pass
	Contact to Coupling Planes	±4kV	Coupling Planes	B	B	Pass
	Air	±2kV, ±4kV, and ±8kV	1,2,3,4,5, 9,10	B	B	Pass

Test Point:

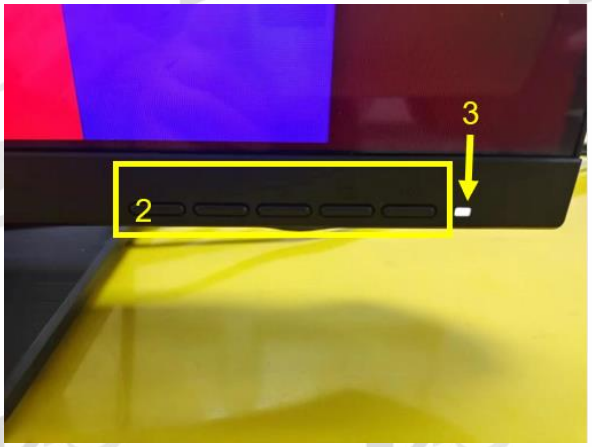
No.	Description	No.	Description	No.	Description
1	Panel	6	HDMI Port	11	/
2	Button	7	VGA Port	12	/
3	Status light	8	Shielded cover	13	/
4	Audio out Port	9	Audio in Port	14	/
5	DP Port	10	Gap	15	/

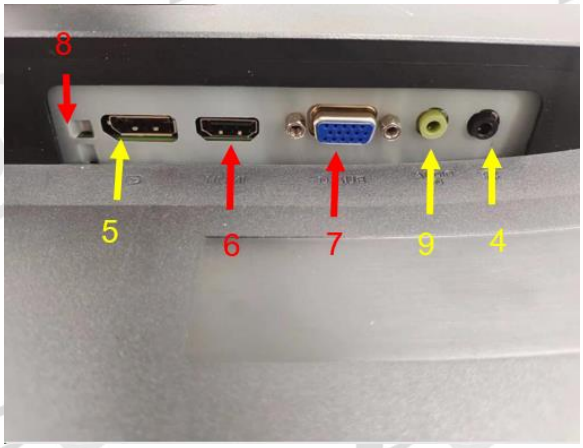
Observation Description:

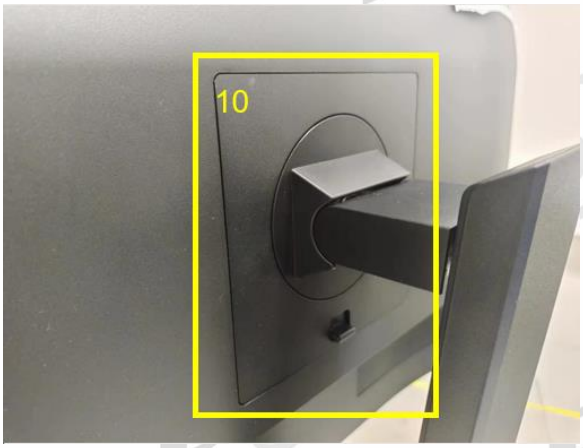
B: Temporary image flicker, when disturbance ceases, and recovers its normal performance, without operator intervention. (Contact discharge of point 8 and Coupling Planes were Criterion B, air discharge ±8kV of point 1 was Criterion B.)

Photo of ESD point on EUT

Contact Air







10. Continuous Radio Frequency Disturbances

10.1 General information

Test date	Apr. 17, 2023	**Test engineer**	Joye	
Climate condition	**Ambient temperature**	22.3±1℃	**Relative humidity**	37±1%
	Atmospheric pressure	101.5±0.2kPa		
Test place	3m Chamber 1#			

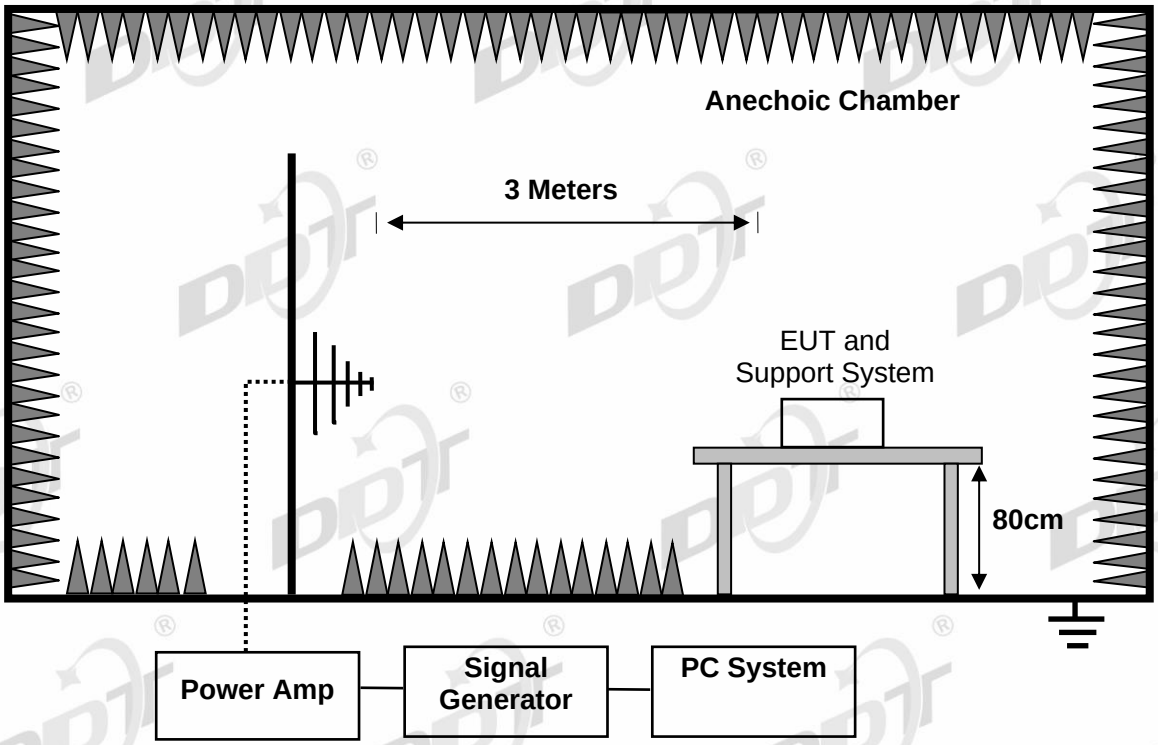
10.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal Generator	R&S	SMB100A	104909	Feb. 15, 2023	1 Year
RF Switch for Radiated	SKET	RS_DC06G-AMC-3C	SK20200819 01	N/A	N/A
Power Amplifier	SKET	HAP_01G032G-250W	202104178	Aug. 03, 2022	1 Year
Power Amplifier	SKET	HAP_03G06G-75W	SK20210622 1	Aug. 23, 2022	1 Year
Power Amplifier(Combiner)	SKET	HAP_80M200M/200M 1G-2000/1000W	202102154	Aug. 03, 2022	1 Year
Power meter	R&S	NRP	102424	Feb. 15, 2023	1 Year
Power sensor	R&S	NRP-Z91	100937	Feb. 15, 2023	1 Year
Power sensor	R&S	NRP-Z91	100938	Feb. 15, 2023	1 Year
Log-periodic antenna	Schwarzbeck	STLP 9149	9149-059	N/A	N/A
Log-periodic antenna	Schwarzbeck	STLP 9128 E special	9128ES-171	N/A	N/A
Audio Analyzer	R&S	UPV	101525	Feb. 15, 2023	1 Year

10.3 Test and reference standards

EN 55035:2017, EN 55035:2017/A11:2020, IEC 61000-4-3:2020

10.4 Block diagram of test setup



10.5 Test levels and performance criterion

Swept frequency test		Performance Criteria
Frequency (MHz)	80 to 1000	A
Field Strength	3V/m rms voltage level of the unmodulated signal	
Modulation	AM modulated to a depth of 80% by a sine wave of ☒1kHz,☐400Hz (note 1)	
Step Size	1% increments	
Dwell time	＜5 Sec.	

Spot frequency test		Performance Criteria
Frequency (MHz)	1800, 2600, 3500, 5000	A
Field Strength	3V/m rms voltage level of the unmodulated signal	
Modulation	AM modulated to a depth of 80% by a sine wave of ☒1kHz, ☐400Hz (note 1)	
Dwell time	＜5 Sec.	

Note 1: The 1kHz modulation may be replaced by a different audio modulation frequency more appropriate for a given EUT if, for example, 1kHz is not within the operating audio range of the EUT.

Performance criteria A description for devices with the audio output function: The measured acoustic interference ratio and/or the measured electrical interference ratio during the test shall be -20 dB or better.
For equipment with audio output function:
☒The acoustic measurement method was selected according to clause G6.4.1 of EN 55035.
☒The electrical measurement method was selected according to clause G6.4.2 of EN 55035.

Performance criteria A for devices with the telephony function.

Frequency range MHz	Acoustic or electrical interference ratio	Equivalent direct measurement		
		dB(SPL)	Digital dBm0	Analogue dBm0
80 to 1000	-0 dB	75	-30	-30

Note: At the step in the frequency range, the lower limit shall be applied.
The interference ratio (electrical or acoustic) shall meet the limits in column 2; or,
The acoustic level of the demodulated audio shall be less than the limits in column 3; or
The digitally coded level of demodulated audio shall be less than limits in column 4; or,
The analogue level of the demodulated audio shall be less than the limits in column 5.

Performance criteria A description for other devices: During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended.

10.6 Test procedure

The field sensor is placed on the EUT table (0.8 meter above the ground) which is 3 meters away from the transmitting antenna. Through the signal generator, power amplifier and transmitting antenna to produce a uniformity field strength (3V/m measured by field sensor) around the EUT table from frequency range specified and records the signal generator‘s output level at the same time for whole measured frequency range. Then, put EUT and its simulators on the EUT turn table and keep them 3 meters away from the transmitting antenna which is mounted on an antenna tower and fixes at 1.4 meter height above the ground. Using the recorded signal generator’s output level to measure the EUT from frequency range specified and both horizontal & vertical polarization of antenna must be set and measured. Each of the four sides of EUT must be faced this transmitting antenna and measures individually.

10.7 Test result

Field Strength : ☒3V/m ☐10V/m Steps: ☒1% ☐other: Dwell time: ☒1s ☐other:						
Swept Frequency Range: ☒80MHz---1GHz; ☒1800MHz, 2600MHz, 3500MHz, 5000MHz; ☐ other:						
Modulation : ☐None ☒AM ☒1kHz ☐400Hz Modulation depth: ☒80% ☐other:						
Operation Mode	EUT Position towards antenna	Antenna: Horizontal		Antenna: Vertical		Result
		Required	Observation	Required	Observation	(Pass/Fail)
Mode 1	Front	A	A	A	A	Pass
	Right	A	A	A	A	Pass
	Rear	A	A	A	A	Pass
	Left	A	A	A	A	Pass
Mode1: Speaker: acoustic interference ratio= -39.31 dB ≤-20dB. Mode1: Audio output: electrical interference ratio= -38.24 dB ≤-20dB. Note 1: this row only for the device with audio output function. Note 2: this device without the telephony function.						
Observation Description: A: Operation as intend, no loss of function during test and after test.						

11. Electrical Fast Transients (EFT)

11.1 General information

Test date	Apr. 18, 2023	**Test engineer**	Oliver	
Climate condition	**Ambient temperature**	22.8±1℃	**Relative humidity**	38±1%
	Atmospheric pressure	101.1±0.2kPa		
Test place	Shield Room 3#			

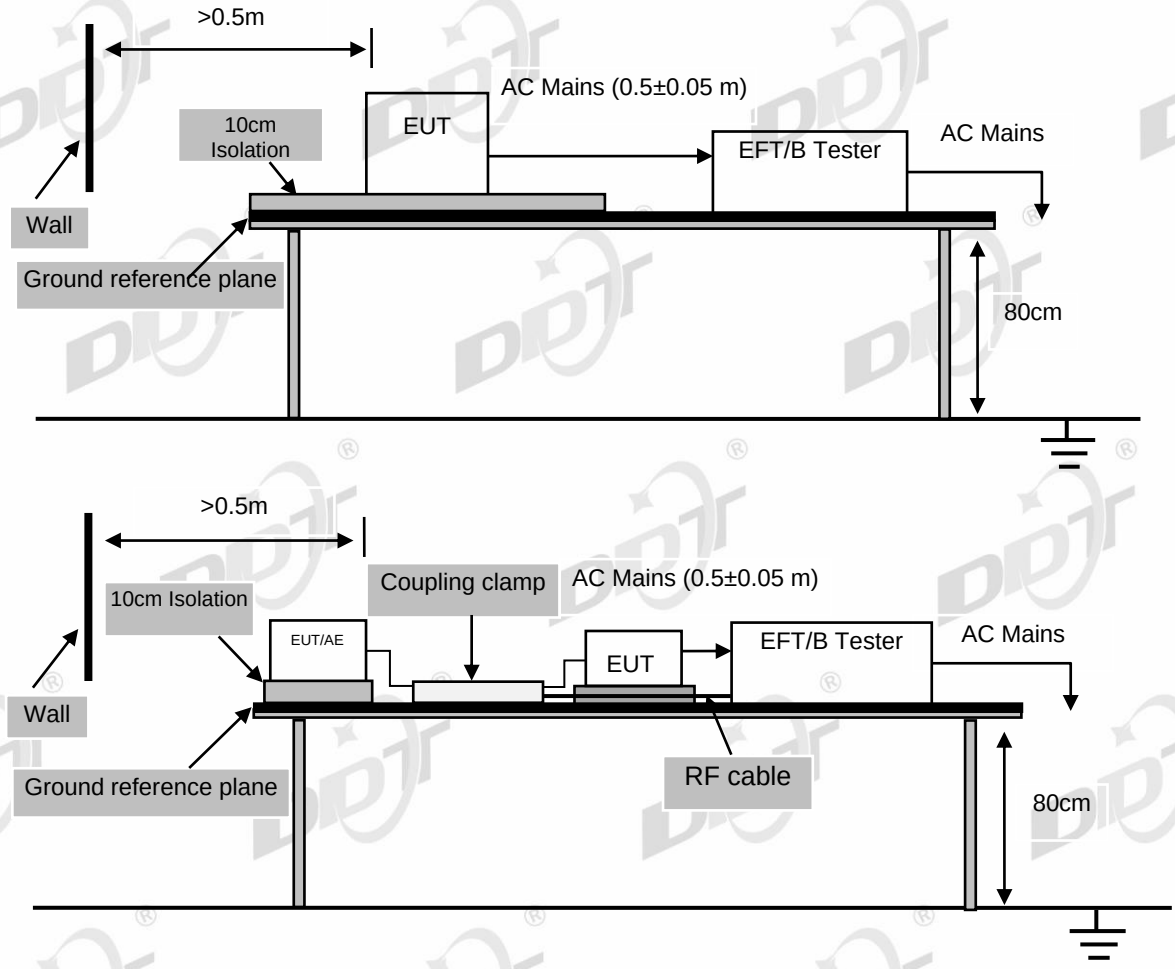
11.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EFT Generator	TESEQ	NSG3060	1338	Feb. 15, 2023	1 Year
Coupling/Decoupling Network	TESEQ	CDN3061	210	Feb. 15, 2023	1 Year

11.3 Test and reference standards

EN 55035:2017, EN 55035:2017/A11:2020, IEC 61000-4-4:2012

11.4 Block diagram of test setup



11.5 Test levels and performance criterion

Test Level			Performance Criteria
Test voltage	±1kV For AC mains Port	±0.5kV for DC input or signal Port	B
Repetition Frequency	5kHz	5kHz	
Burst Duration	15ms	15ms	
Burst Period	300ms	300ms	
Inject Time(s)	120s	120s	
Inject Method	Direct for AC mains port	Direct for signal port Direct for dc input port	
Inject Line	AC Mains of adapter	DC input of adapter or Capacitive coupling clamp	

Note: This test shall be additionally performed on analogue/digital data ports, and DC network power ports, of radio equipment and associated ancillary equipment, if the cables may be longer than 3 m.
Performance criteria B description: During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended.

11.6 Test Procedure

The EUT and its simulators were placed on the ground reference plane and were insulated from it by a wood support 0.1m ± 0.01m thick. The ground reference plane was 1m*1m metallic sheet with 0.65mm minimum thickness. This reference ground plane was project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5m. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.
For DC input and AC power ports:
The EUT was connected to the power mains by using a coupling device that couples the EFT interference signal to AC power lines. Both positive transients and negative transients of test voltage were applied during compliance test and the duration of the test can’t less than 2mins.
For signal ports:
The capacitive coupling clamp was connected to the power by using a coupling device that couples the EFT interference signal to capacitive coupling clamp. Both positive transients and negative transients of test voltage were applied during compliance test and the duration of the test can’t less than 2mins.

11.7 Test result

Port ☒ AC Mains ☐DC Supply ☐Signal			Burst Period: ☒ 300ms ☐Other:			
Coupling: ☒Direct ☐Capacitive Clamp			Test Time: ☒ 120S ☐Other:			
Repetition Frequency: ☒ 5KHz ☐Other:			Burst Durations: ☒15ms ☐Other:			
Operation Mode	Line/port	Test Voltage	Performance			Result
			Required	Observation (+)	Observation (-)	(Pass/Fail)
Mode 1	L	±1kV	B	B	A	Pass
	N	±1kV	B	B	A	Pass
	PE	±1kV	B	B	A	Pass
	L-N	±1kV	B	B	A	Pass
	L-PE	±1kV	B	B	A	Pass
	N-PE	±1kV	B	B	A	Pass
	L-N-PE	±1kV	B	B	A	Pass

Observation Description:
A: Operation as intend, no loss of function during test and after test.
B: Temporary image flicker, when disturbance ceases, and recovers its normal performance, without operator intervention.

12. Surges

12.1 General information

Test date	Apr. 18, 2023	**Test engineer**	Oliver	
Climate condition	**Ambient temperature**	22.8±1℃	**Relative humidity**	38±1%
	Atmospheric pressure	101.1±0.2kPa		
Test place	Shield Room 3#			

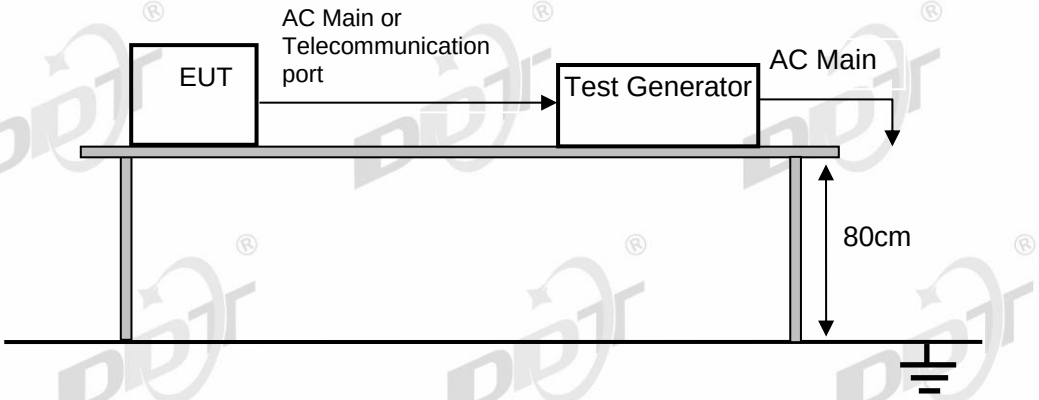
12.2 Test equipment

Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Interval**
Surge Generator	TESEQ	NSG3060	1338	Feb. 15, 2023	1 Year
Coupling/Decoupling Network	TESEQ	CDN3061	210	Feb. 15, 2023	1 Year

12.3 Test and reference standards

EN 55035:2017, EN 55035:2017/A11:2020, IEC 61000-4-5:2014/AMD1:2017

12.4 Block diagram of test setup



12.5 Test levels and performance criterion

Test level for AC mains ports		Performance Criterion
Line to Line	1kV 1.2/50(8/20) μs	B
Line to Ground	2kV 1.2/50(8/20) μs	B
Analogue/digital data port, Port type: unshielded symmetrical		Performance Criterion
Line to Ground	1 kV and 4kV 10/700(5/320) μs (used with the primary protection)	C
Line to Ground	1 kV 10/700(5/320) μs (used without the primary protection)	C
Note: Applicable only to ports which, according to the manufacturer's specification, the cable lengths greater than 3m.		
Analogue/digital data port, Port type: coaxial or shielded		Performance Criterion
Shield to ground	0.5 kV 1.2/50(8/20) μs	B
Note: Applicable only to ports which, according to the manufacturer's specification, the cable lengths greater than 3m.		
DC network power port		Performance Criterion
Line to reference ground	0.5 kV 1.2/50(8/20) μs	B
Note: Applicable only to ports which, according to the manufacturer's specification, 1. The cable lengths greater than 3m; 2. May connect directly to outdoor cables.		

Performance criteria B description: During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended.

12.6 Test Procedure

For line-to-neutral coupling mode, provide a 0.5 kV/1 kV 1.2/50 us voltage surge (at open-circuit condition) and 8/20 us current surge to EUT selected points.
For line-to-ground coupling mode, provide a 0.5 kV/1 kV/2 kV 1.2/50 us voltage surge (at open-circuit condition) and 8/20 us current surge to EUT selected points.

The number of pulses applied shall be as follows:
• Five positive pulses line-to-neutral at 90° phase
• Five negative pulses line-to-neutral at 270° phase

The following additional pulses are required only if the EUT has an earth connection or if the EUT is earthed via any AE.
• Five positive pulses line-to-earth at 90° phase
• Five negative pulses line-to-earth at 270° phase
• Five negative pulses neutral-to-earth at 90° phase
• Five positive pulses neutral-to-earth at 270° phase
Maximum 1/min repetition rate are applied during test.
Different phase angles are done individually.

For telecommunication surge test, each line of internet port to ground coupling mode, provide a 1.0kV 10/700us voltage surge (at open-circuit condition) and 5/320us current surge to EUT selected points.

At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are applied during test.

Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

12.7 Test result

Line: ☒ AC Mains ☐DC Supply ☐Telecommunication port ☐Signal port

Wave Type: ☒ 1.2/50us-8/20us ☐ 10/700 us-5/320us Internal impedance: ☒2Ω☒12Ω☐25Ω☐40Ω ☐160Ω

Pulse times: 5 times at each polarity Pulse Interval: 60S Voltage Phase: ☐ 0°, 90°, 180°, 270°☒90°, 270°

Operation Mode	Line/ Port	0.5kV			1kV			2kV			Result
		Required	Observation		Required	Observation		Required	Observation		Pass/Fail
			+	-		+	-		+	-	
Mode 1	L-N	B	A	A	B	A	A	N/A	N/A	N/A	Pass
	L-Pe	B	A	A	B	A	A	B	A	A	Pass
	N-Pe	B	A	A	B	A	A	B	A	A	Pass

Observation Description:
A: Operation as intend, no loss of function during test and after test.
Note: N/A is an abbreviation for Not Applicable.

13. Continuous Conducted Disturbances

13.1 General information

Test date	Apr. 18, 2023	**Test engineer**	Oliver	
Climate condition	**Ambient temperature**	22.8±1℃	**Relative humidity**	38±1%
	Atmospheric pressure	101.1±0.2kPa		
Test place	Shield Room 3#			

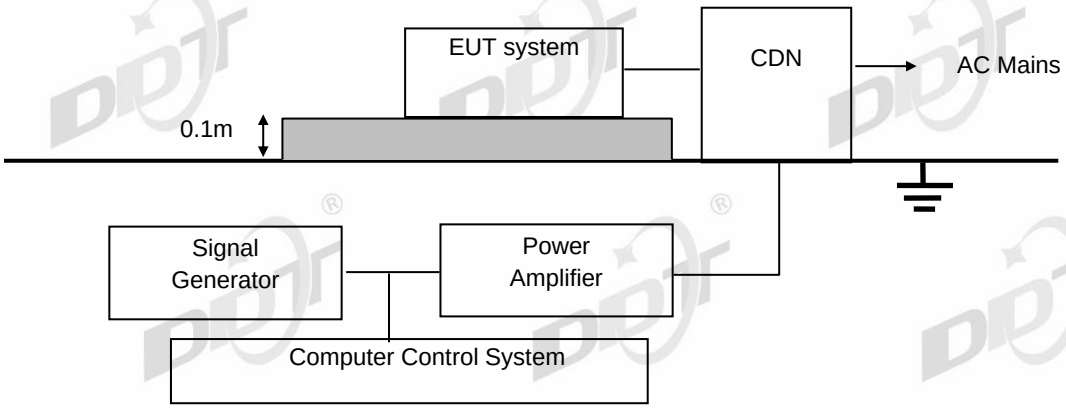
13.2 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal Generator	R&S	SMB100A	103231	Feb. 15, 2023	1 Year
CDN	TESEQ	CDN M016	28987	Feb. 15, 2023	1 Year
RF Power Amplifiers	AR	75A250A	0332892	Feb. 15, 2023	1 Year
Directional Coupler	AR	DC2600M2	0333399	Feb. 15, 2023	1 Year
Power Meter	R&S	NRVS	101785	Feb. 16, 2023	1 Year
Coaxial voltage measurement probe	R&S	URV5-Z4	100215	Feb. 16, 2023	1 Year
Audio Analyzer	R&S	UPV	101525	Feb. 15, 2023	1 Year
Test Software	R&S	EMC 32	Ver 10.28.0	N/A	N/A

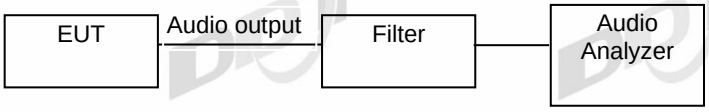
13.3 Test and reference standards

EN 55035:2017, EN 55035:2017/A11:2020, IEC 61000-4-6:2013

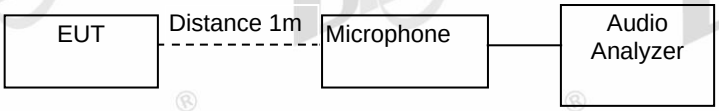
13.4 Block diagram of test setup



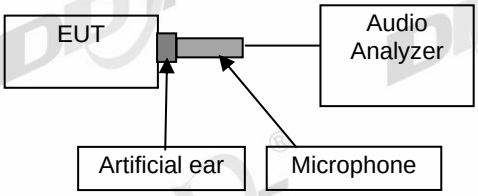
For audio output function (electrical measurement, direct connection to EUT)



For audio output function (acoustic measurement)



For audio output function (on-ear acoustic measurement)



13.5 Test levels and performance criterion

Test Level		Performance Criteria
Frequency and Field Strength	0.15MHz to 10MHz, 3V rms voltage level of the unmodulated signal	A
	10MHz to 30MHz, 3V to 1V rms voltage level of the unmodulated signal	
	30MHz to 80MHz, 1V rms voltage level of the unmodulated signal	
Modulation	AM modulated to a depth of 80% by a sine wave of ☒1kHz, ☐400Hz (note 1)	
Step Size	1% increments	
Dwell time	1 Sec.	

Note 1: The 1kHz modulation may be replaced by a different audio modulation frequency more appropriate for a given EUT if, for example, 1kHz is not within the operating audio range of the EUT.

Performance criteria A description for devices with the audio output function: The measured acoustic interference ratio and/or the measured electrical interference ratio during the test shall be -20 dB or better.
☒The acoustic measurement method was selected according to clause G6.4.1 of EN 55035.
☒The electrical measurement method was selected according to clause G6.4.2 of EN 55035.

Performance criteria A for devices with the telephony function.

Frequency range MHz	Acoustic or electrical interference ratio	Equivalent direct measurement		
		dB(SPL)	Digital dBm0	Analogue dBm0
0.15 to 30	-20 dB	55	-50	-50
30 to 80	-10 dB	65	-40	-40

Note: At the step in the frequency range, the lower limit shall be applied.
The interference ratio (electrical or acoustic) shall meet the limits in column 2; or,
The acoustic level of the demodulated audio shall be less than the limits in column 3; or
The digitally coded level of demodulated audio shall be less than limits in column 4; or,
The analogue level of the demodulated audio shall be less than the limits in column 5.
Performance criteria A description for other devices: During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended.

13.6 Test procedure

The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).

The disturbance signal described below is injected to EUT through CDN.
The EUT operates within its operational mode(s) under intended climatic conditions after power on.
The frequency range is swept from 0.150MHz to ☒80MHz/☐230MHz, the interference signal level according to clause 10.5, and with the disturbance signal 80% amplitude modulated with a ☒1kHz / ☐400Hz sine wave.
The rate of sweep shall not exceed 1.5*10-3decades/s. Where the frequency is swept incrementally; the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

13.7 Test result

Modulation Signal: ☒1kHz ☐400Hz ☒80% AM ☐Other: Steps: ☒1% ☐other: Dwell time: ☒1s ☐other:						
Operation mode	Frequency Range	Injected Position	Strength(e.m.f) (unmodulated)	Required	Observation	Result (Pass/Fail)
Mode 1	0.15MHz-10MHz	AC Port	3V	A	A	Pass
	10MHz-30MHz	AC Port	3V-1V	A	A	Pass
	30MHz-80MHz	AC Port	1V	A	A	Pass
Mode1: Speaker: acoustic interference ratio= -34.58 dB ≤-20dB. Mode1: Audio output: electrical interference ratio= -34.74 dB ≤-20dB. Note 1: this row only for the device with audio output function. Note 2: this device without the telephony function.						
Observation Description: A: Operation as intend, no loss of function during test and after test.						

14. Power-Frequency Magnetic Fields

14.1 General information

Test date	Apr. 18, 2023	**Test engineer**	Oliver	
Climate condition	**Ambient temperature**	22.8±1℃	**Relative humidity**	38±1%
	Atmospheric pressure	101.1±0.2kPa		
Test place	Shield Room 3#			

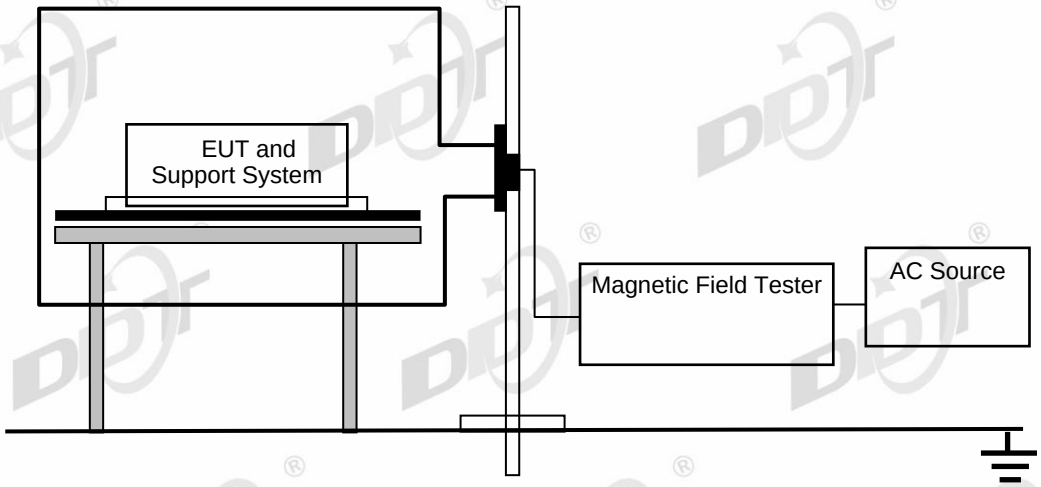
14.2 Test equipment

Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Interval**
Magnetic Field Coil	TESEQ	INA 702	199	Feb. 16, 2023	1 Year
Magnetic Field Option	TESEQ	MFO 6502	123	Feb. 16, 2023	1 Year
Multifunction Generator Systems	TESEQ	NSG 3060	1338	Feb. 15, 2023	1 Year
Coupling/Decoupling Networks	TESEQ	CDN 3061	210	Feb. 15, 2023	1 Year

14.3 Test and reference standards

EN 55035:2017, EN 55035:2017/A11:2020, IEC 61000-4-8:2009

14.4 Block diagram of test setup



14.5 Test levels and performance criterion

Level	Magnetic Field Strength (A/m)	Performance Criterion
1	1	A

Performance criteria A description: During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended.

14.6 Test procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m*1m) and shown in Section 14.4 Then induction coil shall then be rotated by 90°in order to expose the EUT to the test field with different orientations.

14.7 Test result

Operation Mode	Test Level	Testing Duration	Coil Orientation	Required	Observation	Result (Pass/Fail)
Mode 1	1A/m	5min/coil	X	A	A	Pass
		5min/coil	Y	A	A	Pass
		5min/coil	Z	A	A	Pass
Observation Description: A: Operation as intend, no loss of function during test and after test.						

15. Voltage Dips and Interruptions

15.1 General information

Test date	Apr. 18, 2023	**Test engineer**	Oliver	
Climate condition	**Ambient temperature**	22.8±1℃	**Relative humidity**	38±1%
	Atmospheric pressure	101.1±0.2kPa		
Test place	Shield Room 3#			

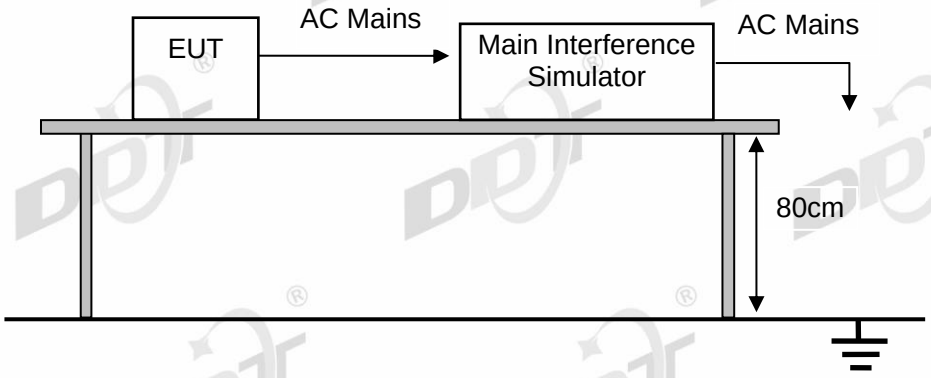
15.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Motorized single phase variac	TESEQ	VAR 3005-D16	094	Feb. 15, 2023	1 Year
Multifunction Generator Systems	TESEQ	NSG 3060	1338	Feb. 15, 2023	1 Year
Coupling/Decoupling Networks	TESEQ	CDN 3061	210	Feb. 15, 2023	1 Year

15.3 Test and reference standards

EN 55035:2017, EN 55035:2017/A11:2020, IEC 61000-4-11:2020

15.4 Block diagram of test setup



15.5 Test levels and performance criterion

Test Level %UT	Duration (in period)	Performance Criterion
＜5	0.5	B
70	25 for 50Hz/30 for 60Hz	C
＜5	250 for 50Hz/300 for 60Hz	C

Performance criteria B description: During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended.

Performance criteria C description: During and after testing, a temporary loss of function is allowed, provided the function is self recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

15.6 Test procedure

The EUT and test generator were setup as shown. The interruptions are introduced at selected phase angles with specified duration. Record any degradation of performance.

15.7 Test result

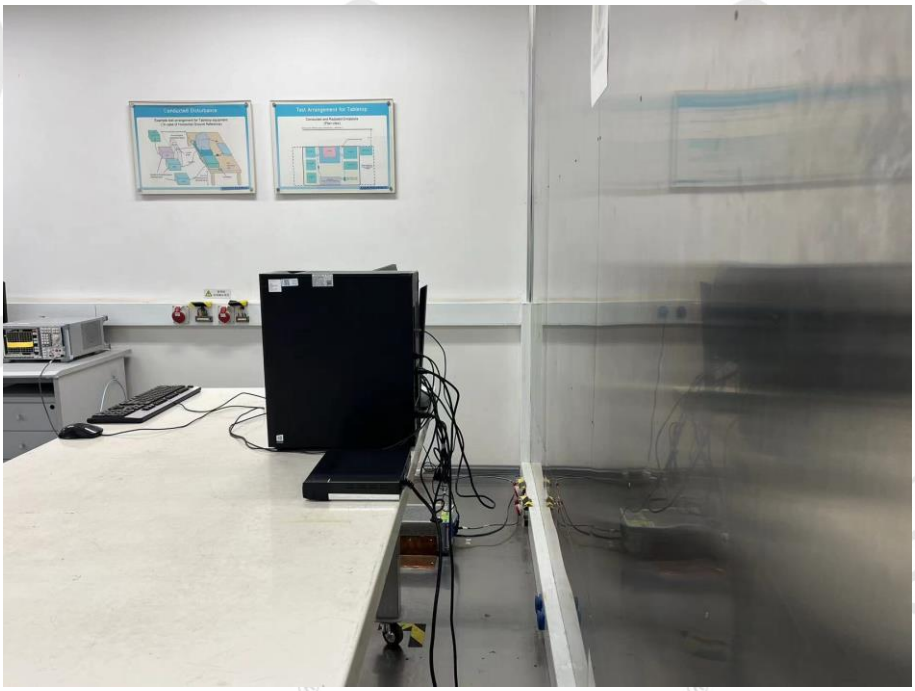
Power Supply: AC 100V/60Hz						
Memo:						
Operation Mode	Voltage Dips & Short Interruptions %Ur	Duration (in period)	Phase Angle	Required	Observation	Result (Pass/Fail)
Mode 1	0	0.5P	0°,180°	B	A	Pass
	70	30P	0°,180°	C	A	Pass
	0	300P	0°,180°	C	B	Pass
Observation Description: A: Operation as intend, no loss of function during test and after test. B: Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention						

Power Supply: AC 240V/50Hz						
Memo:						
Operation Mode	Voltage Dips & Short Interruptions %Ur	Duration (in period)	Phase Angle	Required	Observation	Result (Pass/Fail)
Mode 1	0	0.5P	0°,180°	B	A	Pass
	70	25P	0°,180°	C	A	Pass
	0	250P	0°,180°	C	B	Pass
Observation Description: A: Operation as intend, no loss of function during test and after test. B: Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention						

Annex A Test Setup Photos

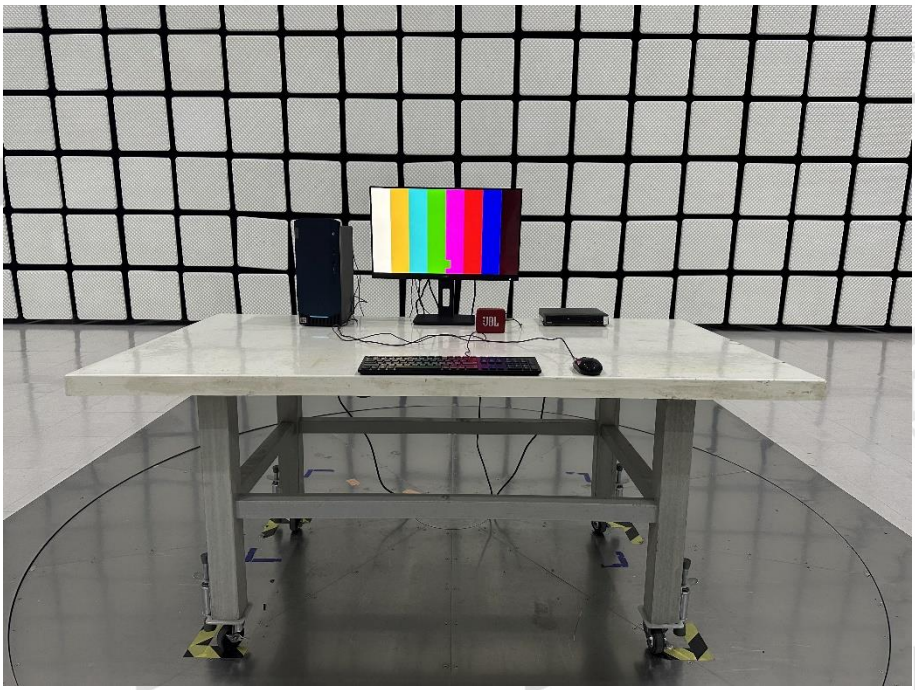
A.1 Conducted emission (mains power port)

[Front]

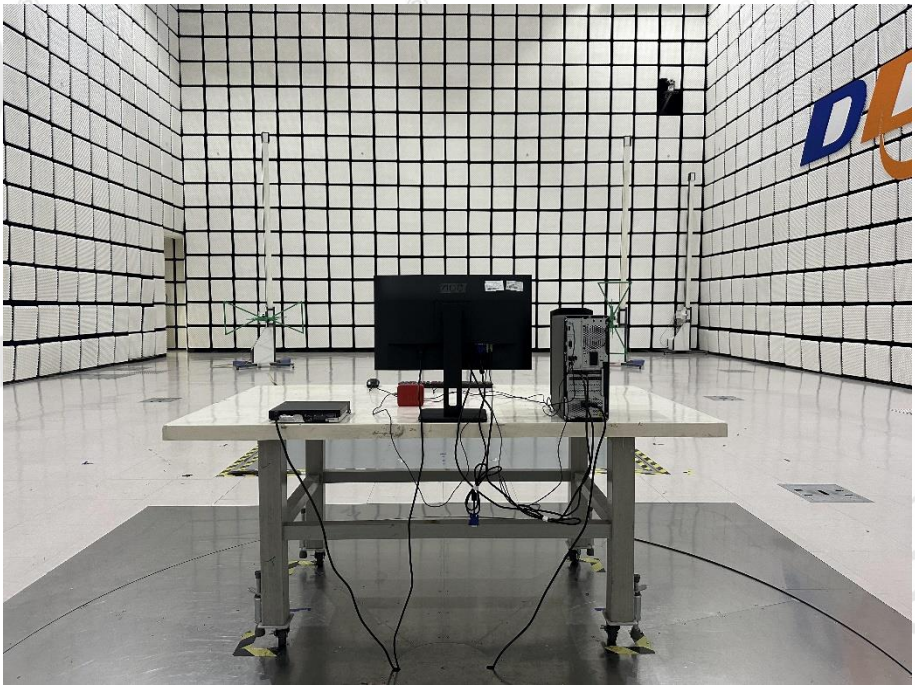


[Rear]

A.2 Radiated emission (Below 1 GHz)

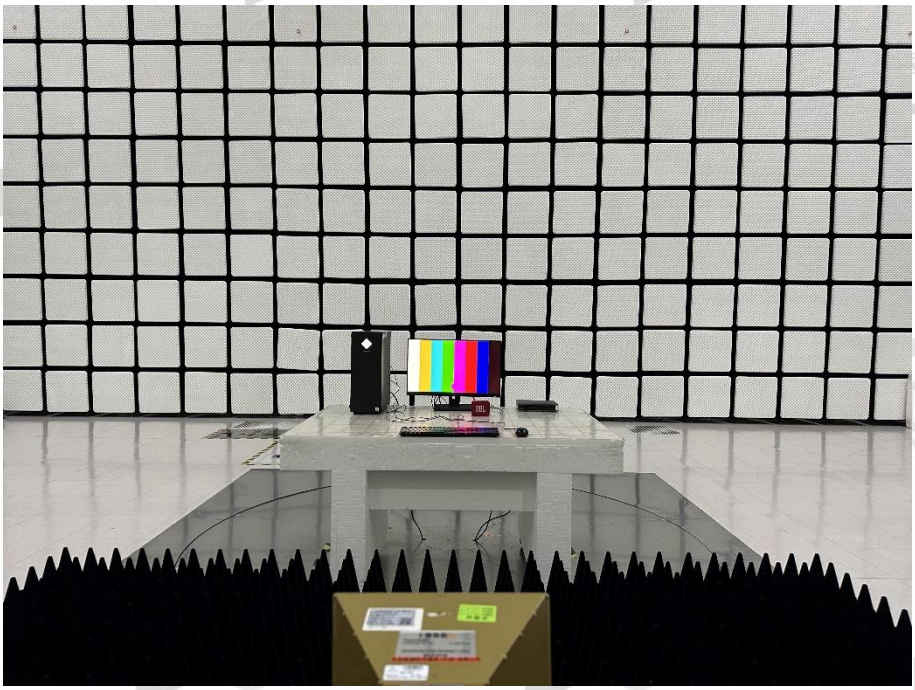


[Front]

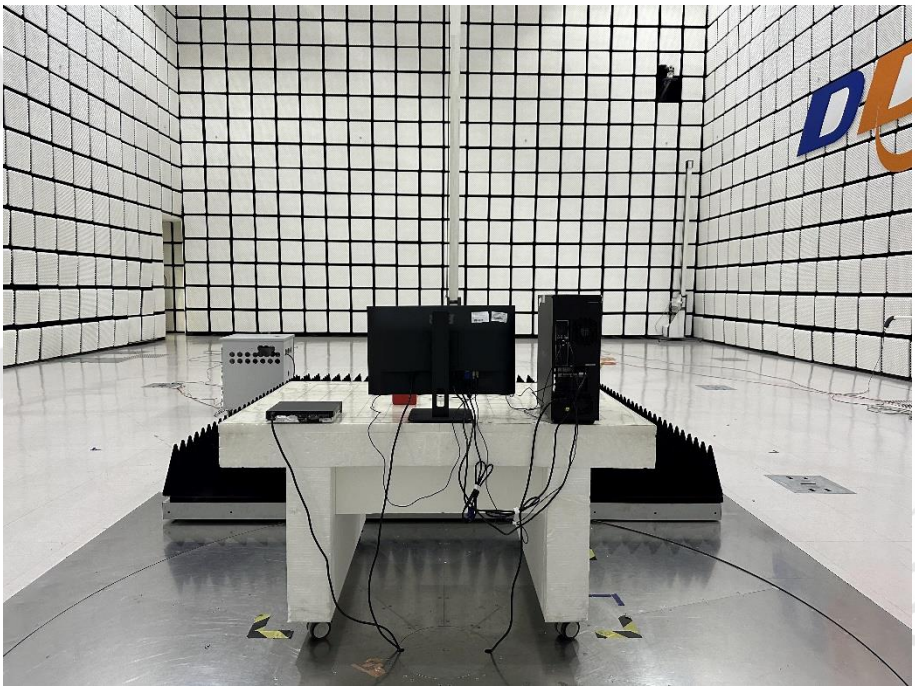


[Rear]

A.3 Radiated emission (Above 1 GHz)



[Front]

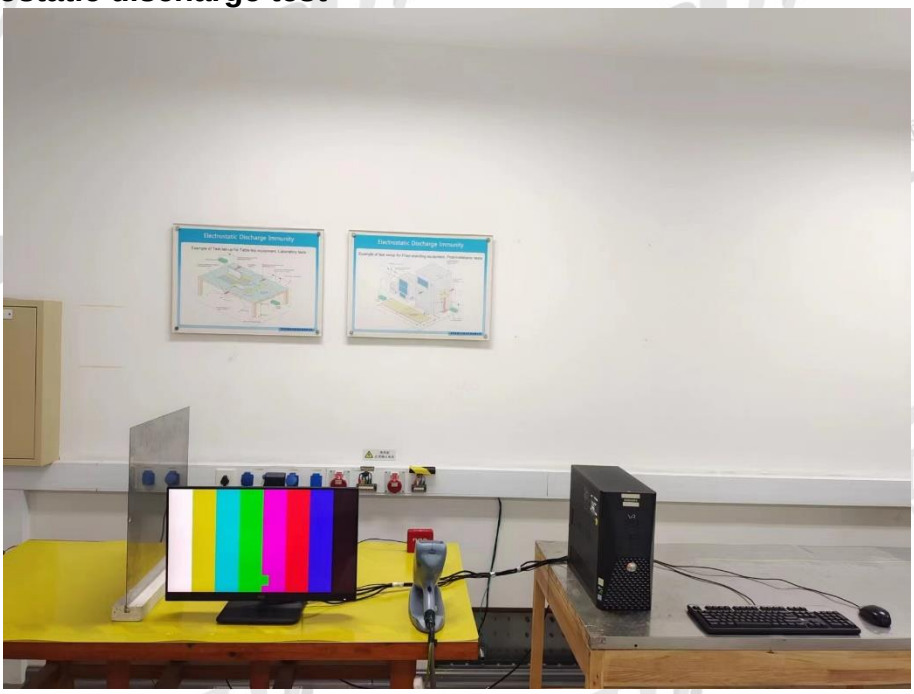


[Rear]

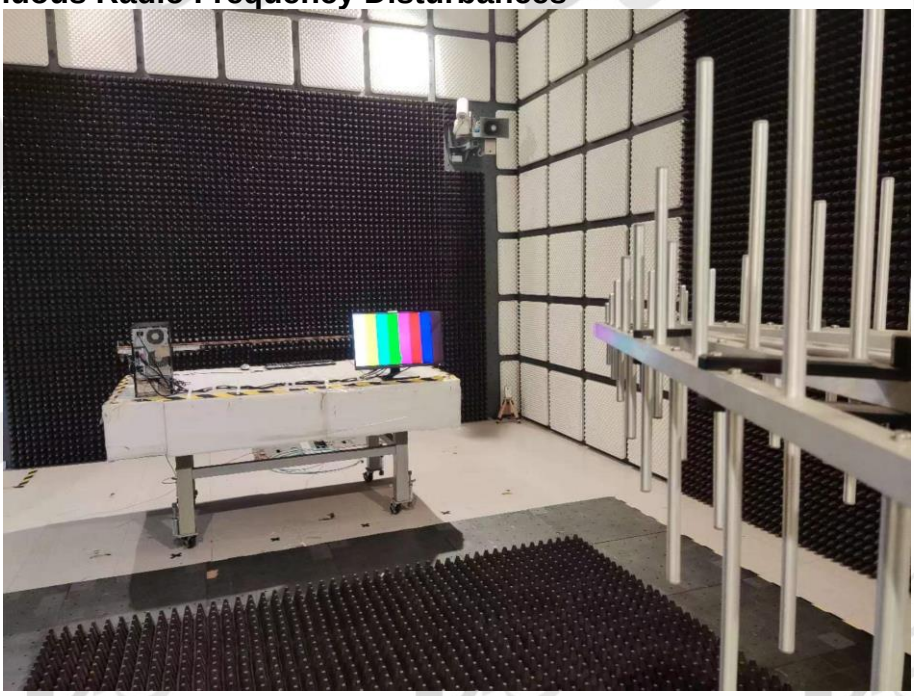
A.4 Harmonic current

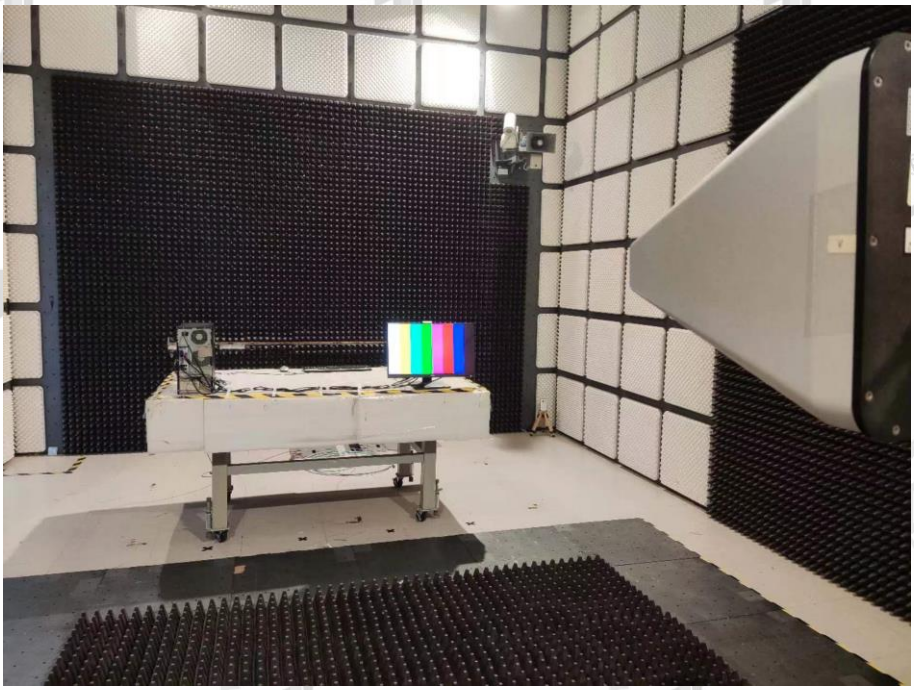
A.5 Voltage fluctuation & Flicker

A.6 Electrostatic discharge test

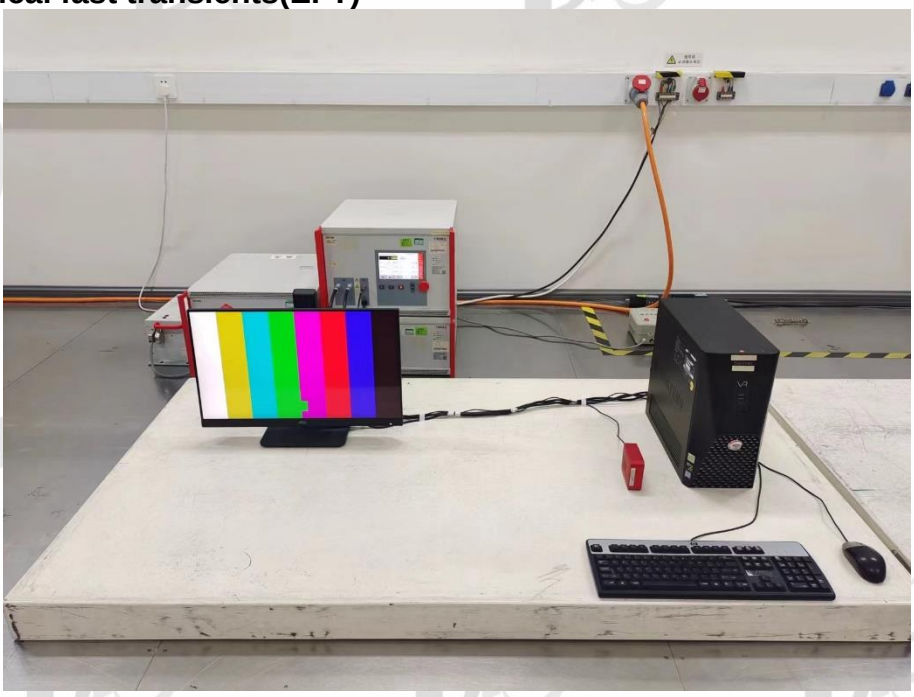


A.7 Continuous Radio Frequency Disturbances

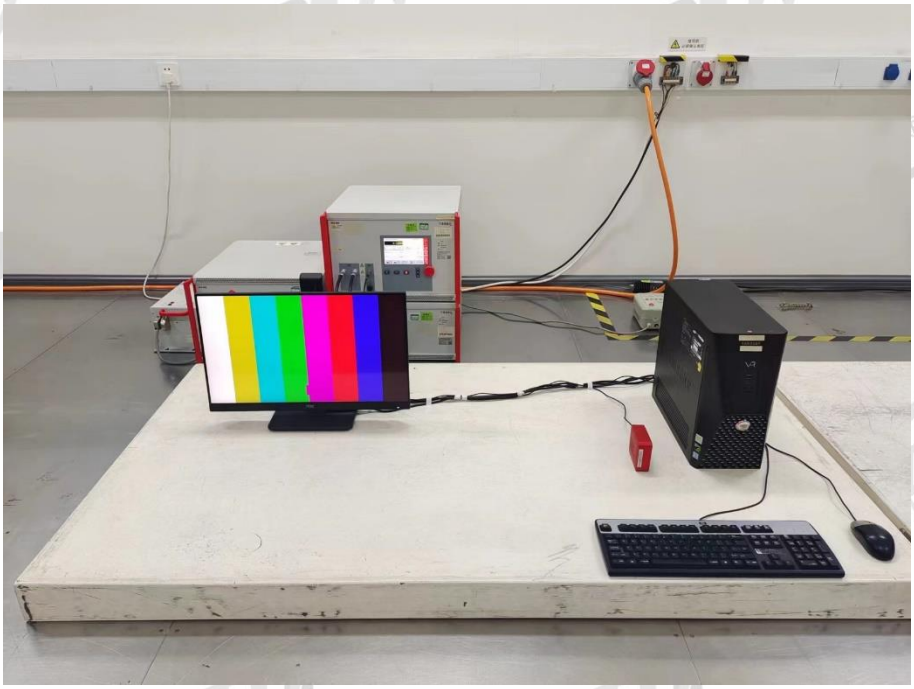




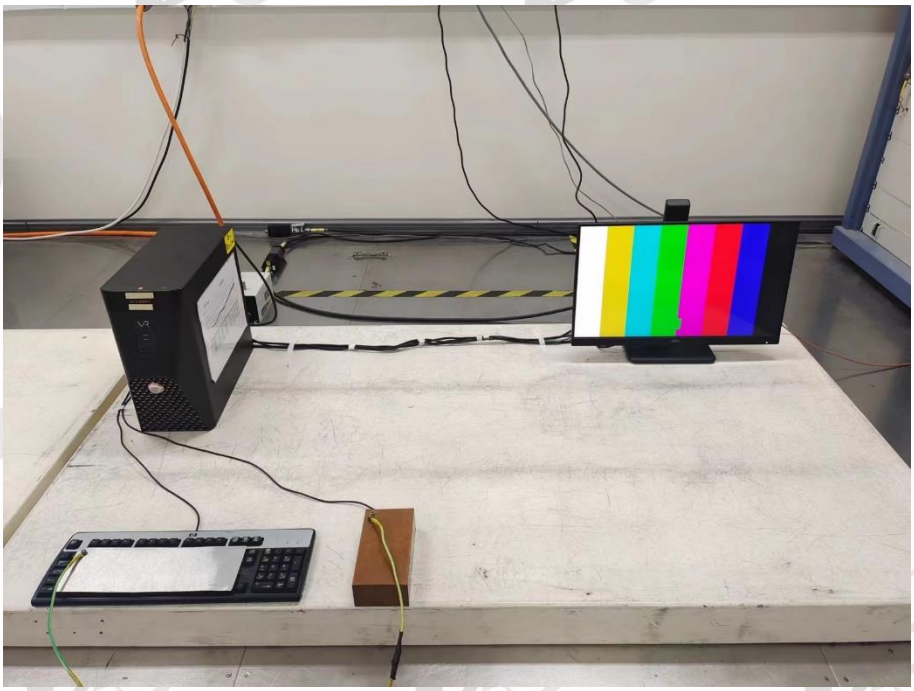
A.8 Electrical fast transients(EFT)



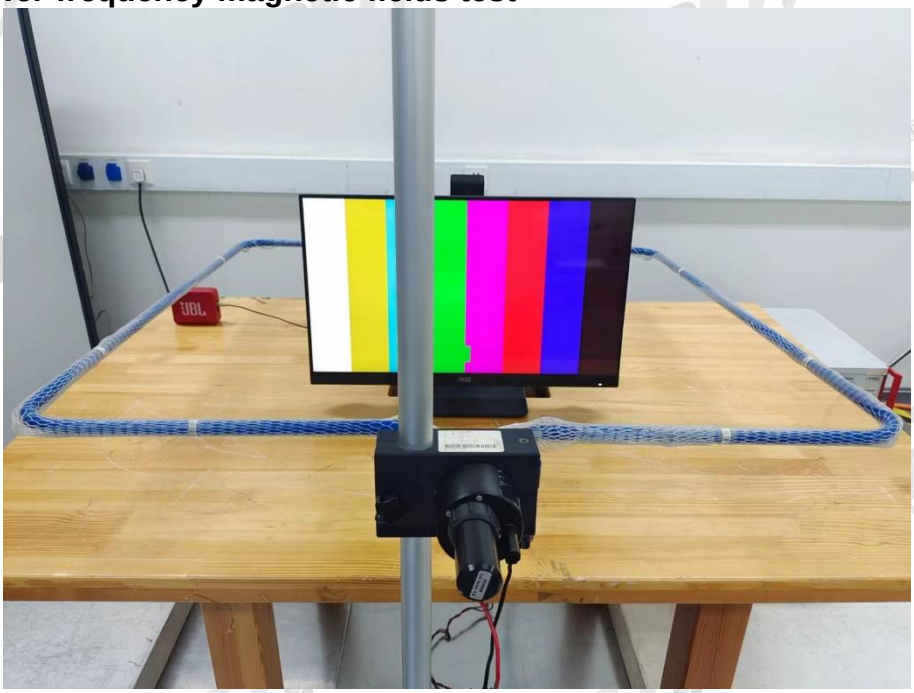
A.9 Surge



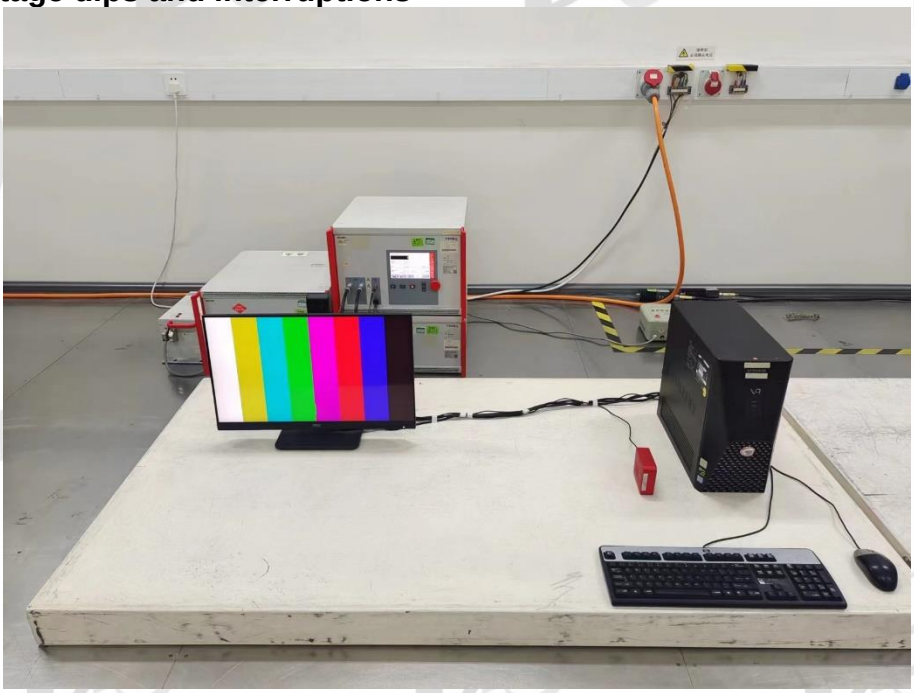
A.10 Continuous conducted disturbances



A.11 Power-frequency magnetic fields test



A.12 Voltage dips and interruptions



END OF REPORT