EMC TEST REPORT

Report No.: SET2017-03444

Product: Off-Grid Solar Inverter

Model No: 10kVA, 20kVA

Applicant: EAST Group Co., Ltd.

Address: No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China

Issued by: CCIC Southern Electronic Product Testing (Shenzhen)CO., Ltd.

Lab location: Electronic Testing Building, No. 43 Shahe Road, Xili Jiedao, Nanshan District, 518055 Shenzhen, Guangdong, China

Tel: 86 755 26627338 Fax: 86 755 26627238

Query No. :Pa6ZPROS

Report

Product.....:	Off-Grid Solar Inverter
Model No. .....:	10kVA, 20kVA
Brand Name.....:	----
Applicant.....:	EAST Group Co., Ltd.
Applicant Address.....:	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China
Manufacturer.....:	EAST Group Co., Ltd.
Manufacturer Address.....:	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China
Test Standards.....:	**EN 62040-2:2006+AC:2006 (IEC 62040-2:2005)** Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements
Test Result.....:	Pass
Tested by .....:	Jiang Haibiao Mar. 28, 2017 Signature, Date
Reviewed by.....:	Lu-Tongzhou Mar. 28, 2017 Signature, Date
Approved by.....:	Smartli Mar. 28, 2017 Signature, Date

CCIC-SET

Table of Contents

1 General Information

1.1 Description of EUT

Product: Off-Grid Solar Inverter
Model No.: 10kVA, 20kVA
Brand Name: ----
Serial No.: /

Rating:
20kVA:
DC Input: PV - voltage range: 350-750 d.c.V
PV current: 1×60 d.c. A max DC input: 360 d.c.V
AC Input: 380 a.c.V,50/60Hz
AC Output: 380 a.c.V,50/60Hz 30 a.c. A
Power : 18kW.
10kVA:
DC Input: PV - voltage range: 350-750 d.c.V
PV current: 1×60 d.c. A max DC input: 360 d.c.V
AC Input: 380 a.c.V,50/60Hz
AC Output: 380 a.c.V,50/60Hz 15 a.c. A
Power : 9kW.

Accessories: /

NOTE:

1. The EUT belongs to Category C3, intended to be used in the second environment. The following warning shall be included in the instruction for use:
   Warning
   In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
2. Model 10kVA and 20kVA have the same circuit and structure. Models differ only on their electrical rating and power component. According to the differences, all tests were performed on model 20kVA, Mains terminal disturbance voltage and Radiated disturbance were performed on the model 10kVA.
3. For more detailed features description about the EUT, please refer to User's Manual.

1.2 Objective

Perform Electro Magnetic Interference (EMI) and Electro Magnetic Susceptibility (EMS) tests for CE Marking.

2 Test Facilities and Configuration

2.1 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35ºC
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

2.2 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

- Uncertainty of Conducted Emission, Uc = ±3.6dB
- Uncertainty of Radiated Emission, Uc = ±5.0dB

2.3 Test Standards and Results

The EUT has been tested according to the following specifications:

EMISSION		
Standard	**Test Type**	**Result**
EN 62040-2:2006+AC:2006 **IEC 62040-2:2005**	Mains terminal disturbance voltage	PASS
	Radiated disturbance	PASS
IMMUNITY (EN 62040-2:2006+AC:2006, IEC 62040-2:2005)		
Basic Standard	**Test Type**	**Result**
IEC 61000-4-2	Electrostatic discharge immunity	PASS
IEC 61000-4-3	Radiated, radio frequency electromagnetic field immunity	PASS
IEC 61000-4-4	Electrical fast transient/burst immunity	PASS
IEC 61000-4-5	Surge immunity	PASS
IEC 61000-4-6	Immunity to conducted disturbances induced by RF fields	PASS
IEC 61000-4-8	Power frequency magnetic field immunity	PASS
IEC 61000-2-2	Power line harmonics and inter-harmonics/ Power line unbalance	PASS

NOTE: The latest versions of basic standards are applied.

2.4 List of Equipments Used

Description	Manufacturer	Model No.	Calibration Due Date	Serial No.
Test Receiver	ROHDE&SCHWARZ	ESCI	Jun.26, 2017	A130901474
LISN	SCHWARZBECK	NNLK8130	Jun.02, 2017	A131001541
Broadband Ant.	SCHWARZBECK	VULB 09160	May.25,2019	A0805560
ESD Test System	3C TEST	EDS30T	Jun.03, 2017	A161002598
EFT/Surge Test System	EM TEST	UCS500N7.7	Nov. 02, 2017	A130201094
	EM TEST	CNI503B9.3	Nov. 02, 2017	A130201095
Power Amplifier	MILMEGA	80RF1000-1000	Dec. 17, 2017	A140101634
Signal Generator	ROHDE&SCHWARZ	SMB100A	Nov.02, 2017	A141002004
Power Meter	Amplifier Research	E4417A	Nov.02, 2017	A140701873
EMS Antenna	Amplifier Research	STLP 9128 E	Jan.28, 2018	A151002436
CDN	TESEQ	M5	Mar.27, 2018	A161102606
Power Amplifier	TESEQ	NSG4070	Jun.06, 2017	A160602544
Anechoic Chamber	Albatross	EMC 19.6*11.8*8.55(m)	May.29, 2017	A0802520
AC Power source	Chroma	Chroma 61860	Jan.20, 2017	A150202185

NOTE: Equipment above has been calibrated and is in the period of validation.

3 Emission Test

3.1 EUT Setup and Operating Conditions

The EUT was powered by 380VAC and 540VDC mains, was continuously operated.
Environment Condition:
Temperature: 24°C; Relative Humidity: 55%; Pressure:101kPa
Test Date: 2017-01-11~2017-02-08
Test Engineer: Jiang Haibiao
Test Site: EMC Lab

3.2 Mains Terminal Disturbance Voltage Measurement

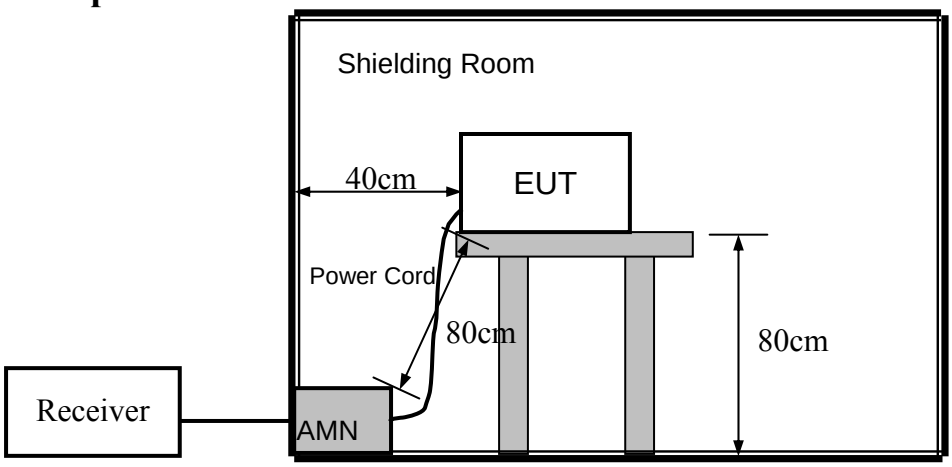
3.2.1 Limits of Mains Terminal Disturbance Voltage

Frequency range (MHz)	Limits (dBμV), Category C3	
	Quasi-peak	Average
0.15 - 0.5	100	90
0.5 - 5	86	76
5-30	90-70	80-60

NOTE:

1. The lower limit shall apply at the transition frequencies.

3.2.2 Test Setup



3.2.3 Test Result

20kVA Model 1 AC input:

No.	Freq. (MHz)	Limit Value (dBμV)		Emission Level (dBμV)	
		QP	AV	QP	AV
1	0.1620	100	90	75.2	69.9
2	0.3420	100	90	77.5	71.3
3	0.9300	86	76	75.3	61.2
4	1.5300	86	76	80.4	63.4
5	1.6140	86	76	77.2	61.6
6	6.1100	89.1	79.1	75.1	69.5

20kVA Model 1 output:

No.	Freq. (MHz)	Limit Value (dBμV)		Emission Level (dBμV)	
		QP	AV	QP	AV
1	0.1500	100	90	75.9	71.1
2	0.1620	100	90	76.9	71.3
3	0.3420	100	90	76.4	69.1
4	2.2460	86	76	80.9	63.9
5	3.5100	86	76	69.0	61.8
6	6.4740	88.8	78.8	75.1	70.0

20kVA Model 2 output:

No.	Freq. (MHz)	Limit Value (dBμV)		Emission Level (dBμV)	
		QP	AV	QP	AV
1	0.1500	100	90	75.6	69.9
2	0.1620	100	90	76.2	70.4
3	0.1780	100	90	75.1	69.7
4	0.3420	100	90	75.8	68.7
5	7.0980	88.3	78.3	76.2	71.3
6	12.5180	84.0	74.0	66.5	61.6

10kVA Model 1 AC input:

No.	Freq. (MHz)	Limit Value (dBμV)		Emission Level (dBμV)	
		QP	AV	QP	AV
1	0.1540	100	90	81.4	73.8
2	0.3740	100	90	74.5	68.6
3	0.7860	86	76	85.4	69.6
4	2.4060	86	76	82.7	64.3
5	2.6660	86	76	81.7	64.1
6	7.2740	88.2	78.2	69.4	64.4

10kVA Model 1 output:

No.	Freq. (MHz)	Limit Value (dBμV)		Emission Level (dBμV)	
		QP	AV	QP	AV
1	0.1540	100	90	72.8	65.4
2	0.7860	86	76	78.3	69.5
3	2.4700	86	76	75.9	63.6
4	6.5620	88.8	78.8	71.1	66.3
5	7.4940	88	78	65.6	61.1
6	21.9260	76.5	66.5	54.1	51.2

10kVA Model 2 output:

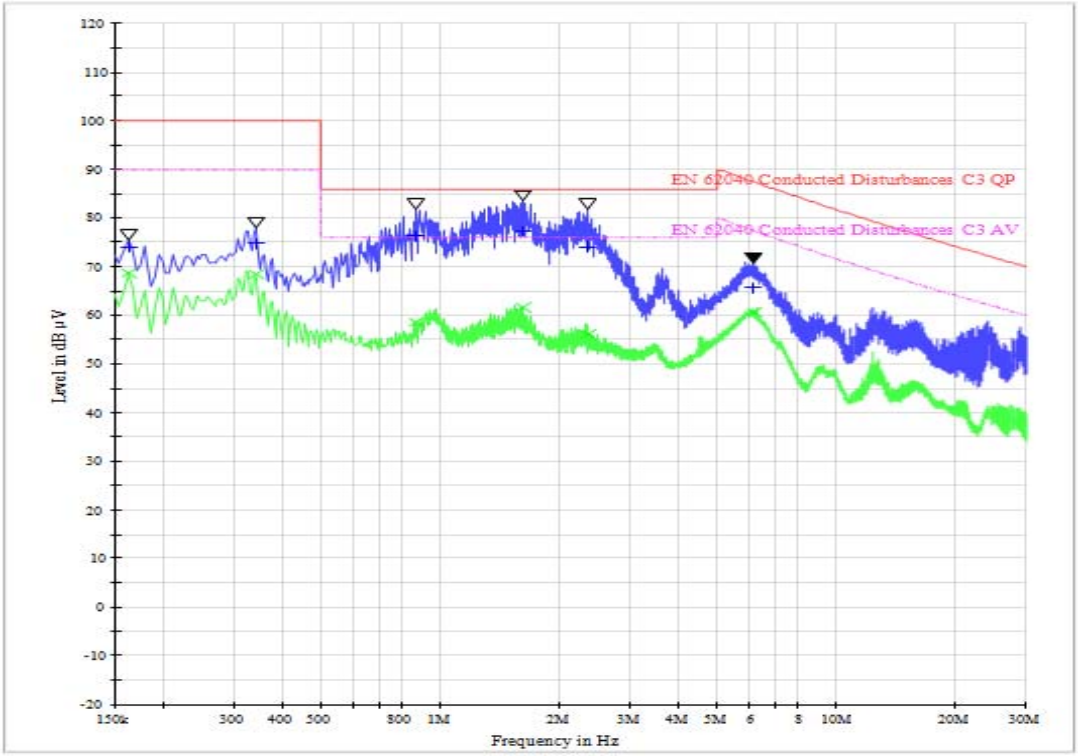
No.	Freq. (MHz)	Limit Value (dBμV)		Emission Level (dBμV)	
		QP	AV	QP	AV
1	0.2020	100	90	92.4	86.5
2	0.2500	100	90	91.0	84.1
3	0.5100	86	76	82.3	75.8
4	0.5460	86	76	81.6	75.9
5	0.7060	86	76	75.3	70.0
6	6.9500	88.4	78.4	70.9	66.0

NOTE:

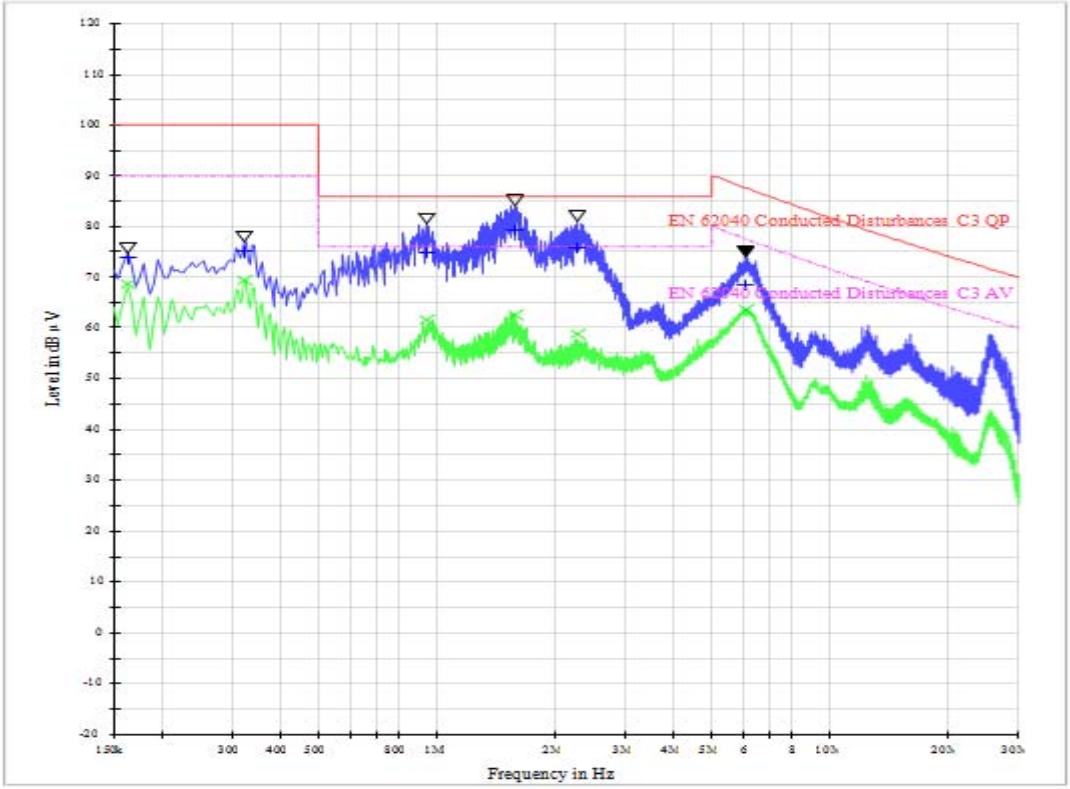
1. QP and AV are abbreviations of the quasi-peak and average individually.
2. If the emission levels measured with QP detector are lower than AV limits, there is unnecessary to measure with AV detector.
3. The emission levels recorded above is the larger ones of each phase.

20kVA Model 1 AC input:

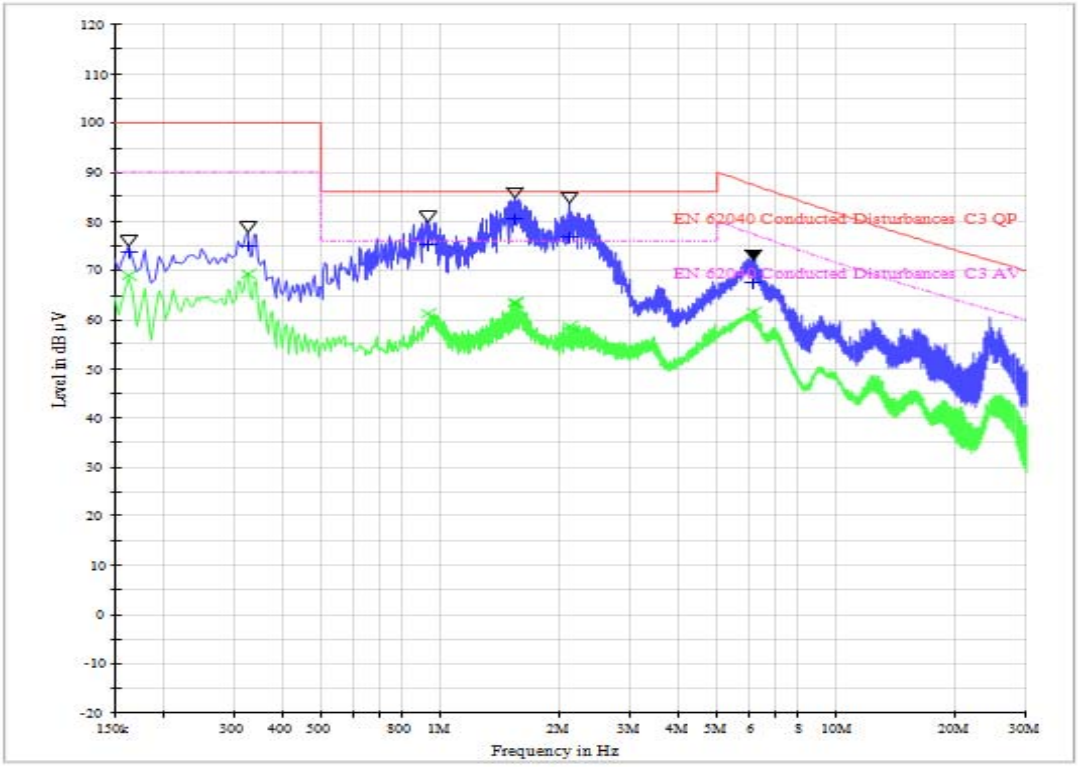
Mains terminal disturbance voltage，L1 phase



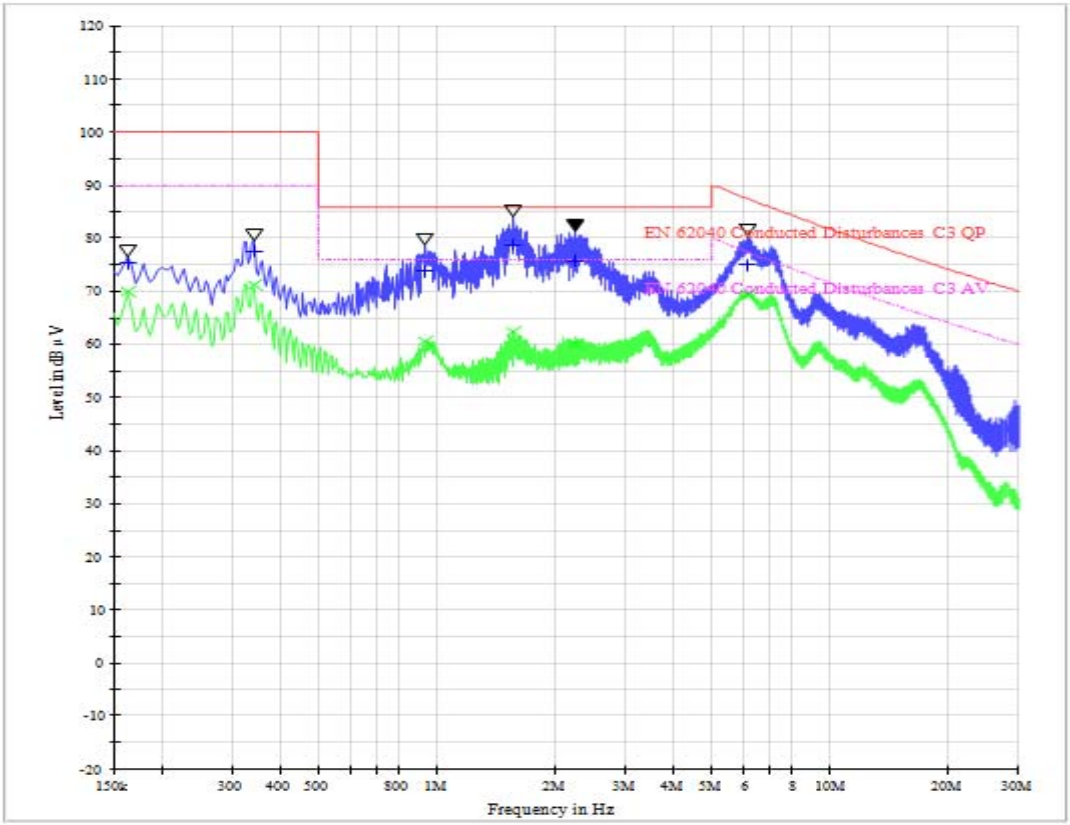
Mains terminal disturbance voltage，L2 phase



Mains terminal disturbance voltage，L3 phase

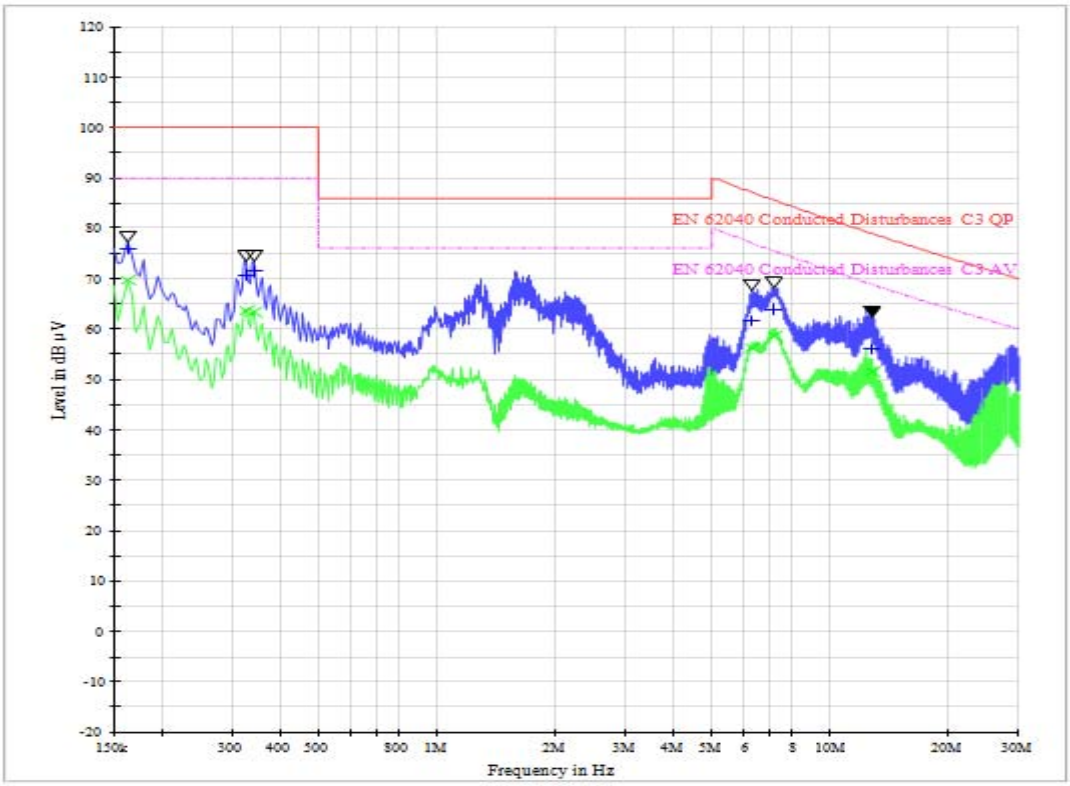


Mains terminal disturbance voltage，N phase

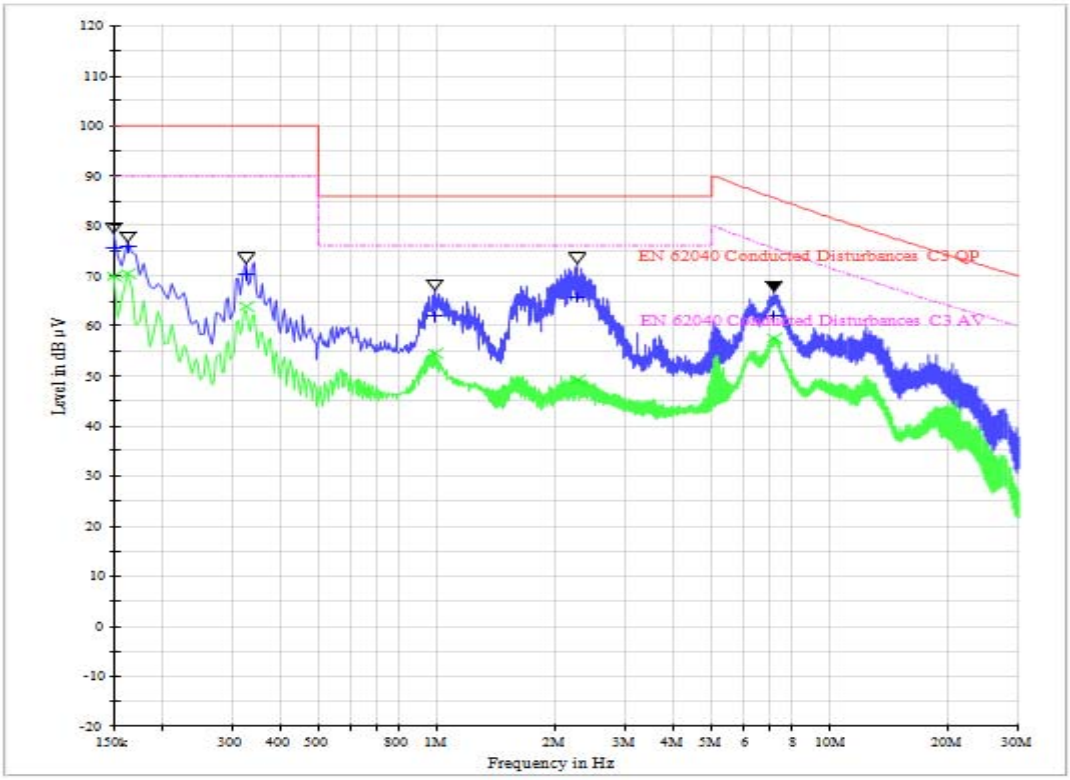


20kVA Model 1 AC output:

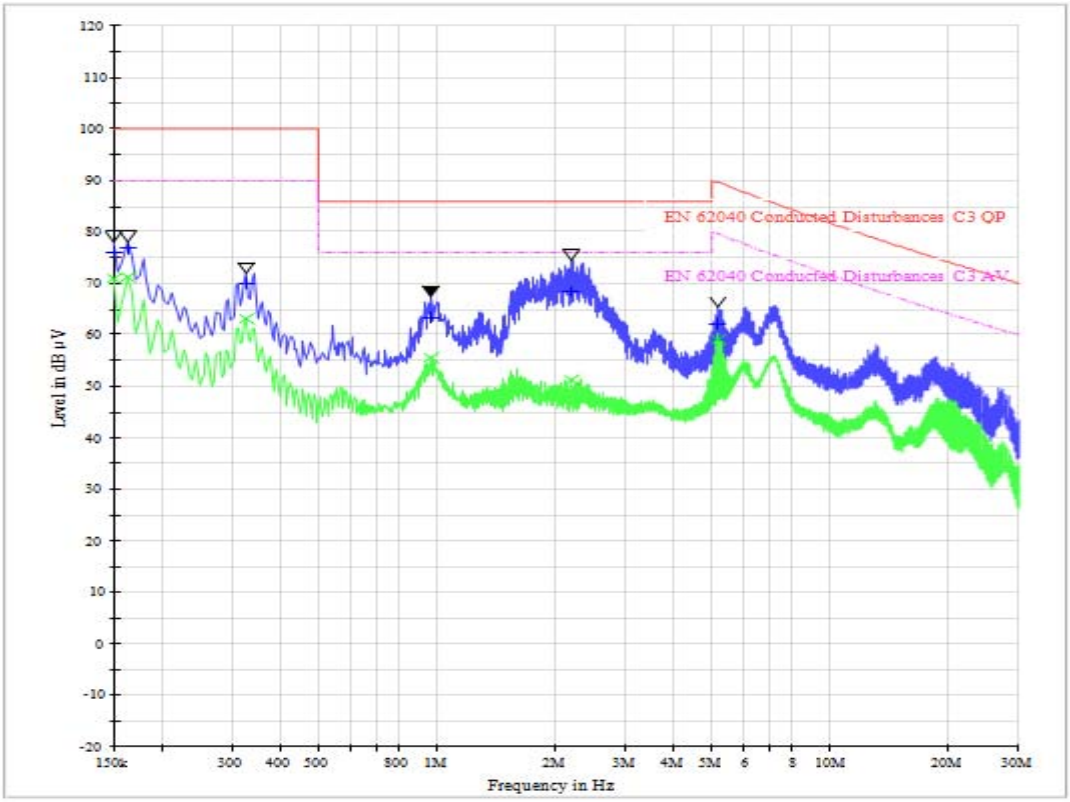
Mains terminal disturbance voltage，L1 phase



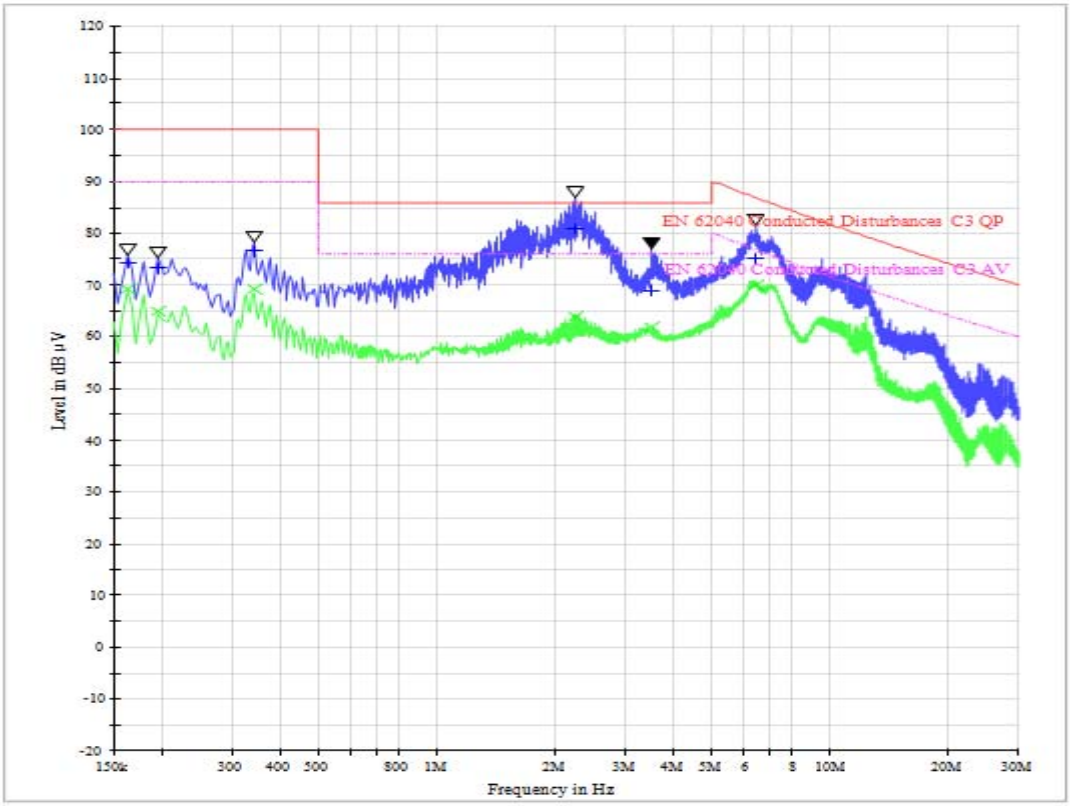
Mains terminal disturbance voltage，L2 phase



Mains terminal disturbance voltage，L3 phase

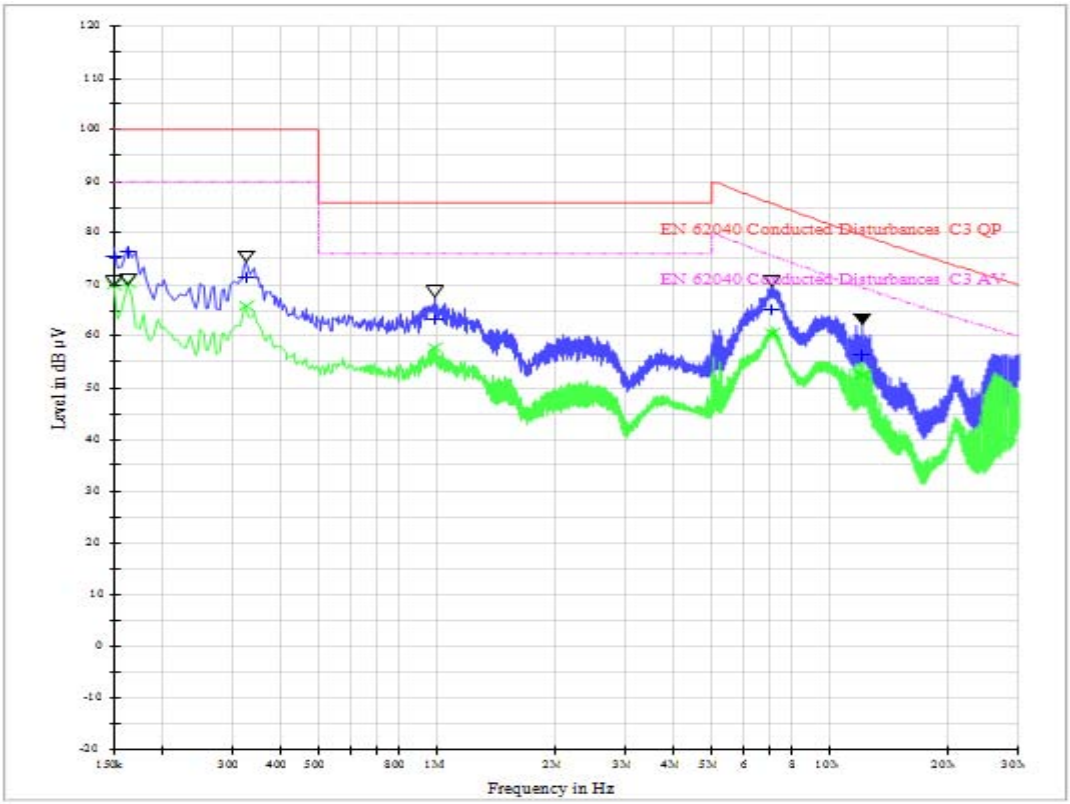


Mains terminal disturbance voltage，N phase

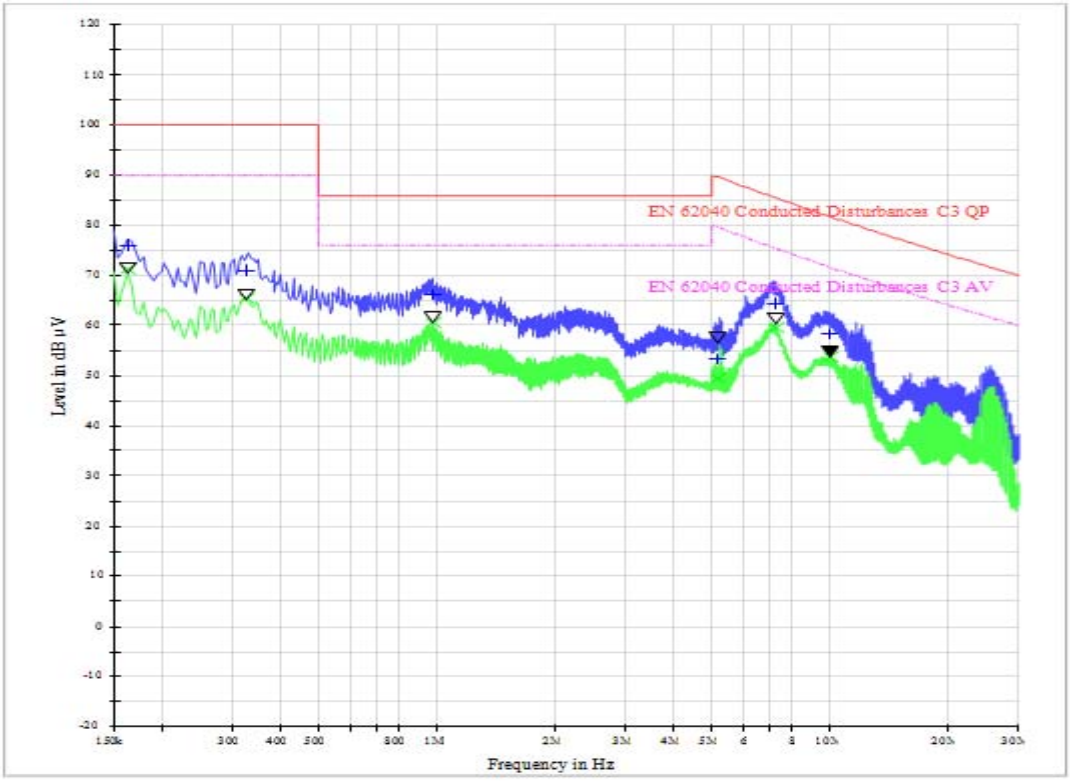


20kVA Model 2 AC output:

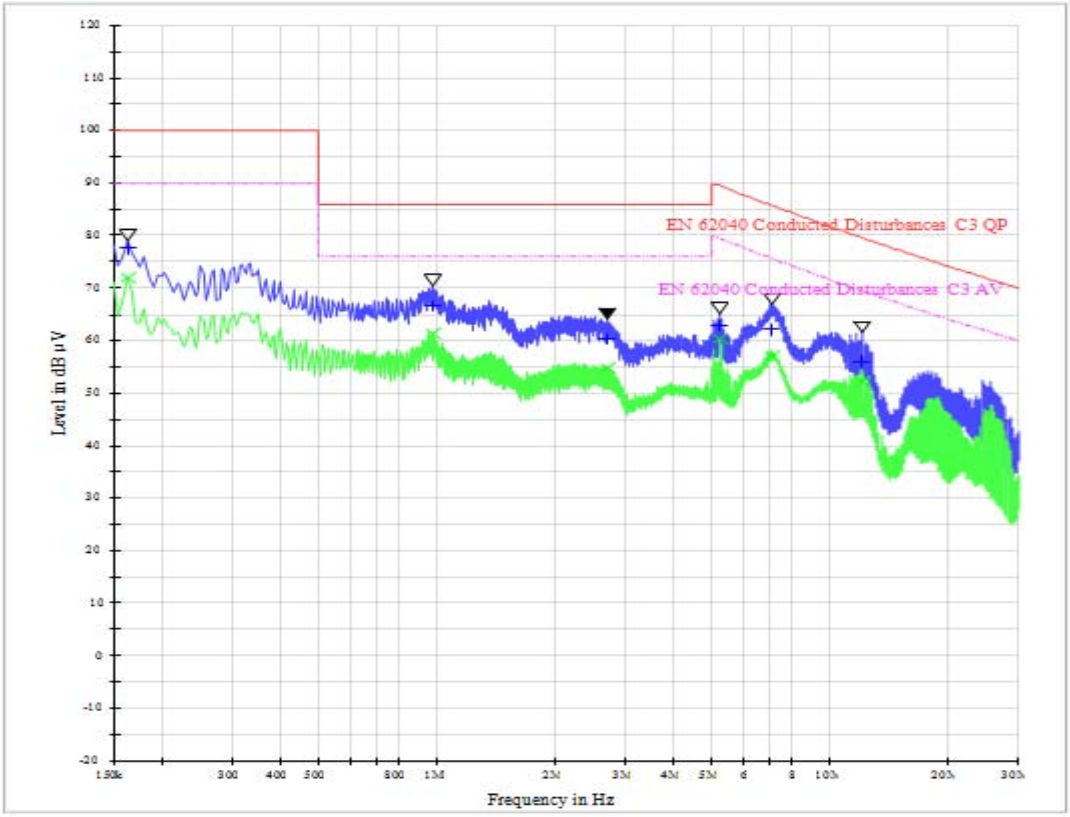
Mains terminal disturbance voltage，L1 phase



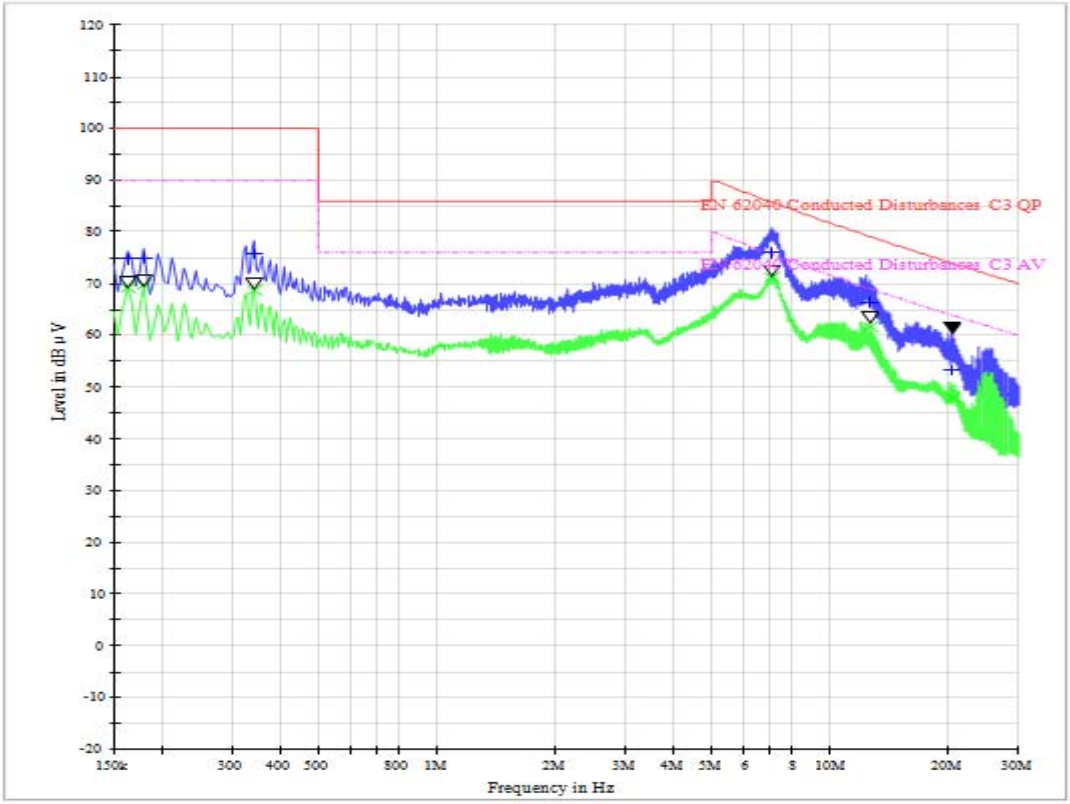
Mains terminal disturbance voltage，L2 phase



Mains terminal disturbance voltage，L3 phase

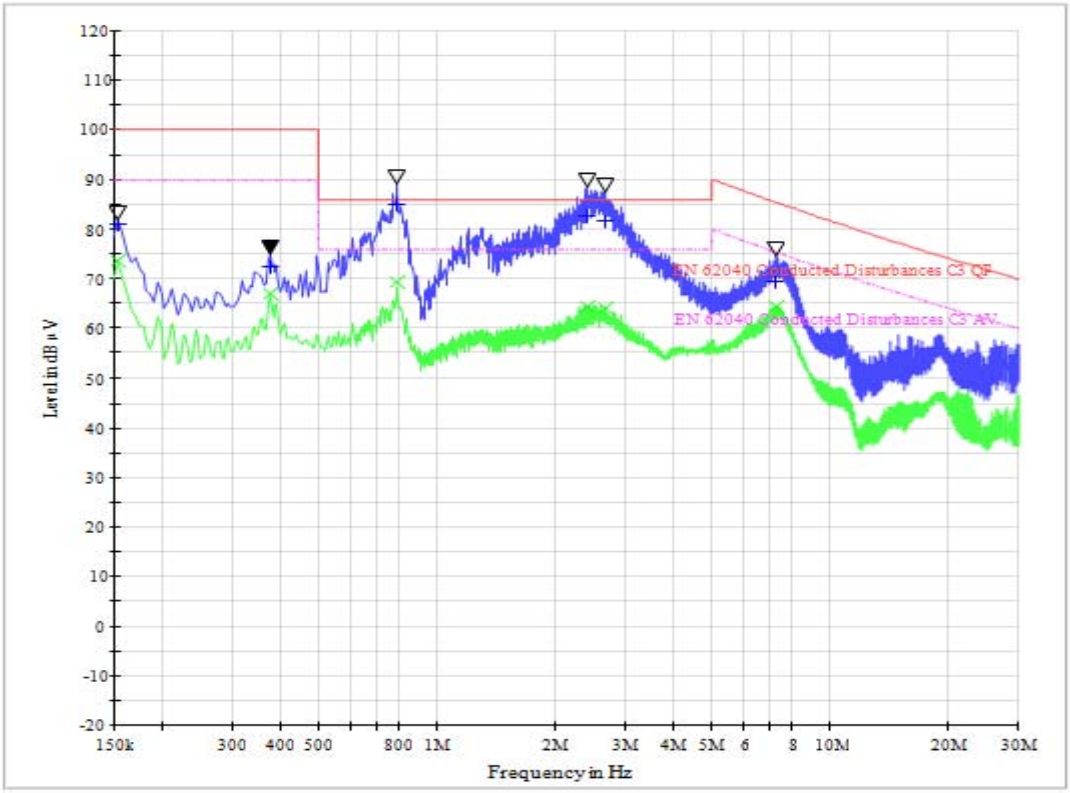


Mains terminal disturbance voltage，N phase

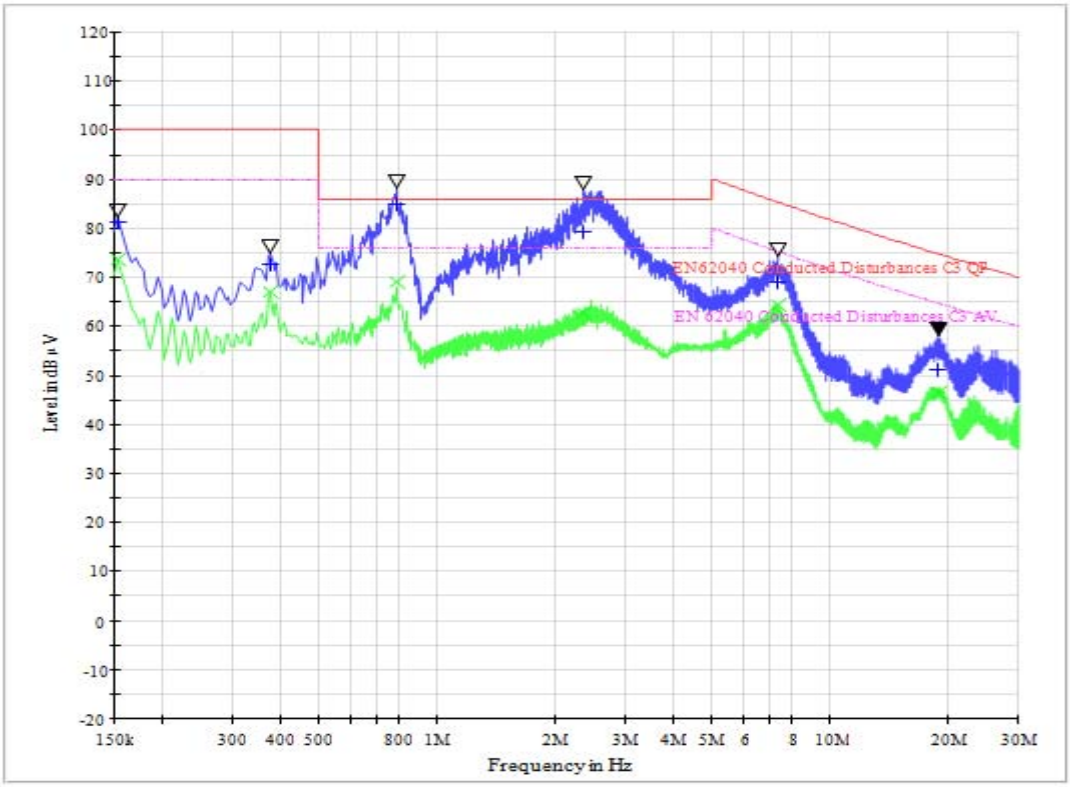


10kVA Model 1 AC input:

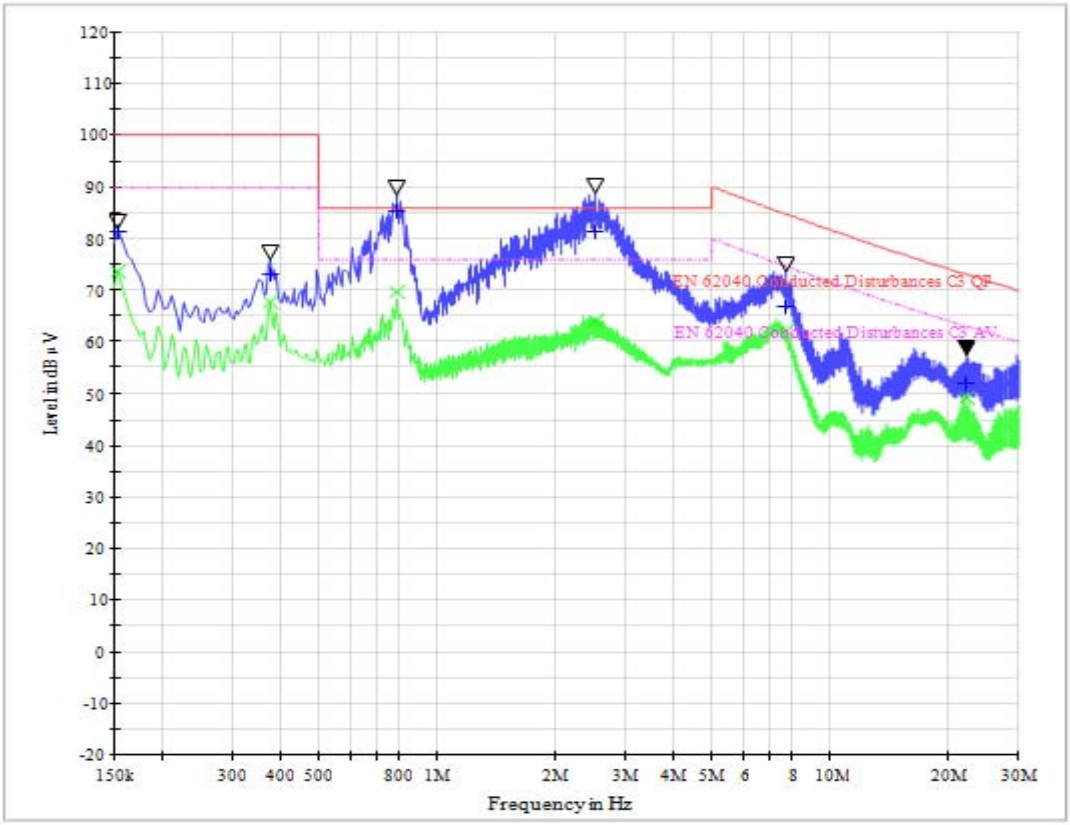
Mains terminal disturbance voltage，L1 phase



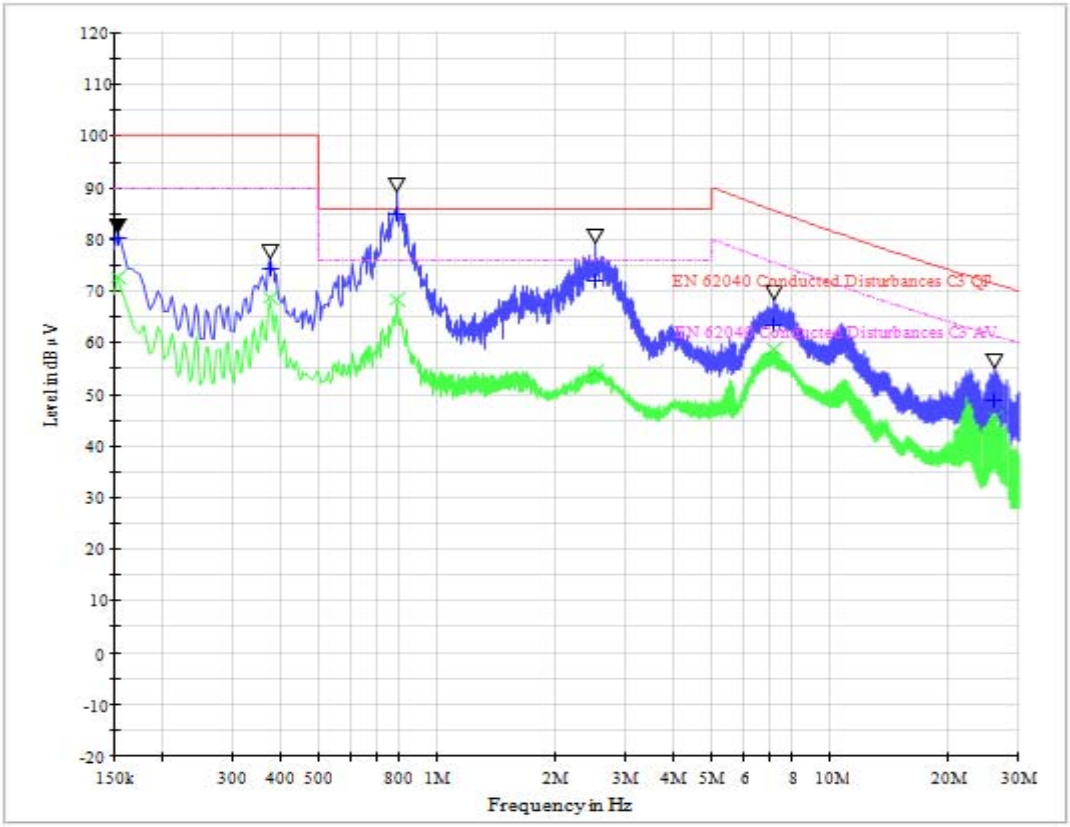
Mains terminal disturbance voltage，L2 phase



Mains terminal disturbance voltage，L3 phase

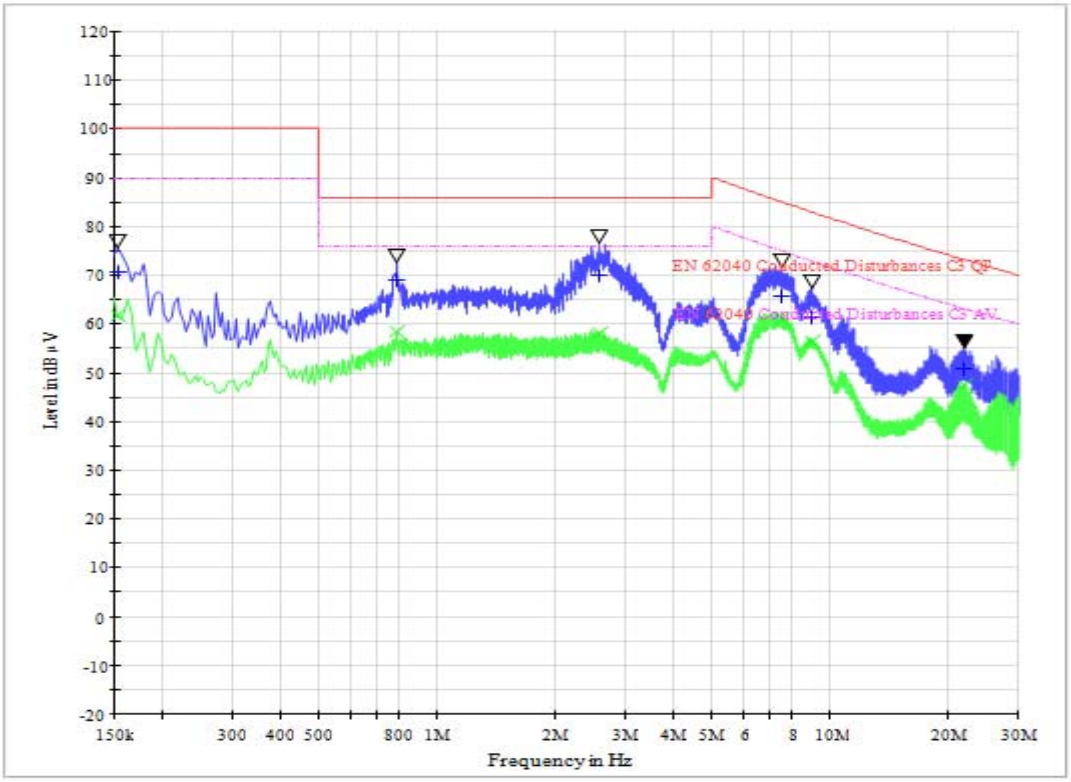


Mains terminal disturbance voltage，N phase

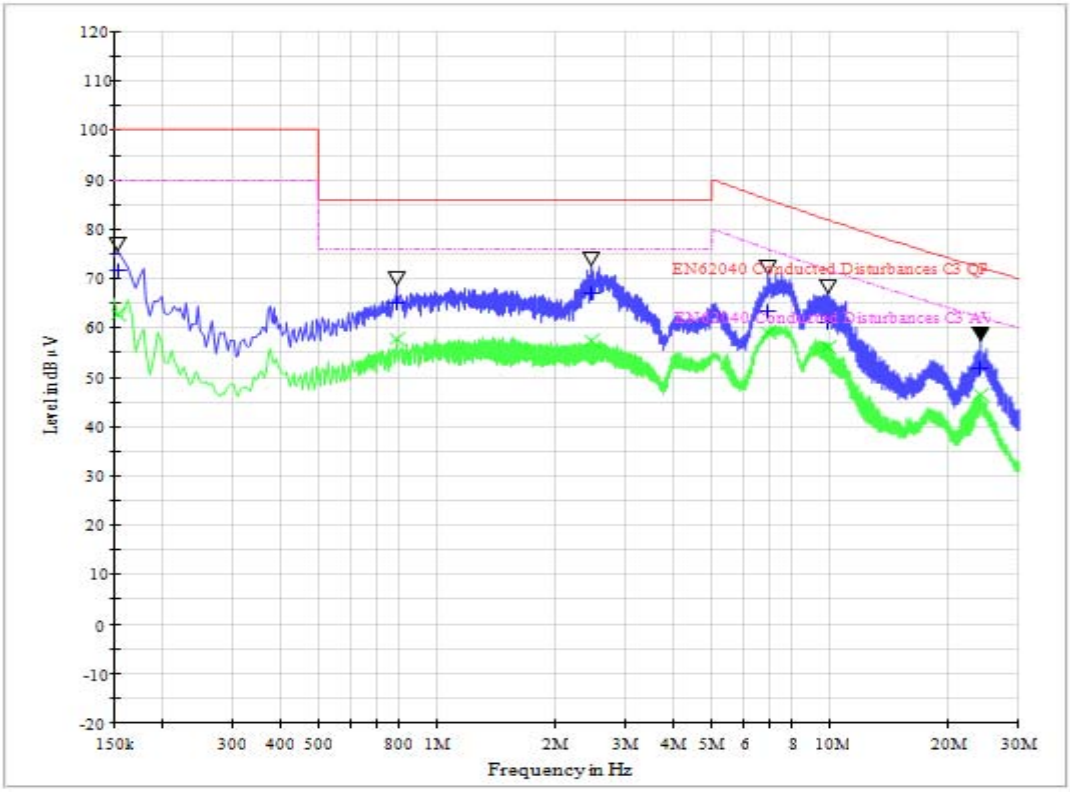


10kVA Model 1 AC output:

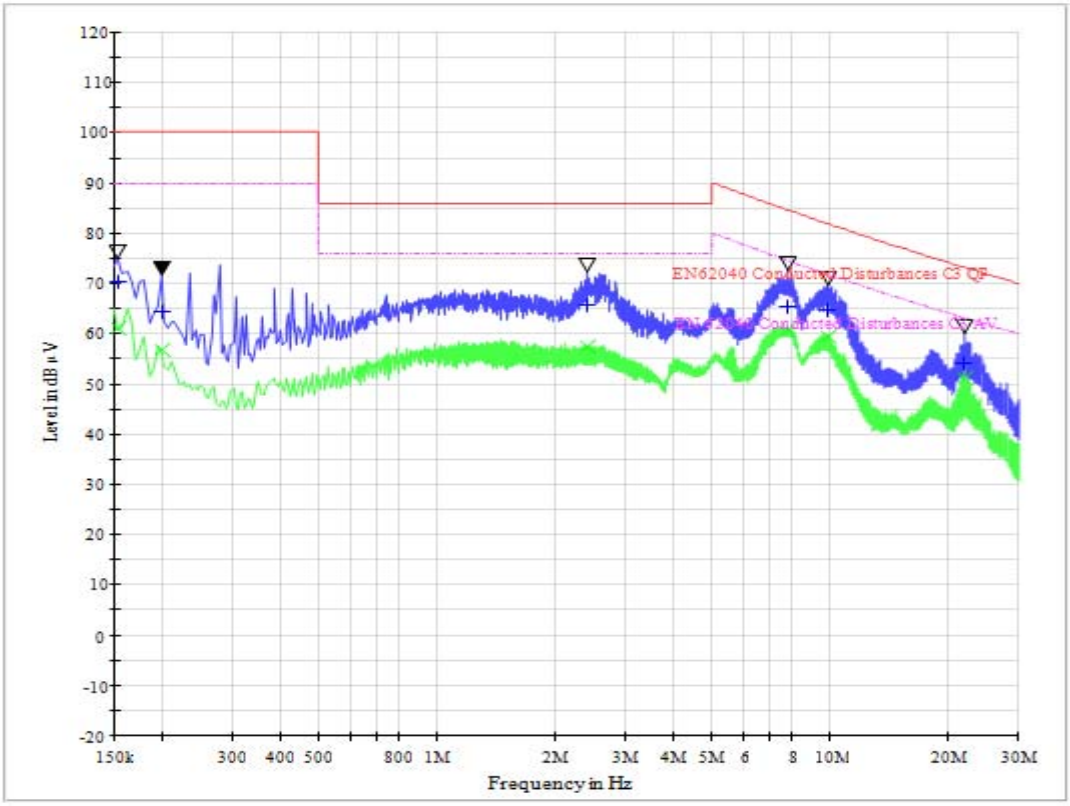
Mains terminal disturbance voltage，L1 phase



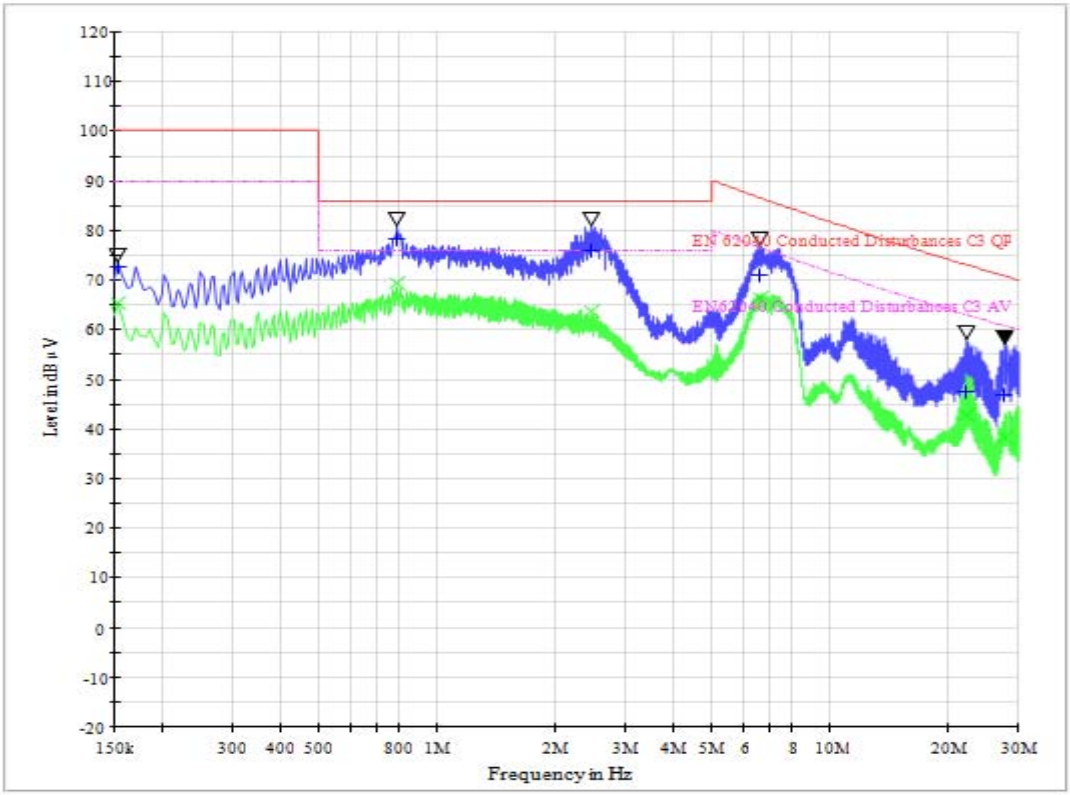
Mains terminal disturbance voltage，L2 phase



Mains terminal disturbance voltage，L3 phase

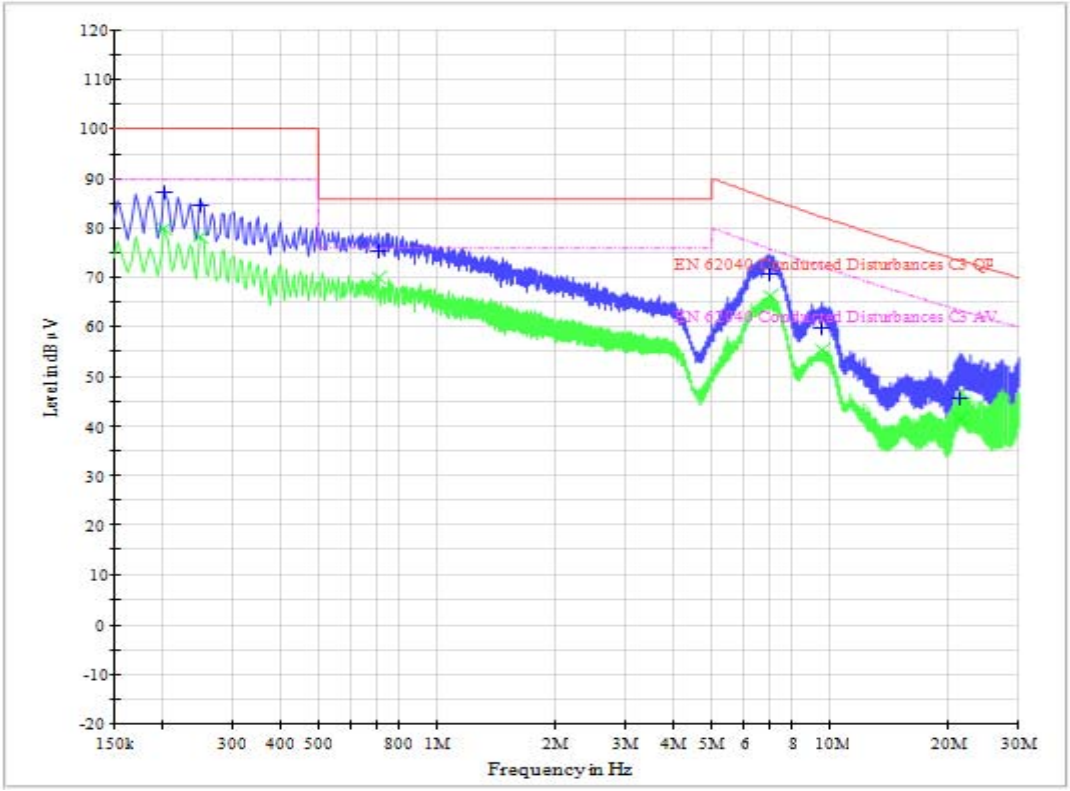


Mains terminal disturbance voltage，N phase

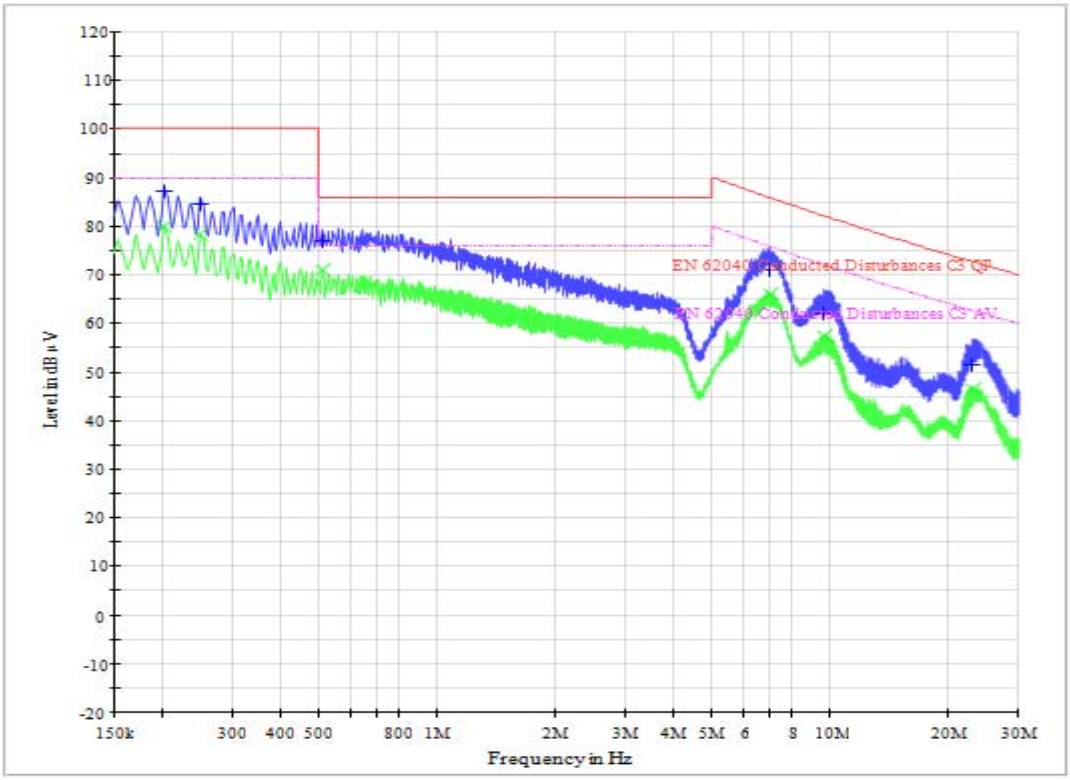


10kVA Model 2 AC output:

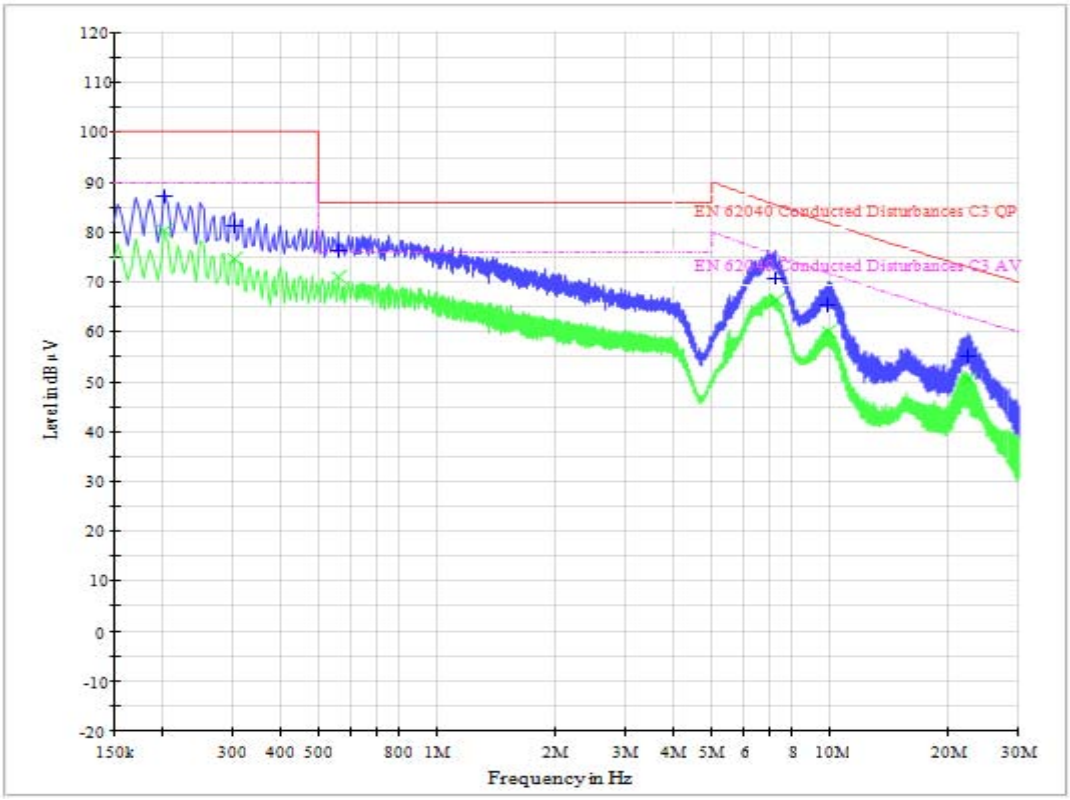
Mains terminal disturbance voltage，L1 phase



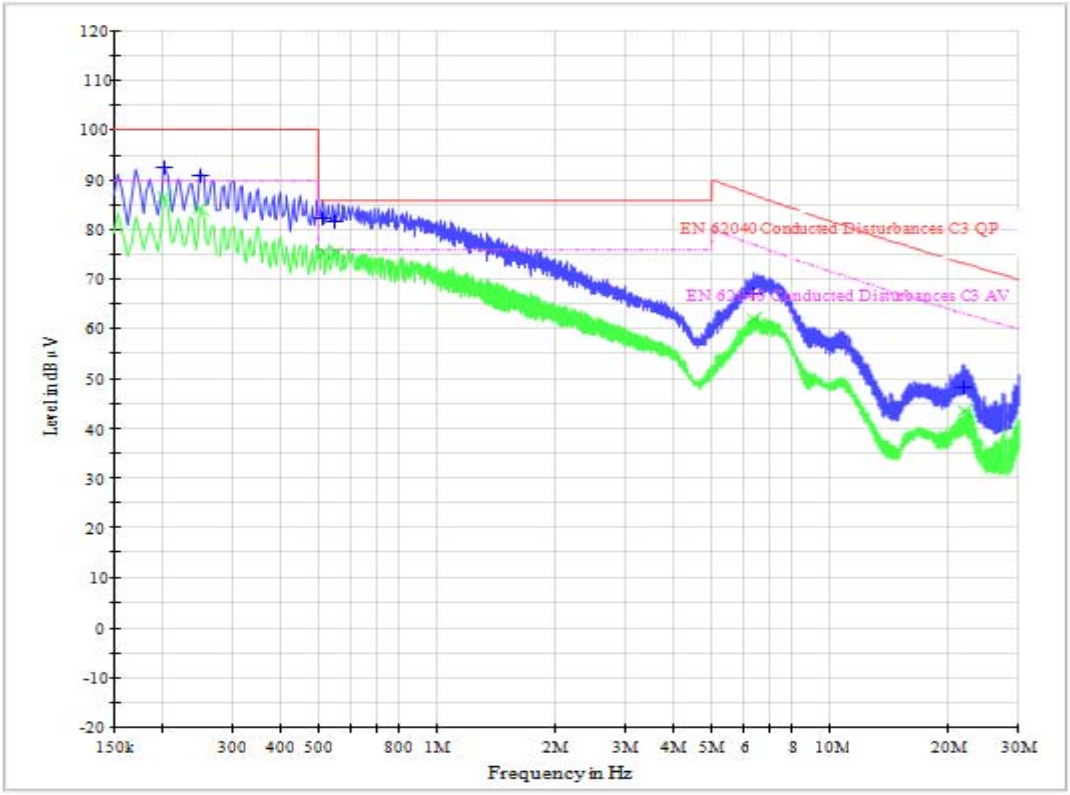
Mains terminal disturbance voltage，L2 phase



Mains terminal disturbance voltage，L3 phase



Mains terminal disturbance voltage，N phase



3.3 Radiated Disturbance Measurement

3.3.1 Limits of Radiated Disturbance

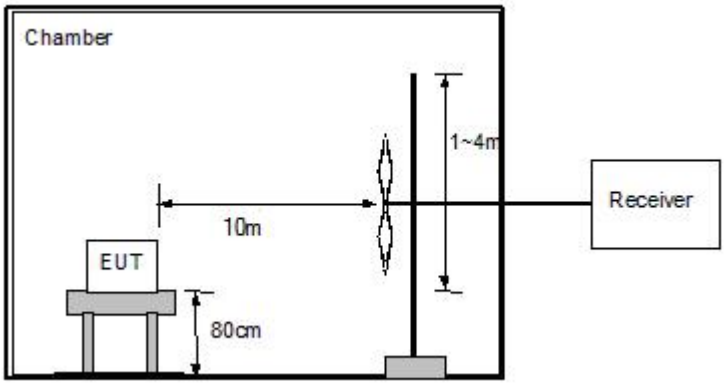
Frequency range (MHz)	Quasi peak limits(dBμV/m), Category C3 at 10m measurement distance
30 – 230	50
230 - 1000	60

Notes:

(1) The lower limit shall apply at the transition frequency.

(2) Additional provisions may be required for cases where interference occurs.

3.3.2 Test Setup



3.3.3 Test Result

20kVA Model 1:

No.	Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	QP Limits (dBμV/m)	Emission Level (dBμV/m)
1	30-230	H	100-400	0-360	50	＜35
2	47.8400	V	100	142	50	37.6
3	59.6400	V	100	267	50	40.8
4	60.8400	V	100	95	50	40.5

20kVA Model 2:

No.	Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	QP Limits (dBμV/m)	Emission Level (dBμV/m)
1	52.3200	H	400	0	50	35.2
2	56.6800	H	400	0	50	36.1
3	48.6400	V	100	4	50	43.7
4	30.7200	V	100	0	50	40.0
5	62.2400	V	100	282	50	40.1

10kVA Model 1:

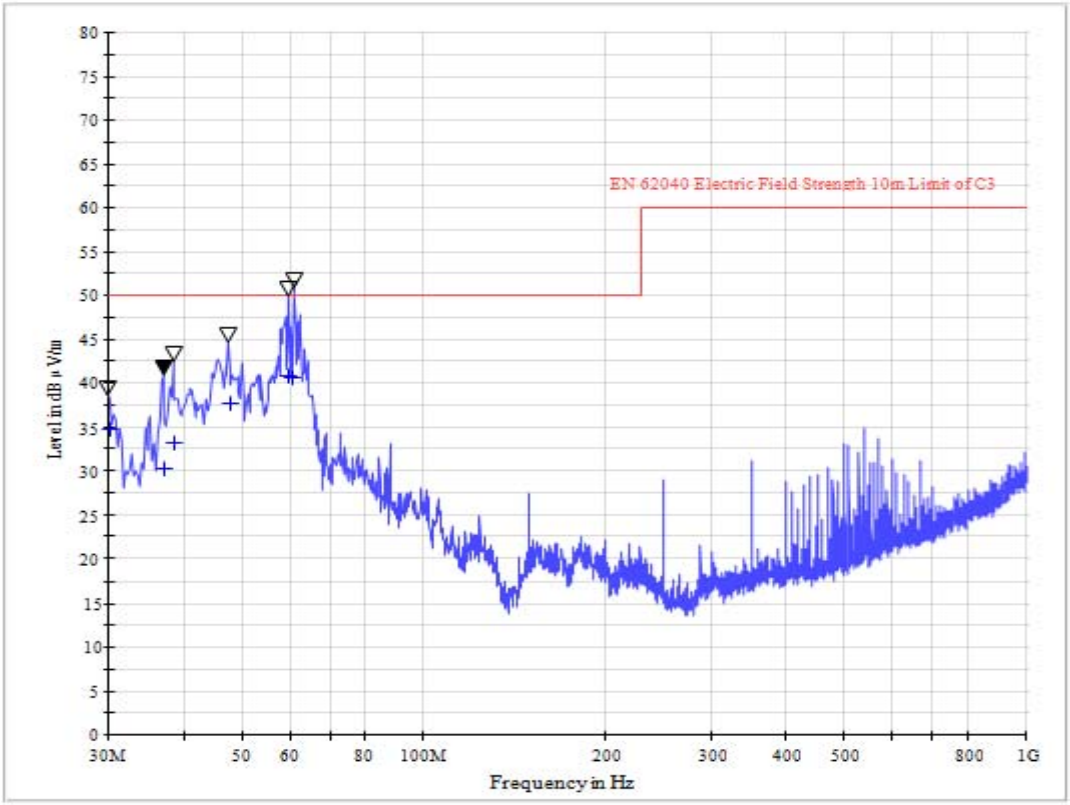
No.	Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	QP Limits (dBμV/m)	Emission Level (dBμV/m)
1	30-230	H	100-400	0-360	50	＜35
2	30.0000	V	100	0	50	39.6
3	34.8400	V	100	0	50	40.6
4	39.1600	V	100	0	50	42.6
5	58.1200	V	100	0	50	40.6
6	62.7200	V	100	0	50	39.2

10kVA Model 2:

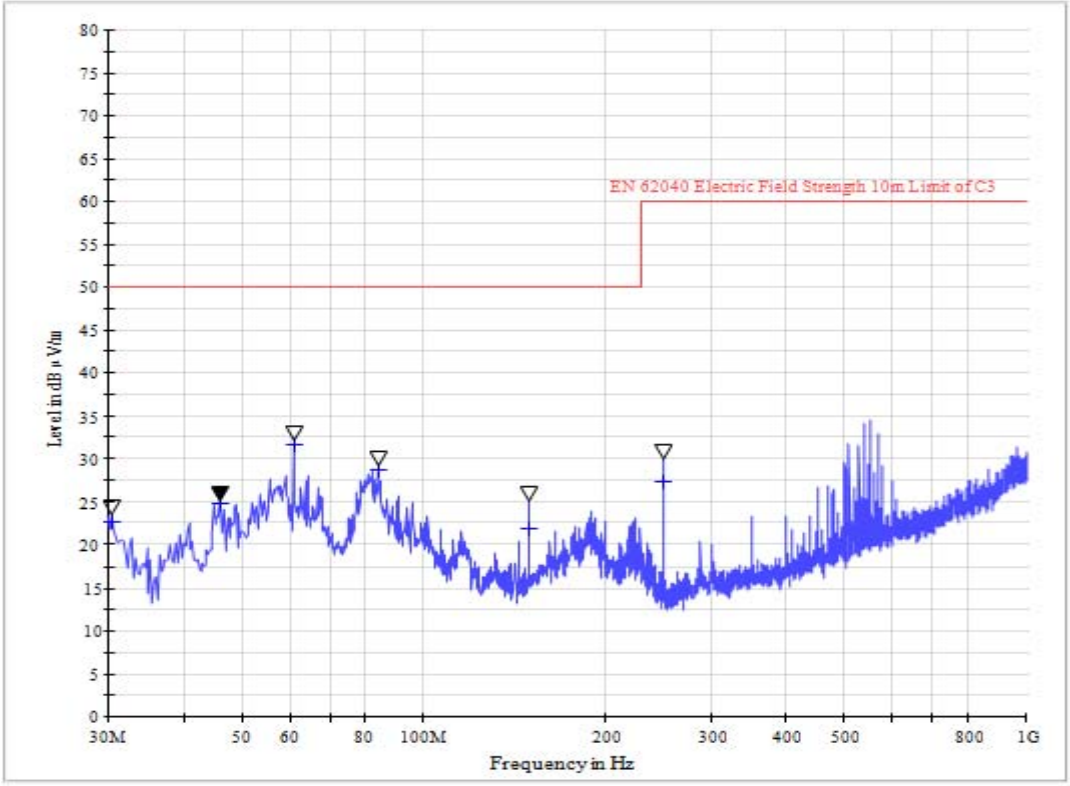
No.	Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	QP Limits (dBμV/m)	Emission Level (dBμV/m)
1	30-230	H	100-400	0-360	50	＜35
2	52.1600	V	100	0	50	44.4
3	30.7200	V	100	0	50	39.2
4	38.4800	V	100	0	50	40.6
5	56.6800	V	100	0	50	41.2

20kVA Model 1:

1. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Vertical

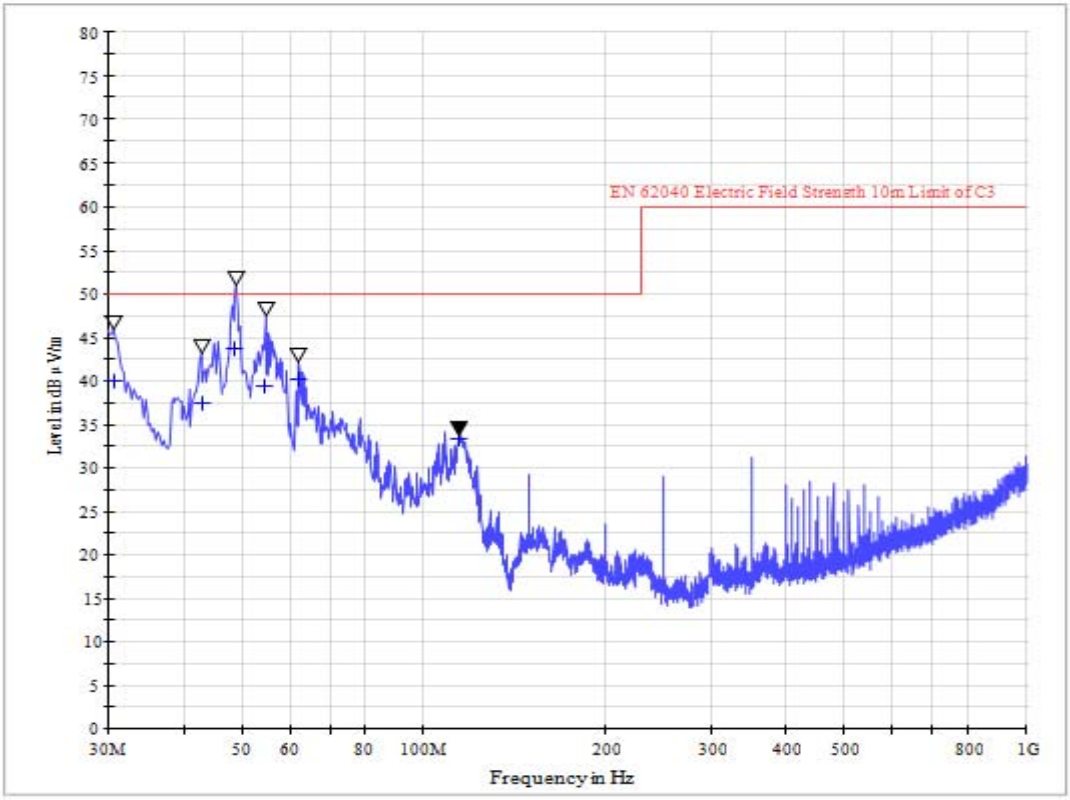


2. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Horizontal

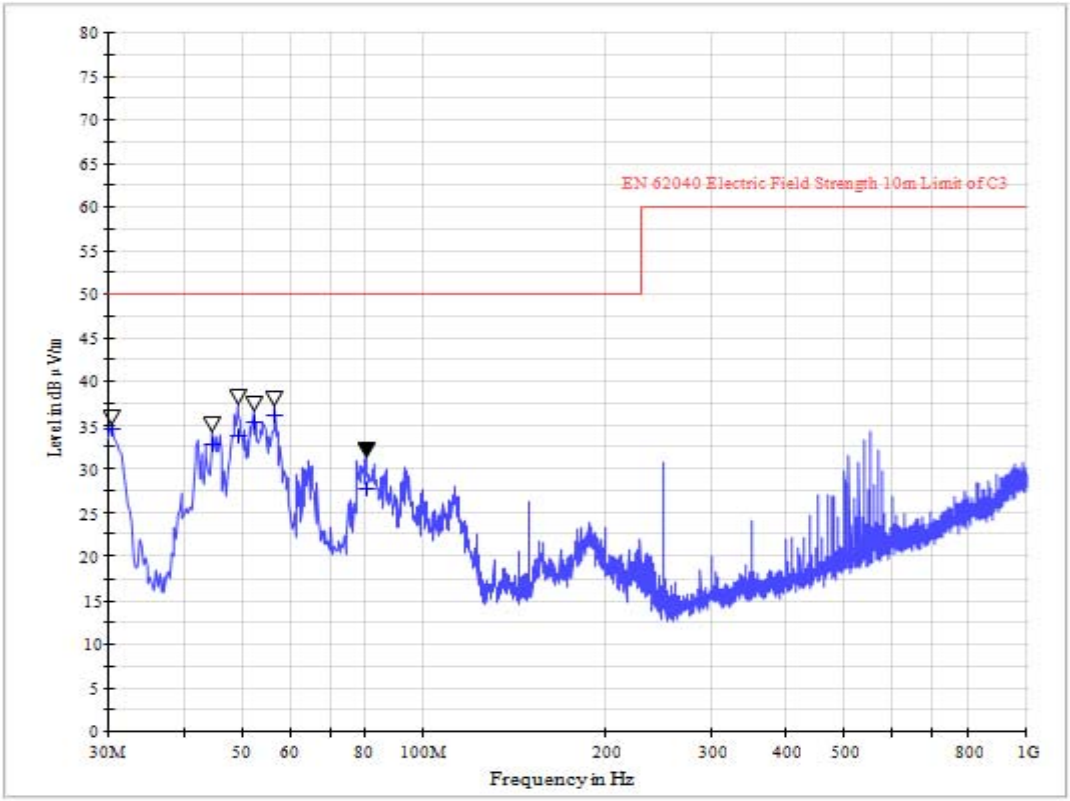


20kVA Model 2:

1. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Vertical

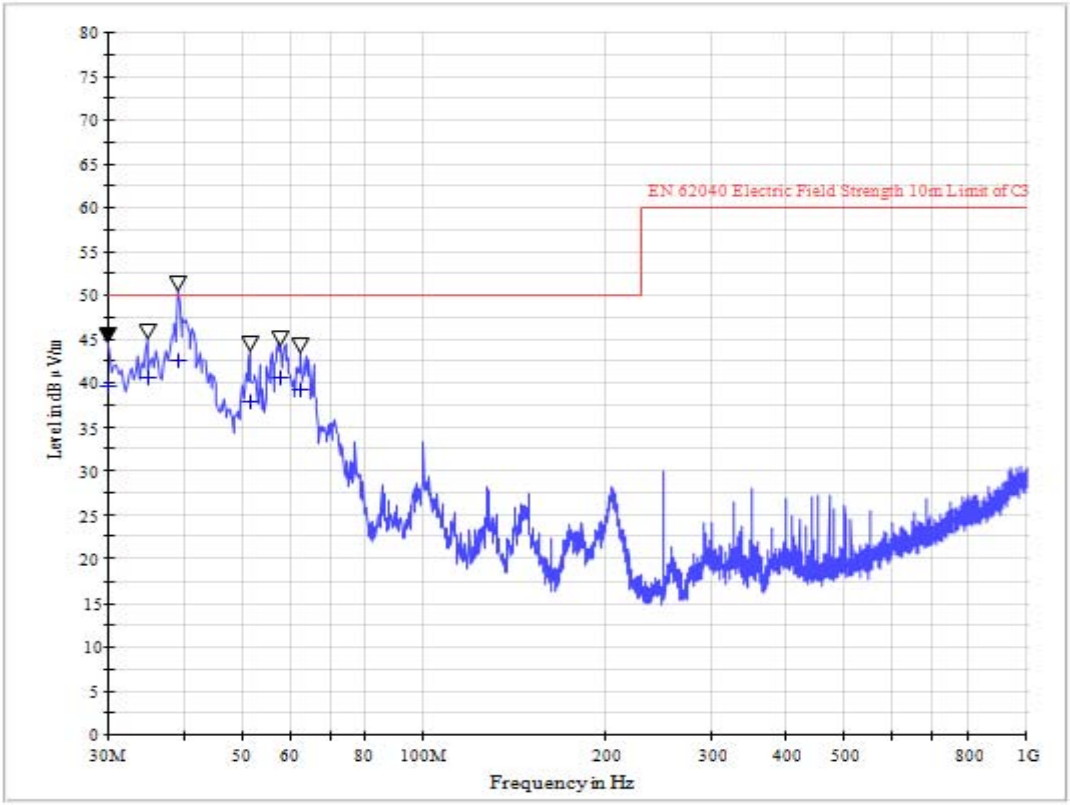


2. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Horizontal

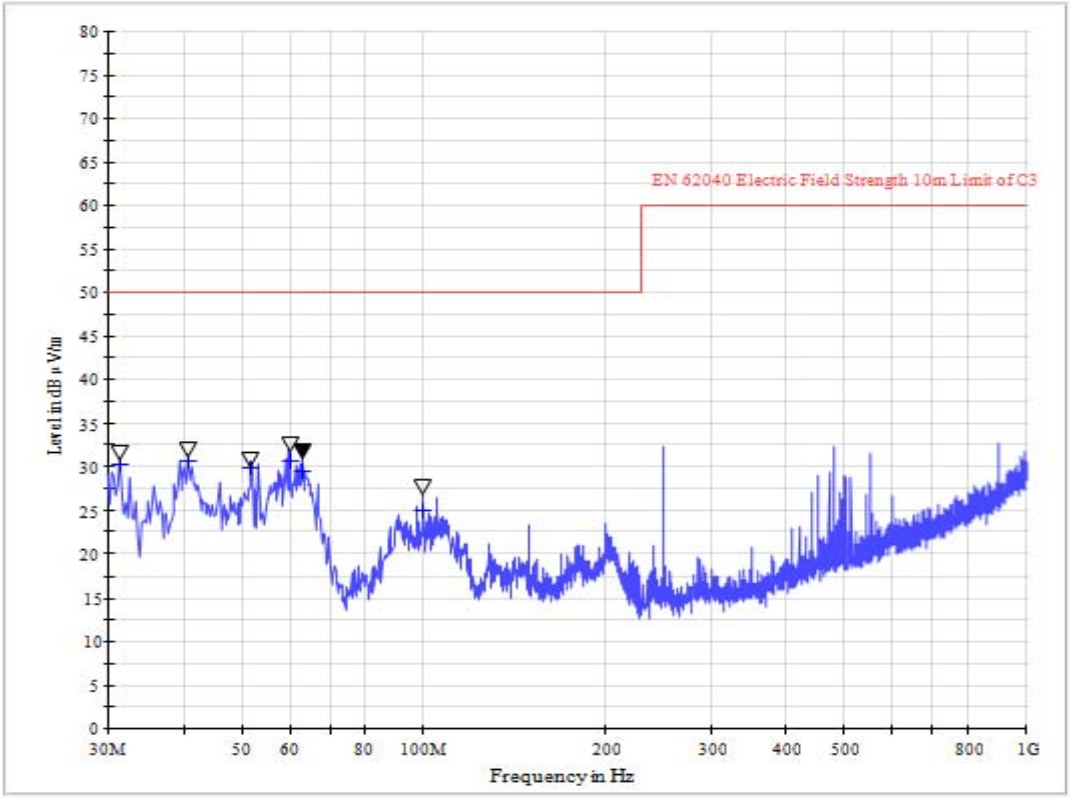


10kVA Model 1:

1. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Vertical

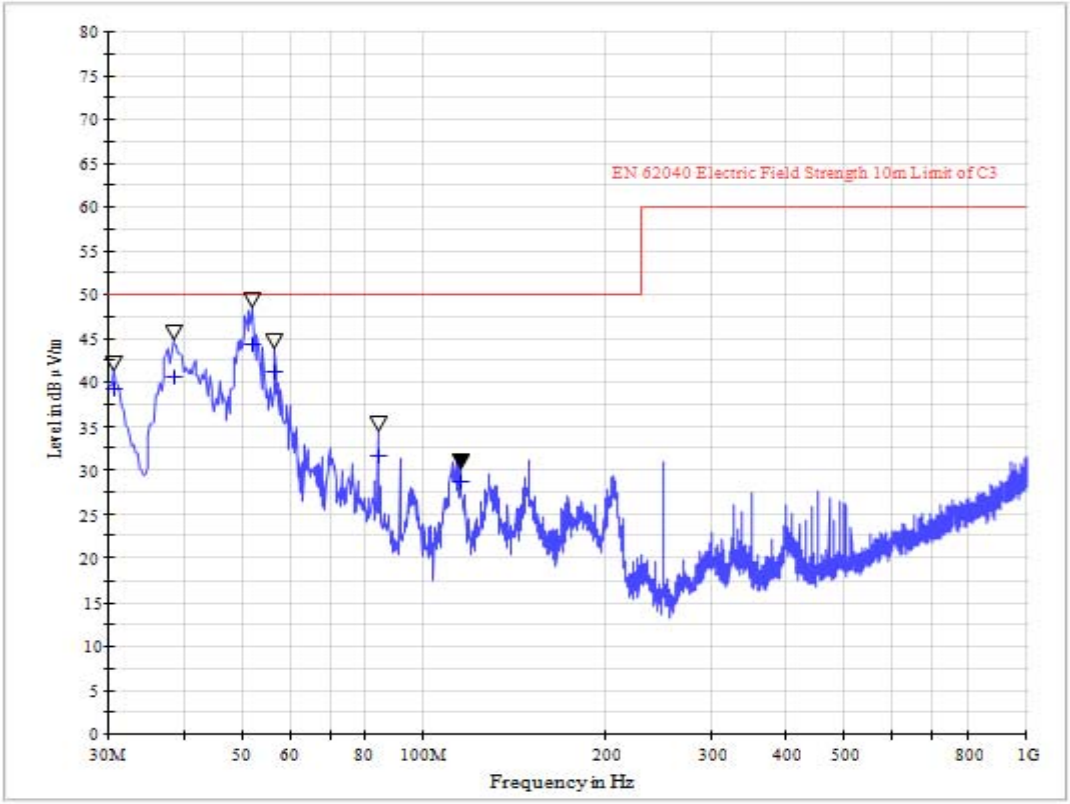


2. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Horizontal

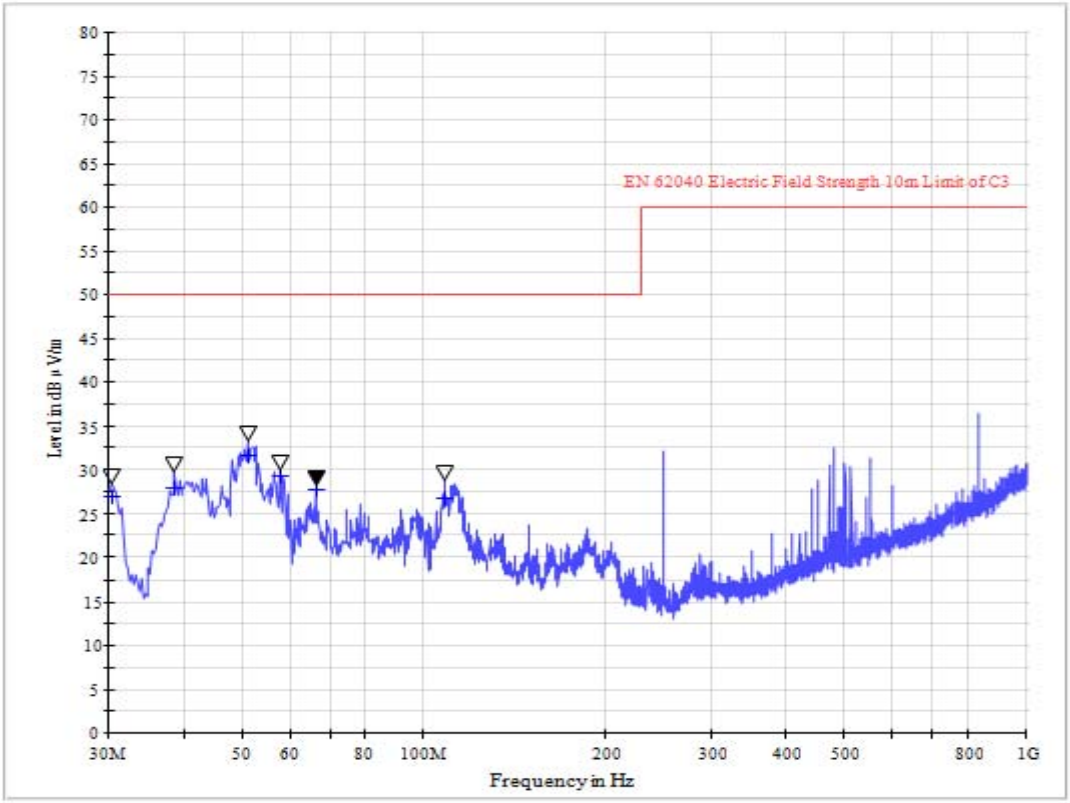


10kVA Model 2:

1. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Vertical



2. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Horizontal



4 Immunity Test

4.1 EUT Setup and Operating Conditions

The EUT was powered by 380VAC mains and continuously operated.
Environment Condition:
Temperature: 24°C; Relative Humidity: 55%; Pressure:101kPa
Test Date: 2017-01-05~2017-02-16
Test Engineer: Jiang Haibiao
Test Site: EMC Lab

4.2 Performance Criteria

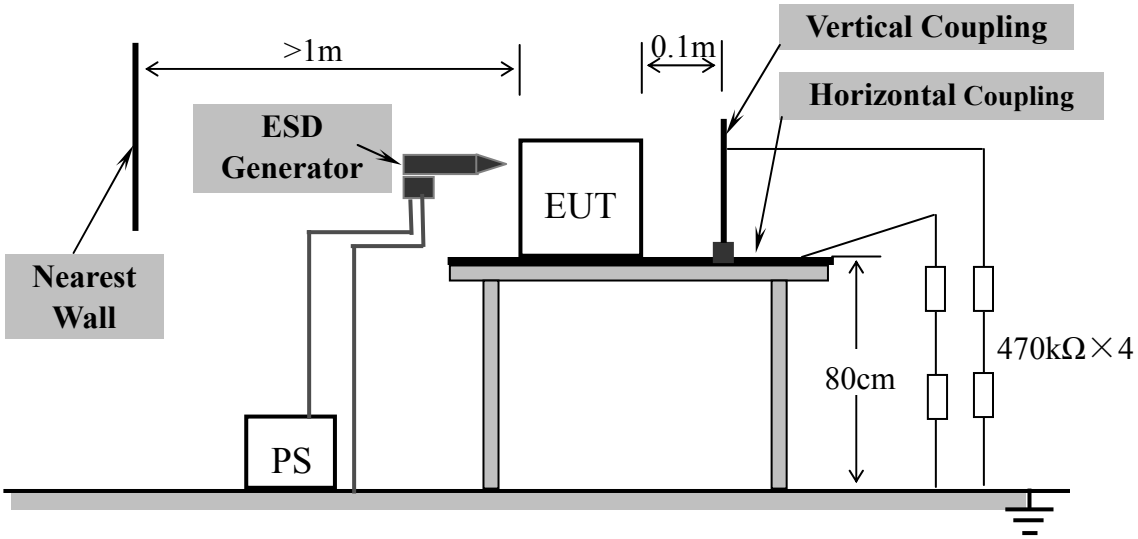
Criterion A	The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
Criterion B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
Criterion C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

4.3 Electrostatic Discharge Immunity Test

4.3.1 Test Specification

Basic Standard:	IEC 61000-4-2
Discharge Impedance	330Ω / 150 pF
Discharge Voltage:	Air Discharge : 8 kV Contact Discharge : 4kV
Polarity:	Positive / Negative
Number of Discharge:	Minimum 20 times at each test point
Discharge Mode:	Single discharge
Discharge Period:	1-second minimum
Criterion:	B

4.3.2Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

4.3.3 Test Result

Test Points	Discharge Level (kV)	Discharge Mode	Observation	Comply with Criterion
Aperture of the cover	±8	Air	Note(1)	A
Screen	±8	Air	Note(1)	A
Button	±8	Air	Note(1)	A
Metallic shell	±4	Contact	Note(1)	A
HCP	±4	Contact	Note(1)	A
VCP	±4	Contact	Note(1)	A

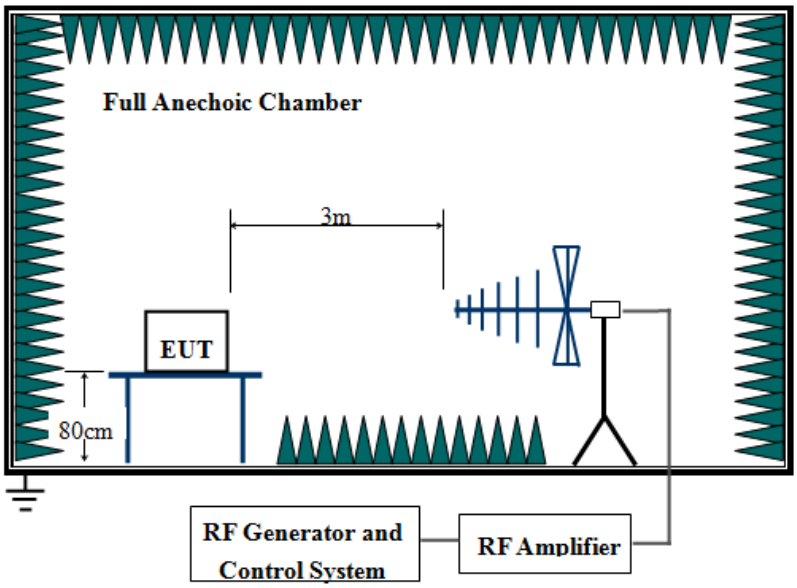
NOTE:
(1). The EUT continued to operate as intended. No degradation of performance was observed.

4.4 Radiated, Radio Frequency Electromagnetic Field Immunity Test

4.4.1 Test Specification

Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz – 1000MHz
Field Strength:	10V/m
Modulation:	1kHz sine wave, 80%, AM modulation
Frequency Step:	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance:	3m
Antenna Height:	1.5m
Dwell Time:	3 seconds
Criterion:	A

4.4.2 Test Setup



4.4.3 Test Result

Frequency	Polarity	Azimuth	Field Strength (V/m)	Observation	Comply with Criterion
80-1000 MHz	V&H	0,90,180, 270	10	Note(1)	A

NOTE:

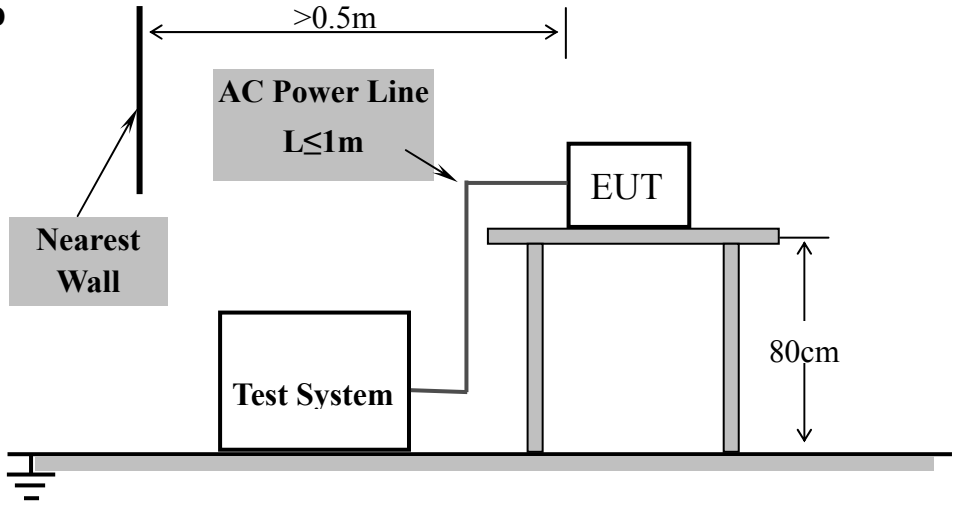
(1). The EUT continued to operate as intended. No degradation of performance was observed.

4.5 Electrical Fast Transient/Burst Immunity Test

4.5.1 Test Specification

Basic Standard:	IEC 61000-4-4
Test Voltage:	AC. power port:2 kV
Polarity:	Positive/Negative
Impulse Frequency:	5kHz
Impulse wave shape:	5/50ns
Burst Duration:	15ms
Burst Period:	300ms
Test Duration:	Not less than 1 min.
Criterion:	B

4.5.2 Test Setup



4.5.3 Test Result

Test Point	Polarity	Test Level (kV)	Observation	Comply with Criterion
AC Power Port	+/-	2	Note (1)	A

NOTE:

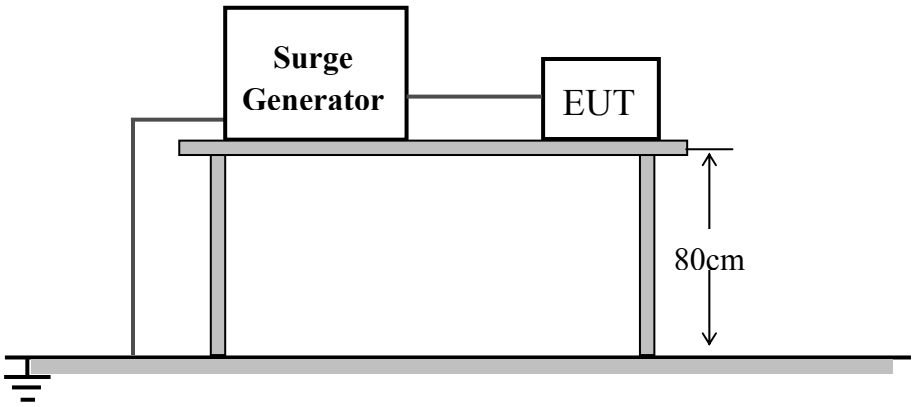
(1). The EUT continued to operate as intended. No degradation of performance was observed.

4.6 Surge Immunity Test

4.6.1 Test Specification

Basic Standard:	IEC 61000-4-5
Waveform:	Voltage 1.2/50 μs; Current 8/20 μs
Test Voltage:	a.c. power port, line to line 1kV, line to earth 2kV
Polarity:	Positive/Negative
Phase Angle:	0°, 90°, 180°, 270°
Repetition Rate:	60sec
Times:	5 time/each condition.
Criterion:	B

4.6.2 Test Setup



4.6.3 Test Result

Coupling Line	Polarity	Voltage (kV)	Observation	Comply with Criterion
AC power, Line-Line	+/-	1	Note (1)	A
AC power, Line-Earth	+/-	2	Note (1)	A

NOTE:

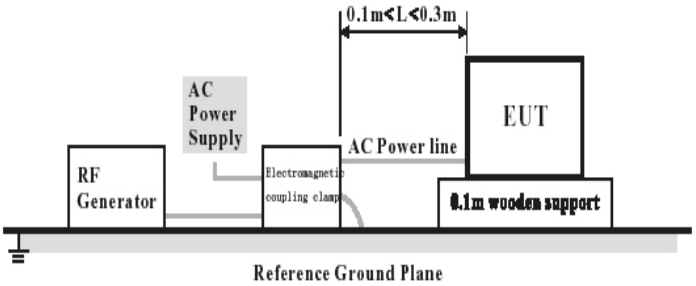
(1). The EUT continued to operate as intended. No degradation of performance was observed.

4.7 Immunity to Conducted Disturbances Induced by RF Fields

4.7.1 Test Specification

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz – 80 MHz
Field Strength:	10V
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1% of fundamental
Coupled Cable:	AC. power line
Coupling Device:	Electromagnetic coupling clamp
Criterion:	A

4.7.2 Test Setup



4.7.3 Test Result

Test Point	Frequency	Field Strength (Vrms)	Observation	Comply with criterion
AC power line	0.15 – 80 MHz	10	Note(1)	A

NOTE:

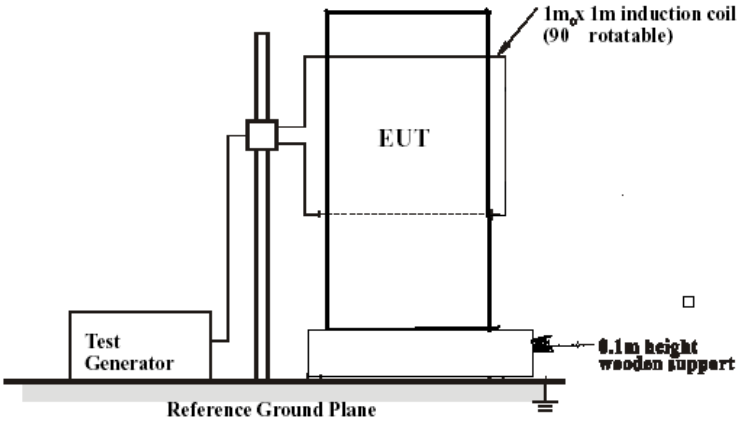
(1). The EUT continued to operate as intended. No degradation of performance was observed.

4.8 Power Frequency Magnetic Field Immunity Test

4.8.1 Test Specification

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	30A/m
Observation Time:	2 minute
Inductance Coil:	Rectangular type, 1m×1m
Criterion:	B

4.8.2 Test Setup



4.8.3 Test Result

Direction	Field Strength(A/m)	Observation	Comply with Criterion
X	30	Note(1)	A
Y	30	Note(1)	A
Z	30	Note(1)	A

NOTE:

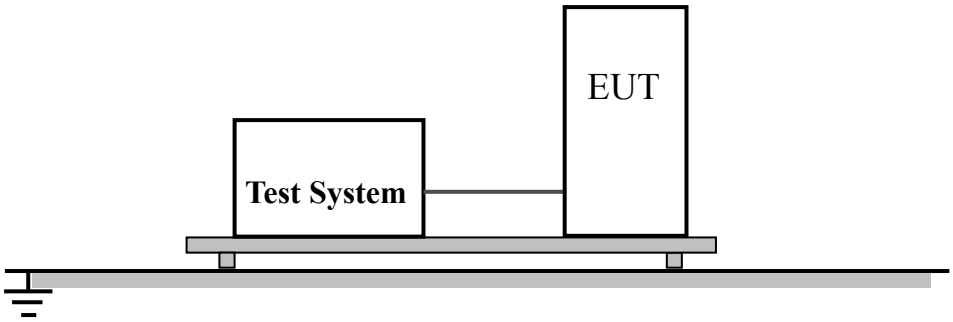
(1). The EUT continued to operate as intended. No degradation of performance was observed

4.9 Power line harmonics and inter-harmonics

4.9.1 Test Specification

Basic Standard:	IEC 61000-2-2
Disturbing Voltage:	10V
Frequency:	140 Hz to 360 Hz
Criterion:	A

4.9.2 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

4.9.3 Test Result

Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Harmonics and Interharmonics	IEC 61000-2-4 10V	2.5	Note (1)	A

Note:

(1). The EUT continued to operate as intended after test. Loss of function was observed.

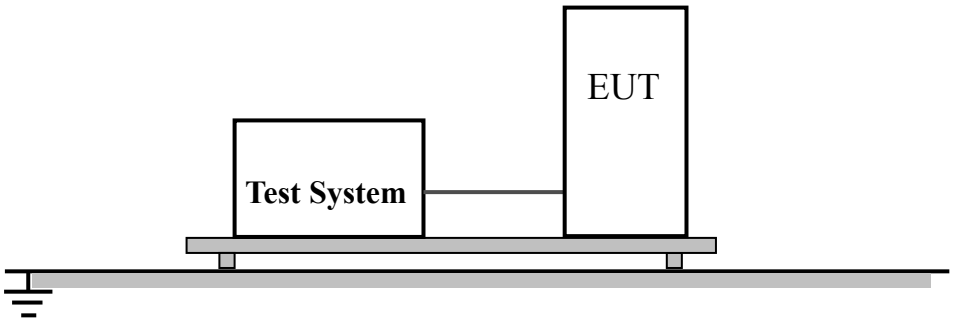
(2). The EUT continued to operate as intended after test. Temporary loss of function was observed during test.

4.10 Power line unbalance

4.10.1 Test Specification

Basic Standard:	IEC 61000-2-2
Voltage unbalance:	Level-Class 3, 3% negative sequence component, 10 min durations
Power frequency variation:	±4%
Frequency rate of change:	±2%
Criterion:	A

4.10.2 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

4.10.3 Test Result

Phenomenon	Reference document and level	Operating time (min.)	Observation	Comply with Criterion
Voltage unbalance	IEC 61000-2-4 3% negative sequence component	10	Note (1)	A

Note:

1) The EUT continued to operate as intended. No degradation of performance was observed.

Appendix I: Photographs of the EUT

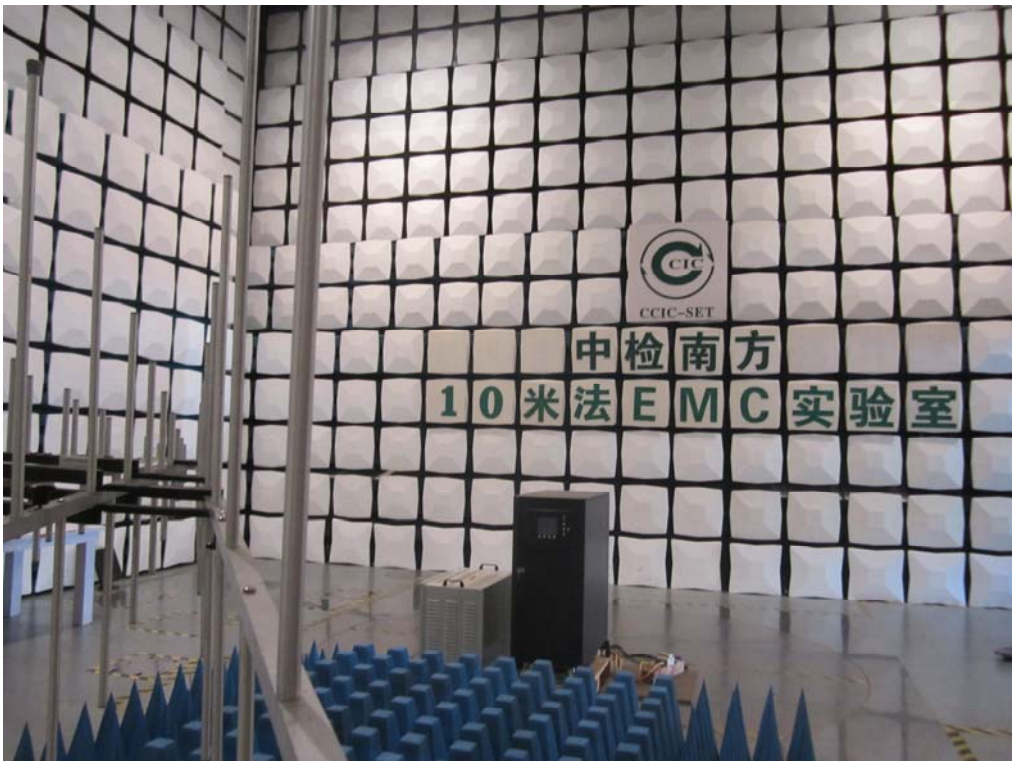
Appendix II: Photographs of EMC Test Configuration

1. Mains Terminal Disturbance Voltage Measurement

2. Radiated Field Strength Measurement

3. Electrostatic Discharge Immunity Test

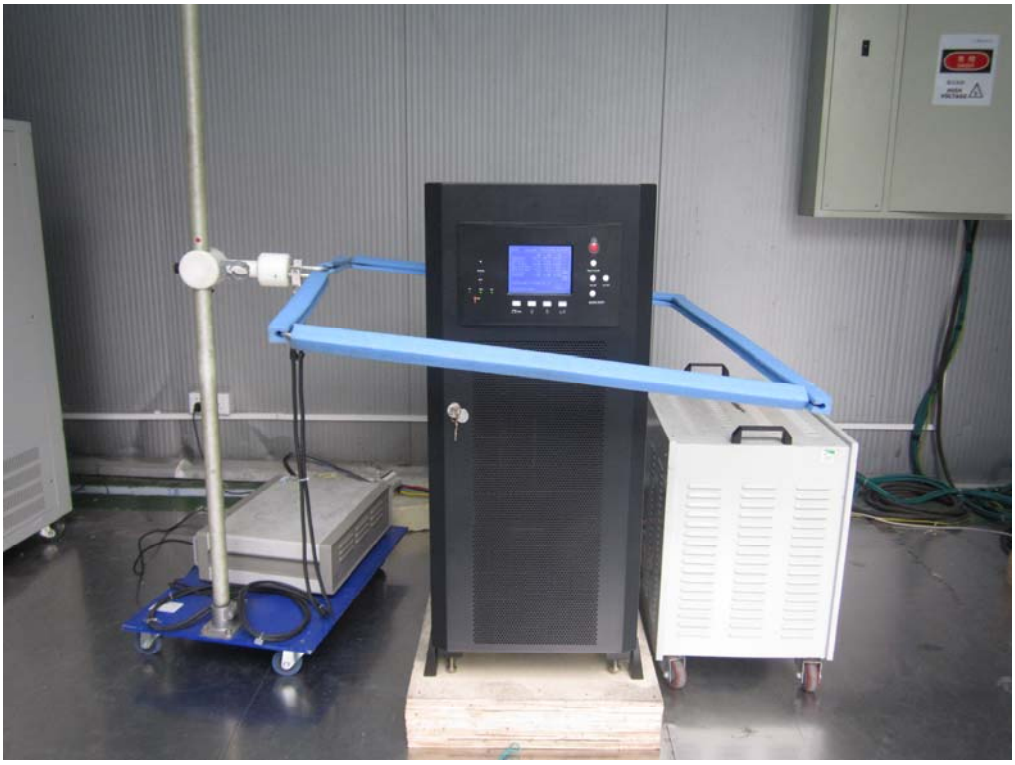
4. Radiated, Radio Frequency Electromagnetic Field Immunity Test



5. Electrical Fast Transient/Burst Immunity Test, Surge Immunity Test

6. Immunity to Conducted Disturbances Induced by RF Fields

7. Power Frequency Magnetic Field Immunity Test



8. Power line harmonics and inter-harmonics

STATEMENT

1. **The test report is invalid without stamp of laboratory.**
2. **The test report is invalid without signature of person(s) testing and authorizing.**
3. **The test report is invalid if erased and corrected.**
4. **Test results of the report are valid to the test samples if sampling by client.**
5. **"☆" project was not maintained by CNAS recognition and CMA.**
6. **The test report shall not be reproduced except in full, without written approval of the laboratory.**
7. **If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.**

Address: Electronic Testing Building, No. 43 Shahe Road, Xili Jiedao, Nanshan District, Shenzhen, Guangdong, China
P.C.: 518055

TEL: 0755-26628093, 26627338 FAX: 0755-26627238
Internet: http://www.ccic-set.com E-Mail: manager@ccic-set.com