

# CE EMC Test Report

**Project No.** : 2003C002C  
**Equipment** : L2 Managed Switch  
**Brand Name** : Tenda  
**Test Model** : TEG3328F  
**Series Model** : N/A  
**Applicant** : SHENZHEN TENDA TECHNOLOGY CO.,LTD  
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**Date of Receipt** : Mar. 02, 2020  
Oct. 30, 2020  
**Date of Test** : Mar. 03, 2020 ~ Mar. 10, 2020  
**Issued Date** : Nov. 06, 2020  
**Report Version** : R00  
**Test Sample** : Engineering Sample No.: DG2020030247  
**Standard(s)** : EN 55032:2015+AC:2016  
EN 61000-3-2:2014  
EN 61000-3-3:2013+A1:2019  
EN 55035:2017

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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**Declaration**

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

**BTL's** reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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**BTL's** laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

**BTL** is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

**Limitation**

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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**REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Compared with original report (BTL-EMC-1-2003C002), 1. The product name and model name are changed. 2. The standard EN 61000-3-3 is updated to the latest. 3. The writing of EMS are updated. The above changes do not affect the test results. Other are kept the same.	Nov. 06, 2020

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Emission			
Standard(s)	Test Item		Result
EN 55032:2015+AC:2016	Radiated emissions up to 1 GHz		PASS
	Radiated emissions above 1 GHz		PASS
	Radiated emissions from FM receivers		N/A
	Conducted emissions AC mains power port		PASS
	Asymmetric mode conducted emissions	AAN	PASS
		Current Probe	N/A
		CP+CVP	N/A
Conducted differential voltage emissions		N/A	

Standard(s)	Test Item	Result
EN 61000-3-2:2014	Harmonic current	PASS
EN 61000-3-3:2013+A1:2019	Voltage fluctuations (Flicker)	PASS

Immunity			
Standard(s)	Ref Standard(s)	Test Item	Result
EN 55035:2017	IEC 61000-4-2:2008	ESD	PASS
	IEC 61000-4-3:2006+AMD1:2007+AMD2:2010	RS	PASS
	IEC 61000-4-4:2012	EFT	PASS
	IEC 61000-4-5:2014+AMD1:2017	Surge	PASS
	IEC 61000-4-6:2013	CS	PASS
	IEC 61000-4-8:2009	PFMF	PASS
	IEC 61000-4-11:2004+AMD1:2017	Dips	PASS

Standard(s)	Section	Test Item	Result
EN 55035:2017	4.2.7	BIN-R	N/A
	4.2.7	BIN-I	N/A

NOTE:

- (1) "N/A" denotes test is not applicable to this device.

### 1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

### 1.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2, The BTL measurement uncertainty is less than the CISPR 16-4-2  $U_{\text{cispr}}$  requirement.

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately **95%**.

#### A. Radiated emissions up to 1 GHz measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB08 (10m)	CISPR	30MHz ~ 200MHz	V	4.44
		30MHz ~ 200MHz	H	3.44
		200MHz ~ 1,000MHz	V	4.28
		200MHz ~ 1,000MHz	H	3.52

#### B. Radiated emissions above 1 GHz measurement:

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB08 (3m)	CISPR	1GHz ~ 6GHz	4.36

#### C. Conducted emissions AC mains power port measurement:

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-C01	CISPR	150kHz ~ 30MHz	2.90

#### D. Asymmetric mode conducted emissions measurement:

Test Site	Method	Test Item	U,(dB)
DG-C01	CISPR	AAN Cat.5 LCL = 65 ... 50 dB	4.06

#### E. Harmonic current / Voltage fluctuations (Flicker) measurement:

Test Site	Method	Item	U (%)
DG-C01	EN 61000-3-2	Current	0.593
	EN 61000-3-3	Voltage	0.595

## F. Immunity Measurement:

Test Site	Method	Item	U
DG-SR02	IEC 61000-4-2	Rise time tr	6.80%
		Peak current Ip	6.30%
		Current at 30 ns	6.50%
		Current at 60 ns	6.90%
DG-CB05	IEC 61000-4-3	Electromagnetic field immunity test	2.38dB
DG-SR05	IEC 61000-4-4	Peak voltage (V <sub>P</sub> )	3.7%
		Rise time (tr)	4.4%
		Pulse width(tw)	4.1%
		Pulse Freq.(kHz)	0.8%
		Burst Duration(ms)	1.4%
		Burst Period(ms)	1.4%
		Peak voltage (V <sub>P</sub> )-with clamp	3.7%
		Rise time (tr) -with clamp	5.0%
		Pulse width(tw) -with clamp	4.8%
DG-SR05/ DG-SR01	IEC 61000-4-5	Open-Circuit Output Voltage (1.2/50us)	3.8%
		Open circuit front time (1.2/50us)	6.3%
		Open circuit time of half value (1.2/50us)	4.6%
		Open-Circuit Output Voltage (10/700us)	3.8%
		Open circuit front time (10/700us)	5.9%
		Open circuit time of half value (10/700us)	4.7%
DG-CB06	IEC 61000-4-6	CDN	1.32dB
		EM clamp	3.16dB
DG-SR05	IEC 61000-4-8	Magnetic Field Level	3.787 %
DG-SR05	IEC 61000-4-11	DIP Amplitude	0.5%
		DIP Time Event	3%

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

### 1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Tested By
Radiated emissions up to 1 GHz	25°C	60%	Promise Yin
Radiated emissions above 1 GHz	25°C	60%	Promise Yin
Conducted emissions AC mains power port	25°C	53%	Bang Liang
Asymmetric mode conducted emissions	25°C	53%	Bang Liang
Harmonic current	25°C	55%	Bang Liang
Voltage fluctuations (Flicker)	25°C	55%	Bang Liang

Test Item	Temperature	Humidity	Pressure	Tested By
ESD	23°C	42%	1012hPa	Maggie Peng
RS	23°C	49%	/	Hunter Xu
EFT	23°C	42%	/	Maggie Peng
Surge	23°C	48%	/	Maggie Peng
CS	23°C	50%	/	Daniel Li
PFMF	23°C	48%	/	Maggie Peng
Dips	23°C	46%	/	Maggie Peng

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	L2 Managed Switch
Brand Name	Tenda
Test Model	TEG3328F
Series Model	N/A
Model Difference(s)	N/A
Power Source	AC Mains.
Power Rating	100-240V~ 50/60Hz 0.7A
Connecting I/O Port(s)	1* AC port 4* Fiber port 24* LAN port 1* Console port
Classification of EUT	Class A
Highest Internal Frequency(Fx)	125MHz

**Note:**

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

## 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	FULL SYSTEM
Mode 2	LAN1 Port 1Gbps
Mode 3	LAN1 Port 10Mbps

Radiated emissions up to 1 GHz test	
Final Test Mode	Description
Mode 1	FULL SYSTEM

Radiated emissions Above 1 GHz test	
Final Test Mode	Description
Mode 1	FULL SYSTEM

Conducted emissions AC mains power port test	
Final Test Mode	Description
Mode 1	FULL SYSTEM

Asymmetric mode conducted emissions test	
Final Test Mode	Description
Mode 2	LAN1 Port 1Gbps
Mode 3	LAN1 Port 10Mbps

Harmonic current & Voltage fluctuations (Flicker) Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM

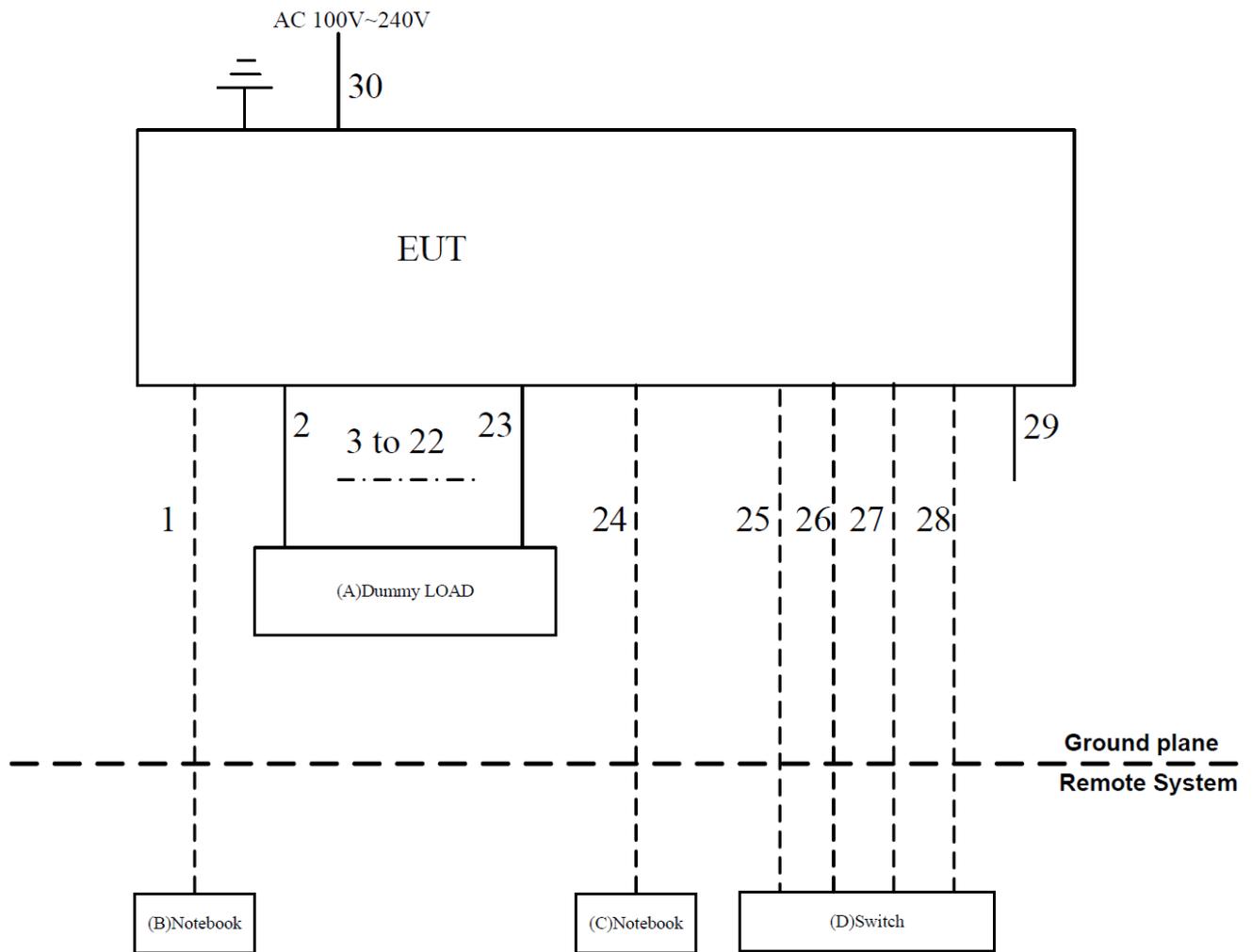
For Immunity Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM

### 2.3 EUT OPERATING CONDITIONS

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use. The standard test signals and output signal as following:

1. EUT connected to Notebook (B&C) via RJ45 Cable.
2. EUT connected to Dummy LOAD via RJ45 Cable (22pcs).
3. EUT connected to Switch via Fiber Cable.

### 2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



## 2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
A	Dummy LOAD	N/A	N/A	N/A
B	Notebook	Lenovo	E445	MP-05Y3X6
C	Notebook	Lenovo	E46L	EB22953770
D	Switch	RUIJIE	RG-S2910-24GT4SFP-UP-H	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	RJ45 Cable	NO	NO	10m
2-23	RJ45 Cable(22pcs)	NO	NO	1m
24	RJ45 Cable	NO	NO	10m
25	Fiber Cable	NO	NO	10m
26	Fiber Cable	NO	NO	10m
27	Fiber Cable	NO	NO	10m
28	Fiber Cable	NO	NO	10m
29	Console Cable	YES	NO	1.5m
30	AC Cable	NO	NO	1.8m

### 3. EMC EMISSION TEST

#### 3.1 RADIATED EMISSIONS UP TO 1 GHZ

##### 3.1.1 LIMITS

Class A equipment up to 1 GHz

Frequency Range MHz	Measurement			Class A limits dB( $\mu$ V/m)
	Facility	Distance m	Detector type/ bandwidth	
30 - 230	SAC	10	Quasi peak / 120 kHz	40
230 - 1000				47

Notes:

- (1) The limit for radiated test was performed according to as following: EN 55032
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dB $\mu$ V/m)=20log Emission level ( $\mu$ V/m).
- (4) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)  
 Margin Level = Measurement Value - Limit Value

##### 3.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Receiver	Keysight	N9038A	MY54450004	Aug. 03, 2020
2	MXE EMI Receiver	Agilent	N9038A	MY53220133	Feb. 28, 2021
3	Pre-Amplifier	EMC INSTRUMENT	EMC 9135	980284	Mar. 01, 2021
4	Pre-Amplifier	EMC INSTRUMENT	EMC 9135	980283	Mar. 01, 2021
5	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	946	Oct. 26, 2020
6	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	947	Dec. 02, 2020
7	Cable	emci	LMR-400(5m+1 1m+15m)	N/A	Nov. 22, 2020
8	Cable	emci	LMR-400(5m+8 m+8m)	N/A	Nov. 22, 2020
9	Measurement Software	Farad	EZ-EMC Ver.BTL-2ANT-1	N/A	N/A
10	Multi-Device Controller	ETS-Lindgren	2090	N/A	N/A
11	Attenuator	EMCI	EMCI-N-6-06	N0670	Dec. 02, 2020
12	Attenuator	EMCI	EMCI-N-6-06	N0671	Oct. 26, 2020

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.

All calibration period of equipment list is one year.

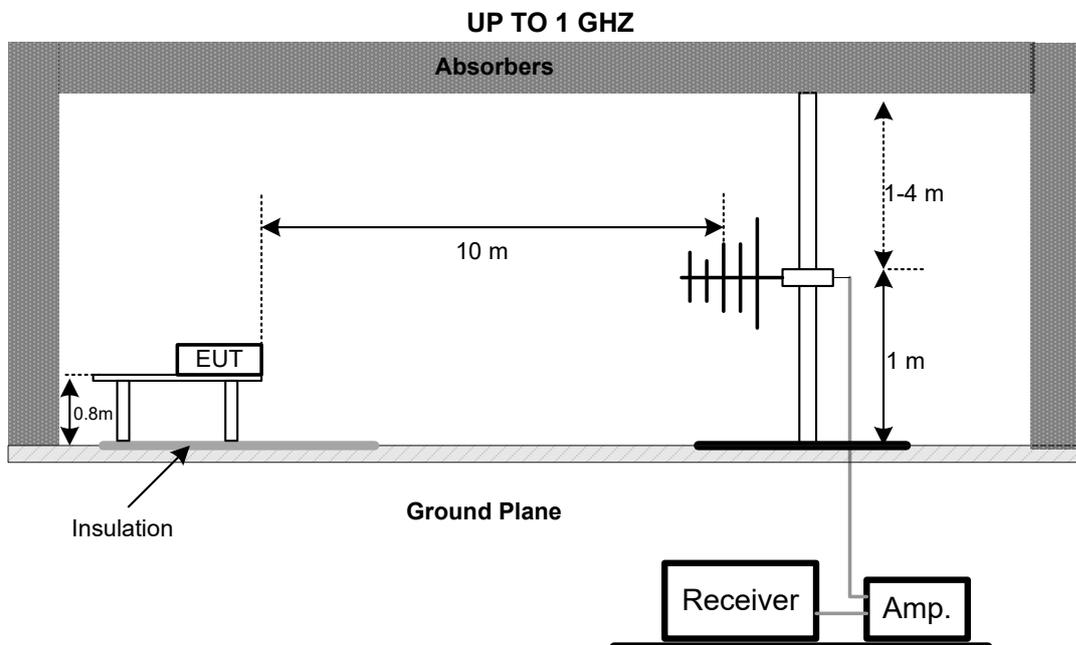
### 3.1.3 TEST PROCEDURE

- The measuring distance of 10 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- For the actual test configuration, please refer to the related Item - Block Diagram of system tested.

### 3.1.4 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.5 TEST SETUP



### 3.1.6 MEASUREMENT DISTANCE

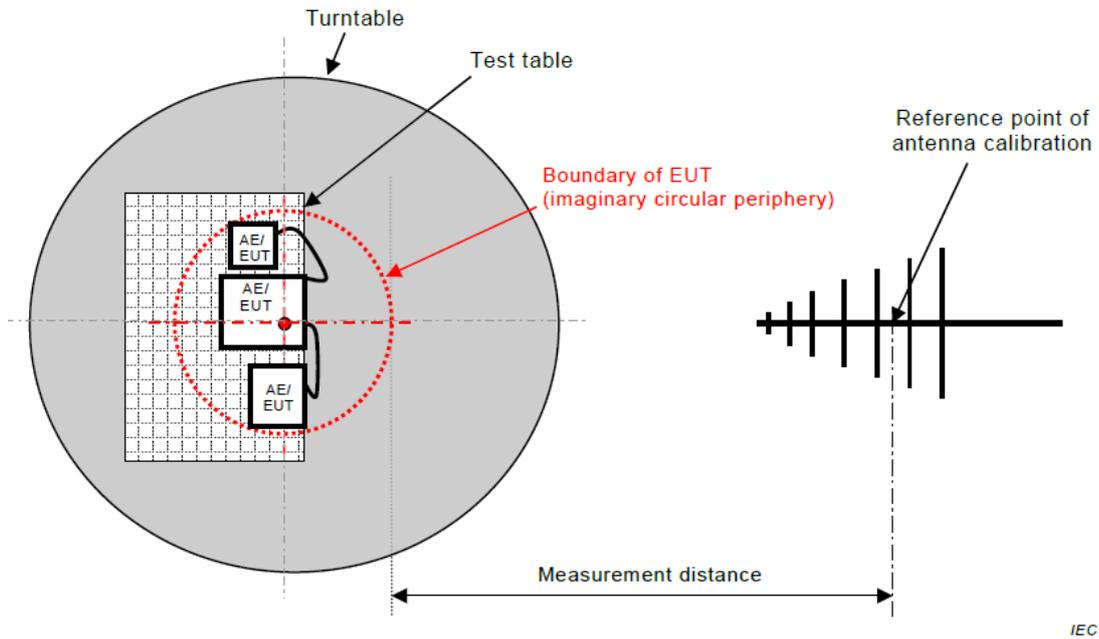


Figure C.1 – Measurement distance

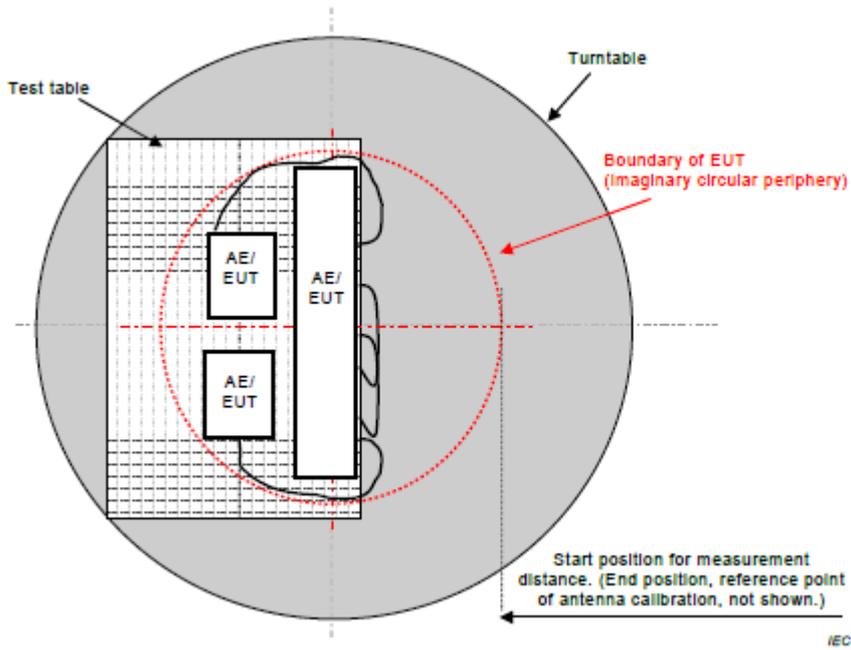
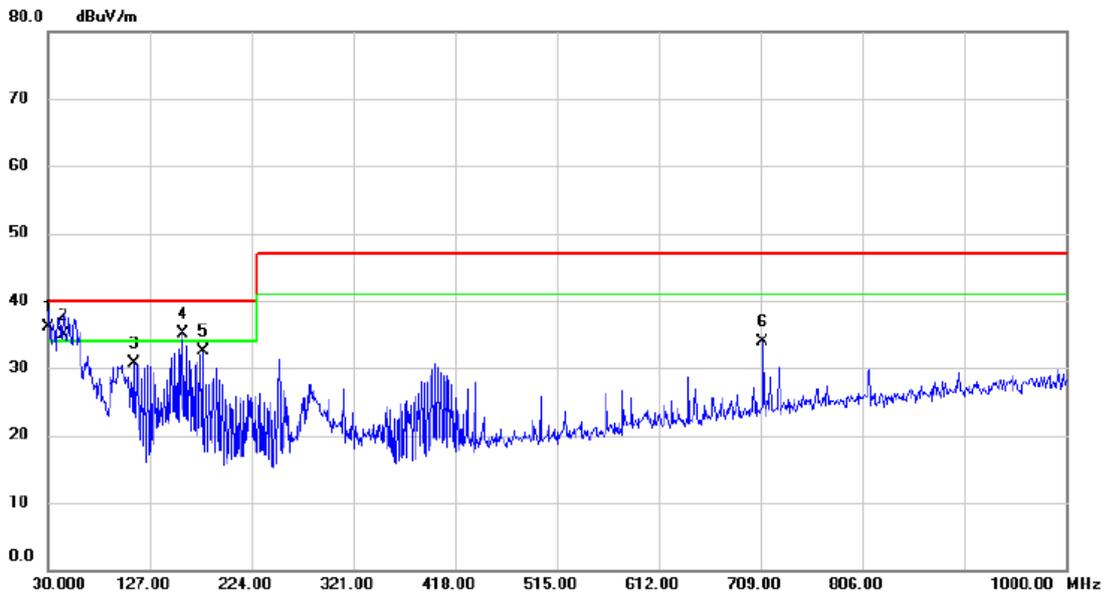


Figure C.2 – Boundary of EUT, Local AE and associated cabling

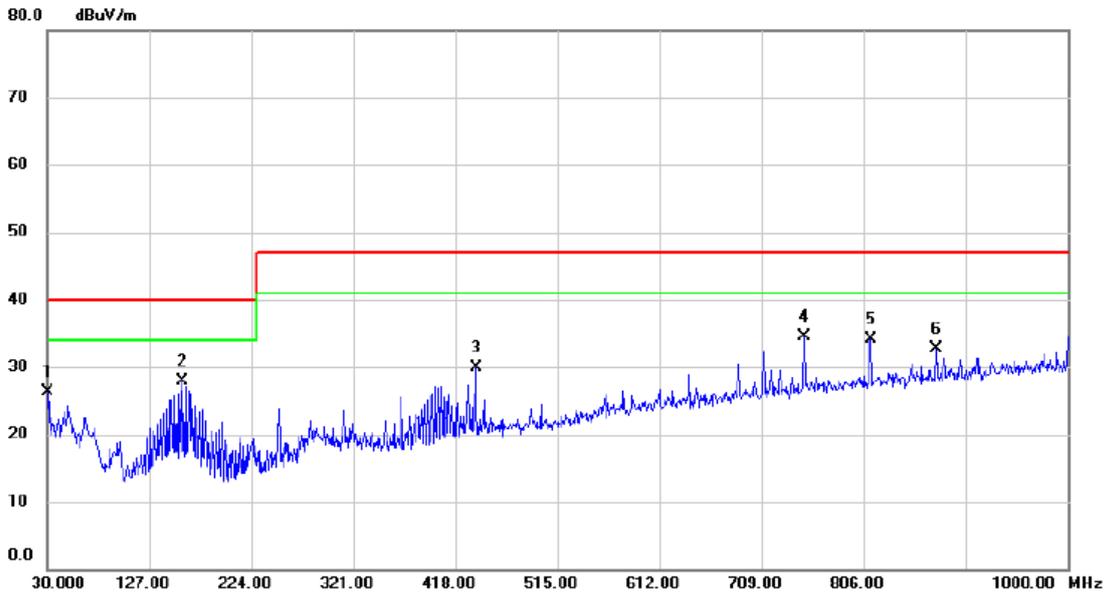
### 3.1.7 TEST RESULTS

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 1		



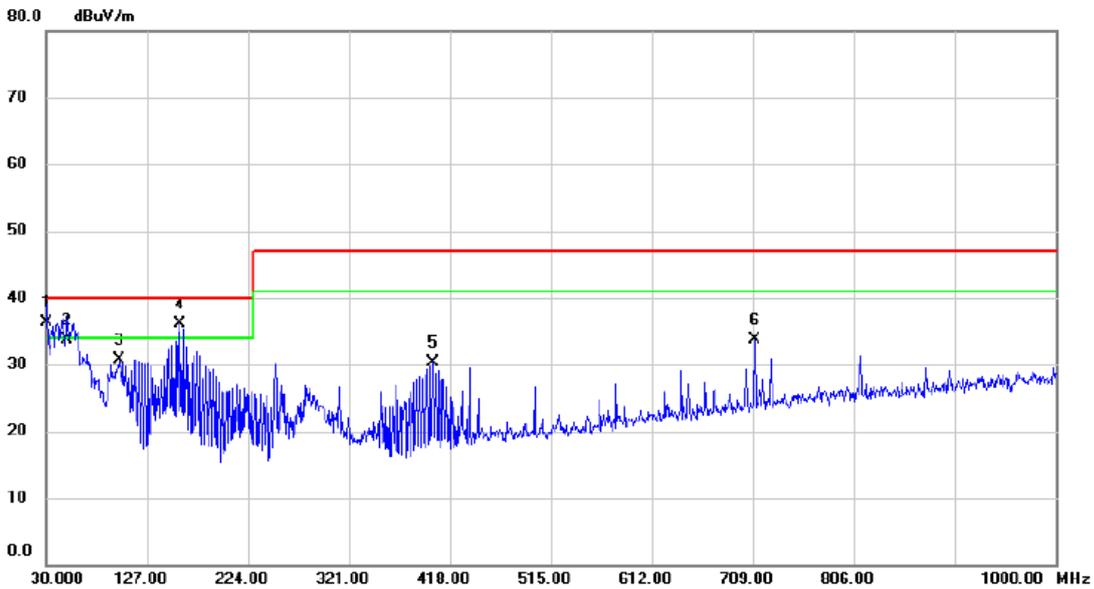
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	30.0000	54.99	-18.82	36.17	40.00	-3.83	QP	
2	!	44.5500	51.77	-16.95	34.82	40.00	-5.18	QP	
3		111.4800	50.06	-19.34	30.72	40.00	-9.28	QP	
4	!	159.0100	50.78	-15.74	35.04	40.00	-4.96	QP	
5		177.4400	49.18	-16.69	32.49	40.00	-7.51	QP	
6		710.9400	39.96	-6.14	33.82	47.00	-13.18	QP	

Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 1		



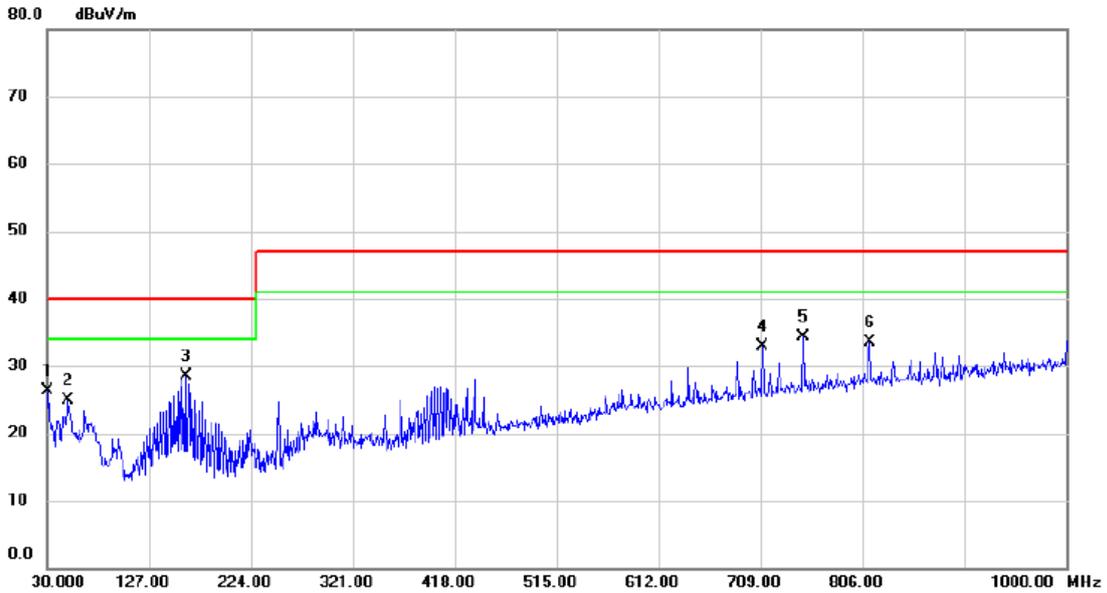
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		30.9700	44.53	-18.19	26.34	40.00	-13.66	QP	
2	*	159.0100	43.41	-15.55	27.86	40.00	-12.14	QP	
3		437.4000	41.00	-11.13	29.87	47.00	-17.13	QP	
4		749.7400	39.48	-4.90	34.58	47.00	-12.42	QP	
5		812.7900	38.45	-4.26	34.19	47.00	-12.81	QP	
6		874.8700	36.12	-3.48	32.64	47.00	-14.36	QP	

Test Voltage	AC 110V/60Hz	Polarization	Vertical
Test Mode	Mode 1		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	30.0000	55.03	-18.82	36.21	40.00	-3.79	QP	
2		50.3700	50.52	-16.73	33.79	40.00	-6.21	QP	
3		100.8100	51.35	-20.58	30.77	40.00	-9.23	QP	
4	!	159.0100	51.75	-15.74	36.01	40.00	-3.99	QP	
5		401.5100	42.79	-12.39	30.40	47.00	-16.60	QP	
6		710.9400	39.78	-6.14	33.64	47.00	-13.36	QP	

Test Voltage	AC 110V/60Hz	Polarization	Horizontal
Test Mode	Mode 1		



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	30.9700	44.53	-18.19	26.34	40.00	-13.66	QP	
2	50.3700	41.37	-16.55	24.82	40.00	-15.18	QP	
3 *	161.9200	44.16	-15.62	28.54	40.00	-11.46	QP	
4	710.9400	38.59	-5.61	32.98	47.00	-14.02	QP	
5	749.7400	39.15	-4.90	34.25	47.00	-12.75	QP	
6	812.7900	37.84	-4.26	33.58	47.00	-13.42	QP	

### 3.2 RADIATED EMISSIONS ABOVE 1 GHZ

#### 3.2.1 LIMITS

Class A equipment above 1 GHz

Frequency Range MHz	Measurement			Class A limits dB( $\mu$ V/m)
	Facility	Distance m	Detector type/bandwidth	
1000 - 3000	FSOATS	3	Average / 1 MHz	56
3000 - 6000				60
1000 - 3000			Peak / 1 MHz	76
3000 - 6000				80

Notes:

- (1) The limit for radiated test was performed according to as following: EN 55032
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)  
 Margin Level = Measurement Value - Limit Value

Required highest frequency for radiated measurement

Highest internal frequency ( $F_x$ )	Highest measured frequency
$F_x \leq 108$ MHz	1 GHz
$108 < F_x \leq 500$ MHz	2 GHz
$500 < F_x \leq 1000$ MHz	5 GHz
$F_x > 1$ GHz	5 x $F_x$ up to a maximum of 6 GHz

### 3.2.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Horn Antenna	EMCO	3115	9605-4803	Mar. 23, 2020
2	Amplifier	Agilent	8449B	3008A02333	Mar. 01, 2021
3	MXE EMI Receiver	Agilent	N9038A	MY53220133	Feb. 28, 2021
4	Measurement Software	Farad	EZ-EMC Ver.BTL-2ANT-1	N/A	N/A
5	Multi-Device Controller	ETS-Lindgren	2090	N/A	N/A
6	Controller	MF	MF-7802	MF780208159	N/A
7	Cable	Micable Inc.	B10-01-01-5M	18047123	Feb. 28, 2021
8	Cable	Micable Inc.	B10-01-01-12M	18072743	Feb. 28, 2021
9	Cable	RegalWay	RWLPS50-7.9A-SMSM-1M	20200102 001	Feb. 28, 2021

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.

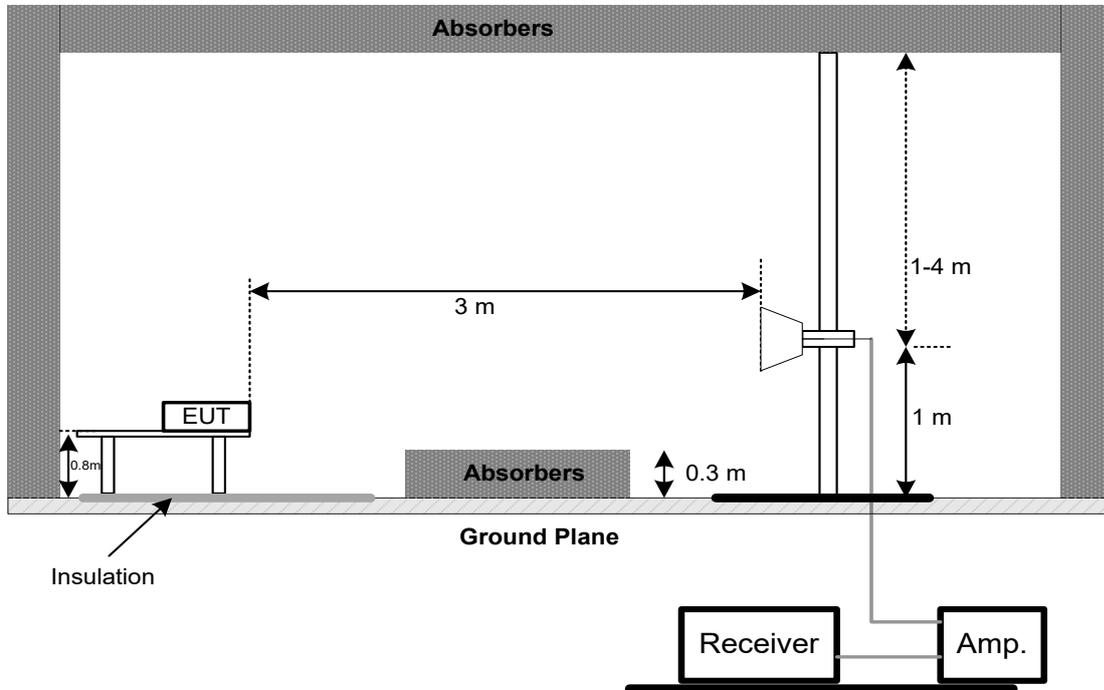
All calibration period of equipment list is one year.

### 3.2.3 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- d. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform.
- e. For the actual test configuration, please refer to the related Item - Block Diagram of system tested.

### 3.2.4 DEVIATION FROM TEST STANDARD

No deviation

**3.2.5 TEST SETUP****ABOVE 1 GHZ**

### 3.2.6 MEASUREMENT DISTANCE

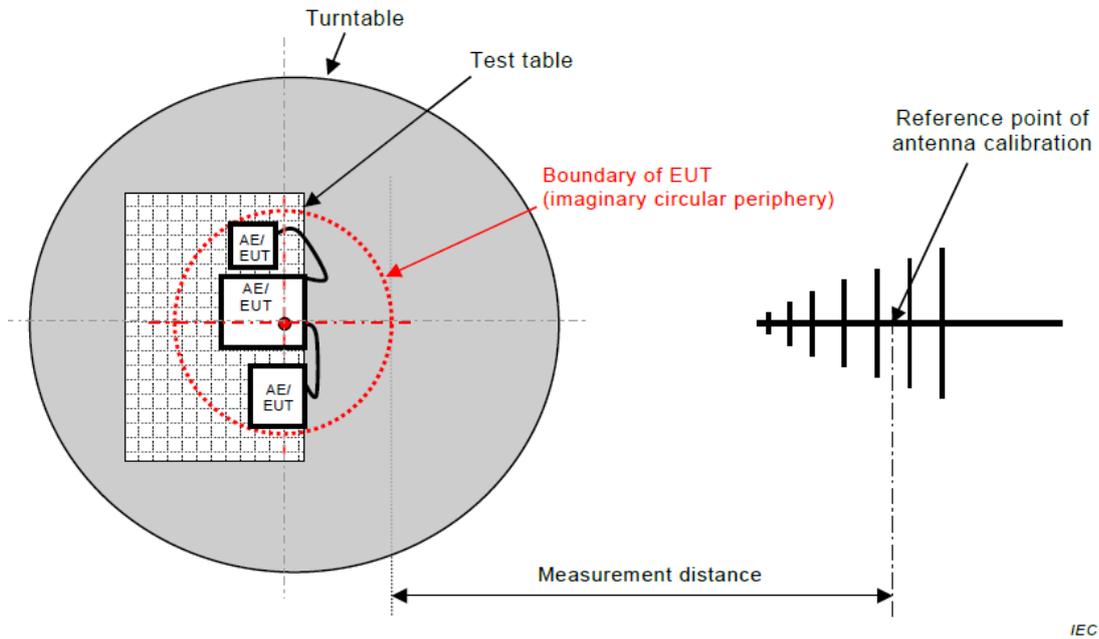


Figure C.1 – Measurement distance

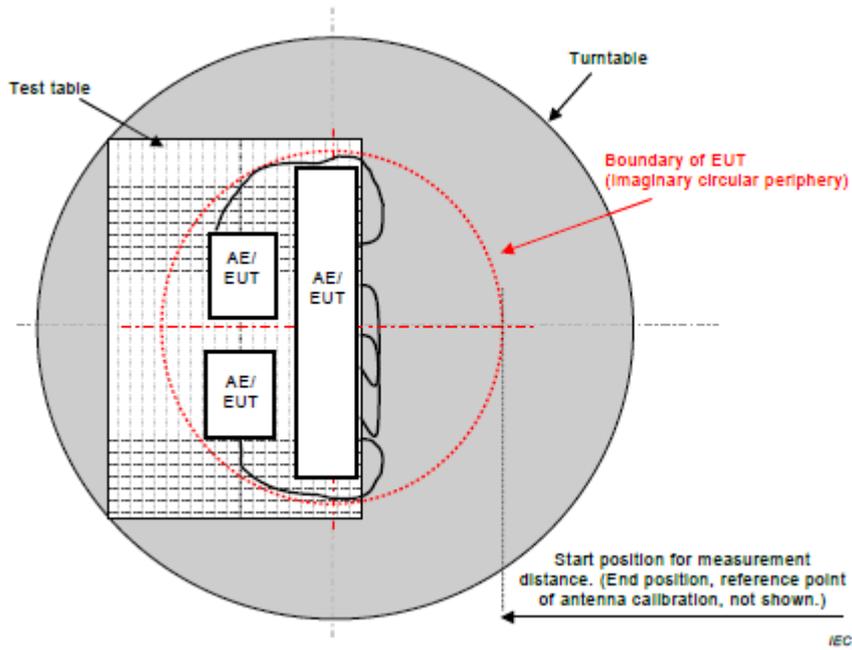
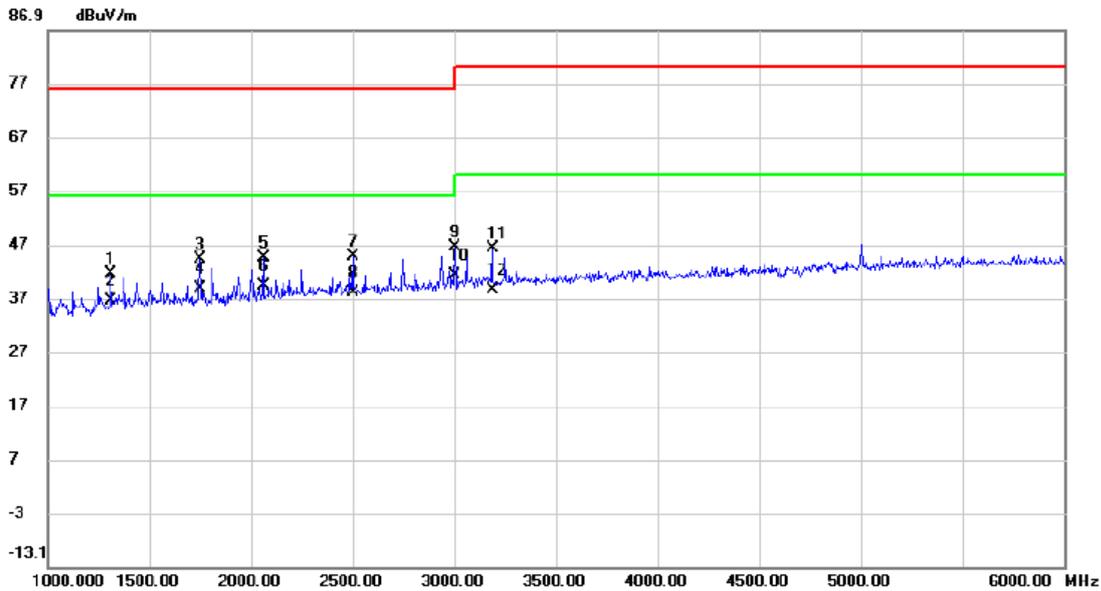


Figure C.2 – Boundary of EUT, Local AE and associated cabling

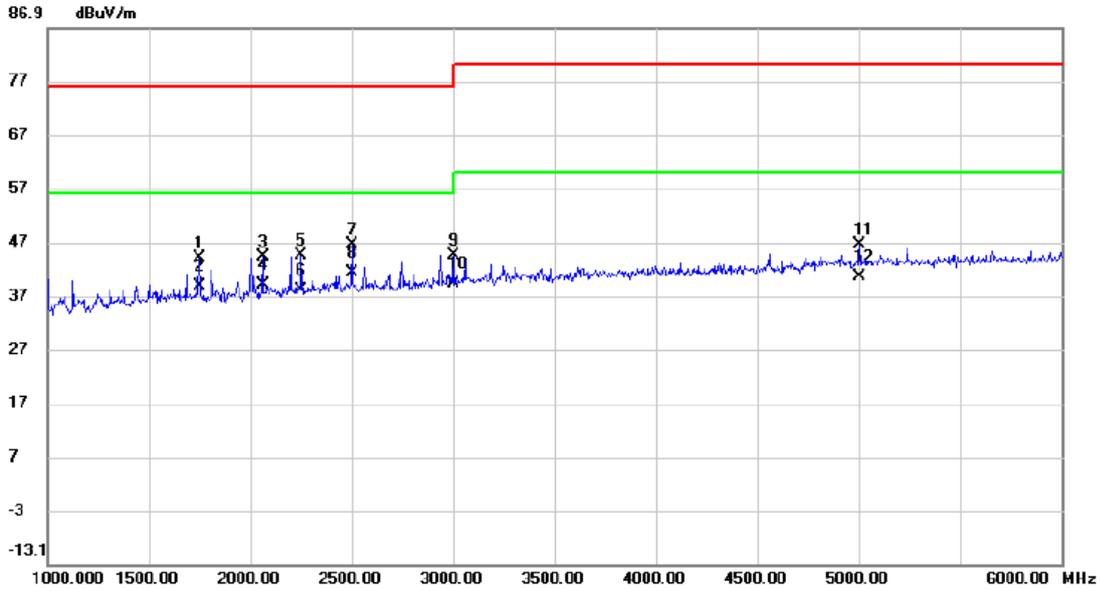
### 3.2.7 TEST RESULTS

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 1		



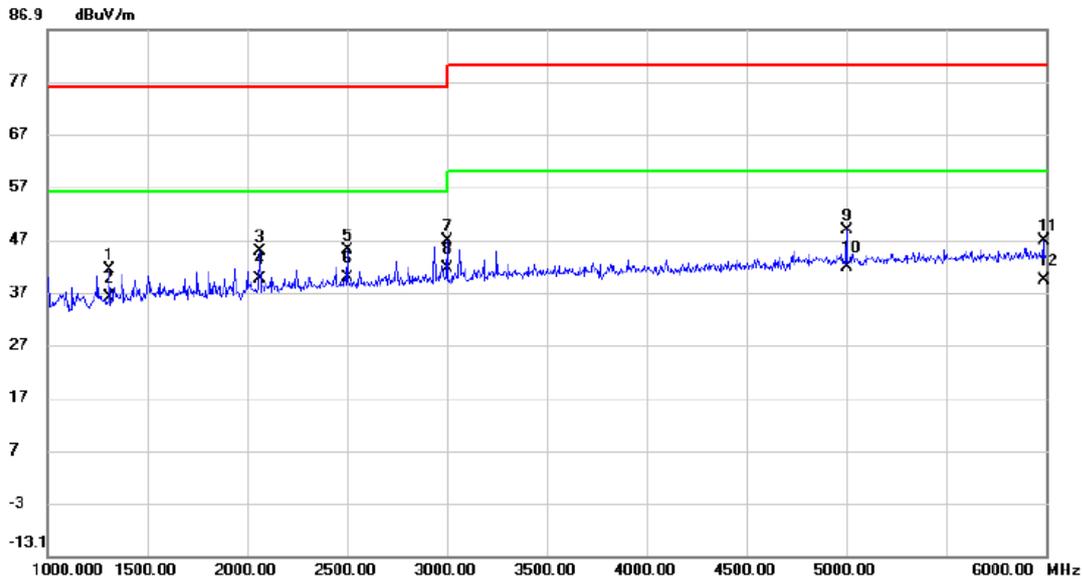
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1312.500	46.61	-4.99	41.62	76.00	-34.38	peak	
2		1312.500	41.56	-4.99	36.57	56.00	-19.43	AVG	
3		1750.000	47.10	-2.90	44.20	76.00	-31.80	peak	
4		1750.000	41.70	-2.90	38.80	56.00	-17.20	AVG	
5		2062.500	46.37	-1.81	44.56	76.00	-31.44	peak	
6		2062.500	41.08	-1.81	39.27	56.00	-16.73	AVG	
7		2500.000	44.84	-0.13	44.71	76.00	-31.29	peak	
8		2500.000	38.24	-0.13	38.11	56.00	-17.89	AVG	
9		3000.000	45.33	1.26	46.59	76.00	-29.41	peak	
10	*	3000.000	40.05	1.26	41.31	56.00	-14.69	AVG	
11		3187.500	44.36	1.88	46.24	80.00	-33.76	peak	
12		3187.500	36.58	1.88	38.46	60.00	-21.54	AVG	

Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 1		



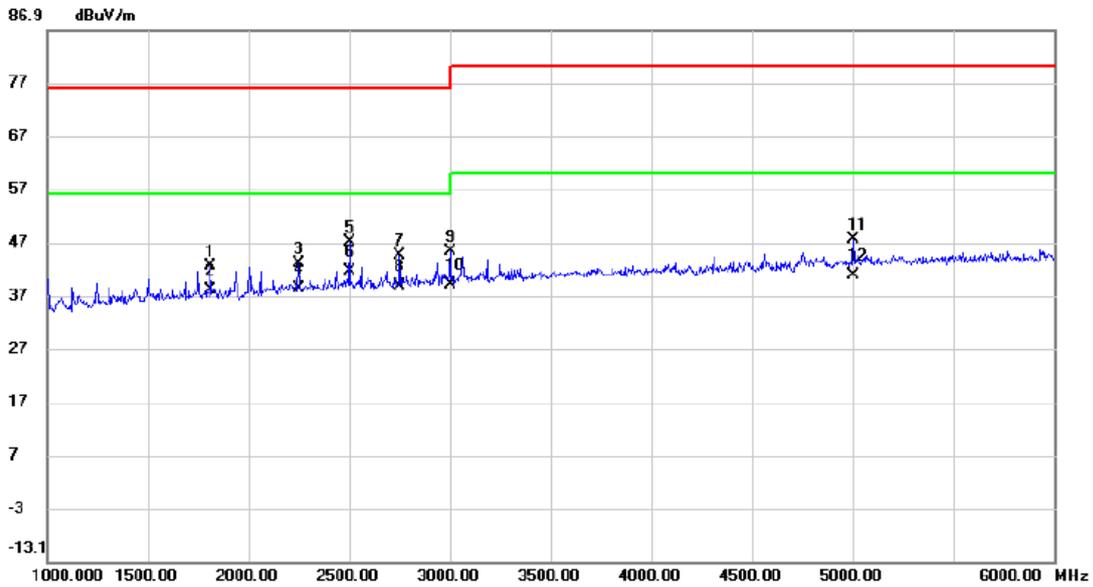
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1750.000	46.84	-2.90	43.94	76.00	-32.06	peak	
2		1750.000	41.72	-2.90	38.82	56.00	-17.18	AVG	
3		2062.500	46.15	-1.81	44.34	76.00	-31.66	peak	
4		2062.500	40.83	-1.81	39.02	56.00	-16.98	AVG	
5		2250.000	45.68	-1.09	44.59	76.00	-31.41	peak	
6		2250.000	39.21	-1.09	38.12	56.00	-17.88	AVG	
7		2500.000	46.72	-0.13	46.59	76.00	-29.41	peak	
8	*	2500.000	41.40	-0.13	41.27	56.00	-14.73	AVG	
9		3000.000	43.37	1.26	44.63	76.00	-31.37	peak	
10		3000.000	38.02	1.26	39.28	56.00	-16.72	AVG	
11		5000.000	39.41	7.17	46.58	80.00	-33.42	peak	
12		5000.000	33.42	7.17	40.59	60.00	-19.41	AVG	

Test Voltage	AC 110V/60Hz	Polarization	Vertical
Test Mode	Mode 1		



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	1312.500	46.29	-4.99	41.30	76.00	-34.70	peak	
2	1312.500	41.05	-4.99	36.06	56.00	-19.94	AVG	
3	2062.500	46.55	-1.81	44.74	76.00	-31.26	peak	
4	2062.500	41.38	-1.81	39.57	56.00	-16.43	AVG	
5	2500.000	45.25	-0.13	45.12	76.00	-30.88	peak	
6	2500.000	39.85	-0.13	39.72	56.00	-16.28	AVG	
7	3000.000	45.62	1.26	46.88	76.00	-29.12	peak	
8 *	3000.000	40.36	1.26	41.62	56.00	-14.38	AVG	
9	5000.000	41.53	7.17	48.70	80.00	-31.30	peak	
10	5000.000	34.65	7.17	41.82	60.00	-18.18	AVG	
11	5987.500	37.92	8.96	46.88	80.00	-33.12	peak	
12	5987.500	30.20	8.96	39.16	60.00	-20.84	AVG	

Test Voltage	AC 110V/60Hz	Polarization	Horizontal
Test Mode	Mode 1		



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	1812.500	45.16	-2.68	42.48	76.00	-33.52	peak	
2	1812.500	40.68	-2.68	38.00	56.00	-18.00	AVG	
3	2250.000	44.06	-1.09	42.97	76.00	-33.03	peak	
4	2250.000	39.35	-1.09	38.26	56.00	-17.74	AVG	
5	2500.000	47.16	-0.13	47.03	76.00	-28.97	peak	
6 *	2500.000	41.58	-0.13	41.45	56.00	-14.55	AVG	
7	2750.000	44.05	0.57	44.62	76.00	-31.38	peak	
8	2750.000	38.21	0.57	38.78	56.00	-17.22	AVG	
9	3000.000	44.01	1.26	45.27	76.00	-30.73	peak	
10	3000.000	37.65	1.26	38.91	56.00	-17.09	AVG	
11	5000.000	40.28	7.17	47.45	80.00	-32.55	peak	
12	5000.000	33.51	7.17	40.68	60.00	-19.32	AVG	

### 3.3 CONDUCTED EMISSION MEASUREMENT AT AC MAINS POWER PORTS

#### 3.3.1 LIMITS

Requirements for conducted emissions from AC mains power ports of Class A equipment

Frequency Range MHz	Coupling Device	Detector Type / bandwidth	Class A Limits (dB(μV) )
0.15 - 0.5	AMN	Quasi Peak / 9 kHz	79
0.5 - 30			73
0.15 - 0.5	AMN	Average / 9 kHz	66
0.5 - 30			60

**NOTE:**

(1) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)

Margin Level = Measurement Value – Limit Value

#### 3.3.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	50Ω Terminator	SHX	TF2-3G-A	8122901	Feb. 28, 2021
2	TWO-LINE V-NETWORK	R&S	ENV216	100526	Mar. 01, 2021
3	EMI Test Receiver	R&S	ESR3	101862	Aug. 03, 2020
4	Artificial-Mains Network	SCHWARZBECK	NSLK 8127	8127685	Mar. 01, 2021
5	TRANSIENT LIMITER	EM	EM-7600	772	Mar. 01, 2021
6	Cable	N/A	N/A(6m)	N/A	Mar. 10, 2021
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.

All calibration period of equipment list is one year.

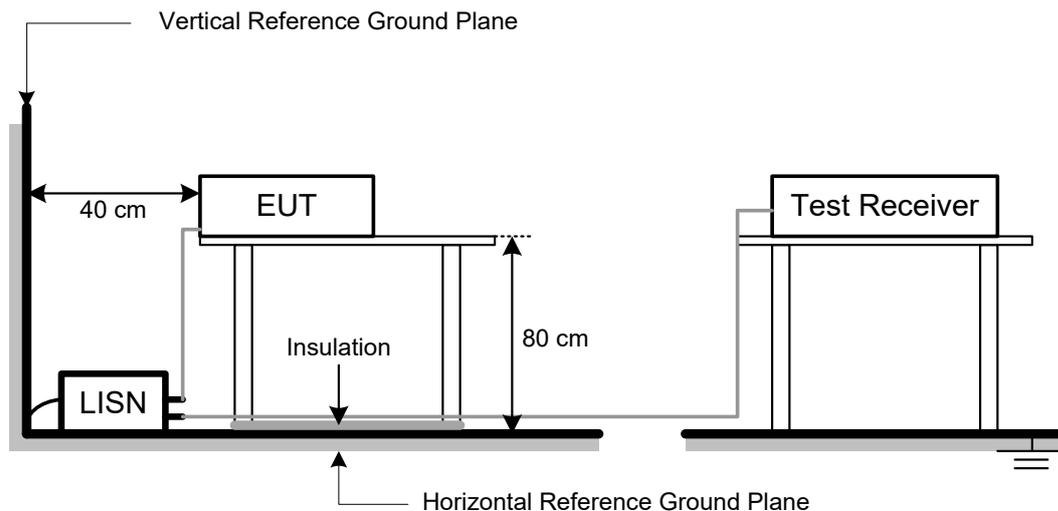
### 3.3.3 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 3.3.4 DEVIATION FROM TEST STANDARD

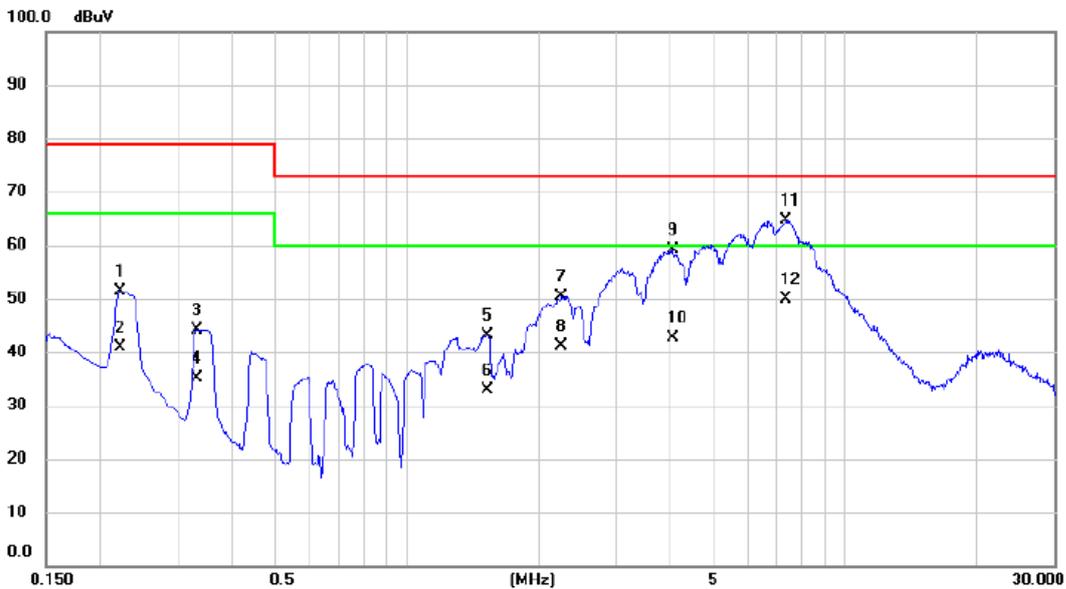
No deviation

### 3.3.5 TEST SETUP



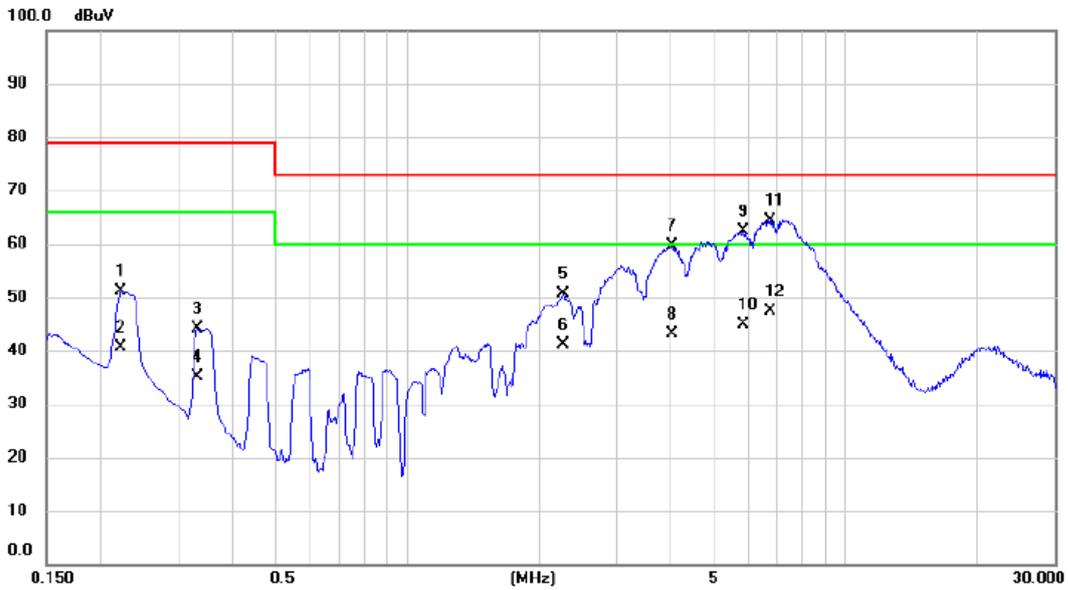
### 3.3.6 TEST RESULTS

Test Voltage	AC 230V/50Hz	Phase	Line
Test Mode	Mode 1		



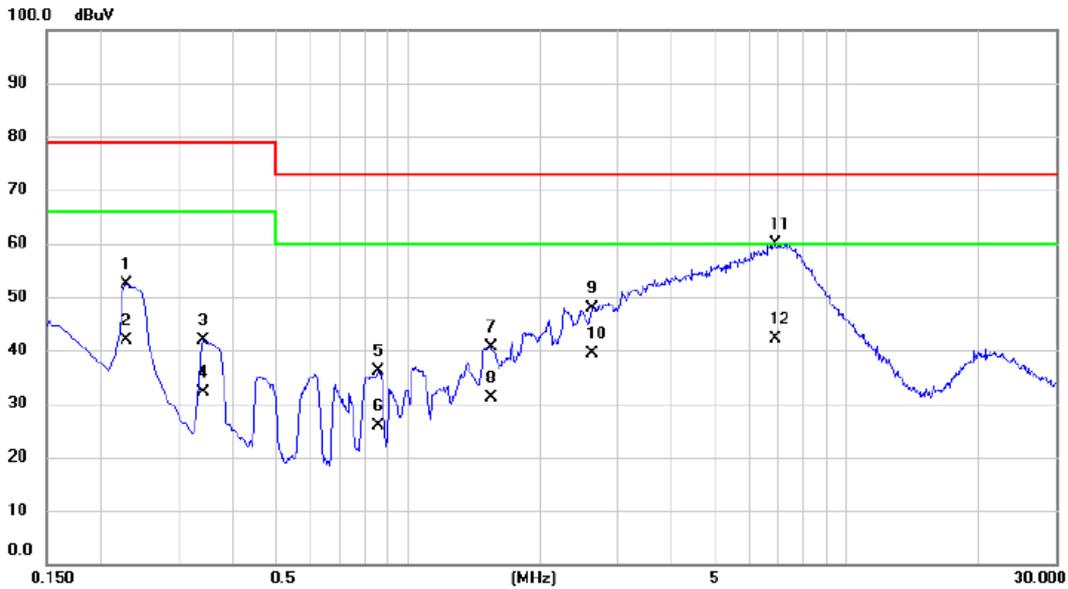
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.2220	41.80	9.57	51.37	79.00	-27.63	QP	
2		0.2220	31.20	9.57	40.77	66.00	-25.23	AVG	
3		0.3322	34.65	9.57	44.22	79.00	-34.78	QP	
4		0.3322	25.60	9.57	35.17	66.00	-30.83	AVG	
5		1.5248	33.46	9.68	43.14	73.00	-29.86	QP	
6		1.5248	23.30	9.68	32.98	60.00	-27.02	AVG	
7		2.2605	40.75	9.74	50.49	73.00	-22.51	QP	
8		2.2605	31.30	9.74	41.04	60.00	-18.96	AVG	
9		4.0448	49.30	9.85	59.15	73.00	-13.85	QP	
10		4.0448	32.90	9.85	42.75	60.00	-17.25	AVG	
11	*	7.3253	54.59	10.06	64.65	73.00	-8.35	QP	
12		7.3253	39.80	10.06	49.86	60.00	-10.14	AVG	

Test Voltage	AC 230V/50Hz	Phase	Neutral
Test Mode	Mode 1		



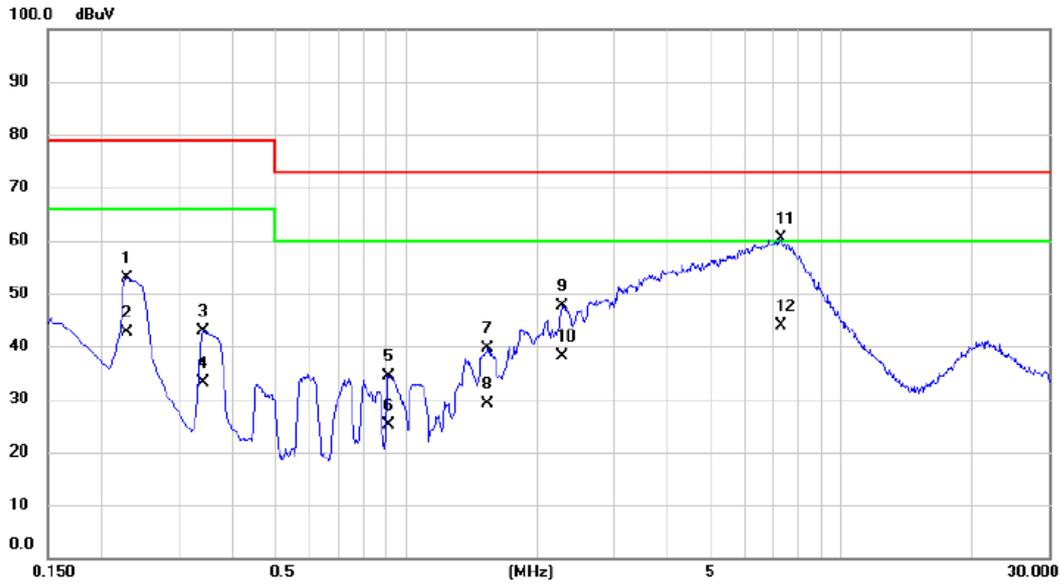
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.2220	41.47	9.55	51.02	79.00	-27.98	QP	
2	0.2220	31.20	9.55	40.75	66.00	-25.25	AVG	
3	0.3322	34.54	9.55	44.09	79.00	-34.91	QP	
4	0.3322	25.50	9.55	35.05	66.00	-30.95	AVG	
5	2.2718	40.79	9.73	50.52	73.00	-22.48	QP	
6	2.2718	31.30	9.73	41.03	60.00	-18.97	AVG	
7	4.0313	49.85	9.84	59.69	73.00	-13.31	QP	
8	4.0313	33.40	9.84	43.24	60.00	-16.76	AVG	
9	5.8358	52.41	9.97	62.38	73.00	-10.62	QP	
10	5.8358	34.80	9.97	44.77	60.00	-15.23	AVG	
11 *	6.7493	54.44	10.02	64.46	73.00	-8.54	QP	
12	6.7493	37.40	10.02	47.42	60.00	-12.58	AVG	

Test Voltage	AC 110V/60Hz	Phase	Line
Test Mode	Mode 1		



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.2288	42.90	9.56	52.46	79.00	-26.54	QP	
2	0.2288	32.20	9.56	41.76	66.00	-24.24	AVG	
3	0.3412	32.35	9.57	41.92	79.00	-37.08	QP	
4	0.3412	22.50	9.57	32.07	66.00	-33.93	AVG	
5	0.8587	26.39	9.64	36.03	73.00	-36.97	QP	
6	0.8587	16.30	9.64	25.94	60.00	-34.06	AVG	
7	1.5473	30.90	9.68	40.58	73.00	-32.42	QP	
8	1.5473	21.50	9.68	31.18	60.00	-28.82	AVG	
9	2.6363	38.23	9.76	47.99	73.00	-25.01	QP	
10	2.6363	29.60	9.76	39.36	60.00	-20.64	AVG	
11 *	6.8775	49.88	10.04	59.92	73.00	-13.08	QP	
12	6.8775	32.20	10.04	42.24	60.00	-17.76	AVG	

Test Voltage	AC 110V/60Hz	Phase	Neutral
Test Mode	Mode 1		



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.2288	43.34	9.55	52.89	79.00	-26.11	QP	
2	0.2288	33.20	9.55	42.75	66.00	-23.25	AVG	
3	0.3412	33.33	9.55	42.88	79.00	-36.12	QP	
4	0.3412	23.50	9.55	33.05	66.00	-32.95	AVG	
5	0.9105	24.82	9.63	34.45	73.00	-38.55	QP	
6	0.9105	15.60	9.63	25.23	60.00	-34.77	AVG	
7	1.5428	29.90	9.66	39.56	73.00	-33.44	QP	
8	1.5428	19.40	9.66	29.06	60.00	-30.94	AVG	
9	2.2830	37.95	9.73	47.68	73.00	-25.32	QP	
10	2.2830	28.40	9.73	38.13	60.00	-21.87	AVG	
11 *	7.2600	50.44	10.06	60.50	73.00	-12.50	QP	
12	7.2600	33.90	10.06	43.96	60.00	-16.04	AVG	

### 3.4 ASYMMETRIC MODE CONDUCTED EMISSIONS TEST

#### 3.4.1 LIMITS

Requirements for asymmetric mode conducted emissions from Class A equipment

Frequency Range MHz	Coupling device	Detector type / Bandwidth	Class A voltage limits dB(μV)	Class A current limits dB(μA)
0.15 - 0.5	AAN	Quasi Peak / 9 kHz	97 - 87	n/a
0.5 - 30			87	
0.15 - 0.5	AAN	Average / 9 kHz	84 - 74	
0.5 - 30			74	

**NOTE:**

(1) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)

Margin Level = Measurement Value – Limit Value

#### 3.4.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	50Ω Terminator	SHX	TF2-3G-A	8122901	Feb. 28, 2021
2	TWO-LINE V-NETWORK	R&S	ENV216	100526	Mar. 01, 2021
3	EMI Test Receiver	R&S	ESR3	101862	Aug. 03, 2020
4	Artificial-Mains Network	SCHWARZBECK	NSLK 8127	8127685	Mar. 01, 2021
5	TRANSIENT LIMITER	EM	EM-7600	772	Mar. 01, 2021
6	Cable	N/A	N/A(6m)	N/A	Mar. 10, 2021
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	ISN	TESEQ	ISN T800	42838	Aug. 03, 2020

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.

All calibration period of equipment list is one year.

### 3.4.3 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- e. **AAN** at least 80 cm from nearest part of EUT chassis.

**NOTE:**

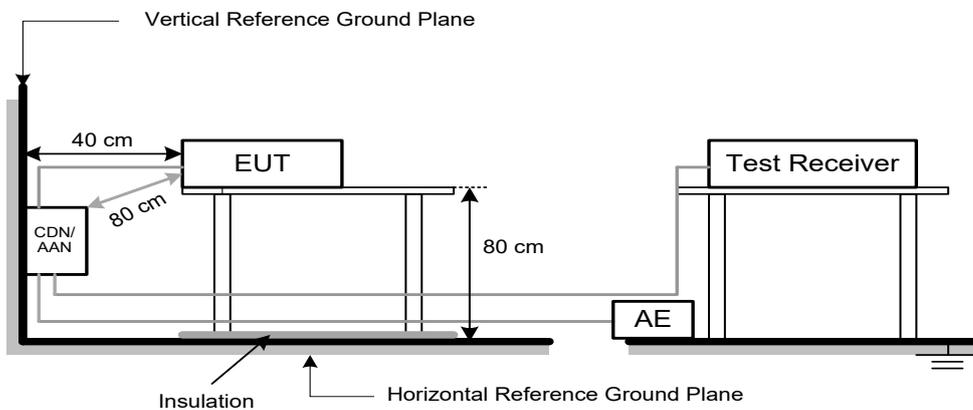
1. The communication function of EUT was executed and AAN was connected between EUT and associated equipment and the AAN was connected directly to reference ground plane.  
 Measure the voltage at the measurement port of the AAN  
 Correct the measured voltage by adding the AAN voltage division factor  
 Compare the corrected voltage with the limit.

### 3.4.4 DEVIATION FROM TEST STANDARD

No deviation

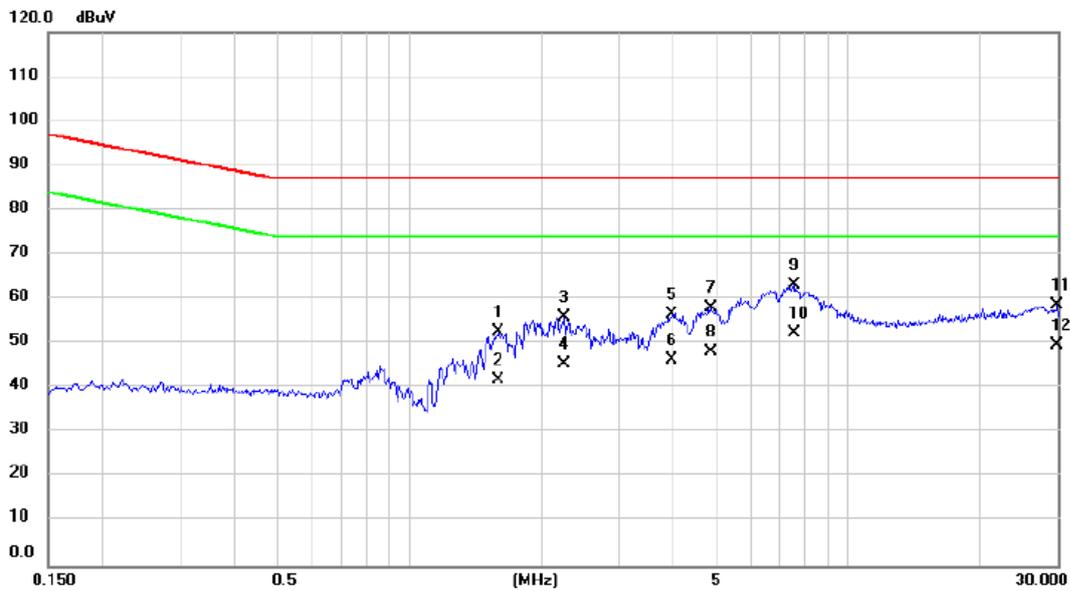
### 3.4.5 TEST SETUP

- a) Cable Type: Balanced Unscreened, Screened or Coaxial



### 3.4.6 TEST RESULTS

Test Voltage	AC 230V/50Hz
Test Mode	Mode 2



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	1.5900	42.80	9.85	52.65	87.00	-34.35	QP	
2	1.5900	32.10	9.85	41.95	74.00	-32.05	AVG	
3	2.2560	45.99	9.88	55.87	87.00	-31.13	QP	
4	2.2560	35.60	9.88	45.48	74.00	-28.52	AVG	
5	3.9705	46.60	9.90	56.50	87.00	-30.50	QP	
6	3.9705	36.30	9.90	46.20	74.00	-27.80	AVG	
7	4.8570	48.01	9.90	57.91	87.00	-29.09	QP	
8	4.8570	38.40	9.90	48.30	74.00	-25.70	AVG	
9	7.5233	53.26	10.01	63.27	87.00	-23.73	QP	
10 *	7.5233	42.20	10.01	52.21	74.00	-21.79	AVG	
11	29.9805	47.70	11.02	58.72	87.00	-28.28	QP	
12	29.9805	38.60	11.02	49.62	74.00	-24.38	AVG	

Test Voltage	AC 230V/50Hz
Test Mode	Mode 3



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	4.0200	47.01	9.90	56.91	87.00	-30.09	QP	
2	4.0200	38.60	9.90	48.50	74.00	-25.50	AVG	
3	6.2498	54.88	9.96	64.84	87.00	-22.16	QP	
4	6.2498	43.30	9.96	53.26	74.00	-20.74	AVG	
5	7.5008	57.22	10.01	67.23	87.00	-19.77	QP	
6	7.5008	47.30	10.01	57.31	74.00	-16.69	AVG	
7 *	10.0004	64.74	10.09	74.83	87.00	-12.17	QP	
8	10.0004	48.90	10.09	58.99	74.00	-15.01	AVG	
9	12.5003	52.21	10.19	62.40	87.00	-24.60	QP	
10	12.5003	42.20	10.19	52.39	74.00	-21.61	AVG	
11	22.9920	41.40	10.66	52.06	87.00	-34.94	QP	
12	22.9920	31.50	10.66	42.16	74.00	-31.84	AVG	

### 3.5 HARMONIC CURRENT EMISSIONS TEST

#### 3.5.1 LIMITS

The power consumption is less than 75W, there is no limit applied.

#### 3.5.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Harmonics and Flicker Analyzer	California Instruments	PACS-1	72344	Aug. 03, 2020
2	3KVA AC Power source	California Instruments	3001ix	56309	Aug. 03, 2020
3	Measurement Software	California	CTS4.0 Version 4.21	N/A	N/A

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

All calibration period of equipment list is one year.

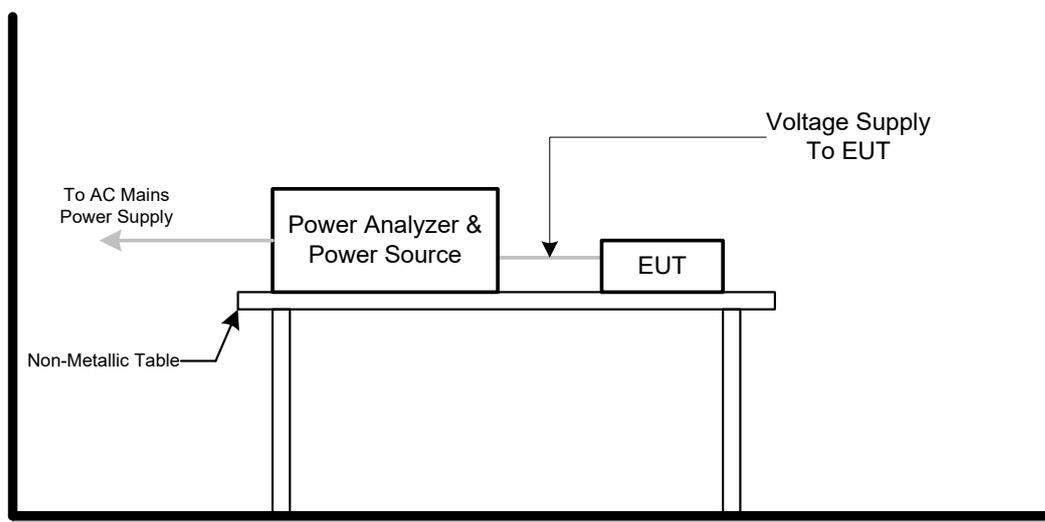
#### 3.5.3 TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.
- The classification of EUT is according to of EN 61000-3-2. The EUT is classified as Class A.
- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

#### 3.5.4 DEVIATION FROM TEST STANDARD

No deviation

#### 3.5.5 TEST SETUP



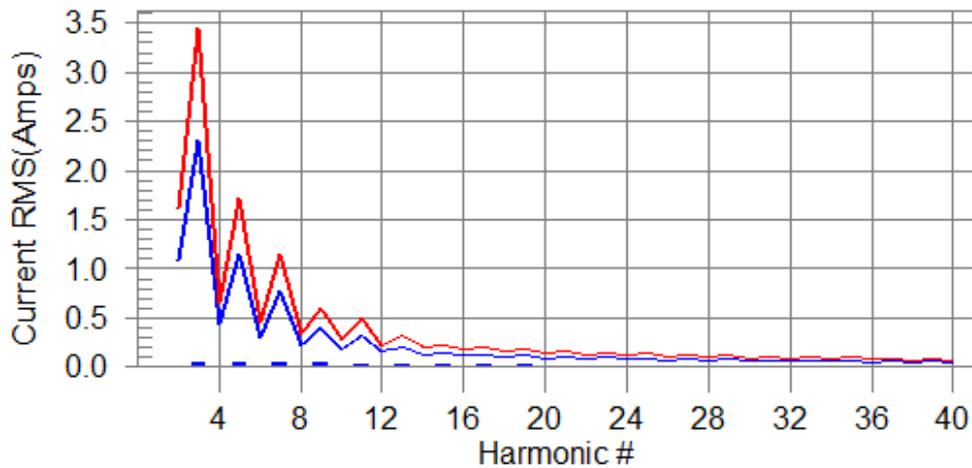
### 3.5.6 TEST RESULTS

Harmonics – Class-A	
Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

#### Current & voltage waveforms



#### Harmonics and Class A limit line      European Limits



**Test result: Pass**    Worst harmonics H15-11.5% of 150% limit, H15-17.1% of 100% limit

## Current Test Result Summary (Run time)

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

## Highest parameter values during test:

V_RMS (Volts):	229.91	Frequency(Hz):	50.00
I_Peak (Amps):	0.531	I_RMS (Amps):	0.118
I_Fund (Amps):	0.051	Crest Factor:	4.590
Power (Watts):	10.8	Power Factor:	0.405

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.001	1.620	N/A	Pass
3	0.046	2.300	2.0	0.047	3.450	1.4	Pass
4	0.001	0.430	N/A	0.001	0.645	N/A	Pass
5	0.044	1.140	3.8	0.044	1.710	2.6	Pass
6	0.000	0.300	N/A	0.001	0.450	N/A	Pass
7	0.041	0.770	5.4	0.041	1.155	3.6	Pass
8	0.000	0.230	N/A	0.001	0.345	N/A	Pass
9	0.038	0.400	9.5	0.038	0.600	6.3	Pass
10	0.000	0.184	N/A	0.000	0.276	N/A	Pass
11	0.034	0.330	10.4	0.034	0.495	6.9	Pass
12	0.000	0.153	N/A	0.000	0.230	N/A	Pass
13	0.030	0.210	14.3	0.030	0.315	9.6	Pass
14	0.000	0.131	N/A	0.000	0.197	N/A	Pass
15	0.026	0.150	17.1	0.026	0.225	11.5	Pass
16	0.000	0.115	N/A	0.000	0.173	N/A	Pass
17	0.021	0.132	16.1	0.021	0.198	10.8	Pass
18	0.000	0.102	N/A	0.000	0.153	N/A	Pass
19	0.017	0.118	14.3	0.017	0.178	9.6	Pass
20	0.000	0.092	N/A	0.000	0.138	N/A	Pass
21	0.013	0.107	12.0	0.013	0.161	8.1	Pass
22	0.000	0.084	N/A	0.000	0.125	N/A	Pass
23	0.009	0.098	9.5	0.009	0.147	6.5	Pass
24	0.000	0.077	N/A	0.000	0.115	N/A	Pass
25	0.006	0.090	6.9	0.006	0.135	4.7	Pass
26	0.000	0.071	N/A	0.000	0.107	N/A	Pass
27	0.004	0.083	N/A	0.004	0.125	N/A	Pass
28	0.000	0.066	N/A	0.000	0.099	N/A	Pass
29	0.003	0.078	N/A	0.003	0.116	N/A	Pass
30	0.000	0.061	N/A	0.000	0.092	N/A	Pass
31	0.003	0.073	N/A	0.003	0.109	N/A	Pass
32	0.000	0.058	N/A	0.000	0.086	N/A	Pass
33	0.004	0.068	N/A	0.004	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.004	0.064	N/A	0.004	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.004	0.061	N/A	0.004	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.004	0.058	N/A	0.004	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass

Voltage Source Verification Data (Run time)	
Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

**Highest parameter values during test:**

Voltage (Vrms):	229.91	Frequency(Hz):	50.00
I_Peak (Amps):	0.531	I_RMS (Amps):	0.118
I_Fund (Amps):	0.051	Crest Factor:	4.590
Power (Watts):	10.8	Power Factor:	0.405

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.121	0.460	26.26	OK
3	0.512	2.069	24.76	OK
4	0.054	0.460	11.78	OK
5	0.057	0.920	6.20	OK
6	0.020	0.460	4.33	OK
7	0.035	0.690	5.01	OK
8	0.019	0.460	4.12	OK
9	0.025	0.460	5.51	OK
10	0.021	0.460	4.54	OK
11	0.030	0.230	13.13	OK
12	0.014	0.230	6.04	OK
13	0.021	0.230	9.11	OK
14	0.012	0.230	5.18	OK
15	0.024	0.230	10.32	OK
16	0.014	0.230	6.27	OK
17	0.014	0.230	5.99	OK
18	0.012	0.230	5.13	OK
19	0.021	0.230	9.34	OK
20	0.017	0.230	7.40	OK
21	0.011	0.230	4.75	OK
22	0.011	0.230	4.88	OK
23	0.015	0.230	6.55	OK
24	0.006	0.230	2.55	OK
25	0.005	0.230	2.14	OK
26	0.008	0.230	3.27	OK
27	0.013	0.230	5.67	OK
28	0.007	0.230	3.17	OK
29	0.009	0.230	3.95	OK
30	0.005	0.230	2.15	OK
31	0.006	0.230	2.57	OK
32	0.006	0.230	2.41	OK
33	0.009	0.230	4.01	OK
34	0.003	0.230	1.12	OK
35	0.008	0.230	3.40	OK
36	0.003	0.230	1.19	OK
37	0.011	0.230	4.72	OK
38	0.003	0.230	1.49	OK
39	0.005	0.230	2.23	OK
40	0.006	0.230	2.66	OK

### 3.6 VOLTAGE FLUCTUATIONS (FLICKER) TEST

#### 3.6.1 LIMITS

Tests	Limits	Descriptions
	EN 61000-3-3	
Pst	$\leq 1.0$ , Tp= 10 min.	Short Term Flicker Indicator
Plt	$\leq 0.65$ , Tp=2 hr.	Long Term Flicker Indicator
dc	$\leq 3.3\%$	Relative Steady-State V-Chang
dmax	$\leq 4\%$	Maximum Relative V-change
d (t)	$\leq 500$ ms	Relative V-change characteristic

#### 3.6.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Harmonics and Flicker Analyzer	California Instruments	PACS-1	72344	Aug. 03, 2020
2	3KVA AC Power source	California Instruments	3001ix	56309	Aug. 03, 2020
3	Measurement Software	California	CTS4.0 Version 4.21	N/A	N/A

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

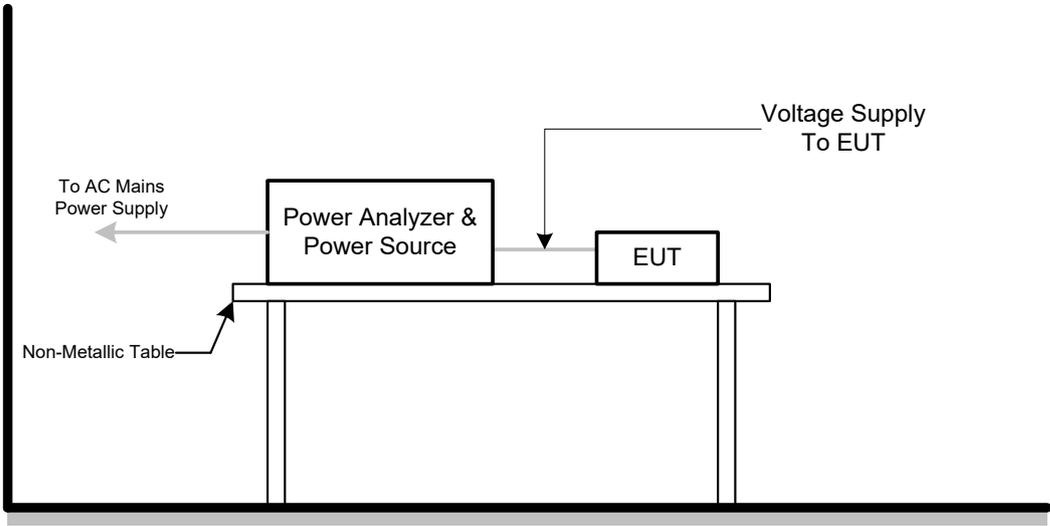
All calibration period of equipment list is one year.

#### 3.6.3 TEST PROCEDURE

- a. Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in EN 61000-3-3 depend on which standard adopted for compliance measurement.
- b. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

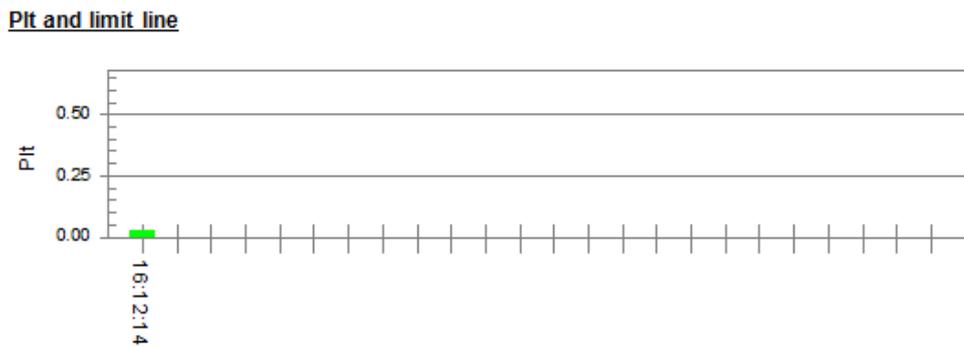
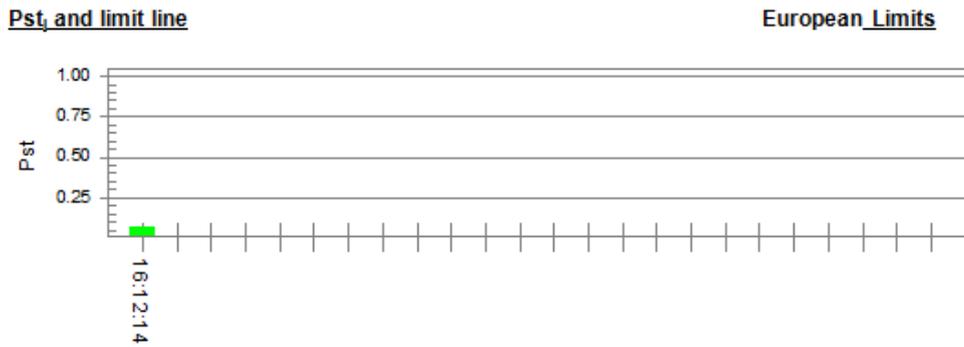
#### 3.6.4 DEVIATION FROM TEST STANDARD

No deviation

**3.6.5 TEST SETUP**

### 3.6.6 TEST RESULTS

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1



**Parameter values recorded during the test:**

Vrms at the end of test (Volt):	229.79		
T-max (mS):	0	Test limit (mS):	500.0 Pass
Highest dc (%):	0.00	Test limit (%):	3.30 Pass
Highest dmax (%):	0.00	Test limit (%):	4.00 Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000 Pass
Highest Pit (2 hr. period):	0.028	Test limit:	0.650 Pass

## 4. EMC IMMUNITY TEST

### 4.1 STANDARD COMPLIANCE/SEVERITY LEVEL/CRITERIA

Tests Standard No.	Test Specification Level / Test Mode	Test Ports	Criteria
Electrostatic discharge IEC 61000-4-2 (ESD)	±8kV air discharge ±4kV contact discharge (Direct Mode)	Enclosure	B
	±4kV HCP discharge ±4kV VCP discharge (Indirect Mode)	Enclosure	B
Continuous RF electromagnetic field disturbances,swept test IEC 61000-4-3 (RS)	80 MHz to 1000 MHz 3V/m(unmodulated, r.m.s), 1 kHz, 80%, AM modulated	Enclosure	A
Continuous RF electromagnetic field disturbances,spot test IEC 61000-4-3 (RS)	1800 MHz, 2600MHz, 3500 MHz, 5000MHz(±1 %) 3V/m(unmodulated, r.m.s), 1 kHz, 80%, AM modulated	Enclosure	A
Electrical fast transient/burst immunity IEC 61000-4-4 (EFT)	±0.5kV(peak) 5/50ns Tr/Th 5kHz Repetition Frequency (100kHz Repetition Frequency for xDSL port)	Analogue/digital data ports <b>(NOTE 2)</b>	B
	±0.5kV(peak) 5/50ns Tr/Th 5kHz Repetition Frequency	DC network power ports <b>(NOTE 2)</b>	B
	±1 kV(peak) 5/50ns Tr/Th 5kHz Repetition Frequency	AC mains power ports	B

Surge immunity IEC 61000-4-5 (Surge)	<b>Port Type: unshielded symmetrical</b>		
	<b>Apply: lines to ground</b>		
	<b>Primary protection is Intended</b> ±1 kV and ±4 kV 10/700(5/320)Tr/Th µs	Analogue/digital data ports <b>(NOTE 1) &amp; (NOTE 2)</b>	C
	<b>Primary protection is not Intended</b> ±1 kV 10/700(5/320) Tr/Th µs		C
	<b>Port type: coaxial or shielded</b>		
	<b>Apply: shield to ground</b>		
±0.5 kV 1.2/50(8/20) Tr/Th µs	Analogue/digital data ports <b>(NOTE 1) &amp; (NOTE 2)</b>	B	
<b>line to reference ground for each individual line:</b> ±0.5 kV(peak) 1.2/50(8/20) Tr/Th µs	DC network power ports <b>(NOTE 2)</b>	B	
±1 kV(peak) 1.2/50(8/20) Tr/Th µs (line to line) ±2 kV(peak) 1.2/50(8/20) Tr/Th µs (line to earth or ground)	AC mains power ports	B	
Continuous induced RF disturbances IEC 61000-4-6 (CS)	0.15 MHz to 10 MHz 3V(unmodulated, r.m.s), 10 MHz to 30 MHz 3V to 1V(unmodulated, r.m.s), 30 MHz to 80 MHz 1V(unmodulated, r.m.s), 1kHz 80%, AM 150Ω source impedance	Analogue/digital data ports <b>(NOTE 2)</b>	A
	0.15 MHz to 10 MHz 3V(unmodulated, r.m.s), 10 MHz to 30 MHz 3V to 1V(unmodulated, r.m.s), 30 MHz to 80 MHz 1V(unmodulated, r.m.s), 1kHz 80%, AM 150Ω source impedance	DC network power ports <b>(NOTE 2)</b>	A
	0.15 MHz to 10 MHz 3V(unmodulated, r.m.s), 10 MHz to 30 MHz 3V to 1V(unmodulated, r.m.s), 30 MHz to 80 MHz 1V(unmodulated, r.m.s), 1kHz 80%, AM 150Ω source impedance	AC mains power ports	A

Power frequency magnetic field immunity IEC 61000-4-8 (PFMF)	50 Hz or 60Hz, 1A/m(r.m.s)	Enclosure	A
Voltage dips, short interruptions and voltage variations immunity IEC 61000-4-11 (Dips)	Voltage dips: Residual voltage < 5% 0.5 cycle Residual voltage < 70% 25 cycle (50Hz), 30 cycle (60Hz) Voltage interruptions: Residual voltage < 5% 250 cycle (50Hz), 300 cycle (60Hz)	AC Power Ports	B C C
Broadband impulse noise disturbances, repetitive (BIN-R)	0.15MHz to 0.5 MHz 107dBuV 0.5 MHz to 10 MHz 107dBuV to 36dBuV 10 MHz to 30 MHz 36dBuV to 30 dBuV	Analogue/digital data ports <b>(Applicable only to CPE xDSL ports)</b>	A
	0.70 ms 8.3 ms(for 60Hz) 10 ms(for 50Hz)	Analogue/digital data ports <b>(Apply period based on the AC mains frequency)</b>	A
Broadband impulse noise disturbances, isolated (BIN-I)	0.15MHz to 30 MHz 110dBuV	Analogue/digital data ports <b>(Applicable only to CPE xDSL ports)</b>	B
	0.24 ms 10 ms 300 ms	Analogue/digital data ports <b>(Apply all burst durations)</b>	B

**Note.**

- 1) Applicable only to ports which, according to the manufacturer's specification, may connect directly to outdoor cables.
- 2) Applicable only to ports which, according to the manufacturer's specification, support cable lengths greater than 3 m.

## 4.2 GENERAL PERFORMANCE CRITERIA

According to **EN 55035** standards, the general performance criteria as following:

<p><b>Criterion A</b></p>	<p>The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
<p><b>Criterion B</b></p>	<p>During the application of the disturbance, degradation of performance is allowed. However, nonintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
<p><b>Criterion C</b></p>	<p>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Areboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

### 4.3 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

#### 4.3.1 TEST SPECIFICATION

Basic Standard	IEC 61000-4-2
Discharge Impedance	330 ohm / 150 pF
Required Performance	B
Discharge Voltage	Air Discharge: $\pm 2\text{kV}$ , $\pm 4\text{kV}$ , $\pm 8\text{kV}$ Contact Discharge: $\pm 2\text{kV}$ , $\pm 4\text{kV}$
Polarity	Positive & Negative
Number of Discharge	20 times at each test point
Discharge Mode	Single Discharge
Discharge Period	1 second

#### 4.3.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	ESD Simulator	EM TEST	dito	305018	Jul. 17, 2020

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

All calibration period of equipment list is one year.

#### 4.3.3 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied.

NOTE 1 The minimum number of discharges applied is depending on the EUT; for products with synchronized circuits the number of discharges should be larger.

For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

NOTE 2 The points to which the discharges should be applied may be selected by means of an exploration carried out at a repetition rate of 20 discharges per second, or more.

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

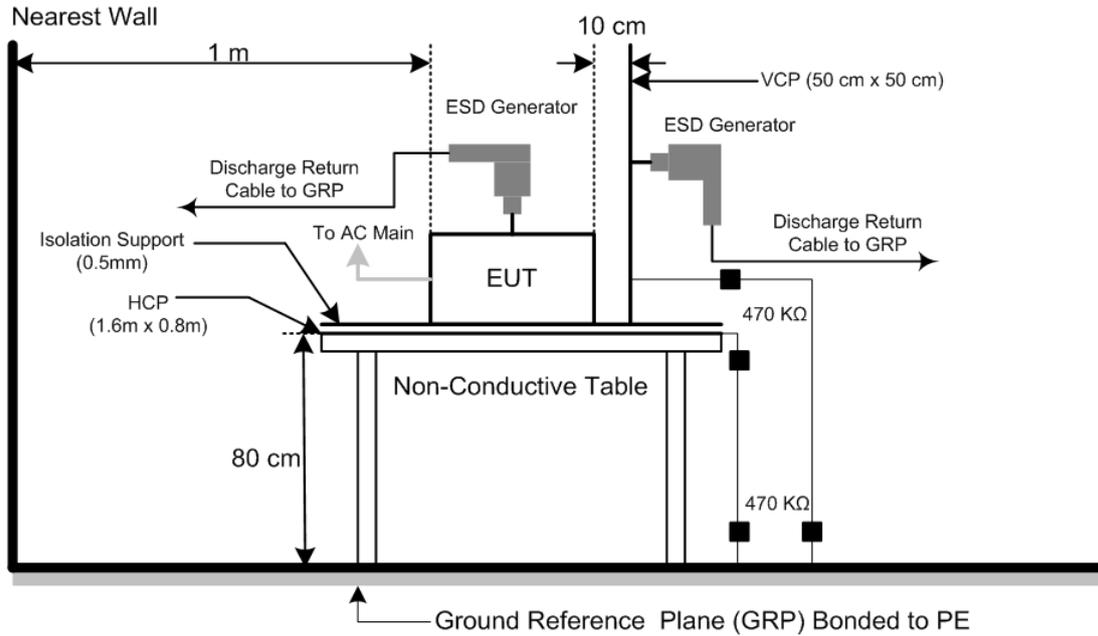
- b. For TABLE-TOP equipment:

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test was installed in a representative system as described in IEC 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.3.5 TEST SETUP



### 4.3.6 TEST RESULTS

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

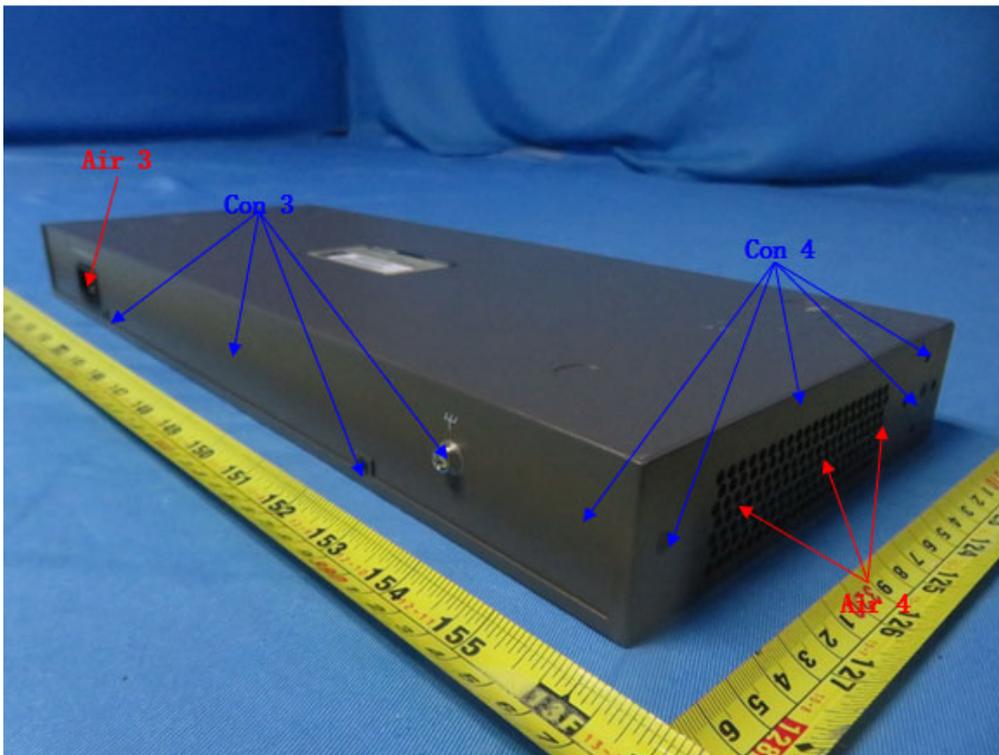
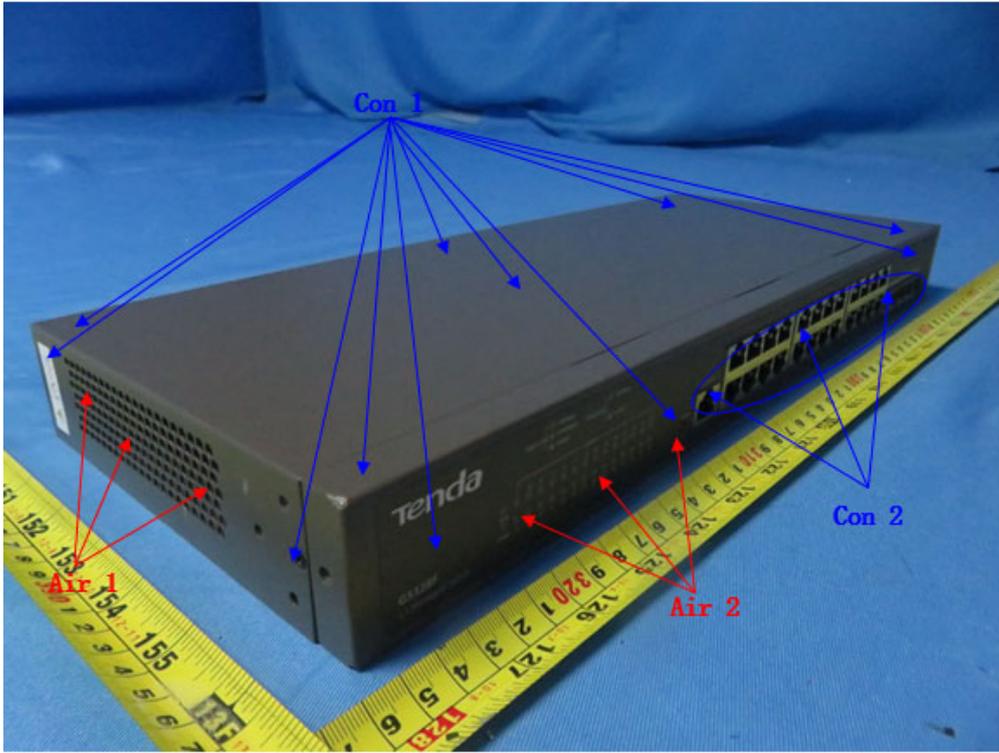
Mode	Air Discharge								Contact Discharge							
	2kV		4kV		8kV		- kV		2kV		4kV		- kV			
Location	P	N	P	N	P	N	P	N	P	N	P	N	P	N		
1	A	A	A	A	A	A	-	-	A	A	A	A	-	-		
2	A	A	A	A	A	A	-	-	A	A	B	B	-	-		
3	A	A	A	A	A	A	-	-	A	A	A	A	-	-		
4	A	A	A	A	A	A			A	A	A	A				
Criteria	B								-		B				-	
Result	A								-		B				-	

Mode	HCP Contact Discharge						VCP Contact Discharge							
	2kV		4kV		- kV		2kV		4kV		- kV			
Location	P	N	P	N	P	N	P	N	P	N	P	N		
Left side	A	A	A	A	-	-	A	A	A	A	-	-		
Right side	A	A	A	A	-	-	A	A	A	A	-	-		
Front side	A	A	A	A	-	-	A	A	A	A	-	-		
Rear side	A	A	A	A	-	-	A	A	A	A	-	-		
Criteria	B						-		B				-	
Result	A						-		A				-	

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable in this test report

PHOTO(S) SHOWN THE LOCATION(S) OF ESD EVALUATED



#### 4.4 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

##### 4.4.1 TEST SPECIFICATION

Basic Standard	IEC 61000-4-3
Required Performance	A
Frequency Range	80 MHz - 1000 MHz, 1800 MHz, 2600 MHz, 3500 MHz, 5000MHz
Field Strength	3 V/m(unmodulated, r.m.s)
Modulation	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance	3 m
Antenna Height	1.55 m
Dwell Time	3 seconds

##### 4.4.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	ETS	3142C	47662	Mar. 23, 2020
2*	Amplifier	AR	50S1G4A	326720	Apr. 08, 2021
3	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Aug. 03, 2020
4*	Power amplifier	MILMEGA	AS1860-50	1064834	Aug. 20, 2020
5	Microwave Log.-Per. Antenna	TESEQ	STLP 9149	9149-277	Mar. 23, 2020
6*	Power amplifier	MILMEGA	80RF1000-250	1064833	Aug. 20, 2020
7	Measurement Software	TOYO	IM5/RS Ver 3.8.050	N/A	N/A

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

"\*\*" calibration period of equipment list is three year.

Except \* item, all calibration period of equipment list is one year.

##### 4.4.3 TEST PROCEDURE

The EUT and support equipment are in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

For TABLE-TOP equipment:

The EUT installed in a representative system as described in IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

The other condition as following manner:

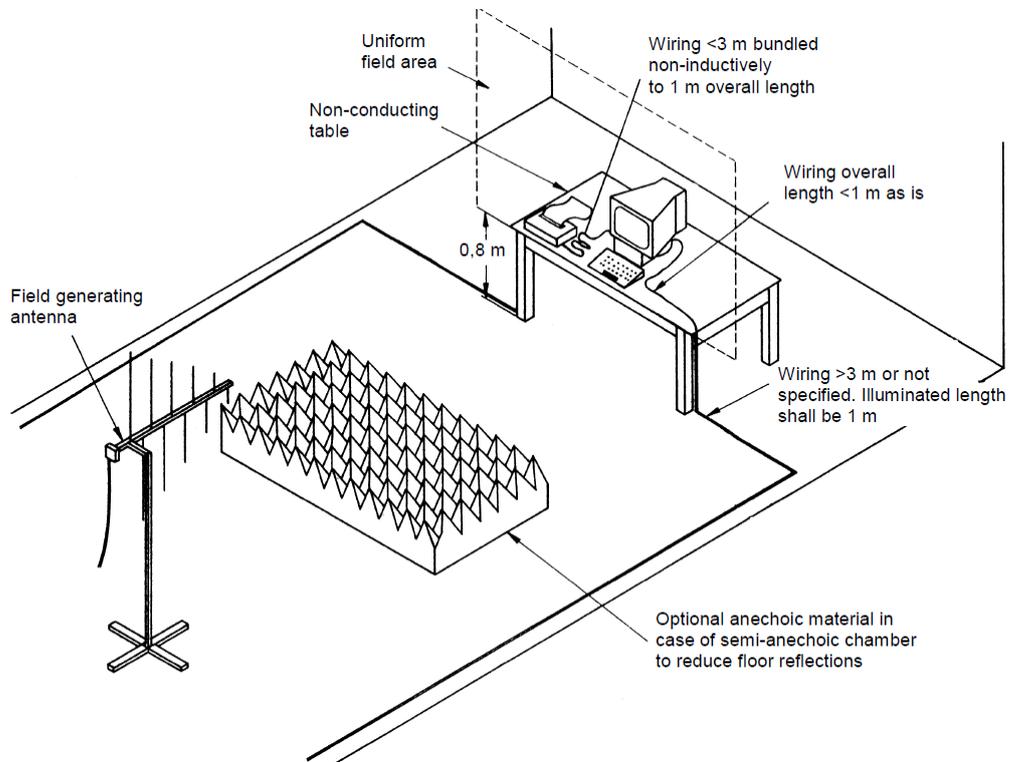
- a. The field strength level was 3 V/m(unmodulated, r.m.s).
- b. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80%amplitude modulated with a 1 kHz sine wave. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

##### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.4.5 TEST SETUP

a) For Continuous induced RF disturbances



#### 4.4.6 TEST RESULTS

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Modulation	Azimuth	Criterion	Result
80 - 1000	H / V	3V/m	AM Modulated 1000Hz, 80%	0	A	A
				90		
				180		
				270		
1800, 2600, 3500, 5000 (±1%)	H / V	3V/m	AM Modulated 1000Hz, 80%	0	A	A
				90		
				180		
				270		

## 4.5 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT)

### 4.5.1 TEST SPECIFICATION

Basic Standard	IEC 61000-4-4
Required Performance	B
Test Voltage	AC mains power ports: $\pm 1$ kV Analogue/digital data ports: $\pm 0.5$ kV
Polarity	Positive & Negative
Impulse Frequency	5 kHz
Impulse Wave shape	5/50 ns
Burst Duration	15 ms
Burst Period	300 ms
Test Duration	1 min.

### 4.5.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Capacitor Clamp	Thermo KeyTek	CCL	502215	Aug. 03, 2020
2	Fast Transient Burst Simulator	Prima	EFT61004TA	PR190741004	Aug. 27, 2020

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

All calibration period of equipment list is one year.

### 4.5.3 TEST PROCEDURE

For TABLE-TOP equipment:

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane and should be located 0.1 m $\pm$  0.01m above the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

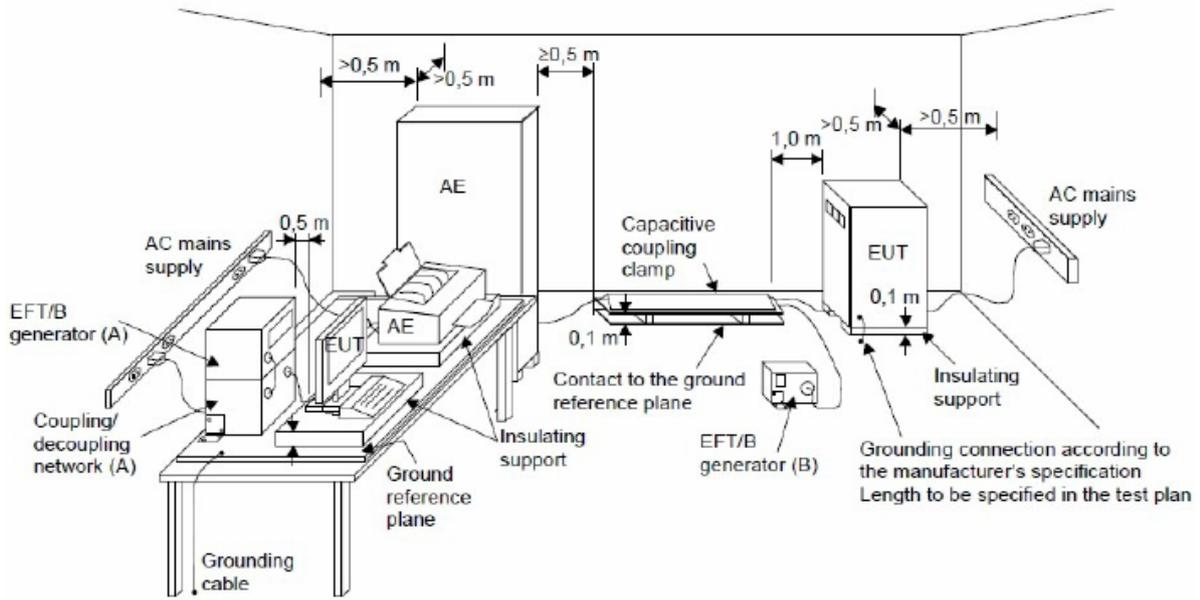
The other condition as following manner:

- a. Both positive and negative polarity discharges were applied.
- b. The duration time of each test sequential was 1 minute

### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

## 4.5.5 TEST SETUP



**4.5.6 TEST RESULTS**

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

EUT Ports Tested		Polarity	Repetition Frequency	Test Level	Criterion	Result
				1kV		
AC Power Port	Line (L)	+	5 kHz	A	B	A
		-	5 kHz	A		
	Neutral (N)	+	5 kHz	A	B	A
		-	5 kHz	A		
	Ground (PE)	+	5 kHz	A	B	A
		-	5 kHz	A		
	L+N	+	5 kHz	A	B	A
		-	5 kHz	A		
	L+PE	+	5 kHz	A	B	A
		-	5 kHz	A		
	N+PE	+	5 kHz	A	B	A
		-	5 kHz	A		
	L+N+PE	+	5 kHz	A	B	A
		-	5 kHz	A		

EUT Ports Tested		Polarity	Repetition Frequency	Test Level	Criterion	Result
				0.5 kV		
Analogue/digital data ports	LAN1 Port	+	5 kHz	A	B	A
		-	5 kHz	A		

## 4.6 SURGE IMMUNITY TEST (SURGE)

### 4.6.1 TEST SPECIFICATION

Basic Standard	IEC 61000-4-5
Required Performance	B(AC mains power ports) C(Analogue/digital data ports)
Wave-Shape	1.2/50(8/20) Tr/Th $\mu$ s combination wave 10/700(5/320) Tr/Th $\mu$ s combination wave
Test Voltage	AC mains power ports: $\pm 0.5$ kV, $\pm 1$ kV, $\pm 2$ kV Analogue/digital data ports: $\pm 0.5$ kV, $\pm 1$ kV
Generator Source Impedance	2 $\Omega$ of the low-voltage power supply network. 12 $\Omega$ (10 $\Omega$ +2 $\Omega$ ) of the low-voltage power supply network and ground. 40 $\Omega$ (15 $\Omega$ +25 $\Omega$ ) between outdoor unshielded symmetrical interconnection line and ground when use 10/700(5/320) waveform
Phase Angle, Polarity and Number of Tests	Five positive pulses line-to-neutral at 90° phase Five negative pulses line-to-neutral at 270° phase 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
Pulse Repetition Rate	1 time / min

### 4.6.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	System mainframe	Schaffner	NSG 2050	200729-619LU	Aug. 03, 2020
2	CDN	EMC PARTNER	CDN-UTP8	40	Mar. 01, 2021
3	Measurement Software	Schaffner	Win 2000 Version V7.10	N/A	N/A
4	Lightning Surge Generator	Prima	SUG61005TB	PR190854067	Aug. 27, 2020

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

All calibration period of equipment list is one year.

### 4.6.3 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT :

The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

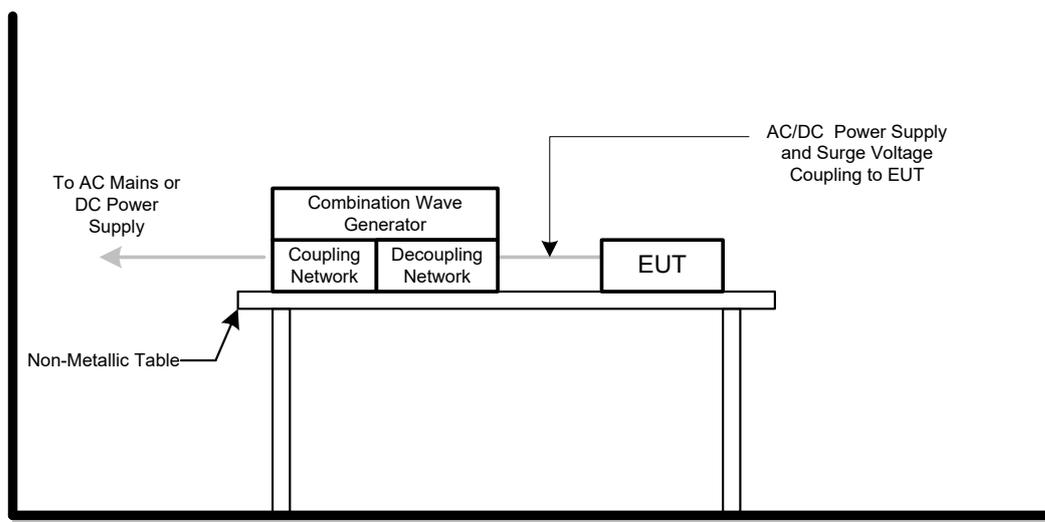
c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT :

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

### 4.6.4 DEVIATION FROM TEST STANDARD

The requirement followed by the client's specification.

### 4.6.5 TEST SETUP



**4.6.6 TEST RESULTS**

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

Wave Form EUT Ports Tested		1.2/50(8/20)Tr/Thµs						Criterion	Result
		Polarity	Phase	Voltage					
				0.5kV	1kV	-- kV	-- kV		
AC	L – N	+	90°	A	A	-	-	B	A
		-	270°	A	A	-	-		

Wave Form EUT Ports Tested		1.2/50(8/20)Tr/Thµs						Criterion	Result
		Polarity	Phase	Voltage					
				0.5kV	1kV	2kV	-- kV		
AC	L – PE	+	90°	A	A	A	-	B	A
		-	270°	A	A	A	-		
	N – PE	-	90°	A	A	A	-	B	A
		+	270°	A	A	A	-		

Wave Form EUT Ports Tested		10/700(5/320)Tr/Thµs						Criterion	Result
		Polarity	Phase	Voltage					
				0.5kV	1kV	-- kV	-- kV		
Analogue/digital data ports(LAN1 Port)		+/-	-	A	B	-	-	C	B

## 4.7 IMMUNITY TO CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS TEST (CS)

### 4.7.1 TEST SPECIFICATION

Basic Standard	IEC 61000-4-6
Required Performance	A
Frequency Range&Field Strength	0.15 MHz - 10 MHz: 3V (unmodulated, r.m.s.) 10 MHz - 30 MHz: 3V to 1V (unmodulated, r.m.s.) 30 MHz - 80 MHz: 1V (unmodulated, r.m.s.)
Modulation	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step	1% of fundamental
Dwell Time	3 seconds

### 4.7.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power CDN	FCC	FCC-801-M2 /M3-16A	100270	Feb. 28, 2021
2	Signal Line CDN	FCC	FCC-801-T4 -RJ45	100272	Feb. 28, 2021
3	TEST SYSTEM FOR CONDUCTED AND RADIATED IMMUNITY	TESEQ	NSG 4070B	37513	Aug. 03, 2020
4	Measurement Software	Farad	EZ-CS (V2.0.1.4)	N/A	N/A

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

All calibration period of equipment list is one year.

### 4.7.3 TEST PROCEDURE

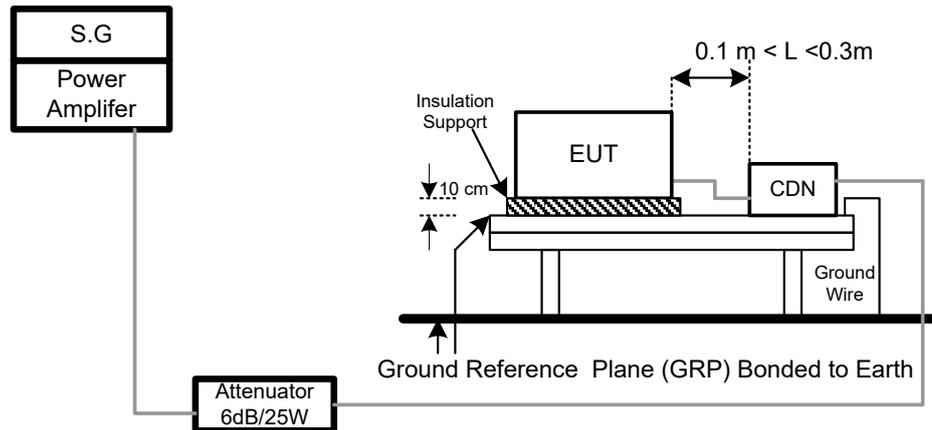
The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m\*1m min. and 0.65mm thick min.

The other condition as following manner:

- a. The field strength level was 3 V (unmodulated, r.m.s.)
- b. The frequency range is swept from 150 kHz to 80 MHz, with the signal 80%amplitude modulated with a 1 kHz sinewave. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

**4.7.4 DEVIATION FROM TEST STANDARD**

No deviation

**4.7.5 TEST SETUP**

#### 4.7.6 TEST RESULTS

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

Test Ports (Mode)	Freq.Range (MHz)	Field Strength	Modulation	Criteria	Results
AC mains power ports	0.15 - 10	3V	AM Modulated 1000Hz, 80%	A	A
	10 - 30	3V to 1V			
	30 - 80	1V			
Analogue/digital data ports (LAN1 Port)	0.15 - 10	3V	AM Modulated 1000Hz, 80%	A	A
	10 - 30	3V to 1V			
	30 - 80	1V			

## 4.8 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST (PFMF)

### 4.8.1 TEST SPECIFICATION

Basic Standard	IEC 61000-4-8
Required Performance	A
Frequency Range	50/60Hz
Field Strength	1 A/m
Observation Time	1 minute
Inductance Coil	Rectangular type, 1mx1m

### 4.8.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Magnetic Field test Generator	FCC	F-1000-4-8-G-125A	4032	Mar. 01, 2021
2	Magnetic Field immunity loop	Thermo KeyTek	F-1000-4-8/9/10-L-1M	4024	Mar. 01, 2021

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

All calibration period of equipment list is one year.

### 4.8.3 TEST PROCEDURE

For TABLE-TOP equipment:

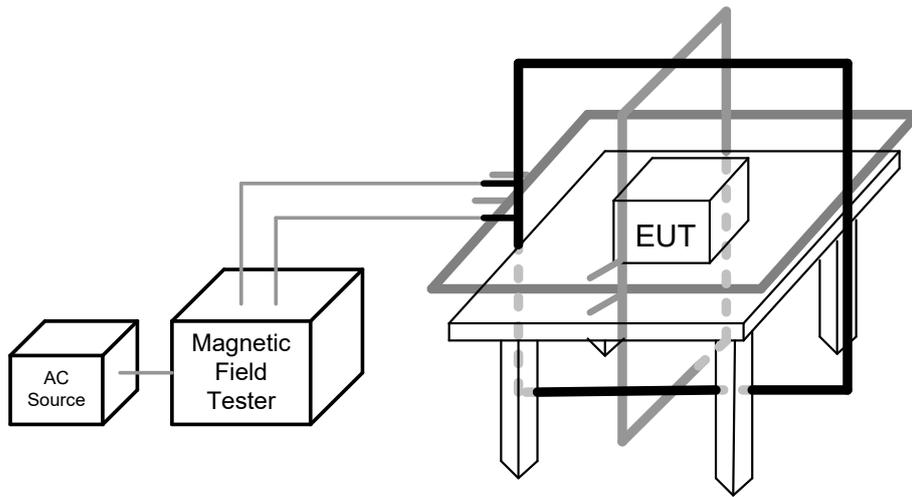
The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

The other condition as following manner:

- a. The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- b. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

### 4.8.4 DEVIATION FROM TEST STANDARD

No deviation

**4.8.5 TEST SETUP**

#### 4.8.6 TEST RESULTS

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

##### 50Hz

Test Mode	Test Level	Antenna aspect	Duration	Criteria	Results
Enclosure	1 A/m	X	60s	A	A
Enclosure	1 A/m	Y	60s	A	A
Enclosure	1 A/m	Z	60s	A	A

##### 60Hz

Test Mode	Test Level	Antenna aspect	Duration	Criteria	Results
Enclosure	1 A/m	X	60s	A	A
Enclosure	1 A/m	Y	60s	A	A
Enclosure	1 A/m	Z	60s	A	A

## 4.9 VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS IMMUNITY TEST (DIPS)

### 4.9.1 TEST SPECIFICATION

Basic Standard	IEC 61000-4-11
Required Performance	Voltage dips: B (For <5% residual voltage, dips) C (For 70% residual voltage, dips) C (For <5% residual voltage, Interruptions)
Interval between Event	Ten seconds
Phase Angle	0°/180°
Test Cycle	3 times

### 4.9.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Cycle Sag Simulator	Prima	DRP61011TA	PR19076452	Aug. 27, 2020

Remark: "N/A" denotes no model name, no serial No. or no calibration specified.

All calibration period of equipment list is one year.

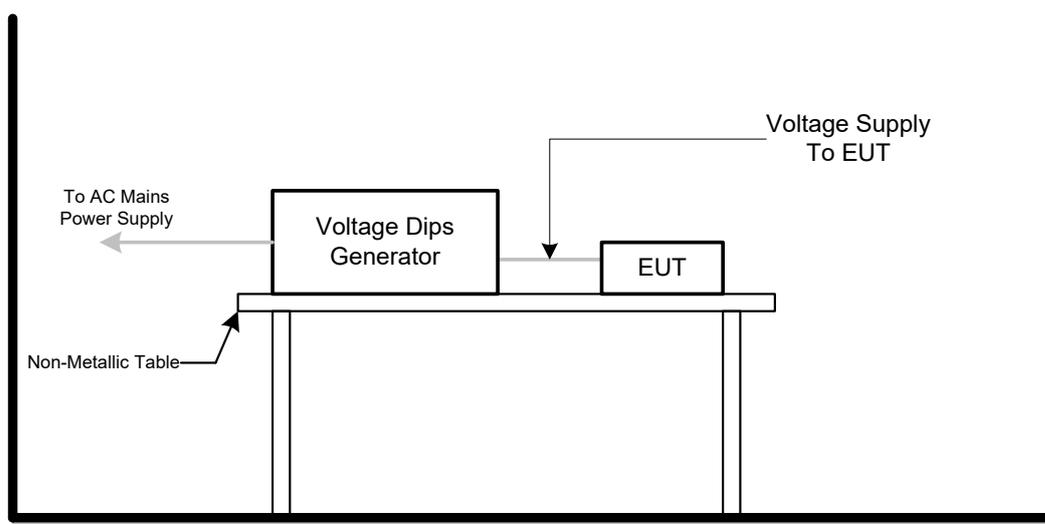
### 4.9.3 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

### 4.9.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.9.5 TEST SETUP



#### 4.9.6 TEST RESULTS

Test Voltage	AC 100V/50Hz, AC 230V/50Hz, AC 240V/50Hz
Test Mode	Mode 1

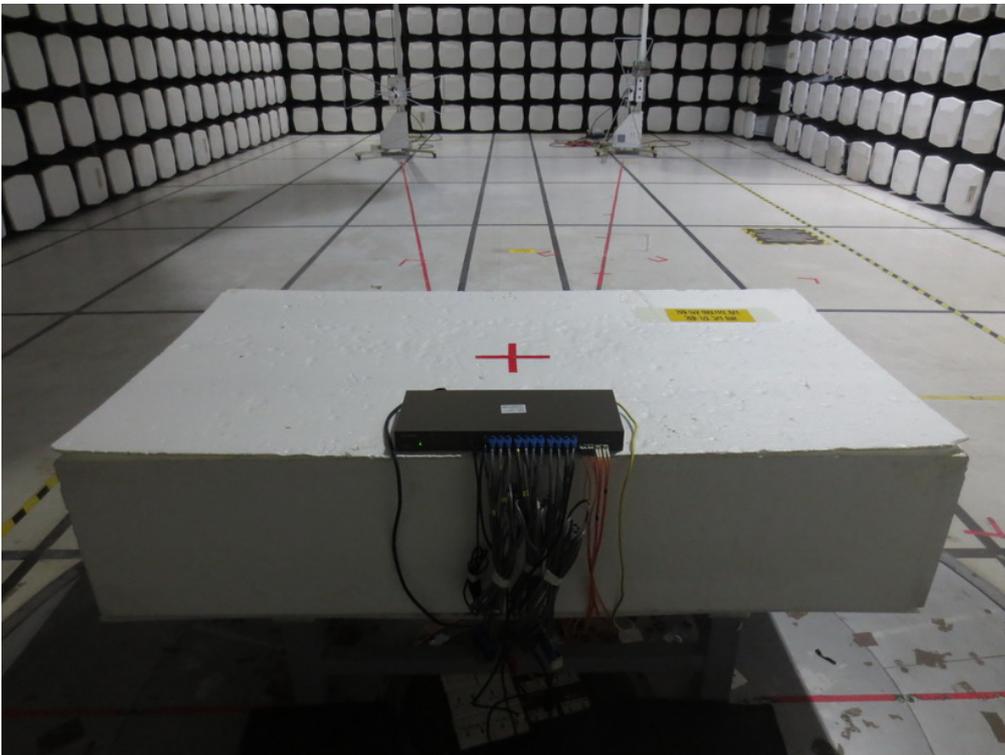
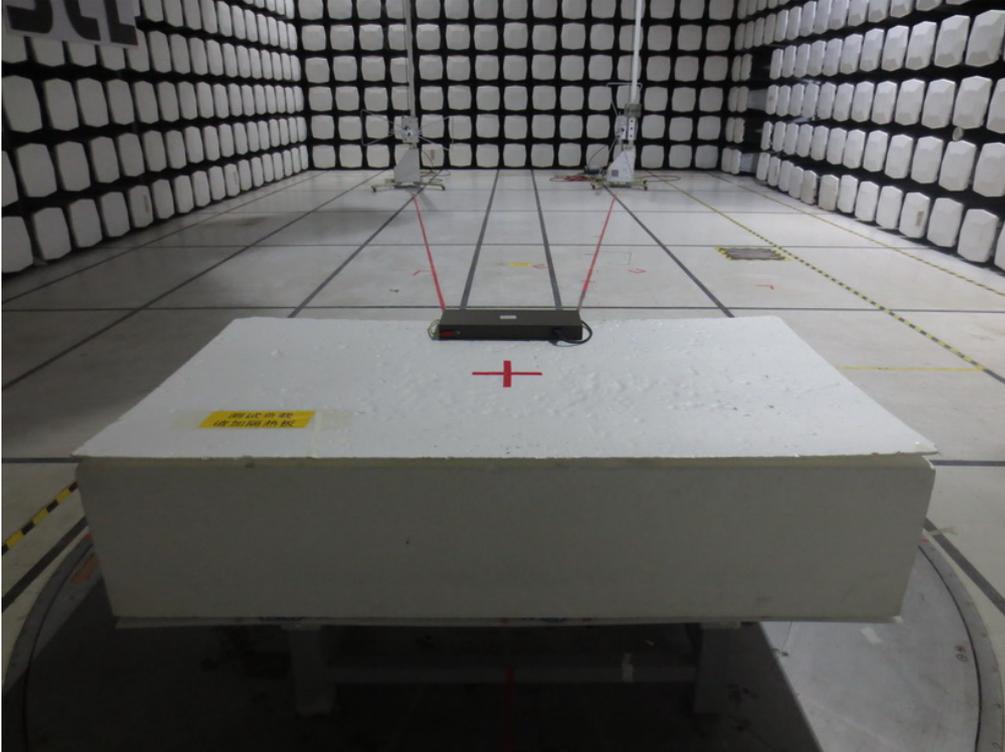
AC 100V/50Hz				
Item	Residual Voltage	Cycle	Criteria	Results
Voltage dips	<5%	0.5	B	A
Voltage dips	70%	25	C	A
Voltage Interruption	<5%	250	C	C

AC 230V/50Hz				
Item	Residual Voltage	Cycle	Criteria	Results
Voltage dips	<5%	0.5	B	A
Voltage dips	70%	25	C	A
Voltage Interruption	<5%	250	C	C

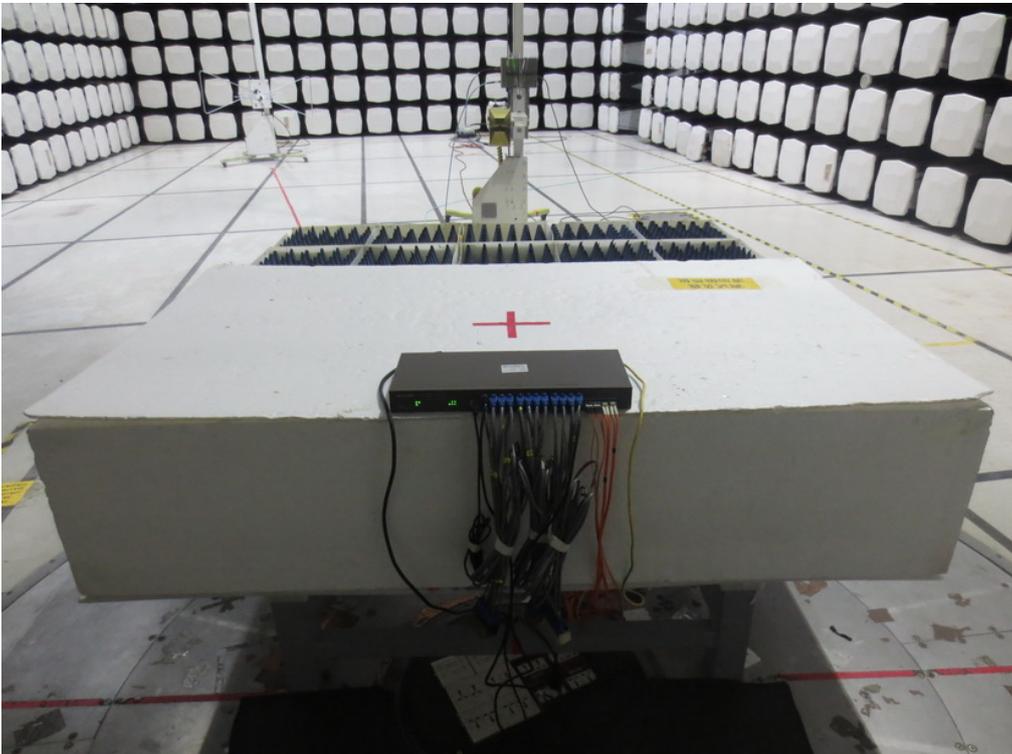
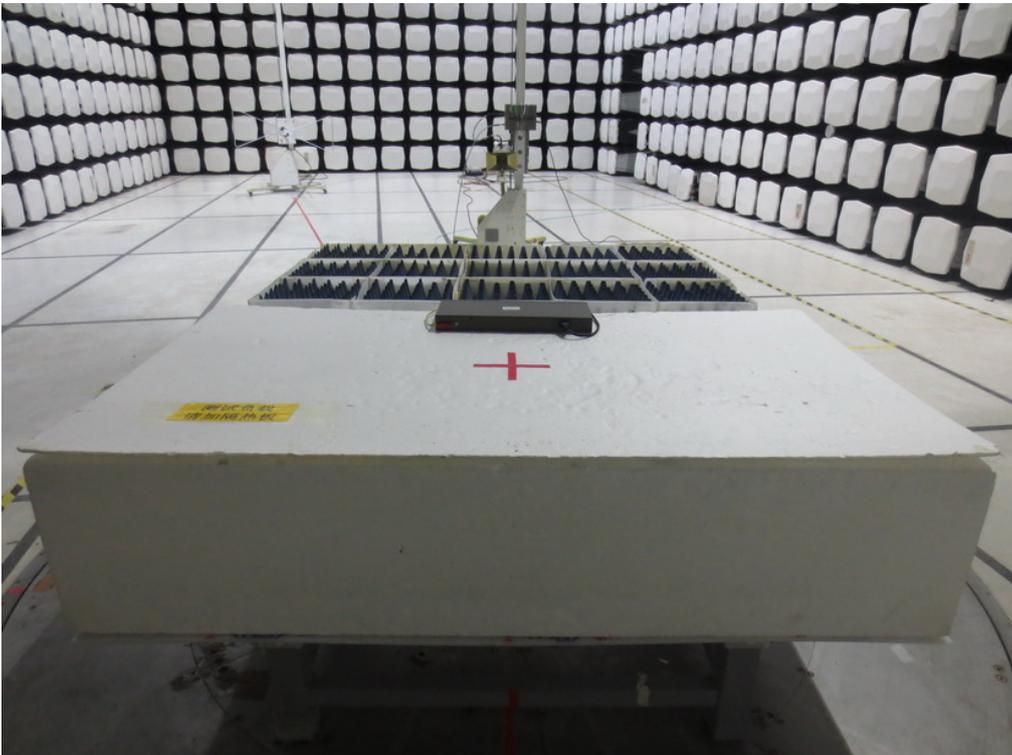
AC 240V/50Hz				
Item	Residual Voltage	Cycle	Criteria	Results
Voltage dips	<5%	0.5	B	A
Voltage dips	70%	25	C	A
Voltage Interruption	<5%	250	C	C

**5. EUT TEST PHOTO**

Radiated emissions up to 1 GHz



Radiated emissions above 1 GHz



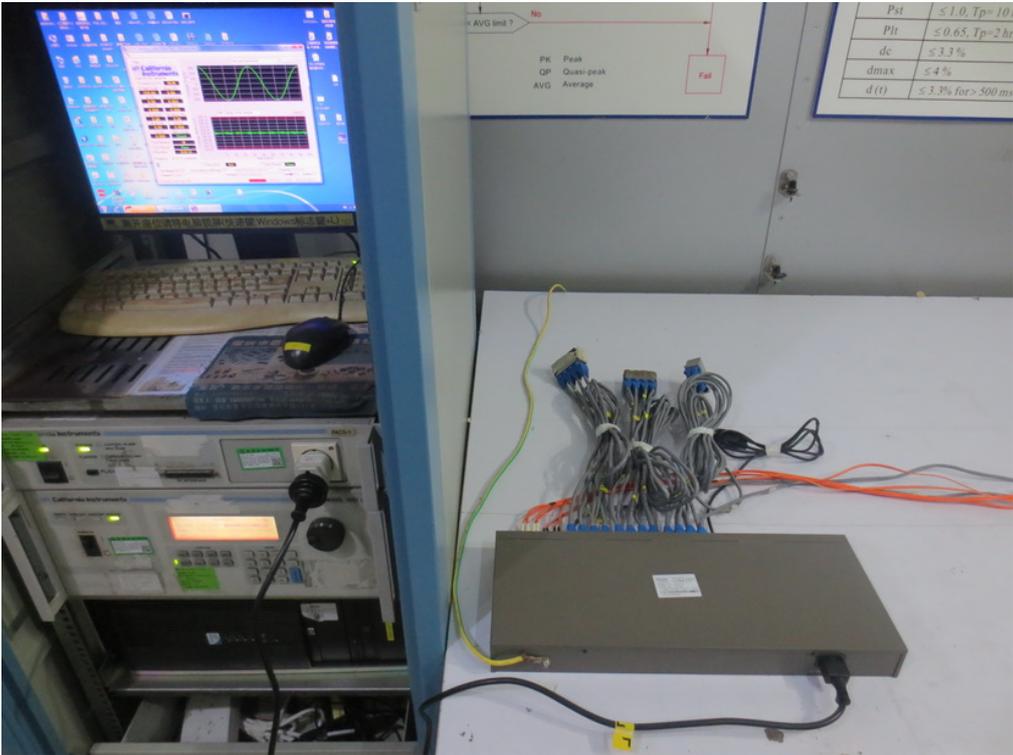
Conducted emissions AC mains power port



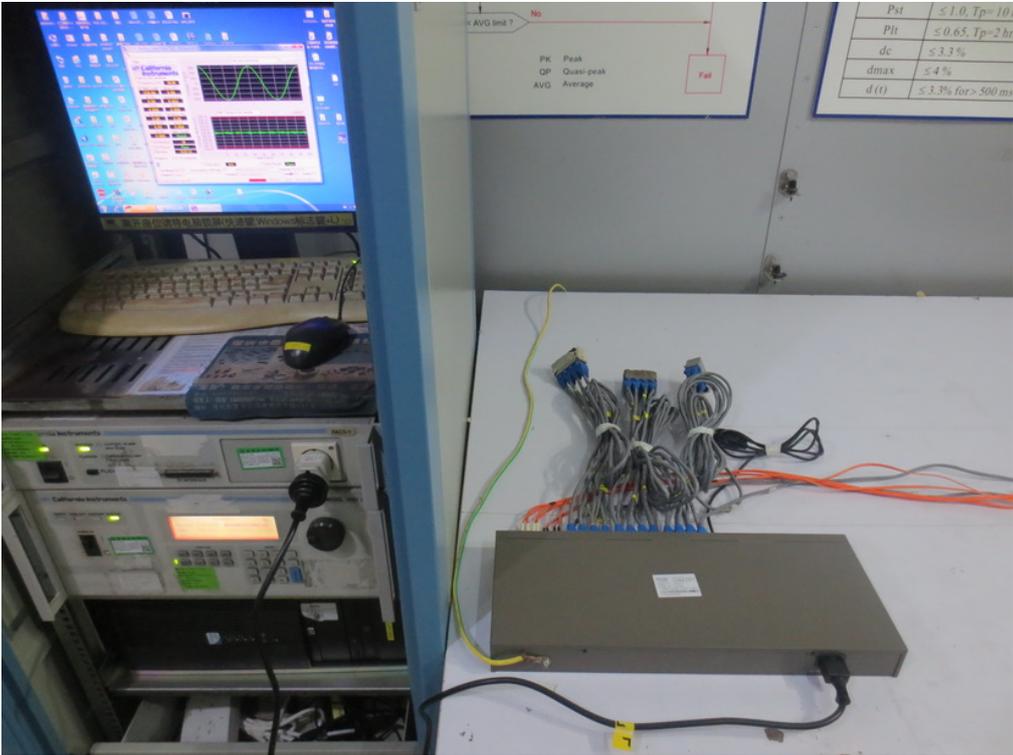
### Asymmetric mode conducted emissions(LAN)



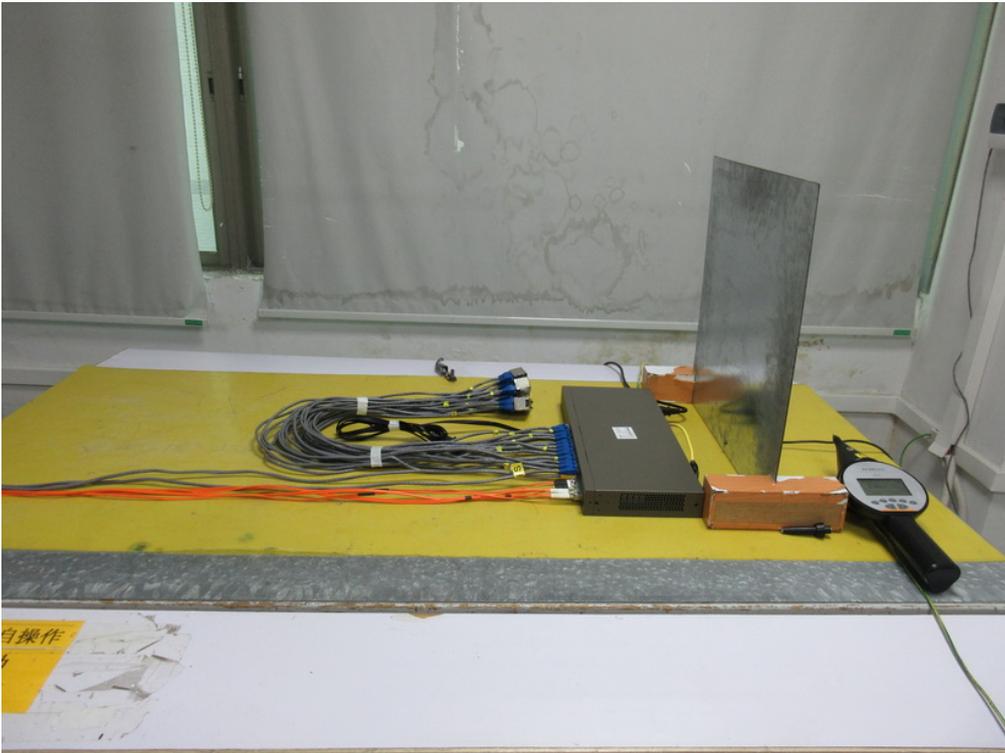
### Harmonic current



### Voltage fluctuations (Flicker)



Electrostatic discharge immunity



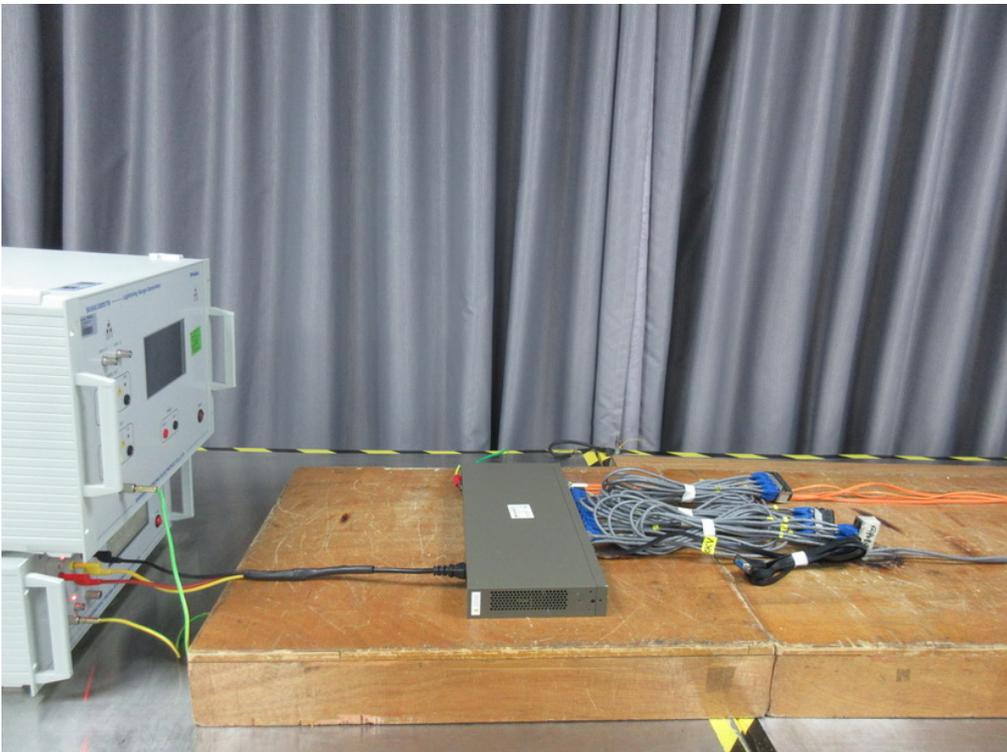
Radiated, radio-frequency, electromagnetic field immunity – Up to 1GHz



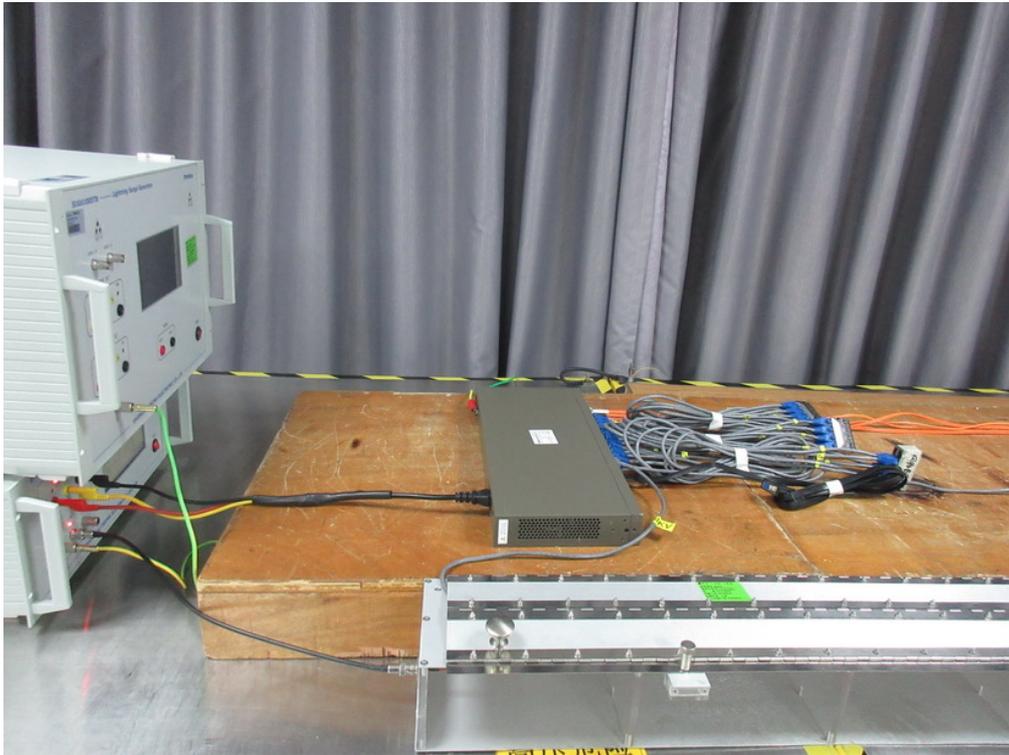
## Radiated, radio-frequency, electromagnetic field immunity – Above 1GHz



## Electrical fast transient/burst immunity - AC



### Electrical fast transient/burst immunity(LAN)



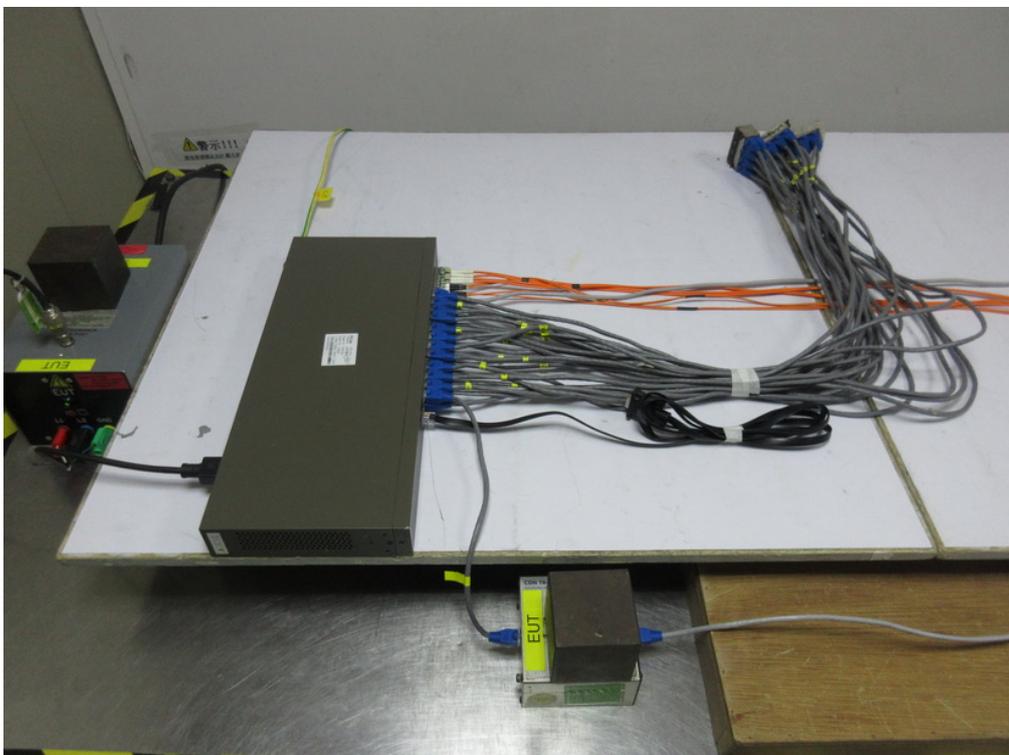
Surge immunity - AC



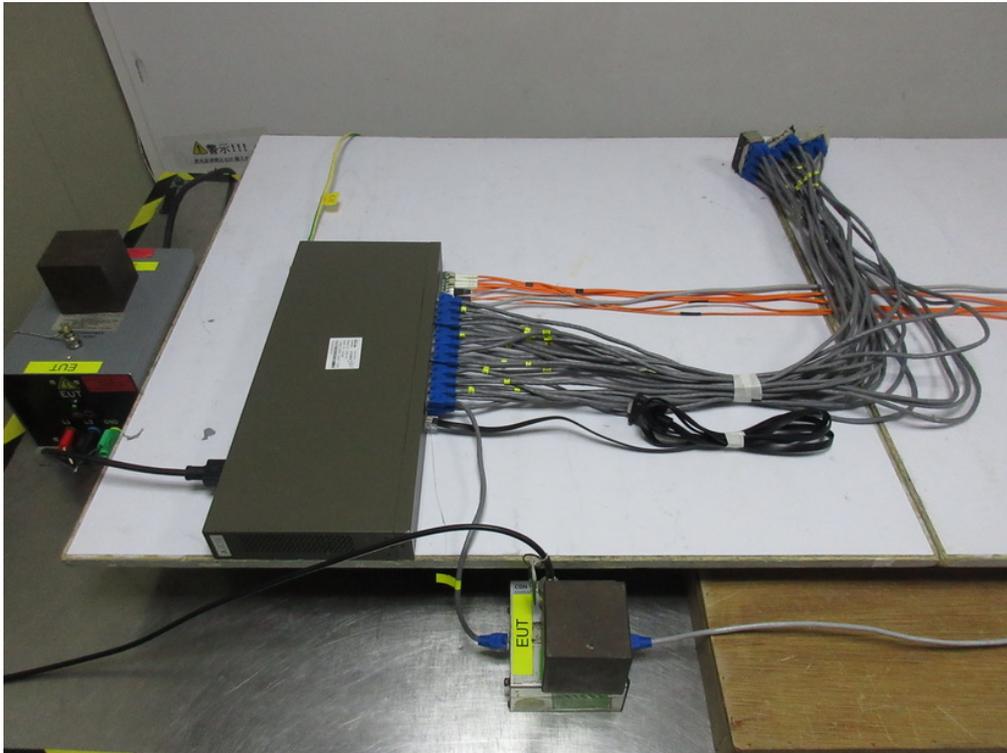
## Surge immunity(LAN)



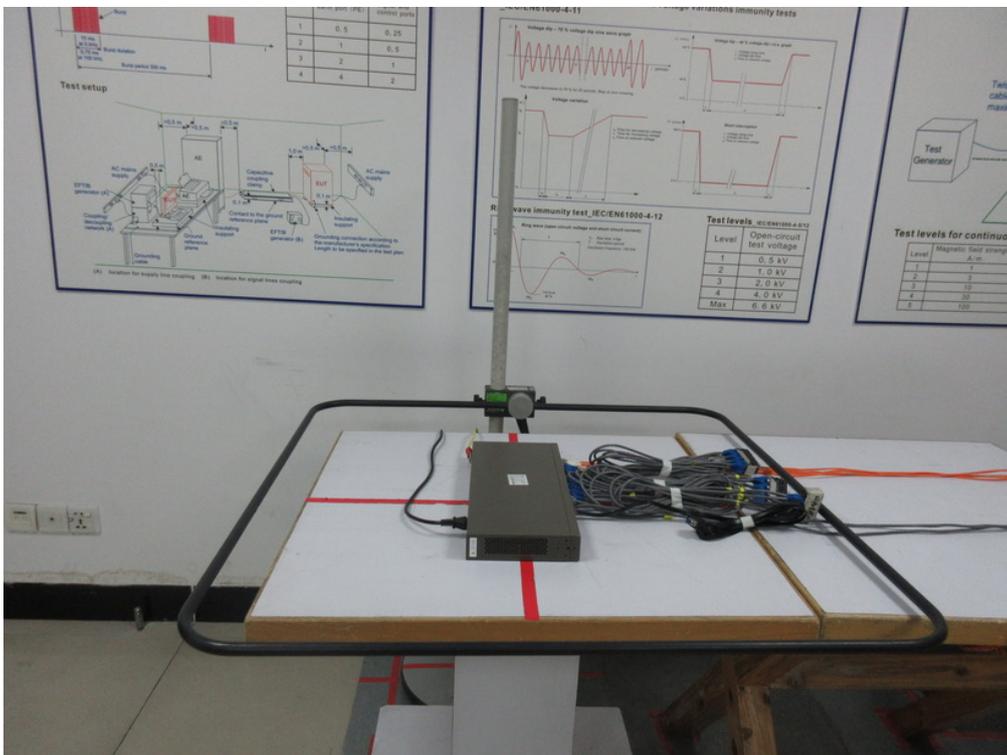
Immunity to conducted disturbances, induced by radio-frequency fields - AC



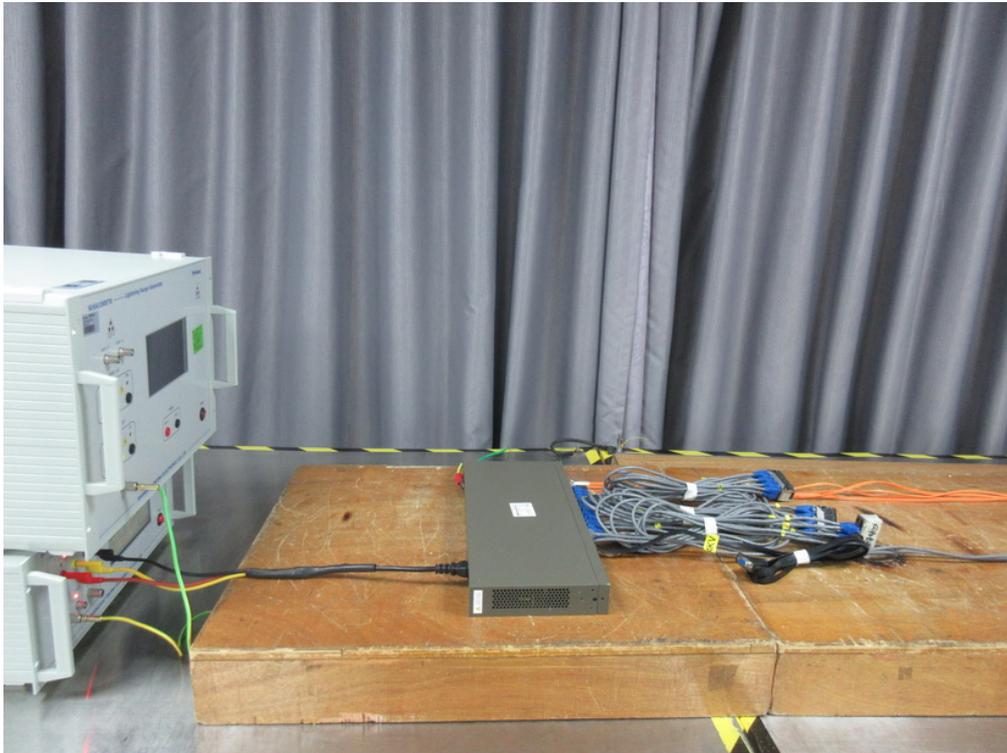
Immunity to conducted disturbances, induced by radio-frequency fields(LAN)



Power frequency magnetic field immunity



## Voltage dips, short interruptions and voltage variations immunity

**End of Test Report**