

# EN 301 489 Test Report

**Project No.** : 1511C190  
**Equipment** : 150Mbps WiFi Module  
**Model Name** : GWF-7M02  
**Applicant** : Shenzhen Ogemray Tech CO.,LTD  
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China

**Date of Receipt** : Nov. 13, 2015  
**Date of Test** : Nov. 13, 2015 ~ Nov. 23, 2015  
**Issued Date** : Nov. 25, 2015  
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### **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.

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### REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-ETSE-1-1511C190	Original Issue	Nov. 25, 2015

## 1. CERTIFICATION

Equipment : 150Mbps WiFi Module  
Brand Name : N/A  
Model Name : GWF-7M02  
Applicant : Shenzhen Ogemray Tech CO.,LTD  
Manufacturer : Shenzhen Ogemray Tech CO.,LTD  
Address : 3/F~4/F,NO.5 Bldg, Dongwu Industrial Park, Donghuan 1st Road, Longhua Town, Shenzhen, China  
Date of Test : Nov. 13, 2015 ~ Nov. 23, 2015  
Test Sample : Engineering Sample  
Standard(s) : EN 301 489-1 V1.9.2 (2011-09)  
EN 301 489-17 V2.2.1 (2012-09)  
EN 61000-4-2: 2009  
EN 61000-4-3: 2006+A1: 2008+A2: 2010  
EN 61000-4-4: 2012  
EN 61000-4-5: 2014  
EN 61000-4-6: 2014  
EN 61000-4-11: 2004

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

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-ETSE-1-1511C190) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

## 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

EMC Emission				
Standard(s)	Test Item	Limit	Judgment	Remark
EN 301 489-1 V1.9.2 (2011-09) NOTE (5)	Conducted Emission	Class B	PASS	
	Conducted Telecom port	Class B	N/A	NOTE (1)
	Radiated emission Below 1 GHz	Class B	PASS	
	Radiated emission Above 1 GHz	Class B	PASS	NOTE (2)
EN 61000-3-2: 2014	Harmonic Current Emission	Class A	N/A	NOTE (1)
EN 61000-3-3: 2013	Voltage Fluctuations & Flicker	-----	N/A	NOTE (1)
EMC Immunity				
Section	Test Item	Performance Criteria	Judgment	Remark
EN 61000-4-2: 2009	Electrostatic Discharge	B (TT,TR)	PASS	
EN 61000-4-3: 2006+A1: 2008+A2: 2010	RF electromagnetic field	A (CT,CR)	PASS	
EN 61000-4-4: 2012	Fast transients	B (TT,TR)	PASS	
EN 61000-4-5: 2014	Surges	B (TT,TR)	PASS	
EN 61000-4-6: 2014	Injected Current	A (CT,CR)	PASS	
EN 61000-4-11: 2004	Volt. Interruptions Volt. Dips	B (TT,TR)/C	PASS	NOTE (4)

**NOTE:**

- (1) " N/A" denotes test is not applicable to this device.
- (2) The EUT's max operating frequency is 2412~2472MHz which exceeds 108MHz, so the test will be performed.
- (3) If the EUT's category is Class D and power consumption is less than 75W, there is no limit applied.
- (4) Voltage dip: 0% residual voltage for 0, 5 cycle - Criteria B (TT,TR)  
Voltage dip: 0% residual voltage for 1 cycle - Criteria B (TT,TR)  
Voltage dip: 70% residual voltage for 25 cycle (at 50Hz) - Criteria B (TT,TR)  
Voltage Interruption: 0% residual voltage for 250 cycle (at 50Hz) - with battery back-up: Criteria B (TT,TR), without battery back-up: Criteria C
- (5) The test method is in accordance with EN 55022:2010+AC:2011.
- (6) For the performance criteria for Transient phenomena applied to Transmitter (TT) and Receiver (TR)
- (7) For the performance criteria for Continuous phenomena applied to Transmitter (CT) and Receiver (CR).

## 2.1 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.

## 2.2 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. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-C02	CISPR	150 kHz ~ 30MHz	2.32

### B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB08 (10m)	CISPR	30MHz ~ 200MHz	V	4.66
		30MHz ~ 200MHz	H	4.64
		200MHz ~ 1,000MHz	V	4.88
		200MHz ~ 1,000MHz	H	4.86

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB08 (3m)	CISPR	1 ~ 6 GHz	4.26
		6 ~18 GHz	5.30

C. Immunity Measurement:

Test Site	Method	Test Item	U
SR02	EN 61000-4-2	Voltage (2kV/4kV/6kV/8kV/15kV/25kV/30kV)	1.0%
		Peak Current	6.0%
		30/60ns Current	6.0%
		Rise time	6.4%
CB05	EN 61000-4-3	80MHz~1GHz	2.175 dB
		1GHz~6GHz	2.175 dB
SR05	EN 61000-4-4	Impulse Voltage	4.0 %
		Impulse Rise Time	4.5 %
		Impulse duration Time	4.0 %
SR05	EN 61000-4-5	Impulse Voltage	4.0 %
		Impulse Rise Time	4.5 %
		Impulse duration Time	4.0 %
CB06	EN 61000-4-6	CDN: 150kHz~230MHz	2.509 dB
		EM Clamp: 150kHz~230MHz	3.094 dB
SR05	EN 61000-4-11	Impulse Amplitude	4 %
		Timing	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.

### 2.3 APPLICABILITY OVERVIEW TABLES

This section refers to sub-clause 7 of the standard EN 301 489-1

#### Definition of I/O Ports:

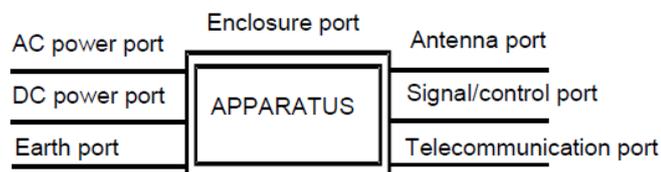


Figure 1: Examples of ports

EMC Emission			
Phenomenon	Application	Equipment test requirement	Reference clause in the present document
		Radio and ancillary equipment for fixed use	
Radiated emission	Enclosure of Ancillary equipment	Applicable for standalone testing	8.2
Conducted emission	DC power input/output port	Not applicable	8.3
Conducted emission	AC mains input/output port	Applicable	8.4
Harmonic current emissions	AC mains Input port	Not applicable	8.5
Voltage fluctuations and flicker	AC mains Input port	Not applicable	8.6
Conducted emission	Telecommunication port	Not applicable	8.7

<b>EMC Immunity</b>			
Phenomenon	Application	Equipment test requirement	Reference clause in the present document
		Radio and ancillary equipment for fixed use	
RF electromagnetic field (80 MHz to 1000 MHz and 1400 MHz to 2700 MHz)	Enclosure	Applicable	9.2
Electrostatic discharge	Enclosure	Applicable	9.3
Fast transients common mode	Signal, telecommunication and control ports, DC and AC power ports	Applicable for AC Power Port	9.4
RF common mode 0,15 MHz to 80 MHz	Signal, telecommunication and control ports, DC and AC power ports	Applicable for AC Power Port	9.5
Transients and surges	DC power input ports	Not applicable	9.6
Voltage dips and interruptions	AC mains power input ports	Applicable	9.7
Surges, line to line and line to ground	AC mains power input ports, telecommunication ports	Applicable for AC Power Port	9.8

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Equipment	150Mbps WiFi Module
Brand Name	N/A
Model Name	GWF-7M02
Model Difference	N/A
Power Source	Supplied from host system.
Power Rating	DC 5V

Note:

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

#### 3.2 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
1	Operating

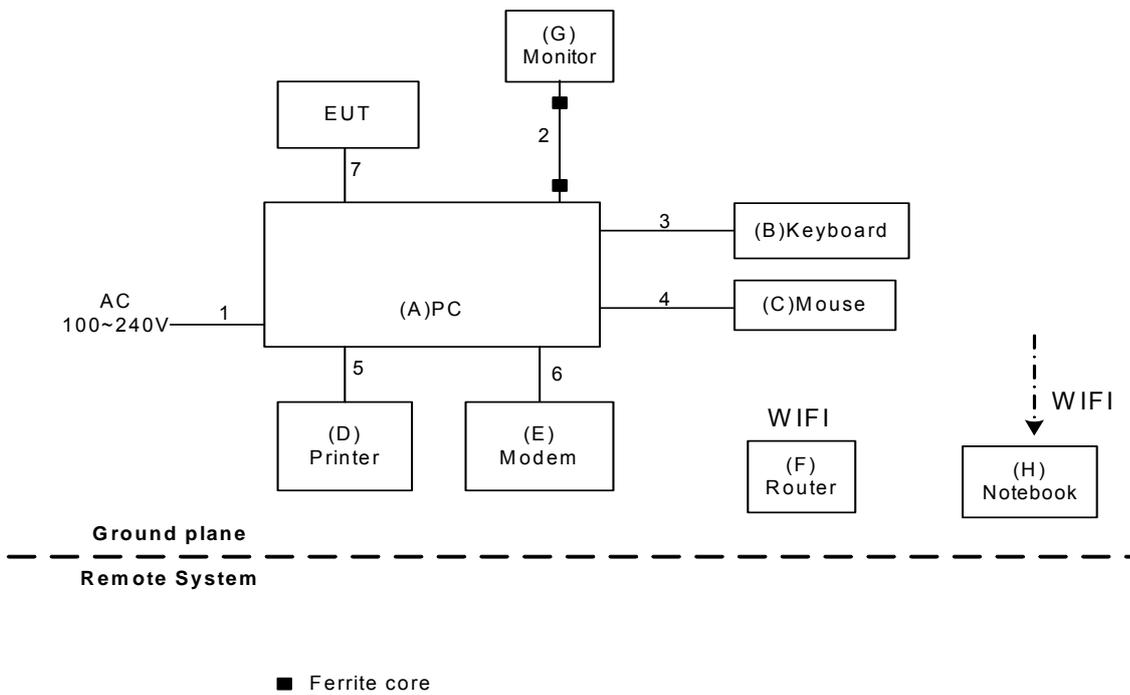
The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Test	
Final Test Mode	Description
1	Operating

For Radiated Test	
Final Test Mode	Description
1	Operating

For EMS Test	
Final Test Mode	Description
1	Operating

### 3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF RADIATION EMISSION TEST



### 3.4 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.	FCC ID	Series No.
A	PC	Dell	Optiplex780	DOC	HMPQY2X
B	USB Keyboard	Dell	L100	DOC	CNORH6596589071T08 NE
C	USB Mouse	Dell	MO56UOA	DOC	FQJ000BS
D	Printer	SII	DPU-414	DOC	3018507 B
E	Modem	ACEEX	DM-1414V	IFAXDM1414	603002131
F	ROUTER	NETIS	WF-2409	DOC	2409US9100095
G	LCD monitor	Dell	E177FPc	DOC	CNOFJ179-64180-6AG- 1WNS
H	Notebook	Dell	E5510	DOC	OJYNHR

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.8m	AC Mains Cable
2	YES	YES	1.8m	D-SUB Cable
3	YES	NO	1.8m	USB Cable
4	YES	NO	1.8m	USB Cable
5	YES	NO	1.5m	Parallel Cable
6	YES	NO	1.8m	RS232 Cable
7	YES	NO	1m	USB Cable

Note:

- (1) For detachable type I/O cable should be specified the length in m in 『Length』 column.

## 4. EMC EMISSION TEST

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 POWER LINE CONDUCTED EMISSION (FREQUENCY RANGE 150KHZ-30MHZ)

FREQUENCY (MHz)	Class A (dB $\mu$ V)		Class B (dB $\mu$ V)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

- (1) The limit for conducted test was performed according to as following: EN 55022
- (2) The tighter limit applies at the band edges.
- (3) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (4) 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

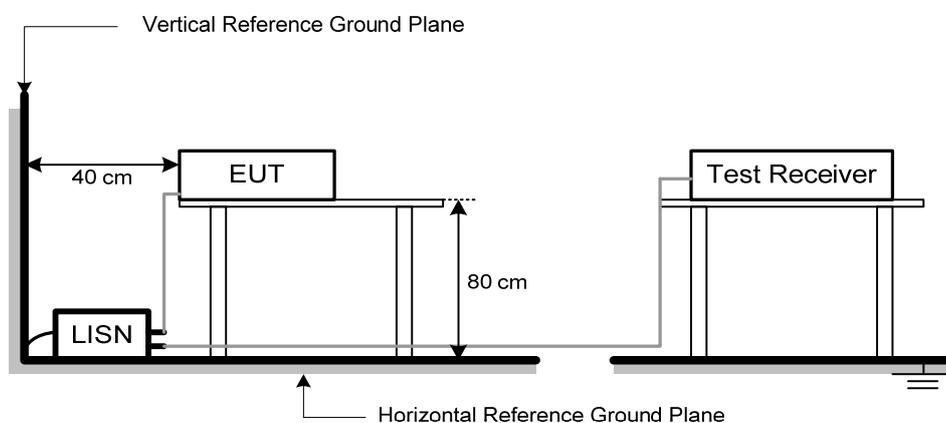
#### 4.1.2 TEST PROCEDURE

- 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 equipments 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.

#### 4.1.3 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.4 TEST SETUP



#### 4.1.5 EUT OPERATING CONDITIONS

The EUT will be configured to operate in a typical fashion as normally used.  
 Temperature: 21°C Relative Humidity: 51%

#### 4.1.6 TEST RESULTS

Please refer to the Attachment A.

## 4.2 CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

### 4.2.1 LIMITS OF DISTURBANCE AT TELECOMMUNICATION PORTS

#### Voltage Limit:

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	97-87*	84-74*	87-74*	74-64*
0.5 -30.0	87	74	74	64

#### Current Limit:

FREQUENCY (MHz)	Class A (dBuA)		Class B (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	53-43*	40-30*	40-30*	30-20*
0.5 -30.0	43	30	30	20

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) 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

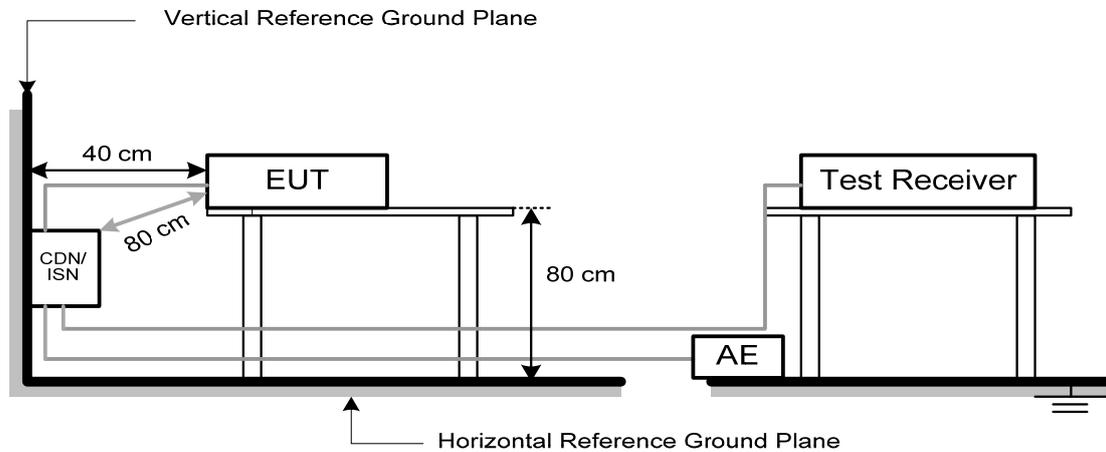
### 4.2.2 TEST PROCEDURE

- 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 equipments 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.

### 4.2.3 DEVIATION FROM TEST STANDARD

No deviation

#### 4.2.4 TEST SETUP



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

#### 4.2.5 EUT OPERATING CONDITIONS

Ethernet connection was better than 10% utilization by Notebook.

Temperature: N/A Relative Humidity: N/A

#### 4.2.6 TEST RESULTS

Please refer to the Attachment B.

### 4.3 RADIATED EMISSION MEASUREMENT

#### 4.3.1 LIMITS OF RADIATED EMISSION MEASUREMENT (BELOW 1000MHZ)

##### Below 1000MHz:

FREQUENCY (MHz)	Class A (at 10m) dBuV/m	Class B (at 10m) dBuV/m
	Quasi-peak	Quasi-peak
30 - 230	40	30
230 - 1000	47	37

##### Notes:

- (1) The limit for radiated test was performed according to as following: CISPR 22.
- (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

##### Above 1 GHz:

FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1000 - 3000	76	56	70	50
3000 - 6000	80	60	74	54

##### NOTE:

- (1) The limit for radiated test was performed according to as following: CISPR 22.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m) = 20log Emission level (uV/m).  
 3m Emission level = 10m Emission level + 20log (10m/3m).
- (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

#### FREQUENCY RANGE OF RADIATED MEASUREMENT (FOR UNINTENTIONAL RADIATORS)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5 <sup>th</sup> harmonic of the highest frequency or 6 GHz, whichever is lower

#### **4.3.2 TEST PROCEDURE**

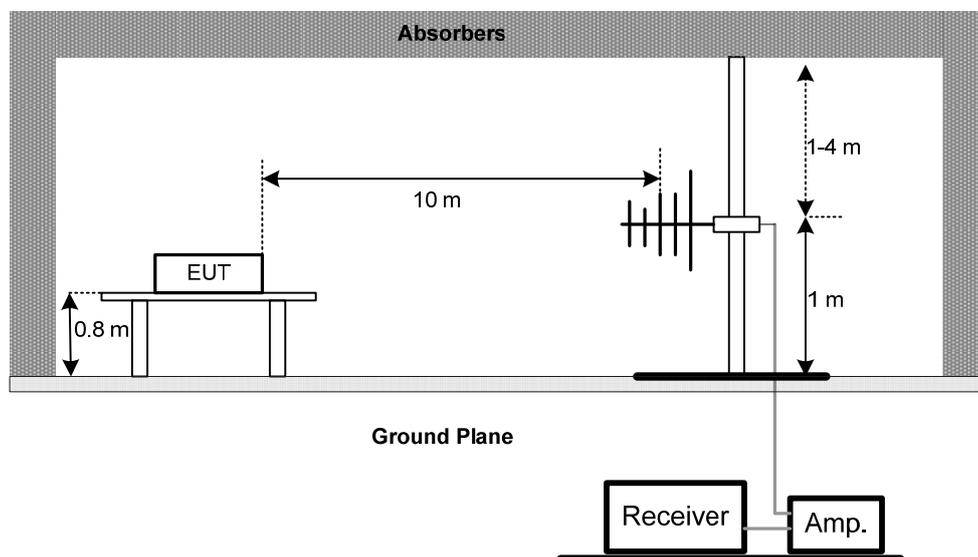
- a. The measuring distance of 10 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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.(above 1GHz)
- c. 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.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. 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.
- g. 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)
- h. 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)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### **4.3.3 DEVIATION FROM TEST STANDARD**

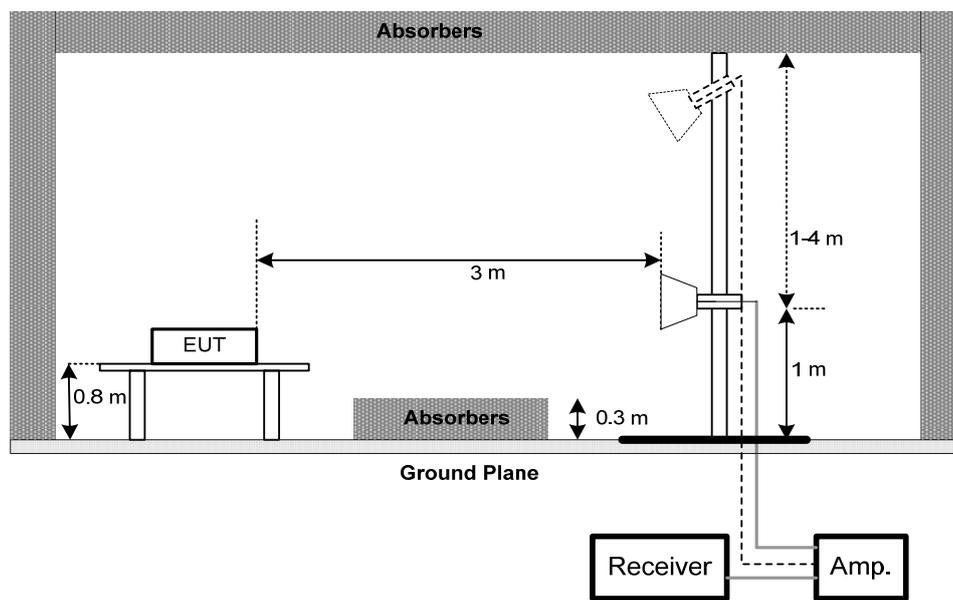
No deviation

### 4.3.4 TEST SETUP

#### (A) Radiated Emission Test Set-Up Frequency Below 1 GHz



#### (B) Radiated Emission Test Set-Up Frequency Above 1 GHz



Note: The antenna can be moved between 1 to 4 meters above the ground.

### 4.3.5 EUT OPERATING CONDITIONS

The EUT will be configured to operate in a typical fashion as normally used.  
 Temperature: 24°C Relative Humidity: 52%

### 4.3.6 TEST RESULTS: 30MHz TO 1000MHz

Please refer to the Attachment C.

### 4.3.7 TEST RESULTS: ABOVE 1000MHz

Please refer to the Attachment D.

#### 4.4 HARMONICS CURRENT MEASUREMENT

##### 4.4.1 LIMITS OF HARMONICS CURRENT MEASUREMENT

EN 61000-3-2						
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current A	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current A      mA/w	
Class A	Odd Harmonics		Class D	Odd Harmonics only		
	3	2.30		3	2.30	3.4
	5	1.14		5	1.14	1.9
	7	0.77		7	0.77	1.0
	9	0.40		9	0.40	0.5
	11	0.33		11	0.33	0.35
	13	0.21		13	0.21	0.30
	15 ≤ n ≤ 39	0.15 x 15/n		15 ≤ n ≤ 39	0.15 x 15/n	3.85/n
	Even Harmonics					
	2	1.08				
	4	0.43				
	6	0.30				
	8 ≤ n ≤ 40	0.23 x 8/n				

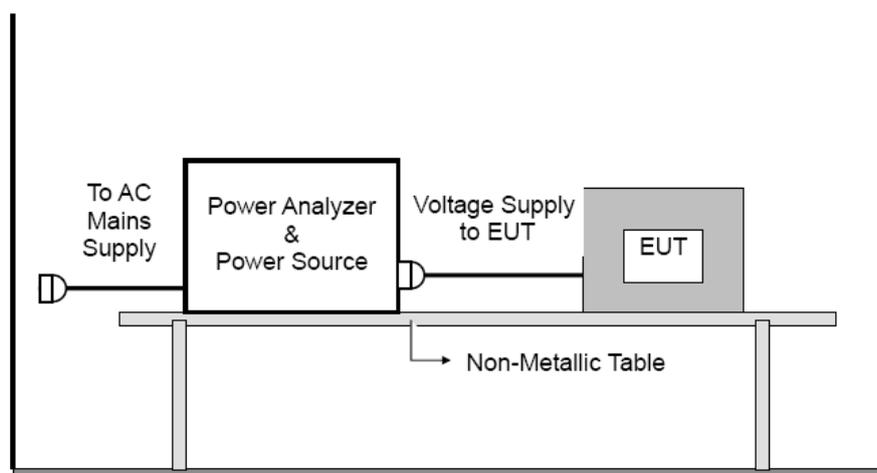
#### 4.4.2 TEST PROCEDURE

- a. 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.
- b. The classification of EUT is according to section 5 of EN 61000-3-2. The EUT is classified as follows:
  - Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
  - Class B: Portable tools. Arc welding equipment which is not professional equipment.
  - Class C: Lighting equipment.
  - Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.
- c. 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.

#### 4.4.3 DEVIATION FROM TEST STANDARD

No deviation

#### 4.4.4 TEST SETUP



#### 4.4.5 EUT OPERATING CONDITIONS

Temperature: N/A Relative Humidity: N/A

#### 4.4.6 TEST RESULTS

Please refer to the Attachment E.

## 4.5 VOLTAGE FLUCTUATION AND FLICKERS MEASUREMENT

### 4.5.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS MEASUREMENT

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)	$\leq 3.3\%$ for $> 500$ ms	Relative V-change characteristic

### 4.5.2 TEST PROCEDURE

a. Fluctuation and Flickers Test:

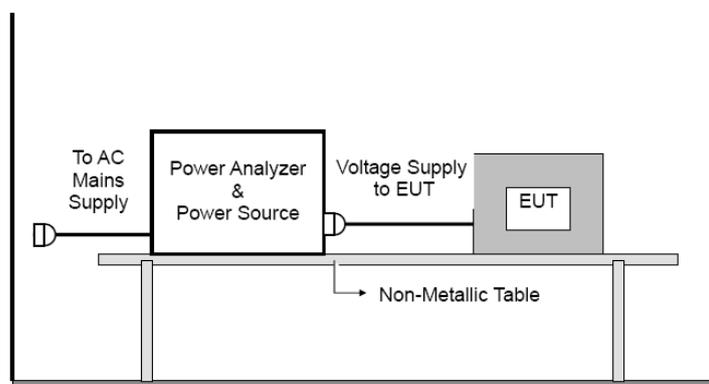
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 6.0/4.0 of EN 61000-3-3 depend on which standard adopted for compliance measurement.

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

### 4.5.3 DEVIATION FROM TEST STANDARD

No deviation

### 4.5.4 TESTSETUP



### 4.5.5 EUT OPERATING CONDITIONS

Temperature: N/A Relative Humidity: N/A

### 4.5.6 TEST RESULTS

Please refer to the Attachment F.

## 5. EMC IMMUNITY TEST

### 5.1 STANDARD COMPLIANCE/SERVIRITY LEVEL/CRITERIA

Test Standard No.	Test Specification Level	Test Mode Test Port	Performance Criteria
Electrostatic discharge immunity EN 61000-4-2 (ESD)	±8kV air discharge ±4kV contact discharge	Direct Mode	B
	±4kV HCP discharge ±4kV VCP discharge	Indirect Mode	B
Radiated, radio-frequency, electromagnetic field immunity EN 61000-4-3 (RS)	80 MHz to 1000 MHz & 1400 MHz to 2700MHz 3V/(rms), 1 KHz, 80%, AM modulated	Enclosure	A
Electrical fast transient/burst immunity EN 61000-4-4 (EFT/Burst)	±1.0kV(peak) 5/50ns Tr/Th 5KHz Repetition Freq.	Power Supply Port	B
	±0.5kV(peak) 5/50ns Tr/Th 5KHz Repetition Freq.	CTL/Signal Data Line Port	B
Surge immunity EN 61000-4-5 (Surges)	±1kV(5P/5N) 1.2/50(8/20) Tr/Th us	L-N	B
	± 2 kV(5P/5N) 1.2/50(8/20) Tr/Th us	L-PE N-PE	B
	± 0.5 kV(RJ45) ±1 kV(DSL)(5P/5P) 1.2/50(8/20) Tr/Th us	CTL/Signal Data Line Port	B
Immunity to conducted disturbances, induced by radio-frequency fields EN 61000-4-6 (Injected Current)	0.15 MHz to 80 MHz 3V(rms), 1KHz 80%, AM Modulated 150Ω source impedance	CTL/Signal Port	A
	0.15 MHz to 80 MHz 3V(rms), 1KHz 80%, AM Modulated 150Ω source impedance	AC Power Port	A
Voltage dips, short interruptions and voltage variations immunity EN 61000-4-11 (Voltage Interruption/Dips)	Voltage dip 0%	AC Power Port	B
	Voltage dip 0%		B
	Voltage dip 70%		B
	Voltage Interruption 0%		B/C

### 5.2 The Requirement of Performance Criteria

1.	Performance criteria for continuous phenomena applied to transmitters (CT)
2.	Performance criteria for transient phenomena applied to transmitters (TT)
3.	Performance criteria for continuous phenomena applied to receivers (CR)
4.	Performance criteria for transient phenomena applied to receivers (TR)

According to **ETSI EN 301 489-17** standard, the general performance criteria as following:

Criteria	During Test	After Test
<b>A</b>	Shall operate as intended May show degradation of performance (see note 1) Shall be no loss of function Shall be no unintentional transmissions	Shall operate as intended Shall be no degradation of performance (see note 2) Shall be no loss of function Shall be no loss of stored data or user programmable functions
<b>B</b>	May show loss of function (one or more) May show degradation of performance (see note 1) No unintentional transmissions	Functions shall be self-recoverable Shall operate as intended after recovering Shall be no degradation of performance (see note 2) Shall be no loss of stored data or user programmable functions
<b>C</b>	May be loss of function (one or more)	Functions shall be recoverable by the operator Shall operate as intended after recovering Shall be no degradation of performance (see note 2)

**NOTE 1:** Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

**NOTE 2:** No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

**Performance Criteria for CT and CR:**

Refer to EN 301 489-17 subclasses 6.3 and 6.5 for the performance criteria for Continuous phenomena applied to Transmitter (CT) and Receiver (CR).

**Performance Criteria for TT and TR:**

Refer to EN 301 489-17 subclasses 6.4 and 6.6 for the performance criteria for Transient phenomena applied to Transmitter (TT) and Receiver (TR).

**5.3 GENERAL PERFORMANCE CRITERIA TEST SETUP**

The EUT tested system was configured as the related operation mode otherwise a special operating condition is specified in the follows during the testing.

## 5.4 ESD TESTING

### 5.4.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Contact Discharge: $\pm 2\text{kV}/\pm 4\text{kV}$ (Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Contact Discharge: min. 200 times in total
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

### 5.4.2 TEST PROCEDURE

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

- a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT. During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.

If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

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.

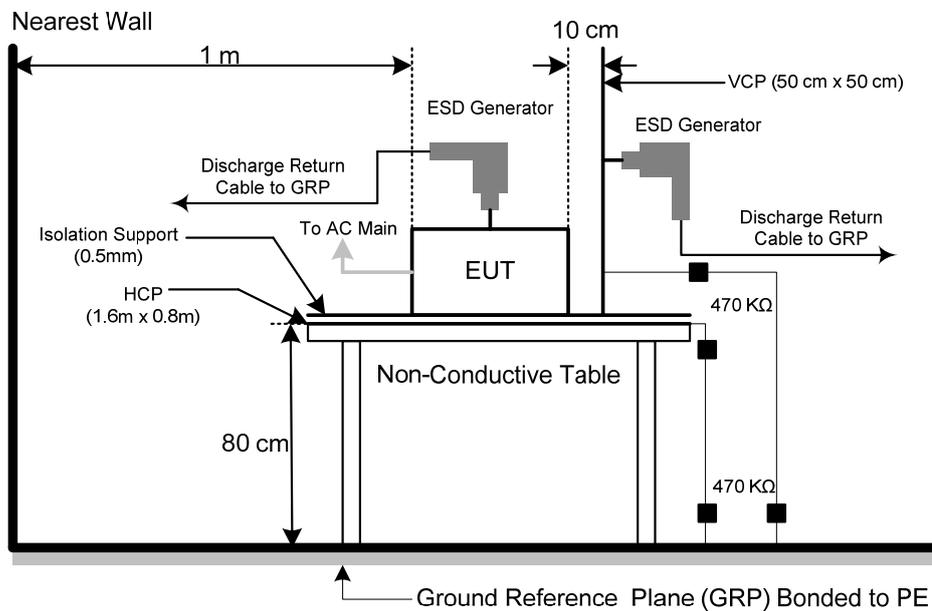
The four faces of the EUT will be performed with electrostatic discharge.

- 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.

### 5.4.3 DEVIATION FROM TEST STANDARD

No deviation

### 5.4.4 TEST SETUP



Note:

#### 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 section 7 of 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.

#### FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

### 5.4.5 EUT OPERATING CONDITIONS

Temperature: 25°C Relative Humidity: 47% Test Pressure: 1012 hPa

### 5.4.6 TEST RESULTS

Please refer to the Attachment G.

## 5.5 RS TESTING

### 5.5.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 1000 MHz & 1400MHz - 2700MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation If the wanted signal is modulated at 1 000 Hz, then an audio signal of 400 Hz shall be used;
Frequency Step:	1% of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

### 5.5.2 TEST PROCEDURE

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

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

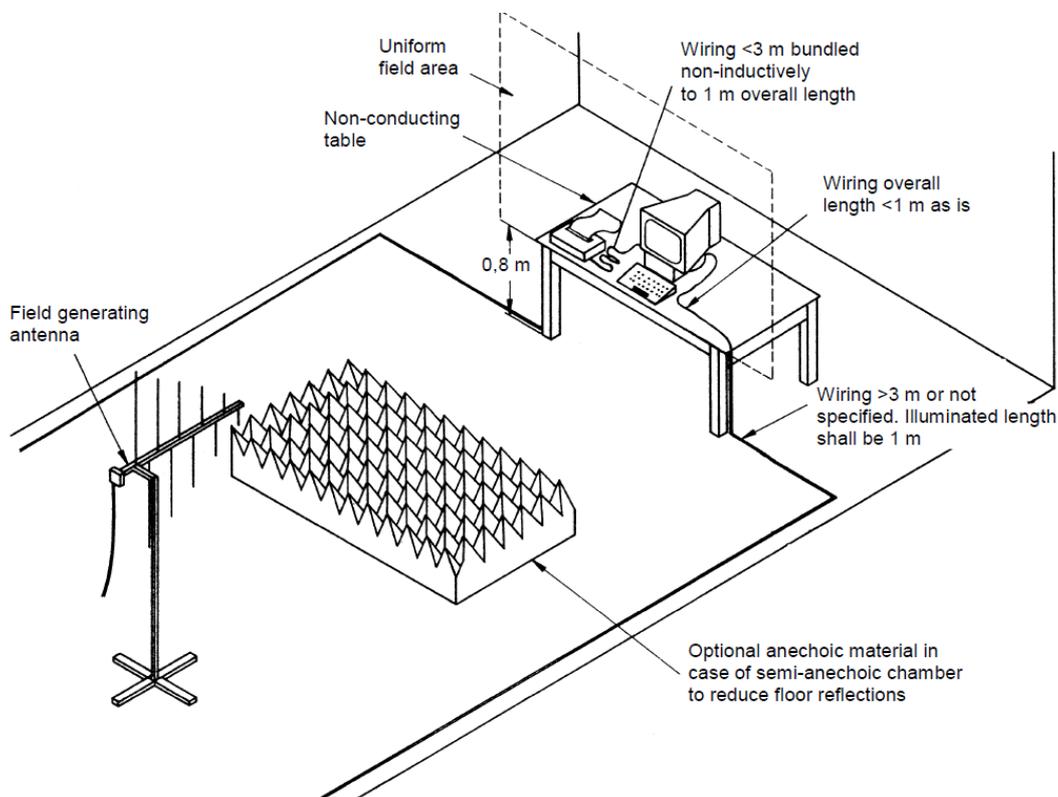
The other condition as following manner:

- a. The field strength level was 3V/m.
- b. 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 1 000 Hz. If the wanted signal is modulated at 1 000 Hz, then an audio signal of 400 Hz shall be used;  
The test shall be performed over the frequency range 80 MHz to 1 000 MHz and 1 400 MHz to 2 700 MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers (see clause 4), as appropriate;  
For receivers and transmitters the stepped frequency increments shall be 1 % frequency increment of the momentary used frequency, unless specified otherwise in the part of EN 301 489 series [i.13] dealing with the relevant type of radio equipment;
- 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.

### 5.5.3 DEVIATION FROM TEST STANDARD

No deviation

### 5.5.4 TEST SETUP



Note:

#### TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 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.

#### FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

### 5.5.5 EUT OPERATING CONDITIONS

Temperature: 25°C Relative Humidity: 44%

### 5.5.6 TEST RESULTS

Please refer to the Attachment H.

## 5.6 EFT/BURST TESTING

### 5.6.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-4
Required Performance	B
Test Voltage :	Power Line: $\pm 1$ kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

### 5.6.2 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.

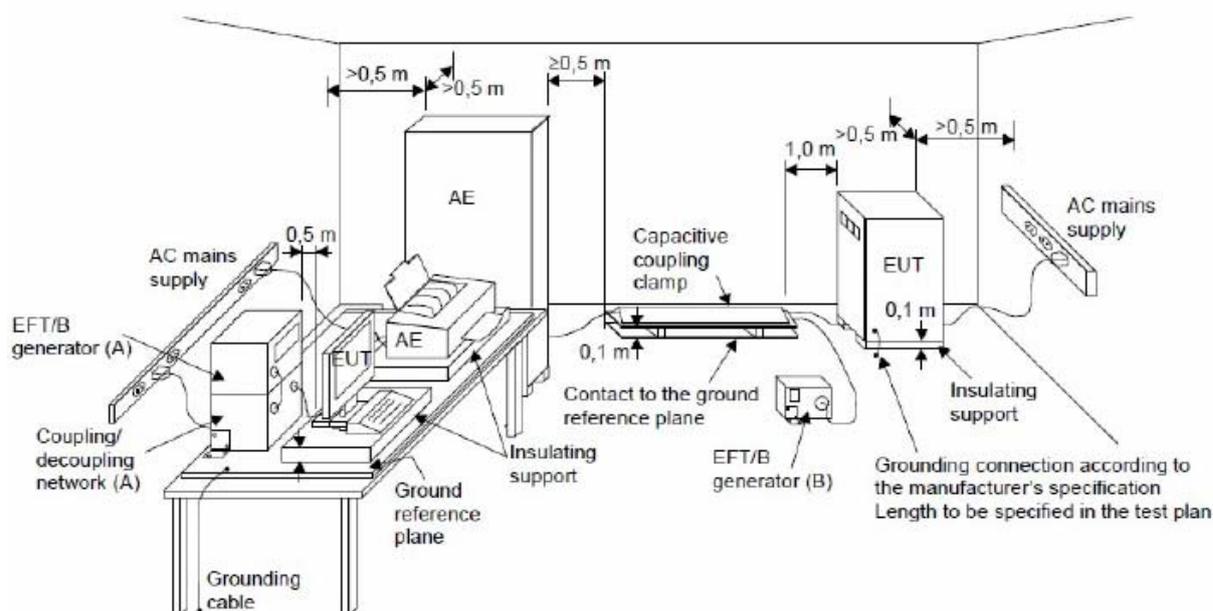
The other condition as following manner:

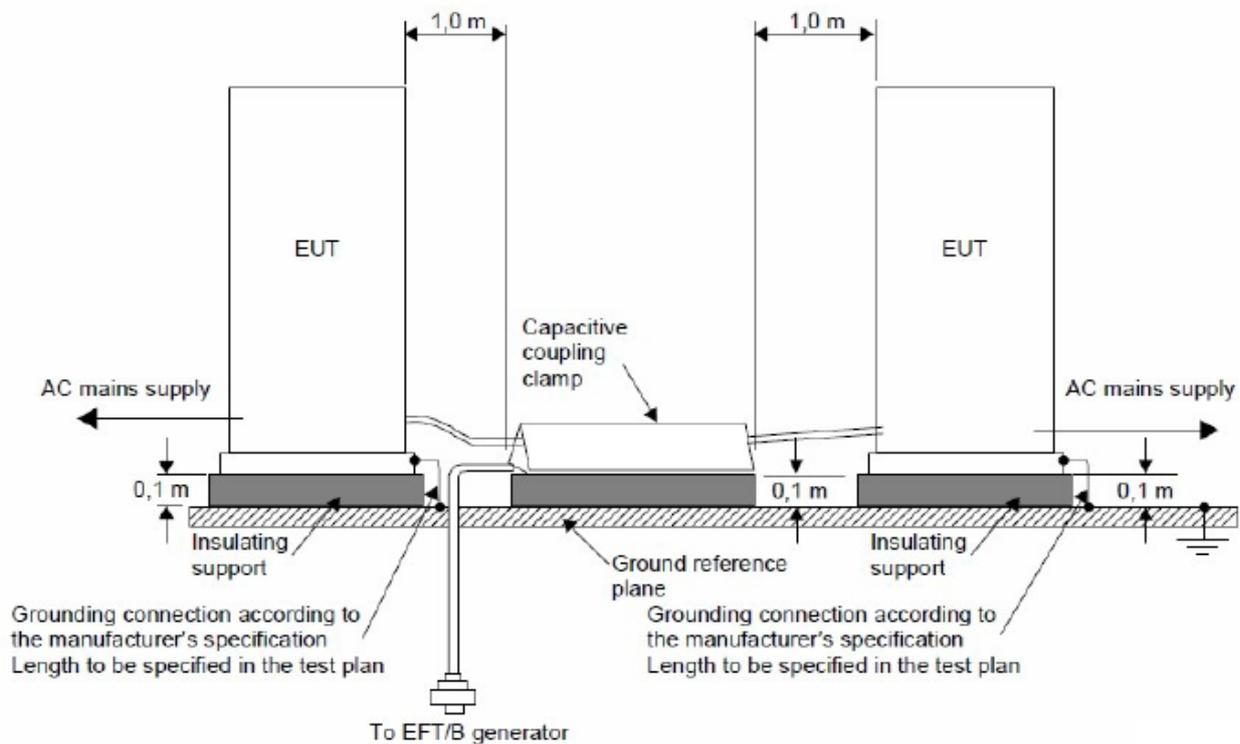
- The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- Both positive and negative polarity discharges were applied.
- The duration time of each test sequential was 1 minute

### 5.6.3 DEVIATION FROM TEST STANDARD

No deviation

### 5.6.4 TEST SETUP





Note:

#### 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.

#### FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

#### 5.6.5 EUT OPERATING CONDITIONS

Temperature: 25°C Relative Humidity: 44%

#### 5.6.6 TEST RESULTS

Please refer to the Attachment I.

## 5.7 SURGE TESTING

### 5.7.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line: $\pm 0.5$ kV, $\pm 1$ kV, $\pm 1.5$ kV, $\pm 2$ kV
Surge Input/Output:	L1-L2, L1-PE, L2-PE
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	AC Power Port: 0 /90/180/270
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

### 5.7.2 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).

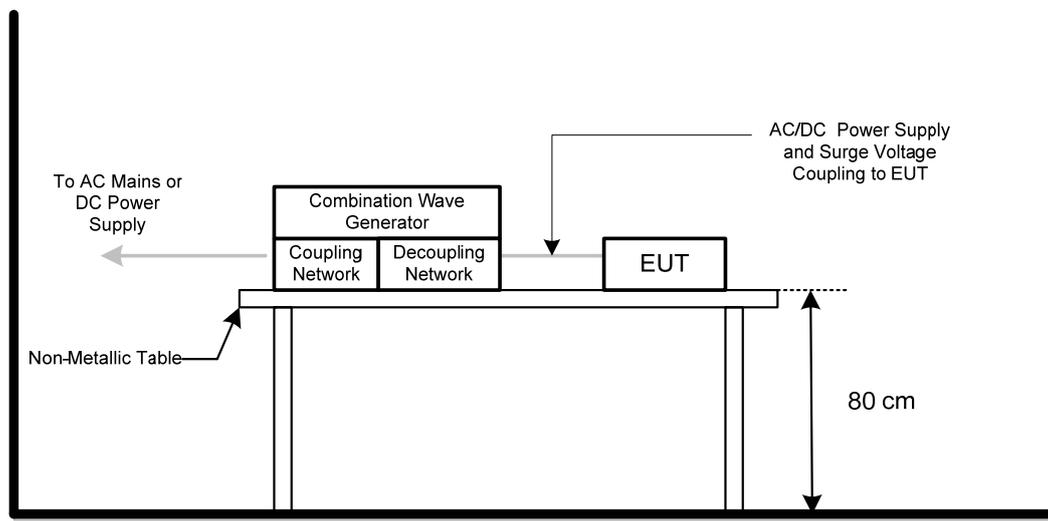
c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

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).

### 5.7.3 DEVIATION FROM TEST STANDARD

No deviation

### 5.7.4 TEST SETUP



### 5.7.5 EUT OPERATING CONDITIONS

Temperature: 25°C Relative Humidity: 44%

### 5.7.6 TEST RESULTS

Please refer to the Attachment J.

## 5.8 INJECTION CURRENT TESTING

### 5.8.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 Vrms.
Modulation:	1kHz Sine Wave, 80%, AM Modulation If the wanted signal is modulated at 1 000 Hz, then the test signal of 400 Hz shall be used;
Frequency Step:	1% of fundamental
Dwell Time:	at least 3 seconds

### 5.8.2 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.

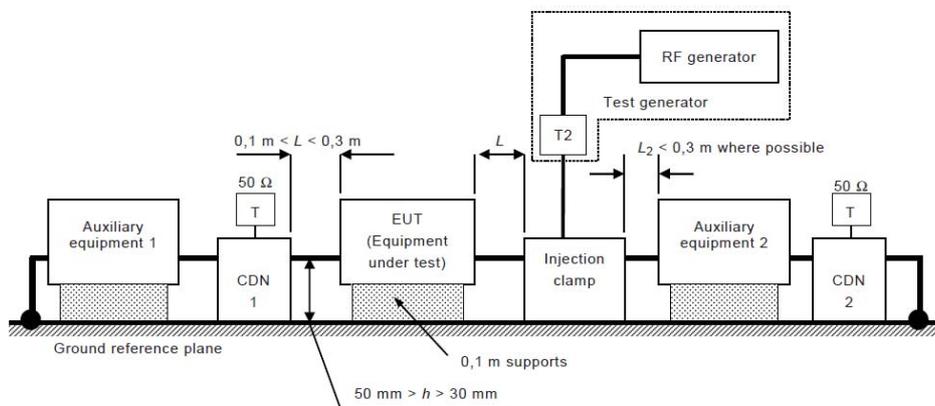
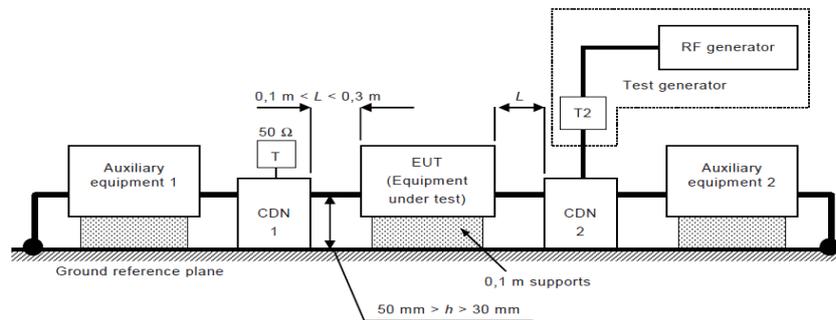
The other condition as following manner:

- a. The field strength level was 3V.
- b. The frequency range is swept from 150 KHz to 80 MHz,  
The test level shall be severity level 2 as given in EN 61000-4-6 [6] corresponding to 3 V rms unmodulated. The test signal shall then be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 000 Hz. If the wanted signal is modulated at 1 000 Hz, then the test signal of 400 Hz shall be used;  
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, (see clause 4);  
For receivers and transmitters the stepped frequency increments shall be 1 % frequency increment of the momentary frequency in the frequency range 150 kHz to 80 MHz, unless specified otherwise in the part of EN 301 489 series [i.13] dealing with the particular type of radio equipment;
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

### 5.8.3 DEVIATION FROM TEST STANDARD

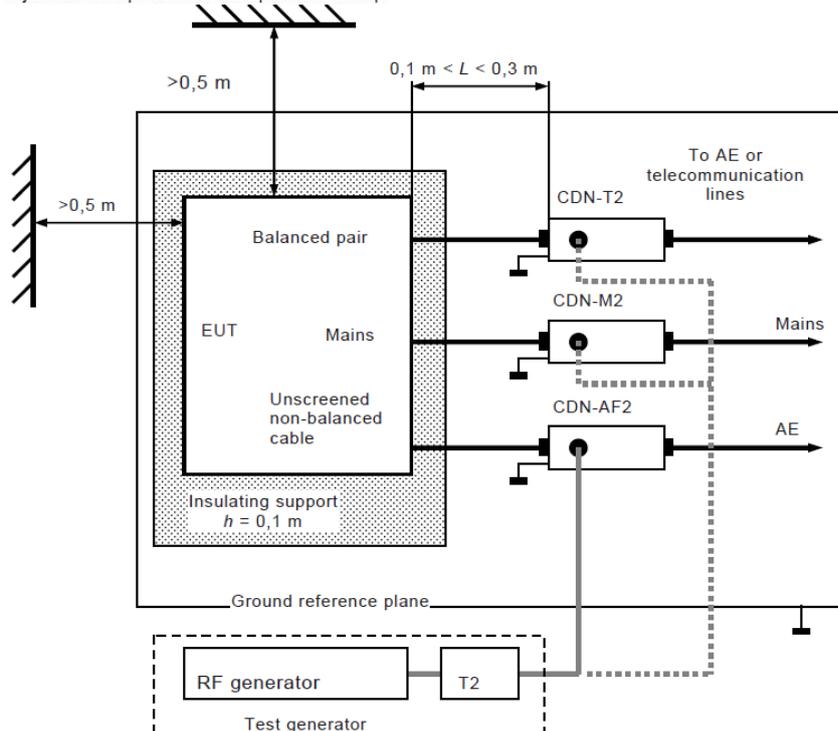
No deviation

### 5.8.4 TEST SETUP



IEC 1583/03

T : Termination 50 Ω  
 T2: Power attenuator (6 dB)  
 CDN: Coupling and decoupling network  
 Injection clamp: current clamp or EM clamp



The EUT clearance from any metallic objects shall be at least 0.5 m.

**5.8.5 EUT OPERATING CONDITIONS**

Temperature: 25°C Relative Humidity: 44%

**5.8.6 TEST RESULTS**

Please refer to the Attachment K.

## 5.9 VOLTAGE INTERRUPTION/DIPS TESTING

### 5.9.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-11
Required Performance	B (For 0% Voltage Dips) B (For 0% Voltage Dips) B (For 70% Voltage Dips) C (For 0% Voltage Interruptions)
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

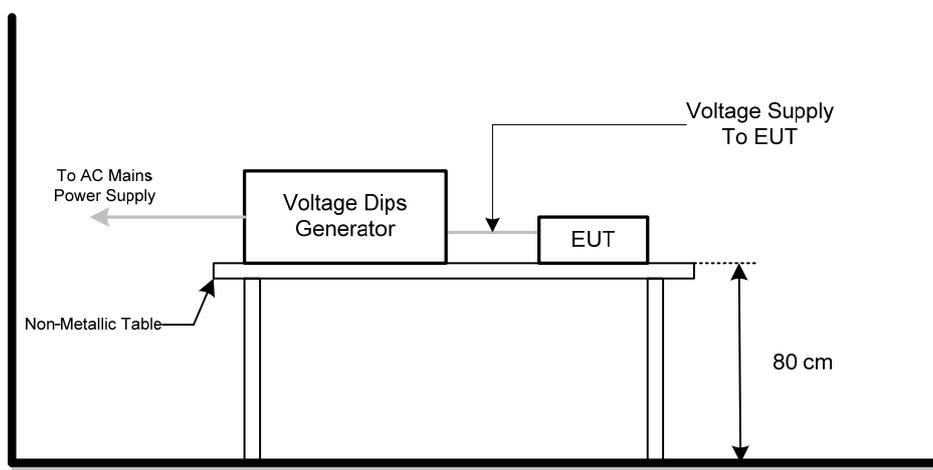
### 5.9.2 TEST PROCEDURE

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.

### 5.9.3 DEVIATION FROM TEST STANDARD

No deviation

### 5.9.4 TEST SETUP



### 5.9.5 EUT OPERATING CONDITIONS

Temperature: 25°C Relative Humidity: 44%

### 5.9.6 TEST RESULTS

Please refer to the Attachment L.

## 6. MEASUREMENT INSTRUMENTS LIST

Conducted Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	EMCO	699837	0052765	Mar. 28, 2016
2	LISN	R&S	ENV216	101447	Mar. 28, 2016
3	Test Cable	emci	RG223(9KHz-30 MHz)	C_17	Mar. 13, 2016
4	EMI Test Receiver	R&S	ESCS30	826547/022	Mar. 28, 2016
5	50Ω Terminator	SHX	TF2-3G-A	08122901	Mar. 28, 2016
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	EMCO	3142C	00066462	Mar. 28, 2016
2	Antenna	EMCO	3142C	00066464	Mar. 28, 2016
3	Amplifier	Agilent	8447D	2944A11203	Oct. 11, 2016
4	Amplifier	Agilent	8447D	2944A11204	Oct. 11, 2016
5	Spectrum Analyzer	Agilent	E4443A	MY48250370	Oct. 11, 2016
6	RF Pre-selector	Agilent	N9039A	MY46520201	Oct. 11, 2016
7	Test Cable	emci	LMR-400 (30MHz-1GHz)	C-23	Jan. 04, 2016
8	Test Cable	emci	LMR-400 (30MHz-1GHz)	C-22	Jan. 04, 2016
9	Receiver	Agilent	N9038A	MY53220133	Jun. 24, 2016
10	Multi-Device Controller	ETS-Lindgren	2090	N/A	N/A
11	Measurement Software	Farad	EZ-EMC Ver.BTL-2ANT-1	N/A	N/A
12	Horn Antenna	EMCO	3115	9605-4803	Mar. 28, 2016
13	Amplifier	Agilent	8449B	3008A02584	Oct. 11, 2016
14	Spectrum Analyzer	R&S	FSP40	100185	Oct. 11, 2016
15	Test Cable	emci	SUCOFLEX_15 m_5m(0.01GHz-26.5GHz)	C-15/C-39	Jun. 04, 2016
16	Position Control	MF	MF-7802	MF780208159	N/A
17	Test Cable	emci	SUCOFLEX 102_8m(0.01GH z-40GHz)	C-38	Mar. 27, 2016

ESD					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	ESD Generator	TESEQ AG	NSG 437	450	Oct. 28, 2016

RS					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Digital Signal Generator	HP	ESG-D3000A	US36260188	Mar. 28, 2016
2	Antenna	ETS	3142C	00047662	Mar. 28, 2016
3	Antenna	TESEQ	STLP 9149	9149-277	Dec. 27, 2015
4	Power amplifier	MILMEGA	AS1860-50	1064834	Nov. 02, 2016
5	Power amplifier	MILMEGA	80RF1000-250	N/A	Nov. 02, 2016
6	Amplifier	AR	50S1G4A	326720	Mar. 28, 2016
7	Measurement Software	TOYO	IM5/R Ver 3.8.050	N/A	N/A

EFT					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	THE MODULAR SOLUTION FOR 6 KV APPLICATIONS	Teseq	NSG 3060	1423	Oct. 11, 2016
2	Measurement Software	Teseq	Win 3000 Version 1.2.0	N/A	N/A

Surge					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	THE MODULAR SOLUTION FOR 6 KV APPLICATIONS	Teseq	NSG 3060	1423	Oct. 11, 2016
2	Measurement Software	Teseq	Win 3000 Version 1.2.0	N/A	N/A

CS					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Signal Generator	HP	8648A	3636A02964	Mar. 28, 2016
2	Power Amplifier	Teseq	CBA230M-080	T43748	Mar. 28, 2016
3	Power CDN	FCC	FCC-801-M2/ M3-16A	100271	Mar. 28, 2016
4	Measurement Software	TOYO	IM5/C Ver 3.7.028	N/A	N/A

DIPS					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	THE MODULAR SOLUTION FOR 6 KV APPLICATIONS	Teseq	NSG 3060	1423	Oct. 11, 2016
2	Measurement Software	Teseq	Win 3000 Version 1.2.0	N/A	N/A

Remark: "N/A" denotes no model name, serial no. or calibration specified.  
All calibration period of equipment list is one year.

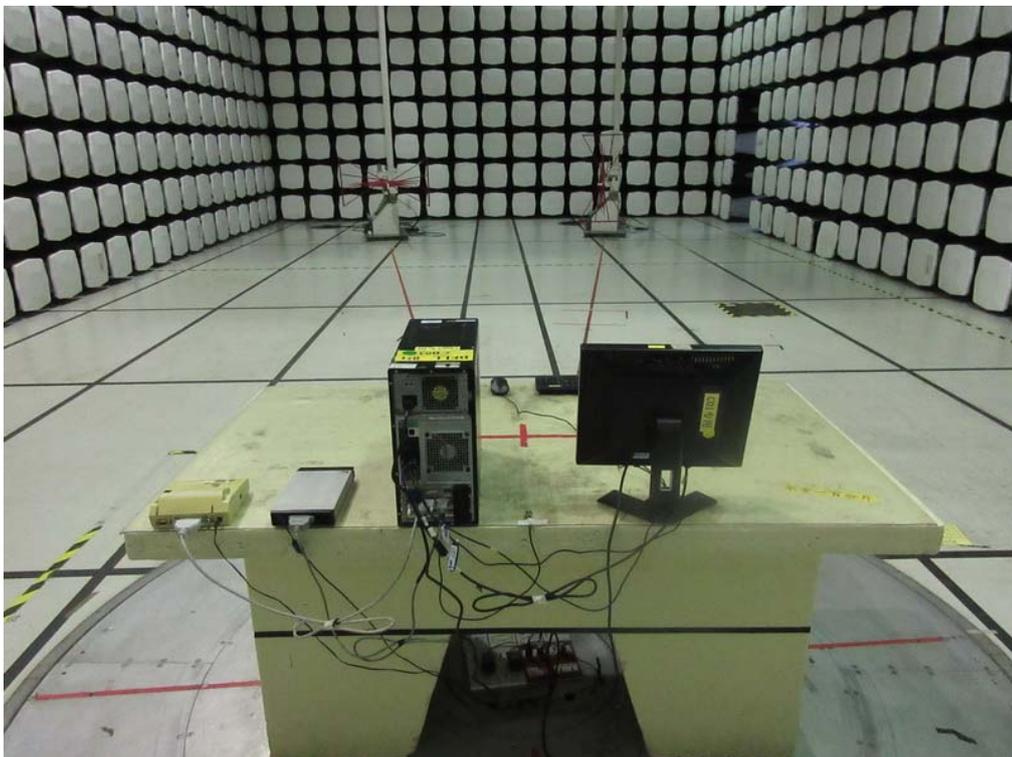
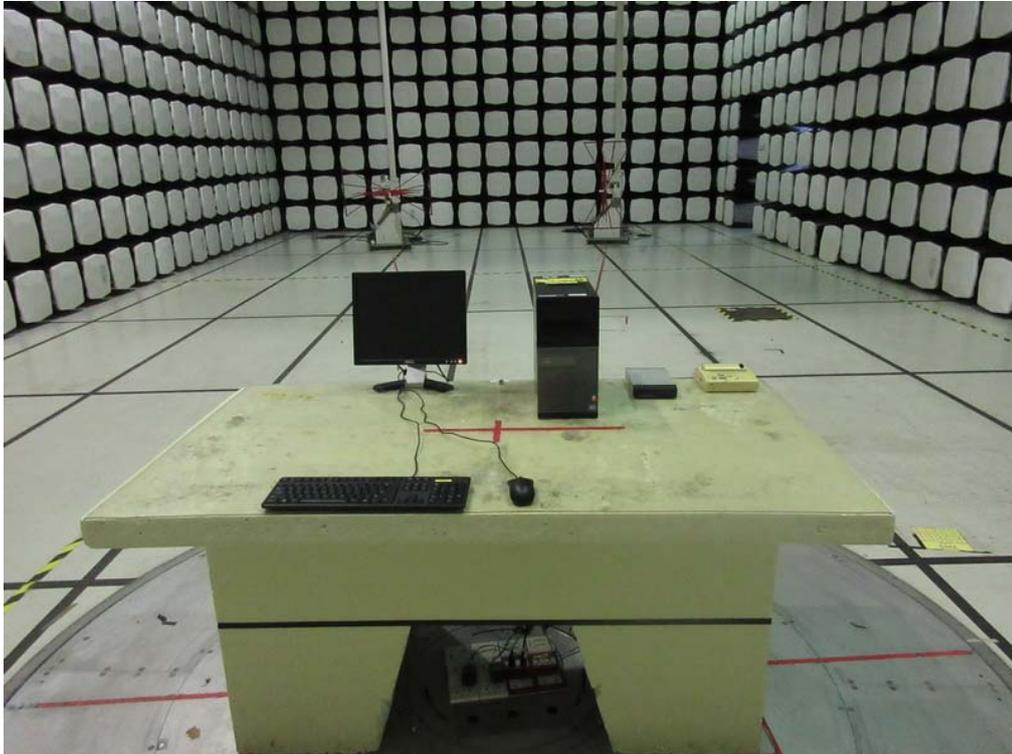
## 7. EUT TEST PHOTO

### Conducted Measurement Photos



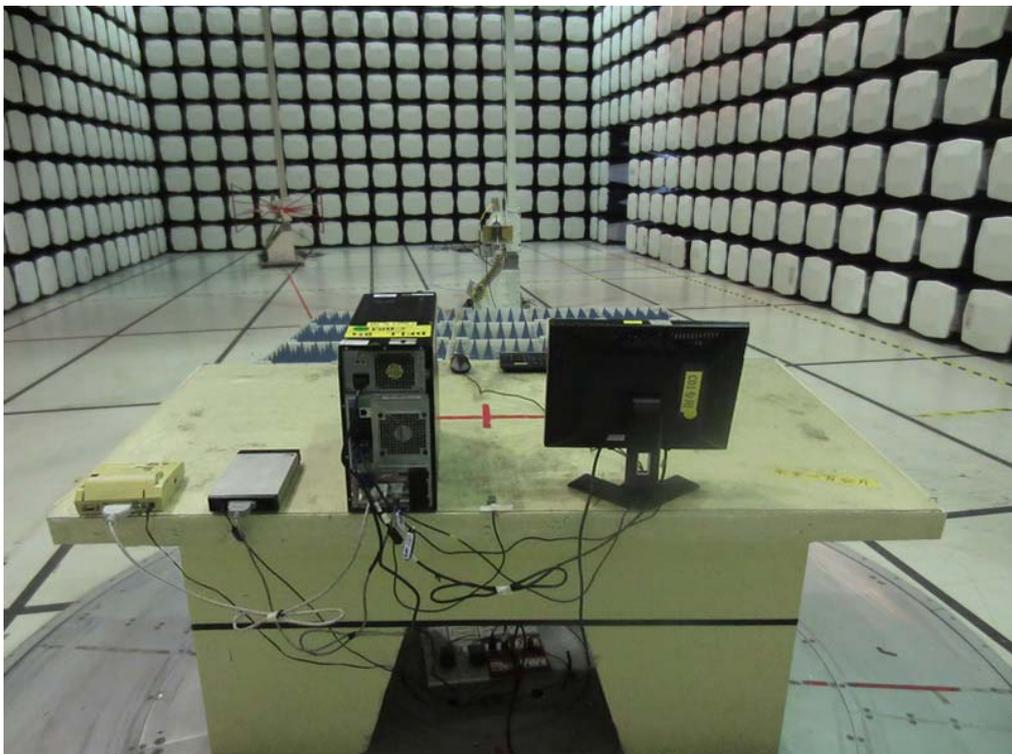
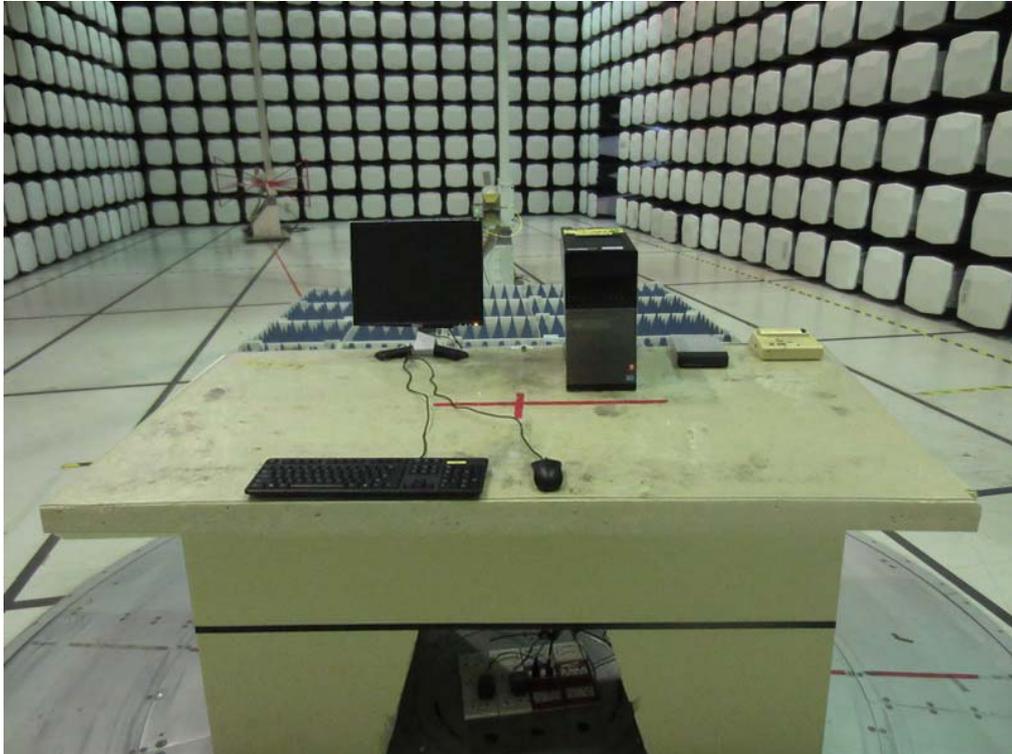
## Radiated Measurement Photos

30MHz to 1GHz



## Radiated Measurement Photos

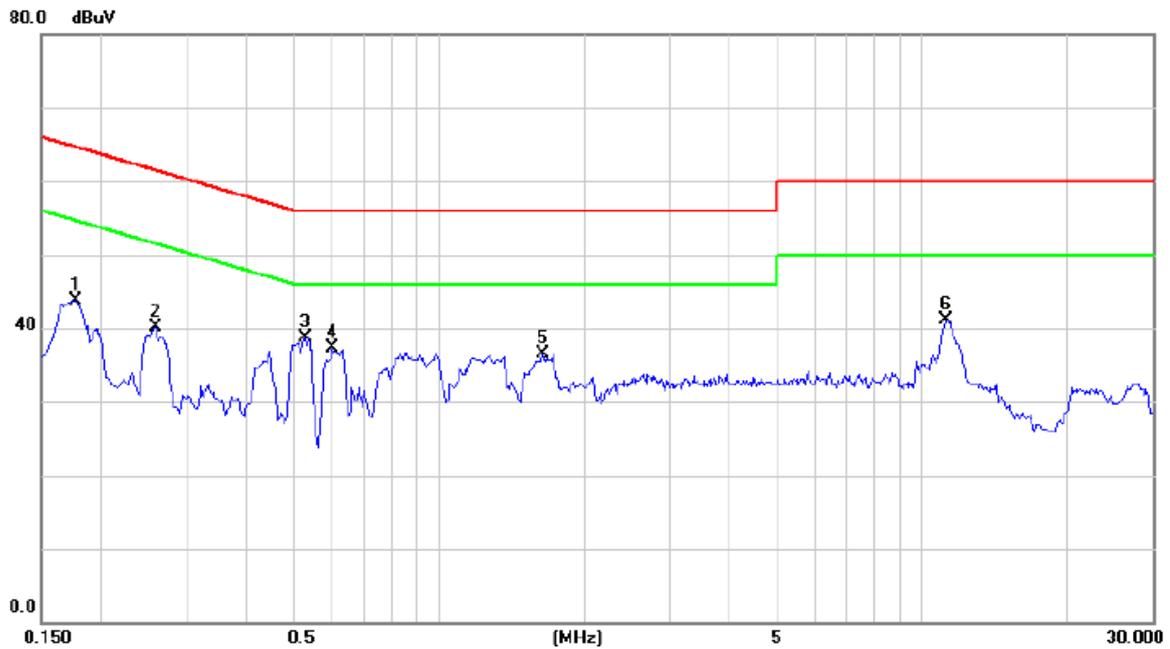
Above 1GHz



## ATTACHMENT A - CONDUCTED EMISSION

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

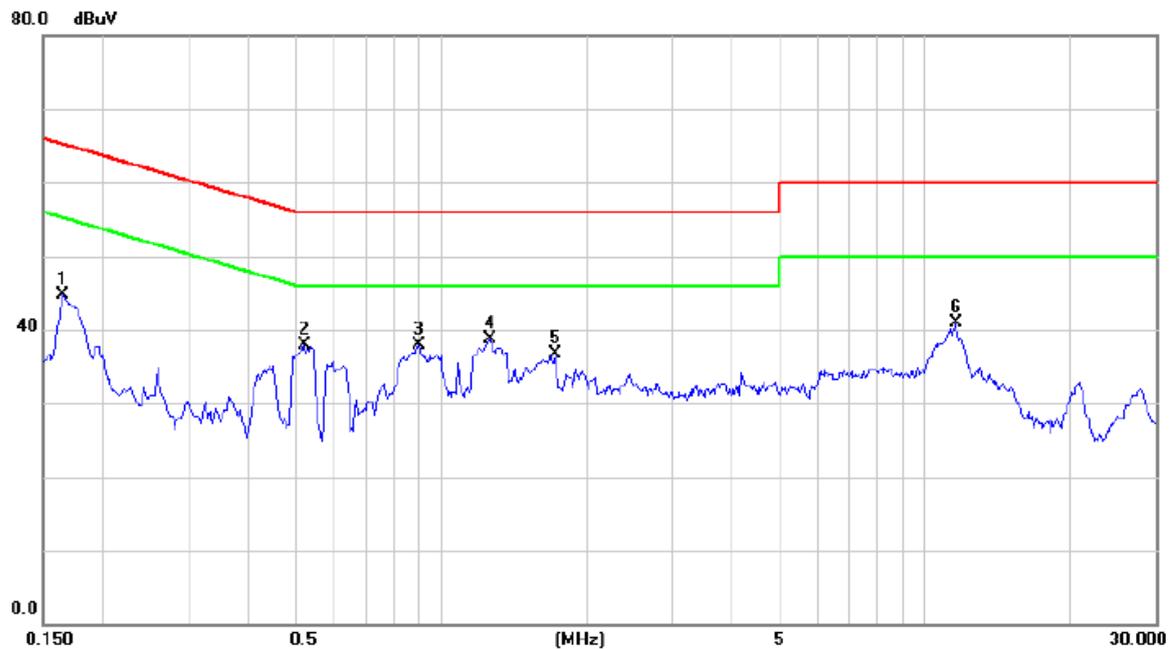
### Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1773	34.11	9.69	43.80	64.61	-20.81	peak	
2		0.2590	30.42	9.74	40.16	61.46	-21.30	peak	
3	*	0.5292	28.81	9.83	38.64	56.00	-17.36	peak	
4		0.6010	27.50	9.86	37.36	56.00	-18.64	peak	
5		1.6343	26.59	9.90	36.49	56.00	-19.51	peak	
6		11.2301	31.08	10.10	41.18	60.00	-18.82	peak	

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

## Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1655	35.19	9.60	44.79	65.18	-20.39	peak	
2		0.5210	28.18	9.65	37.83	56.00	-18.17	peak	
3		0.9000	28.21	9.75	37.96	56.00	-18.04	peak	
4	*	1.2593	28.87	9.81	38.68	56.00	-17.32	peak	
5		1.7240	26.76	9.86	36.62	56.00	-19.38	peak	
6		11.5625	30.85	10.11	40.96	60.00	-19.04	peak	

## ATTACHMENT B - ISN EMISSION

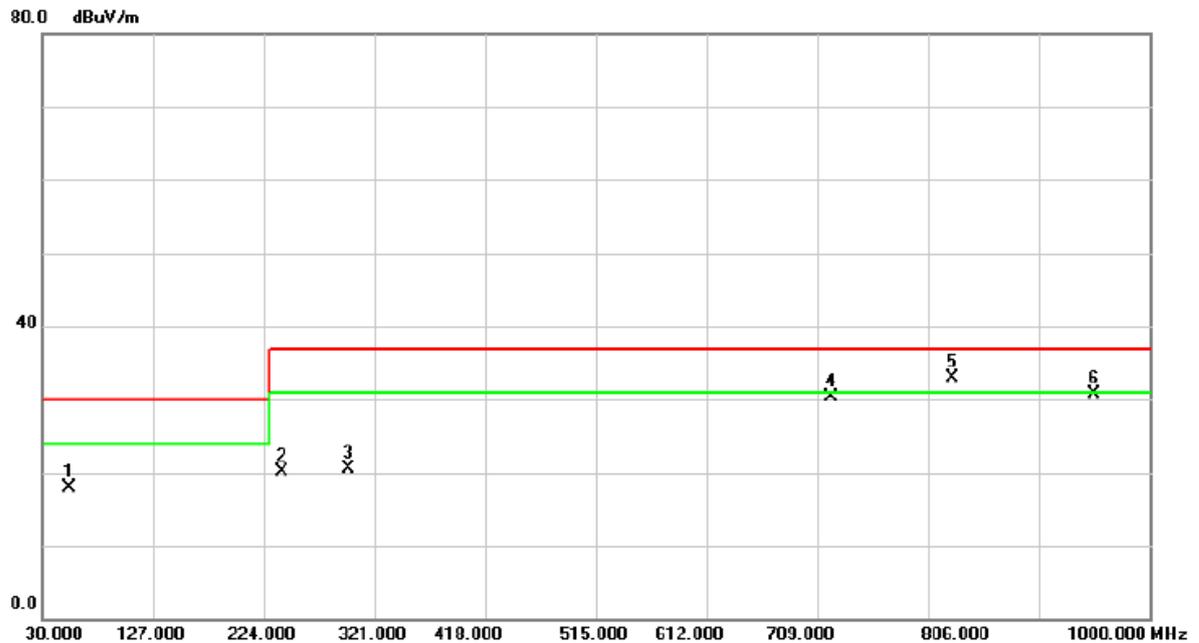
**Test Mode: N/A**

Note: "N/A" denotes test is not applicable to this device.

**ATTACHMENT C - RADIATED EMISSION (30MHZ TO 1000MHZ)**

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

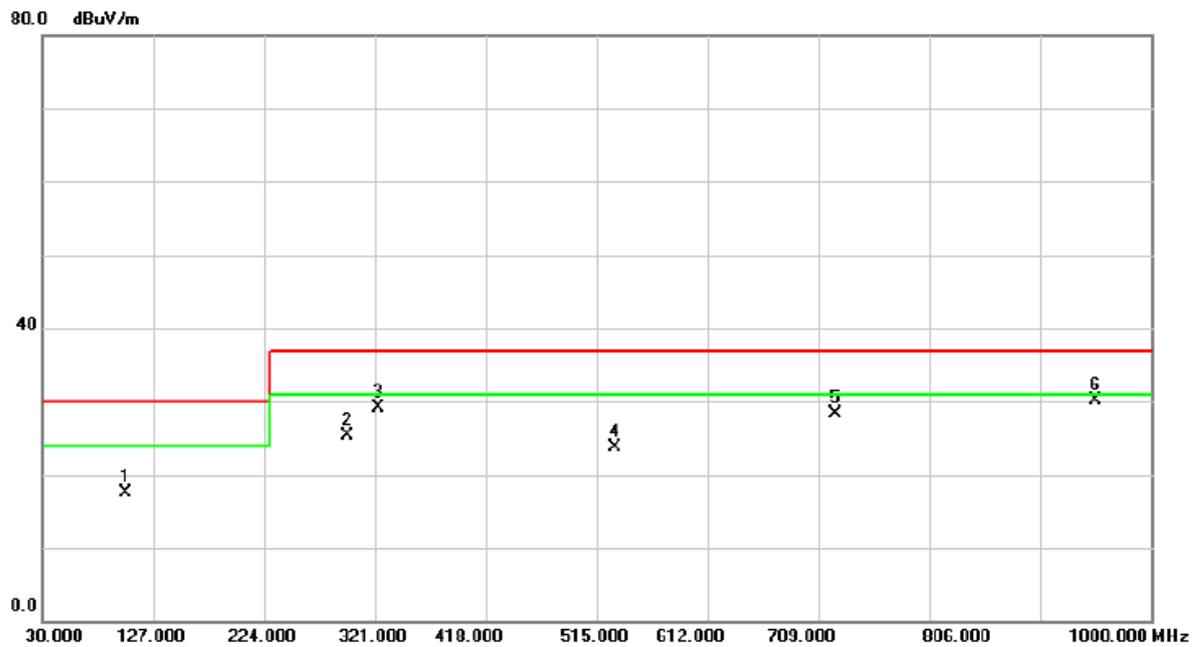
## Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		54.2500	36.85	-18.86	17.99	30.00	-12.01	peak	
2		239.5200	33.06	-12.87	20.19	37.00	-16.81	peak	
3		298.6900	31.85	-11.29	20.56	37.00	-16.44	peak	
4		721.6100	31.42	-1.13	30.29	37.00	-6.71	peak	
5	*	827.3400	32.82	0.13	32.95	37.00	-4.05	peak	
6		951.5000	28.69	2.09	30.78	37.00	-6.22	peak	

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

## Horizontal

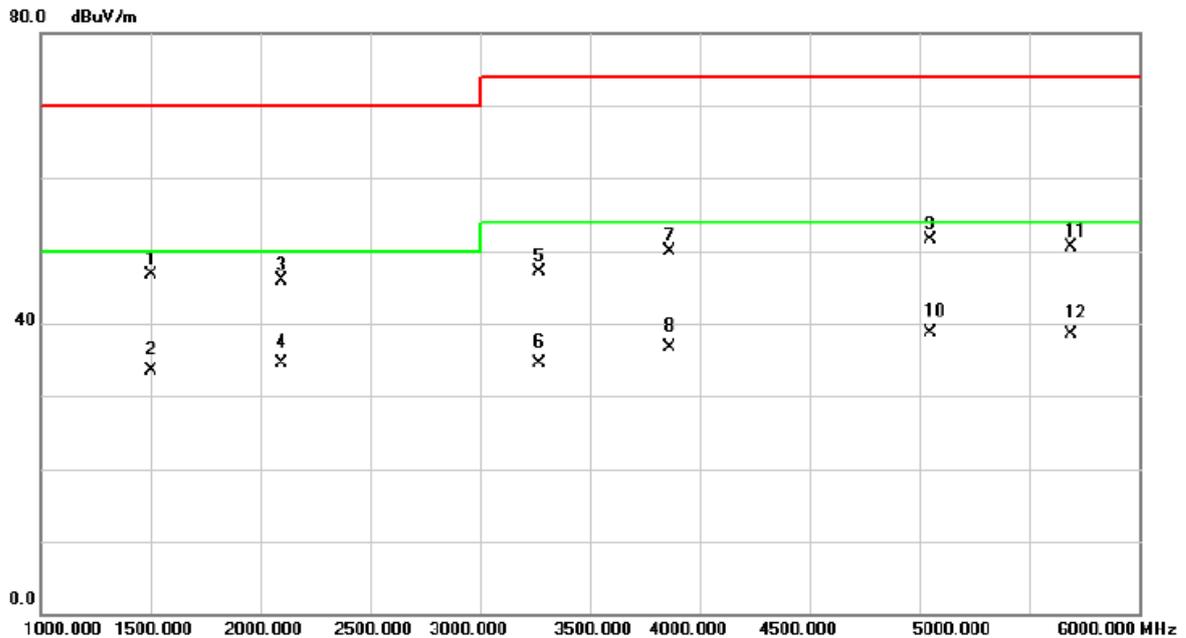


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		102.7500	35.89	-18.29	17.60	30.00	-12.40	peak	
2		296.7500	36.58	-11.33	25.25	37.00	-11.75	peak	
3		323.9100	39.13	-10.00	29.13	37.00	-7.87	peak	
4		530.5200	28.27	-4.62	23.65	37.00	-13.35	peak	
5		723.5500	29.40	-1.10	28.30	37.00	-8.70	peak	
6	*	951.5000	28.11	2.09	30.20	37.00	-6.80	peak	

**ATTACHMENT D - RADIATED EMISSION (ABOVE 1GHZ)**

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

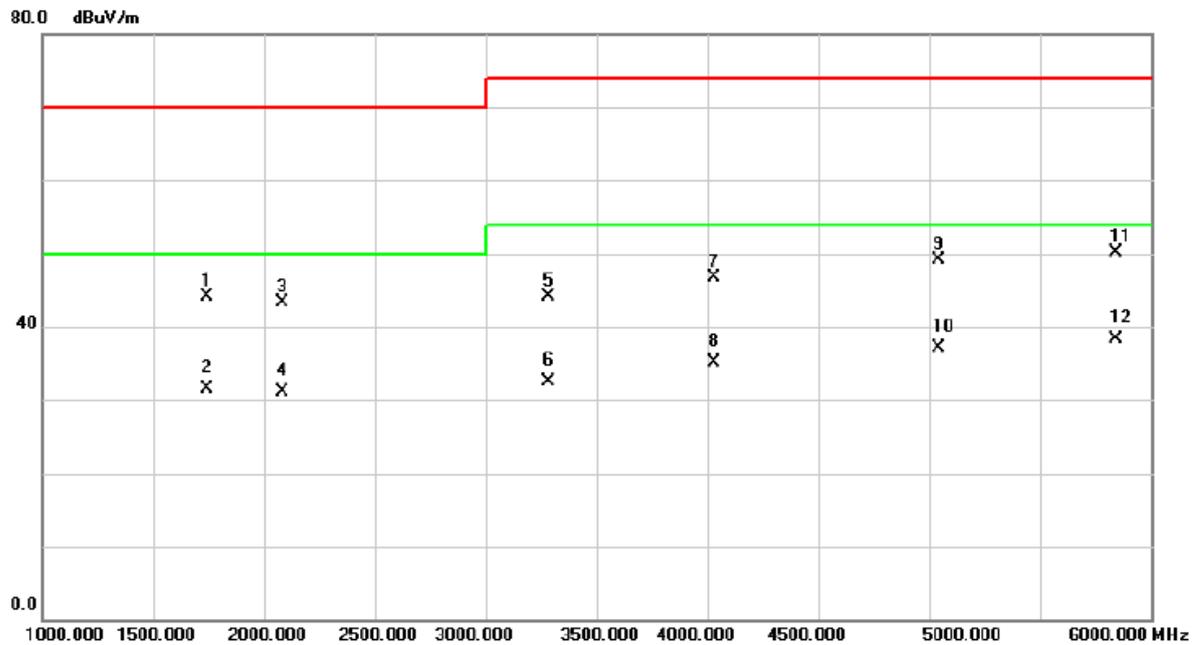
### Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1500.000	55.29	-8.65	46.64	70.00	-23.36	peak	
2		1500.000	42.07	-8.65	33.42	50.00	-16.58	AVG	
3		2095.000	52.91	-7.01	45.90	70.00	-24.10	peak	
4		2095.000	41.54	-7.01	34.53	50.00	-15.47	AVG	
5		3270.000	50.64	-3.59	47.05	74.00	-26.95	peak	
6		3270.000	38.07	-3.59	34.48	54.00	-19.52	AVG	
7		3860.000	52.05	-2.06	49.99	74.00	-24.01	peak	
8		3860.000	38.75	-2.06	36.69	54.00	-17.31	AVG	
9		5050.000	51.91	-0.33	51.58	74.00	-22.42	peak	
10	*	5050.000	38.96	-0.33	38.63	54.00	-15.37	AVG	
11		5690.000	49.98	0.43	50.41	74.00	-23.59	peak	
12		5690.000	38.07	0.43	38.50	54.00	-15.50	AVG	

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

### Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1745.000	52.10	-8.03	44.07	70.00	-25.93	peak	
2		1745.000	39.55	-8.03	31.52	50.00	-18.48	AVG	
3		2085.000	50.42	-7.05	43.37	70.00	-26.63	peak	
4		2085.000	38.07	-7.05	31.02	50.00	-18.98	AVG	
5		3280.000	47.62	-3.58	44.04	74.00	-29.96	peak	
6		3280.000	35.99	-3.58	32.41	54.00	-21.59	AVG	
7		4030.000	48.20	-1.59	46.61	74.00	-27.39	peak	
8		4030.000	36.60	-1.59	35.01	54.00	-18.99	AVG	
9		5040.000	49.48	-0.33	49.15	74.00	-24.85	peak	
10		5040.000	37.52	-0.33	37.19	54.00	-16.81	AVG	
11		5840.000	49.11	0.90	50.01	74.00	-23.99	peak	
12	*	5840.000	37.46	0.90	38.36	54.00	-15.64	AVG	

## ATTACHMENT E - HARMONICS CURRENT

**Test Mode: N/A**

Note: "N/A" denotes test is not applicable to this device.

## ATTACHMENT F - VOLTAGE FLUCTUATION AND FLICKERS

**Test Mode: N/A**

Note: "N/A" denotes test is not applicable to this device.

## ATTACHMENT G - ESD

Test Power :	AC 230V/50Hz
Test Mode :	Operating

Mode	Air Discharge								Contact Discharge									
	2kV		4kV		8kV		-kV		2kV		4kV		-kV		-kV			
Location	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N		
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Criteria	<b>B</b>								<b>-</b>		<b>B</b>							
Result	<b>N/A</b>								<b>-</b>		<b>N/A</b>							
Judgment	<b>N/A</b>								<b>-</b>		<b>N/A</b>							

Mode	HCP Discharge								VCP Discharge							
	2kV		4kV		-kV		-kV		2kV		4kV		-kV		-kV	
Location	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
1	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
2	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
3	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
4	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
Criteria	<b>B</b>				<b>-</b>				<b>B</b>				<b>-</b>			
Result	<b>A</b>				<b>-</b>				<b>A</b>				<b>-</b>			
Judgment	<b>PASS</b>				<b>-</b>				<b>PASS</b>				<b>-</b>			

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) Test condition: Direct / Indirect (HCP/VCP) discharges: Minimum 20 times (Positive/Negative) at each point. Air discharges: Minimum 20 times (Positive/Negative) at each point.
- 3) Test location(s) in which discharge (Air and contact discharge) to be applied illustrated by photos shown in next page(s)
- 4) The Indirect (HCP/VCP) discharges description of test point as following:  
1.left side 2.right side 3.front side 4.rear side
- 5) N/A - denotes test is not applicable to this device
- 6) Criterion A: No observation of any performance degradation.
- 7) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
- 8) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.

**ATTACHMENT H - RS**

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

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Criteria	Results	Judgment
80 - 1000	V/H	3 V/m (rms) AM Modulated 1000Hz, 80%	0	A	A	PASS
			90			
			180			
			270			
1400 - 2700	V/H	3 V/m (rms) AM Modulated 1000Hz, 80%	0	A	A	PASS
			90			
			180			
			270			

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable to this device.
- 3) Criterion A: No observation of any performance degradation.
- 4) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
- 5) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.

## ATTACHMENT I - EFT/BURST

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

Mode	( V ) AC Power Line		( ) DC Power Line		( ) Signal/Control Line	
Test Level	1kV		0.5kV		0.5kV	
Port(s)	Polarity	Results	Polarity	Results	Polarity	Results
Line (L)	P	A	P	-	P	-
	N	A	N	-	N	-
Neutral (N)	P	A	P	-	P	-
	N	A	N	-	N	-
Ground (PE)	P	A	P	-	P	-
	N	A	N	-	N	-
Signal/Control Line	P	-	P	-	P	-
	N	-	N	-	N	-
Criteria	<b>B</b>		<b>B</b>		<b>B</b>	
Result	<b>A</b>		<b>N/A</b>		<b>N/A</b>	
Judgment	<b>PASS</b>		<b>N/A</b>		<b>N/A</b>	

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable to this device
- 3) Criterion A: No observation of any performance degradation.
- 4) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
- 5) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.

## ATTACHMENT J - SURGE

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

Wave Form EUT Ports Tested	1.2/50(8/20)Ti/Th us						Criteria	Results	Judgment
	Polarity	Phase	Voltage						
			0.5kV	1kV	1.5kV	2kV			
L - N	+	0°	A	A	-	-	B	A	PASS
	-		A	A	-	-			
	+	90°	A	A	-	-			
	-		A	A	-	-			
	+	180°	A	A	-	-			
	-		A	A	-	-			
	+	270°	A	A	-	-			
	-		A	A	-	-			
L - PE	+	0°	A	A	A	A	B	A	PASS
	-		A	A	A	A			
	+	90°	A	A	A	A			
	-		A	A	A	A			
	+	180°	A	A	A	A			
	-		A	A	A	A			
	+	270°	A	A	A	A			
	-		A	A	A	A			
N - PE	+	0°	A	A	A	A	B	A	PASS
	-		A	A	A	A			
	+	90°	A	A	A	A			
	-		A	A	A	A			
	+	180°	A	A	A	A			
	-		A	A	A	A			
	+	270°	A	A	A	A			
	-		A	A	A	A			
Signal Line	+	N/A	-	-	-	-	B	NA	NA
	-		-	-	-	-			

Note:

- 1) Polarity and Numbers of Impulses:5 Pst / Ngt at each tested mode
- 2) N/A - denotes test is not applicable to this device
- 3) Criterion A: No observation of any performance degradation.
- 4) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
- 5) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.

## ATTACHMENT K - INJECTION CURRENT

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

Test Ports (Mode)	Freq. Range (MHz)	Field Strength	Criteria	Results	Judgment
Input/ Output AC. Power Port	0.15 ---80	3V(rms) AM Modulated 1000Hz, 80%	A	A	PASS
Input/ Output DC. Power Port	0.15 --- 80		A	N/A	N/A
Signal Line	0.15 --- 80		A	N/A	N/A

Note:

- 1) N/A - denotes test is not applicable to this device.
- 2) Criterion A: No observation of any performance degradation.
- 3) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
- 4) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.

## **ATTACHMENT L - VOLTAGE INTERRUPTION/DIPS**

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

AC 230V/50Hz				
Voltage Residual	Cycles	Criteria	Results	Judgment
Voltage dip 0%	0.5	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage dip 0%	1	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage dip 70%	25	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage Interruption 0%	250	<b>C</b>	<b>C</b>	<b>PASS</b>

AC 240V/50Hz				
Voltage Residual	Cycles	Criteria	Results	Judgment
Voltage dip 0%	0.5	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage dip 0%	1	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage dip 70%	25	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage Interruption 0%	250	<b>C</b>	<b>C</b>	<b>PASS</b>

AC 100V/50Hz				
Voltage Residual	Cycles	Criteria	Results	Judgment
Voltage dip 0%	0.5	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage dip 0%	1	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage dip 70%	25	<b>B</b>	<b>A</b>	<b>PASS</b>
Voltage Interruption 0%	250	<b>C</b>	<b>C</b>	<b>PASS</b>

Note:

- 1). N/A - denotes test is not applicable to this device.
- 2) Criterion A: No observation of any performance degradation.
- 3) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
- 4) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.
- 5) Voltage Interruption: 0% residual voltage for 250 cycle (at 50Hz)