



CE EMC TEST REPORT

Report No.: DDT-B22030702-1E01

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.	:	**344***** ("*" = 0-9, A-Z, a-z, +, -, /, \ or blank)
Trade Mark	:	N/A

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

Address: Building D-1, No. 19, Wensi Road, Microelectronics Industrial Park, Development Area, Tianjin, China

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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	32
8.1	General information	32
8.2	Test equipment	32
8.3	Reference standard	32
8.4	Block diagram of test setup	33

8.5	Limits	33
8.6	Test result	33
9.	Electrostatic Discharge	35
9.1	General information	35
9.2	Test equipment	35
9.3	Test and reference standards	35
9.4	Block diagram of test setup	35
9.5	Test levels and performance criterion	36
9.6	Test procedure	36
9.7	Test result	37
10.	Continuous Radio Frequency Disturbances	39
10.1	General information	39
10.2	Test equipment	39
10.3	Test and reference standards	39
10.4	Block diagram of test setup	39
10.5	Test levels and performance criterion	40
10.6	Test procedure	41
10.7	Test result	41
11.	Electrical Fast Transients (EFT)	42
11.1	General information	42
11.2	Test equipment	42
11.3	Test and reference standards	42
11.4	Block diagram of test setup	42
11.5	Test levels and performance criterion	43
11.6	Test Procedure	43
11.7	Test result	44
12.	Surges	45
12.1	General information	45
12.2	Test equipment	45
12.3	Test and reference standards	45
12.4	Block diagram of test setup	45
12.5	Test levels and performance criterion	46
12.6	Test Procedure	46
12.7	Test result	47
13.	Continuous Conducted Disturbances	48
13.1	General information	48
13.2	Test Equipment	48
13.3	Test and reference standards	48
13.4	Block diagram of test setup	48
13.5	Test levels and performance criterion	49
13.6	Test procedure	50
13.7	Test result	50
14.	Power-Frequency Magnetic Fields	51
14.1	General information	51
14.2	Test equipment	51
14.3	Test and reference standards	51
14.4	Block diagram of test setup	51
14.5	Test levels and performance criterion	52
14.6	Test procedure	52
14.7	Test result	52
15.	Voltage Dips and Interruptions	53
15.1	General information	53
15.2	Test equipment	53
15.3	Test and reference standards	53
15.4	Block diagram of test setup	53
15.5	Test levels and performance criterion	53
15.6	Test procedure	54
15.7	Test result	54

Annex A Test Setup Photos 55

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.	: **344***** (** = 0-9, A-Z, A-Z, +, -, /, \ OR BLANK)
Trade Mark	: N/A

Test Standard Used:

EN 55032:2015, CISPR 32:2015, EN 55032:2015+AC:2016, CISPR 32:2015+cor1:2016, EN 55032:2015+A11:2020, BS EN 55032:2015+A11:2020, EN 55035:2017, BS EN 55035:2017, CISPR 35:2016, EN 55035:2017+A11:2020, AS/NZS CISPR 32:2015, AS/NZS CISPR 32:2015 AMD 1:2020, EN 61000-3-2:2014, BS EN 61000-3-2:2014, IEC 61000-3-2:2014, EN IEC 61000-3-2:2019, IEC 61000-3-2:2018, EN 61000-3-3:2013, BS EN 61000-3-3:2013, IEC 61000-3-3:2013, EN 61000-3-3:2013+A1:2019, IEC 61000-3-3:2013+A1:2017

Test Procedure Used:

IEC 61000-4-2:2008, BS EN 61000-4-2:2009, IEC 61000-4-3:2006+A1:2007+A2:2010, BS EN 61000-4-3:2006+A1:2008+A2:2010, IEC 61000-4-4:2012, BS EN 61000-4-4:2012, IEC 61000-4-5:2014, IEC 61000-4-5:2014 + A1:2017, BS EN 61000-4-5:2014+A1:2017, IEC 61000-4-6:2013, BS EN 61000-4-6:2014, IEC 61000-4-8:2009, BS EN 61000-4-8:2010, IEC 61000-4-11:2004, IEC 61000-4-11:2004+A1:2017, BS EN 61000-4-11:2004+A1:2017

We Declare:

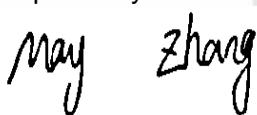
The equipment described above is tested and assessed by Tianjin Dongdian Testing Service Co., Ltd. and in the configuration assessed the equipment complied with the standards specified above. The tested and assessed results are contained in this test report and Tianjin Dongdian Testing Service Co., Ltd. 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-B22030702-1E01		
Date of Receipt:	Mar. 07, 2022	Date of Test:	Mar. 07, 2022 ~ Mar. 10, 2022



Prepared By:



May Zhang/Engineer

Approved By:



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	Mar. 11, 2022	

1. Summary of Test Results

Emission				
Description of Test Item	Standard	Result		
Conducted emission at AC mains terminals	EN 55032:2015+A11:2020 EN55032:2015 EN 55032:2015+AC:2016 BS EN 55032:2015+A11:2020	PASS		
Conducted emission at telecommunication port	EN 55032:2015+A11:2020 EN55032:2015 EN 55032:2015+AC:2016 BS EN 55032:2015+A11:2020	N/A		
Radiated emission	EN 55032:2015+A11:2020 EN55032:2015 EN 55032:2015+AC:2016 BS EN 55032:2015+A11:2020	PASS		
Harmonic current	EN 61000-3-2:2014 BS EN 61000-3-2:2014 EN IEC 61000-3-2:2019	PASS		
Voltage fluctuation & Flicker	EN 61000-3-3:2013 BS EN 61000-3-3:2013 EN 61000-3-3:2013+A1:2019	PASS		
Immunity				
Description of Test Item	Standard	Result	Performance Criteria	
			Required	Observation
Electrostatic discharge (ESD)	IEC 61000-4-2:2008 BS EN 61000-4-2:2009	Pass	B	A
Radiated, radio-frequency, electromagnetic field	IEC 61000-4-3:2006+A1:2007+A2:2010 BS EN 61000-4-3:2006+A1:2008+A2:2010	Pass	A	A
Electrical fast transients (EFT)	IEC 61000-4-4:2012 BS EN 61000-4-4:2012	Pass	B	A
Surges	IEC 61000-4-5:2014 IEC 61000-4-5:2014 + A1:2017 BS EN 61000-4-5:2014+A1:2017	Pass	B	A
Continuous conducted disturbances	IEC 61000-4-6:2013 BS EN 61000-4-6:2014	Pass	A	A
Power frequency magnetic field	IEC 61000-4-8:2009 BS EN 61000-4-8:2010	Pass	A	A
Voltage dips, < 5%	IEC 61000-4-11:2004 IEC 61000-4-11:2004+A1:2017 BS EN 61000-4-11:2004+A1:2017	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	: **344***** ("**" = 0-9, A-Z, A-Z, +, -, /, \ OR BLANK)
Model Differences	: All models difference is in sale marketing.
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	: 1000 MHz

Note: EUT is the abbreviation of equipment under test.

2.2 Primary Function of EUT

Function	Description
<input checked="" type="checkbox"/> Broadcast reception function	N/A
<input checked="" type="checkbox"/> Print	N/A
<input checked="" type="checkbox"/> Scan	N/A
<input checked="" type="checkbox"/> Display or display output	Display
<input checked="" type="checkbox"/> Musical tone generating	N/A
<input checked="" type="checkbox"/> Networking	N/A
<input checked="" type="checkbox"/> Audio output	Audio output
<input checked="" type="checkbox"/> Telephony	N/A
<input checked="" type="checkbox"/> Bluetooth	N/A
<input checked="" type="checkbox"/> 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
<input checked="" type="checkbox"/> AC mains power port	AC Main Port
<input type="checkbox"/> DC network power port	N/A
<input type="checkbox"/> Wired network port	N/A
<input checked="" type="checkbox"/> Signal data/control port	Two HDMI in ports, One DP in port, One Type-C port, Four USB Ports, One USB-B Port, One mini USB port, Two audio in ports,
<input type="checkbox"/> Antenna port	N/A
<input type="checkbox"/> Broadcast receiver tuner port	N/A
<input checked="" type="checkbox"/> Audio output port	One audio out port, Two speakers
<input type="checkbox"/> Video output port	N/A
<input type="checkbox"/> 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

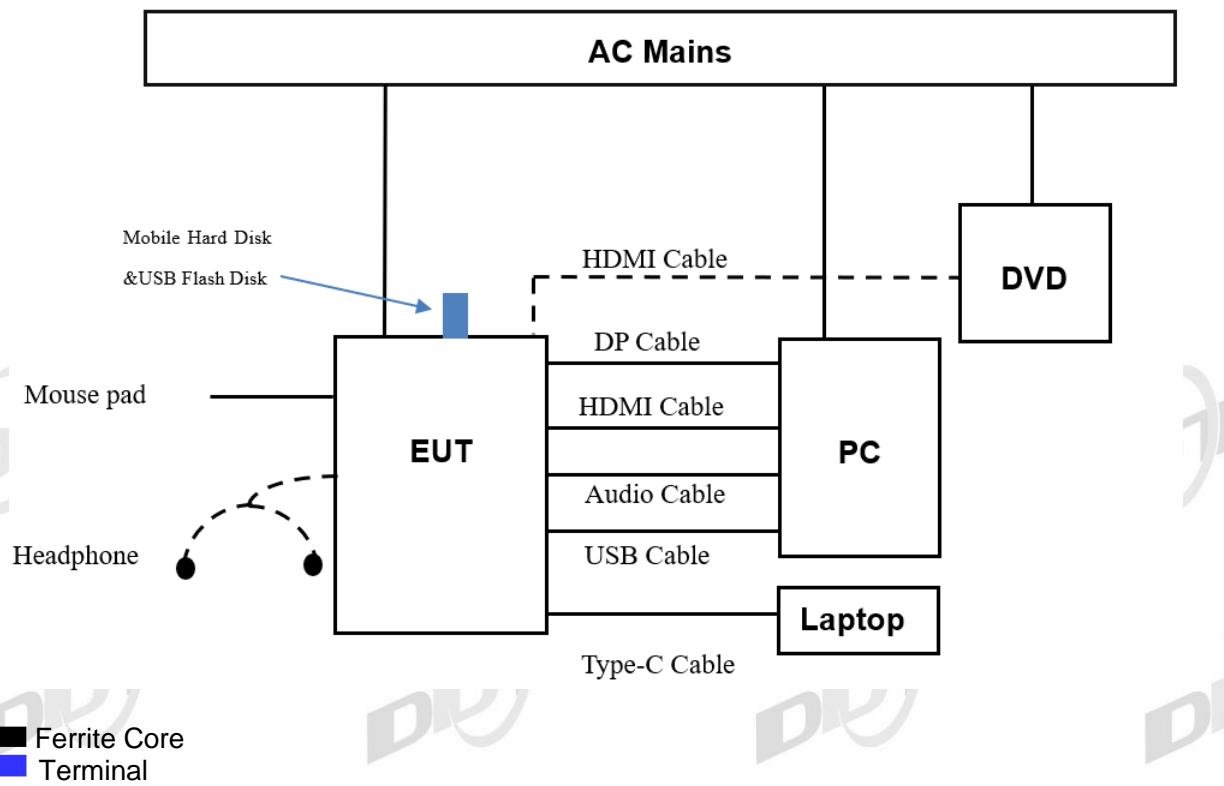
Description of Accessories	Manufacturer	Model number	Description	Remark
AC Cable	N/A	N/A	Length: 1.5m/1.8m, Unshielded	N/A
HDMI Cable	N/A	N/A	Length: 1.5m/1.8m, Shielded	N/A
DP Cable	N/A	N/A	Length: 1.5m/1.8m, Shielded	N/A
Type-C Cable	N/A	N/A	Length: 1.5m/1.8m, Shielded	N/A
AUDIO Cable	N/A	N/A	Length: 1.5m/1.8m, Shielded	N/A
USB Cable	N/A	N/A	Length: 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
Laptop	HP	HP ProBook 455R G6	5CD0122F5D	N/A
Laptop	LENOVO	WEI6 14 ITL	MP22HP0E	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
Mouse pad	N/A	N/A	N/A	N/A

Mobile hard disk	N/A	N/A	N/A	N/A
USB flash disk	N/A	N/A	N/A	N/A

2.6 Block diagram EUT configuration for test



2.7 EUT operating mode(s)

Mode1: HDMI1	Connect HDMI cable from PC's HDMI port to EUT's HDMI1 Port. The test signal is color bars with moving picture element according to ITU-R BT 471-1.
Mode2: HDMI2	Connect HDMI cable from PC's HDMI port to EUT's HDMI2 Port. The test signal is color bars with moving picture element according to ITU-R BT 471-1.
Mode3: 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.
Mode4: Type-C	Connect Type-C cable from PC's Type-C port to EUT's Type-C 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	1,2,3,4	<p>No noticeable degradation or loss of function is allowed during the test. The EUT shall continue to operate as intended without operator intervention.</p> <p>The product conforms with the requirements of clause 8 of EN55035:2017.</p> <p>The product conforms with the requirements of Annex of EN55035:2017.</p> <p><input type="checkbox"/> Annex A <input type="checkbox"/> Annex B <input type="checkbox"/> Annex C <input checked="" type="checkbox"/> Annex D <input type="checkbox"/> Annex E <input type="checkbox"/> Annex F <input checked="" type="checkbox"/> Annex G</p>
B	1,2,3,4	<p>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.</p> <p>The product conforms with the requirements of clause 8 of EN55035:2017.</p> <p>The product conforms with the requirements of Annex of EN55035:2017.</p> <p><input type="checkbox"/> Annex A <input type="checkbox"/> Annex B <input type="checkbox"/> Annex C <input checked="" type="checkbox"/> Annex D <input type="checkbox"/> Annex E <input type="checkbox"/> Annex F <input checked="" type="checkbox"/> Annex G</p>
C	1,2,3,4	<p>Loss of function is allowed, provided that the function is self recoverable.</p> <p>or can be restored by the operation of the controls by the user.</p> <p>The product conforms with the requirements of clause 8 of EN55035:2017.</p> <p>The product conforms with the requirements of Annex of EN55035:2017.</p> <p><input type="checkbox"/> Annex A <input type="checkbox"/> Annex B <input type="checkbox"/> Annex C <input checked="" type="checkbox"/> Annex D <input type="checkbox"/> Annex E <input type="checkbox"/> Annex F <input checked="" type="checkbox"/> Annex G</p>

2.9 Deviations of test standard

[Standard deviation 1] Surge immunity test was done according to IEC 61000-4-5:2014 + A1:2017 instead of IEC 61000-4-5:2005.

[Standard deviation 2] Radio-frequency conducted immunity test was done according to IEC 61000-4-6:2013 instead of IEC 61000-4-6:2008.

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	Mar. 07, 2022	Test engineer	Sam	
Climate condition	Ambient temperature	23.1±1°C	Relative humidity	23±1%
	Atmospheric pressure	101.7±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	Mar. 03, 2022	1 Year
LISN 1	R&S	ENV216	101122	Mar. 31, 2021	1 Year
LISN 2	R&S	ENV216	101254	Mar. 17, 2021	1 Year
Test software	TOYO	EP5/CE	V 5.4.40	N/A	N/A

3.3 Reference standard

EN 55032:2015+A11:2020 (Class B)

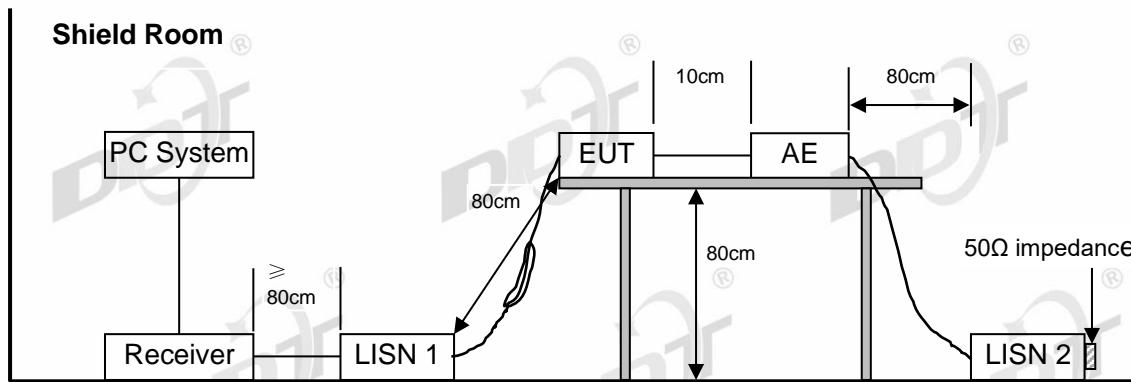
EN 55032:2015

EN 55032:2015+AC:2016

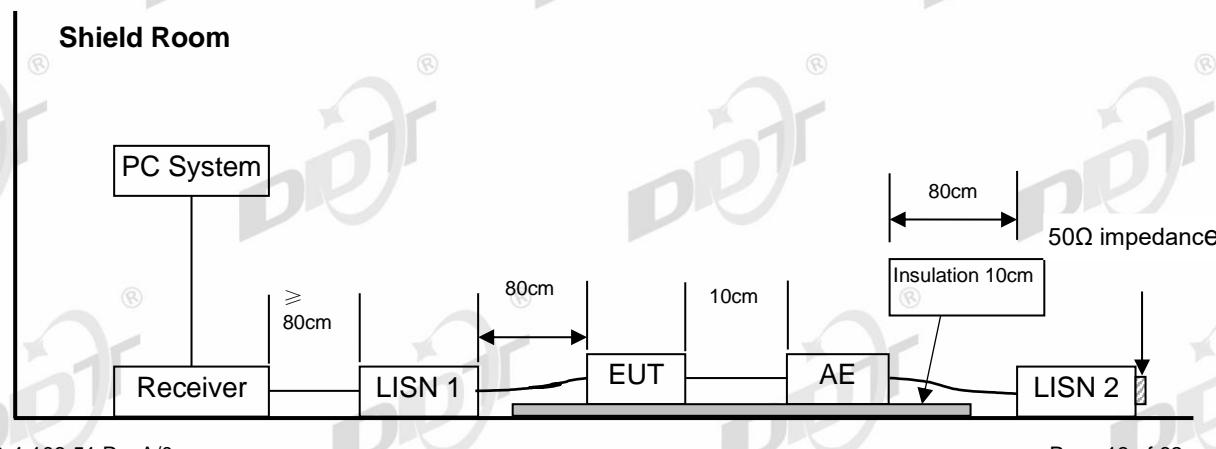
BS EN 55032:2015+A11:2020

3.4 Block diagram of test setup

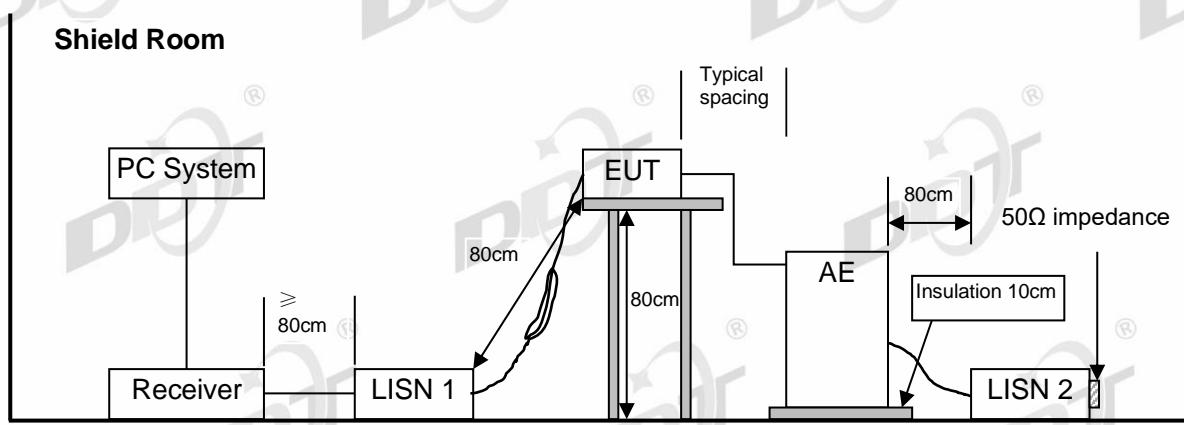
For table-top equipment



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 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.

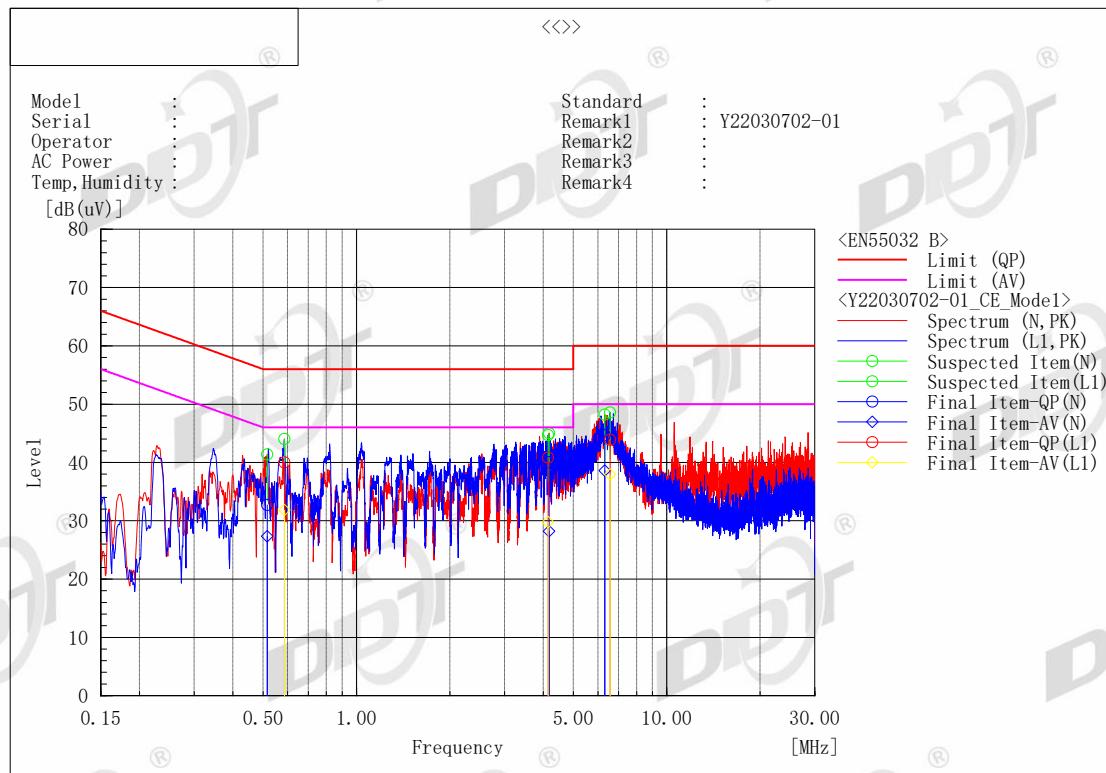
The EUT with following test modes were pre-tested:

No.	Test Voltage	Operation Mode	Cable Length	Resolution
1.	230V 50Hz	Mode 1 HDMI1	1.8m	3440*1440@170Hz
2. *			1.8m	3440*1440@60Hz
3.			1.8m	1920*1080@60Hz
4.			1.8m	800*600@60Hz
5.		Mode 2 HDMI2	1.5m	3440*1440@170Hz
6.			1.5m	3440*1440@60Hz
7.			1.5m	1920*1080@60Hz
8.			1.5m	800*600@60Hz
9.		HDMI1	1.8m	DVD
10.		Mode 3 DP	1.8m	3440*1440@170Hz
11.			1.8m	3440*1440@60Hz
12.			1.8m	1920*1080@60Hz
13.			1.8m	800*600@60Hz
14.		Mode 4 Type-C	1.5m	3440*1440@60Hz
15.			1.8m	3440*1440@170Hz
16.			1.8m	3440*1440@60Hz
17.			1.8m	1920*1080@60Hz
18.			1.8m	800*600@60Hz
19.			1.8m	Full Load
20.			1.5m	3440*1440@170Hz
21.	230V 50Hz	HDMI1 3440*1440@60Hz with 1.5m power cord		
22.	110V 60Hz	HDMI1 3440*1440@60Hz		

* Means the worst test mode.

3.7 Test result

Operating Mode 1: HDMI IN



Final Result

--- N Phase ---											
No.	Frequency	Reading QP	Reading CAV	c. f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV	
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]	
1	6.31219	34.9	28.8	9.8	44.7	38.6	60.0	50.0	15.3	11.4	
2	4.17607	30.2	18.4	9.8	40.0	28.2	56.0	46.0	16.0	17.8	
3	0.51545	23.0	17.6	9.7	32.7	27.3	56.0	46.0	23.3	18.7	

--- L1 Phase ---											
No.	Frequency	Reading QP	Reading CAV	c. f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV	
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]	
1	6.56638	34.1	28.1	9.8	43.9	37.9	60.0	50.0	16.1	12.1	
2	4.14653	31.0	20.0	9.8	40.8	29.8	56.0	46.0	15.2	16.2	
3	0.5856	30.3	22.2	9.7	40.0	31.9	56.0	46.0	16.0	14.1	

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	Mar. 03, 2022	1 Year
ISN	TESEQ	T800	30844	Nov. 23, 2022	1 Year
Test software	TOYO	EP5/CE	V 5.4.40	N/A	N/A

4.3 Reference standard

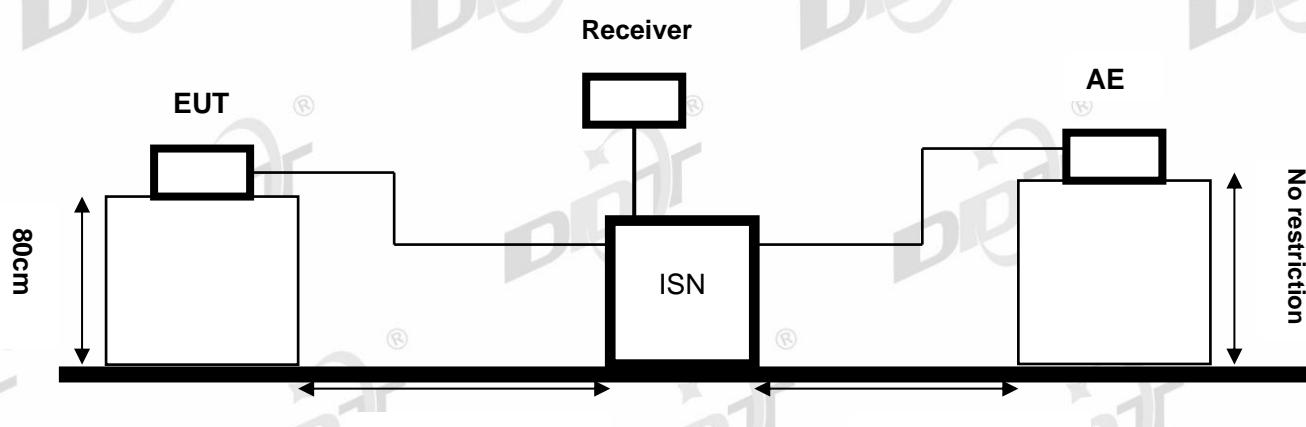
EN 55032:2015+A11:2020

EN 55032:2015

EN 55032:2015+AC:2016

BS EN 55032:2015+A11:2020

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	Mar. 08, 2022	Test engineer	Sam	
Climate condition	Ambient temperature	19.6±1°C	Relative humidity	20±1%
	Atmospheric pressure	101.6±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	Mar. 03, 2022	1 Year
EMI Test Receiver	R&S	ESCI	101030	May 15, 2021	1 Year
Bilog Antenna	TESEQ	CBL6112D	29068	Oct. 12, 2020	2 Year
Bilog Antenna	TESEQ	CBL6112D	29069	Oct. 12, 2020	2 Year
Amplifier	Sonoma	310N	300913	Feb. 15, 2022	1 Year
Amplifier	Sonoma	310N	300914	Feb. 15, 2022	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+A11:2020 (Class B)

EN 55032:2015

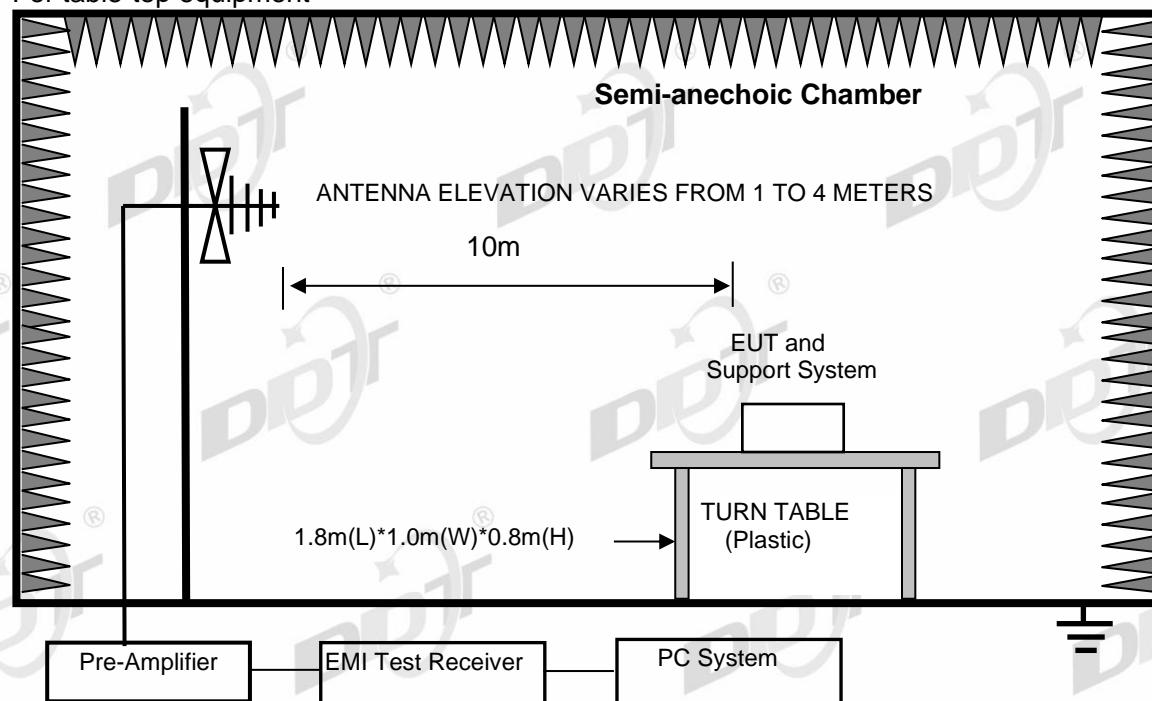
EN 55032:2015+AC:2016

BS EN 55032:2015+A11:2020

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

Class B

Equipment	Frequency	Field Strengths Limits at 10m measuring distance dB(μ V/m)	Field Strengths Limits at 3m measuring distance dB(μ V/m)
Class B Equipment	30MHz to 230MHz	30	40
Equipment	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			
1.	230V 50Hz	Mode 1 HDMI1	1.8m	3440*1440@170Hz			
2. *			1.8m	3440*1440@60Hz			
3.			1.8m	1920*1080@60Hz			
4.			1.8m	800*600@60Hz			
5.		Mode 2 HDMI2	1.5m	3440*1440@170Hz			
6.			1.5m	3440*1440@60Hz			
7.			1.5m	1920*1080@60Hz			
8.			1.5m	800*600@60Hz			
9.		HDMI1	1.8m	DVD			
10.		Mode 3 DP	1.8m	3440*1440@170Hz			
11.			1.8m	3440*1440@60Hz			
12.			1.8m	1920*1080@60Hz			
13.			1.8m	800*600@60Hz			
14.		Mode 4 Type-C	1.5m	3440*1440@170Hz			
15.			1.8m	3440*1440@170Hz			
16.			1.8m	3440*1440@60Hz			
17.			1.8m	1920*1080@60Hz			
18.			1.8m	800*600@60Hz			
19.			1.8m	Full Load			
20.			1.5m	3440*1440@60Hz			
21.	230V 50Hz	HDMI1 3440*1440@60Hz with 1.5m power cord					
22.	110V 60Hz	HDMI1 3440*1440@60Hz					
23.	HDMI1 1920*1080@60Hz with headphone						
24.	HDMI1 1920*1080@60Hz without headphone						

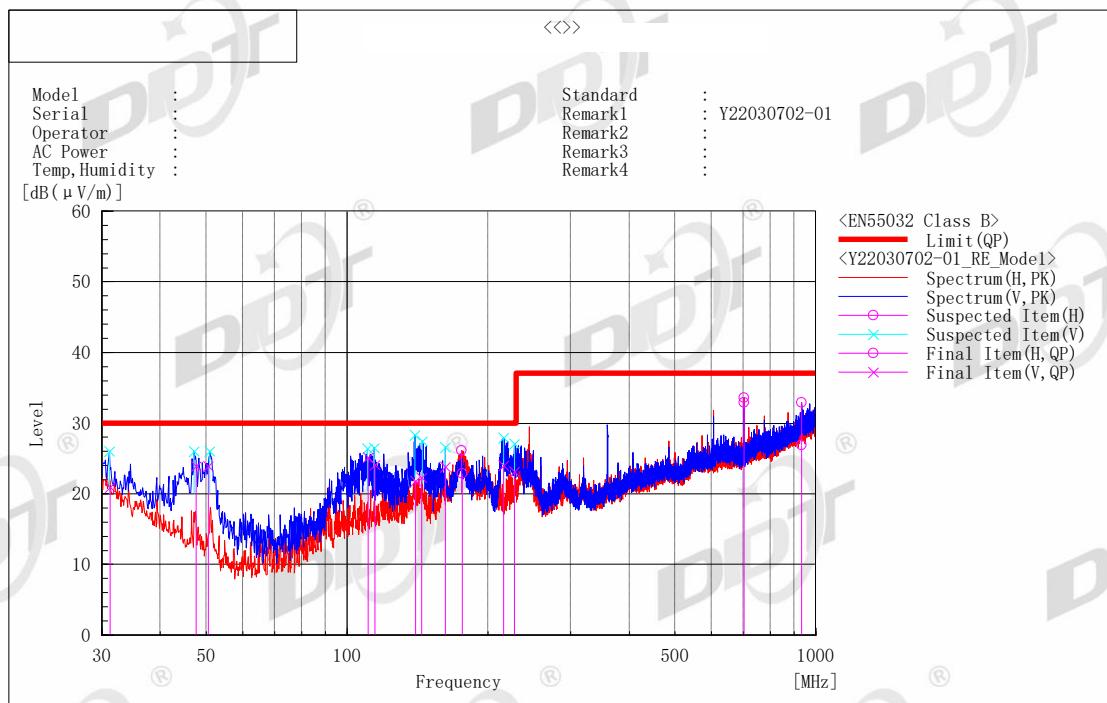
* Means the worst test mode.

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 1: HDMI IN



Final Result

No.	Frequency (P) [MHz]	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	702.011	H 32.9	0.0	32.9	37.0	4.1	147.0	141.9	1	
2	931.569	H 22.8	4.1	26.9	37.0	10.1	167.0	209.9	1	
3	176.040	H 35.7	-12.8	22.9	30.0	7.1	286.0	276.5	1	
4	114.573	V 33.8	-9.7	24.1	30.0	5.9	182.0	4.0	2	
5	144.385	V 33.0	-10.7	22.3	30.0	7.7	146.0	13.8	2	
6	161.856	V 35.2	-11.4	23.8	30.0	6.2	129.0	28.5	2	
7	215.864	V 35.8	-11.8	24.0	30.0	6.0	139.0	152.4	2	
8	31.234	V 25.4	-4.4	21.0	30.0	9.0	188.0	210.7	2	
9	110.824	V 35.1	-9.9	25.2	30.0	4.8	169.0	243.6	2	
10	50.564	V 38.3	-14.4	23.9	30.0	6.1	173.0	309.3	2	
11	139.956	V 32.1	-10.3	21.8	30.0	8.2	161.0	352.6	2	
12	47.624	V 37.2	-13.3	23.9	30.0	6.1	153.0	356.9	2	
13	227.426	V 34.2	-11.0	23.2	30.0	6.8	185.0	351.9	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	Mar. 08, 2022	Test engineer	Sam	
Climate condition	Ambient temperature	19.6±1°C	Relative humidity	20±1%
	Atmospheric pressure	101.6±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	Mar. 03, 2022	1 Year
Double Ridged Horn Antenna	TESEQ	BHA 9118	31754	Oct. 12, 2021	2 Year
Pre-amplifier	TOYO	TPA0108-40	1409	Feb. 15, 2022	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+A11:2020 (Class B)

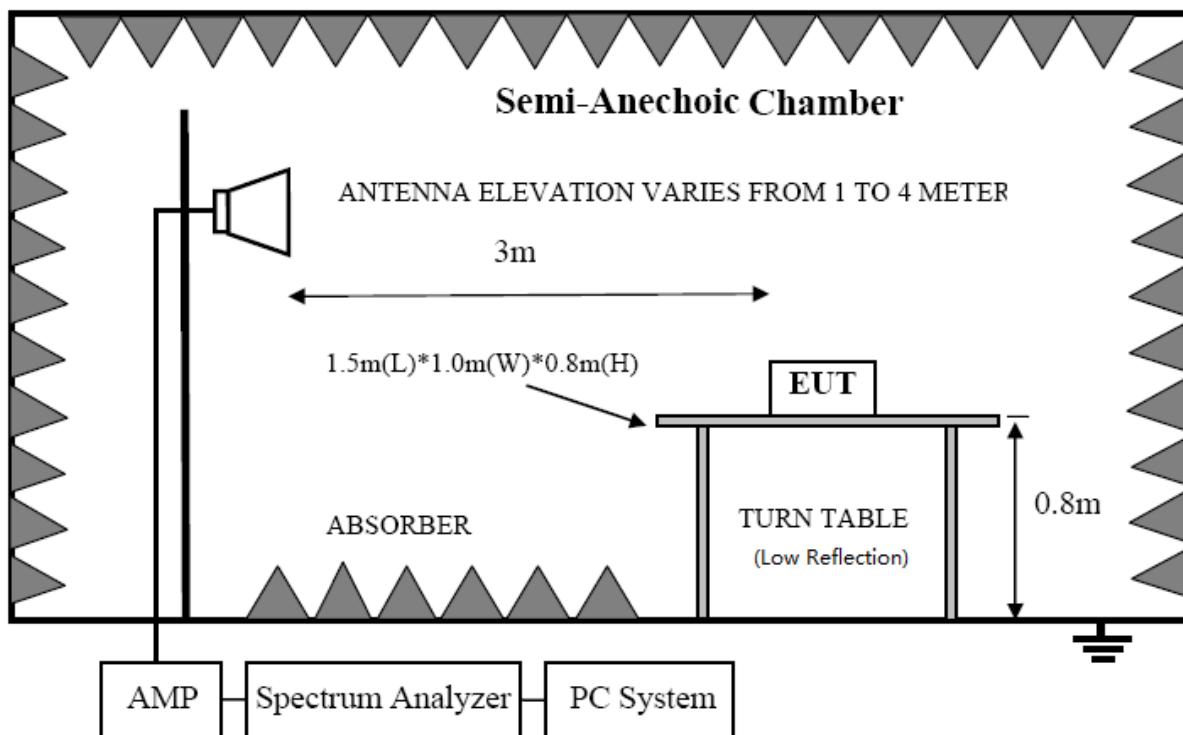
EN 55032:2015

EN 55032:2015+AC:2016

BS EN 55032:2015+A11:2020

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(μ V/m)		Limits of Class B, dB(μ V/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			
1. *	230V 50Hz	Mode 1 HDMI1	1.8m	3440*1440@170Hz			
2.			1.8m	3440*1440@60Hz			
3.			1.8m	1920*1080@60Hz			
4.			1.8m	800*600@60Hz			
5.		Mode 2 HDMI2	1.5m	3440*1440@170Hz			
6.			1.5m	3440*1440@60Hz			
7.			1.5m	1920*1080@60Hz			
8.			1.5m	800*600@60Hz			
9.		HDMI1	1.8m	DVD			
10.		Mode 3 DP	1.8m	3440*1440@170Hz			
11.			1.8m	3440*1440@60Hz			
12.			1.8m	1920*1080@60Hz			
13.			1.8m	800*600@60Hz			
14.		Mode 4 Type-C	1.5m	3440*1440@170Hz			
15.			1.8m	3440*1440@170Hz			
16.			1.8m	3440*1440@60Hz			
17.			1.8m	1920*1080@60Hz			
18.			1.8m	800*600@60Hz			
19.			1.8m	Full Load			
20.			1.5m	3440*1440@170Hz			
21.	230V 50Hz	HDMI1 3440*1440@170Hz with 1.5m power cord					
22.	110V 60Hz	HDMI1 3440*1440@170Hz					
23.	HDMI1 1920*1080@60Hz with headphone						
24.	HDMI1 1920*1080@60Hz without headphone						

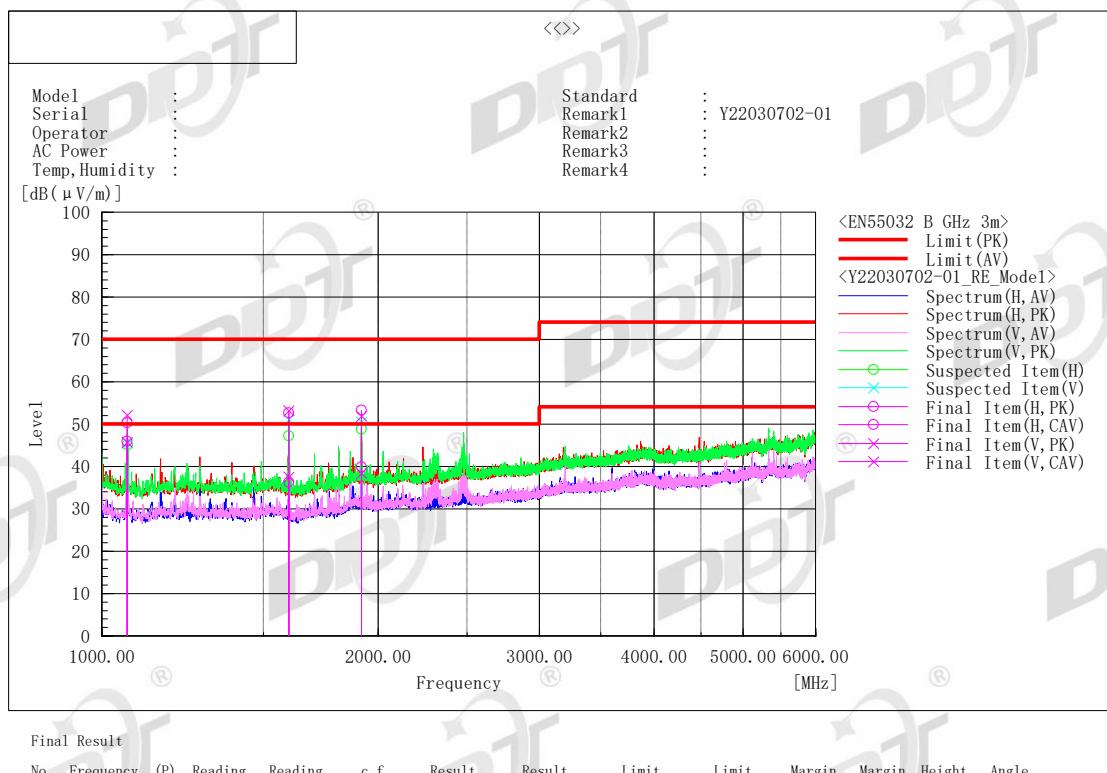
* Means the worst test mode.

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: HDMI1 IN



No.	Frequency [MHz]	(P)	Reading		c. f	Result PK	Result CAV	Limit		Margin PK	Margin CAV	Height [cm]	Angle [°]
			PK [dB(μ V)]	CAV [dB(μ V)]				PK [dB(1/m)]	CAV [dB(1/m)]	PK [dB(μ V/m)]	CAV [dB(μ V/m)]		
1	1598.759	V	70.9	55.3	-17.7	53.2	37.6	70.0	50.0	16.8	12.4	152.0	213.7
2	1918.489	V	66.2	52.7	-14.3	51.9	38.4	70.0	50.0	18.1	11.6	162.0	183.8
3	1918.547	H	67.6	54.2	-14.3	53.3	39.9	70.0	50.0	16.7	10.1	115.0	104.5
4	1598.757	H	70.4	54.0	-17.7	52.7	36.3	70.0	50.0	17.3	13.7	198.0	110.1
5	1066.004	V	70.6	64.2	-18.5	52.1	45.7	70.0	50.0	17.9	4.3	182.0	180.8
6	1066.006	H	68.8	64.5	-18.5	50.3	46.0	70.0	50.0	19.7	4.0	153.0	299.4

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	Mar. 07, 2022	Test engineer	Sam	
Climate condition	Ambient temperature	23.1±1°C	Relative humidity	23±1%
	Atmospheric pressure	101.7±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	Dec. 27, 2021	1 year
Reference Impedance Network	Voltech	IEC61000-3	1G164/2021	Dec. 27, 2021	1 year
AC Power Source	Pacific	360-AMX	1235	Feb. 16, 2022	1 year
AC Power Source	Pacific	360-AMX	1234	Feb. 16, 2022	1 year

Notes. N/A means Not applicable.

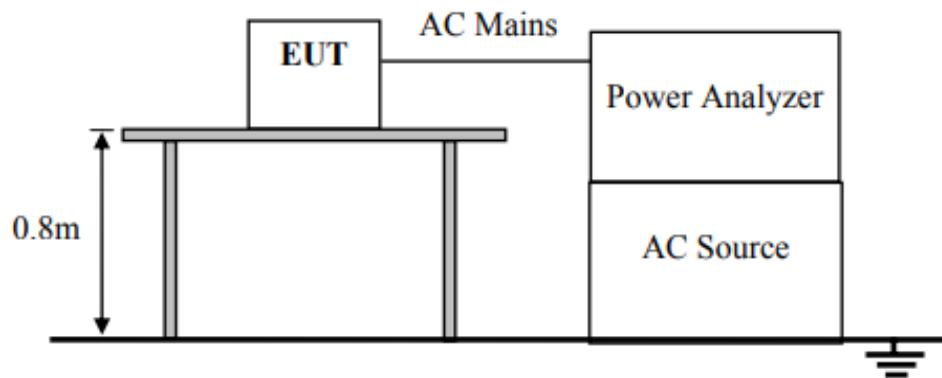
7.3 Reference standard

EN 61000-3-2:2014 (Class D)

EN IEC 61000-3-2:2019

BS EN 61000-3-2:2014

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	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$ (odd harmonics only)	0.15 15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	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	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)	3.85/n	See Table 1

7.6 Test result

PASS. (See below detailed test result)

Operating Mode 1: HDMI IN

07th March 2022 - 13:28:07

Page

IECSoft v2 6

**IEC61000-3-2:2014**
Fluctuating Harmonics**Instrument Details**

Instrument Model	PPA5511
Serial Number	162-04584
Firmware Version	2. 170
Instrument Version	Standard

Test Settings

Class	Class D
Mode	Measured

Equipment Under Test

Brand	N/A
Model	**344*****
Serial	N/A
Impedance Network ID	N/A

Test Conditions

	User Entered	Measured
Rated Voltage	230. 000V	230. 931V
Rated Current	N/A	650. 590mA
Rated Frequency	50. 000Hz	50. 000Hz
Rated Power	N/A	136. 283W

Additional Test Information

Measured Power Factor	0. 9059
Max Current THD	42. 18%
Average THC	148. 683mA
Max Power	149. 381W
Max F. Current	688. 772mA
Average F. Current	632. 396mA
Minimum Current	10A
Test Duration	2. 5 minutes

Additional Test Details

Operator	N/A
Lab Name	N/A
Location	N/A
Notes	
Signature	

Results	PASS
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07th March 2022 - 13:28:07		Ph:1 Page 2/6		IECSoft v2.6			
IEC61000-3-2:2014 Fluctuating Harmonics							
Instrument Details							
Instrument Model		PPA5511					
Instrument Serial		162-04584					
Instrument Firmware		2.17					
Equipment Under Test							
Brand		N/A					
Model		**344*****					
Serial		N/A					
Harmonic Difference							
Harmonic	Lowest	Highest	Limit	Difference (A)	Status		
	Average (A)	Test #	Average (A)	Test #	Allowance (A)		
2	1.503m*	2	1.615m*	1	0	0	N/A
3	121.850m	2	122.510m	1	0.024756	0.00066	PASS
4	744.070u*	1	779.860u*	2	0	0	N/A
5	49.132m	2	49.264m	1	0.013834	0.000132	PASS
6	672.210u*	1	679.320u*	2	0	0	N/A
7	47.060m	2	48.178m	1	0.007281	0.001118	PASS
8	644.480u*	2	649.210u*	1	0	0	N/A
9	29.120m	2	29.580m	1	0.003641	0.00046	PASS
10	601.240u*	1	617.550u*	2	0	0	N/A
11	17.522m	2	17.721m	1	0.002548	0.000199	PASS
12	596.350u*	1	602.350u*	2	0	0	N/A
13	21.673m	2	21.696m	1	0.002156	0.000023	PASS
14	562.180u*	2	569.470u*	1	0	0	N/A
15	17.258m	2	17.601m	1	0.001869	0.000343	PASS
16	563.050u*	2	567.430u*	1	0	0	N/A
17	12.272m	2	12.535m	1	0.001649	0.000263	PASS
18	589.370u*	1	605.000u*	2	0	0	N/A
19	9.091m	2	9.383m	1	0.001475	0.000292	PASS
20	555.100u*	1	560.600u*	2	0	0	N/A
21	11.333m	1	11.447m	2	0.001335	0.000114	PASS
22	582.280u*	1	589.200u*	2	0	0	N/A
23	12.610m	2	12.836m	1	0.001219	0.000226	PASS
24	571.050u*	1	576.470u*	2	0	0	N/A
25	16.279m	2	16.482m	1	0.001121	0.000203	PASS
26	556.370u*	1	562.230u*	2	0	0	N/A
27	5.247m	1	5.367m	2	0.001038	0.000121	PASS
28	577.190u*	1	582.630u*	2	0	0	N/A
29	7.353m	2	7.397m	1	0.000967	0.000045	PASS
30	541.470u*	1	545.910u*	2	0	0	N/A
31	6.596m	2	6.720m	1	0.000904	0.000125	PASS
32	532.820u*	2	534.650u*	1	0	0	N/A
33	5.581m	2	5.710m	1	0.000849	0.000129	PASS
34	577.370u*	1	587.780u*	2	0	0	N/A
35	4.575m*	2	4.617m*	1	0.000801	0	N/A
36	564.560u*	1	568.450u*	2	0	0	N/A
37	5.369m	1	5.429m	2	0.000758	0.00006	PASS
38	543.910u*	2	544.130u*	1	0	0	N/A
39	4.886m*	2	4.935m*	1	0.000719	0	N/A
40	558.760u*	2	559.350u*	1	0	0	N/A

Key:

Ignored	Since both values are less than 5mA or 0.6% of the Input Current this harmonic is ignored.
Good	The difference is less than 50% of the allowance
OK	The difference is between 50% of the allowance and 75% of the allowance
Poor	The difference is between 75% of the allowance and 100% of the allowance
Fail	The difference has exceeded the allowance

8. Voltage fluctuation & Flicker

8.1 General information

Test date	Mar. 07, 2022	Test engineer	Sam
Climate condition	Ambient temperature	23.1±1°C	Relative humidity
	Atmospheric pressure	101.7±0.2 kPa	23±1%
Test place	Shield Room 2#		

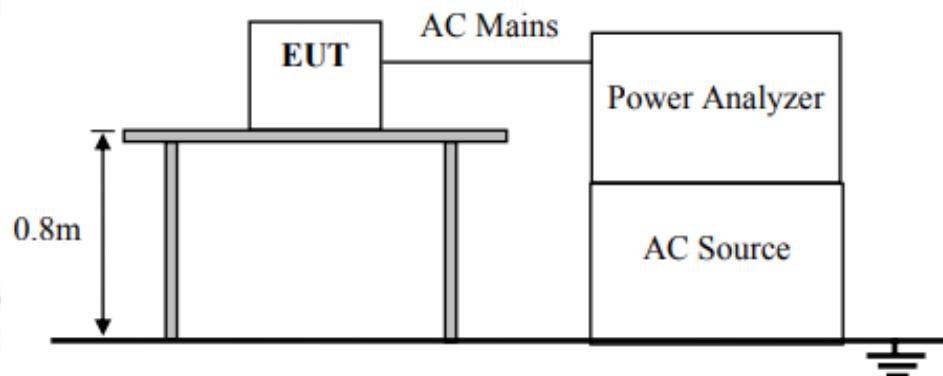
8.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Power Analyzer	N4L	PPA5511	162-04584	Dec. 27, 2021	1 year
Reference Impedance Network	Voltech	IEC61000-3	1G164/2021	Dec. 27, 2021	1 year
AC Power Source	Pacific	360-AMX	1235	Feb. 16, 2022	1 year
AC Power Source	Pacific	360-AMX	1234	Feb. 16, 2022	1 year

8.3 Reference standard

EN 61000-3-3:2013
EN 61000-3-3:2013+A1:2019
BS EN 61000-3-3:2013

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, d_{max}
1.0	3.3 %	500 ms	4 %

8.6 Test result

PASS. (See below detailed test result)

Operating Mode 1: HDMI IN

07th March 2022 - 13:51:24

Page 1/2

IECSoft v2 6

**IEC61000-3-3:2013 Ed. 3.0**
Flickermeter**Instrument Details**

Instrument Model	PPA5511
Serial Number	162-04584
Firmware Version	2.170
Instrument Version	Standard

Test Settings

Class	Voltage
Mode	Normal (4.0%)
Minimum Current	10A
PST	N/A - Inrush Test Only
PLT	N/A - Inrush Test Only

Equipment Under Test

Brand	N/A
Model	**344*****
Serial	N/A
Impedance Network ID	N/A

Test Conditions

	User Entered	Measured
Rated Voltage	230.000V	230.895V
Rated Current	N/A	N/A
Rated Frequency	50.000Hz	50.000Hz
Rated Power	N/A	N/A
D max	N/A - Inrush Test Only	
T max	N/A - Inrush Test Only	
DC max	N/A - Inrush Test Only	
Inrush Test	1.936% (Limit: 4.0%)	

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	Mar. 09, 2022	Test engineer	Sam
Climate condition	Ambient temperature Atmospheric pressure	25.0±1°C 101.5±0.2kPa	Relative humidity 32±1%
Test place	Shield Room 3#		

9.2 Test equipment

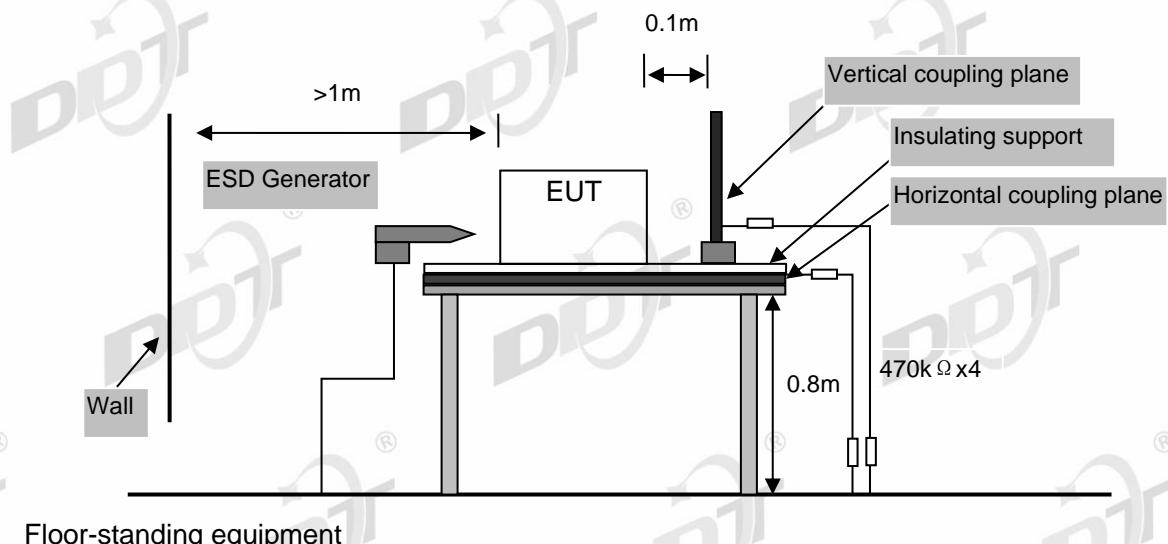
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ESD Generator	TESEQ	NSG 438	1040	Oct. 08, 2021	1 Year

9.3 Test and reference standards

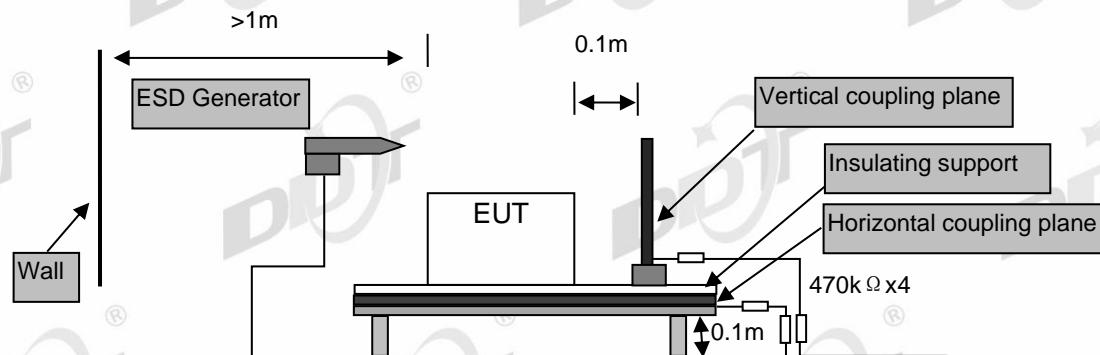
IEC 61000-4-2:2008
BS EN 61000-4-2:2009

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	$\pm 2\text{kV}$, $\pm 4\text{kV}$ and $\pm 8\text{kV}$	B
Contact Discharge	$\pm 4\text{kV}$	

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:

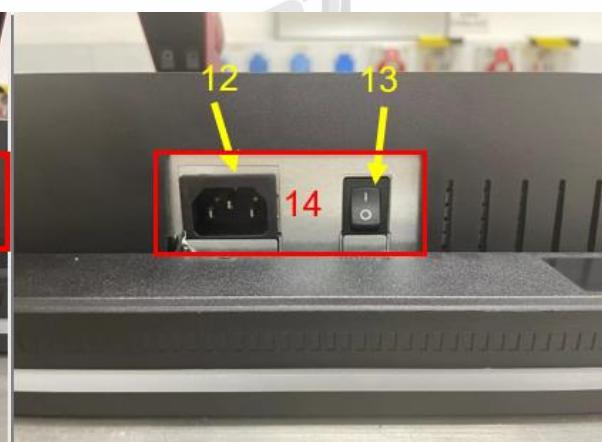
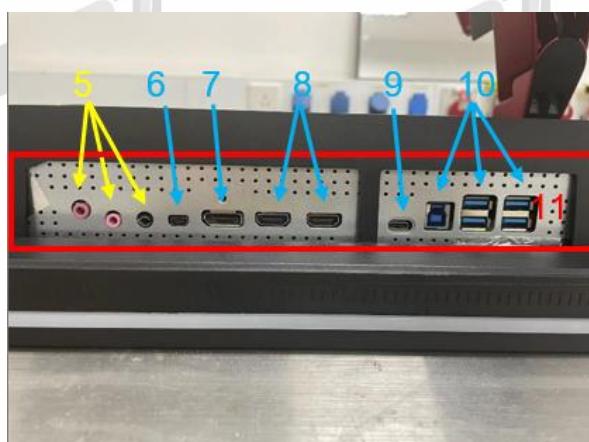
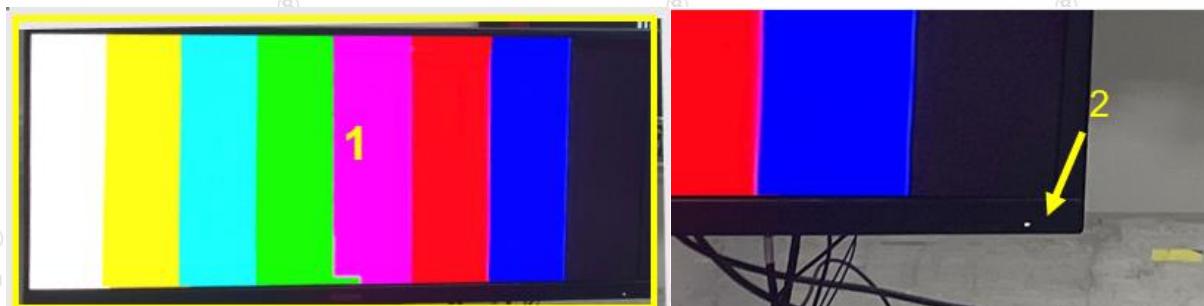
At least 20 single discharges were applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

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

Power supply: AC 230V/50Hz, AC 110V/60Hz						
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	
Mode 1	Contact to EUT	$\pm 4\text{kV}$	6,7,8,9,10,11,14	B	A	Pass
	Contact to Coupling Planes	$\pm 4\text{kV}$	Coupling Planes	B	A	Pass
	Air	$\pm 2\text{kV}$, $\pm 4\text{kV}$, and $\pm 8\text{kV}$	1,2,3,4,5, 6,7,8,9,10, 12,13	B	A	Pass
Test Point:						
No.	Description	No.	Description	No.	Description	
1	Panel	6	Mini USB Port	11	Shielded cover	
2	Status light	7	DP Port	12	AC Port	
3	Button	8	HDMI Port	13	Switch	
4	Gap	9	Type-C Port	14	Shield Cover	
5	Audio Port	10	USB Port	15	/	
Observation Description:						
A: Operation as intend, no loss of function during test and after test.						

Photo of ESD point on EUTContact Air Contact + Air 

10. Continuous Radio Frequency Disturbances

10.1 General information

Test date	Mar. 10, 2022	Test engineer	Mike	
Climate condition	Ambient temperature	20.3±1°C	Relative humidity	28±1%
Test place	RS Chamber			

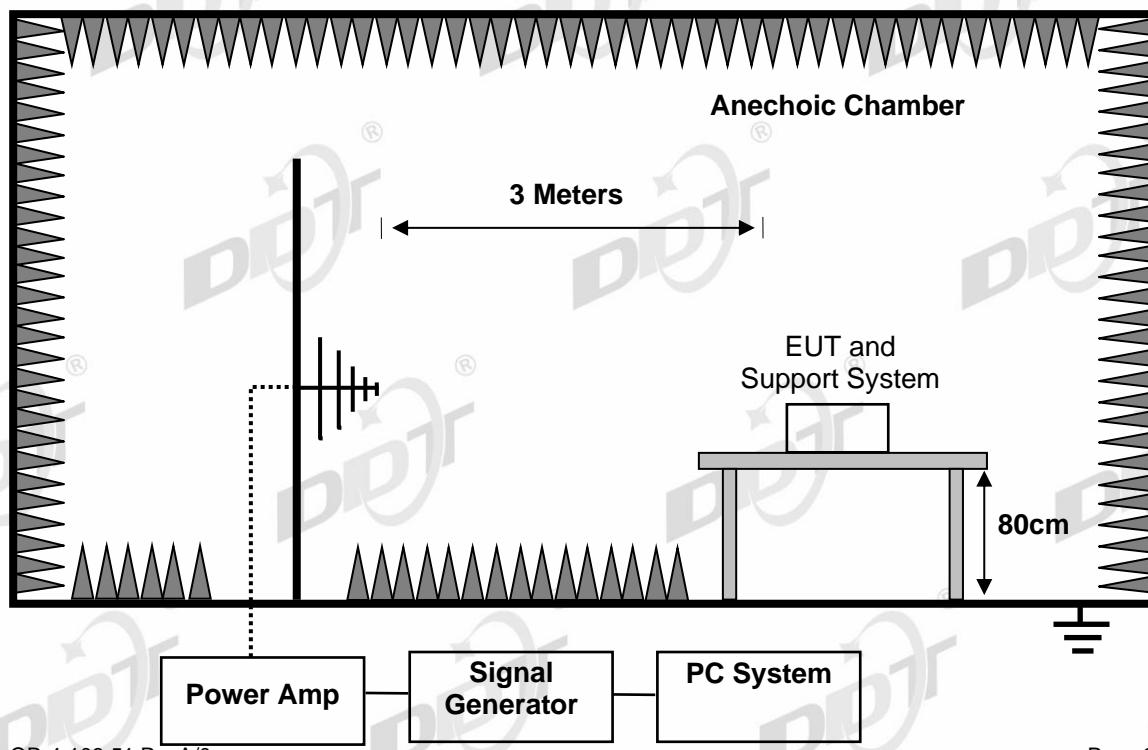
10.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal Generator	R&S	SMB100A	104909	Feb. 15, 2022	1 Year
RF Switch for Radiated	SKET	RS_DC06G-AMC-3C	SK2020081901	N/A	N/A
Power Amplifier	SKET	HAP_01G032G-250W	202104178	Aug. 12, 2021	1 Year
Power Amplifier	SKET	HAP_03G06G-75W	SK202106221	Aug. 12, 2021	1 Year
Power Amplifier(Combiner)	SKET	HAP_80M200M/200M 1G-2000/1000W	202102154	Aug. 12, 2021	1 Year
Power meter	R&S	NRP	102424	Feb. 15, 2022	1 Year
Power sensor	R&S	NRP-Z91	100937	Feb. 15, 2022	1 Year
Power sensor	R&S	NRP-Z91	100938	Feb. 15, 2022	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, 2022	1 Year

10.3 Test and reference standards

IEC 61000-4-3:2006+A1:2007+A2:2010
 BS EN 61000-4-3:2006+A1:2008+A2:2010

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 <input checked="" type="checkbox"/> 1kHz, <input type="checkbox"/> 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 <input checked="" type="checkbox"/> 1kHz, <input type="checkbox"/> 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

Power supply: AC 230V/50Hz, AC 110V/60Hz						
Field Strength : <input checked="" type="checkbox"/> 3V/m <input type="checkbox"/> 10V/m Steps: <input checked="" type="checkbox"/> 1% <input type="checkbox"/> other: Dwell time: <input checked="" type="checkbox"/> 1s <input type="checkbox"/> other:						
Swept Frequency Range: <input checked="" type="checkbox"/> 80MHz---1GHz; <input checked="" type="checkbox"/> 1800MHz, 2600MHz, 3500MHz, 5000MHz; <input type="checkbox"/> other:						
Modulation : <input type="checkbox"/> None <input checked="" type="checkbox"/> AM <input checked="" type="checkbox"/> 1kHz <input type="checkbox"/> 400Hz Modulation depth: <input checked="" type="checkbox"/> 80% <input type="checkbox"/> 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: Audio output: electrical interference ratio= <u>-42.94</u> dB \leq -20dB.						
Mode1:Speaker: Acoustic interference ratio= <u>-40.52</u> dB \leq -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	Mar. 09, 2022	Test engineer	Make
Climate condition	Ambient temperature Atmospheric pressure	21.0±1°C 101.5±0.2kPa	Relative humidity 25±1%
Test place	Shield Room 3#		

11.2 Test equipment

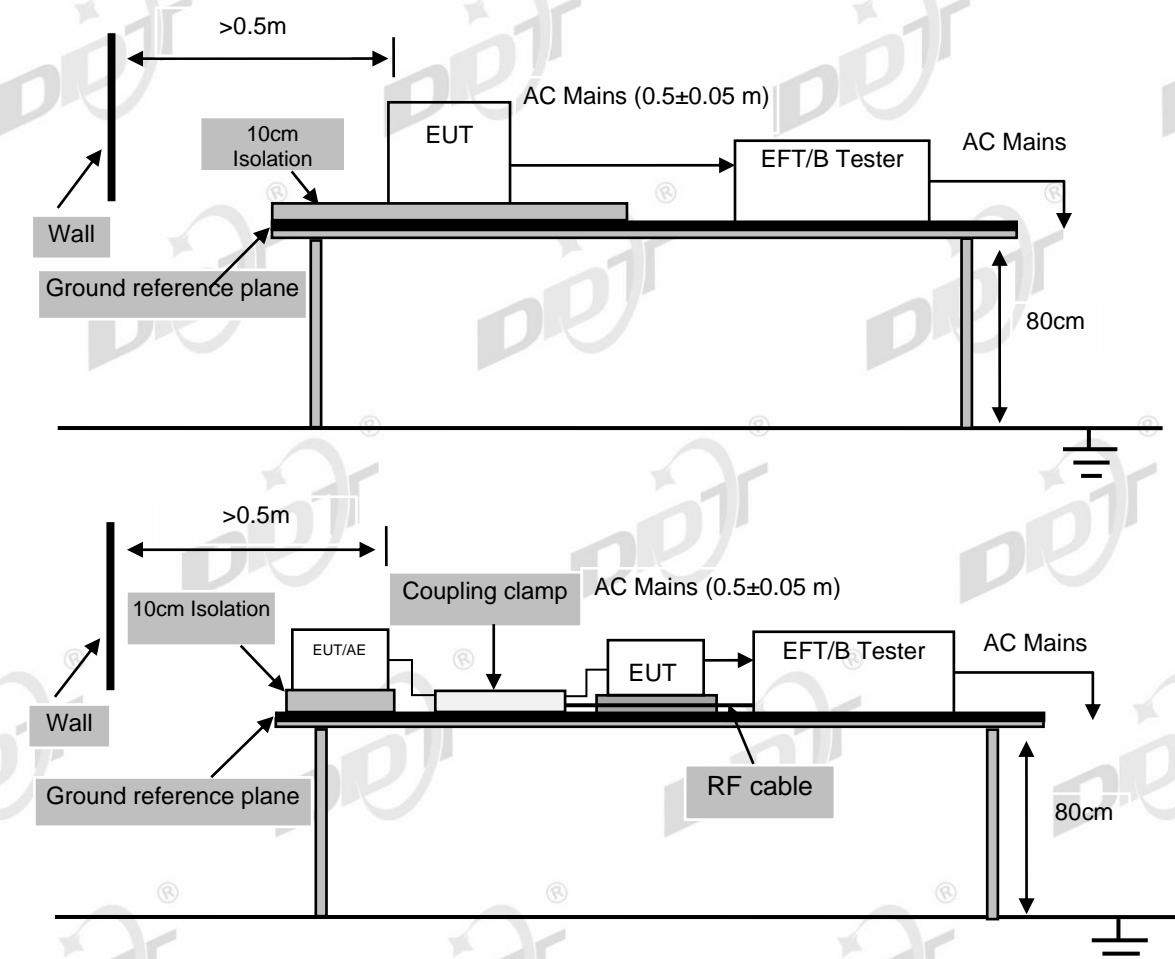
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EFT Generator	TESEQ	NSG3060	210	Feb. 15, 2022	1 Year
Coupling/Decoupling Network	TESEQ	CDN3061	210	Feb. 15, 2022	1 Year

11.3 Test and reference standards

IEC 61000-4-4:2012

BS EN 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	B	±0.5kV for DC input or signal Port
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 or 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 $0.1m \pm 0.01m$ thick. The ground reference plane was $1m \times 1m$ 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

Power supply: AC 230V/50Hz, AC 110V/60Hz						
<input checked="" type="checkbox"/>	AC Mains	<input type="checkbox"/>	DC Supply	<input type="checkbox"/>	Signal	Burst Period: <input checked="" type="checkbox"/> 300ms <input type="checkbox"/> Other:
Coupling: <input checked="" type="checkbox"/> Direct <input type="checkbox"/> Capacitive Clamp			Test Time: <input checked="" type="checkbox"/> 120S <input type="checkbox"/> Other:			
Repetition Frequency: <input checked="" type="checkbox"/> 5KHz <input type="checkbox"/> Other:			Burst Durations: <input checked="" type="checkbox"/> 15ms <input type="checkbox"/> Other:			
Operation Mode	Line/port	Test Voltage	Performance Required	Observation (+)	Observation (-)	Result
Mode 1	L	±1kV	B	A	A	Pass
	N	±1kV	B	A	A	Pass
	PE	±1kV	B	A	A	Pass
	L-N	±1kV	B	A	A	Pass
	L-PE	±1kV	B	A	A	Pass
	N-PE	±1kV	B	A	A	Pass
	L-N-PE	±1kV	B	A	A	Pass
Observation Description: A: Operation as intend, no loss of function during test and after test.						

12. Surges

12.1 General information

Test date	Mar. 09, 2022	Test engineer	Make
Climate condition	Ambient temperature Atmospheric pressure	21.0±1°C 101.5±0.2kPa	Relative humidity 25±1%
Test place	Shield Room 3#		

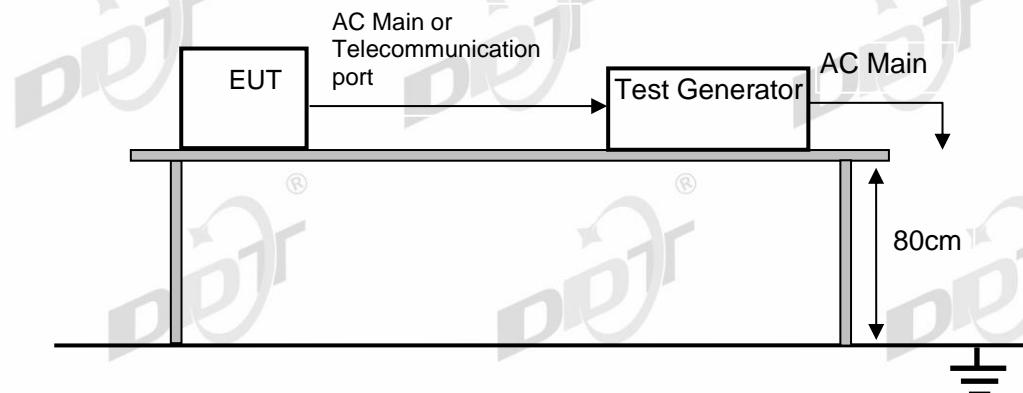
12.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Surge Generator	TESEQ	NSG3060	210	Feb. 15, 2022	1 Year
Coupling/Decoupling Network	TESEQ	CDN3061	210	Feb. 15, 2022	1 Year

12.3 Test and reference standards

IEC 61000-4-5:2014
IEC 61000-4-5:2014 + A1:2017
BS EN 61000-4-5:2014+A1:2017

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) μ s	B
Line to Ground	2kV 1.2/50(8/20) μ s	B
Analogue/digital data port, Port type: unshielded symmetrical		Performance Criterion
Line to Ground	1 kV and 4kV 10/700(5/320) μ s (used with the primary protection)	C
Line to Ground	1 kV 10/700(5/320) μ s (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) μ s	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) μ s	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

Power supply: AC 230V/50Hz, AC 110V/60Hz											
Line: <input checked="" type="checkbox"/> AC Mains <input type="checkbox"/> DC Supply <input type="checkbox"/> Telecommunication port <input type="checkbox"/> Signal port											
Wave Type: <input checked="" type="checkbox"/> 1.2/50us-8/20us <input type="checkbox"/> 10/700 us-5/320us Internal impedance: <input checked="" type="checkbox"/> 2Ω <input checked="" type="checkbox"/> 12Ω <input type="checkbox"/> 25Ω <input type="checkbox"/> 40Ω <input type="checkbox"/> 160Ω											
Pulse times: 5 times at each polarity Pulse Interval: 60S Voltage Phase: <input type="checkbox"/> 0°, 90°, 180°, 270° <input checked="" type="checkbox"/> 90°, 270°											
Operation Mode	Line/Port	0.5kV		1kV		2kV		Result			
		Required	Observation	Required	Observation	Required	Observation				
Mode 1	L-N	B	A A	B	A A	N/A	N/A	N/A	N/A	N/A	Pass
	L-Pe	B	A A	B	A A	B	A	A	A	A	Pass
	N-Pe	B	A A	B	A A	B	A	A	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	Mar. 09, 2022	Test engineer	Sam	
Climate condition	Ambient temperature	25.0±1°C	Relative humidity	32±1%
Test place	Shield Room 3#			

13.2 Test Equipment

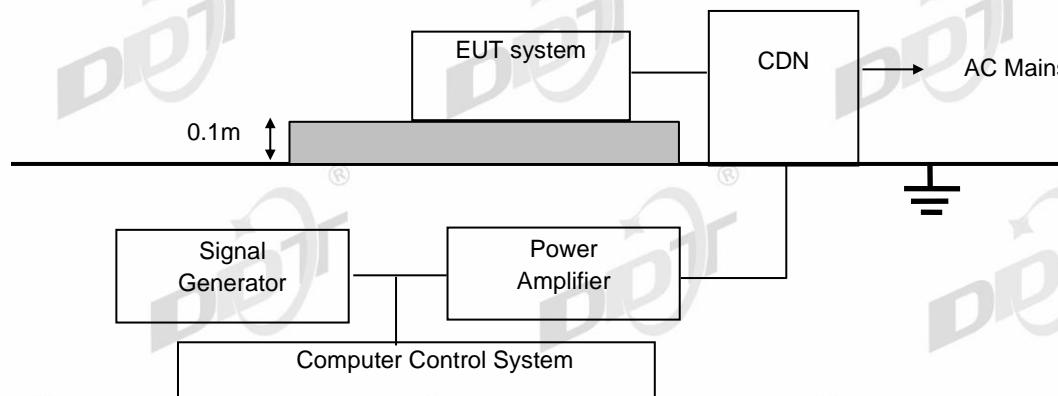
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal Generator	R&S	SMB100A	103231	Feb. 15, 2022	1 Year
CDN	TESEQ	CDN M016	28987	Feb. 16, 2022	1 Year
RF Power Amplifiers	AR	75A250A	0332892	Mar. 31, 2021	1 Year
Directional Coupler	AR	DC2600M2	0333399	Feb. 16, 2022	1 Year
Power Meter	R&S	NRVS	101785	Mar. 31, 2021	1 Year
Coaxial voltage measurement probe	R&S	URV5-Z4	100215	Mar. 31, 2021	1 Year
Audio Analyzer	R&S	UPV	101525	Feb. 15, 2022	1 Year
Test Software	R&S	EMC 32	Ver 10.28.0	N/A	N/A

13.3 Test and reference standards

IEC 61000-4-6:2013

BS EN 61000-4-6:2014

13.4 Block diagram of test setup



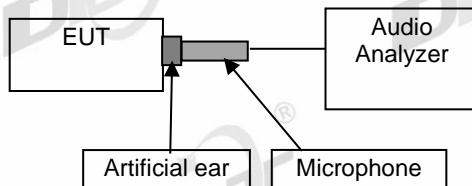
For audio output function (electrical measurement, direct connection to EUT)



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
	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 <input checked="" type="checkbox"/> 1kHz, <input type="checkbox"/> 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

Power supply: AC 230V/50Hz, AC 110V/60Hz						
Modulation Signal: <input checked="" type="checkbox"/> 1kHz <input type="checkbox"/> 400Hz <input checked="" type="checkbox"/> 80% AM <input type="checkbox"/> Other:						
Steps: <input checked="" type="checkbox"/> 1% <input type="checkbox"/> other: Dwell time: <input checked="" type="checkbox"/> 1s <input type="checkbox"/> 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: Audio output: electrical interference ratio= <u>-32.46 dB</u> ≤-20dB.						
Mode1:Speaker: Acoustic interference ratio= <u>-36.38 dB</u> ≤-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	Mar. 09, 2022	Test engineer	Make
Climate condition	Ambient temperature Atmospheric pressure	21.0±1°C 101.5±0.2kPa	Relative humidity 25±1%
Test place	Shield Room 3#		

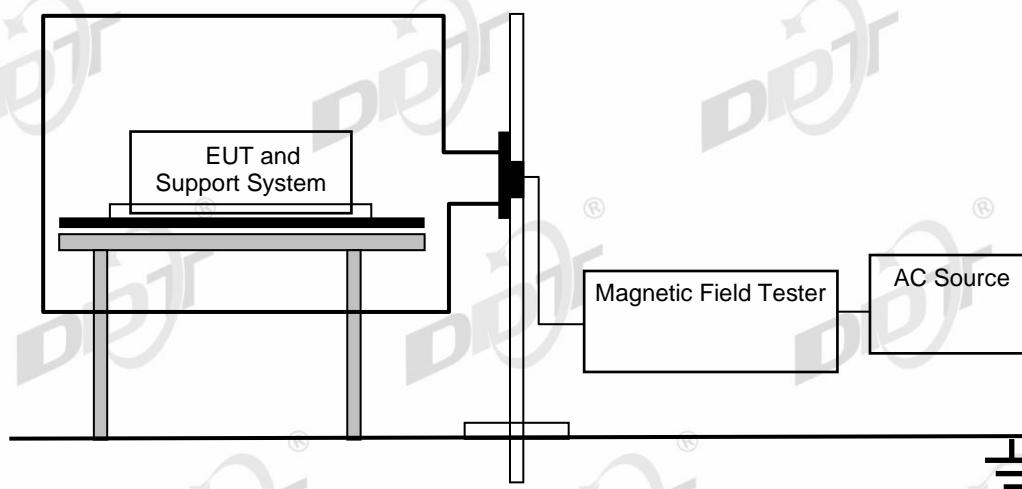
14.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Magnetic Field Coil	TESEQ	INA 702	199	Feb. 15, 2022	1 Year
Magnetic Field Option	TESEQ	MFO 6502	123	Feb. 15, 2022	1 Year
Multifunction Generator Systems	TESEQ	NSG 3060	1338	Feb. 15, 2022	1 Year
Coupling/Decoupling Networks	TESEQ	CDN 3061	1326	Feb. 15, 2022	1 Year

14.3 Test and reference standards

IEC 61000-4-8:2009
BS EN 61000-4-8:2010

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

Power supply: AC 230V/50Hz, AC 110V/60Hz						
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	Mar. 09, 2022	Test engineer	Make
Climate condition	Ambient temperature Atmospheric pressure	21.0±1°C 101.5±0.2kPa	Relative humidity 25±1%
Test place	Shield Room 3#		

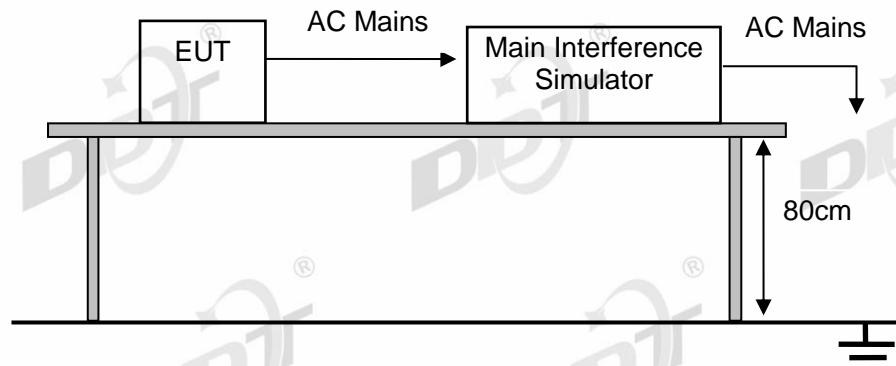
15.2 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Motorized single phase variac	TESEQ	VAR 3005-D16	094	Feb. 15, 2022	1 Year
Multifunction Generator Systems	TESEQ	NSG 3060	210	Feb. 15, 2022	1 Year
Coupling/Decoupling Networks	TESEQ	CDN 3061	210	Feb. 15, 2022	1 Year

15.3 Test and reference standards

IEC 61000-4-11:2004, IEC 61000-4-11:2004+A1:2017
BS EN 61000-4-11:2004+A1:2017

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

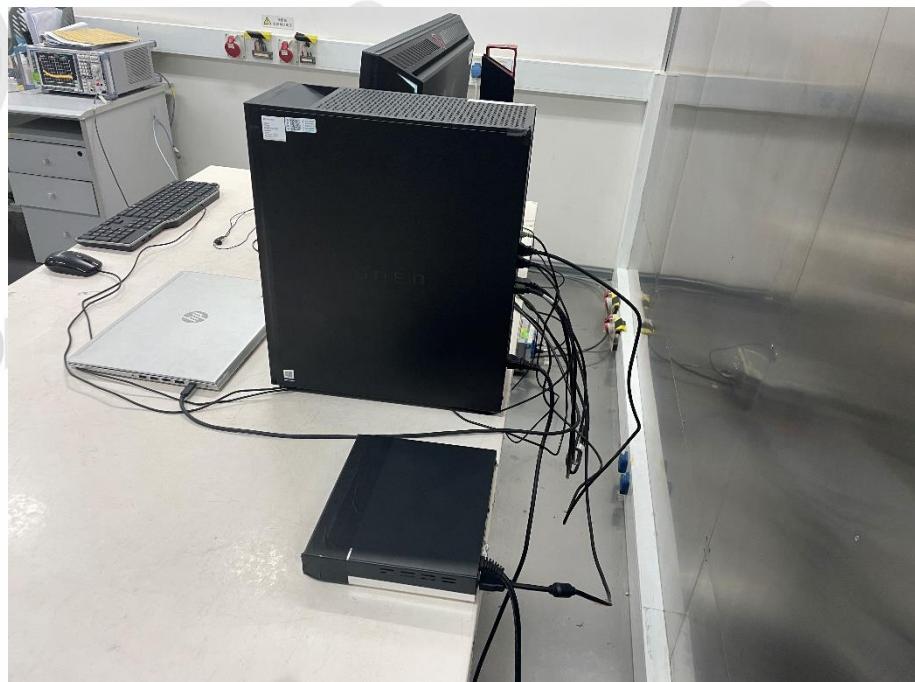
Observation Description:
 A: Operation as intend, no loss of function during test and after test.
 B: Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention

Annex A Test Setup Photos

A.1 Conducted emission (mains power port)



[Front]

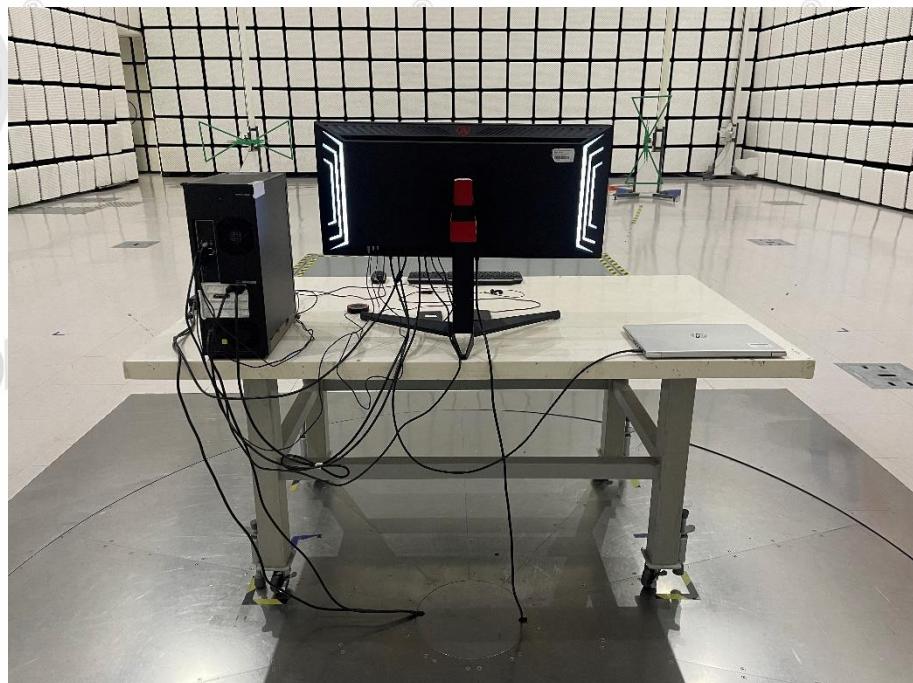


[Rear]

A.2 Radiated emission (Below 1 GHz)

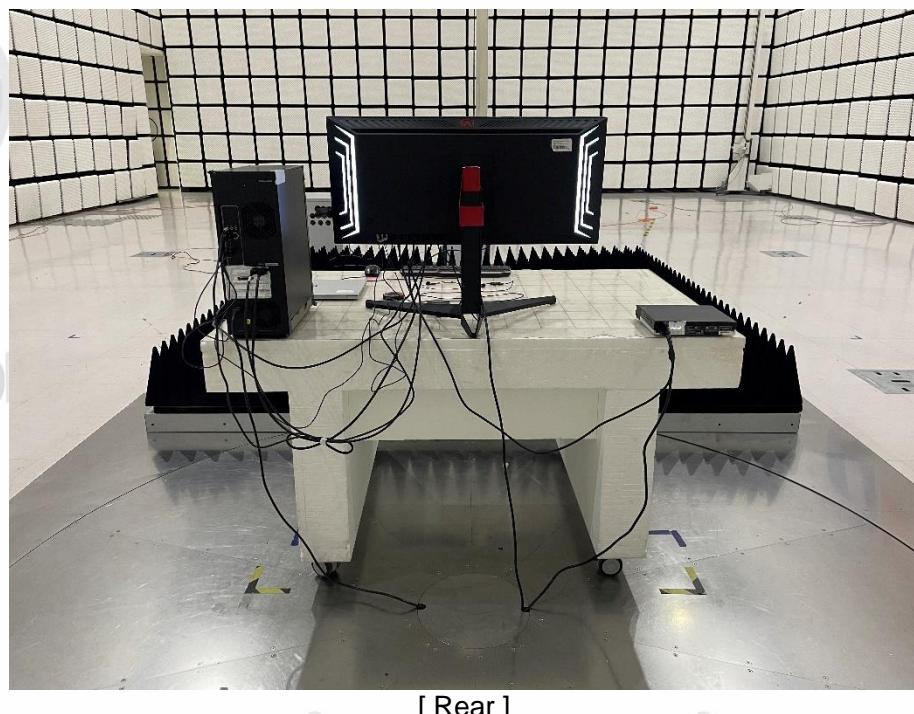
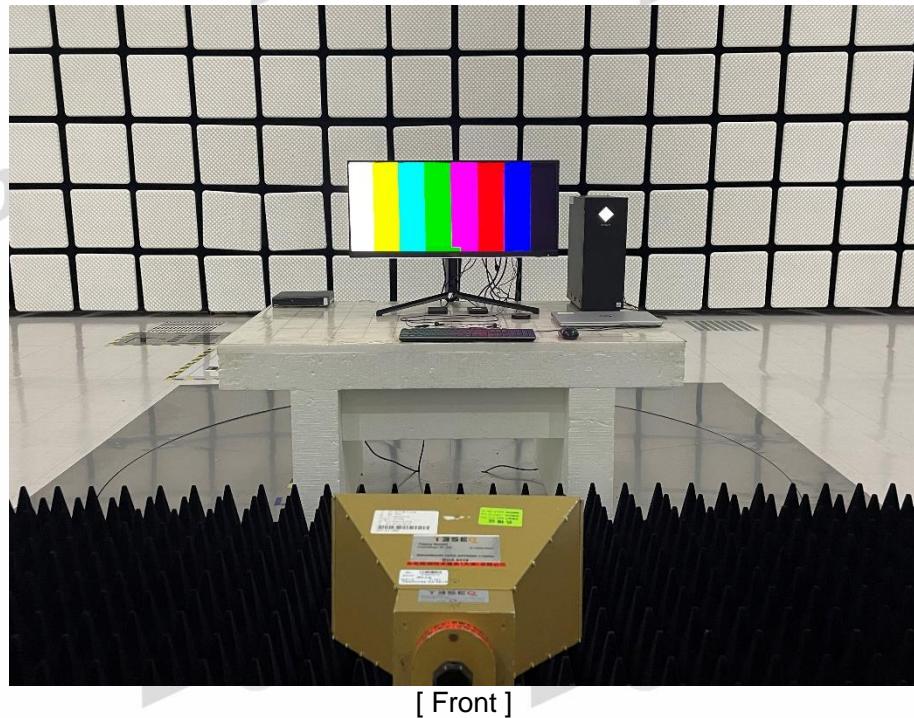


[Front]



[Rear]

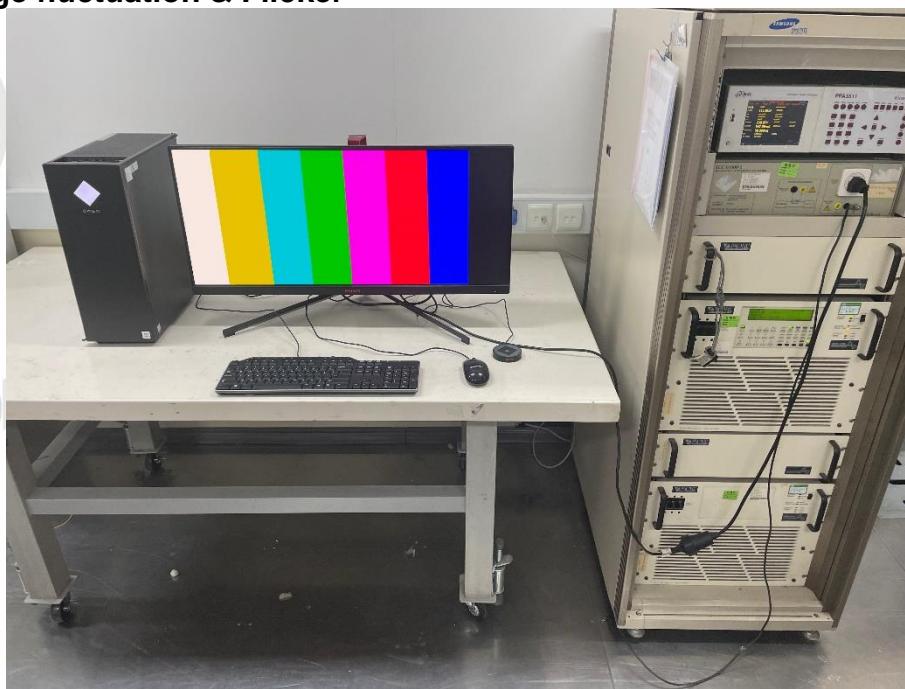
A.3 Radiated emission (Above 1 GHz)



A.4 Harmonic current



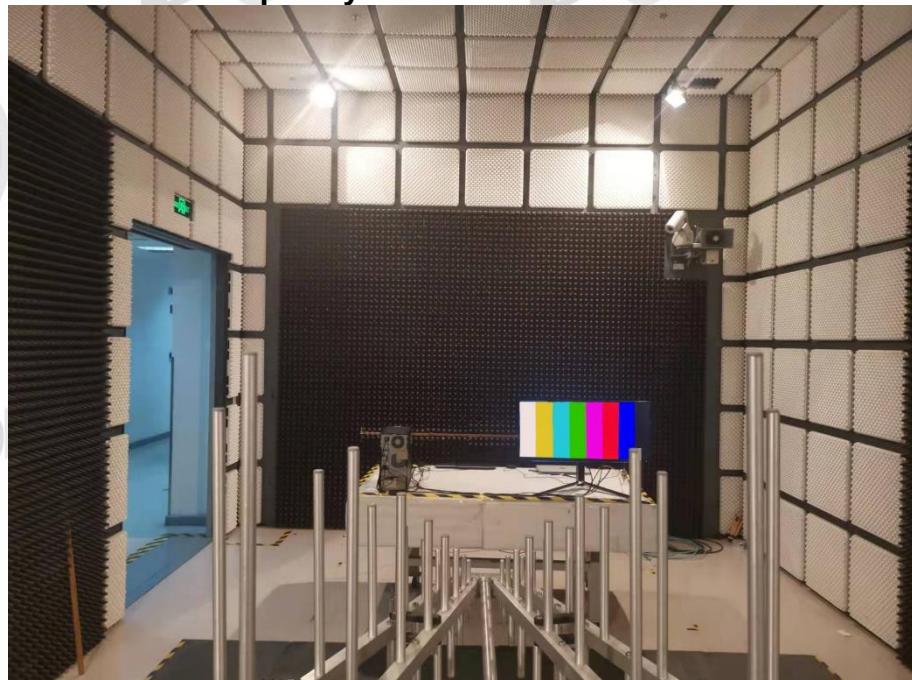
A.5 Voltage fluctuation & Flicker

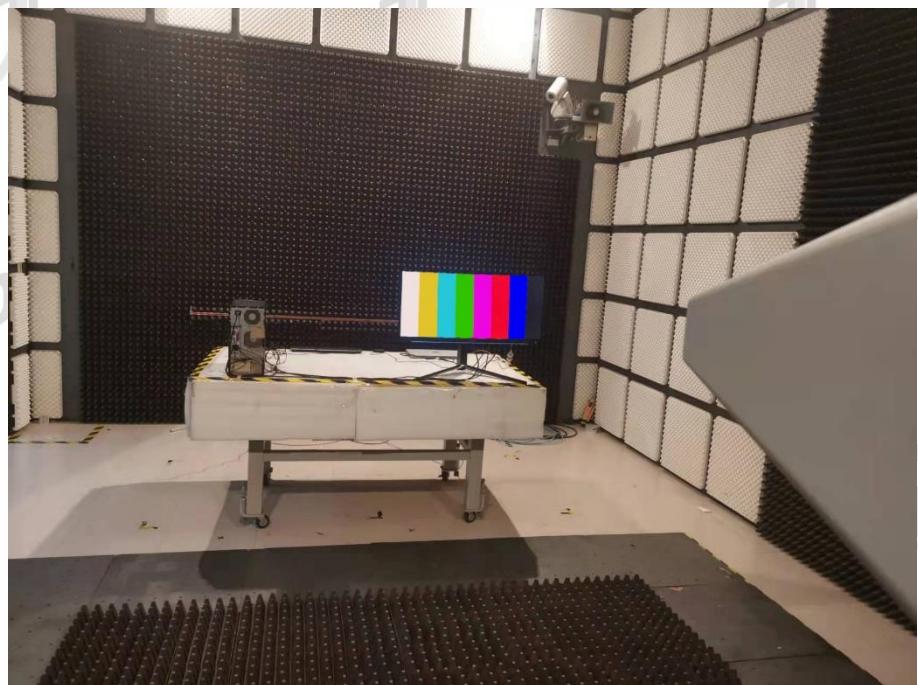


A.6 Electrostatic discharge test



A.7 Continuous Radio Frequency Disturbances





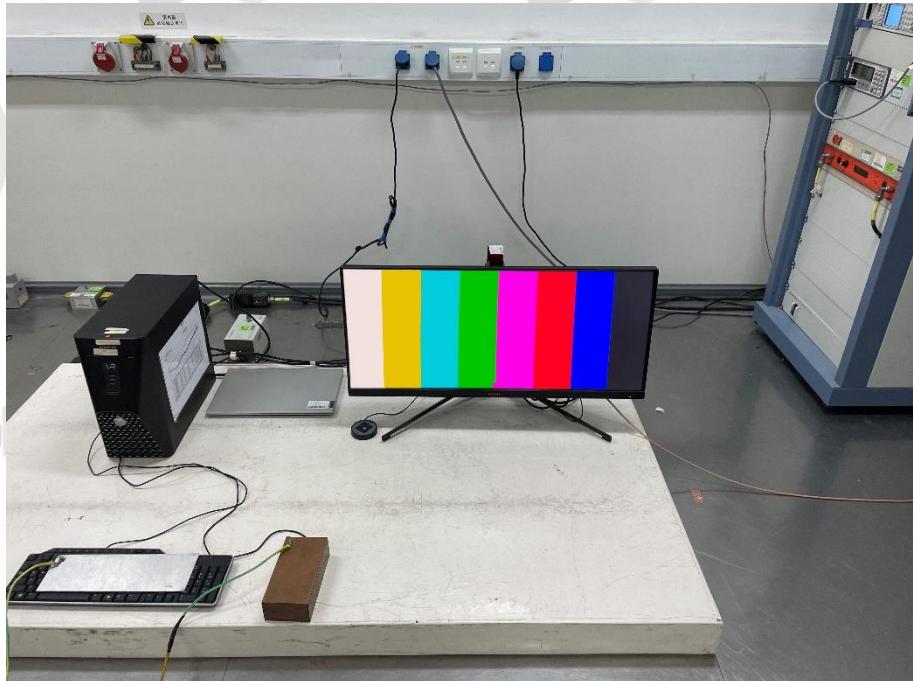
A.8 Electrical fast transients(EFT)



A.9 Surge



A.10 Continuous conducted disturbances



A.11 Power-frequency magnetic fields test



A.12 Voltage dips and interruptions



END OF REPORT