

# ETSI EN 301 489-1&-52 Test Report

**Project No.** : 2207C142  
**Equipment** : AX1800 Wi-Fi 6 5G NR Router  
**Brand Name** : Tenda  
**Test Model** : 5G03  
**Series Model** : N/A  
**Applicant** : SHENZHEN TENDA TECHNOLOGY CO.,LTD.  
**Address** : 6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052  
**Manufacturer** : SHENZHEN TENDA TECHNOLOGY CO.,LTD.  
**Address** : 6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052  
**Date of Receipt** : Jul. 29, 2022  
**Date of Test** : Aug. 01, 2022 ~ Aug. 08, 2022  
**Issued Date** : Sep. 14, 2022  
**Report Version** : R00  
**Test Sample** : Engineering Sample No.: DG2022072965  
**Standard(s)** : ETSI EN 301 489-1 V2.2.3 (2019-11)  
Draft ETSI EN 301 489-52 V1.1.2 (2020-12)

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

Draft ETSI EN 301 489-52 V1.1.2 (2020-12) is currently a draft version and therefore is not authorized within the scope of A2LA.

*Sam. Wang*

Prepared by : Sam Wang

*Kang Zhang*

Approved by : Kang Zhang



TESTING CERT #5123.02

## BTL Inc.

No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

Tel: +86-769-8318-3000

Web: [www.newbtl.com](http://www.newbtl.com)

Service mail: [btl\\_qa@newbtl.com](mailto:btl_qa@newbtl.com)

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**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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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 No.	Version	Description	Issued Date	Note
BTL-ETSE-2-2207C142	R00	Original Report.	Sep. 14, 2022	Valid

## 1. SUMMARY OF TEST RESULTS

Emission EN 301 489-1 / EN 301 489-52		
Ref Standard(s)	Test Item	Result
EN 55032:2015+A11:2020	Radiated emissions up to 1 GHz	PASS
	Radiated emissions above 1 GHz	PASS
	Conducted emissions AC mains power port	PASS
	Conducted emissions DC power port	N/A
	Asymmetric mode conducted emissions	AAN
		Current Probe
		CP+CVP
EN IEC 61000-3-2:2019	Harmonic current	PASS
EN 61000-3-3:2013+A1:2019	Voltage fluctuations (Flicker)	PASS

Ref Standard(s)	Test Item	Result
EN 61000-4-2:2009	ESD	PASS
EN IEC 61000-4-3:2020	RS	PASS
EN 61000-4-4:2012	EFT	PASS
EN 61000-4-5:2014+A1:2017	Surge	PASS
EN 61000-4-6:2014+AC:2015	CS	PASS
EN IEC 61000-4-11:2020	Dips	PASS

### 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 Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of 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-CB01 (3m)	CISPR	30MHz ~ 200MHz	V	4.62
		30MHz ~ 200MHz	H	3.58
		200MHz ~ 1,000MHz	V	4.44
		200MHz ~ 1,000MHz	H	4.36

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

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB01 (3m)	CISPR	1GHz ~ 6GHz	3.72

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

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-C01	CISPR	150kHz ~ 30MHz	2.86

### D. Asymmetric mode conducted emissions measurement:

Test Site	Method	Test Item	U,(dB)
DG-C01	CISPR	AAN Cat.5 LCL = 65 ... 50 dB	4.04

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

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



## F. Immunity Measurement:

Test Site	Method	Item	U
DG-SR02	EN 61000-4-2	Rise time tr	6.30%
		Peak current Ip	6.70%
		Current at 30 ns	6.40%
		Current at 60 ns	6.90%
DG-CB05	EN IEC 61000-4-3 (80MHz~6GHz)	Electromagnetic field immunity test	2.00dB
		Error Ratios measurement, test set-up for RS 2G/3G	2.08dB
		Throughput Percentages measurement, test set-up for RS 4G	2.08dB
		Throughput Percentages measurement, test set-up for RS 5G	2.08dB
DG-SR05	EN 61000-4-4	Peak voltage (VP)	3.8%
		Rise time (tr)	4.4%
		Pulse width(tw)	4.2%
		Pulse Freq.(kHz)	0.7%
		Burst Duration(ms)	1.5%
		Burst Period(ms)	1.4%
		Peak voltage (VP)-with clamp	3.7%
		Rise time (tr) -with clamp	4.4%
		Pulse width(tw) -with clamp	4.4%
DG-SR05 DG-SR01	EN 61000-4-5	Open-Circuit Output Voltage (1.2/50us)	4.0%
		Open circuit front time (1.2/50us)	6.2%
		Open circuit time of half value (1.2/50us)	4.8%
DG-CB06	EN 61000-4-6 (150kHz-80MHz)	CDN	1.32dB
		EM clamp	3.14dB
		Error Ratios measurement, test set-up for CS 2G/3G	1.44dB
		Throughput Percentages measurement, test set-up for CS 4G	1.44dB
		Throughput Percentages measurement, test set-up for CS 5G NR	1.44dB
DG-SR01	EN IEC 61000-4-11	DIP Amplitude	3.6%
		DIP Time Event	4.0%

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	54%	Farun Liang
Radiated emissions above 1 GHz	25°C	54%	Farun Liang
Conducted emissions AC mains power port	25°C	51%	Gerry Zhao
Asymmetric mode conducted emissions	25°C	51%	Gerry Zhao
Harmonic current	25°C	55%	Eli Chen
Voltage fluctuations (Flicker)	25°C	55%	Eli Chen

Test Item	Temperature	Humidity	Pressure	Tested By
ESD	23°C	50%	1017hPa	Cole Chen
RS	27°C	42%	/	Robert Luo
EFT	24°C	55%	/	Wade Liang
Surge	24-26°C	45-55%	/	Wade Liang Karl Wu
CS	28°C	38%	/	Hunter Xu
Dips	26°C	45%	/	Karl Wu

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	AX1800 Wi-Fi 6 5G NR Router
Brand Name	Tenda
Test Model	5G03
Series Model	N/A
Model Difference(s)	N/A
Power Source	DC Voltage supplied from AC adapter. 1# Model: BN026-A24012E (EU) 2# Model: BN026-A24012B (UK) Only differ in plug.
Power Rating	I/P: 100-240V~ 50/60Hz 0.7A    O/P: 12.0V  2.0A
Connecting I/O Port(s)	1* PWR port 1* Type-C port 1* LAN port 1* WAN/LAN port 1* SIM Card port
Classification of EUT	Class B
Intended Operating Frequency(Fo)	WCDMA: Band I : 1920MHz ~ 1980MHz, Band VIII: 880MHz ~ 915MHz, Band V: TX: 824 MHz ~ 849 MHz, RX: 869 MHz ~ 894 MHz LTE : Band 1: 1920-1980 MHz, Band 3: 1710-1785 MHz, Band 5: 824-849 MHz, Band 7: 2500-2570 MHz, Band 8: 880-915 MHz, Band 20: 832-862 MHz, Band 28: 703-748 MHz, Band 32: N/A, Band 38: 2570-2620 MHz, Band 40: 2300-2400 MHz, Band 41: 2496-2690 MHz, Band 42: 3400-3600 MHz, Band 43: 3600-3800 MHz 5G NR: Band n1: 1920-1980 MHz, Band n3: 1710-1785 MHz, Band n5: 824-849 MHz, Band n7: 2500-2570 MHz, Band n8: 880-915 MHz, Band n20: 832-862 MHz, Band n28: 703-748 MHz, Band n38: 2570-2620 MHz, Band n40: 2300-2400 MHz, Band n41: 2496-2690 MHz, Band n77: 3300-4200 MHz, Band n78: 3300-3800 MHz
Highest Internal Frequency(Fx)	4200MHz

**Note:**

- 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 generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible 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(WCDMA B1/B5/B8+2.4G WIFI+5G WIFI )
Mode 2	FULL SYSTEM(LTE FDD: B1/B3/B5/B7/B8/B20/B28/B32 TDD: B38/B40/B41/B42/B43+2.4G WIFI+5G WIFI)
Mode 3	FULL SYSTEM(5G NR: n1/n3/n5/n7/n8/n20/n28/n38/n40/n41/n77/n78 +2.4G WIFI+5G WIFI)
Mode 4	FULL SYSTEM(Idle)
Mode 5	WAN 1Gbps
Mode 6	LAN1 1Gbps

Radiated emissions up to 1 GHz Test	
Final Test Mode	Description
Mode 4	FULL SYSTEM(Idle)

Radiated emissions Above 1 GHz Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM(WCDMA B1+2.4G WIFI+5G WIFI )

Conducted emissions AC mains power port Test	
Final Test Mode	Description
Mode 4	FULL SYSTEM(Idle)

Asymmetric mode conducted emissions Test	
Final Test Mode	Description
Mode 5	WAN 1Gbps
Mode 6	LAN1 1Gbps

Harmonic current & Voltage fluctuations (Flicker) Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM(WCDMA B1+2.4G WIFI+5G WIFI )

Immunity Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM(WCDMA B1/B5/B8+2.4G WIFI+5G WIFI )
Mode 2	FULL SYSTEM(LTE FDD: B1/B3/B5/B7/B8/B20/B28/B32 TDD: B38/B40/B41/B42/B43+2.4G WIFI+5G WIFI)
Mode 3	FULL SYSTEM(5G NR: n1/n3/n5/n7/n8/n20/n28/n38/n40/n41/n77/n78 +2.4G WIFI+5G WIFI)
Mode 4	FULL SYSTEM(Idle)

Note:

1. For EMI, pretested Mode 1 - Mode 4, the worst case is recorded in this report.
2. Mode 1 tested WCDMA B1/B5/B8, the worst case is B1 and recorded.
3. RS: The Front, Rear, Left and Right were evaluated. The worst placement direction is Rear and recorded in this report.
4. Two adapters only differ in plug, so tested with EU.
5. The product supports 2.4G&5G WIFI function.  
The frequency exemptions are 2400-2483.5MHz, 5150-5250MHz.
6. Radiated emission above 1GHz tested with 2.4G&5G filter.

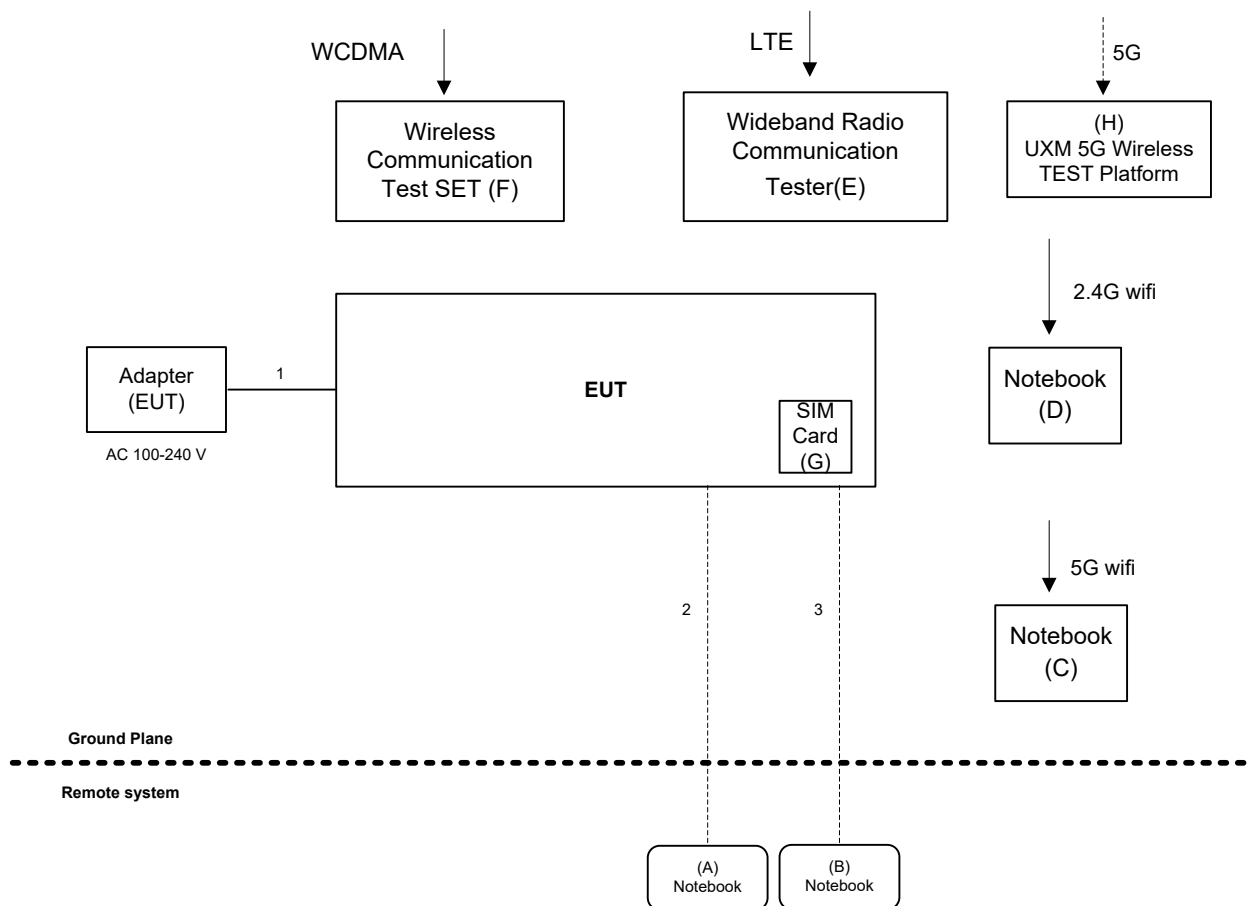
## 2.3 EUT OPERATING CONDITIONS

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 Adapter (EUT) via DC Cable.
2. EUT connected to Notebook (A&B) via RJ45 Cable.
3. EUT connected to Notebook (D) via 2.4G WIFI.
4. EUT connected to Notebook (C) via 5G WIFI.
5. EUT connected to Wireless Communication Test SET via WCDMA.
6. EUT connected to Wideband Radio Communication Tester via LTE.
7. EUT connected to UXM 5G Wireless TEST Platform via 5G.
8. SIM Card is plugged into EUT.

## 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	Notebook	Lenovo	E445	MP-05Y56S
B	Notebook	Lenovo	G40	YB09261386
C	Notebook	Lenovo	V310-14ISK	LR07GZHC
D	Notebook	Lenovo	V310-14ISK	LR07GZML
E	Wideband Radio Communication Tester	RS	CMW500	122125
F	Wireless Communication Test SET	Agilent	(8960 Series) E5515C	MY48364183
G	SIM Card	Agilent	N/A	N/A
H	UXM 5G Wireless TEST Platform	KEYSIGHT	E7515B	MY59110295

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m
2-3	RJ45 Cable	NO	NO	10m

### 3. EMC EMISSION TEST

#### 3.1 RADIATED EMISSIONS UP TO 1 GHZ

##### 3.1.1 LIMITS

Class B equipment up to 1 GHz

Frequency Range MHz	Measurement			Class B limits dB(μV/m)
	Facility	Distance m	Detector type/ bandwidth	
30 - 230	SAC	3	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 (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

##### 3.1.2 TEST PROCEDURE

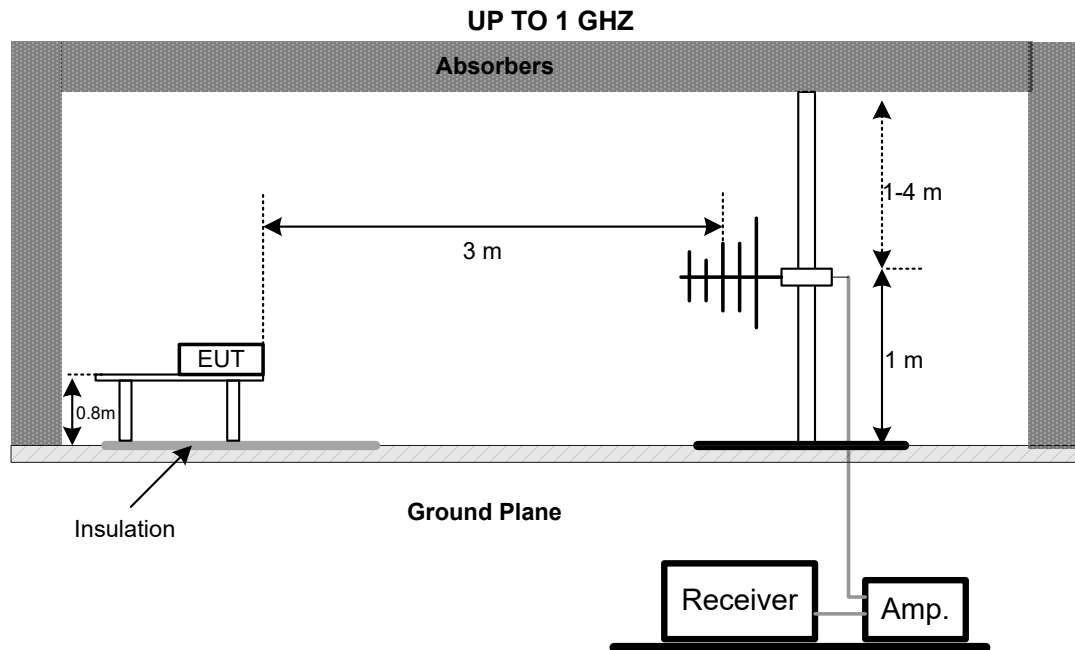
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz).
- b. The height of the 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 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.  
(below 1GHz)
- e. For the actual test configuration, please refer to the related Item - EUT Test Photos.

##### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation



### 3.1.4 TEST SETUP



### 3.1.5 MEASUREMENT DISTANCE

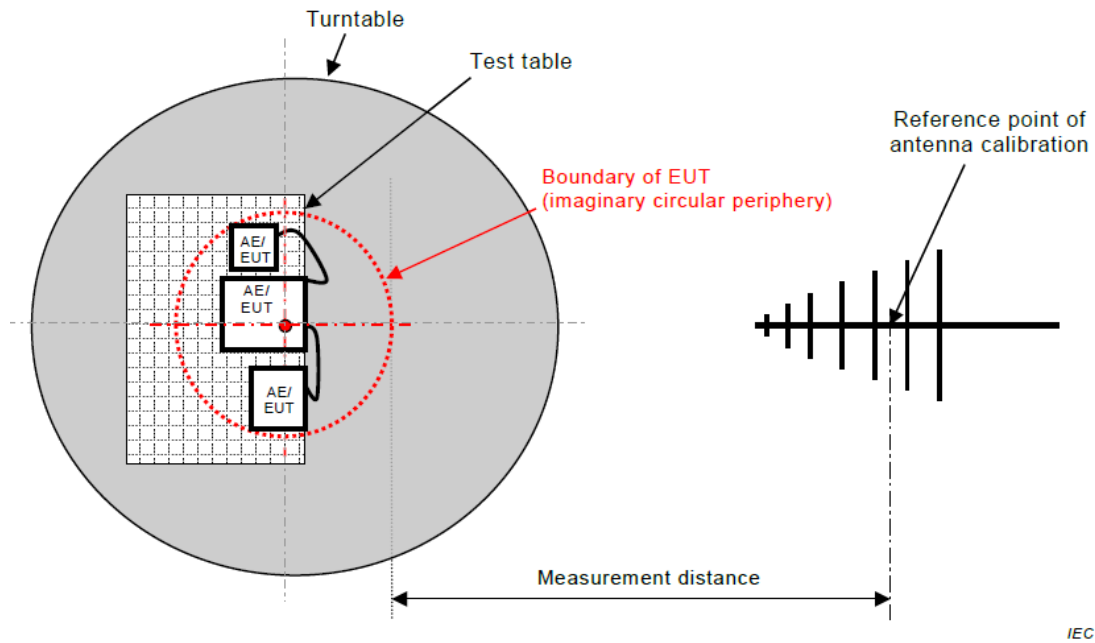


Figure C.1 – Measurement distance

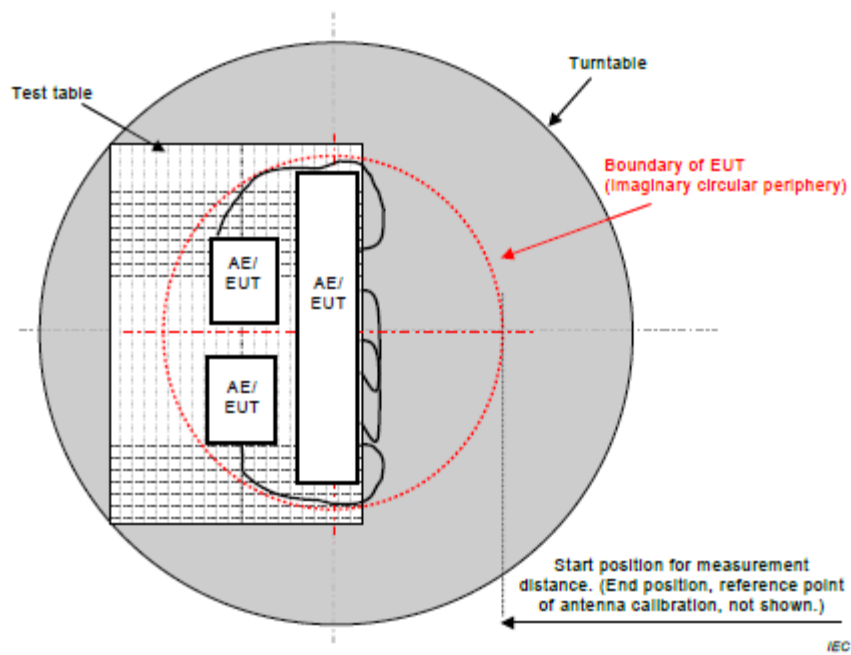


Figure C.2 – Boundary of EUT, Local AE and associated cabling

### 3.1.6 TEST RESULTS (UP TO 1 GHZ)

Please refer to the Appendix A.

### 3.2 RADIATED EMISSIONS ABOVE 1 GHZ

#### 3.2.1 LIMITS

Class B equipment above 1 GHz

Frequency Range MHz	Measurement			Class B limits dB(μV/m)
	Facility	Distance m	Detector type/bandwidth	
1000 - 3000	FSOATS	3	Average / 1 MHz	50
3000 - 6000				54
1000 - 3000			Peak / 1 MHz	70
3000 - 6000				74

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 <sub>x</sub> )	Highest measured frequency
F <sub>x</sub> ≤ 108 MHz	1 GHz
108 < F <sub>x</sub> ≤ 500 MHz	2 GHz
500 < F <sub>x</sub> ≤ 1000 MHz	5 GHz
F <sub>x</sub> > 1 GHz	5 x F <sub>x</sub> up to a maximum of 6 GHz

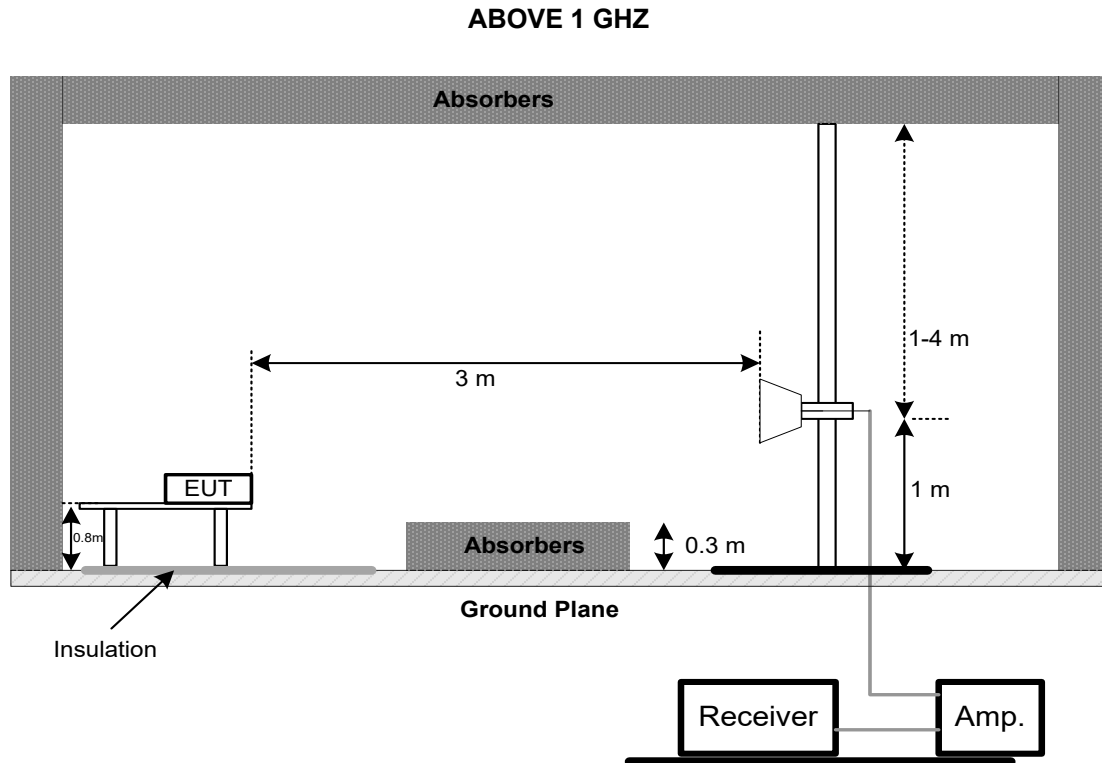
#### 3.2.2 TEST PROCEDURE

- 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 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz).
- 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. (above 1GHz)
- e. For the actual test configuration, please refer to the related Item - EUT Test Photos.

### 3.2.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.2.4 TEST SETUP



## 3.2.5 MEASUREMENT DISTANCE

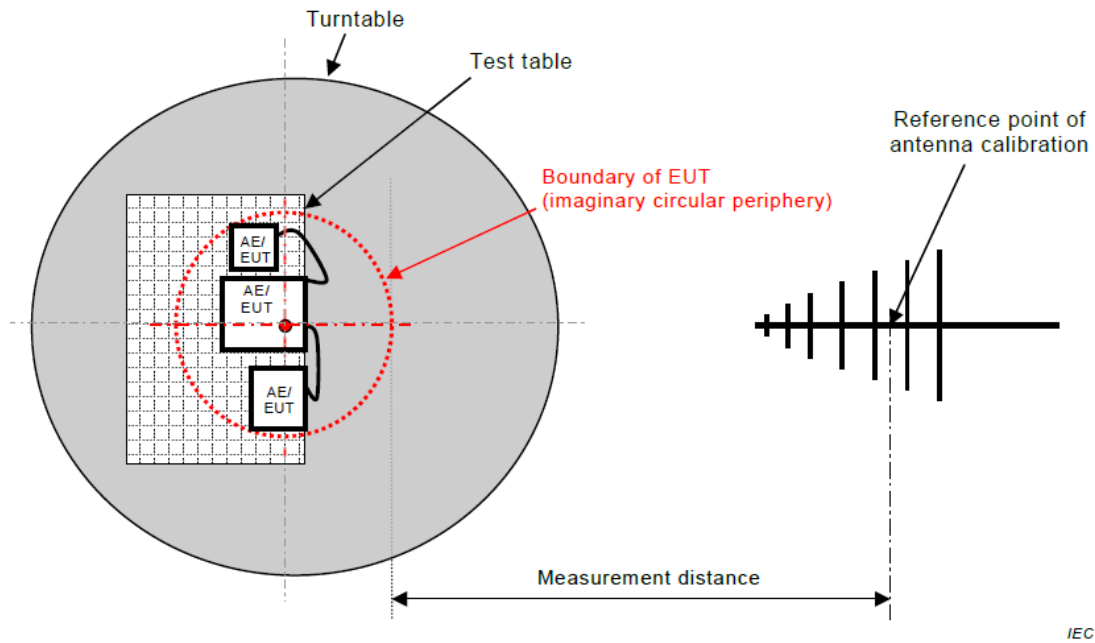


Figure C.1 – Measurement distance

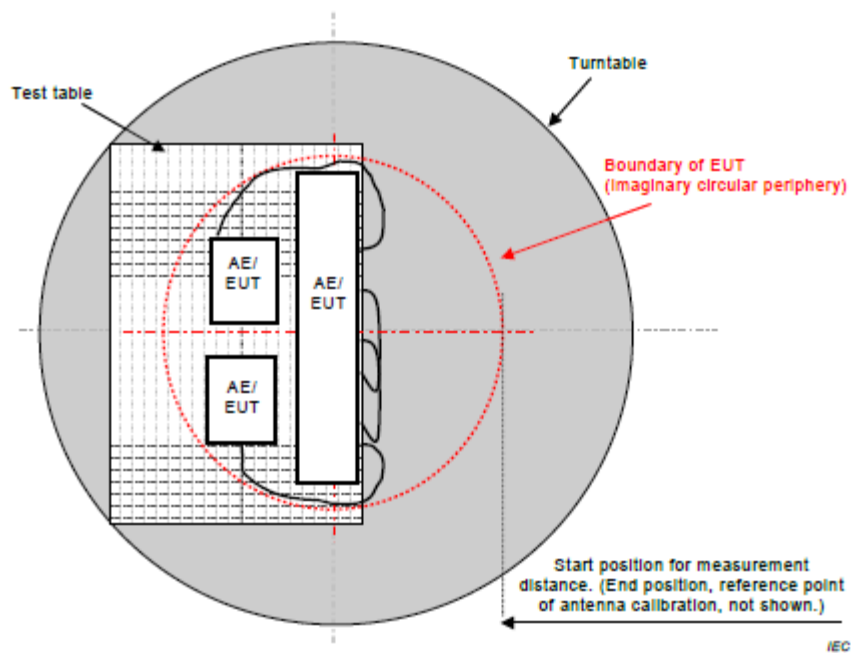


Figure C.2 – Boundary of EUT, Local AE and associated cabling

## 3.2.6 TEST RESULTS (ABOVE 1 GHZ)

Please refer to the Appendix B.

### 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 B equipment

Frequency Range MHz	Coupling Device	Detector Type / bandwidth	Class B Limits (dB(μV))
0.15 - 0.5	AMN	Quasi Peak / 9 kHz	66-56
0.5 - 5			56
5 - 30			60
0.15 - 0.5	AMN	Average / 9 kHz	56-46
0.5 - 5			46
5 - 30			50

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

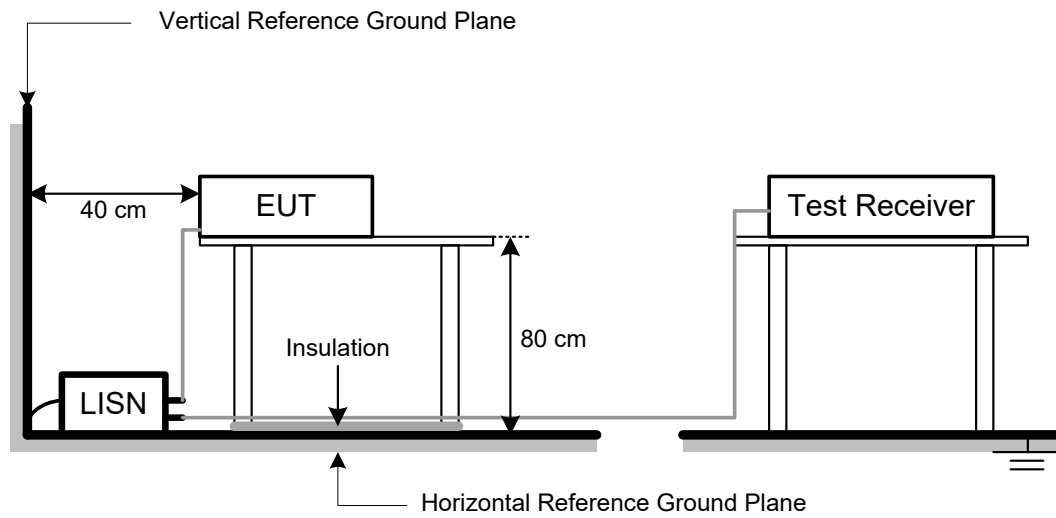
#### 3.3.2 TEST PROCEDURE

- 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item – EUT Test Photos.

#### 3.3.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.3.4 TEST SETUP



### 3.3.5 TEST RESULTS

Please refer to the Appendix C.

### 3.4 ASYMMETRIC MODE CONDUCTED EMISSIONS TEST

#### 3.4.1 LIMITS

Requirements for asymmetric mode conducted emissions from Class B equipment

Frequency Range MHz	Coupling device	Detector type / Bandwidth	Class B voltage limits dB(μV)	Class B current limits dB(μA)
0.15 - 0.5	AAN	Quasi Peak / 9 kHz	84 - 74	n/a
0.5 - 30			74	
0.15 - 0.5	AAN	Average / 9 kHz	74 - 64	
0.5 - 30			64	

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 TEST PROCEDURE

- 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.
- 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.
- 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.
- For the actual test configuration, please refer to the related Item – EUT Test Photos.

NOTE:

- 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.

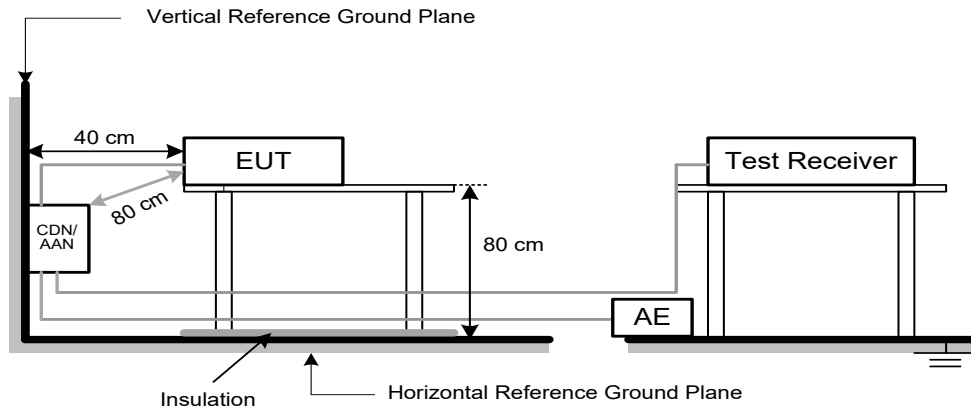
#### 3.4.3 DEVIATION FROM TEST STANDARD

No deviation



### 3.4.4 TEST SETUP

a) Cable Type: Balanced Unscreened, Screened or Coaxial



### 3.4.5 TEST RESULTS

Please refer to the Appendix D.

### 3.5 HARMONIC CURRENT EMISSIONS TEST

#### 3.5.1 LIMITS

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

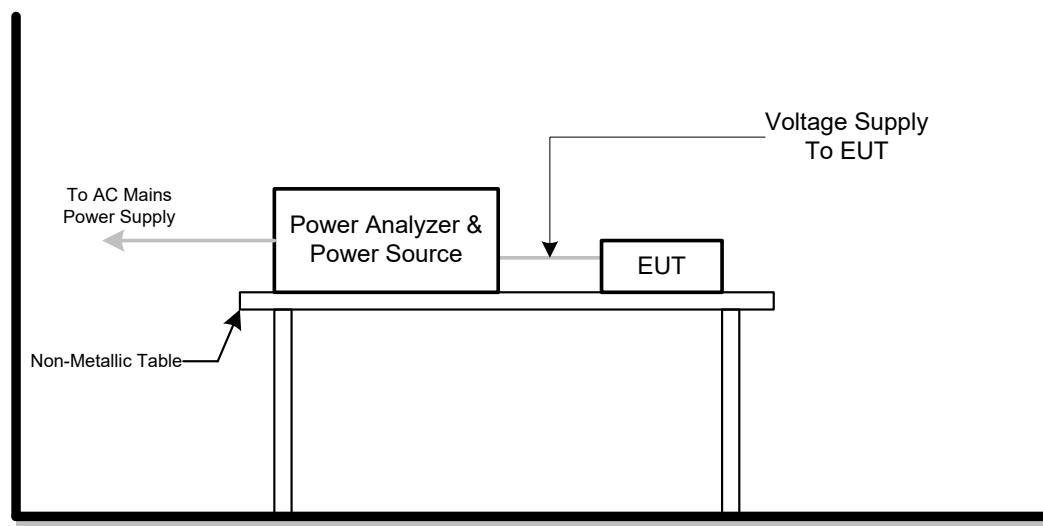
#### 3.5.2 TEST PROCEDURE

- 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 IEC 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.

#### 3.5.3 DEVIATION FROM TEST STANDARD

No deviation

#### 3.5.4 TEST SETUP



#### 3.5.5 TEST RESULTS

Please refer to the Appendix E.

## 3.6 VOLTAGE FLUCTUATIONS AND FLICKER

### 3.6.1 LIMITS

Tests	Limits	Descriptions
	EN 61000-3-3	
Pst	$\leq 1.0$ , $T_p = 10$ min.	Short Term Flicker Indicator
Plt	$\leq 0.65$ , $T_p = 2$ 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

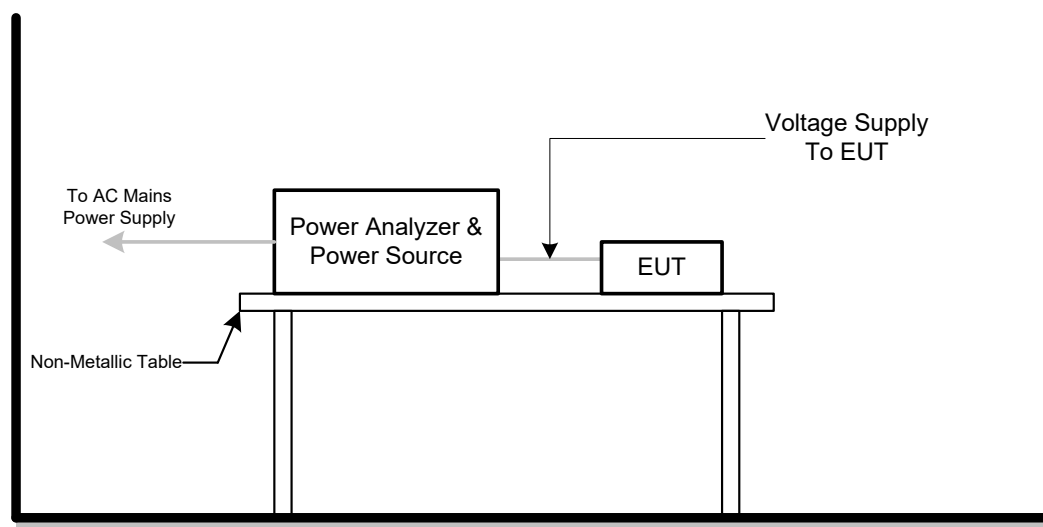
### 3.6.2 TEST PROCEDURE

- 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.
- All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

### 3.6.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.6.4 TEST SETUP



### 3.6.5 TEST RESULTS

Please refer to the Appendix F.

## 4. EMC IMMUNITY TEST

### 4.1 STANDARD COMPLIANCE/SEVERITY LEVEL/CRITERIA

Equipment operating in locations other than telecommunication centres			
Test Standard No.	Test Specification Level	Test Mode Test Port	Performance Criteria
Electrostatic discharge EN 61000-4-2 (ESD)	± 8 kV air discharge ± 4 kV contact discharge	Direct Mode	B
	± 4 kV HCP discharge ± 4 kV VCP discharge	Indirect Mode	B
Radio frequency electromagnetic Field EN IEC 61000-4-3 (RS)	80 MHz to 6000 MHz 3 V/m (unmodulated, r.m.s), 1000 Hz, 80%, AM modulated	Enclosure	A
Fast transients, common mode EN 61000-4-4 (EFT)	± 1 kV(peak) 5/50 ns Tr/Th 5 kHz Repetition Frequency	AC mains power port	B
	±0.5 kV(peak) 5/50ns Tr/Th 5 kHz Repetition Frequency	DC power port (NOTE 1)	B
	± 0.5 kV(peak) 5/50 ns Tr/Th 5 kHz Repetition Frequency	Signal port, Wired network port, Control port (NOTE 1)	B
Surges, line to line and line to Ground EN 61000-4-5 (Surge)	±1 kV(5P/5N) 1.2/50(8/20) Tr/Th us (line to line)	AC mains power port	B
	± 2 kV(5P/5N) 1.2/50(8/20) Tr/Th us (line to earth or ground)		B
	±1 kV (5P/5N) 10/700 (5/320)Tr/Th us (symmetrically operated line to ground )	wired network ports (NOTE 2)	B
	±0.5 kV (5P/5N) 1.2/50(8/20) Tr/Th us (non-symmetrically line to line)		
	±1 kV (5P/5N) 1.2/50(8/20) Tr/Th us (non-symmetrically line to ground, or shield to ground)		
	±0.5 kV (5P/5N) 1.2/50(8/20) Tr/Th us (line to ground, or shield to ground)	wired network ports (NOTE 1)	B

Radio frequency, common mode EN 61000-4-6 (CS)	0.15 MHz to 80 MHz 3 V (unmodulated, r.m.s), 1000 Hz, 80%, AM Modulated 150Ω source impedance	AC Power Port	A
	0.15 MHz to 80 MHz 3 V (unmodulated, r.m.s), 1000 Hz, 80%, AM Modulated 150Ω source impedance	DC Power Port (NOTE 1)	A
	0.15 MHz to 80 MHz 3V (unmodulated, r.m.s), 1000 Hz, 80%, AM Modulated 150Ω source impedance	signal ports, wired network ports, control ports (NOTE 1)	A
Voltage dips and interruptions EN IEC 61000-4-11 (Dips)	Voltage dips: 0 % residual voltage for 0,5 cycle 0 % residual voltage for 1 cycle 70 % residual voltage for 25 cycles (at 50 Hz) Voltage interruptions: 0 % residual voltage for 250 cycles (at 50 Hz)	AC Power Port	B B C C

NOTE:

- (1) If the cables may be longer than 3 m.
- (2) Only for directly connected to outdoor cables.
- (3) Only for connected to indoor cables (longer than 30 m).

#### 4.2 Client Special Requirements

Tests Standard No.	Test Specification Level	Test Ports	Criteria
Surges, line to line and line to Ground EN 61000-4-5 (Surge)	±1 kV (5P/5N) 1.2/50(8/20) Tr/Th us <b>(line to ground, or shield to ground)</b>	wired network ports	B

### 4.3 GENERAL PERFORMANCE CRITERIA

According to ETSI EN 301 489-52 standard, the general performance criteria as following:

UTRA / E-UTRA, E-UTRA with LAA, inband or guard band NB-IoT, Stand-alone NB-IoT / NR Performance Criteria	
1.	Performance criteria for continuous phenomena(CT/CR)
2.	Performance criteria for Transient phenomena(TT/TR)

Criteria		During / After Test
<b>A</b>	CT/CR	<p>At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained.</p> <p>In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.</p> <p>UTRA: In the data transfer mode, the performance criteria can be one of the following: If the BER is used, it shall not exceed 0,001 during the test sequence; If the BLER is used, it shall not exceed 0,01 during the test sequence. The BLER calculation shall be based on evaluating the CRC on each transport block.</p> <p>E-UTRA, E-UTRA with LAA, inband or guard band NB-IoT, Stand-alone NB-IoT: In the data transfer mode, the performance criteria shall be that the throughput shall be <math>\geq 95\%</math> of the maximum throughput.</p> <p>NR: In the data transfer mode, the performance criteria shall be that the throughput shall be <math>\geq 95\%</math> of the maximum throughput.</p>
<b>B</b>	TT/TR	<p>At the conclusion of each exposure, the EUT shall operate with no user noticeable loss of the communication link.</p> <p>At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared, and the communication link shall have been maintained.</p> <p>In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.</p>
<b>C</b>	See Note	<p>The user data may have been lost and if applicable the communication link need not to be maintained and lost function should be recoverable by user or operator.</p> <p>No unintentional responses shall occur at the end of the test, when the voltage is restored to nominal.</p>

Note:

Criterion A applies for immunity tests with phenomena of a continuous nature. (CT, CR)

Criterion B applies for immunity tests with phenomena of a transient nature. (TT, TR)

Criterion C applies for immunity tests with power dips 70% and power interruptions exceeding a certain time where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up)

## 4.4 ELECTROSTATIC DISCHARGE (ESD)

### 4.4.1 TEST SPECIFICATION

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

### 4.4.2 TEST PROCEDURE

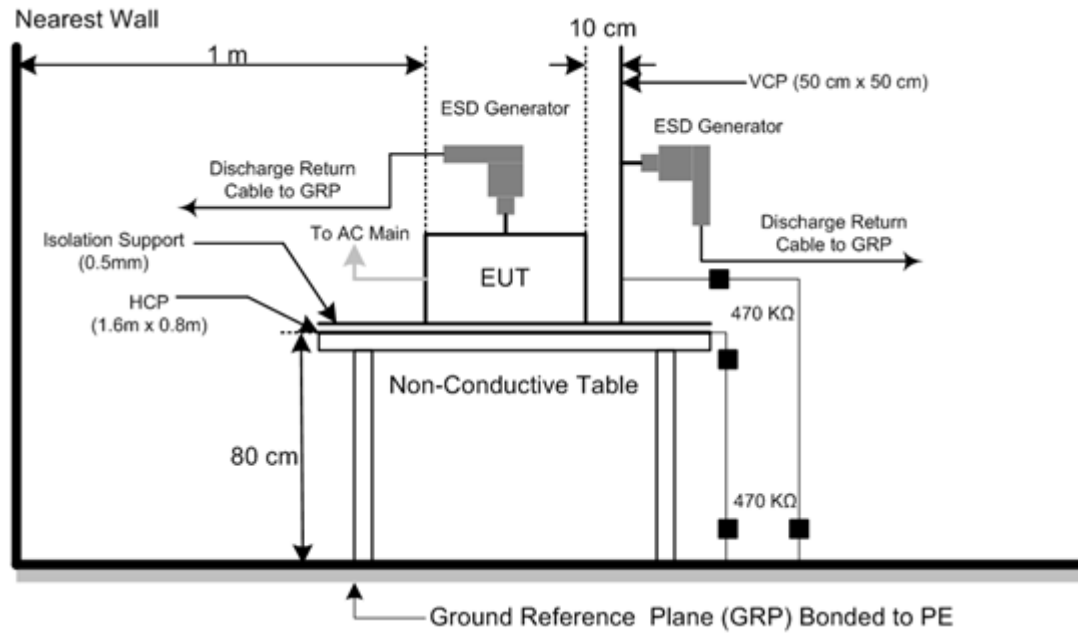
The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- 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. Air discharges at insulation surfaces of the EUT.  
 It was at least ten single discharges with positive and negative at the same selected point.
- c. 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 EN 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.

#### 4.4.3 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.4.4 TEST SETUP



#### 4.4.5 TEST RESULTS

Please refer to the Appendix G.



## 4.5 RADIO FREQUENCY ELECTROMAGNETIC FIELD (RS)

### 4.5.1 TEST SPECIFICATION

Test Method	EN IEC 61000-4-3
Performance Criteria	A
Frequency Range	80 MHz - 6000 MHz
Field Strength	3 V/m (unmodulated, r.m.s)
Modulation	1000 Hz 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

### 4.5.2 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 EN 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 test level shall be 3 V/m (measured unmodulated).

The test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1000 Hz. The test shall be performed over the frequency range 80 MHz to 6000 MHz.

For receivers and transmitters the stepped frequency increments shall be 1 % frequency.

When using the max hold detector method at each test frequency step initially an unmodulated test signal shall be applied. Then the test modulation shall be applied. The test shall be repeated with the equipment in the idle mode of operation and the exclusion band shall not be used during this test.

- d. CDMA Direct Spread (UTRA and E-UTRA) Transmitter exclusion band:

UTRA:

The frequency bands including in band emissions and out of band emissions are covered by the RF spectral mask specification and need no further consideration.

For the purpose of EMC specifications the transmitter exclusion band this shall be as defined in clause 4.3.2.2 of ETSI EN 301 489-1.

E-UTRA:

For the purpose of EMC specifications there shall be a transmitter exclusion band as defined in clause 4.3.2.2 of ETSI EN 301 489-1 where BW Channel is the channel bandwidth as defined in ETSI TS 136 101.

- e. CDMA Direct Spread (UTRA and E-UTRA) Receiver exclusion band:

As defined in clause 4.3.3 of ETSI EN 301 489-1 where  $n=1$  and Channel Width is as follows:

- UTRA Channel Width 5 MHz.
- E-UTRA Channel Width 20 MHz (see note).

Note: For systems that support multiple channel widths, the Channel Width used should be the widest support by the EUT.

- f. NR FR1 SA and NSA Transmitter exclusion band:

For the purpose of EMC specifications there shall be a transmitter exclusion band as defined in clause 4.3.2.2 of ETSI EN 301 489-1 where BW Channel is the channel bandwidth as defined in ETSI TS 138 101-1.

- g. NR FR1 SA and NSA Receiver exclusion band:

As defined in clause 4.3.3 of ETSI EN 301 489-1 where  $n=1$  and Channel Width is as follows:

- NR Channel Width 100 MHz.
- E-UTRA Channel Width 20 MHz.

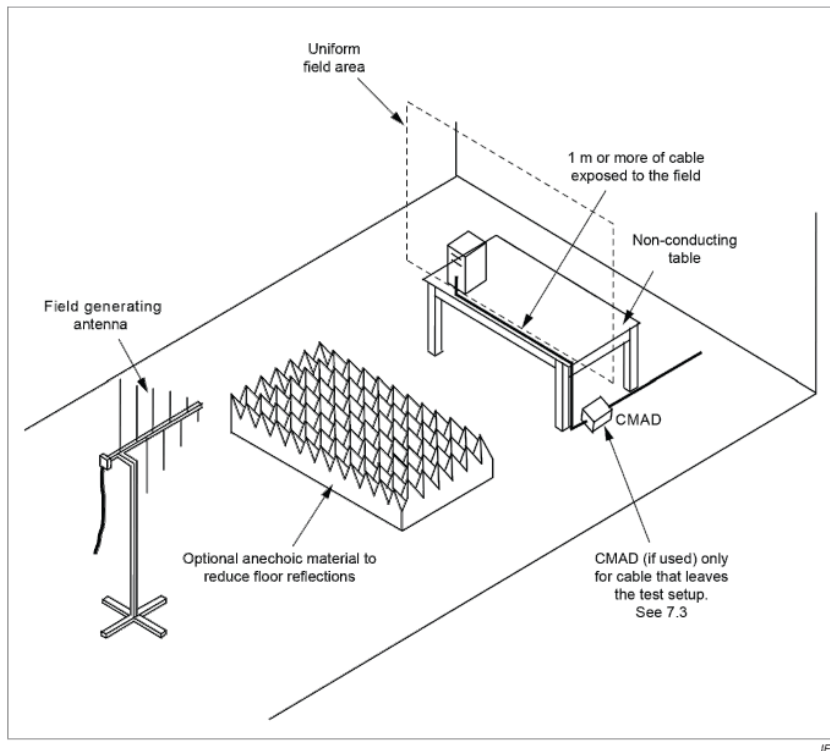
Note: For systems that support multiple channel widths, the Channel Width used should be the widest support by the EUT.

- h. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- i. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

### 4.5.3 DEVIATION FROM TEST STANDARD

No deviation.

### 4.5.4 TEST SETUP



### 4.5.5 TEST RESULTS

Please refer to the Appendix H.

#### 4.6 FAST TRANSIENTS, COMMON MODE (EFT)

#### 4.6.1 TEST SPECIFICATION

Test Method	EN 61000-4-4
Performance Criteria	B
Test Voltage	AC mains power port: $\pm 1$ kV Signal port, Wired network port, Control port: $\pm 0.5$ 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.

#### 4.6.2 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+/- 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.

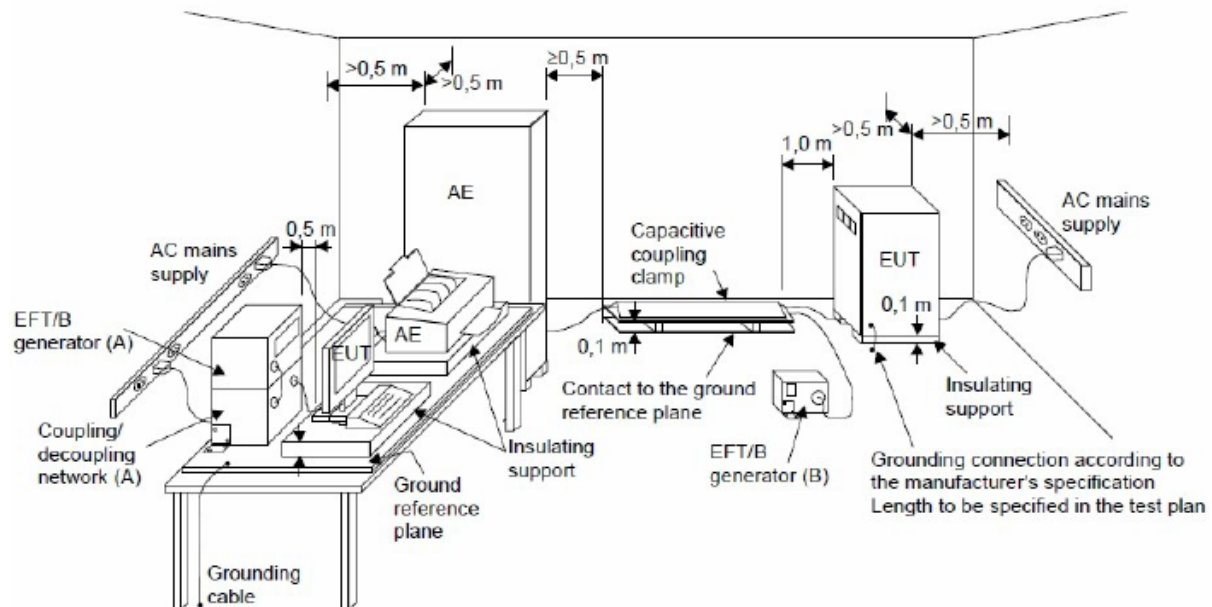
The other condition as following manner:

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

#### 4.6.3 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.6.4 TEST SETUP



#### 4.6.5 TEST RESULTS

Please refer to the Appendix I.

## 4.7 SURGE IMMUNITY TEST (SURGE)

### 4.7.1 TEST SPECIFICATION

Test Method	EN 61000-4-5
Performance Criteria	B
Wave-Shape	1.2/50(8/20) Tr/Th $\mu$ s combination wave
Test Voltage	AC Power Line: $\pm 0.5$ kV, $\pm 1$ kV Wired network ports: $\pm 0.5$ kV, $\pm 1$ kV
Generator Source Impedance	2 $\Omega$ of the low-voltage power supply network. 42 $\Omega$ (40 $\Omega$ +2 $\Omega$ ) between all other signal lines and ground when use 1.2/50(8/20) waveform
Polarity	5 positive and 5 negative at selected points
Number of Tests & Polarity	AC Power Port: 0°/90°/180°/270°
Pulse Repetition Rate	1 time / min.

### 4.7.2 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 2meters 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).

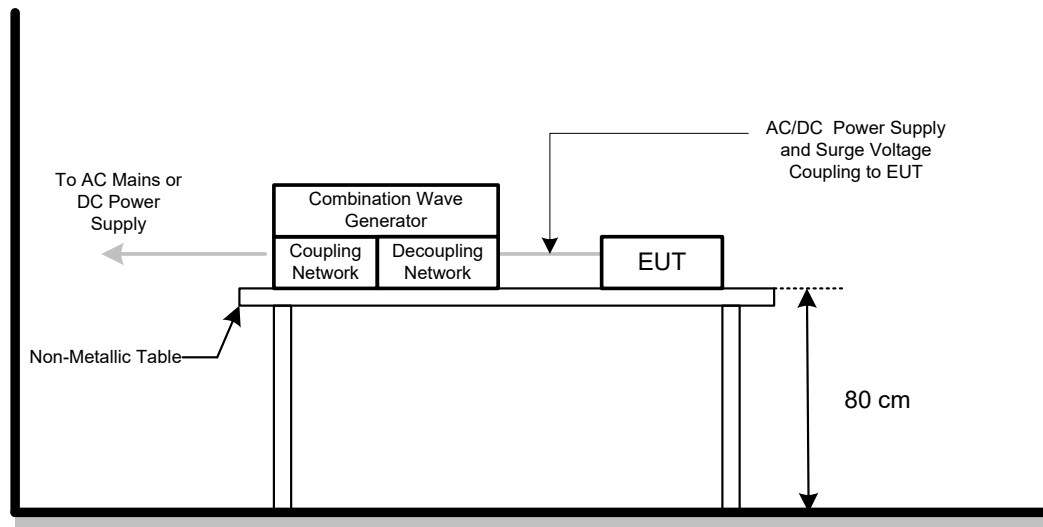
c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

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).

### 4.7.3 DEVIATION FROM TEST STANDARD

The requirement followed by the client's specification.

#### 4.7.4 TEST SETUP



#### 4.7.5 TEST RESULTS

Please refer to the Appendix J.

## 4.8 RADIO FREQUENCY, COMMON MODE (CS)

### 4.8.1 TEST SPECIFICATION

Test Method	EN 61000-4-6
Performance Criteria	A
Frequency Range	0.15 MHz - 80 MHz
Field Strength	3 V (unmodulated, r.m.s)
Modulation	1000 Hz Sine Wave, 80%, AM Modulation
Frequency Step	1 % of the present frequency except, GSM mode (150kHz~ 5MHz):50kHz Incremental step
Dwell Time	3 seconds

### 4.8.2 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.

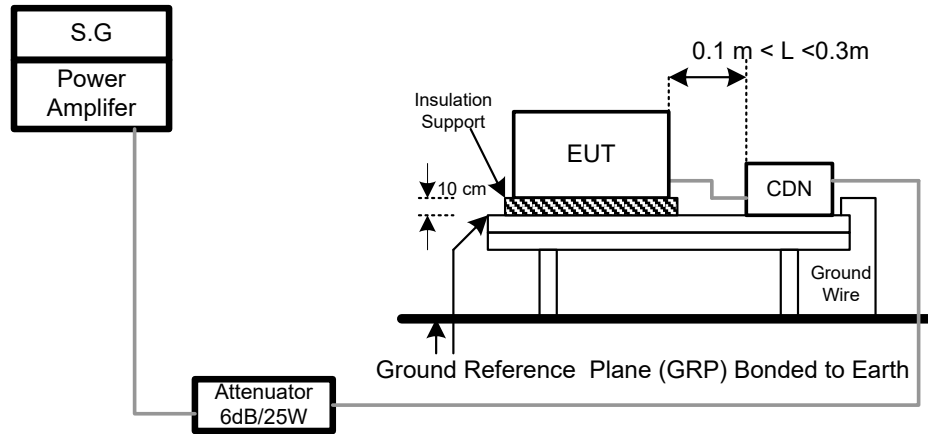
The other condition as following manner:

- The test level shall be severity level 2 as given in EN 61000-4-6 corresponding to 3 V (unmodulated, r.m.s). The test signal shall then be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1000 Hz.
- The test shall be performed over the frequency range 150 kHz to 80 MHz with the exception of an exclusion band for transmitters, and for receivers and duplex transceivers.
- Increase the frequency by a maximum of 1 % of the present frequency(when GSM mode operating, the stepped frequency increment is 50kHz in 150kHz to 5MHz)
- When using the max hold detector method at each test frequency step initially an unmodulated test signal shall be applied. Then the test modulation shall be applied. The procedure used for identifying narrowband responses does not apply to conducted immunity tests in the frequency range 150 kHz to 80 MHz
- The injection method to be used shall be selected according to the basic standard EN 61000-4-6.

### 4.8.3 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.8.4 TEST SETUP



#### 4.8.5 TEST RESULTS

Please refer to the Appendix K.

## 4.9 VOLTAGE DIPS AND INTERRUPTIONS (DIPS)

### 4.9.1 TEST SPECIFICATION

Test Method	EN IEC 61000-4-11
Performance Criteria	Voltage dips: B (0 % residual voltage for 0,5 cycle) B (0 % residual voltage for 1 cycle) C (70 % residual voltage for 25 cycles (at 50 Hz)) Voltage interruptions: C (0 % residual voltage for 250 cycles (at 50 Hz))
Interval between Event	ten seconds
Phase Angle	0°/180°
Test Cycle	3 times

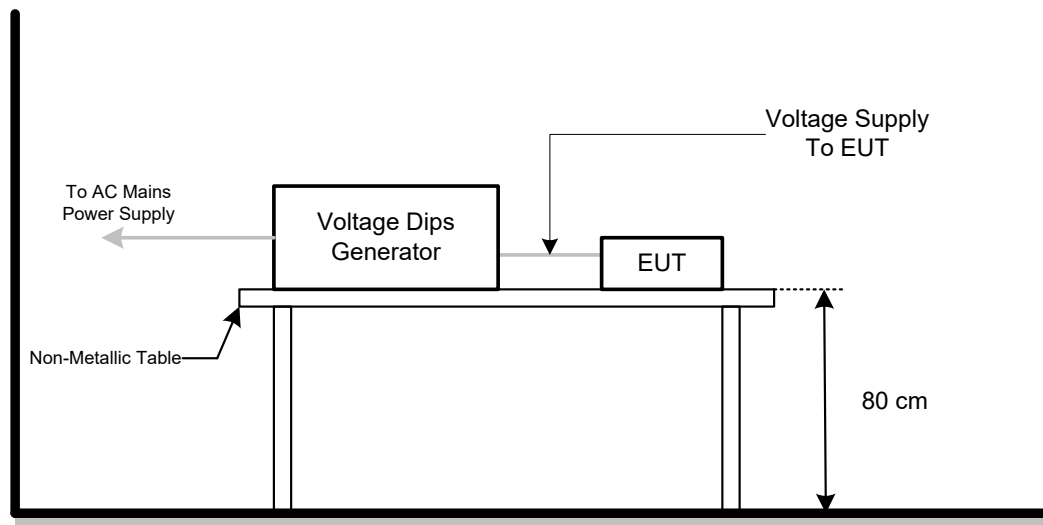
### 4.9.2 TEST PROCEDURE

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.

### 4.9.3 DEVIATION FROM TEST STANDARD

No deviation.

### 4.9.4 TEST SETUP



### 4.9.5 TEST RESULTS

Please refer to the Appendix L.



## 5. MEASUREMENT INSTRUMENTS LIST

Radiated emission up to 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	EMCO	3142C	66462	Mar. 08, 2023
2	Amplifier	SONOMA	310N	186128	Jan. 22, 2023
3	MXE EMI Receiver	Keysight	N9038A	MY56400091	Jan. 22, 2023
4	Cable	emci	LMR-400(30MHz-1 GHz)(7m+7m)	N/A	Sep. 23, 2022
5	Controller	ETS-Lindgren	2090	N/A	N/A
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated emission above 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Cable	MIcable Inc.	B10-01-01-15M(10 MHz~26.5GHz)	18047122	Jan. 06, 2023
2	Controller	ETS-Lindgren	2090	N/A	N/A
3	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
4	Double-Ridged Waveguide Horn Antennas	ETS-LINDGREN	3117-PA	224991	Apr. 18, 2023
5	MXA Signal Analyzer	Keysight	N9020B	MY57100162	Jan. 22, 2023
6	Cable	MIcable Inc.	B10-01-01-2M	18072745	Jan. 06, 2023
7	Preamplifier	ETS-LINDGREN	3117-PA	224991	Jul. 03, 2023
8*	Band Reject Filter	Wairwright Instruments GmbH	WRCG 2400/2483-2375/25 05-50/10SS	16	Feb. 28, 2024
9*	Band Reject Filter	Micro-Tronics	BRC50703-01	7	Feb. 27, 2024

Conducted emission at AC mains power port					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	50Ω Terminator	SHX	TF2-3G-A	8122901	Jan. 23, 2023
2	TWO-LINE V-NETWORK	R&S	ENV216	100526	Jul. 03, 2023
3	EMI Test Receiver	R&S	ESR3	101862	Jan. 22, 2023
4*	Artificial-Mains Network	SCHWARZBECK	NSLK 8127	8127685	Feb. 28, 2024
5	Cable	N/A	RG400	N/A(12m)	Mar. 08, 2023
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

### Asymmetric mode conducted emissions

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	50Ω Terminator	SHX	TF2-3G-A	8122901	Jan. 23, 2023
2	TWO-LINE V-NETWORK	R&S	ENV216	100526	Jul. 03, 2023
3	EMI Test Receiver	R&S	ESR3	101862	Jan. 22, 2023
4*	Artificial-Mains Network	SCHWARZBECK	NSLK 8127	8127685	Feb. 28, 2024
5	Cable	N/A	RG400	N/A(12m)	Mar. 08, 2023
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
7	ISN	TESEQ	ISN T800	42838	Jul. 03, 2023

### Harmonic current emissions & Voltage fluctuations and flicker

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Harmonics and Flicker Analyzer	California Instruments	PACS-1	72344	Jul. 03, 2023
2	3KVA AC Power source	California Instruments	3001ix	56309	Jul. 03, 2023
3	Measurement Software	California	CTS4.0 Version 4.29	N/A	N/A

### Electrostatic discharge

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	ESD Generator	TESEQ AG	NSG 437	450	Dec. 01, 2022

### Radio frequency electromagnetic Field

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	ETS	3142C	47662	Jan. 11, 2023
2	Amplifier	AR	50S1G4A	326720	Jan. 23, 2023
3	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Jul. 03, 2023
4	Power amplifier	MILMEGA	AS1860-50	1064834	Jan. 23, 2023
5	Microwave Log.-Per. Antenna	Schwarzbeck	STLP 9149	9149-277	Apr. 18, 2023
6	Power amplifier	MILMEGA	80RF1000-250	1064833	Jan. 23, 2023
7	Measurement Software	Farad	(EZ-RS )V2.0.1.3	N/A	N/A
8	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Jan. 23, 2023

Fast transients, common mode					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Fast Transient Burst Simulator	Prima	EFT61004TA	PR190741004	Jul. 03, 2023
2	EFT	Prima	EFT_Series V1.0.0.0.20180710	N/A	N/A

Surge					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	System mainframe	Schaffner	NSG 2050	200729-619LU	Jul. 03, 2023
2	Impulse Network	Schaffner	PNW 2050	200719-610LU	Jul. 03, 2023
3	Impulse Network	Schaffner	PNW 2051	200708-533LU	Jul. 03, 2023
4	Pulse coupling network	Schaffner	CDN 131	34426	Jul. 03, 2023
5	CDN	EMC PARTNER	CDN-UTP8	40	Jan. 23, 2023
6	Measurement Software	Schaffner	Win 2000 Version V7.10	N/A	N/A
7	Lightning Surge Generator	Prima	SUG61005TB	PR190854067	Jul. 03, 2023
8	Surge	Prima	SUG_Series V1.0.0.7.2019082 7	N/A	N/A

Radio frequency, common mode					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power CDN	FCC	FCC-801-M2/M3-16A	100270	Jan. 23, 2023
2	TEST SYSTEM FOR CONDUCTED AND RADIATED IMMUNITY	TESEQ	NSG 4070B	37513	Jul. 03, 2023
3	Coupling Decoupling Network	Teseq GmbH	CDN T8-10	40373	Jul. 03, 2023
4	Measurement Software	Farad	EZ-CS (V2.0.1.4)	N/A	N/A
5	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Jan. 23, 2023

Voltage dips and interruptions					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Cycle Sag Simulator	Prima	DRP61011TA	PR19076452	Dec. 01, 2022
2	Measurement Software	Prima	DRP_Series V1.0.0.3.2019012 3	N/A	N/A

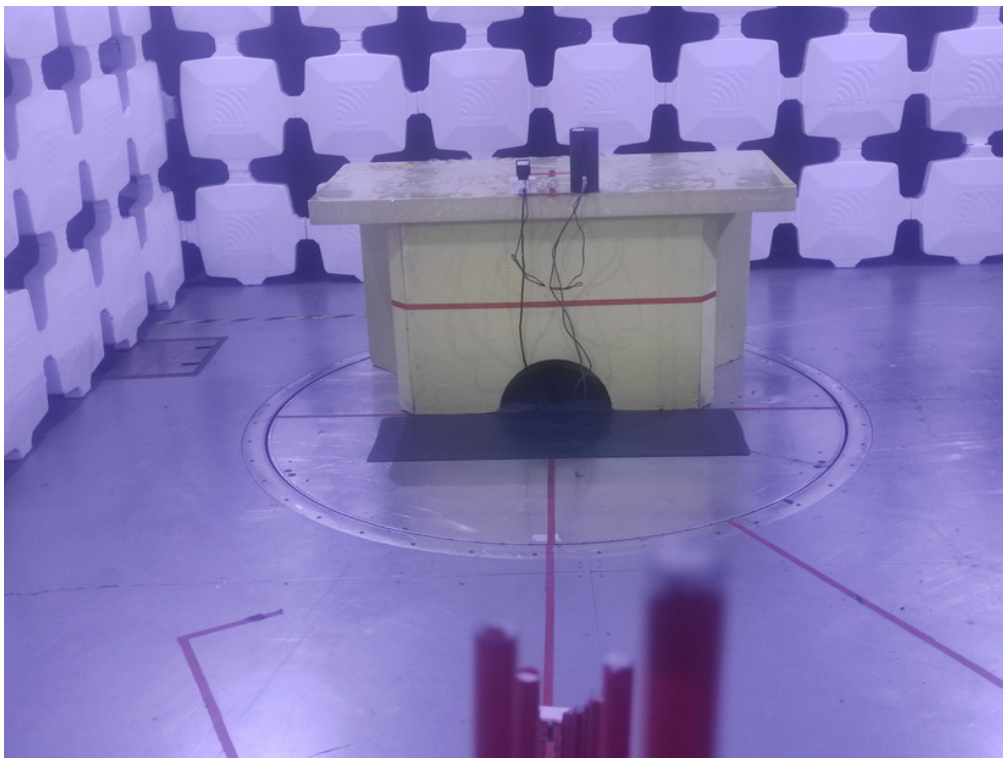
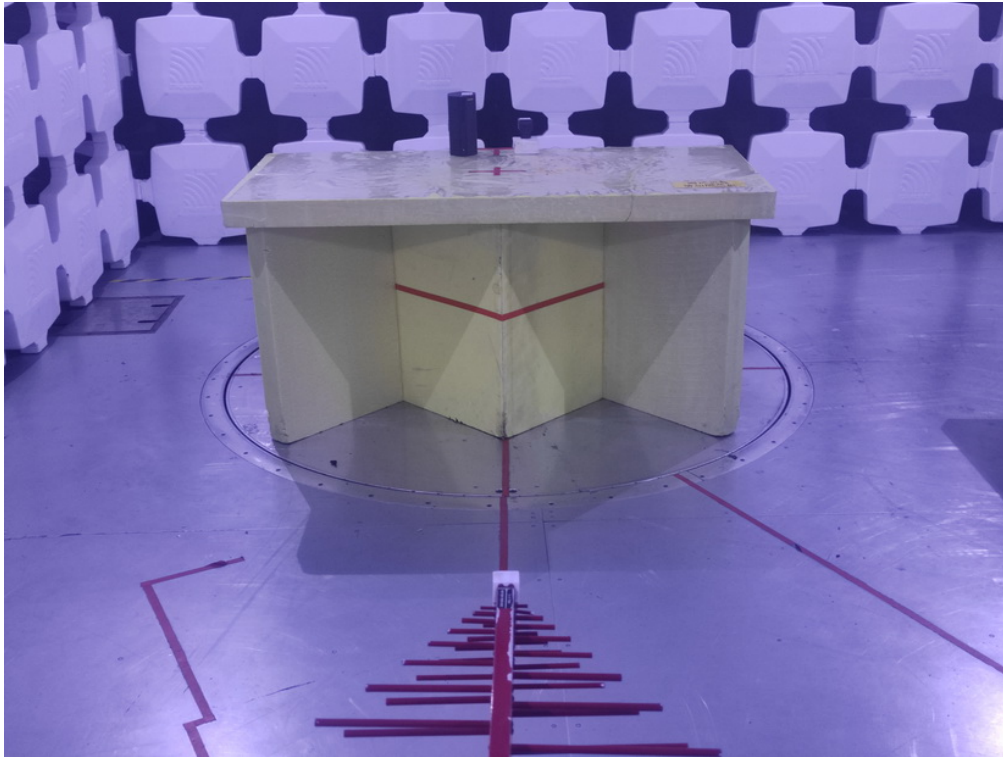
Remark: "N/A" denotes no model name, serial no. or calibration specified.

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

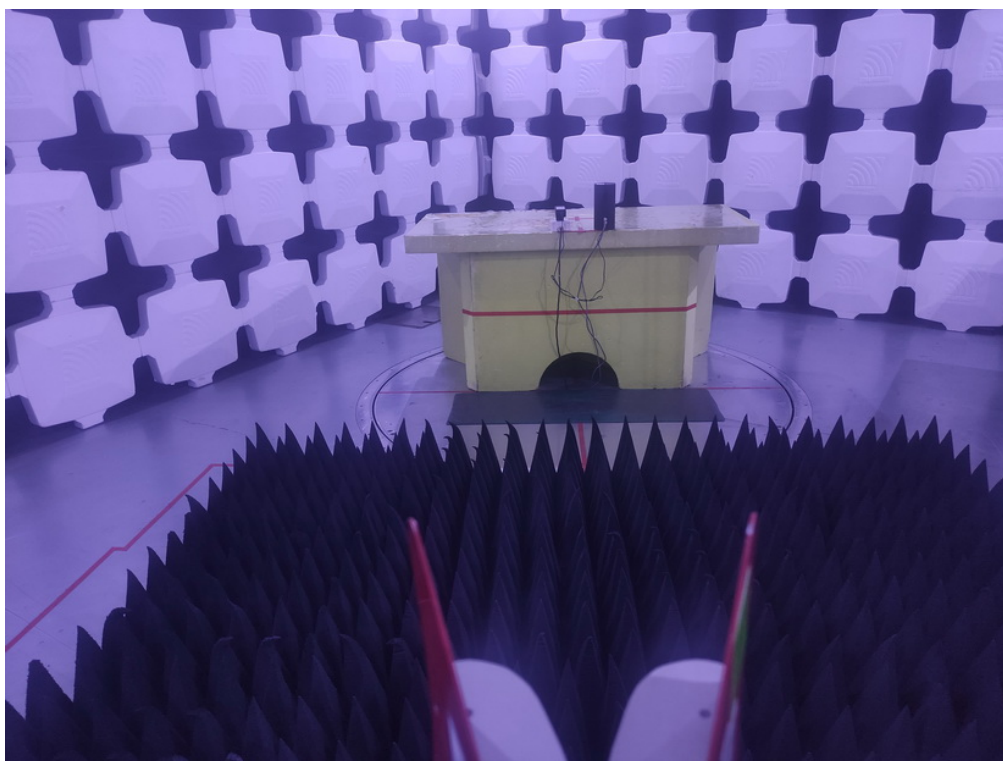
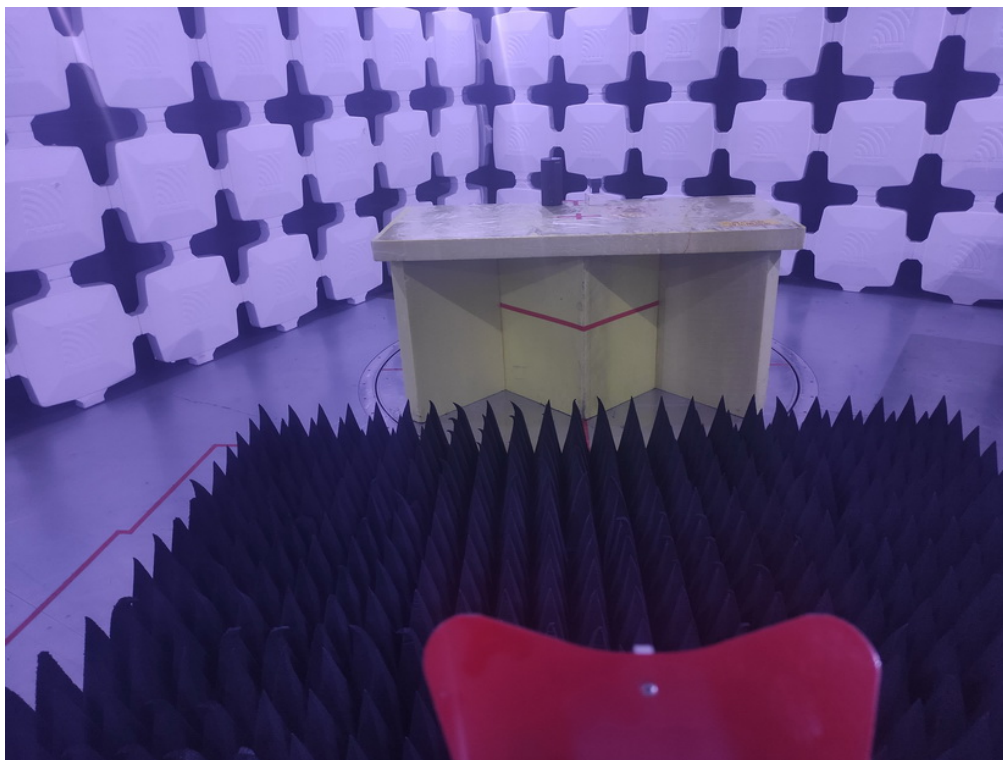
Except \* item, all calibration period of equipment list is one year.

## 6. EUT TEST PHOTO

Radiated emissions up to 1 GHz

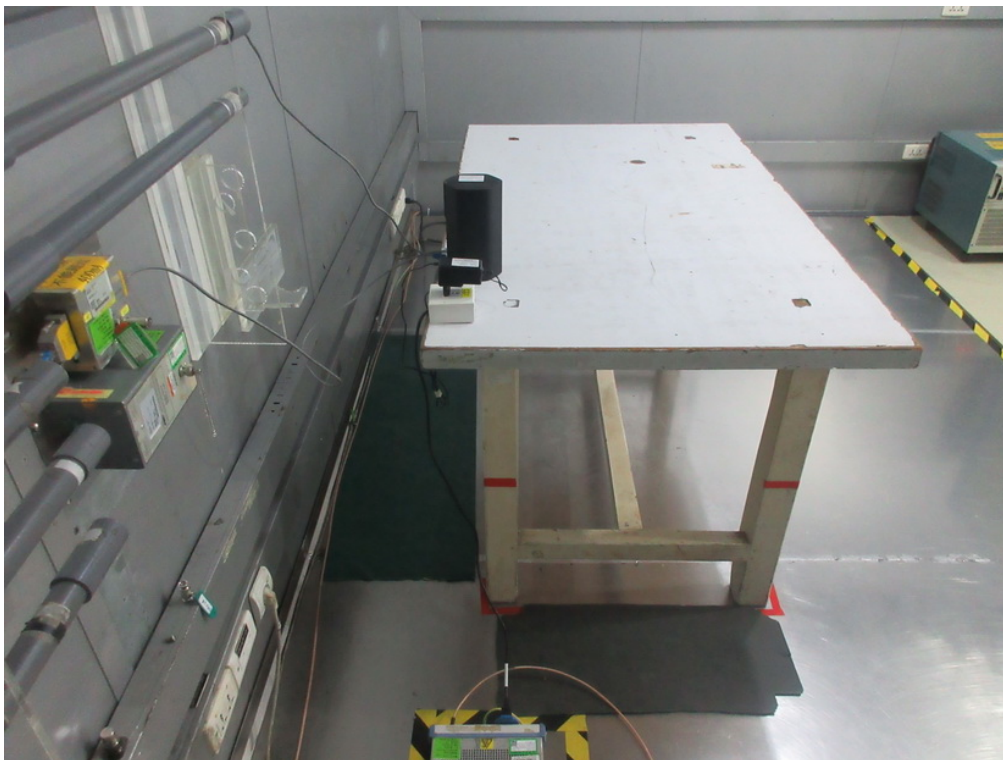


Radiated emissions above 1 GHz

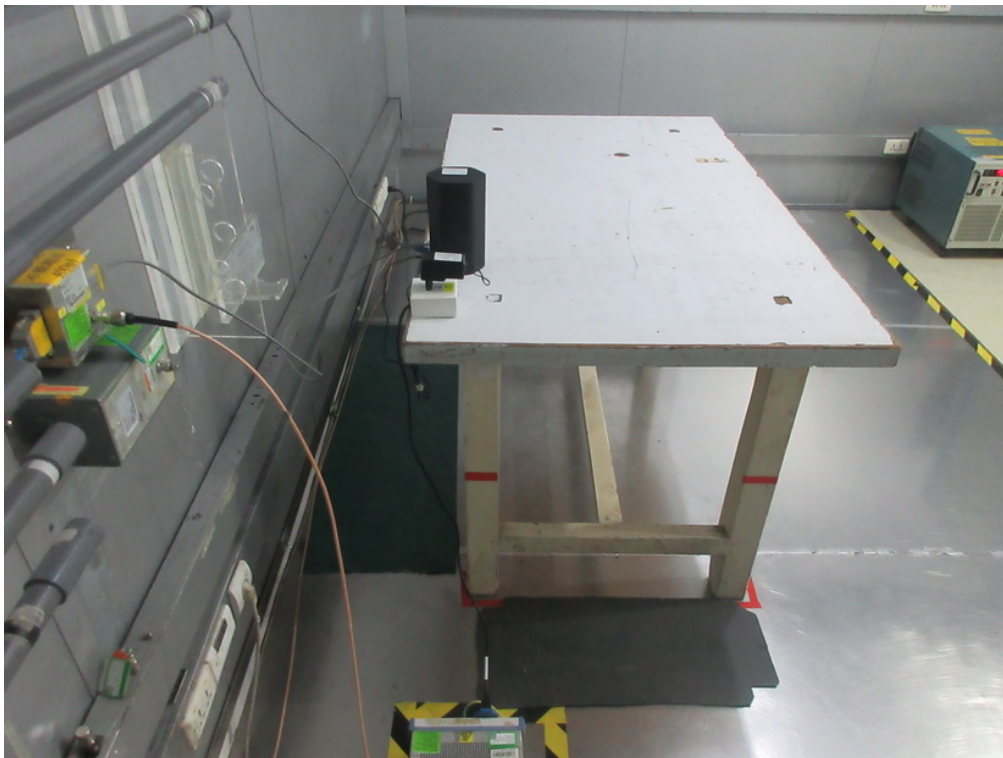




Conducted emissions AC mains power port



## Asymmetric mode conducted emissions(RJ45)





### Harmonic current



### Voltage fluctuations (Flicker)





Electrostatic discharge immunity



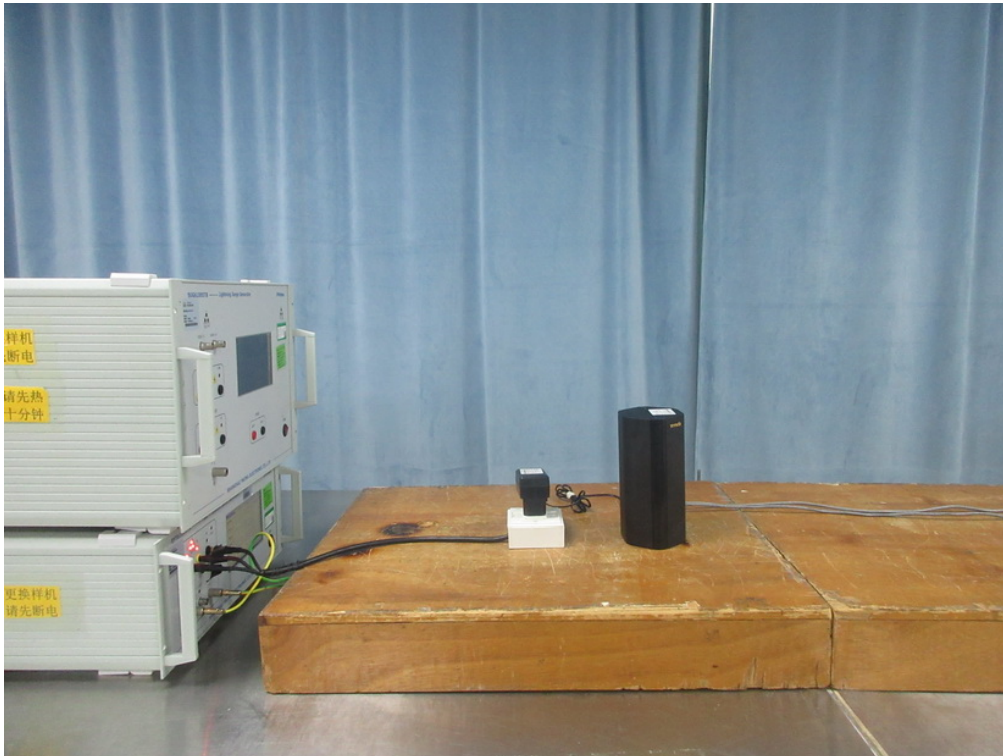
Immunity to radiated electromagnetic fields – Up to 1GHz



Immunity to radiated electromagnetic fields – Above 1GHz

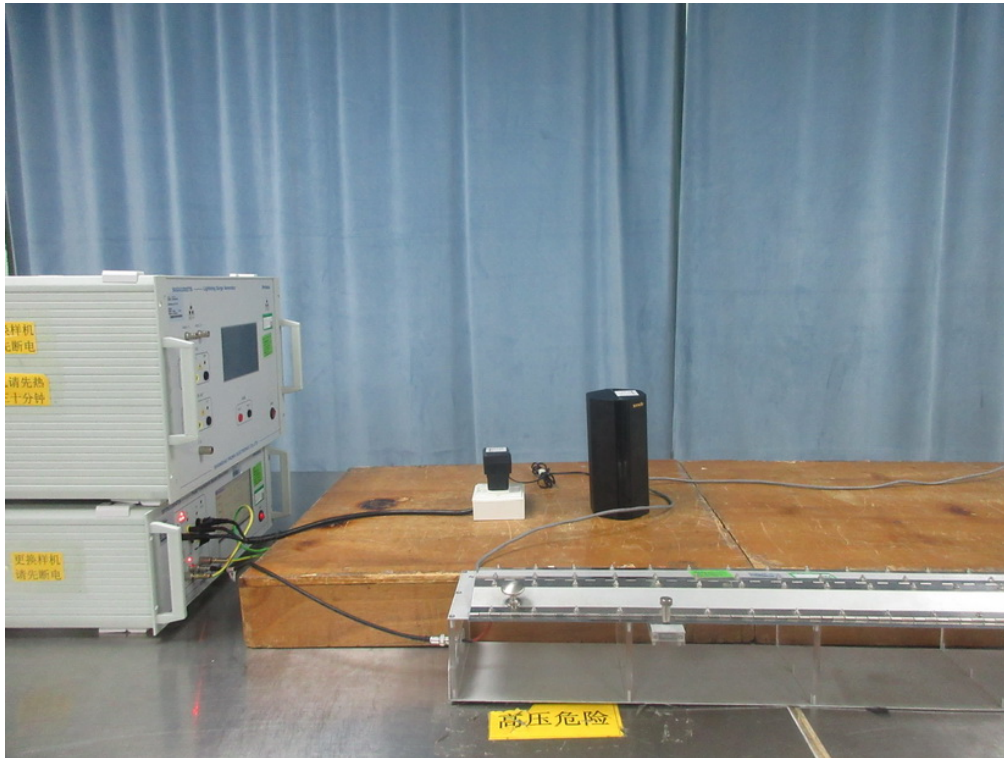


Electrical fast transient/burst - AC

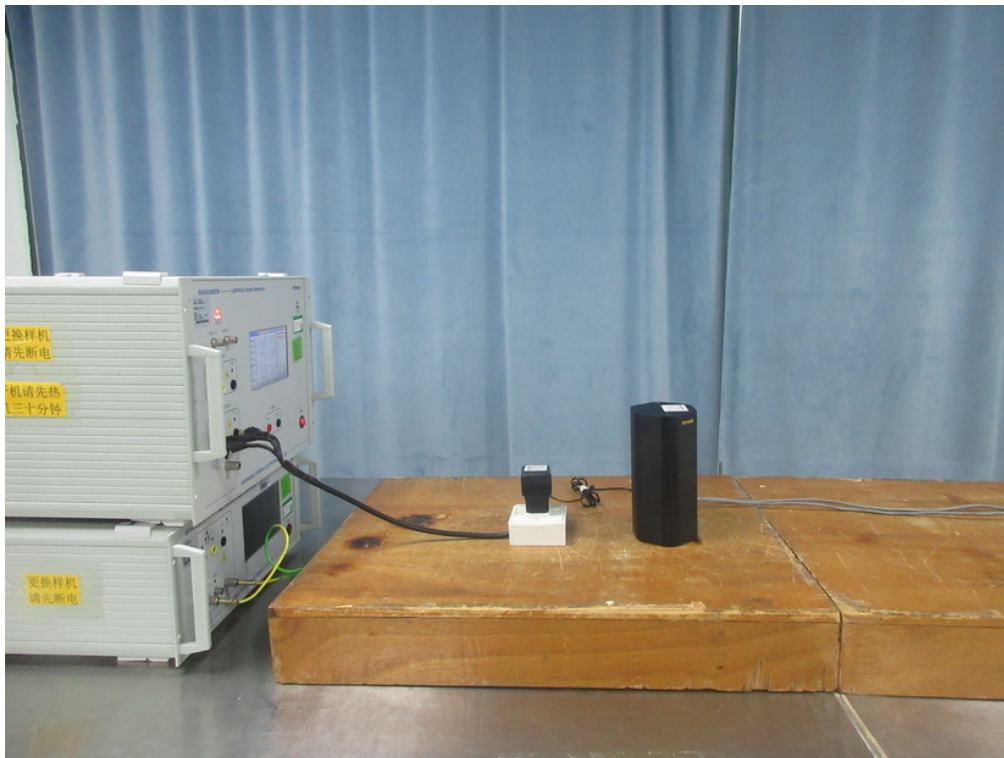




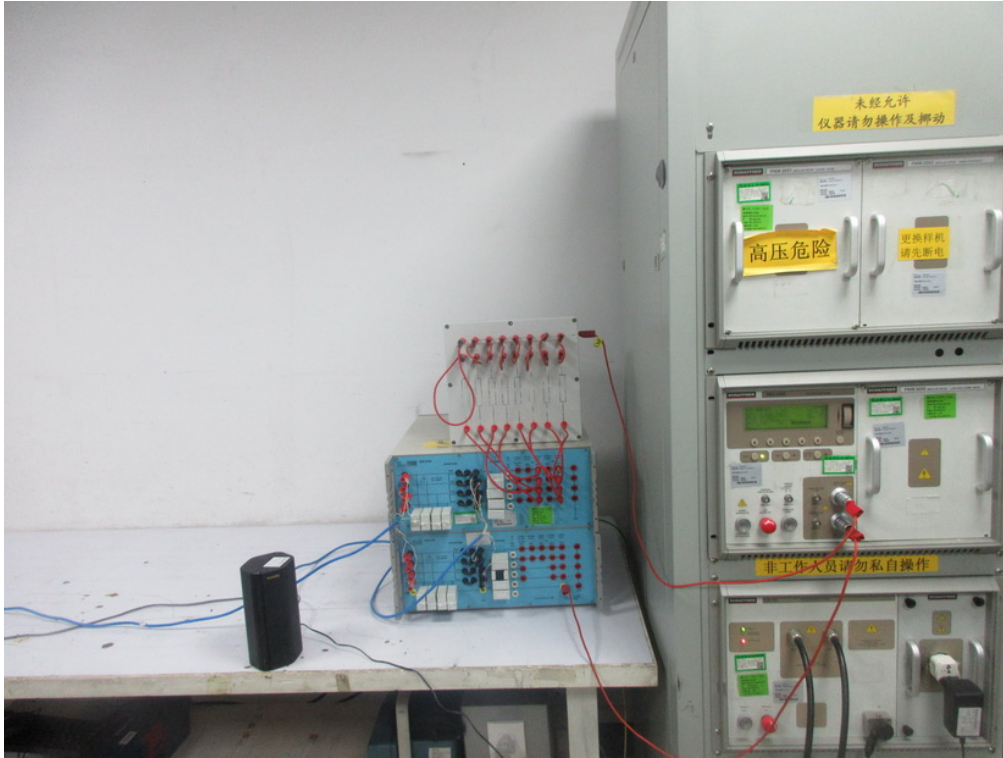
Electrical fast transient/burst(RJ45)



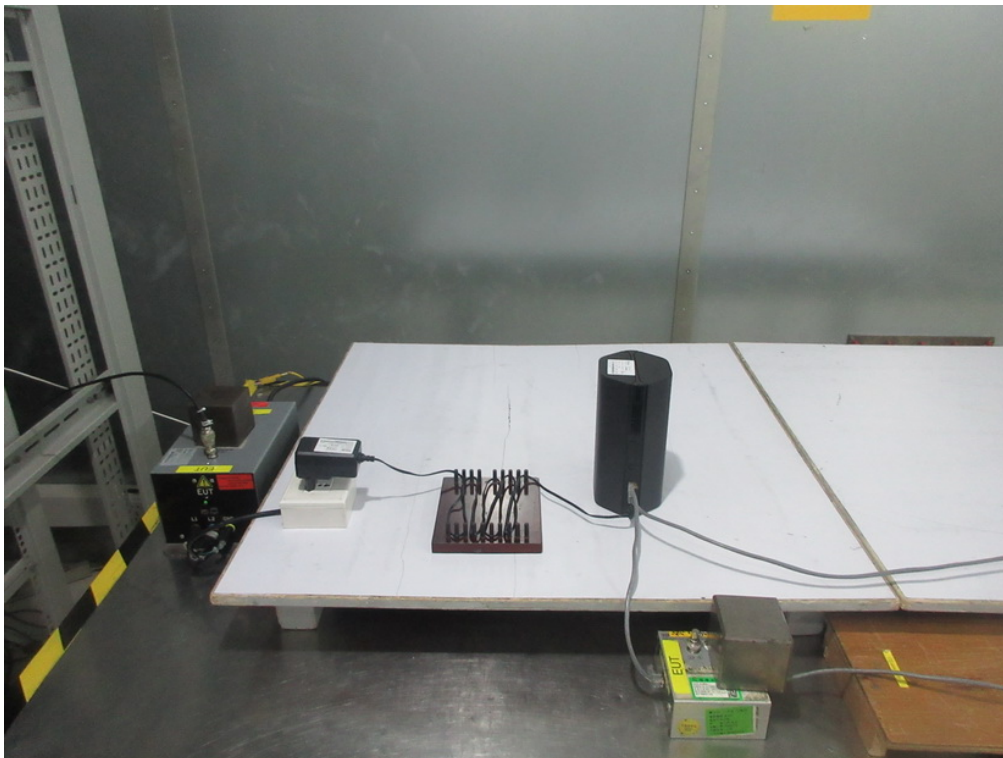
Surge immunity - AC



## Surge immunity(RJ45)

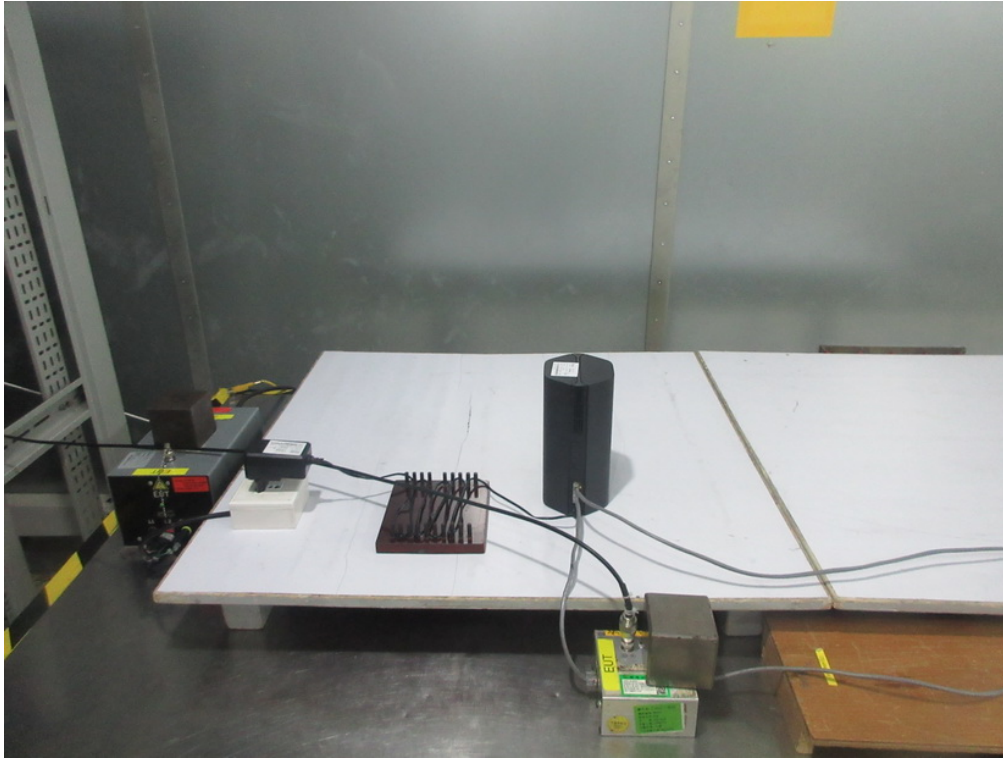


## Immunity to conducted disturbances, induced by radio-frequency fields - AC





Immunity to conducted disturbances, induced by radio-frequency fields(RJ45)

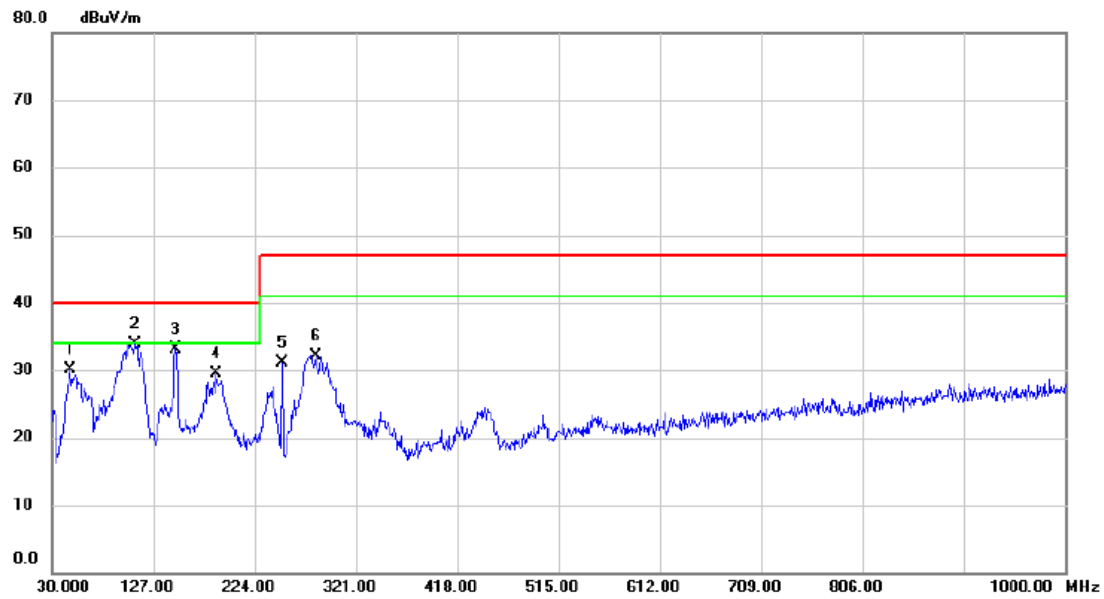


Voltage dips, short interruptions and voltage variations immunity



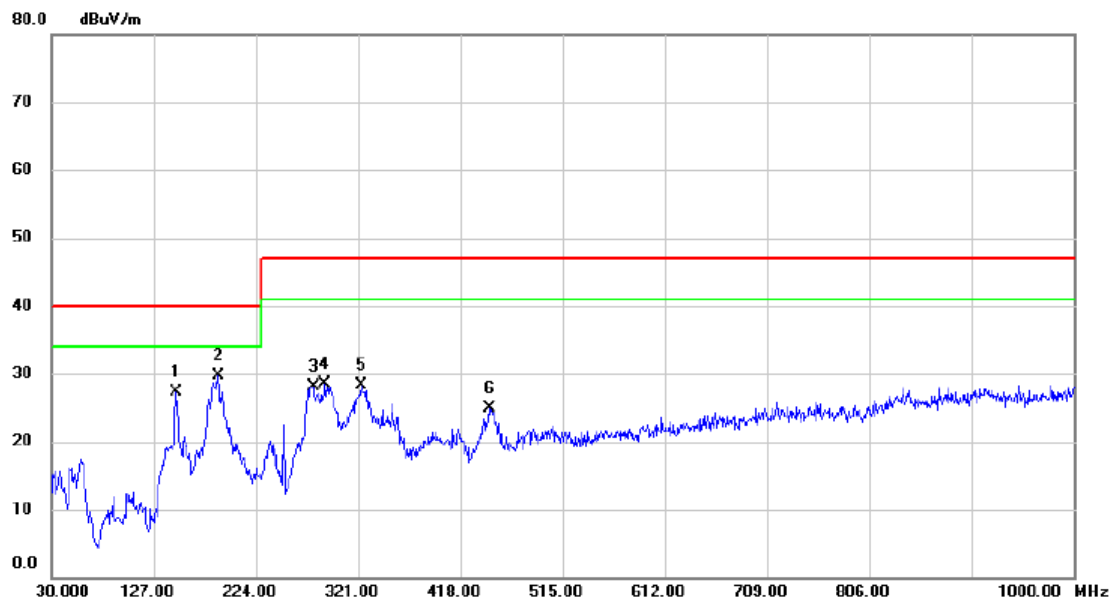
## **APPENDIX A - RADIATED EMISSION UP TO 1GHZ**

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 4		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		47.4600	51.20	-21.16	30.04	40.00	-9.96	QP	
2	*	109.5400	56.68	-22.84	33.84	40.00	-6.16	QP	
3		148.3400	54.68	-21.48	33.20	40.00	-6.80	QP	
4		187.1400	49.43	-19.93	29.50	40.00	-10.50	QP	
5		250.1900	48.14	-17.10	31.04	47.00	-15.96	QP	
6		282.2000	48.81	-16.66	32.15	47.00	-14.85	QP	

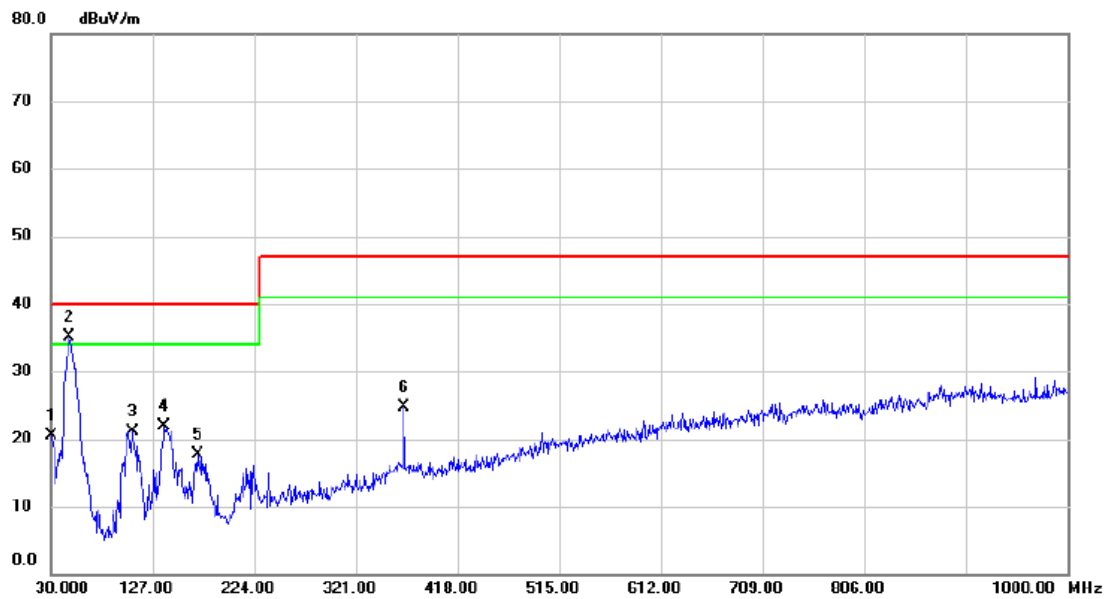
Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 4		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		148.3400	48.69	-21.48	27.21	40.00	-12.79	QP	
2	*	188.1100	49.62	-19.92	29.70	40.00	-10.30	QP	
3		278.3200	44.81	-16.63	28.18	47.00	-18.82	QP	
4		289.9600	45.14	-16.71	28.43	47.00	-18.57	QP	
5		323.9100	43.26	-14.90	28.36	47.00	-18.64	QP	
6		445.1600	36.73	-11.76	24.97	47.00	-22.03	QP	

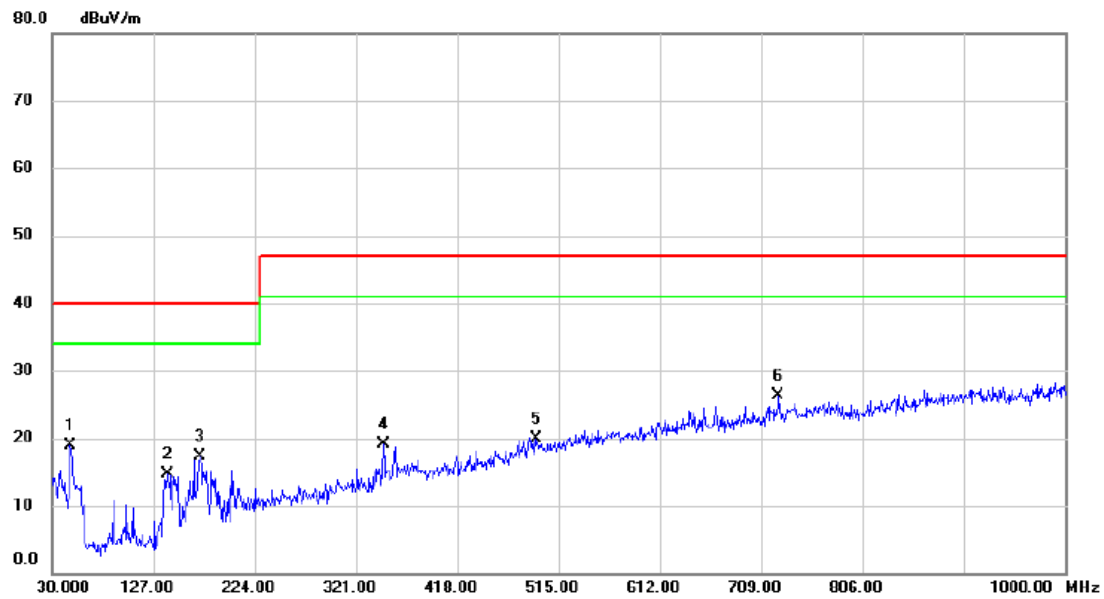


Test Voltage	AC 110V/60Hz	Polarization	Vertical
Test Mode	Mode 4		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		30.9700	34.90	-14.36	20.54	40.00	-19.46	QP	
2	*	47.4600	56.19	-21.16	35.03	40.00	-4.97	QP	
3		107.6000	43.92	-22.73	21.19	40.00	-18.81	QP	
4		138.6400	44.44	-22.47	21.97	40.00	-18.03	QP	
5		169.6800	38.59	-20.86	17.73	40.00	-22.27	QP	
6		366.5900	37.37	-12.61	24.76	47.00	-22.24	QP	

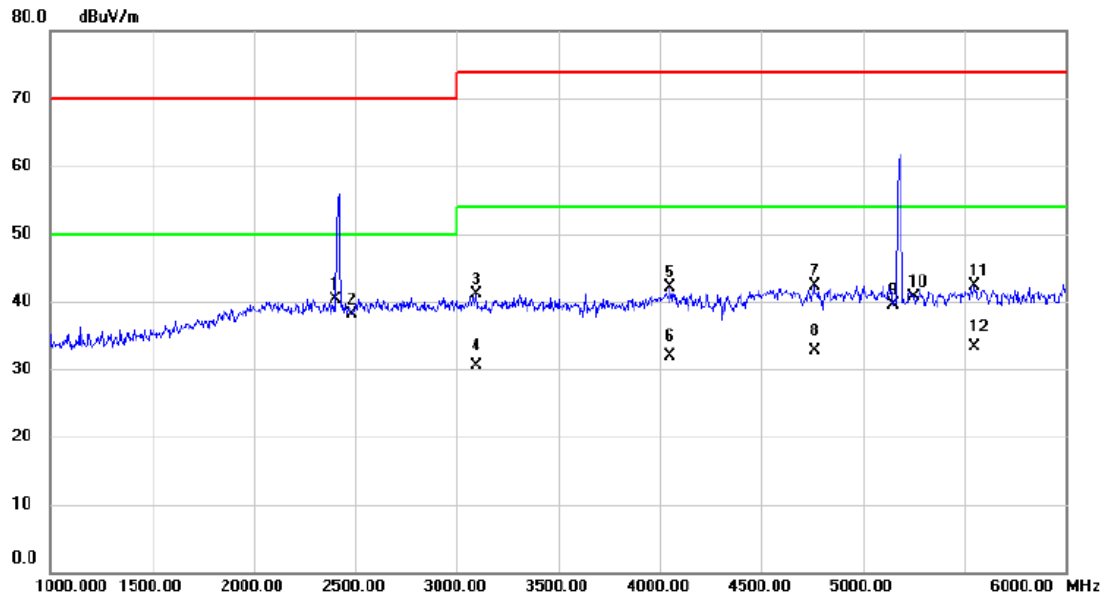
Test Voltage	AC 110V/60Hz	Polarization	Horizontal
Test Mode	Mode 4		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		47.4600	40.06	-21.16	18.90	40.00	-21.10	QP	
2		140.5800	37.02	-22.29	14.73	40.00	-25.27	QP	
3		171.6200	38.06	-20.73	17.33	40.00	-22.67	QP	
4		347.1900	32.67	-13.63	19.04	47.00	-27.96	QP	
5		493.6600	29.95	-10.13	19.82	47.00	-27.18	QP	
6	*	725.4900	31.51	-5.19	26.32	47.00	-20.68	QP	

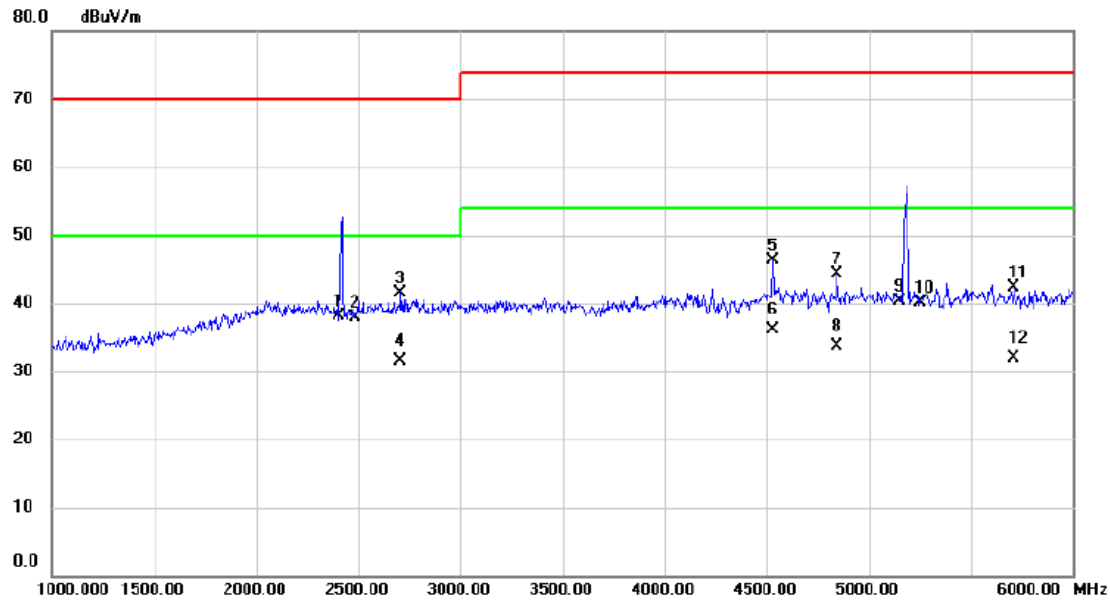
## **APPENDIX B - RADIATED EMISSION ABOVE 1GHZ**

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 1		
Note	2.4G WIFI(2400-2483.5MHz) and 5G WIFI(5150-5250MHz) are intentional transmissions, which are not applicable to the radiation emission requirements in this standard.		



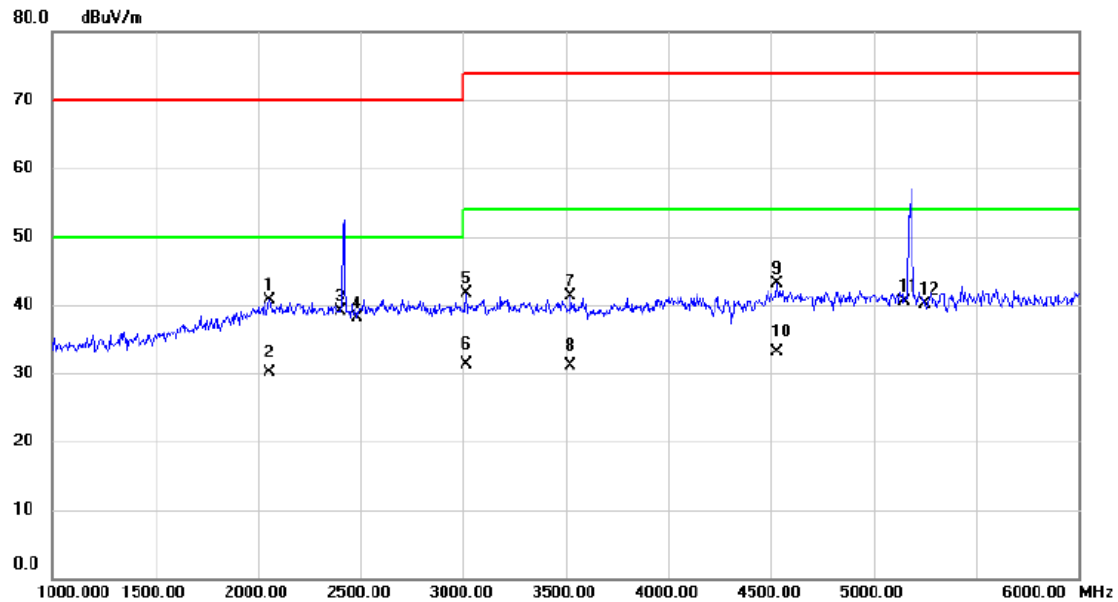
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2400.000	49.68	-9.34	40.34	70.00	-29.66	peak	
2		2483.500	47.20	-9.12	38.08	70.00	-31.92	peak	
3		3095.000	48.90	-7.84	41.06	74.00	-32.94	peak	
4		3095.000	38.25	-7.84	30.41	54.00	-23.59	AVG	
5		4050.000	47.32	-5.31	42.01	74.00	-31.99	peak	
6		4050.000	37.15	-5.31	31.84	54.00	-22.16	AVG	
7		4760.000	46.05	-3.73	42.32	74.00	-31.68	peak	
8		4760.000	36.36	-3.73	32.63	54.00	-21.37	AVG	
9		5150.000	42.95	-3.42	39.53	74.00	-34.47	peak	
10		5250.000	44.30	-3.50	40.80	74.00	-33.20	peak	
11		5550.000	45.91	-3.64	42.27	74.00	-31.73	peak	
12	*	5550.000	36.86	-3.64	33.22	54.00	-20.78	AVG	

Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 1		
Note	2.4G WIFI(2400-2483.5MHz) and 5G WIFI(5150-5250MHz) are intentional transmissions, which are not applicable to the radiation emission requirements in this standard.		



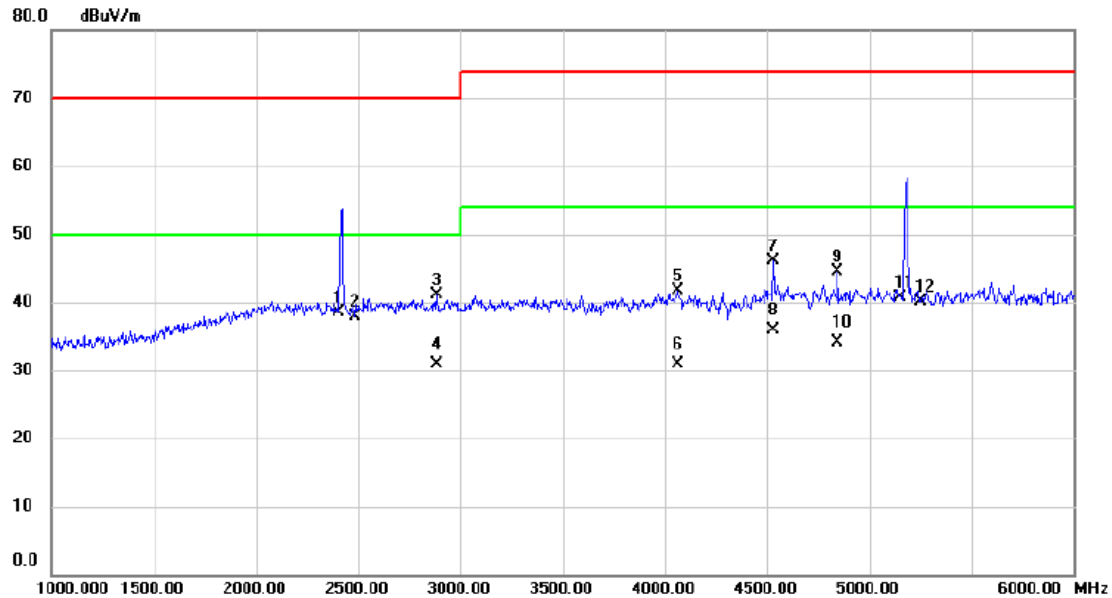
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2400.000	47.38	-9.34	38.04	70.00	-31.96	peak	
2		2483.500	47.07	-9.12	37.95	70.00	-32.05	peak	
3		2705.000	50.25	-8.65	41.60	70.00	-28.40	peak	
4		2705.000	40.14	-8.65	31.49	50.00	-18.51	AVG	
5		4530.000	50.39	-4.16	46.23	74.00	-27.77	peak	
6	*	4530.000	40.26	-4.16	36.10	54.00	-17.90	AVG	
7		4845.000	47.79	-3.57	44.22	74.00	-29.78	peak	
8		4845.000	37.25	-3.57	33.68	54.00	-20.32	AVG	
9		5150.000	43.81	-3.42	40.39	74.00	-33.61	peak	
10		5250.000	43.69	-3.50	40.19	74.00	-33.81	peak	
11		5710.000	45.71	-3.35	42.36	74.00	-31.64	peak	
12		5710.000	35.34	-3.35	31.99	54.00	-22.01	AVG	

Test Voltage	AC 110V/60Hz	Polarization	Vertical
Test Mode	Mode 1		
Note	2.4G WIFI(2400-2483.5MHz) and 5G WIFI(5150-5250MHz) are intentional transmissions, which are not applicable to the radiation emission requirements in this standard.		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2055.000	50.87	-10.24	40.63	70.00	-29.37	peak	
2	*	2055.000	40.43	-10.24	30.19	50.00	-19.81	AVG	
3		2400.000	48.38	-9.34	39.04	70.00	-30.96	peak	
4		2483.500	47.23	-9.12	38.11	70.00	-31.89	peak	
5		3015.000	49.76	-8.00	41.76	74.00	-32.24	peak	
6		3015.000	39.25	-8.00	31.25	54.00	-22.75	AVG	
7		3525.000	48.23	-6.97	41.26	74.00	-32.74	peak	
8		3525.000	38.10	-6.97	31.13	54.00	-22.87	AVG	
9		4530.000	47.35	-4.16	43.19	74.00	-30.81	peak	
10		4530.000	37.19	-4.16	33.03	54.00	-20.97	AVG	
11		5150.000	43.85	-3.42	40.43	74.00	-33.57	peak	
12		5250.000	43.65	-3.50	40.15	74.00	-33.85	peak	

Test Voltage	AC 110V/60Hz	Polarization	Horizontal
Test Mode	Mode 1		
Note	2.4G WIFI(2400-2483.5MHz) and 5G WIFI(5150-5250MHz) are intentional transmissions, which are not applicable to the radiation emission requirements in this standard.		

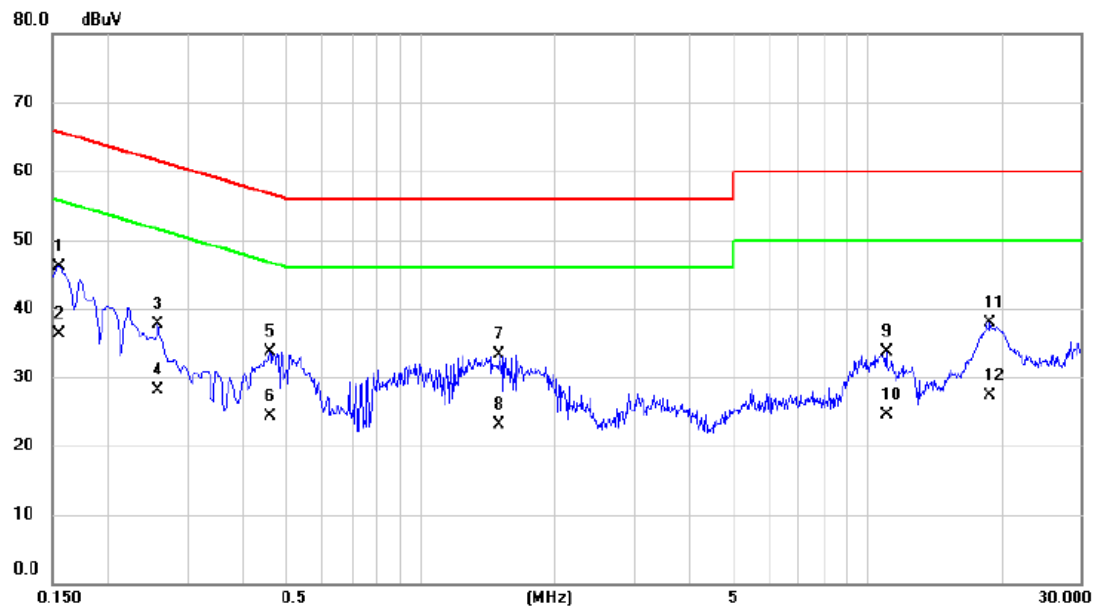


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2400.000	47.80	-9.34	38.46	70.00	-31.54	peak	
2		2483.500	47.01	-9.12	37.89	70.00	-32.11	peak	
3		2880.000	49.39	-8.28	41.11	70.00	-28.89	peak	
4		2880.000	39.14	-8.28	30.86	50.00	-19.14	AVG	
5		4060.000	47.04	-5.28	41.76	74.00	-32.24	peak	
6		4060.000	36.25	-5.28	30.97	54.00	-23.03	AVG	
7		4530.000	50.28	-4.16	46.12	74.00	-27.88	peak	
8	*	4530.000	40.12	-4.16	35.96	54.00	-18.04	AVG	
9		4845.000	47.98	-3.57	44.41	74.00	-29.59	peak	
10		4845.000	37.69	-3.57	34.12	54.00	-19.88	AVG	
11		5150.000	44.22	-3.42	40.80	74.00	-33.20	peak	
12		5250.000	43.69	-3.50	40.19	74.00	-33.81	peak	

## **APPENDIX C - CONDUCTED EMISSION AT AC MAINS POWER PORT**

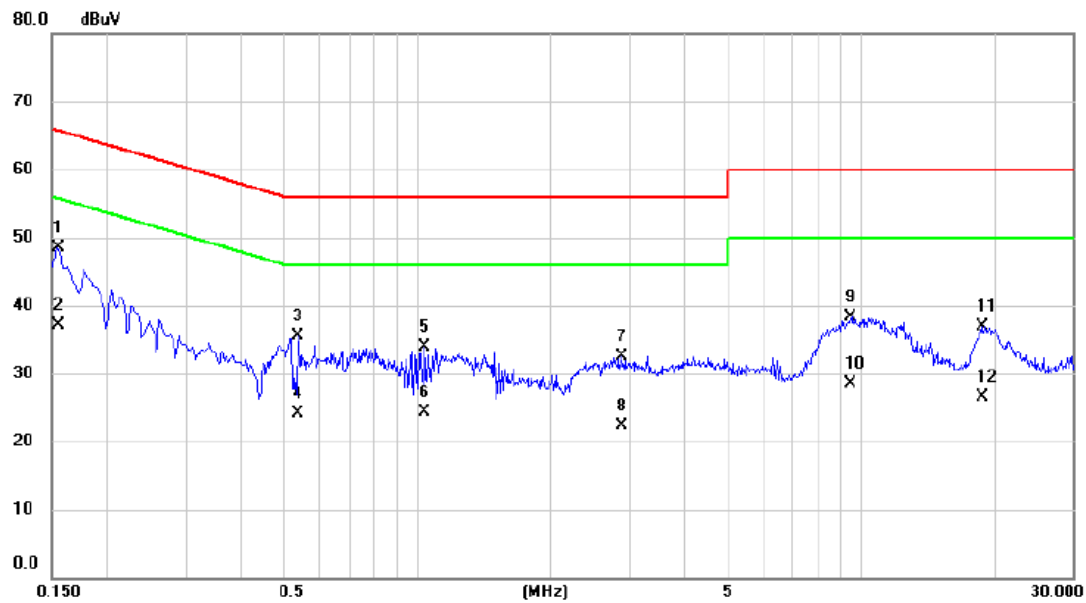


Test Voltage	AC 230V/50Hz	Phase	Line
Test Mode	Mode 4		



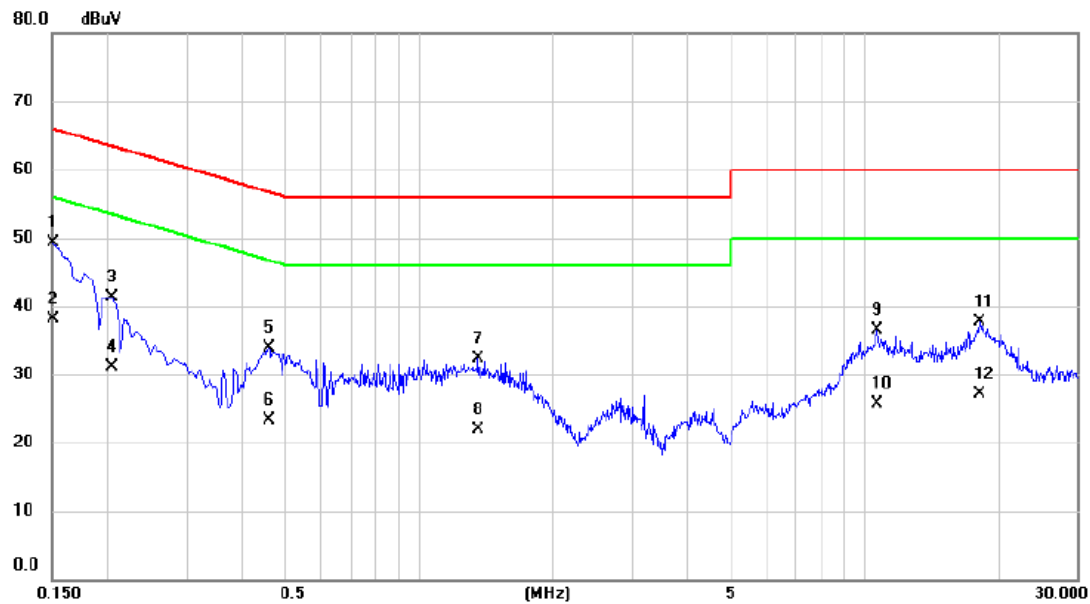
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1545	36.42	9.66	46.08	65.75	-19.67	QP	
2	*	0.1545	26.70	9.66	36.36	55.75	-19.39	AVG	
3		0.2580	27.93	9.69	37.62	61.50	-23.88	QP	
4		0.2580	18.50	9.69	28.19	51.50	-23.31	AVG	
5		0.4605	24.04	9.73	33.77	56.68	-22.91	QP	
6		0.4605	14.50	9.73	24.23	46.68	-22.45	AVG	
7		1.5000	23.45	9.83	33.28	56.00	-22.72	QP	
8		1.5000	13.20	9.83	23.03	46.00	-22.97	AVG	
9		11.0040	23.40	10.31	33.71	60.00	-26.29	QP	
10		11.0040	14.10	10.31	24.41	50.00	-25.59	AVG	
11		18.8115	27.47	10.49	37.96	60.00	-22.04	QP	
12		18.8115	16.90	10.49	27.39	50.00	-22.61	AVG	

Test Voltage	AC 230V/50Hz	Phase	Neutral
Test Mode	Mode 4		



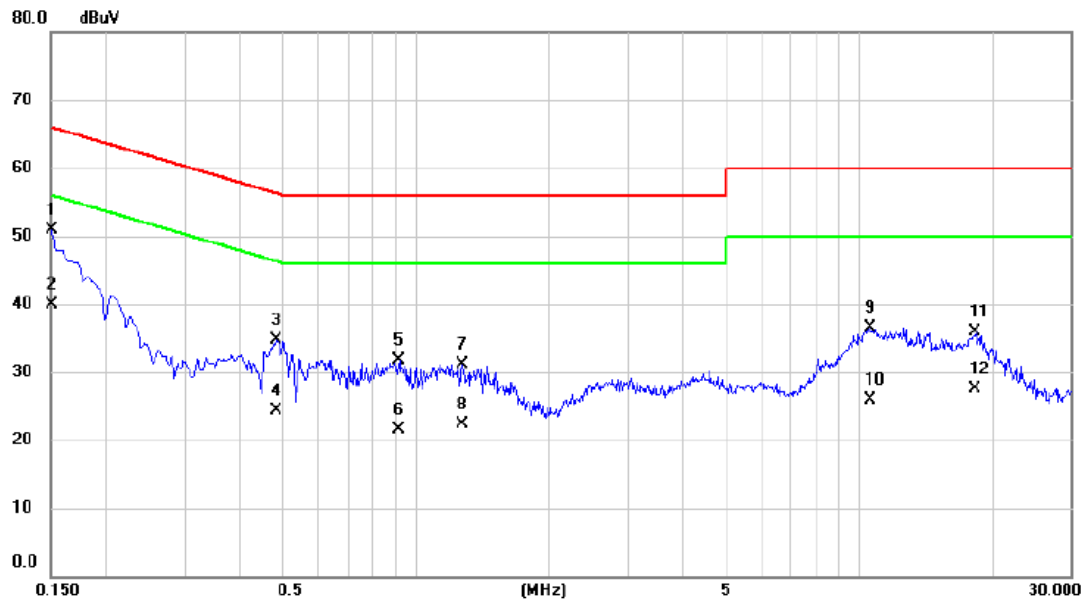
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1545	38.90	9.63	48.53	65.75	-17.22	QP	
2		0.1545	27.40	9.63	37.03	55.75	-18.72	AVG	
3		0.5370	25.86	9.69	35.55	56.00	-20.45	QP	
4		0.5370	14.50	9.69	24.19	46.00	-21.81	AVG	
5		1.0320	24.17	9.76	33.93	56.00	-22.07	QP	
6		1.0320	14.60	9.76	24.36	46.00	-21.64	AVG	
7		2.8815	22.52	9.92	32.44	56.00	-23.56	QP	
8		2.8815	12.30	9.92	22.22	46.00	-23.78	AVG	
9		9.4560	28.02	10.34	38.36	60.00	-21.64	QP	
10		9.4560	18.20	10.34	28.54	50.00	-21.46	AVG	
11		18.7035	26.21	10.77	36.98	60.00	-23.02	QP	
12		18.7035	15.70	10.77	26.47	50.00	-23.53	AVG	

Test Voltage	AC 110V/60Hz	Phase	Line
Test Mode	Mode 4		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	39.58	9.66	49.24	66.00	-16.76	QP	
2		0.1500	28.50	9.66	38.16	56.00	-17.84	AVG	
3		0.2040	31.64	9.68	41.32	63.45	-22.13	QP	
4		0.2040	21.40	9.68	31.08	53.45	-22.37	AVG	
5		0.4605	24.26	9.73	33.99	56.68	-22.69	QP	
6		0.4605	13.60	9.73	23.33	46.68	-23.35	AVG	
7		1.3515	22.56	9.81	32.37	56.00	-23.63	QP	
8		1.3515	12.10	9.81	21.91	46.00	-24.09	AVG	
9		10.6305	26.23	10.31	36.54	60.00	-23.46	QP	
10		10.6305	15.40	10.31	25.71	50.00	-24.29	AVG	
11		18.0825	27.23	10.49	37.72	60.00	-22.28	QP	
12		18.0825	16.70	10.49	27.19	50.00	-22.81	AVG	

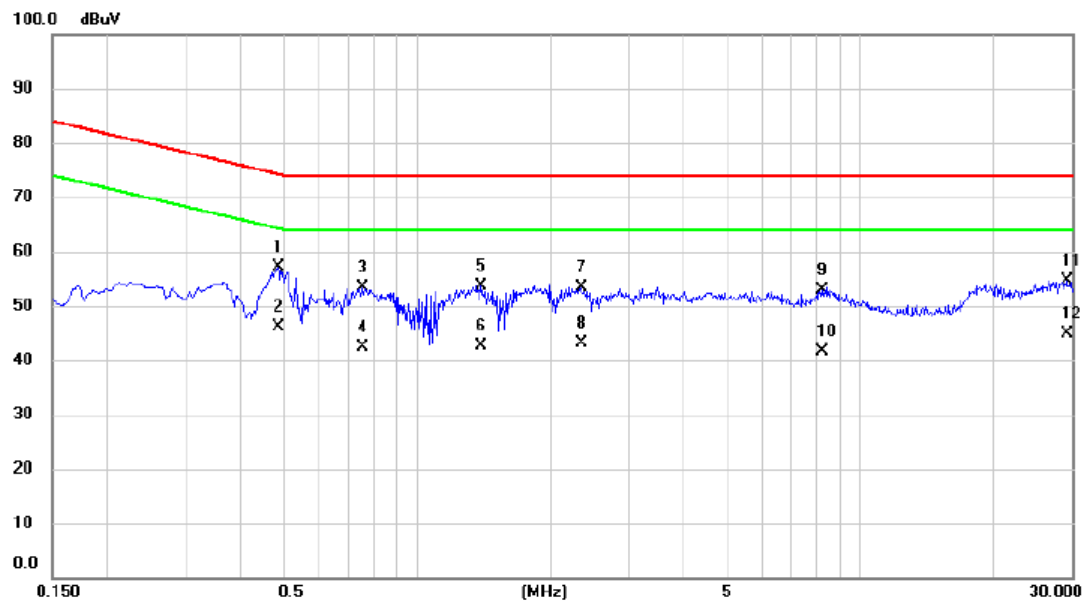
Test Voltage	AC 110V/60Hz	Phase	Neutral
Test Mode	Mode 4		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1500	41.35	9.63	50.98	66.00	-15.02	QP	
2		0.1500	30.20	9.63	39.83	56.00	-16.17	AVG	
3		0.4830	25.07	9.69	34.76	56.29	-21.53	QP	
4		0.4830	14.70	9.69	24.39	46.29	-21.90	AVG	
5		0.9150	21.99	9.75	31.74	56.00	-24.26	QP	
6		0.9150	11.70	9.75	21.45	46.00	-24.55	AVG	
7		1.2705	21.35	9.80	31.15	56.00	-24.85	QP	
8		1.2705	12.50	9.80	22.30	46.00	-23.70	AVG	
9		10.6125	26.11	10.39	36.50	60.00	-23.50	QP	
10		10.6125	15.60	10.39	25.99	50.00	-24.01	AVG	
11		18.2445	25.18	10.74	35.92	60.00	-24.08	QP	
12		18.2445	16.80	10.74	27.54	50.00	-22.46	AVG	

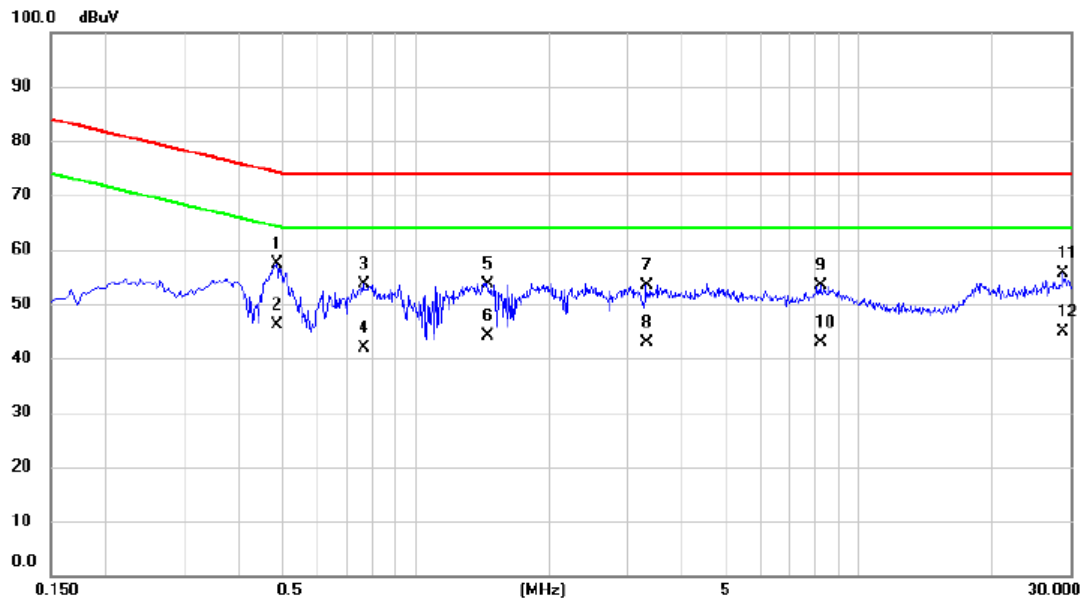
## **APPENDIX E - ASYMMETRIC MODE CONDUCTED EMISSIONS TEST**

Test Voltage	AC 230V/50Hz
Test Mode	Mode 5



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.4875	47.27	9.77	57.04	74.21	-17.17	QP	
2		0.4875	36.28	9.77	46.05	64.21	-18.16	AVG	
3		0.7530	43.75	9.74	53.49	74.00	-20.51	QP	
4		0.7530	32.75	9.74	42.49	64.00	-21.51	AVG	
5		1.3965	43.88	9.72	53.60	74.00	-20.40	QP	
6		1.3965	32.82	9.72	42.54	64.00	-21.46	AVG	
7		2.3460	43.56	9.74	53.30	74.00	-20.70	QP	
8		2.3460	33.30	9.74	43.04	64.00	-20.96	AVG	
9		8.2094	42.94	9.97	52.91	74.00	-21.09	QP	
10		8.2094	31.59	9.97	41.56	64.00	-22.44	AVG	
11		29.3595	44.04	10.67	54.71	74.00	-19.29	QP	
12		29.3595	34.16	10.67	44.83	64.00	-19.17	AVG	

Test Voltage	AC 230V/50Hz
Test Mode	Mode 6



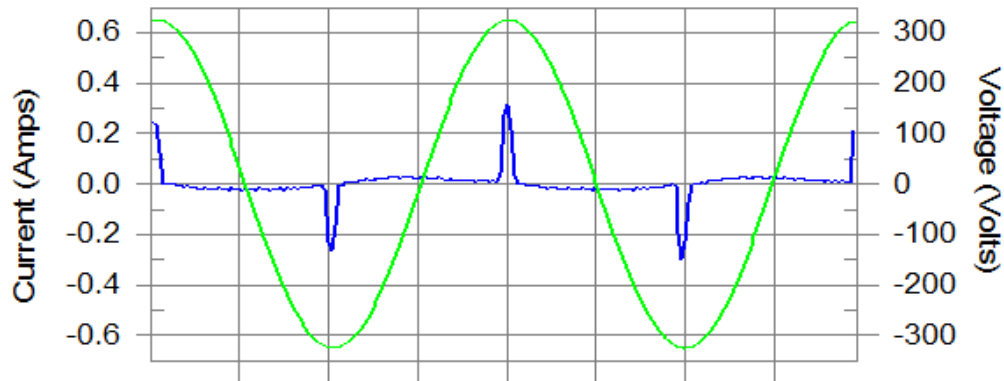
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.4875	47.50	9.77	57.27	74.21	-16.94	QP	
2		0.4875	36.48	9.77	46.25	64.21	-17.96	AVG	
3		0.7665	43.86	9.74	53.60	74.00	-20.40	QP	
4		0.7665	32.25	9.74	41.99	64.00	-22.01	AVG	
5		1.4550	43.93	9.72	53.65	74.00	-20.35	QP	
6		1.4550	34.52	9.72	44.24	64.00	-19.76	AVG	
7		3.3270	43.64	9.79	53.43	74.00	-20.57	QP	
8		3.3270	32.99	9.79	42.78	64.00	-21.22	AVG	
9		8.2275	43.38	9.97	53.35	74.00	-20.65	QP	
10		8.2275	32.79	9.97	42.76	64.00	-21.24	AVG	
11		28.9365	44.87	10.66	55.53	74.00	-18.47	QP	
12		28.9365	34.16	10.66	44.82	64.00	-19.18	AVG	

## **APPENDIX F - HARMONIC CURRENT EMISSION**

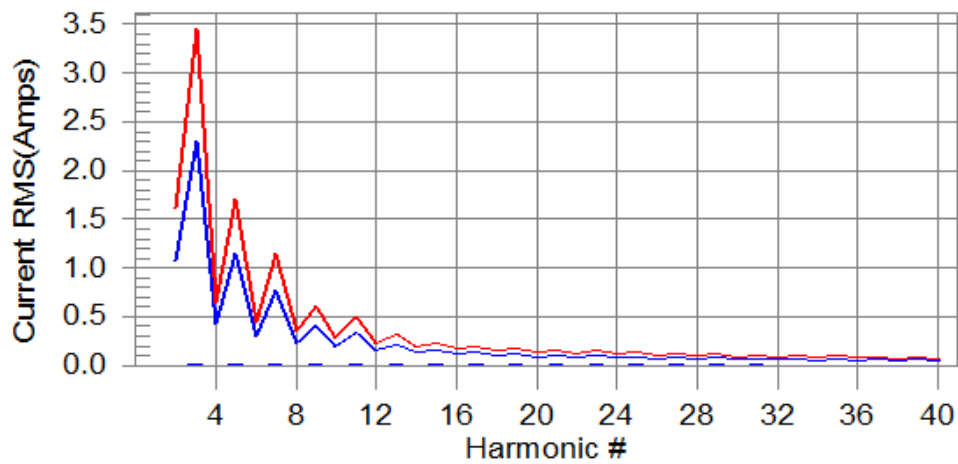


Harmonics - Class A	
Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

#### Current & voltage waveforms



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



Test result: Pass Worst harmonics H17-6.5% of 150% limit, H19-8.6% 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):	230.00	Frequency(Hz):	50.00
I Peak (Amps):	0.337	I RMS (Amps):	0.063
I Fund (Amps):	0.026	Crest Factor:	6.175
Power (Watts):	4.6	Power Factor:	0.354

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.002	1.620	N/A	Pass
3	0.017	2.300	0.8	0.021	3.450	0.6	Pass
4	0.001	0.430	N/A	0.001	0.645	N/A	Pass
5	0.017	1.140	1.5	0.019	1.710	1.1	Pass
6	0.001	0.300	N/A	0.001	0.450	N/A	Pass
7	0.016	0.770	2.1	0.019	1.155	1.6	Pass
8	0.001	0.230	N/A	0.001	0.345	N/A	Pass
9	0.015	0.400	3.8	0.018	0.600	3.0	Pass
10	0.001	0.184	N/A	0.001	0.276	N/A	Pass
11	0.014	0.330	4.4	0.017	0.495	3.4	Pass
12	0.001	0.153	N/A	0.001	0.230	N/A	Pass
13	0.014	0.210	6.4	0.016	0.315	5.0	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.012	0.150	8.3	0.014	0.225	6.4	Pass
16	0.001	0.115	N/A	0.001	0.173	N/A	Pass
17	0.011	0.132	8.6	0.013	0.198	6.5	Pass
18	0.000	0.102	N/A	0.001	0.153	N/A	Pass
19	0.010	0.118	8.6	0.011	0.178	6.4	Pass
20	0.000	0.092	N/A	0.000	0.138	N/A	Pass
21	0.009	0.107	8.4	0.010	0.161	6.1	Pass
22	0.000	0.084	N/A	0.000	0.125	N/A	Pass
23	0.008	0.098	8.0	0.008	0.147	5.7	Pass
24	0.000	0.077	N/A	0.000	0.115	N/A	Pass
25	0.007	0.090	7.4	0.007	0.135	5.1	Pass
26	0.000	0.071	N/A	0.000	0.107	N/A	Pass
27	0.006	0.083	6.6	0.006	0.125	4.5	Pass
28	0.000	0.066	N/A	0.000	0.099	N/A	Pass
29	0.004	0.078	N/A	0.005	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	0.004	0.109	N/A	Pass
32	0.000	0.058	N/A	0.000	0.086	N/A	Pass
33	0.003	0.068	N/A	0.003	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.002	0.064	N/A	0.002	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.001	0.061	N/A	0.002	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.001	0.058	N/A	0.002	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):	230.00	Frequency(Hz):	50.00
I Peak (Amps):	0.337	I RMS (Amps):	0.063
I Fund (Amps):	0.026	Crest Factor:	6.175
Power (Watts):	4.6	Power Factor:	0.354

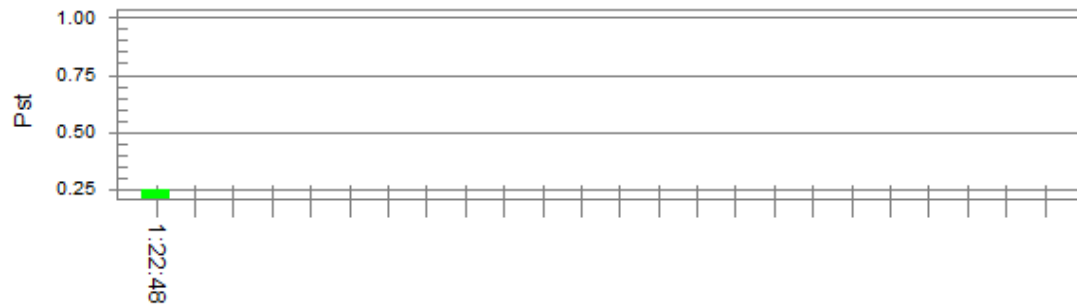
Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.123	0.460	26.78	OK
3	0.552	2.070	26.67	OK
4	0.063	0.460	13.70	OK
5	0.062	0.920	6.79	OK
6	0.035	0.460	7.63	OK
7	0.042	0.690	6.10	OK
8	0.020	0.460	4.36	OK
9	0.038	0.460	8.30	OK
10	0.022	0.460	4.80	OK
11	0.024	0.230	10.57	OK
12	0.018	0.230	7.86	OK
13	0.022	0.230	9.39	OK
14	0.016	0.230	7.00	OK
15	0.015	0.230	6.40	OK
16	0.015	0.230	6.57	OK
17	0.010	0.230	4.53	OK
18	0.013	0.230	5.67	OK
19	0.015	0.230	6.58	OK
20	0.016	0.230	7.10	OK
21	0.012	0.230	5.19	OK
22	0.012	0.230	5.32	OK
23	0.012	0.230	5.32	OK
24	0.006	0.230	2.58	OK
25	0.010	0.230	4.49	OK
26	0.008	0.230	3.60	OK
27	0.011	0.230	4.72	OK
28	0.007	0.230	3.02	OK
29	0.004	0.230	1.92	OK
30	0.005	0.230	2.39	OK
31	0.007	0.230	3.21	OK
32	0.005	0.230	2.32	OK
33	0.007	0.230	2.98	OK
34	0.003	0.230	1.22	OK
35	0.006	0.230	2.67	OK
36	0.003	0.230	1.32	OK
37	0.003	0.230	1.52	OK
38	0.003	0.230	1.40	OK
39	0.006	0.230	2.68	OK
40	0.007	0.230	2.84	OK

## **APPENDIX G - VOLTAGE FLUCTUATIONS AND FLICKER**

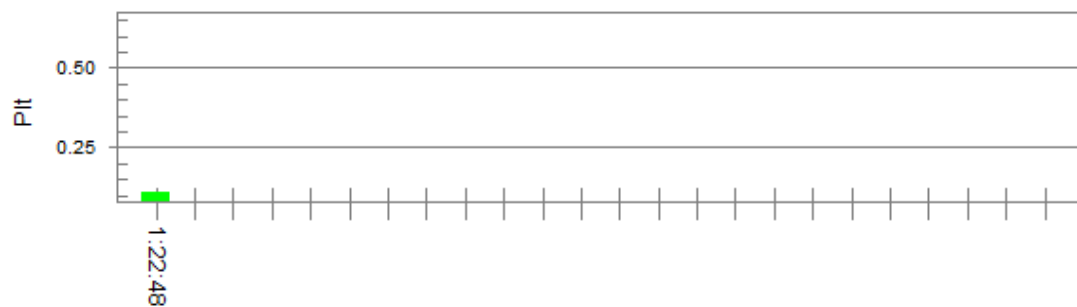
Test Voltage	AC 230V/50Hz
Test Mode	Mode 1

## Pst<sub>i</sub> and limit line

## European Limits



## Plt and limit line



## Parameter values recorded during the test:

Vrms at the end of test (Volt): 229.96

Highest dt (%):

0

T-max (mS):

0.00

Highest dc (%):

0.00

Highest dmax (%):

0.00

Highest Pst (10 min. period):

0.248

Highest Plt (2 hr. period):

0.108

Test limit (%):

Test limit (mS):

500.0

Pass

Test limit (%):

3.30

Pass

Test limit (%):

4.00

Pass

Test limit:

1.000

Pass

Test limit:

0.650

Pass

## **APPENDIX H - ELECTROSTATIC DISCHARGE**

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1-4

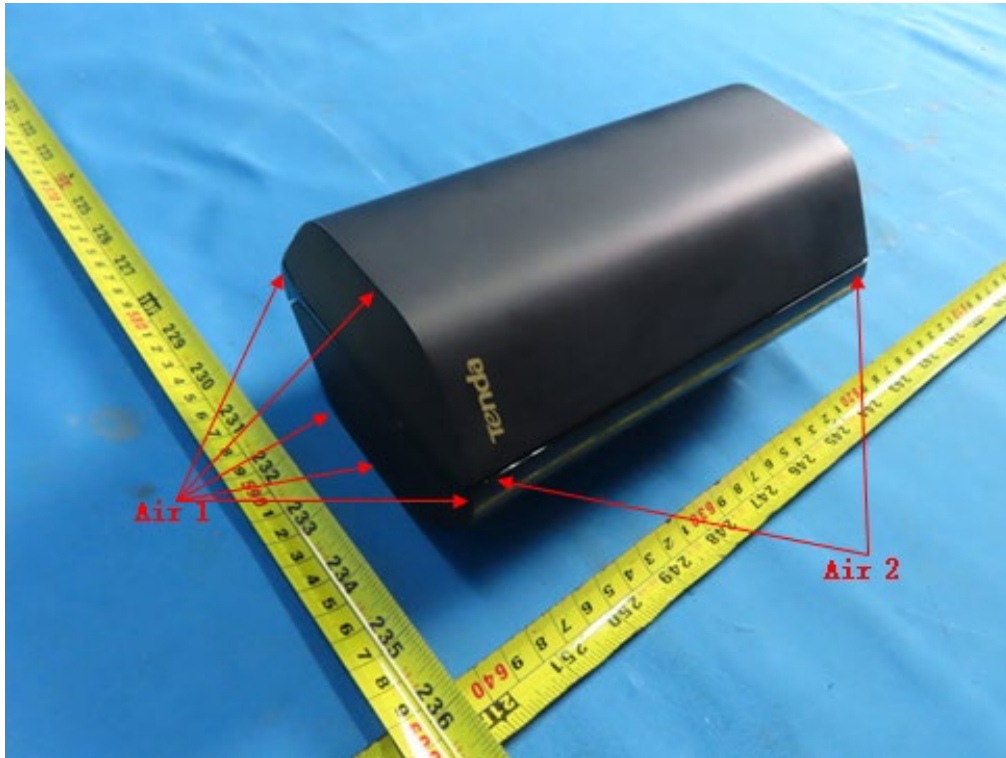
Mode	Air Discharge								Contact Discharge							
Test Level	2kV		4kV		8kV		- kV		- kV		- kV		- kV		- kV	
Location	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
1	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-	-
2	A	A	A	A	B	B	-	-	-	-	-	-	-	-	-	-
3	A	A	A	A	A	A	-	-	-	-	-	-	-	-	-	-
4	A	A	A	A	A	A	-	-	-	-	-	-	-	-	-	-
5	A	A	A	A	A	A	-	-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

Mode	HCP Contact Discharge						VCP Contact Discharge					
Test Level	2kV		4kV		- kV		2kV		4kV		- kV	
Location	P	N	P	N	P	N	P	N	P	N	P	N
Left side	A	A	B	B	-	-	A	A	B	B	-	-
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	B						B					

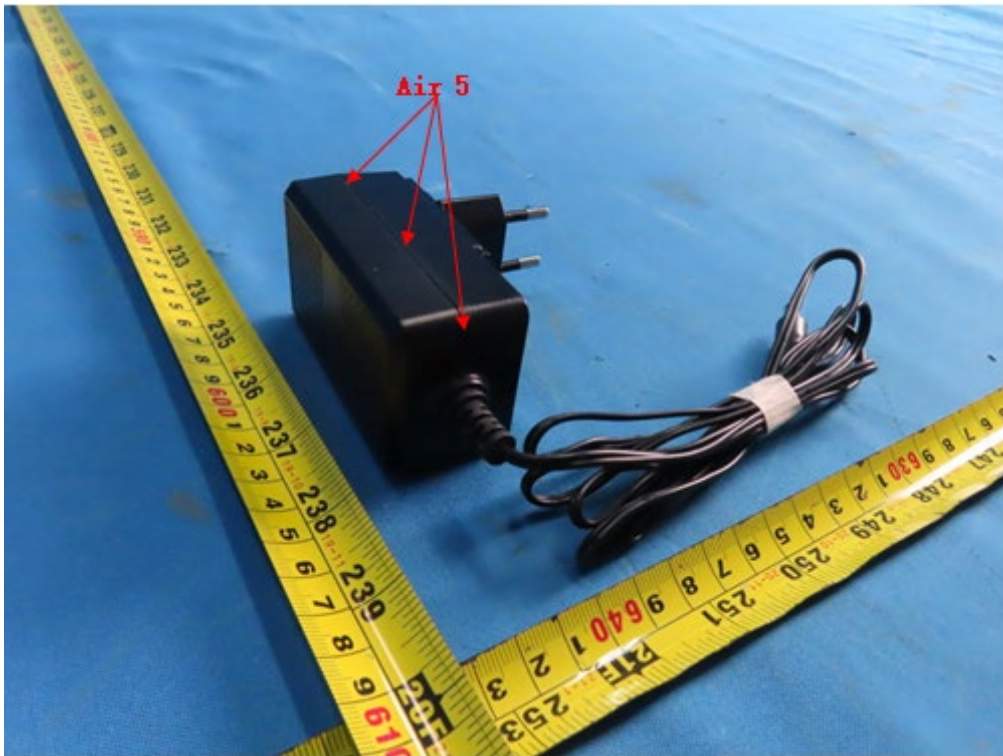
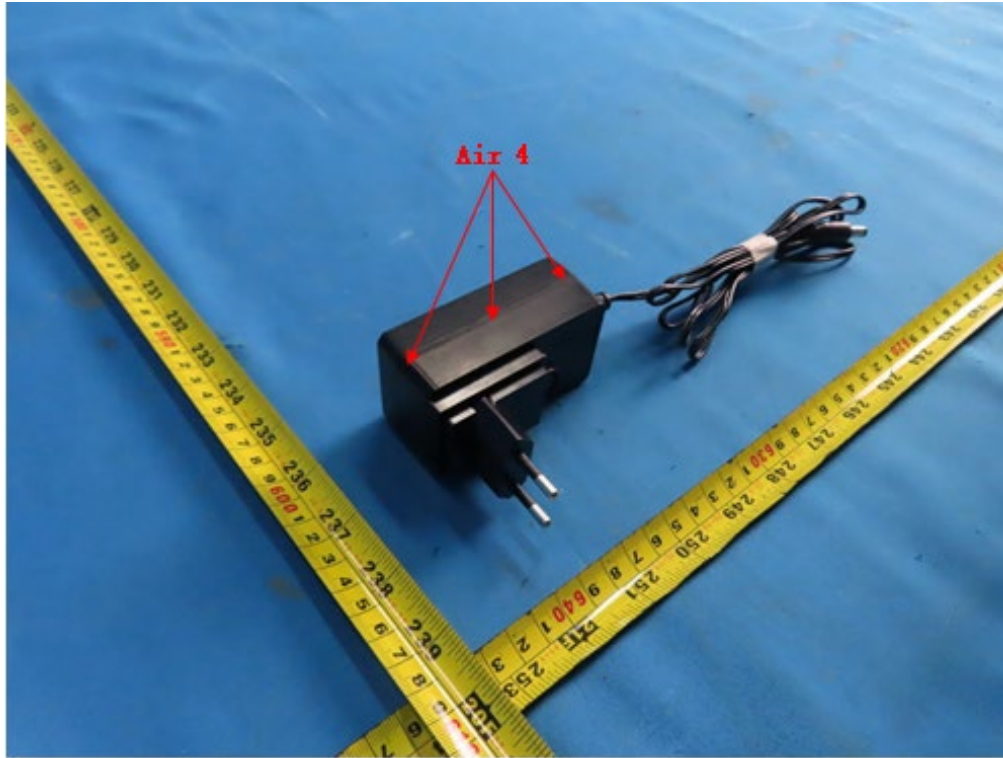
Note:

- 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







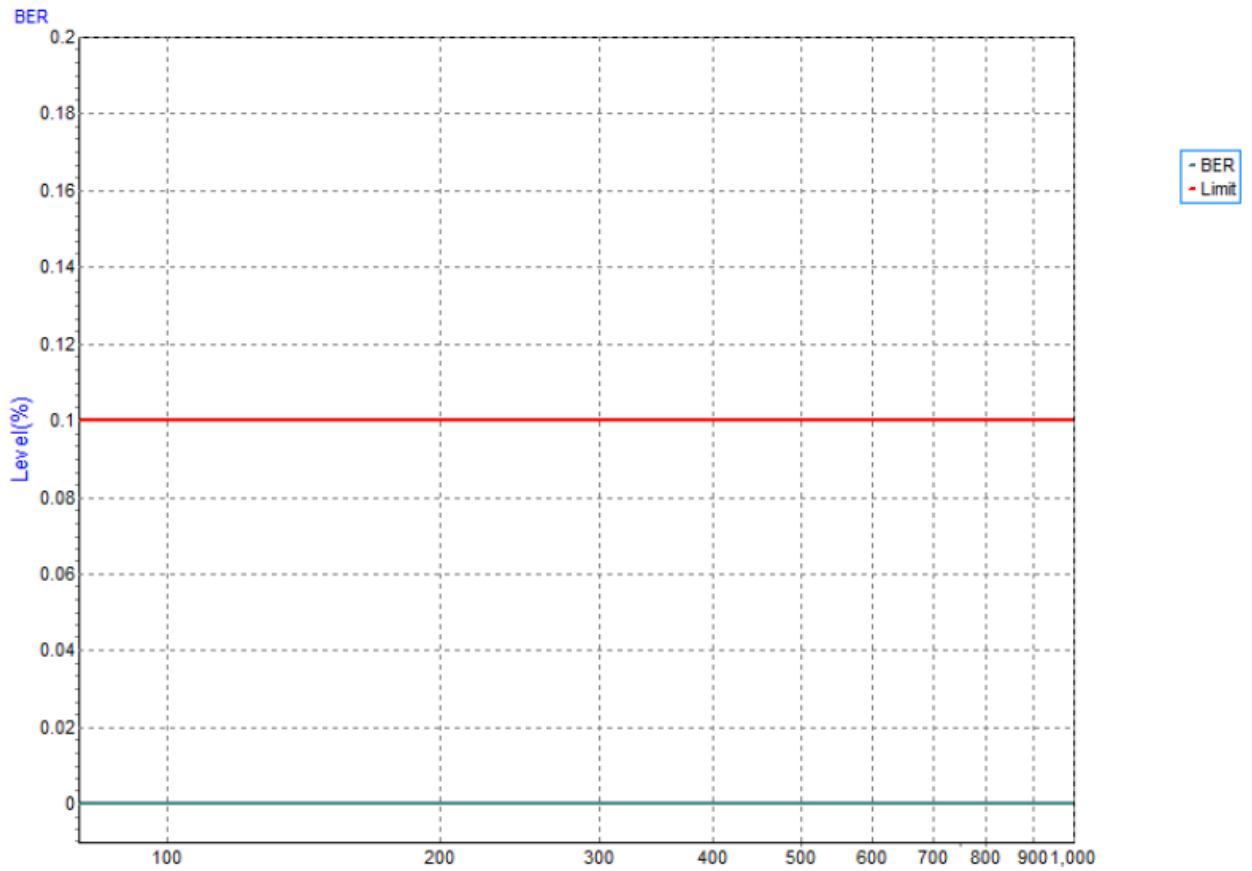
## **APPENDIX I - RF ELECTROMAGNETIC FIELD**

Test Voltage	AC 230V/50Hz
Test Mode:	Mode 1-4

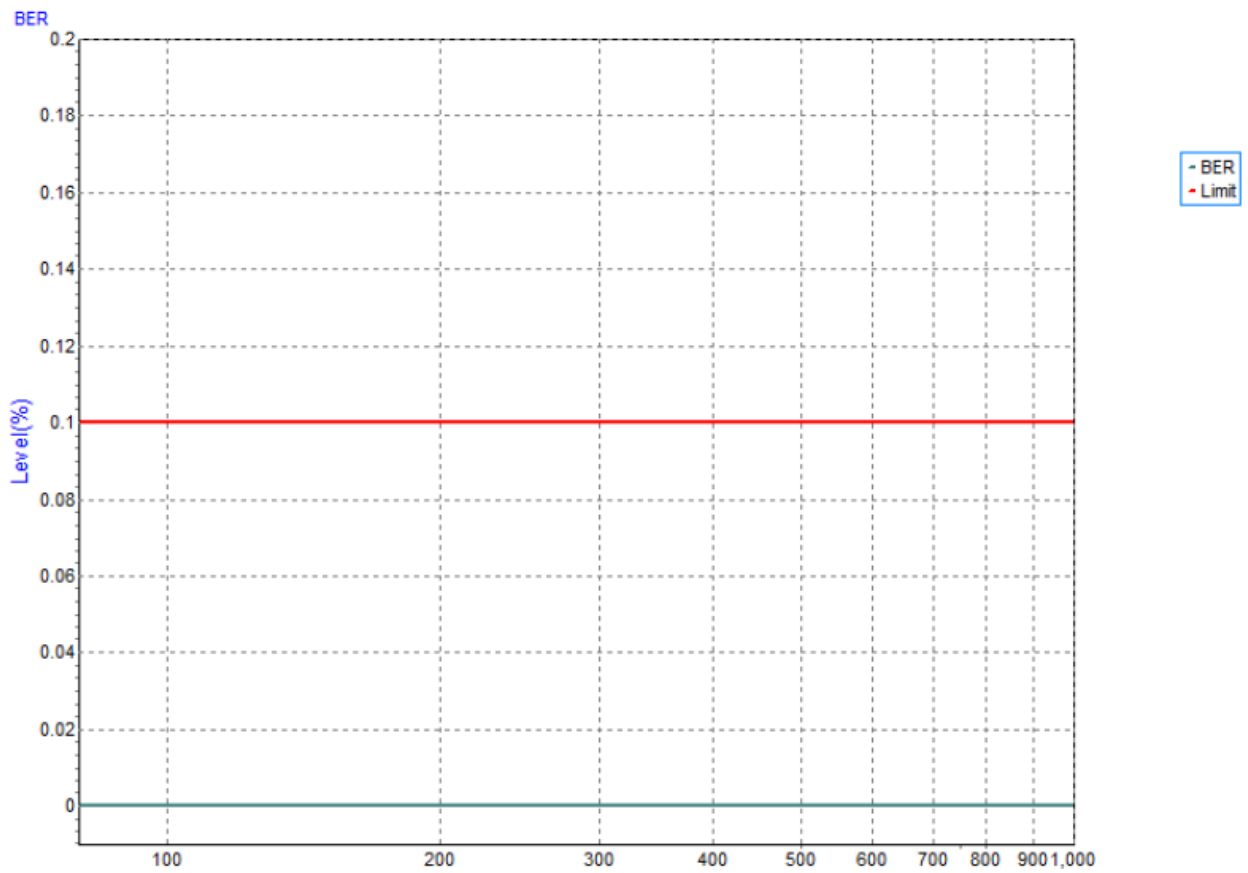
Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Modulation	Azimuth	Criteria	Results
80 - 1000	V/H	3 V/m	AM Modulated 1000 Hz, 80%	0	A	A
				90		
				180		
				270		
1000 - 3000	V/H	3 V/m	AM Modulated 1000 Hz, 80%	0	A	A
				90		
				180		
				270		
3000 - 6000	V/H	3 V/m	AM Modulated 1000 Hz, 80%	0	A	A
				90		
				180		
				270		

The data transfer:

Test Voltage	AC 230V/50Hz
Test Mode	(80 – 1000MHz) WCDMA_Vertical_Rear



Test Voltage	AC 230V/50Hz
Test Mode	(80 – 1000MHz) WCDMA_Horizontal_Rear



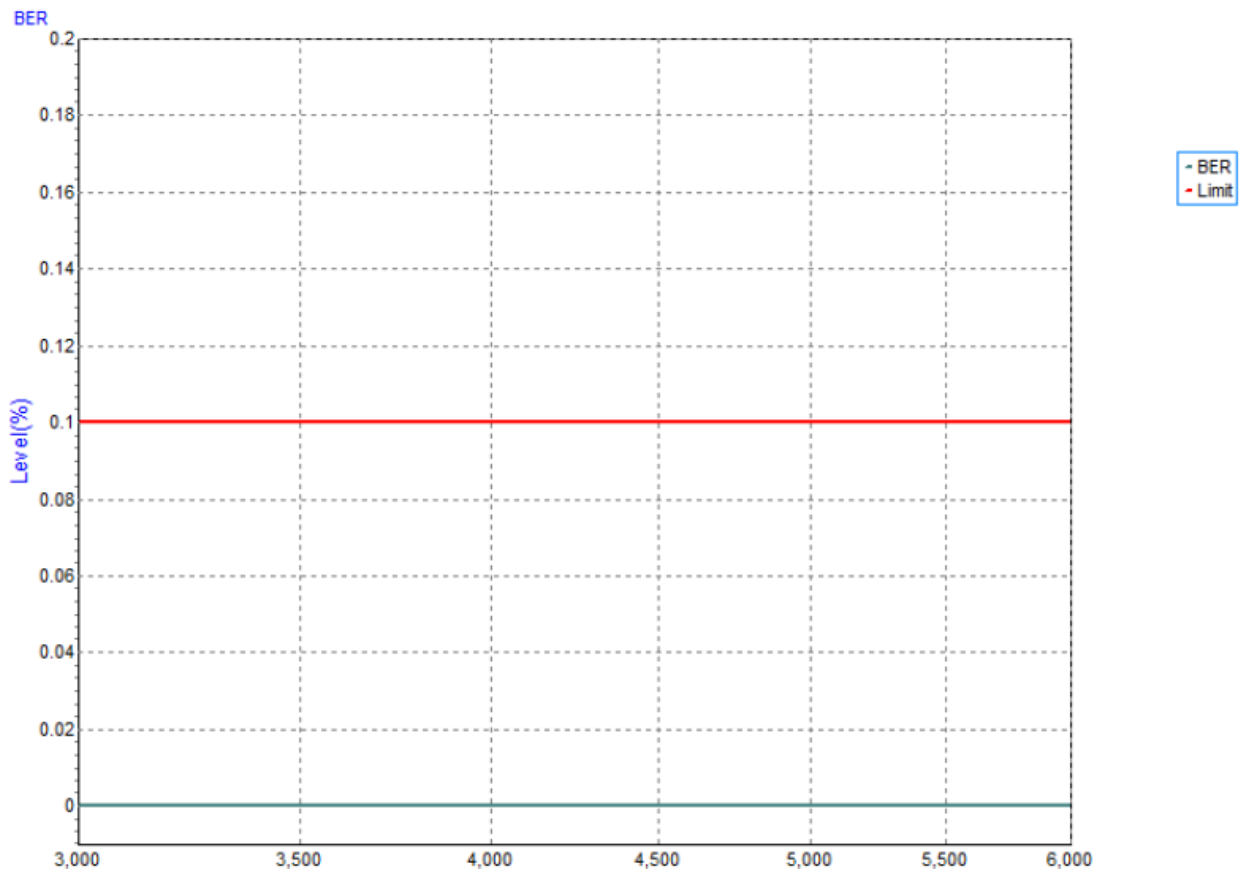
Test Voltage	AC 230V/50Hz
Test Mode	(1000 – 3000MHz) WCDMA_Vertical_Rear



Test Voltage	AC 230V/50Hz
Test Mode	(1000 – 3000MHz) WCDMA_Horizontal_Rear

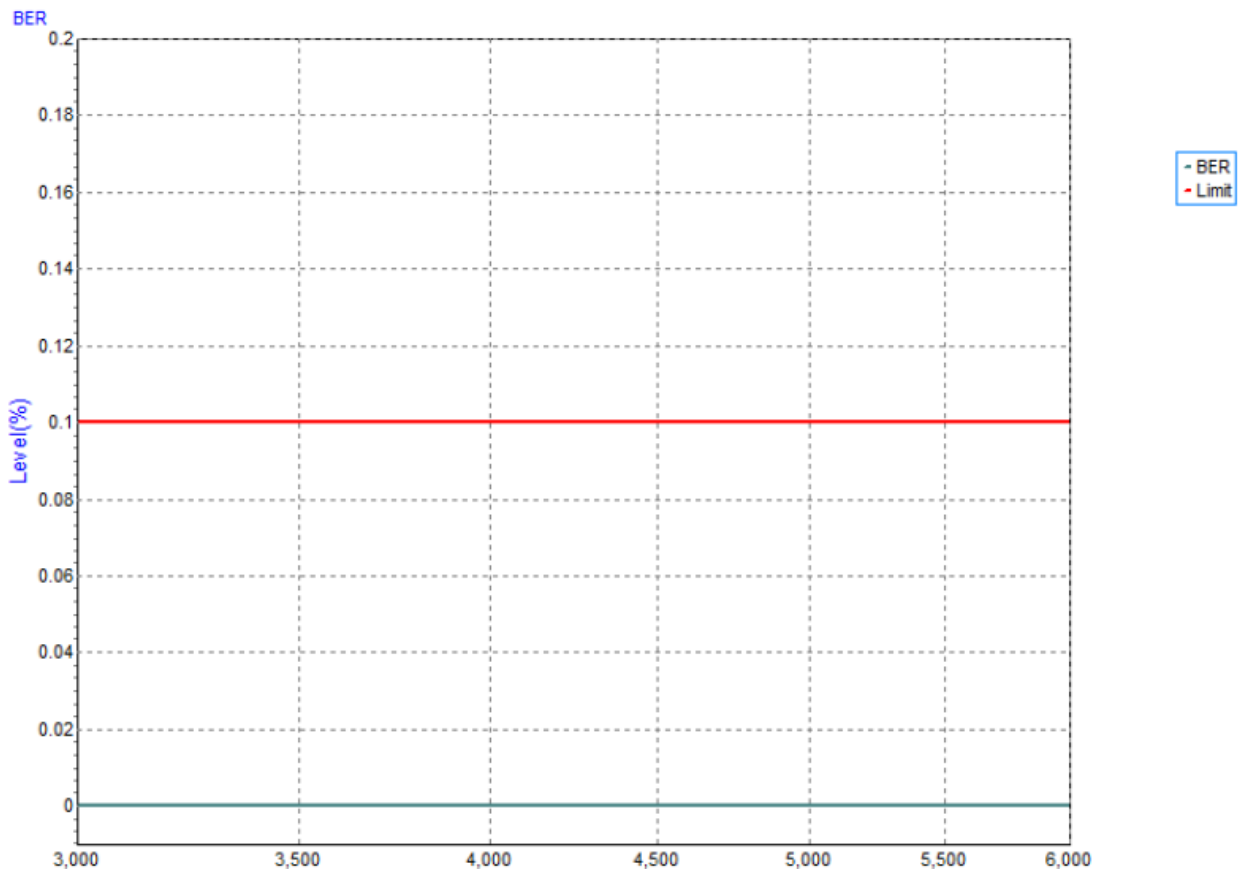


Test Voltage	AC 230V/50Hz
Test Mode	(3000 – 6000MHz) WCDMA_Vertical_Rear

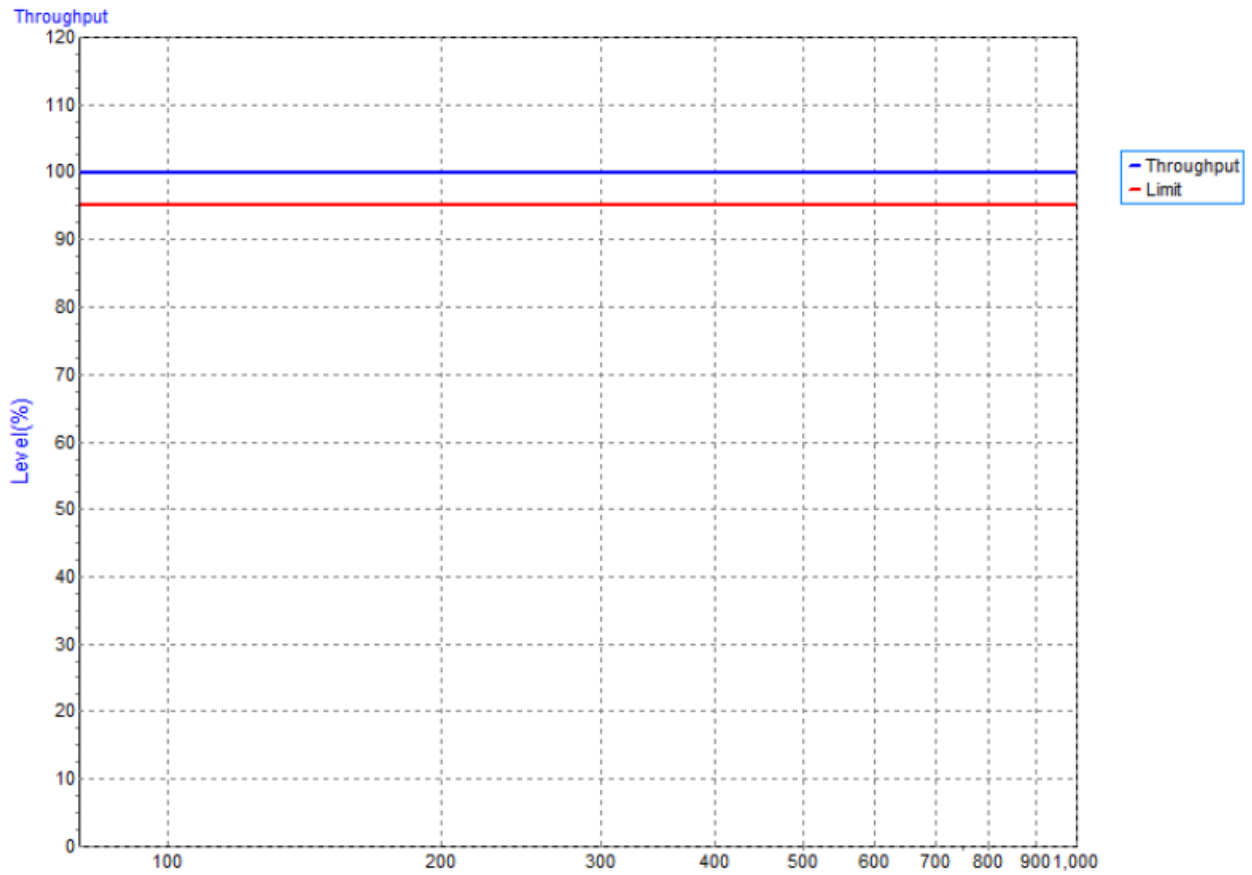




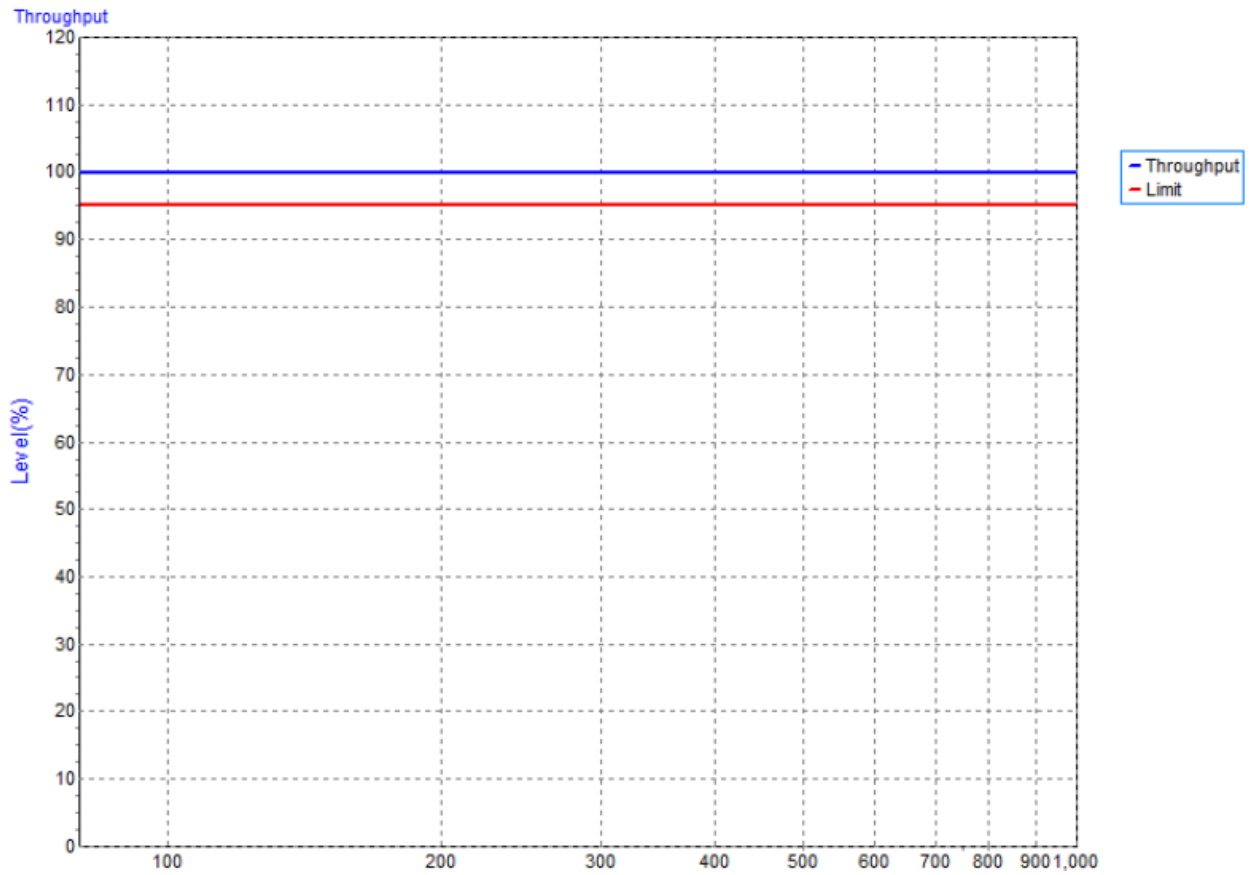
Test Voltage	AC 230V/50Hz
Test Mode	(3000 – 6000MHz) WCDMA_Horizontal_Rear



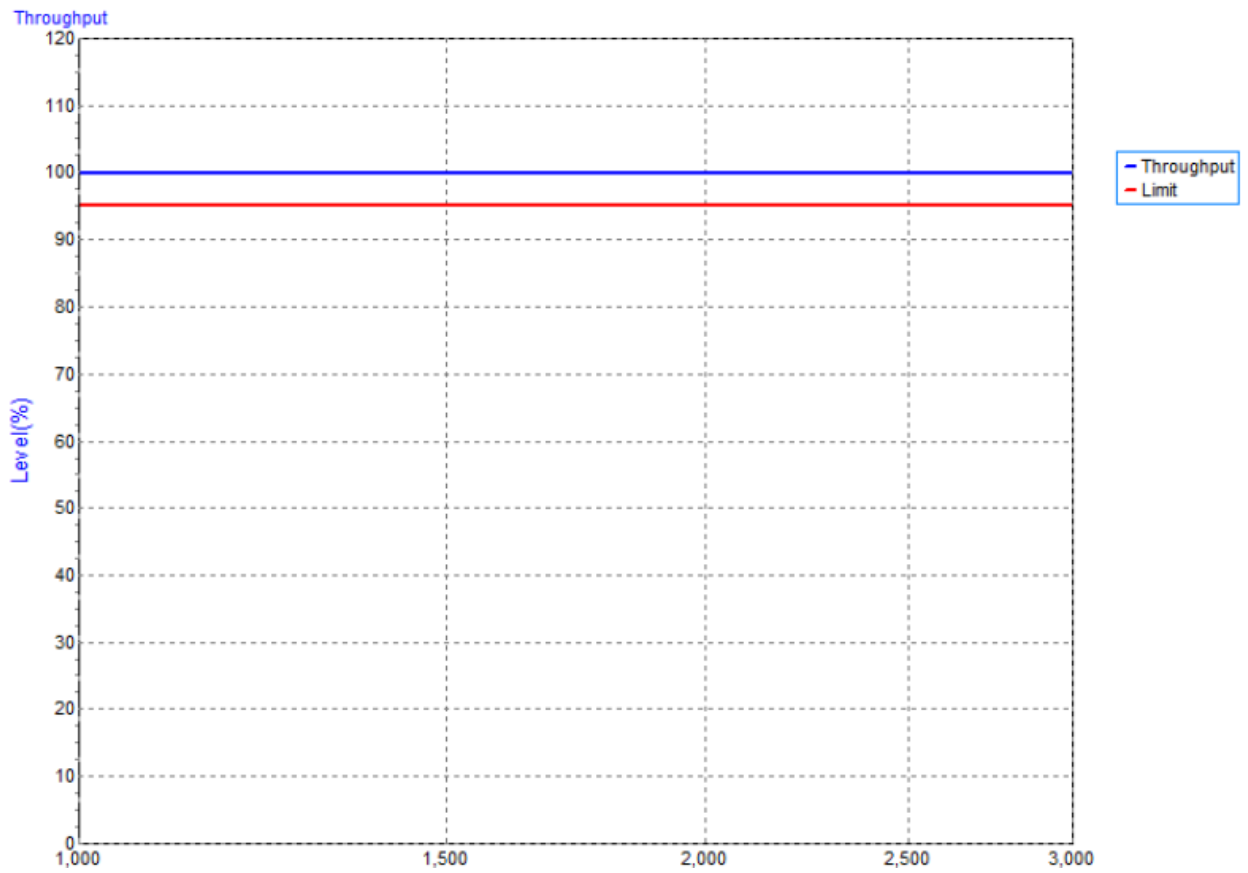
Test Voltage	AC 230V/50Hz
Test Mode	(80 – 1000MHz) LTE_Vertical_Rear



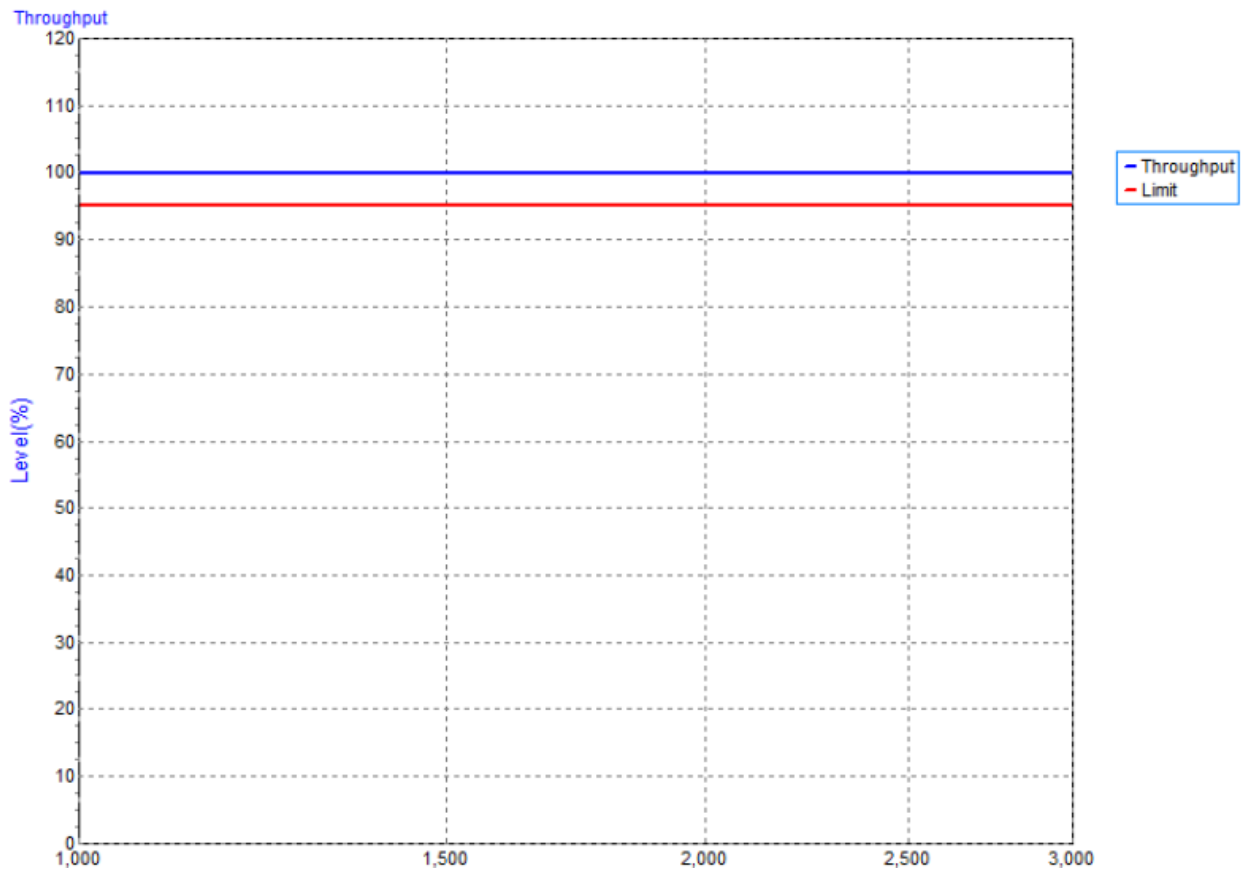
Test Voltage	AC 230V/50Hz
Test Mode	(80 – 1000MHz) LTE_Horizontal_Rear



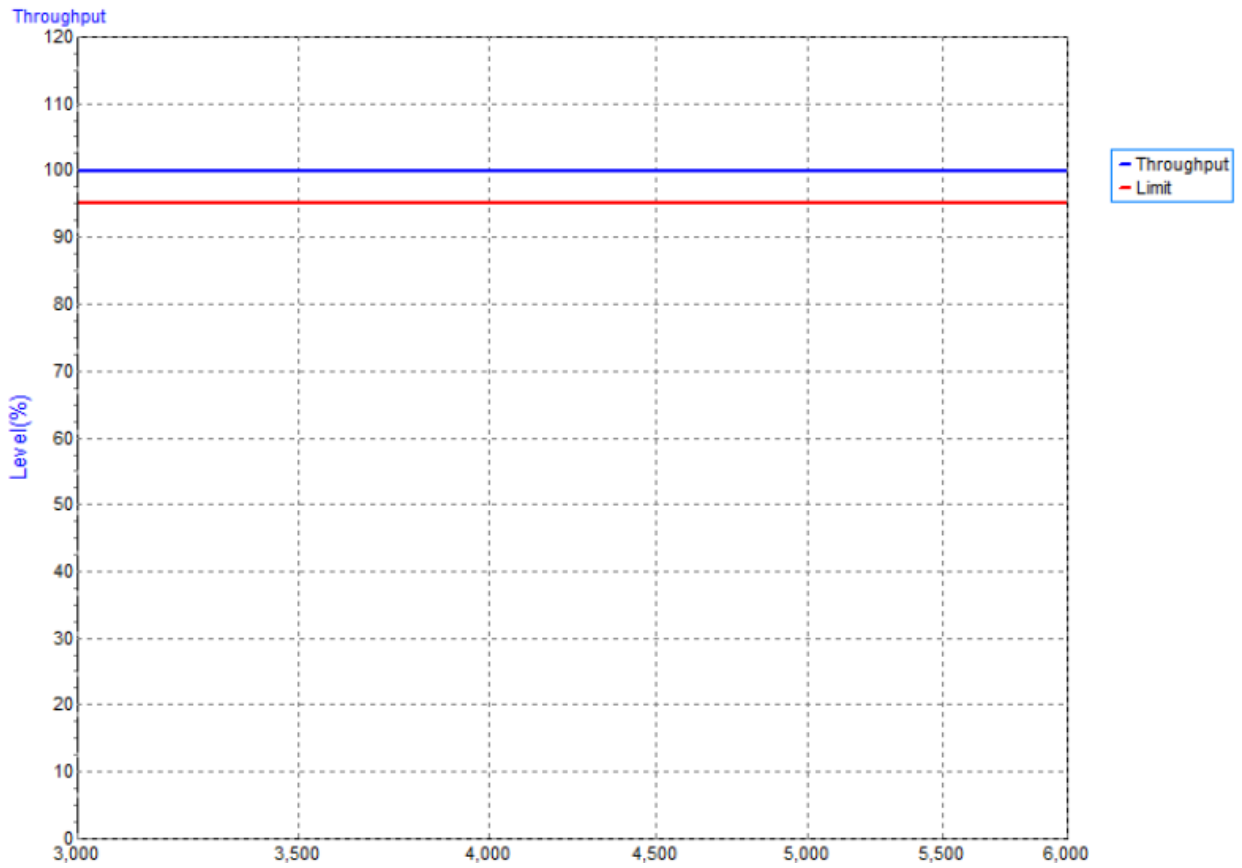
Test Voltage	AC 230V/50Hz
Test Mode	(1000 – 3000MHz) LTE_Vertical_Rear



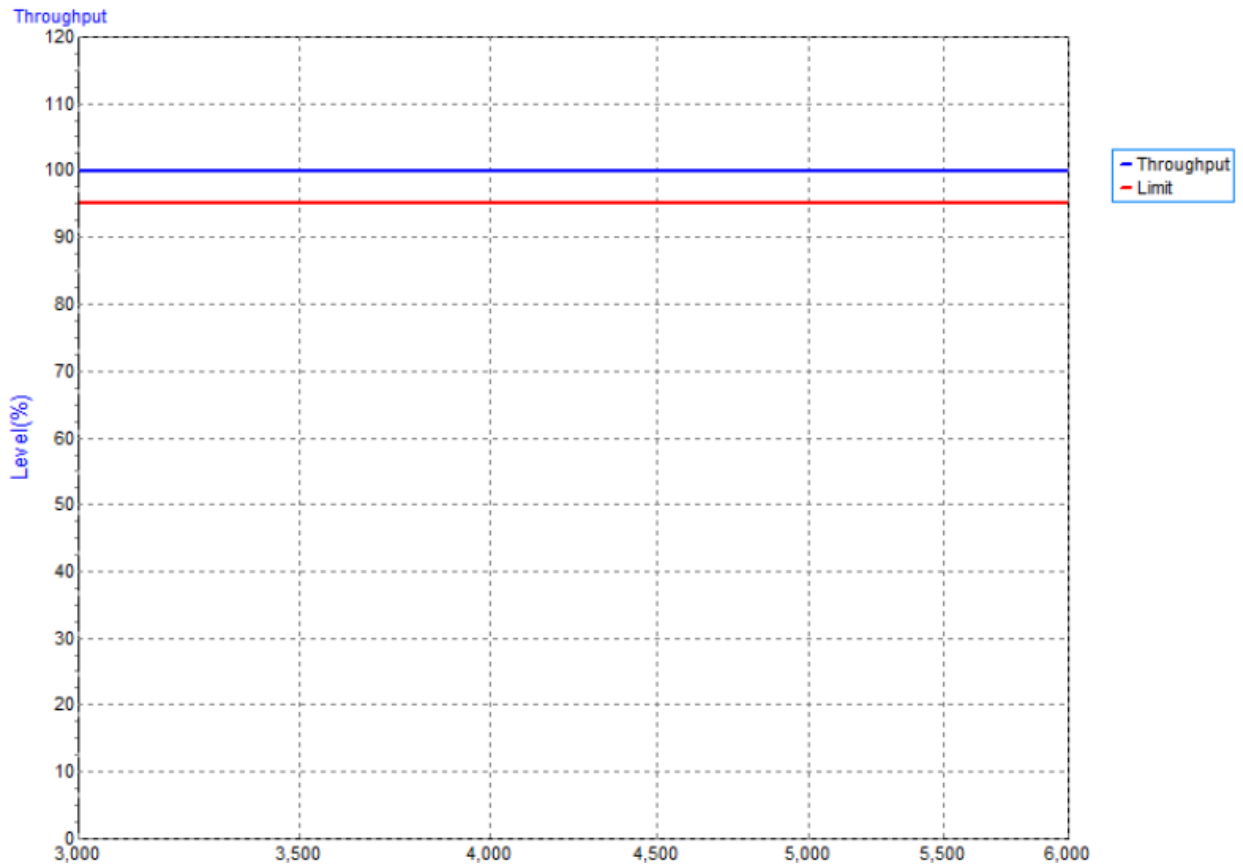
Test Voltage	AC 230V/50Hz
Test Mode	(1000 – 3000MHz) LTE_Horizontal_Rear



Test Voltage	AC 230V/50Hz
Test Mode	(3000 – 6000MHz)LTE_Vertical_Rear



Test Voltage	AC 230V/50Hz
Test Mode	(3000 – 6000MHz) LTE_Horizontal_Rear



The data transfer of 5G NR throughput:

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

Frequency Range (MHz)	Field Strength	RF Field Position	Azimuth	Limit	Results	Judgment
80 - 1000	3 V/m (rms) AM Modulated 1000Hz, 80%	V	Front	95%	99.04%	PASS
			Rear		99.01%	
			Left		99.31%	
			Right		99.26%	
	3 V/m (rms) AM Modulated 1000Hz, 80%	H	Front	95%	99.38%	PASS
			Rear		99.10%	
			Left		99.58%	
			Right		99.53%	
1000 - 3000	3 V/m (rms) AM Modulated 1000Hz, 80%	V	Front	95%	99.44%	PASS
			Rear		99.16%	
			Left		99.34%	
			Right		99.51%	
	3 V/m (rms) AM Modulated 1000Hz, 80%	H	Front	95%	99.37%	PASS
			Rear		99.17%	
			Left		99.47%	
			Right		99.36%	
3000 - 6000	3 V/m (rms) AM Modulated 1000Hz, 80%	V	Front	95%	99.44%	PASS
			Rear		99.32%	
			Left		99.29%	
			Right		99.42%	
	3 V/m (rms) AM Modulated 1000Hz, 80%	H	Front	95%	99.50%	PASS
			Rear		99.35%	
			Left		99.18%	
			Right		99.37%	



## **APPENDIX J - FAST TRANSIENTS COMMON MODE**

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1-4

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

EUT Ports Tested		Polarity	Repetition Frequency	Test Level 0.5 kV	Criterion	Result
Signal port, Wired network port, Control port	WAN	+	5 kHz	B	B	B
		-	5 kHz	B		
	LAN	+	5 kHz	B	B	B
		-	5 kHz	B		

## APPENDIX K - SURGE

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1-4

Wave Form EUT Ports Tested		1.2/50(8/20)Tr/Th μs						Criterion	Result
		Polarity	Phase	Voltage					
				0.5kV	1kV	-- kV	-- kV		
AC	L – N	+/-	0°	A	B	-	-	B	B
		+/-	90°	A	B	-	-		
		+/-	180°	A	B	-	-		
		+/-	270°	A	B	-	-		

Wave Form EUT Ports Tested		1.2/50(8/20)Tr/Th μs					Criterion	Result
		Polarity	Voltage					
			0.5kV	1kV	-- kV	-- kV		
Wired network ports	WAN	+/-	B	B	-	-	B	B
	LAN	+/-	B	B	-	-	B	B

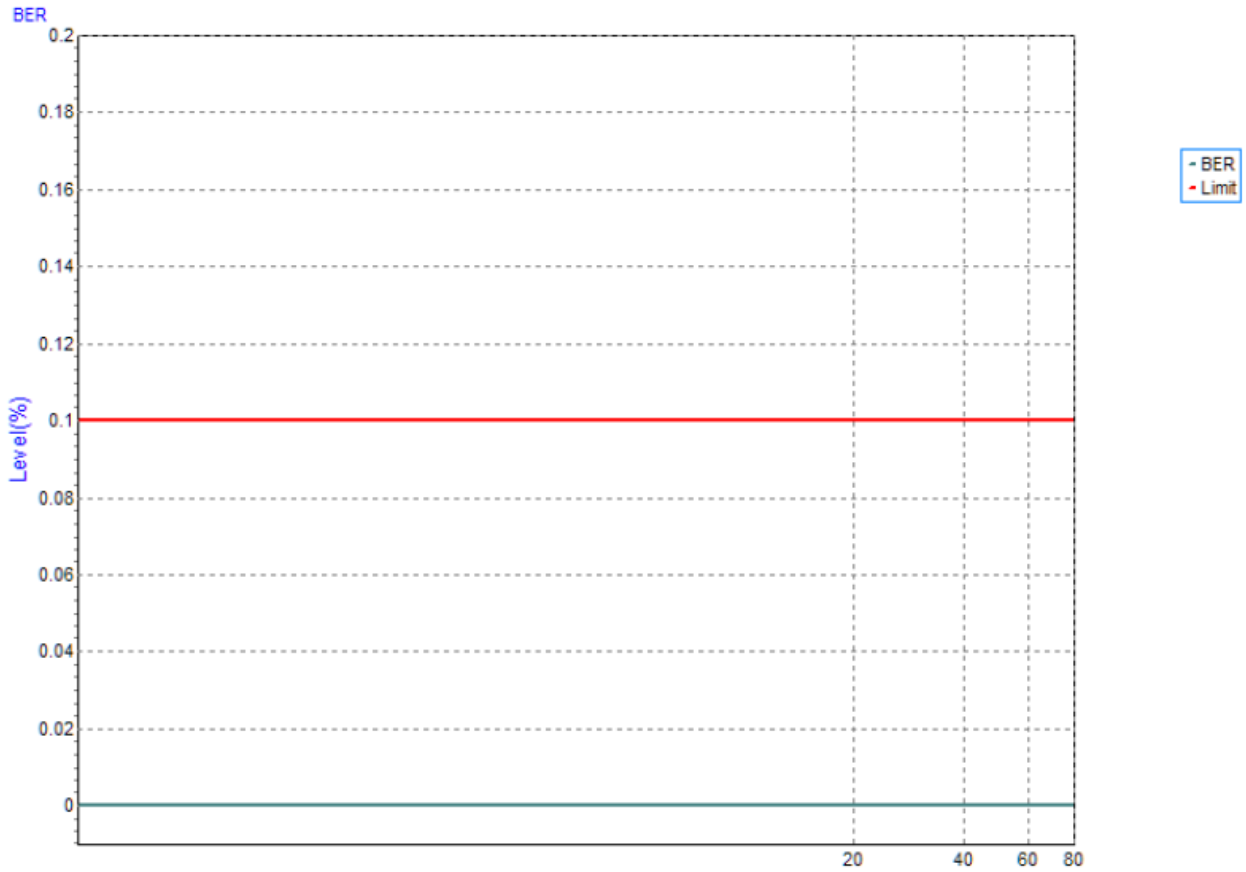
## **APPENDIX L - RADIO FREQUENCY COMMON MODE**

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1-4

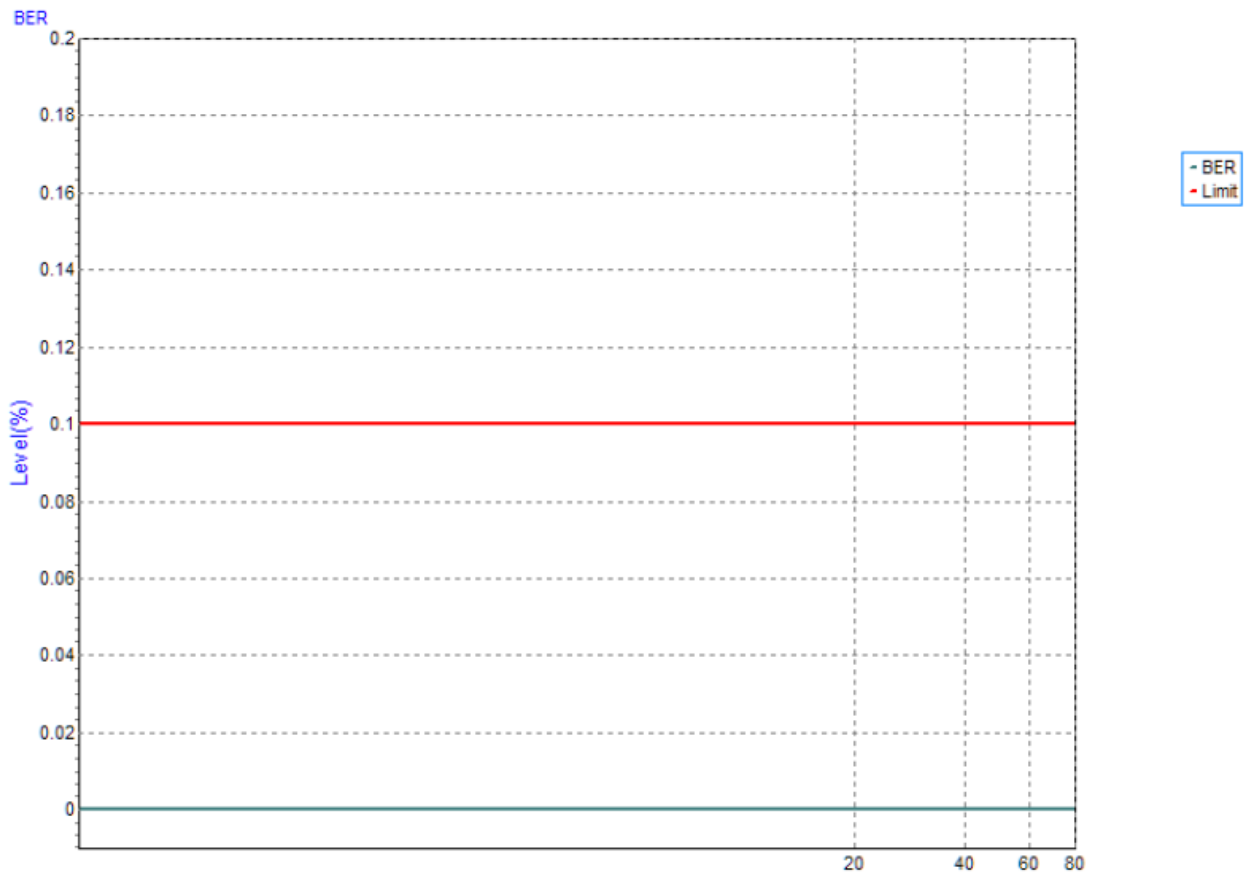
Test Ports (Mode)	Freq. Range (MHz)	Field Strength	Modulation	Criteria	Results
Input/ Output AC. Power Port	0.15 ---80	3 V	AM Modulated 1000 Hz, 80%	A	A
Signal ports, wired network ports, control ports (WAN)	0.15 --- 80			A	A
Signal ports, wired network ports, control ports (LAN)	0.15 --- 80			A	A

The data transfer:

Test Voltage	AC 230V/50Hz
Test Mode	WCDMA_CDN M2

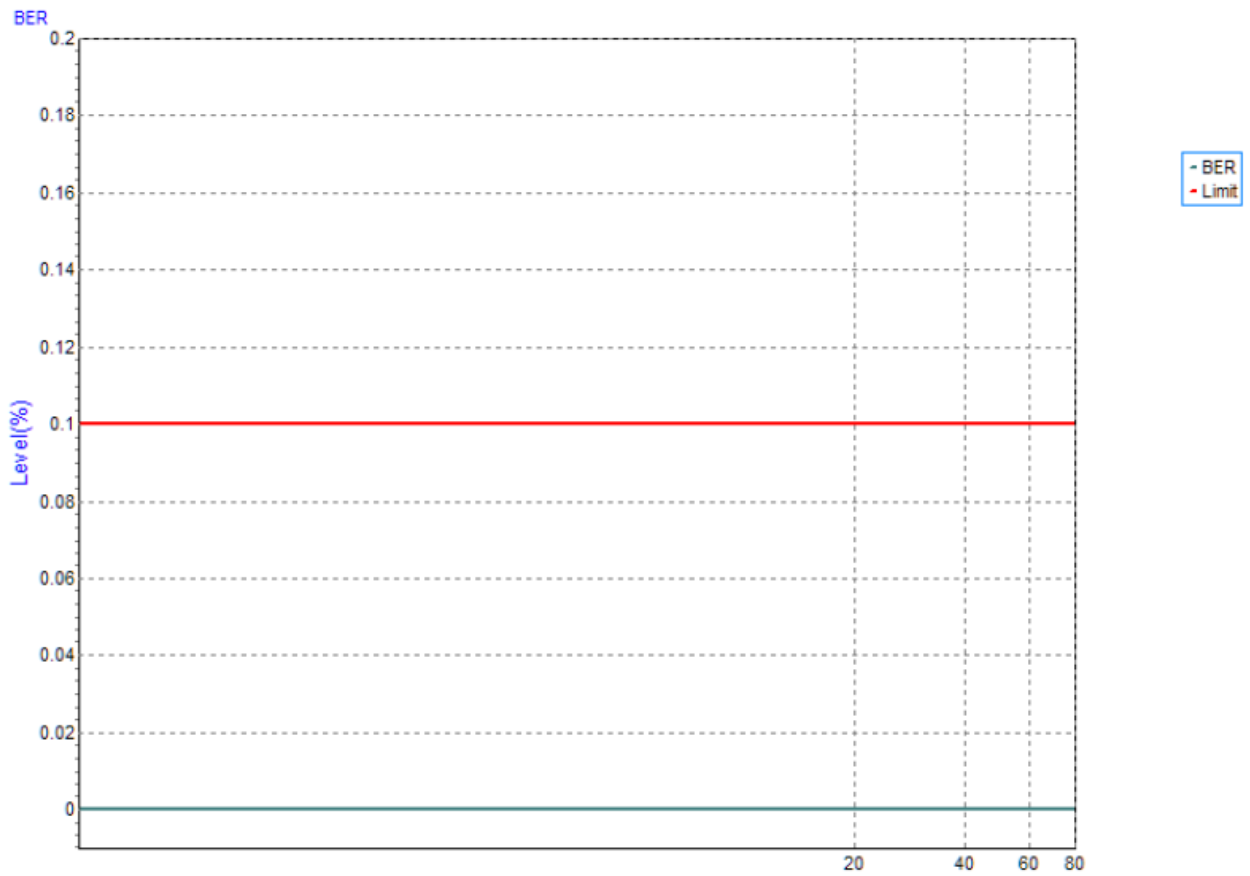


Test Voltage	AC 230V/50Hz
Test Mode	WCDMA_CDN T8(WAN)

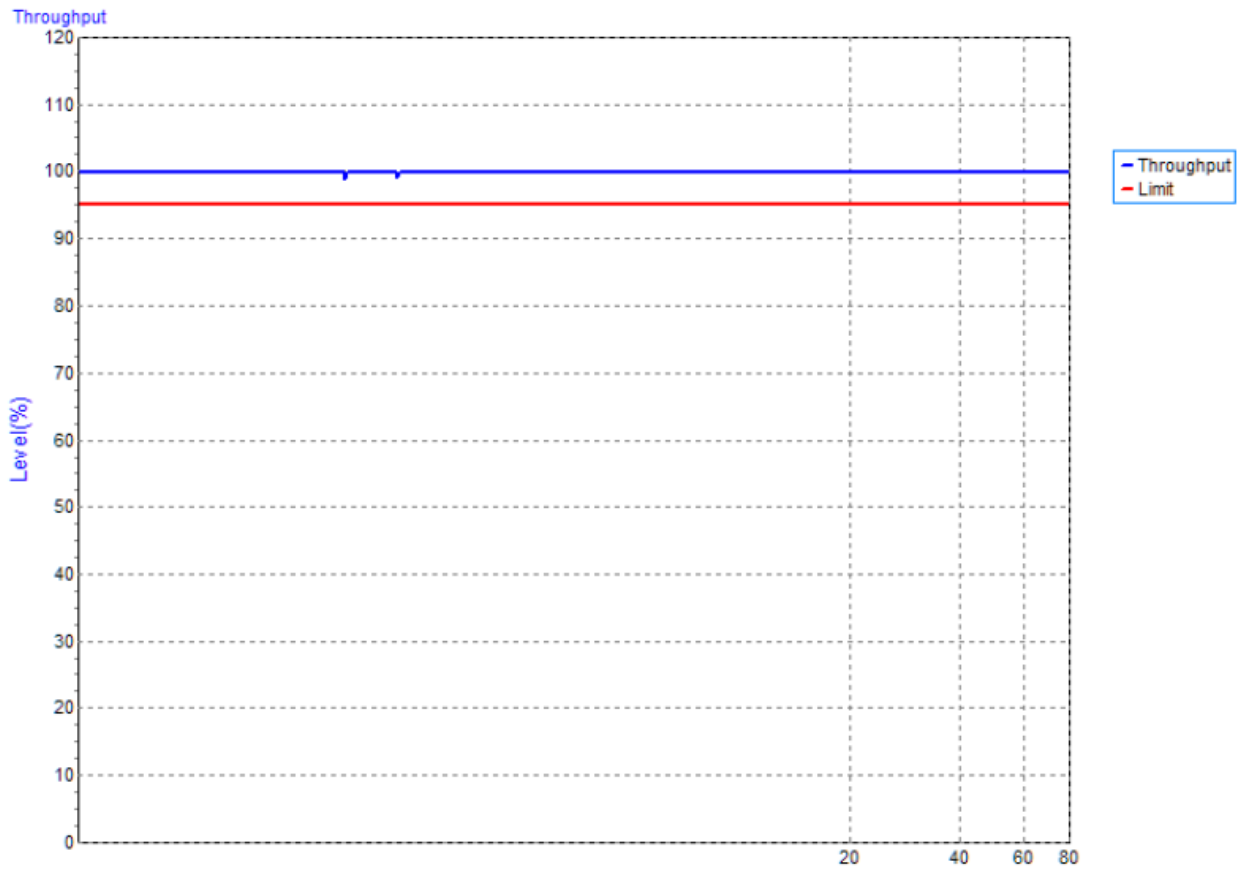




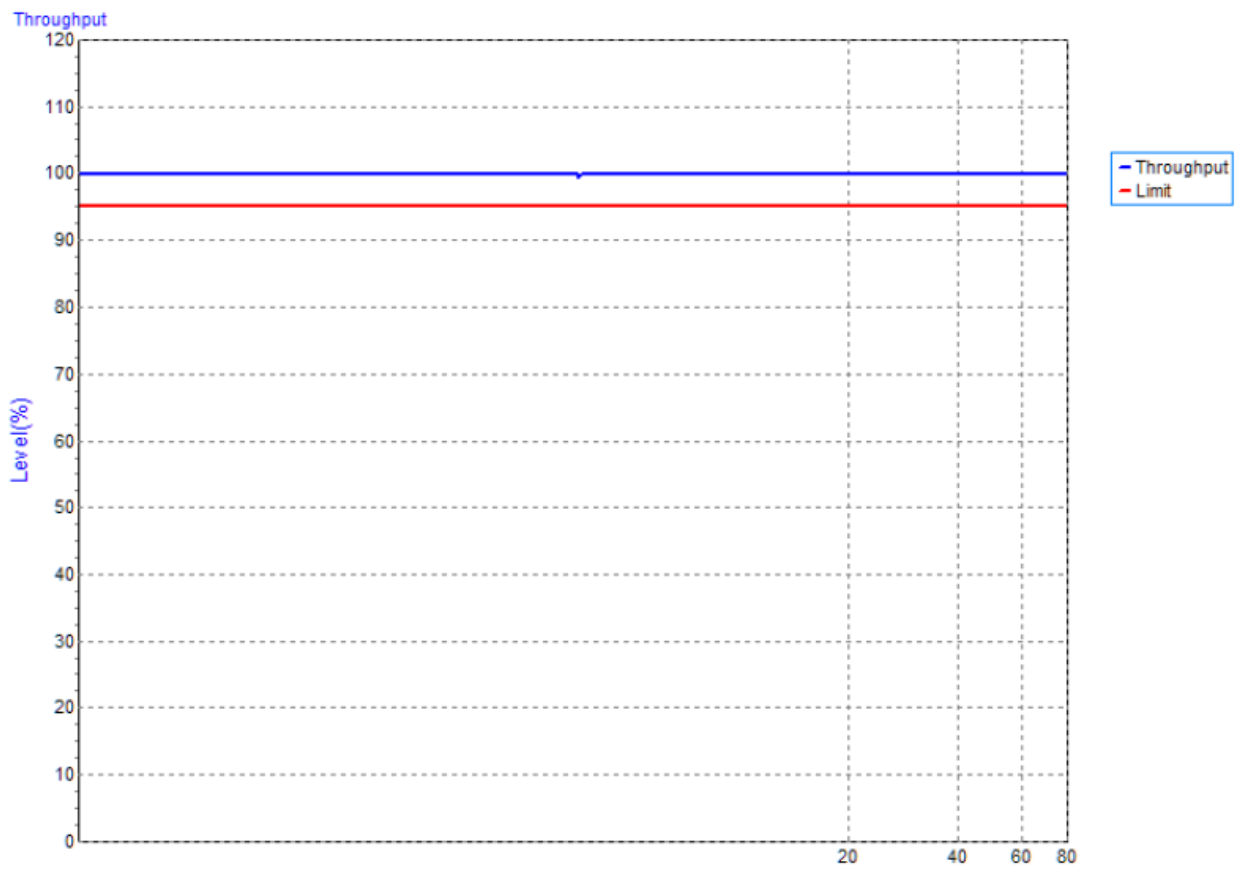
Test Voltage	AC 230V/50Hz
Test Mode	WCDMA_CDN T8(WAN)



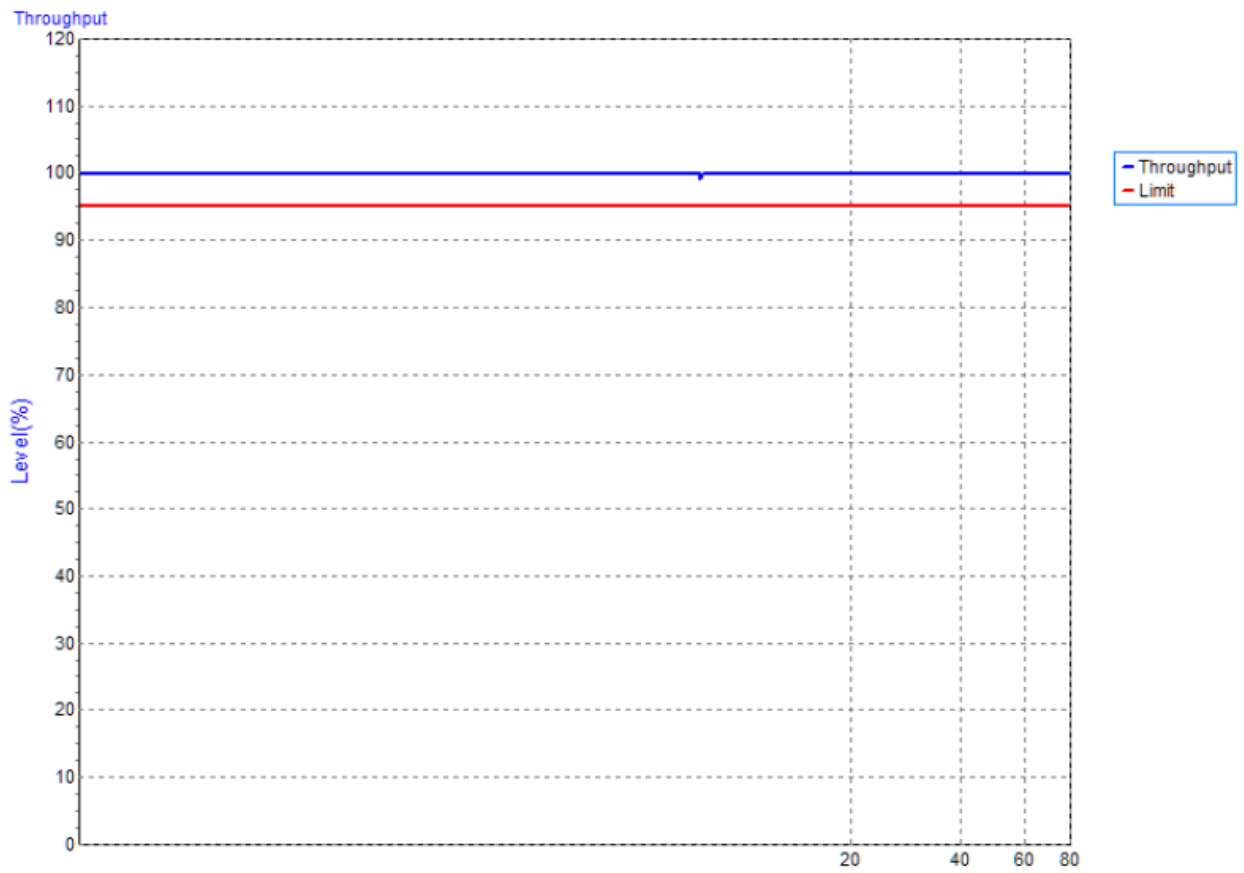
Test Voltage	AC 230V/50Hz
Test Mode	LTE_CDN M2



Test Voltage	AC 230V/50Hz
Test Mode	LTE_CDN T8(WAN)



Test Voltage	AC 230V/50Hz
Test Mode	LTE_CDN T8(WAN)



The data transfer of 5G NR throughput:

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

Interference signal injection	Freq. Range (MHz)	Field Strength	Limit	Results	Judgment
Input/ Output AC. Power Port	0.15 --- 80	3V(rms) AM Modulated 1000Hz, 80%	95%	99.16%	PASS
Signal Line (WAN)			95%	99.23%	PASS
Signal Line (LAN)			95%	99.15%	PASS

## **APPENDIX M - VOLTAGE DIPS AND INTERRUPTIONS**

Test Voltage	AC 100V/50Hz, AC 230V/50Hz, AC 240V/50Hz
Test Mode	Mode 1-4

AC 100V/50Hz				
Item	Residual Voltage	Cycle	Perform Criteria	Results
Voltage dips	0%	0.5	B	A
Voltage dips	0%	1	B	A
Voltage dips	70%	25	C	A
Voltage interruptions	0%	250	C	C

AC 230V/50Hz				
Item	Residual Voltage	Cycle	Perform Criteria	Results
Voltage dips	0%	0.5	B	A
Voltage dips	0%	1	B	A
Voltage dips	70%	25	C	A
Voltage interruptions	0%	250	C	C

AC 240V/50Hz				
Item	Residual Voltage	Cycle	Perform Criteria	Results
Voltage dips	0%	0.5	B	A
Voltage dips	0%	1	B	A
Voltage dips	70%	25	C	A
Voltage interruptions	0%	250	C	C

**End of Test Report**