EMC Test Report

Applicant	:	Cermate Technologirs Inc.
Product Type	:	Human machine interface
Trade Name	:	Cermate
Model Number	:	IT407-22ST,NT407-22ST,MT407-22ST,KT407-22ST,RT407-22ST,PT407-22ST FT407-22ST,GT407-22ST,HT407-22ST,OT407-22ST,VT407-22ST,PT2070-22ST NT2070-22ST,MT2070-22ST,KT2070-22ST,RT2070-22ST,FT2070-22ST,GT2070-22ST HT2070-22ST,OT2070-22ST,VT2070-22ST,IT2070-22ST,IPT2070-22ST,xPT2070-22ST GPT2070-22ST,xIT407-22ST,GIT407-22ST
Applicable Standard	:	EN 61000-6-2: 2005 +AC: 2005 EN 61000-6-4: 2007 +A1:2011 EN 61000-3-2:2014 EN 61000-3-3:2013+A1:2019
Received Date	:	Jan. 21, 2021
Test Period	:	Jan. 29 ~ Mar. 22, 2021
Issued Date	:	Apr. 01, 2021

Issued by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C.)
Tel：+886-3-2710188 / Fax：+886-3-2710190

Testing Laboratory
1330

Taiwan Accreditation Foundation accreditation number: 1330
Certified Scope: 9 kHz ~ 6 GHz

Note:
1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
2.This report shall not be reproduced except in full, without the written approval of A Test Lab Technology Corporation.
3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Revision History

Rev.	Issued Date	Revisions	Revised By
00	Apr. 01, 2021	Initial Issue	Yutsen Chou

Verification of Compliance

Applicant	:	Cermate Technologirs Inc.
Product Type	:	Human machine interface
Trade Name	:	Cermate
Model Number	:	IT407-22ST,NT407-22ST,MT407-22ST,KT407-22ST,RT407-22ST,PT407-22ST FT407-22ST,GT407-22ST,HT407-22ST,OT407-22ST,VT407-22ST,PT2070-22ST NT2070-22ST,MT2070-22ST,KT2070-22ST,RT2070-22ST,FT2070-22ST,GT2070-22ST HT2070-22ST,OT2070-22ST,VT2070-22ST,IT2070-22ST,IPT2070-22ST,xPT2070-22ST GPT2070-22ST,xIT407-22ST,GIT407-22ST
EUT Rated Voltage	:	DC 24 V, 0.8 A
Test Voltage	:	230 Vac / 50 Hz ; 100 Vac / 50 Hz
Applicable Standard	:	EN 61000-6-2: 2005 +AC: 2005 EN 61000-6-4: 2007 +A1:2011 EN 61000-3-2:2014 EN 61000-3-3:2013+A1:2019
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 33465, Taiwan (R.O.C.) Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330 http://www.atl-lab.com.tw/e-index.htm

The above equipment has been tested by A Test Lab Techno Corp., and found compliance with the requirements set forth in the Electromagnetic Compatibility Directive 2004/108/EC and technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By : Terry Ljao

(Manager) (Terry Liao)

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1 General Information

1.1 Summary of Test Result

Emission			
Standard	Item	Result	Remark
EN 61000-6-4:2007 +A1:2011. CISPR 22: 2008	Conducted Emission	PASS	Meet Class A limit
EN 61000-6-4:2007 +A1:2011 CISPR 22: 2008	Radiated Emission	PASS	Meet Class A limit
EN 61000-3-2:2014	Harmonic Current Emissions	N/A	The EUT power <75 W, so does not test.
EN 61000-3-3: 2013+A1:2019	Voltage Fluctuations & Flicker	PASS	Meets the requirements

Immunity			
Standard	Item	Result	Remark
EN 61000-4-2: 2009	ESD	PASS	Meets the requirements of Criterion B
EN 61000-4-3: 2006 +A1:2008 +A2:2010	RS	PASS	Meets the requirements of Criterion A
EN 61000-4-4: 2012	EFT	PASS	Meets the requirements of Criterion B
EN 61000-4-5: 2014/A1:2017	Surge	PASS	Meets the requirements of Criterion B
EN 61000-4-6: 2014	CS	PASS	Meets the requirements of Criterion A
EN 61000-4-8:2010	PMF	PASS	Meets the requirements of Criterion A
EN 61000-4-11: 2004+A1:2017	Voltage dips & voltage variations	PASS	Meets the requirements of Voltage Dips: 1) 0% residual voltage Criterion B 2) 40% residual voltage Criterion C 3) 70% residual voltage Criterion C Voltage Interruptions: 1) 0% residual voltage Criterion C

Decision Rule

■ Uncertainty is not included.

□ Uncertainty is included.

1.2 Measurement Uncertainty

Test Item		Frequency Range	Uncertainty (dB)
Conducted Emission	AC Power Port	9 kHz ~ 150 kHz	± 2.7
		150 kHz ~ 30 MHz	± 2.7
	Telecommunication Port	150 kHz ~ 30 MHz	± 2.8
	Current Probe	150 kHz ~ 30 MHz	± 2.9

Test Item	Test Site	Frequency Range		Uncertainty (dB)
Radiated Emission	TE06	30 MHz ~ 1000 MHz	Horizontal	± 4.4
			Vertical	± 4.5
	TE01	1000 MHz ~ 6000 MHz		± 5.2
	TE09	1000 MHz ~ 6000 MHz		± 5.0
Note: The Vertical and Horizontal measurement uncertainty of 1 GHz to 6 GHz is evaluated and choose which polarity is worst value.				

Test Item		Uncertainty
Harmonic Current Emission		± 1 %+10 mA
Voltage Fluctuations and Flicker	Pst	± 8.0 %
Electrostatic Discharge	Voltage	1.9 %
	Current	4.2 %
	Rise time	6.9 %
Radiated Susceptibility		2.85 dB
Electrical Fast Transient/Burst	Voltage Peak	± 6.1 %
	Timing	± 5.1 %
	Repetition Frequency	± 5.1 %
	Burst Duration	± 5.1 %
	Burst Period	± 5.1 %
Surge	Open Circuit Voltage (1.2/50 μs)	5.6 %
	Open Circuit Timing	4.7 %
	Short Circuit Current (1.2/50 μs)	4.8 %
	Short Circuit Timing	3.4 %
	Surge EUT Power Phase Shifting	2.3 %
	Open Circuit Voltage (10/700 μs)	5.6 %
	Short Circuit Current (10/700 μs)	4.6 %
Conducted Susceptibility	CDN	3.4 dB
	EM Clamp/Direct Injection	2.9 dB
Power Frequency Magnetic Field		3.6 %
Voltage Dips and Interruption	DIP Function Check	17 %
	VAR Function Check	17 %

1.3 Test Site Environment

Test Item	Required (IEC 60068-1)		Actual
Conducted Emission	Temperature (°C)	15-35	15-30
	Humidity (%RH)	25-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005
Radiated Emission	Temperature (°C)	15-35	15-30
	Humidity (%RH)	25-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005
Voltage Fluctuations & Flicker	Temperature (°C)	--	15-30
	Humidity (%RH)	--	45-75
	Barometric pressure (mbar)	--	990-1005
ESD	Temperature (°C)	15-35	15-30
	Humidity (%RH)	30-60	42-48
	Barometric pressure (mbar)	860-1060	990-1005
RS	Temperature (°C)	--	15-30
	Humidity (%RH)	--	45-75
	Barometric pressure (mbar)	--	990-1005
EFT	Temperature (°C)	15-35	15-30
	Humidity (%RH)	25-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005
Surge	Temperature (°C)	15-35	15-30
	Humidity (%RH)	10-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005
CS	Temperature (°C)	--	15-30
	Humidity (%RH)	--	45-75
	Barometric pressure (mbar)	--	990-1005
PMF	Temperature (°C)	15-35	15-30
	Humidity (%RH)	25-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005
Voltage Dips & Voltage Variations	Temperature (°C)	15-35	15-30
	Humidity (%RH)	25-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005

2 EUT Description

Applicant	Cermate Technologirs Inc. 7F-1, No.168, Lien Cheng Rd., Chung-Ho District, New Taipei City, Taiwan 235
Manufacturer	Cermate Technologirs Inc. 7F-1, No.168, Lien Cheng Rd., Chung-Ho District, New Taipei City, Taiwan 235
Product Type	Human machine interface
Trade Name	Cermate
Model Number	IT407-22ST,NT407-22ST,MT407-22ST,KT407-22ST,RT407-22ST,PT407-22ST FT407-22ST,GT407-22ST,HT407-22ST,OT407-22ST,VT407-22ST,PT2070-22ST NT2070-22ST,MT2070-22ST,KT2070-22ST,RT2070-22ST,FT2070-22ST,GT2070-22ST HT2070-22ST,OT2070-22ST,VT2070-22ST,IT2070-22ST,IPT2070-22ST,xPT2070-22ST GPT2070-22ST,xIT407-22ST,GIT407-22ST
Difference description of model number	Difference is due to selling region.
I/O Ports	Refer to User Manual
Highest Operating Frequency	300 MHz

3 Test Methodology

3.1. Decision of Test Mode

3.1.1 The following test mode(s) were scanned during the preliminary test:

Pre-Test Mode
Mode 1: Normal Operation Mode (100 V / 50 Hz) Mode 2: Normal Operation Mode (230 V / 50 Hz)

3.1.2 After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode			
EMI	Conducted Emission		Mode 1 / Mode 2
	Radiated Emission	Below 1 GHz	Mode 1 / Mode 2
		Above 1 GHz	Mode 1 / Mode 2
	Harmonic Current Emissions		N/A
	Voltage Fluctuations & Flicker		Mode 2
EMS	ESD		Mode 2
	RS		Mode 2
	EFT		Mode 2
	Surge		Mode 2
	CS		Mode 2
	PMF		Mode 2
	Voltage Dips & Voltage Variations		Mode 2

Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.

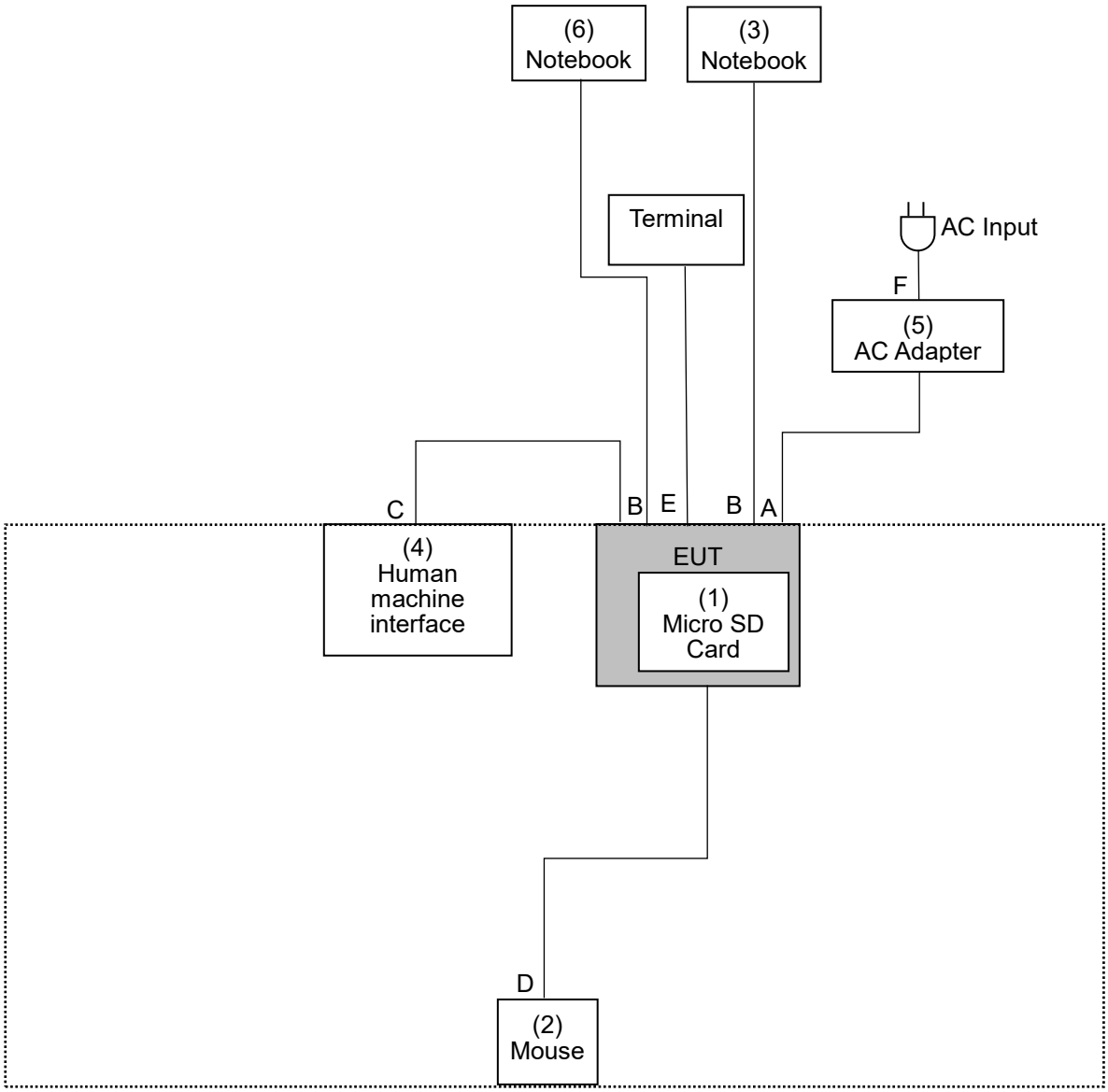
3.2. EUT Test Step

1.Setup the EUT and simulators as shown on 3.3.
2.Turn on the power of all equipment.
3.Data will be communicated between EUT and Notebook, that is connected to LAN Port of EUT and Notebook.
4.Connected Human machine interface and transfer data(Read/Write).
5.Start to test till get the worst reading.

Measurement Software			
No.	Description	Software	Version
1	Conducted Emission	EZ EMC	1.1.4.3
2	Radiated Emission _ Below 1 GHz	EZ EMC	1.1.4.2
3	Radiated Emission _ Above 1 GHz	EZ EMC	1.1.4.4
4	Voltage Fluctuations & Flicker	Harcs	4.20.0.0
5	RS	EMC-RS	2.0.1.3
6	CS	EMC-CS	2.0.1.2

3.3. Configuration of Test System Details

Mode 1 / Mode 2



Signal Cable Type		Signal Cable Description
A	DC Power Cable	Non-Shielded, 1.5 m
B	LAN Cable	Non-Shielded, 5.0 m
C	COM1/COM2 Cable	Shielded, 2.8 m
D	USB Cable	Shielded, 1.2 m
E	USB Cable	Shielded, 1.8 m
F	AC Power Cable	Non-Shielded, 0.8 m

Devices Description					
Product		Manufacturer	Model Number	Serial Number	Power Cord
(1)	Micro SD Card	SanDisk	16GB	N/A	N/A
(2)	Mouse	DELL	MOCZL	CN-049 TWY-73826-63N015S	Power by EUT
(3)	Notebook	DELL	LATITUDE E5440	25627158361	Non-Shielded, 1.8 m
(4)	Human machine interface	Cermate	IT407-22ST-F4B4	07127GXC000005	Non-Shielded, 1.5 m
(5)	AC Adapter	MEAN WELL	SE-100-24	N/A	Non-Shielded, 1.5 m
(6)	Notebook	DELL	LATITUDE E5440	6699565657	Non-Shielded, 1.8 m

3.4. Test Instruments

Test Period : Jan. 29 ~ Feb. 23, 2021

Testing Engineer : Shenglung Wen

Conducted Emission test site					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Test Receiver	R&S	ESCI	100367	05/25/2020	1 year
LISN	R&S	ENV216	101040	03/23/2020	1 year
LISN	R&S	ENV216	101041	04/06/2020	1 year
ISN	TESEQ	ISN-T8	34413	06/01/2020	1 year
Cable	Woken	00100D1380194M	TE-02-03 (CB-098)	05/26/2020	1 year
Test Site	ATL	TE02	TE02	N.C.R.	-----

Test Period : Feb. 25 ~ Mar. 10, 2021

Testing Engineer : Andy Liu, Jacky Wu

Radiated Emission - 10 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Amplifier	EMCI	EMC9135	980298	11/02/2020	1 year
Amplifier	EMCI	EMC9135	980299	11/30/2020	1 year
Test Receiver	R&S	ESCI	100722	10/28/2020	1 year
Test Receiver	R&S	ESCI	101000	11/27/2020	1 year
Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	670	11/11/2020	1 year
Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	671	11/26/2020	1 year
RF Cable	EMC	EMC102-N-N-6000	TE06-H-1	02/15/2021	1 year
RF Cable	EMC	EMC102-N-N-7000	TE06-H-2	02/15/2021	1 year
RF Cable	EMC	EMC102-N-N-3000	TE06-H-3	02/15/2021	1 year
RF Cable	EMC	EMC102-N-N-1000	TE06-H-4	02/15/2021	1 year
RF Cable	EMC	EMC102-N-N-7000	TE06-V-2	02/15/2021	1 year
RF Cable	EMC	EMC102-N-N-3000	TE06-V-3	02/15/2021	1 year
RF Cable	EMC	EMC102-N-N-1000	TE06-V-4	02/15/2021	1 year
RF Cable	EMC	EMC104-N-N-6000	TE06-V-5	02/15/2021	1 year
Test Site	ATL	TE06	TE06	10/18/2020	1 year

Note: N.C.R. = No Calibration Request.

Test Period : Feb. 24, 2021

Testing Engineer : Terry Wu

Radiated Emission - 3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/30/2020	1 year
Amplifier (1-26.5 GHz)	Agilent	8449B	3008A02456	03/25/2020	1 year
Double Ridged Horn Antenna (1-18 GHz)	ETS	3117	00152321	09/23/2020	1 year
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/17/2021	1 year
Microwave Cable	EMCI	EMC104-SM-SM-13000	150503	02/17/2021	1 year
Spectrum Analyzer	Keysight	N9010A	MY52221312	01/18/2021	1 year
Test Site(VSWR)	ATL	TE09	TE09	04/11/2020	1 year

Test Period : Mar. 18, 2021

Testing Engineer : Serene Yang, Alex Chiu

Voltage Fluctuation and Flicker test site					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Power Harmonics Analyzers	EMC-Partner AG	HAR1000-1P	171	04/10/2020	2 years
Test Site	ATL	TE08	TE08	N.C.R.	-----

Test Period : Mar. 25, 2021

Testing Engineer : James Chen

Electrostatic Discharge test site					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Discharge Gun	Noiseken	ESS-B3011A	ESS 1868539	11/23/2020	1 year
0.8 m Height Wooden Table	N/A	N/A	N/A	N.C.R.	-----
Test Site	ATL	TE04	TE04	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

Test Period : Mar. 18, 2021

Testing Engineer : Serene Yang

Radiated Electromagnetic Field test site					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
SMB 100A SIGNAL GENERATOR	R&S	SMB100A	100724	09/18/2020	1 year
NRP-Z91 POWER SENSOR	R&S	NRP-Z91	100611	07/06/2020	1 year
WIDE BAND SENSOR	R&S	NRP-Z81	100017	07/06/2020	1 year
NRP POWER METER	R&S	NRP	101591	07/06/2020	1 year
Solid State Power Amplifier	R&K	GA020M102-5454F	830140	N.C.R.	-----
Direction Coupler	WERLATONE	C8686-714	109646	01/07/2021	1 year
Log-periodic Antenna	R&S	HL046	100046	N.C.R.	-----
RS Amplifier	MILMEGA	AS0860B-50/50	1078855	N.C.R.	-----
Direction Coupler	WERLATONE	C10117-10	113203	08/10/2020	1 year
Antenna	Schwarzbeck Mess-Elektronik	STLP 9149	9149-513	N.C.R.	-----
Test Site	ATL	TE07	TE07	N.C.R.	-----

Test Period : Mar. 22, 2021

Testing Engineer : Travis Kuo

Electrical Fast Transient / Surge / Power Frequency Magnetic Field / Voltage Dips and Interruption test site					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
EMC Immunity Tester	EMC-PARTNER AG	TRANSIENT 2000IN6	952	05/15/2020	1 year
EFT CLAMP	Noiseken	15-00001A	N/A	05/15/2020	1 year
Magnetic Field Antenna	EMC-PARTNER AG	MF1000-1	155	04/07/2020	1 year
Test Site	ATL	TE08	TE08	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

Test Period : Mar. 19, 2021

Testing Engineer : Serene Yang, Alex Chiu

Conducted Susceptibility test site					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Signal Line Coupling Decoupling Network	FCC	FCC-801-M2/M3-16A8030	8030	06/03/2020	1 year
Coupling Decoupling Network	TESEQ	CDN M016	41059	01/14/2021	1 year
CDN	TESEQ	CDN T8-10	41245	01/19/2021	1 year
EM Injection Clamp	FCC	F-203I-23MM	8576	07/08/2020	1 year
Power Meter	Boonton	4242-01	15205	07/06/2020	1 year
Power Sensor	Boonton	51013A-4E	36160	07/06/2020	1 year
Power Sensor	Boonton	51013A-4E	36161	07/06/2020	1 year
Signal Generator	R&S	SMJ100A	101061	06/03/2020	1 year
Dual Directional Coupler	ar	DC2600M2	329049	07/09/2020	1 year
Amplifiers	ar	75A250A	328729	N.C.R.	-----
Test Site	ATL	TE08	TE08	N.C.R.	-----

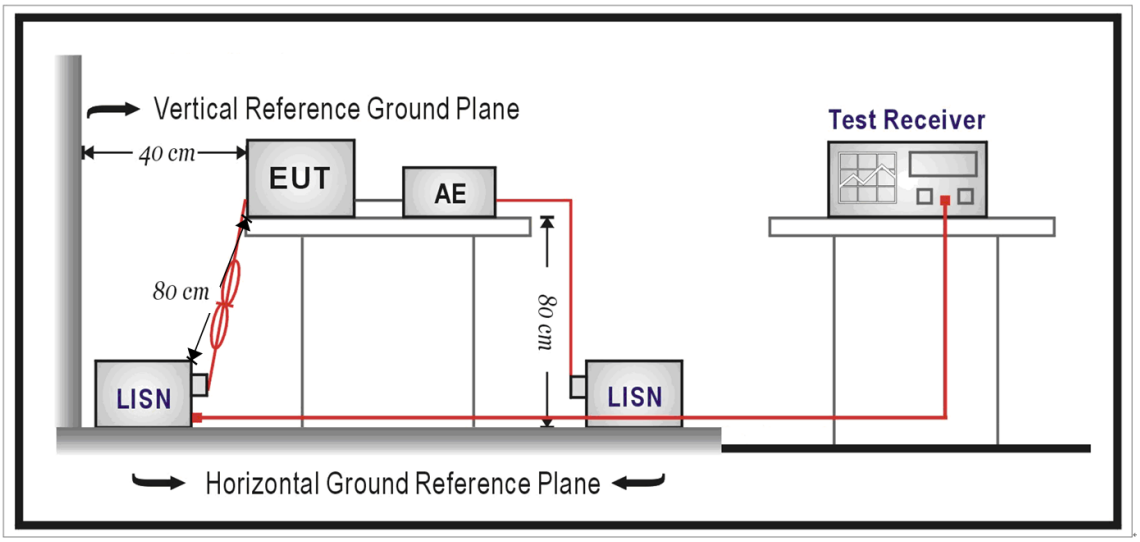
Note: N.C.R. = No Calibration Request.

4 Measurement Procedure

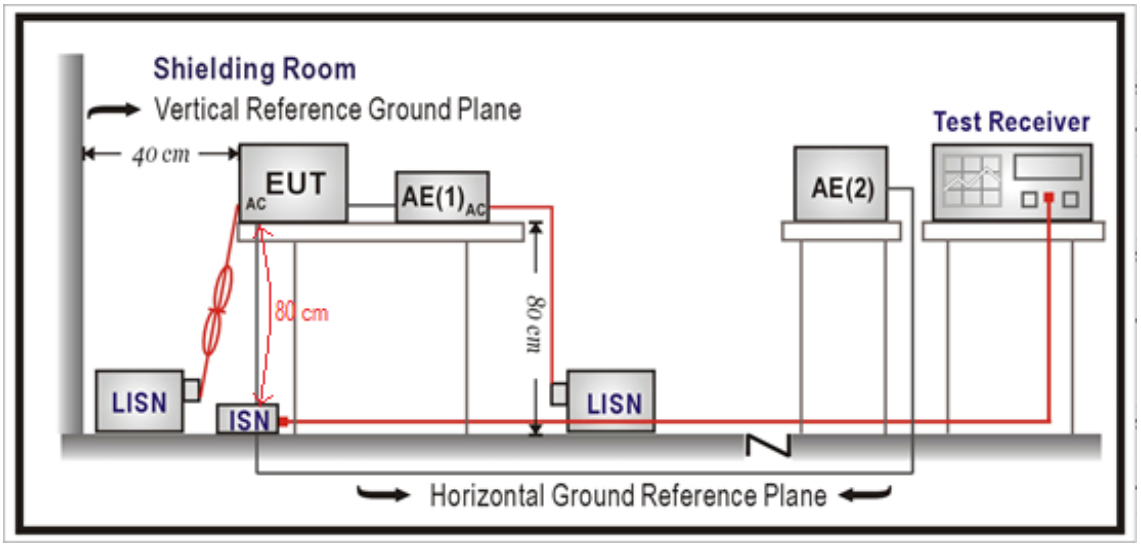
4.1. Conducted Emission

■ **Test Setup**

Power input/output ports setup



Telecommunication port setup



■ Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
The mains voltage shall be supplied to the EUT via the LISN when the measurement of telecommunication port is performed. The common mode disturbances at the telecommunication port shall be connected to the ISN.

For A.C. mains conducted interference, measured both sides of A.C. lines and carried out using quasi-peak and average detector receivers of maximum conducted interference.

For telecommunication port interference measurement, using ISNs with suitable longitudinal conversion losses (LCL) as defined in the port of specification from manufacture, and the LCL shall be meet the related standard requirement. Measured the line and carried out using quasi-peak and average detector receivers of maximum conducted interference.

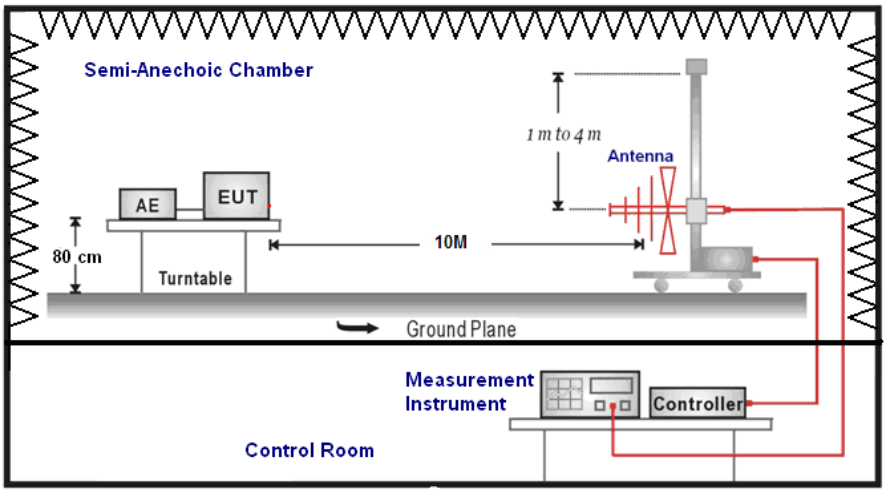
Conducted emissions were invested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1.2, as applicable, including the average limit and the quasi-peak limit when using respectively (A.C. mains and telecommunication port), an average detector and quasi-peak detector measured in accordance with the methods described of related standard. Either the voltage limits or the current limits shall be met. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

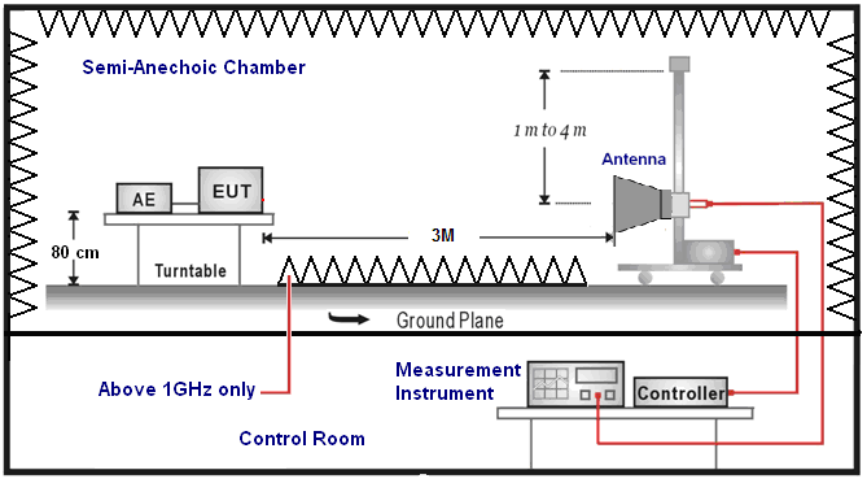
4.2. Radiated Emission

■ Setup

Below 1 GHz



Above 1 GHz



■ **Test Procedure**

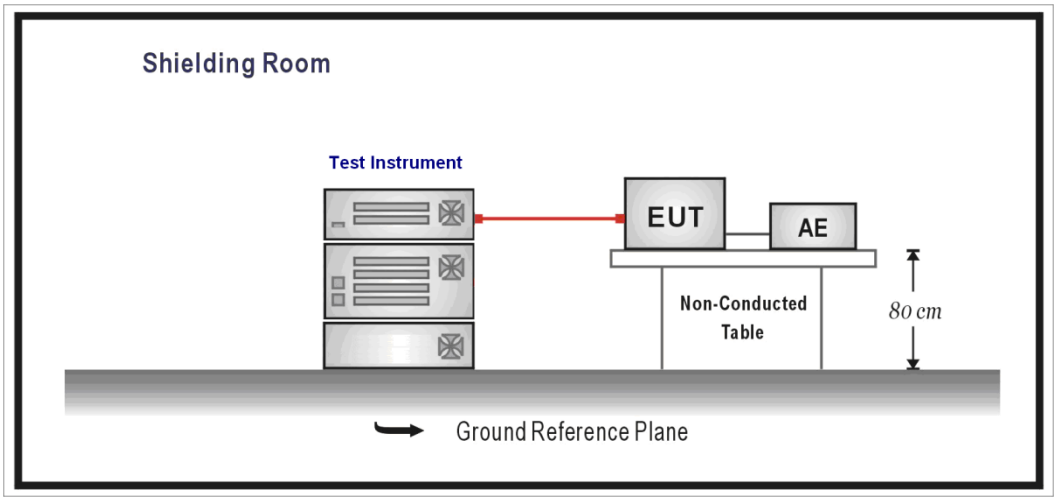
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. When the EUT is floor-standing equipment, it is placed on the ground plane which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 10 meters for under 1 GHz, and 3 meter for above 1 GHz if the highest internal source frequency of the EUT is higher than 108 MHz.

The highest internal source of a EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated on radiated measurement.
Radiated emissions were invested over the frequency range from 30MHz to1GHz using a receiver bandwidth of 120 kHz. Radiated was performed at an antenna to EUT distance of 10 meters.

4.3. Voltage Fluctuation and Flicker

■ Test Setup



■ Test Procedure

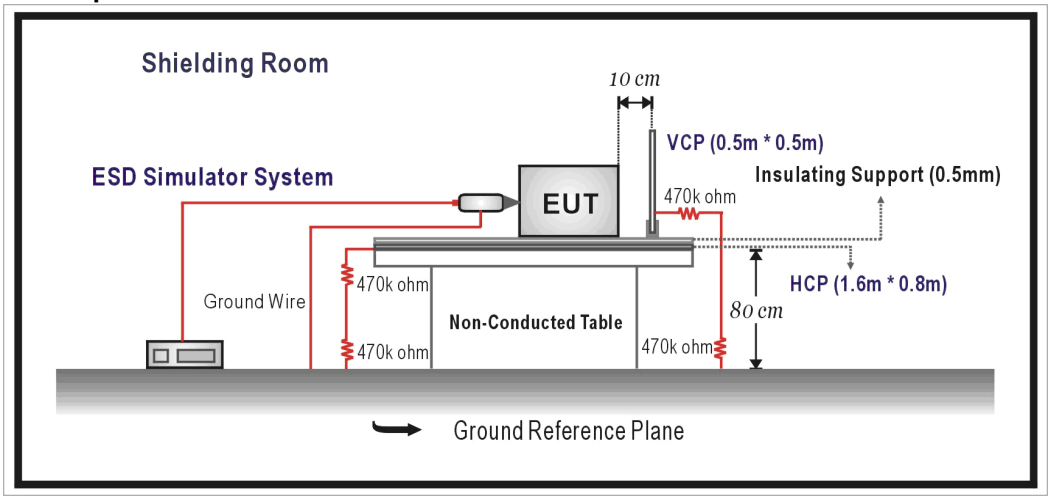
The EUT is supplied in series with power analyzer from a power source having the same normal voltage and frequency as the rated supply voltage and the equipment under test. And the rated voltage at the supply voltage of EUT of 0.94 times and 1.06 times shall be performed.

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.

During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

4.4. Electrostatic Discharge (ESD)

■ **Setup**



■ **Test Procedure**

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and coupling planes:

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 (HCP). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test point be 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.

b) Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with EN 61000-4-2:

a) The EUT was located 0.1 m minimum from all side of the HCP (dimensions 1.6 m x 0.8 m).

b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.

c) The time interval between two successive single discharges was at least 1 second.

d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

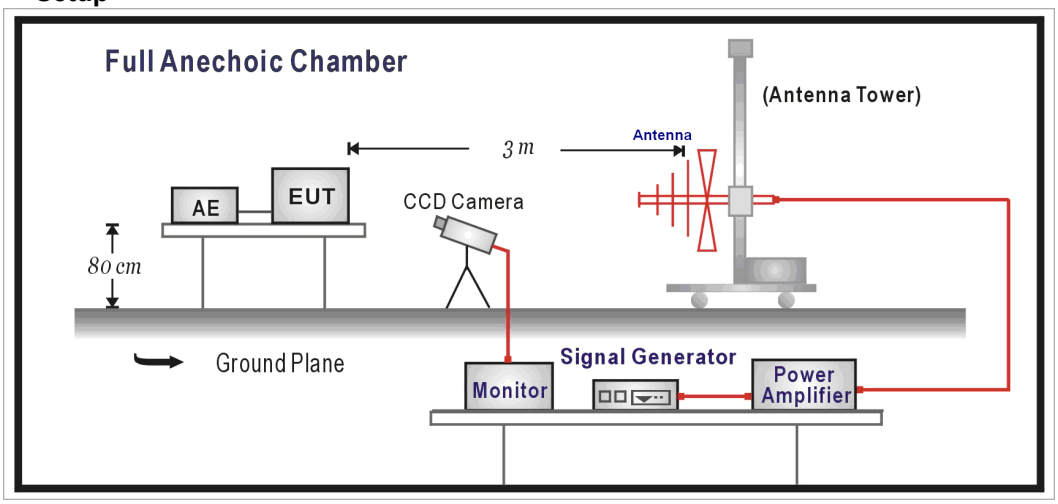
e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each HCP opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the HCP and perpendicular to its front edge during the discharge.

g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane (VCP) in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5 m x 0.5 m) was placed vertically to and 0.1 meters from the EUT.

4.5. Radiated Electromagnetic Field (RS)

■ **Setup**



■ **Test Procedure**

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna and six sides of the EUT are set on measurement.

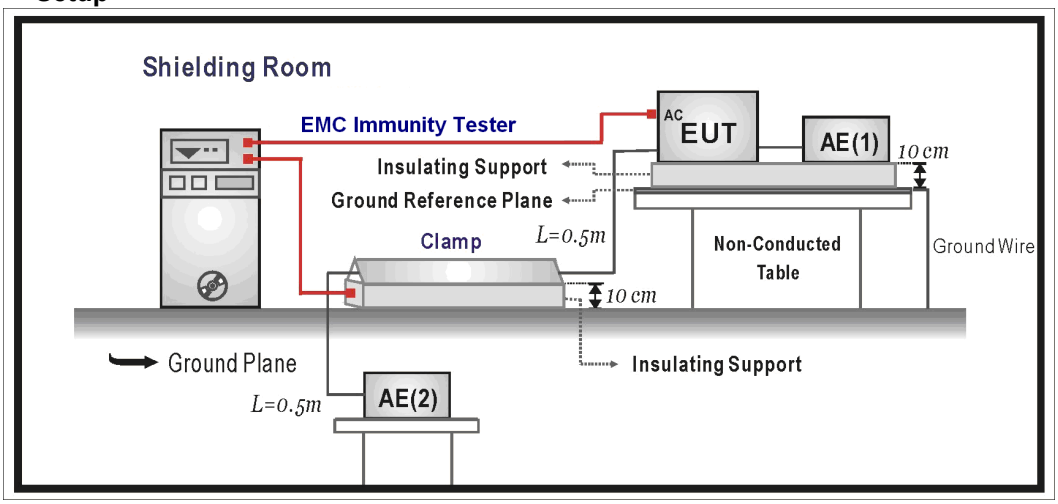
In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

All the scanning conditions are as follows:

	Condition of Test	Remarks
1.	Field Strength	3 V/M Level 2
2.	Radiated Signal	AM 80 % Modulated with 1 kHz
3.	Scanning Frequency	80 MHz – 1000 MHz
4.	Dwell Time	3 Seconds
5.	Frequency step size Δf :	1 %
6.	The rate of Swept of Frequency	1.5 x 10-3 decades/s

4.6. Electrical Fast Transient/Burst (EFT)

■ **Setup**



■ **Test Procedure**

a) Both positive and negative polarity discharges were applied.

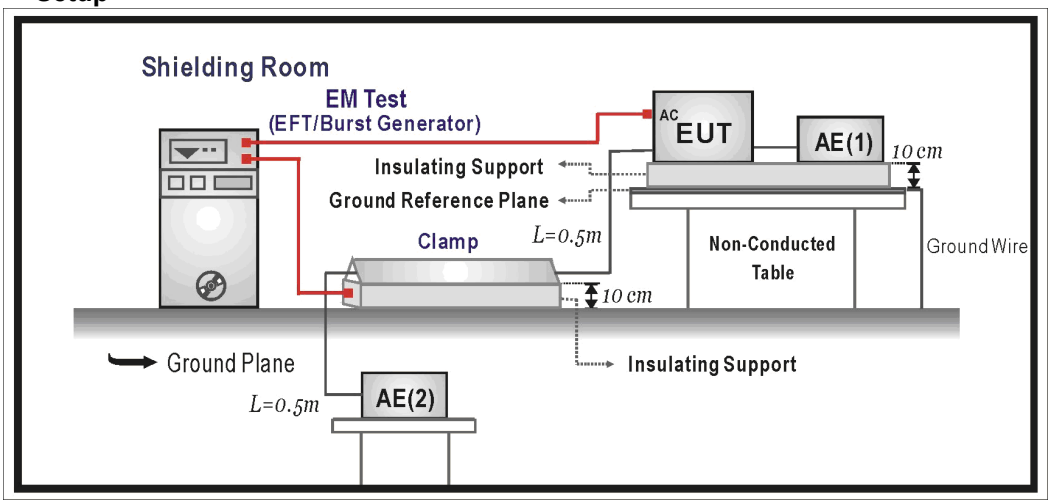
b) The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.

c) The duration time of each test sequential was 1 minute.

d) The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

4.7. Surge

■ **Setup**



■ **Test Procedure**

a) For EUT power supply:

The surge is 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 was shorter than 2 meters in length.

b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

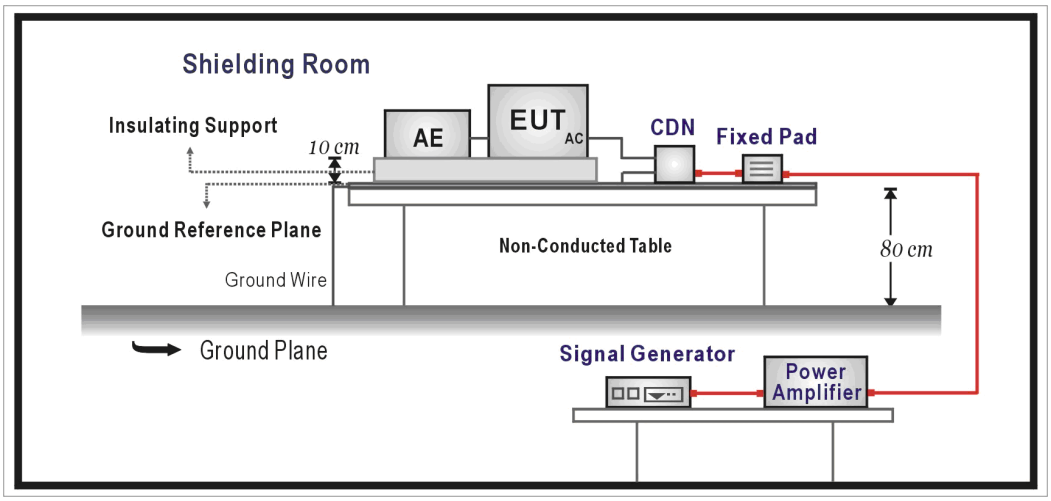
c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

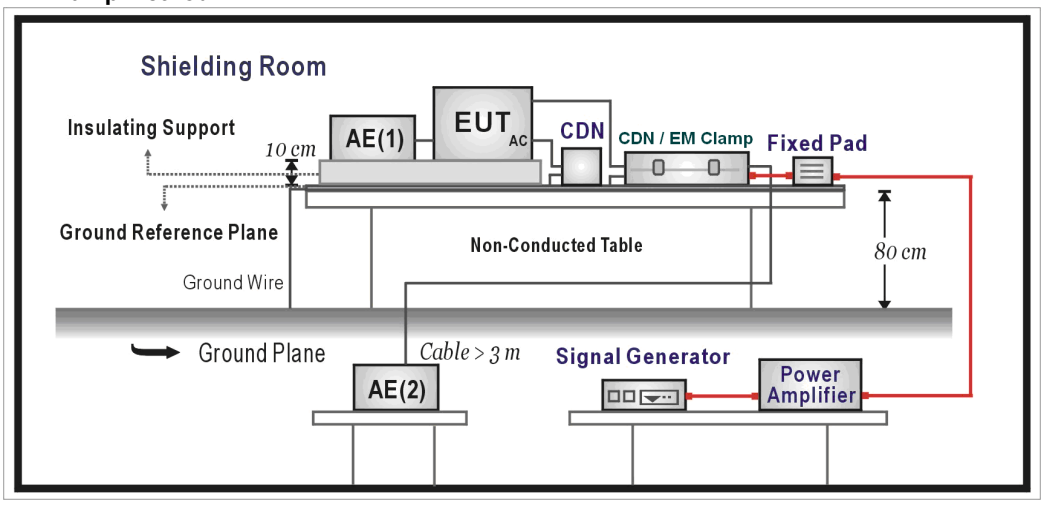
4.8. Conducted Susceptibility (CS)

■ Setup

CDN Method



EM Clamp Method



■ Test Procedure

The EUT shall be tested within its intended operating and climatic conditions.

The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

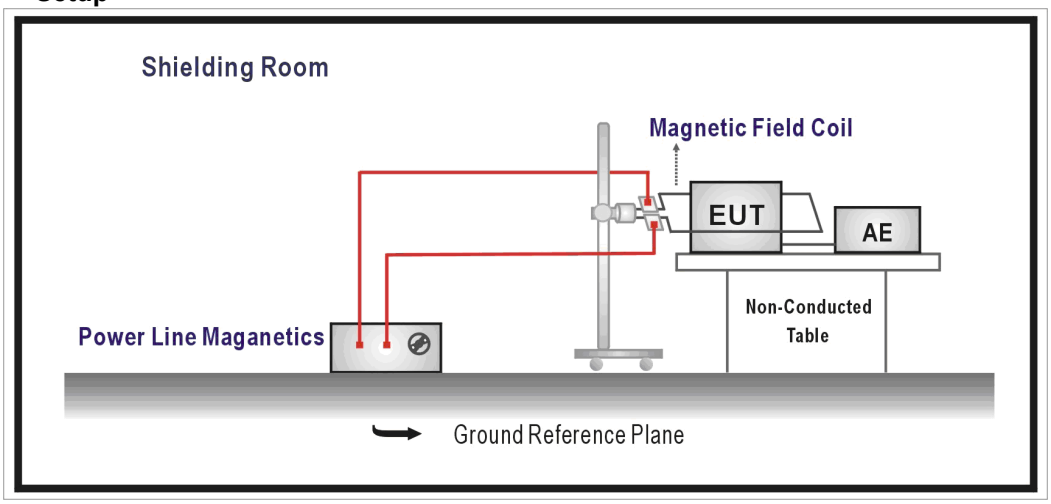
The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x 10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts was made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

4.9. Power Frequency Magnetic Field (PMF)

■ **Setup**



■ **Test Procedure**

a). The equipment was configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.

b). The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.

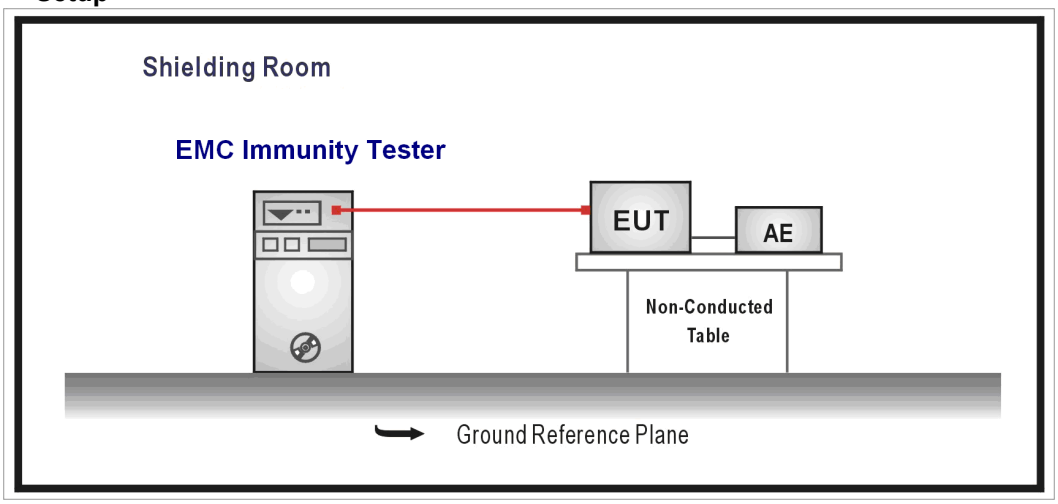
c). The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

d). The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

e). The EUT is tested in three antenna appositions (Front, top, and side) for 5 minutes each.

4.10. Voltage Dips and Interruption

■ **Setup**



■ **Test Procedure**

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1 m*1 m min. And 0.65 mm thick min. And projected beyond the EUT by at least 0.1 m on all sides. The power cord shall be used the shortest power cord as specified by the manufacturer.

For Voltage Dips/ Interruptions test:

The selection of test voltage is based on the rated power range. If the operation range is large than 20 % of lower power range, both end of specified voltage shall be tested. Otherwise, the typical voltage specification is selected as test voltage.

The EUT is connected to the power mains through a coupling device that directly couples to the Voltage Dips and Interruption Generator.

The EUT shall be tested for 30 % voltage dip of supplied voltage and duration 25/30 Periods, for 95 % voltage dip of supplied voltage and duration 0.5/1.0 Periods with a sequence of three voltage dips with intervals of 10 seconds, and for 95% voltage interruption of supplied voltage and duration 250/300 Periods with a sequence of three voltage interruptions with intervals of 10 seconds.

Voltage phase shifting are shall occur at 00, 450, 900, 1350, 1800, 2250, 2700, 3150 of the voltage.

5 Test Results

5.1. Conducted Emission

■ **Limit**

AC mains power input/output ports limit：

Frequency (MHz)	Class A (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	79	66
0.50 - 5.0	73	60
5.0 - 30.0	73	60

Note: (1) The lower limit shall apply at the transition frequencies.

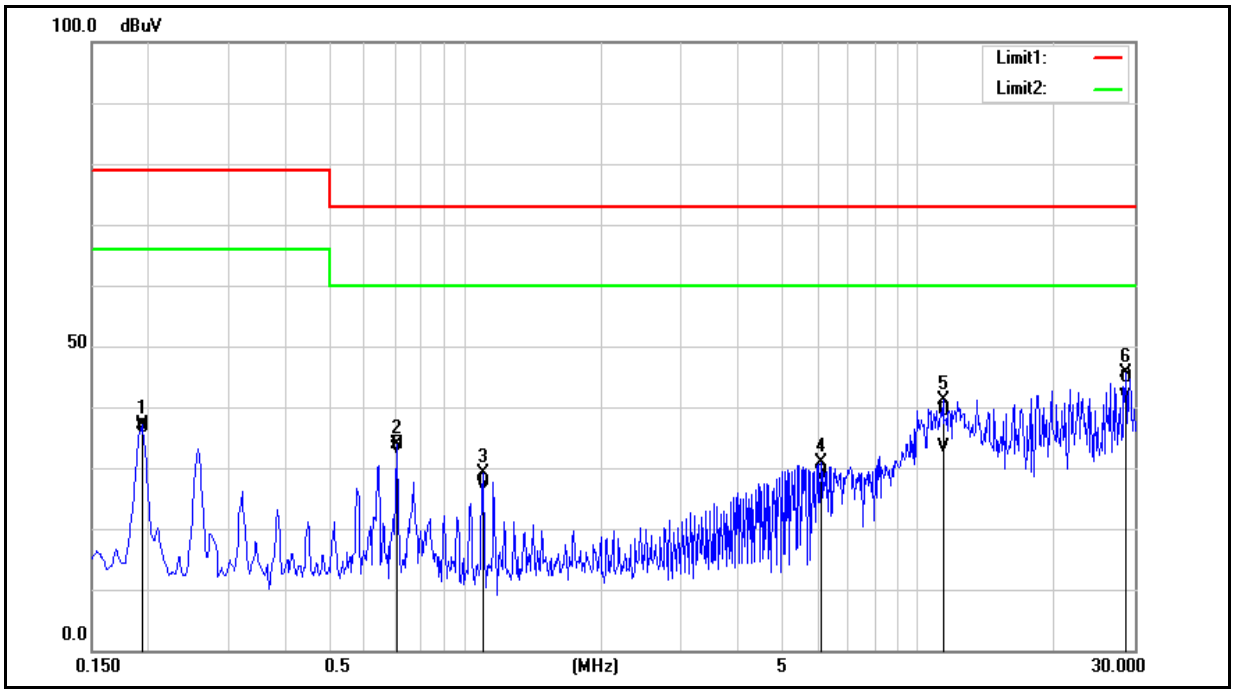
(2) The limit decreases in line with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Telecommunication port limits:

Requirement (MHz)	Class A Equipment			
	Voltage Limit (dBμV)		Current Limit (dBμA)	
	QP	Avg.	QP	Avg.
0.15 to 0.50	97 to 87	84 to 74	53 to 43	40 to 30
0.50 to 30	87	74	43	30

■ **Test Result**

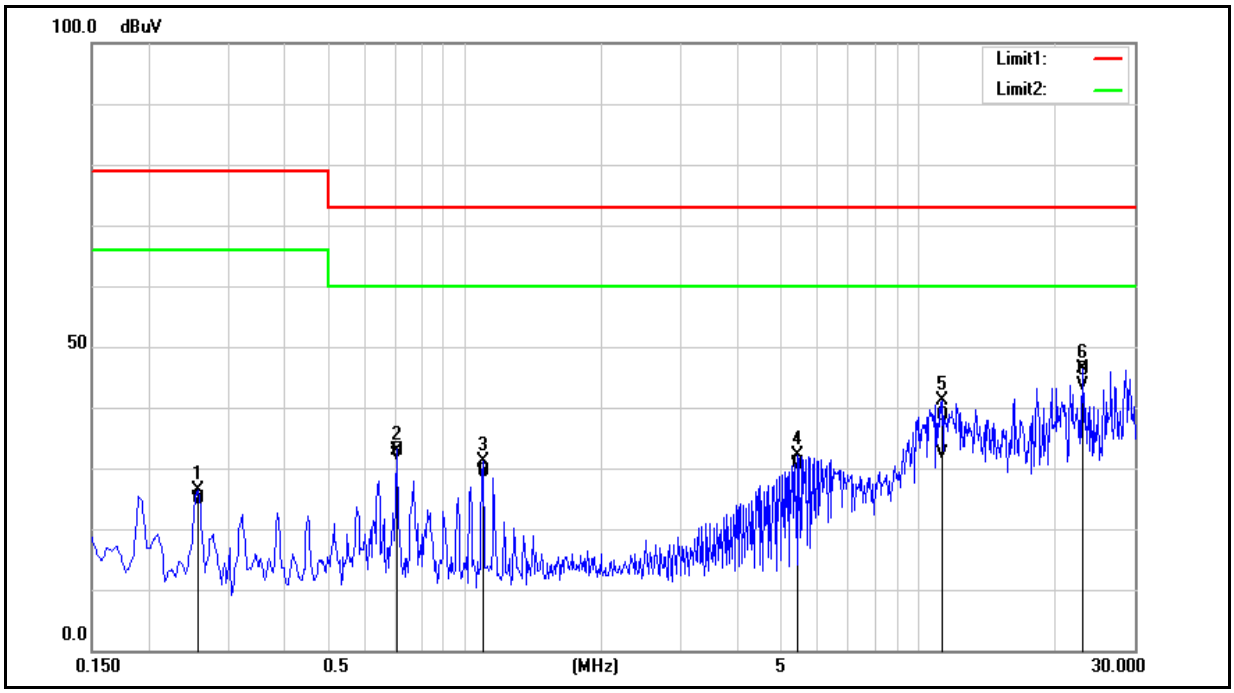
Test Standard:	CISPR 22	Line:	L1
Test Mode:	Mode 1	Power:	AC 100 V / 50 Hz
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1940	26.99	26.94	9.70	36.69	36.64	79.00	66.00	-42.31	-29.36	Pass
2	0.7060	24.10	23.40	9.70	33.80	33.10	73.00	60.00	-39.20	-26.90	Pass
3	1.0940	17.84	17.16	9.71	27.55	26.87	73.00	60.00	-45.45	-33.13	Pass
4	6.1060	19.23	19.03	9.83	29.06	28.86	73.00	60.00	-43.94	-31.14	Pass
5	11.3540	29.39	23.40	9.91	39.30	33.31	73.00	60.00	-33.70	-26.69	Pass
6	28.6860	34.88	31.67	10.08	44.96	41.75	73.00	60.00	-28.04	-18.25	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

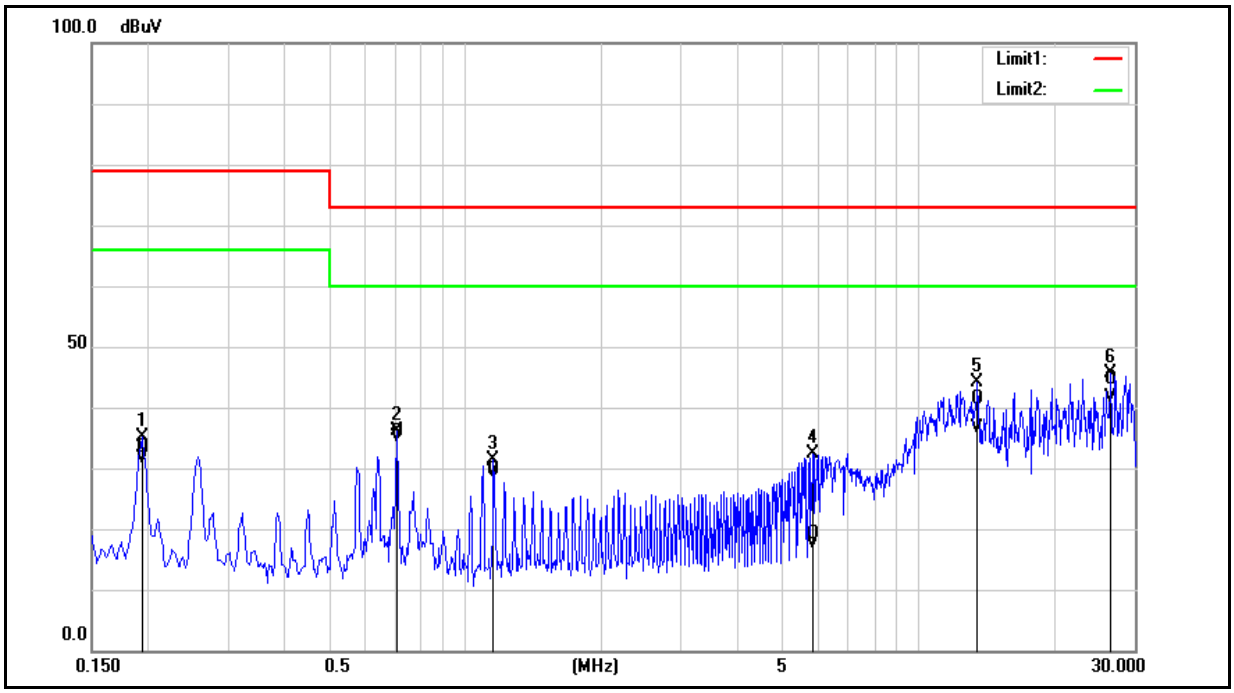
Test Standard:	CISPR 22	Line:	N
Test Mode:	Mode 1	Power:	AC 100 V / 50 Hz
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.2580	15.30	15.13	9.69	24.99	24.82	79.00	66.00	-54.01	-41.18	Pass
2	0.7060	23.19	22.42	9.69	32.88	32.11	73.00	60.00	-40.12	-27.89	Pass
3	1.0940	19.70	19.52	9.70	29.40	29.22	73.00	60.00	-43.60	-30.78	Pass
4	5.3980	20.78	20.72	9.81	30.59	30.53	73.00	60.00	-42.41	-29.47	Pass
5	11.2900	28.77	22.44	9.91	38.68	32.35	73.00	60.00	-34.32	-27.65	Pass
6	23.1300	36.04	33.41	10.10	46.14	43.51	73.00	60.00	-26.86	-16.49	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

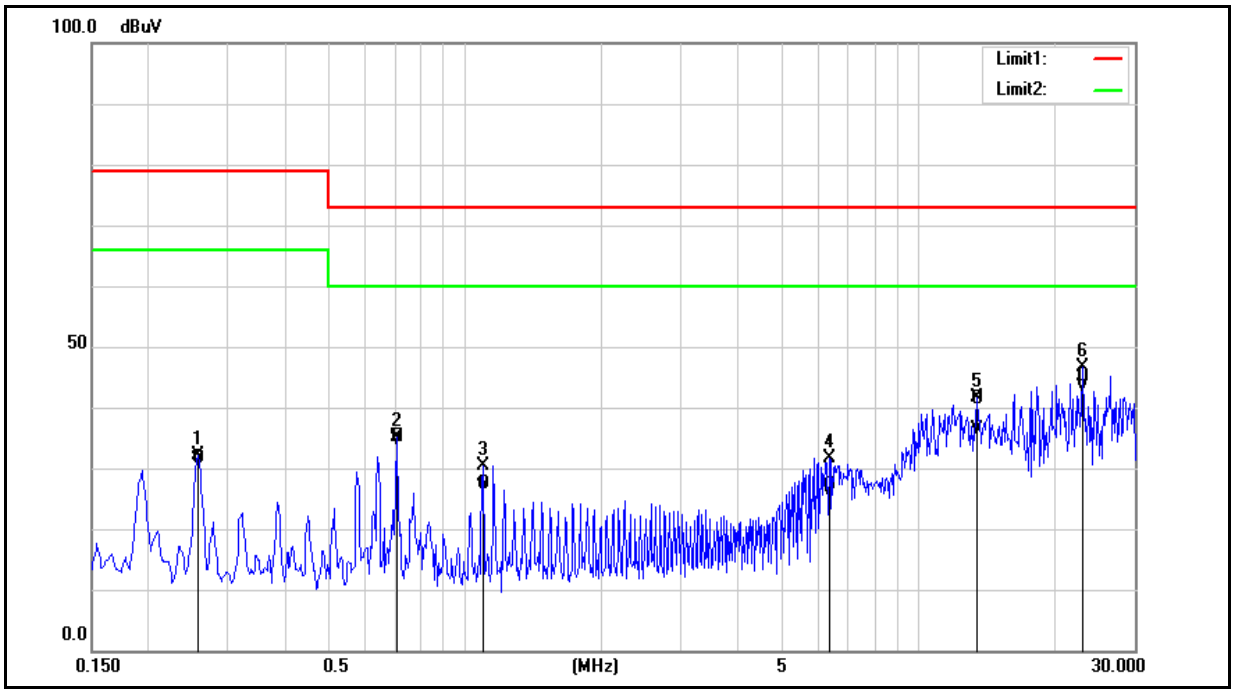
Test Standard:	CISPR 22	Line:	L1
Test Mode:	Mode 2	Power:	AC 230 V / 50 Hz
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1940	23.64	22.01	9.70	33.34	31.71	79.00	66.00	-45.66	-34.29	Pass
2	0.7060	26.14	25.54	9.70	35.84	35.24	73.00	60.00	-37.16	-24.76	Pass
3	1.1580	19.81	19.63	9.72	29.53	29.35	73.00	60.00	-43.47	-30.65	Pass
4	5.8540	9.20	7.80	9.83	19.03	17.63	73.00	60.00	-53.97	-42.37	Pass
5	13.4820	31.33	26.77	9.95	41.28	36.72	73.00	60.00	-31.72	-23.28	Pass
6	26.6100	34.55	31.68	10.07	44.62	41.75	73.00	60.00	-28.38	-18.25	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

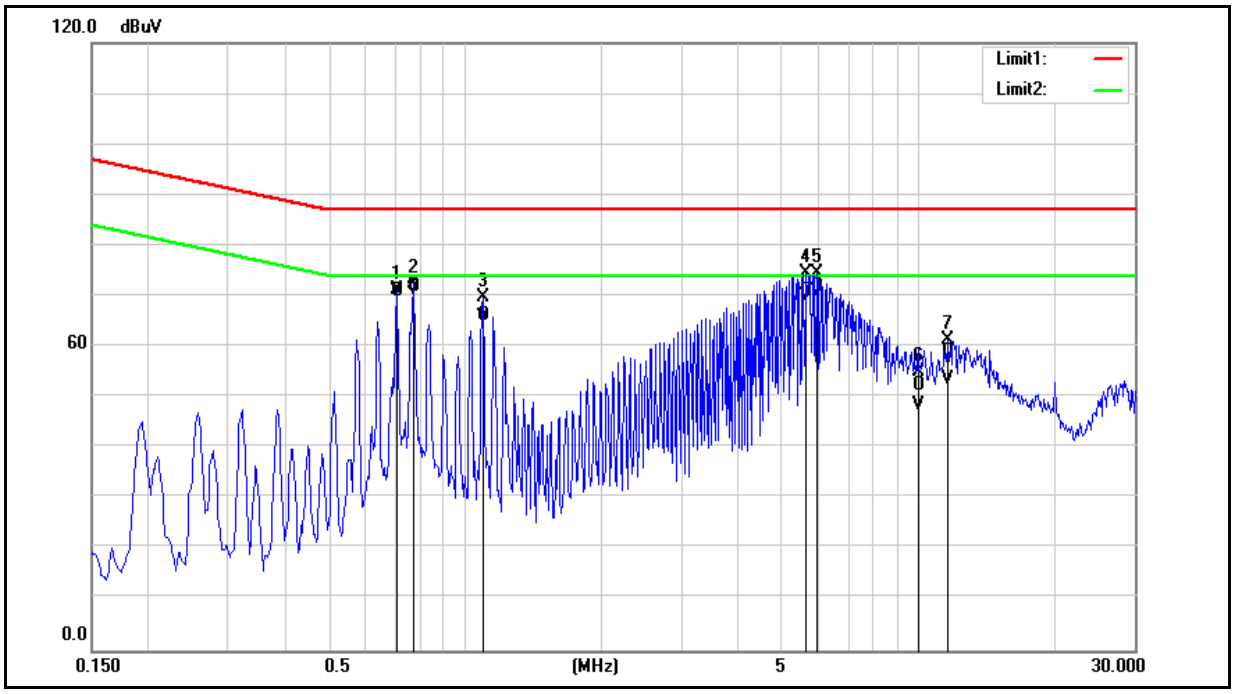
Test Standard:	CISPR 22	Line:	N
Test Mode:	Mode 2	Power:	AC 230 V / 50 Hz
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.2580	21.94	21.58	9.69	31.63	31.27	79.00	66.00	-47.37	-34.73	Pass
2	0.7060	25.44	24.87	9.69	35.13	34.56	73.00	60.00	-37.87	-25.44	Pass
3	1.0940	17.69	17.08	9.70	27.39	26.78	73.00	60.00	-45.61	-33.22	Pass
4	6.3620	17.19	16.16	9.83	27.02	25.99	73.00	60.00	-45.98	-34.01	Pass
5	13.4820	31.35	26.50	9.95	41.30	36.45	73.00	60.00	-31.70	-23.55	Pass
6	23.1300	35.13	33.23	10.10	45.23	43.33	73.00	60.00	-27.77	-16.67	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

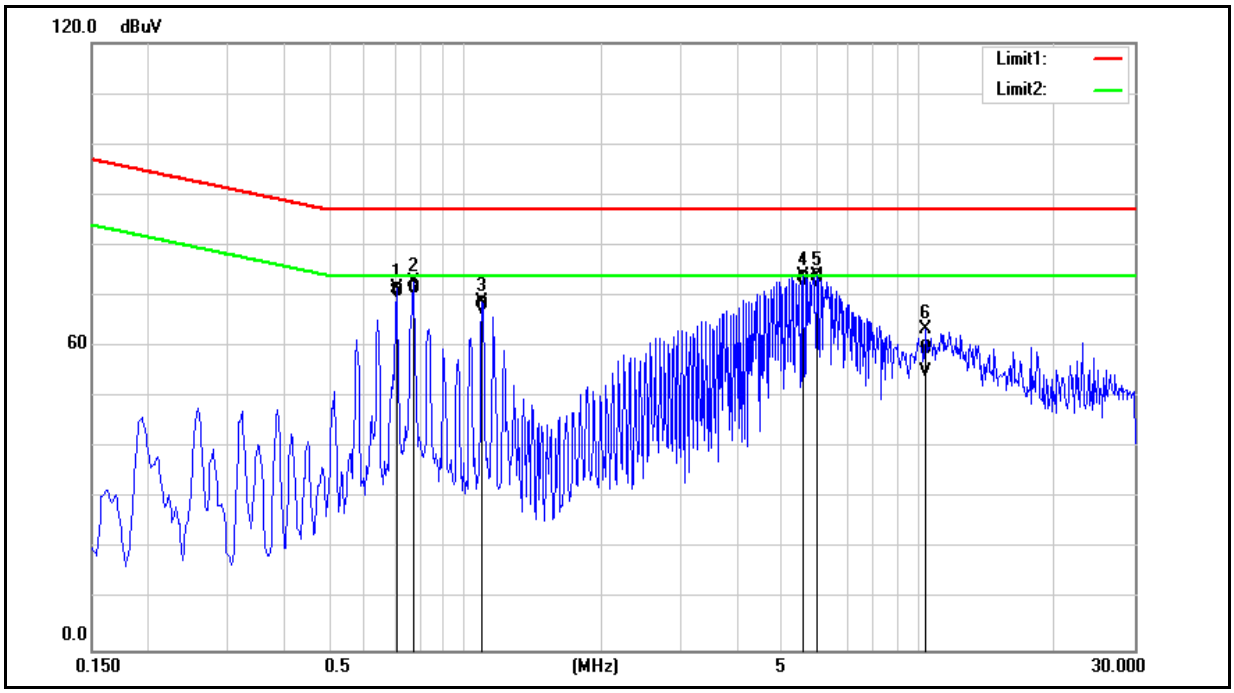
Standard:	CISPR 22	Line:	N/A
Test Mode:	Mode 2 (ISN 10 M)	Power:	AC 230 V / 50 Hz
Description:	Port 1		



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.7060	61.31	61.13	9.72	71.03	70.85	87.00	74.00	-15.97	-3.15	Pass
2	0.7700	62.04	61.52	9.72	71.76	71.24	87.00	74.00	-15.24	-2.76	Pass
3	1.0940	56.52	56.09	9.67	66.19	65.76	87.00	74.00	-20.81	-8.24	Pass
4	5.6500	61.32	60.36	9.66	70.98	70.02	87.00	74.00	-16.02	-3.98	Pass
5	5.9700	62.07	61.35	9.66	71.73	71.01	87.00	74.00	-15.27	-2.99	Pass
6	10.0000	42.64	38.77	9.70	52.34	48.47	87.00	74.00	-34.66	-25.53	Pass
7	11.6780	49.17	43.75	9.74	58.91	53.49	87.00	74.00	-28.09	-20.51	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

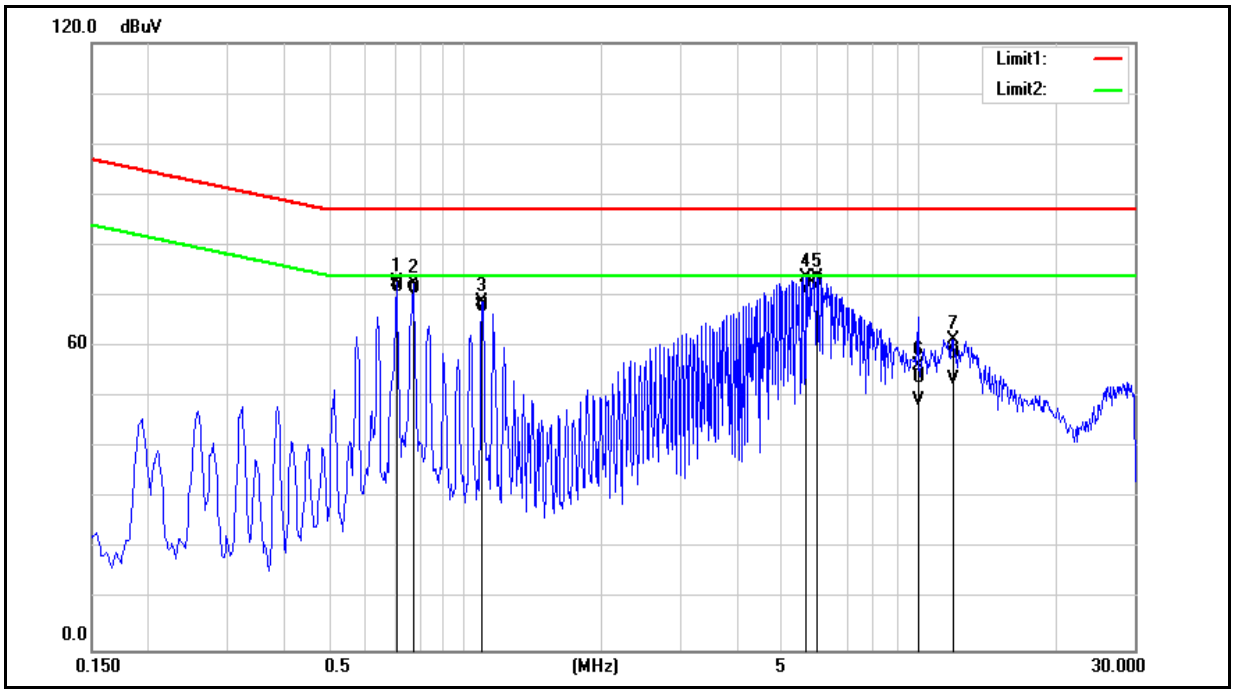
Standard:	CISPR 22	Line:	N/A
Test Mode:	Mode 2 (ISN 100 M)	Power:	AC 230 V / 50 Hz
Description:	Port 1		



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.7060	61.10	60.99	9.72	70.82	70.71	87.00	74.00	-16.18	-3.29	Pass
2	0.7700	61.81	61.31	9.72	71.53	71.03	87.00	74.00	-15.47	-2.97	Pass
3	1.0900	58.58	57.72	9.67	68.25	67.39	87.00	74.00	-18.75	-6.61	Pass
4	5.5820	63.67	62.88	9.66	73.33	72.54	87.00	74.00	-13.67	-1.46	Pass
5	5.9660	63.87	62.99	9.66	73.53	72.65	87.00	74.00	-13.47	-1.35	Pass
6	10.3860	49.89	45.20	9.72	59.61	54.92	87.00	74.00	-27.39	-19.08	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

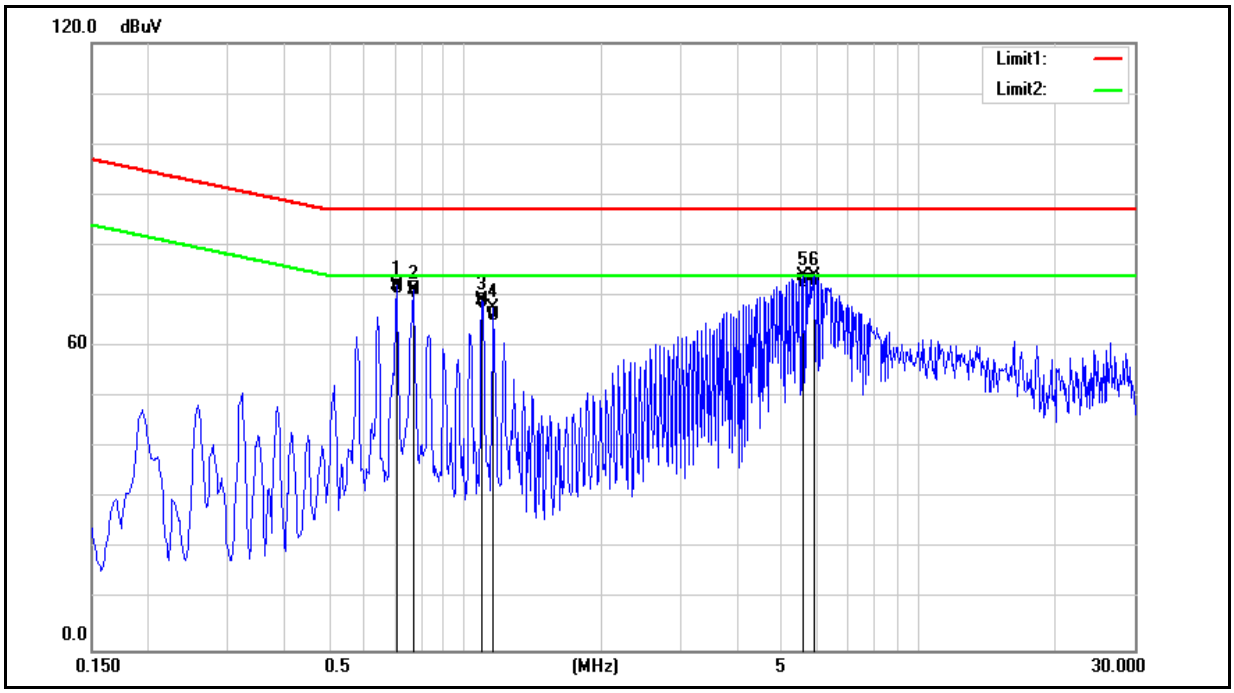
Standard:	CISPR 22	Line:	N/A
Test Mode:	Mode 2 (ISN 10 M)	Power:	AC 230 V / 50 Hz
Description:	Port 2		



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.7060	62.28	62.13	9.72	72.00	71.85	87.00	74.00	-15.00	-2.15	Pass
2	0.7700	61.79	61.27	9.72	71.51	70.99	87.00	74.00	-15.49	-3.01	Pass
3	1.0900	58.39	58.35	9.67	68.06	68.02	87.00	74.00	-18.94	-5.98	Pass
4	5.6460	63.04	61.94	9.66	72.70	71.60	87.00	74.00	-14.30	-2.40	Pass
5	5.9660	63.42	62.79	9.66	73.08	72.45	87.00	74.00	-13.92	-1.55	Pass
6	10.0000	44.24	39.78	9.70	53.94	49.48	87.00	74.00	-33.06	-24.52	Pass
7	11.9340	49.00	43.90	9.76	58.76	53.66	87.00	74.00	-28.24	-20.34	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Standard:	CISPR 22	Line:	N/A
Test Mode:	Mode 2 (ISN 100 M)	Power:	AC 230 V / 50 Hz
Description:	Port 2		



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.7060	61.93	61.76	9.72	71.65	71.48	87.00	74.00	-15.35	-2.52	Pass
2	0.7700	61.40	60.87	9.72	71.12	70.59	87.00	74.00	-15.88	-3.41	Pass
3	1.0900	59.11	58.97	9.67	68.78	68.64	87.00	74.00	-18.22	-5.36	Pass
4	1.1540	56.45	56.37	9.68	66.13	66.05	87.00	74.00	-20.87	-7.95	Pass
5	5.5820	63.13	62.95	9.66	72.79	72.61	87.00	74.00	-14.21	-1.39	Pass
6	5.9020	63.29	63.23	9.66	72.95	72.89	87.00	74.00	-14.05	-1.11	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

5.2. Radiated Emission

■ **Limit**

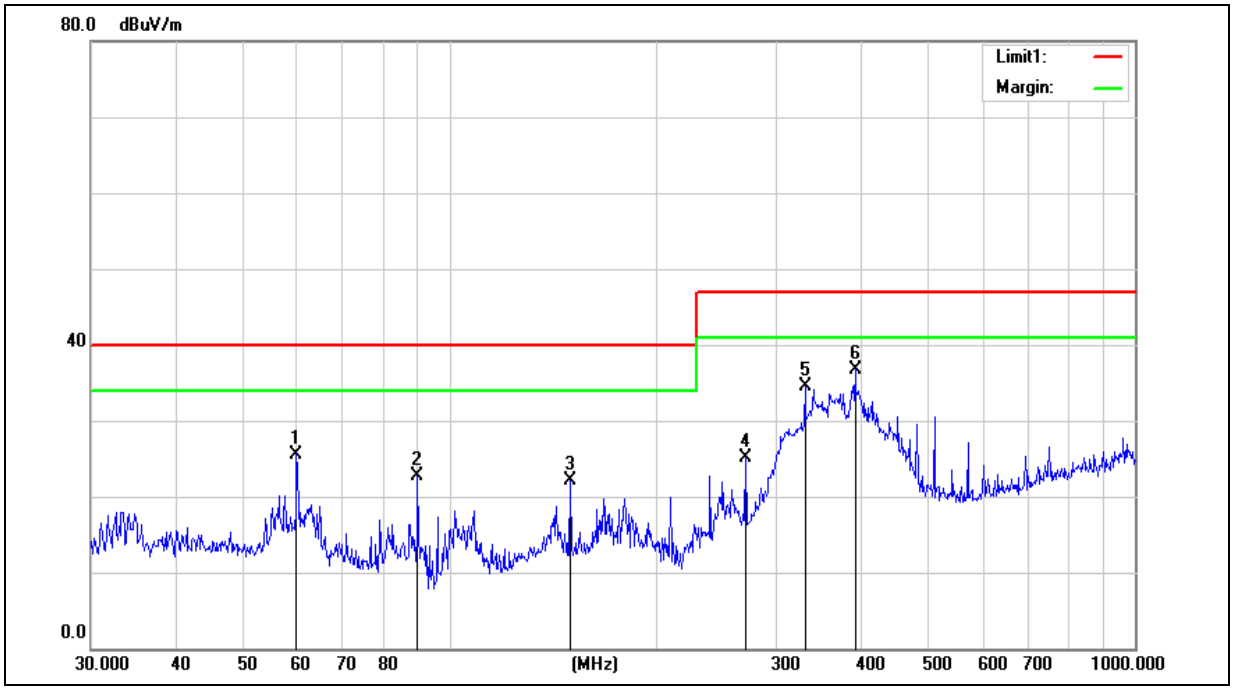
Frequency (MHz)	dBuV/m (Distance 10 m)
	Class A
30 ~ 230	40
230 ~ 1000	47

Frequency (MHz)	dBuV/m (Distance 3m)	
	Class A	
	Average	Peak
1000 ~ 3000	56	76
3000 ~ 6000	60	80

Note: The lower limit shall apply at the transition frequencies.

■ **Test Result**

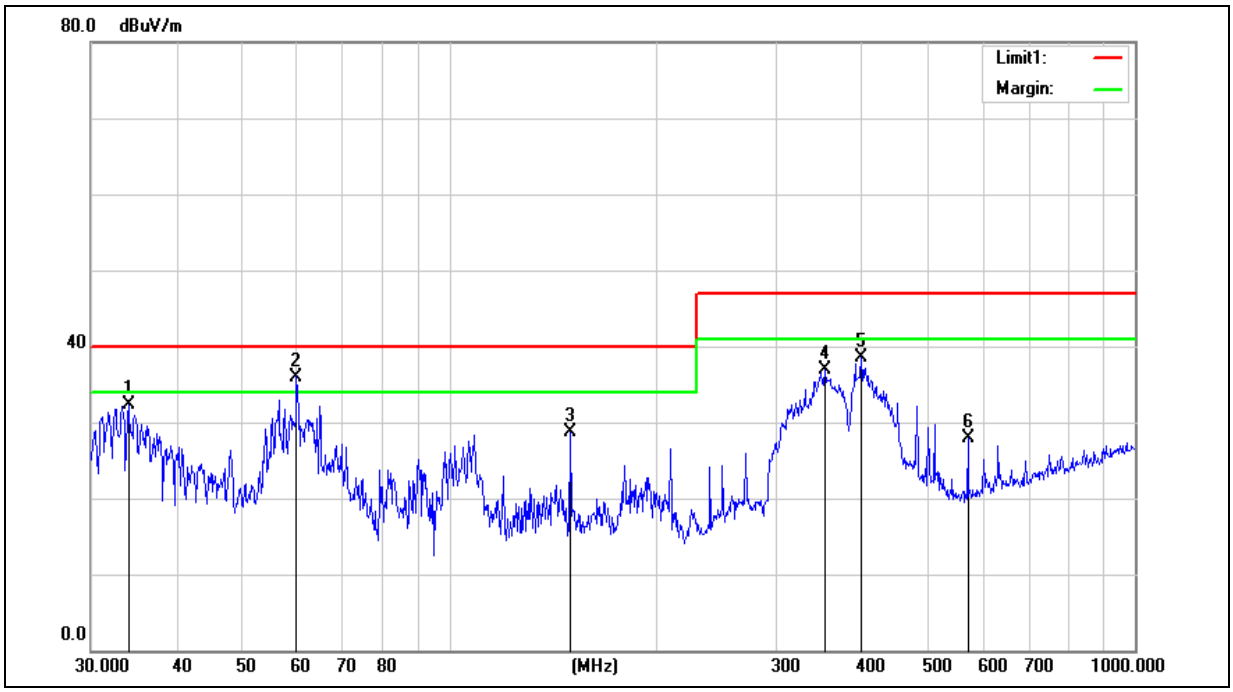
Standard:	CISPR 22	Test Distance:	10 m
Test Mode:	Mode 1 (30 MHz~1 GHz)	Power:	AC 100 V / 50 Hz
		Ant.Polar.:	Horizontal
Description:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	59.8588	43.70	-18.10	25.60	40.00	-14.40	100	359	QP
2	89.9047	45.96	-23.16	22.80	40.00	-17.20	400	266	QP
3	150.0108	39.03	-16.83	22.20	40.00	-17.80	400	16	QP
4	270.3748	42.23	-17.03	25.20	47.00	-21.80	300	57	QP
5	330.1950	49.66	-15.16	34.50	47.00	-12.50	400	80	QP
6	390.7226	50.68	-13.88	36.80	47.00	-10.20	200	95	QP

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	CISPR 22	Test Distance:	10 m
Test Mode:	Mode 1 (30 MHz~1 GHz)	Power:	AC 100 V / 50 Hz
		Ant.Polar.:	Vertical
Description:			

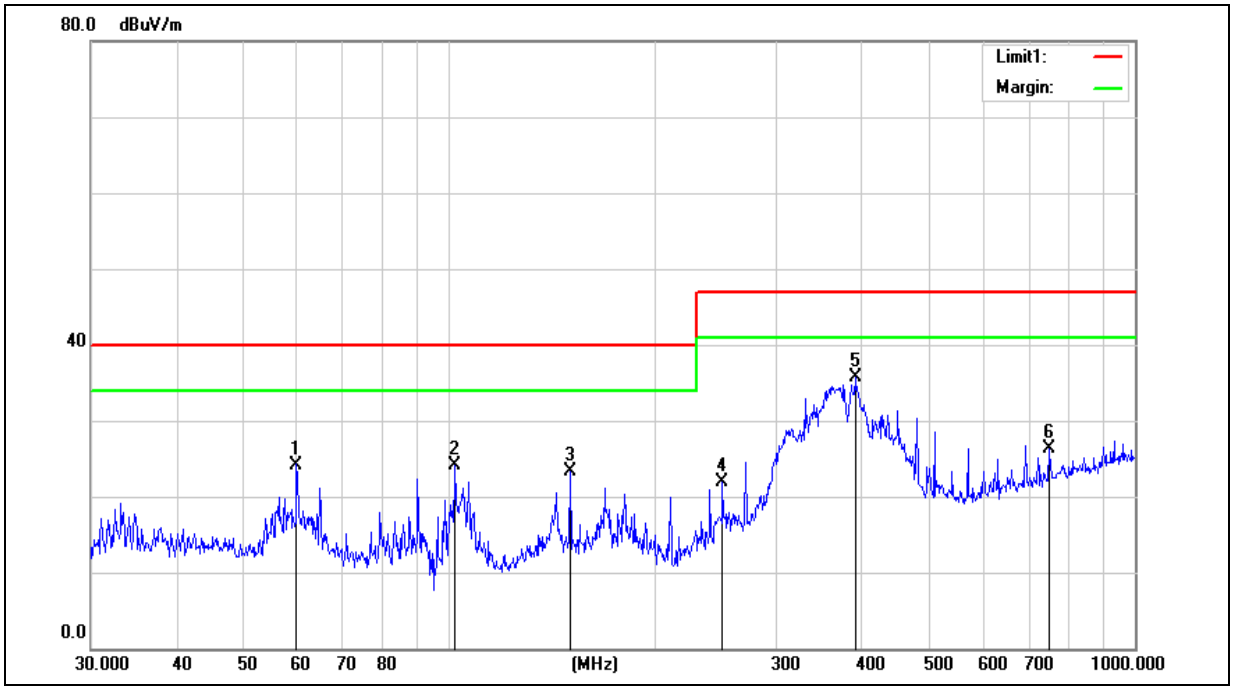


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	34.0365	50.25	-17.95	32.30	40.00	-7.70	199	193	QP
2	59.8588	52.94	-16.94	36.00	40.00	-4.00	299	338	QP
3	150.0108	44.39	-15.59	28.80	40.00	-11.20	100	288	QP
4	352.9433	50.30	-13.30	37.00	47.00	-10.00	100	122	QP
5	399.0302	50.34	-11.84	38.50	47.00	-8.50	100	130	QP
6	570.6100	36.25	-8.25	28.00	47.00	-19.00	299	149	QP

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	CISPR 22	Test Distance:	10 m
Test Mode:	Mode 2 (30 MHz~1 GHz)	Power:	AC 230 V / 50 Hz
		Ant.Polar.:	Horizontal
Description:			

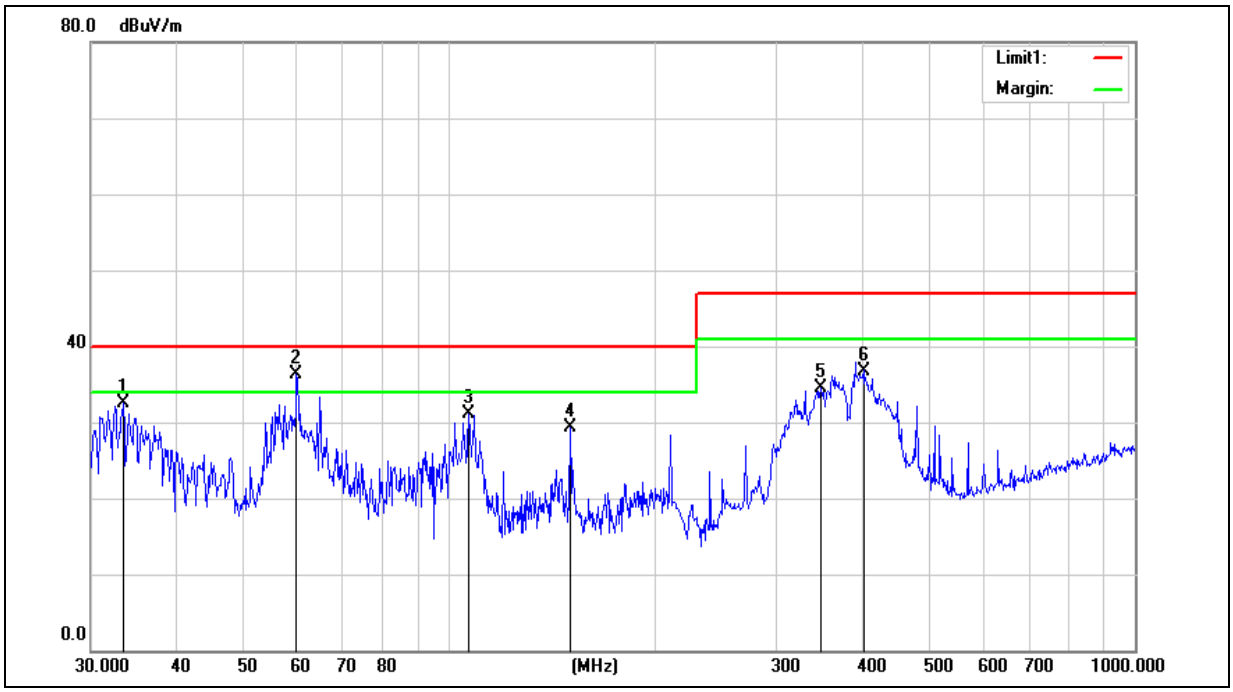


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	59.8588	42.30	-18.10	24.20	40.00	-15.80	200	0	QP
2	102.0014	45.52	-21.42	24.10	40.00	-15.90	400	87	QP
3	150.0108	40.23	-16.83	23.40	40.00	-16.60	400	19	QP
4	250.3012	39.90	-17.90	22.00	47.00	-25.00	400	33	QP
5	390.7226	49.58	-13.88	35.70	47.00	-11.30	200	131	QP
6	750.1083	33.53	-7.23	26.30	47.00	-20.70	100	359	QP

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	CISPR 22	Test Distance:	10 m
Test Mode:	Mode 2 (30 MHz~1 GHz)	Power:	AC 230 V / 50 Hz
		Ant.Polar.:	Vertical
Description:			

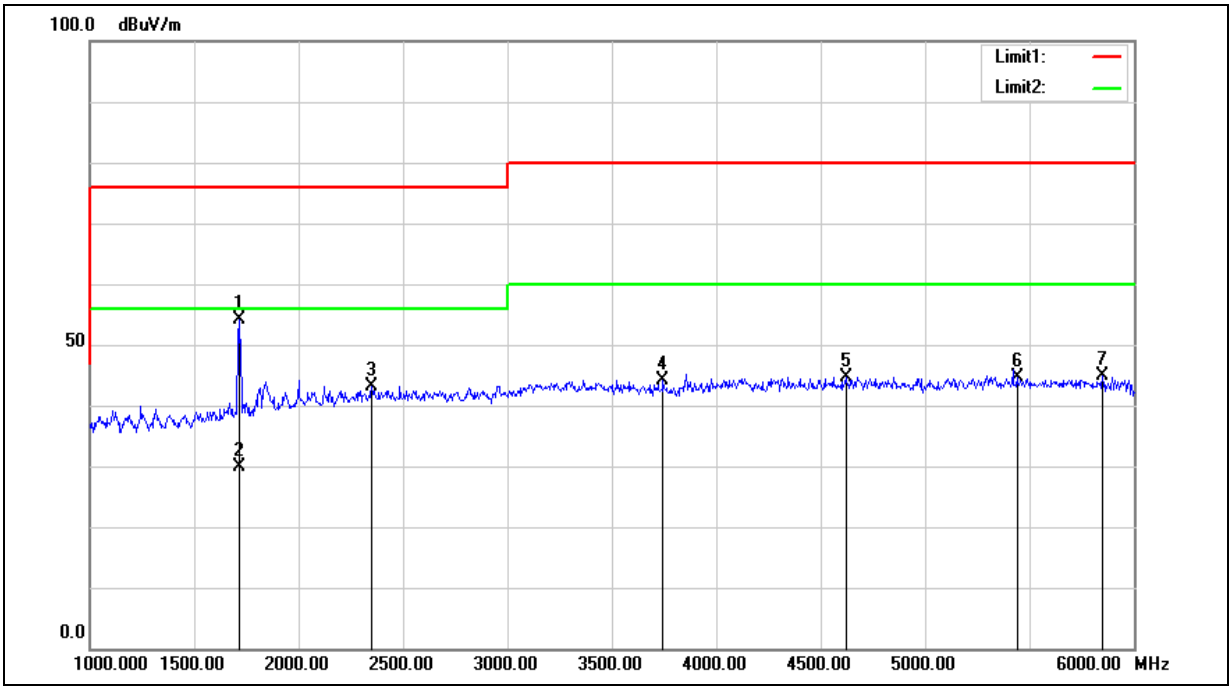


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	33.4450	50.70	-18.20	32.50	40.00	-7.50	100	94	QP
2	59.8588	53.24	-16.94	36.30	40.00	-3.70	300	360	QP
3	106.7587	50.69	-19.59	31.10	40.00	-8.90	100	285	QP
4	150.0108	44.99	-15.59	29.40	40.00	-10.60	100	292	QP
5	348.0274	47.93	-13.43	34.50	47.00	-12.50	100	116	QP
6	401.8385	48.59	-11.79	36.80	47.00	-10.20	100	130	QP

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	CISPR 22	Test Distance:	3 m
Test Mode:	Mode 1 (1 GHz~6 GHz)	Power:	AC 100 V / 50 Hz
		Ant.Polar.:	Horizontal
Description:			

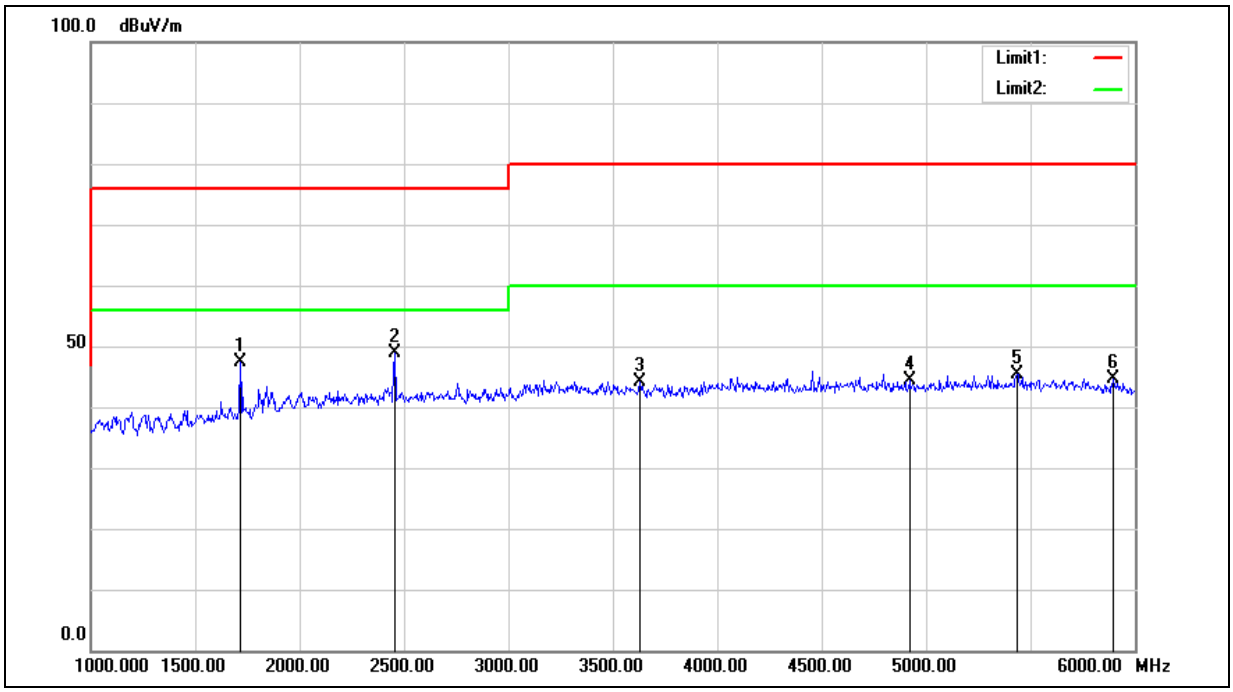


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1715.000	55.80	-1.57	54.23	76.00	-21.77	100	70	peak
2	1715.000	31.55	-1.57	29.98	56.00	-26.02	100	70	AVG
3	2350.000	41.28	1.96	43.24	76.00	-32.76	100	52	peak
4	3745.000	39.96	4.21	44.17	80.00	-35.83	100	332	peak
5	4620.000	38.75	5.97	44.72	80.00	-35.28	200	106	peak
6	5440.000	37.48	7.16	44.64	80.00	-35.36	100	360	peak
7	5850.000	37.08	7.77	44.85	80.00	-35.15	200	60	peak

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	CISPR 22	Test Distance:	3 m
Test Mode:	Mode 1 (1 GHz~6 GHz)	Power:	AC 100 V / 50 Hz
		Ant.Polar.:	Vertical
Description:			

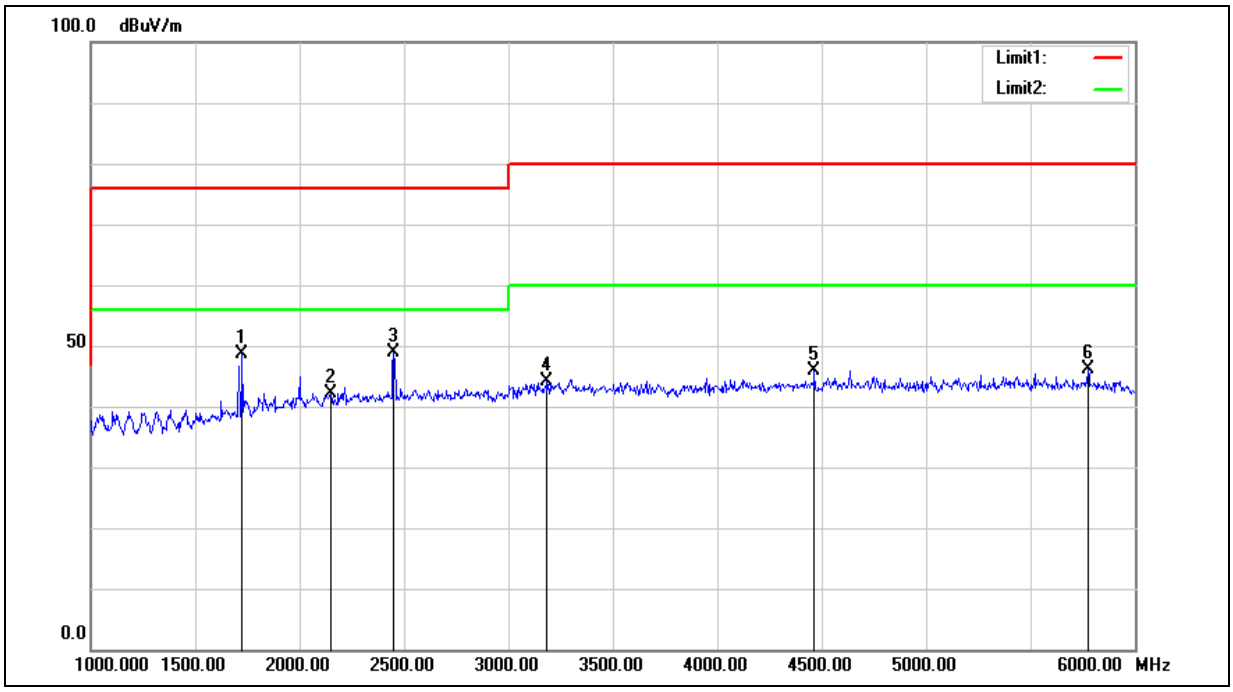


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1715.000	48.93	-1.57	47.36	76.00	-28.64	200	336	peak
2	2455.000	46.50	2.26	48.76	76.00	-27.24	200	340	peak
3	3630.000	40.28	3.96	44.24	80.00	-35.76	100	360	peak
4	4920.000	38.07	6.31	44.38	80.00	-35.62	100	0	peak
5	5435.000	38.17	7.15	45.32	80.00	-34.68	100	200	peak
6	5895.000	36.72	7.84	44.56	80.00	-35.44	200	19	peak

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	CISPR 22	Test Distance:	3 m
Test Mode:	Mode 2 (1 GHz~6 GHz)	Power:	AC 230 V / 50 Hz
		Ant.Polar.:	Horizontal
Description:			

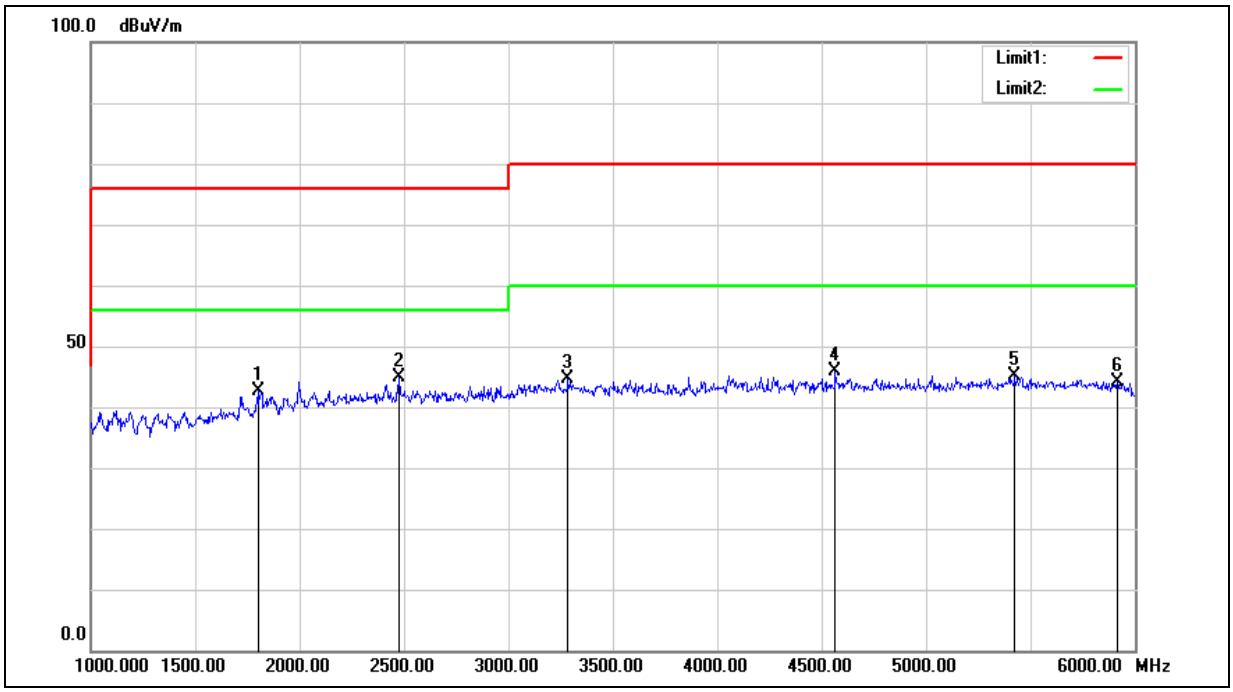


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1725.000	50.21	-1.48	48.73	76.00	-27.27	200	100	peak
2	2150.000	40.76	1.42	42.18	76.00	-33.82	200	309	peak
3	2450.000	46.69	2.24	48.93	76.00	-27.07	100	123	peak
4	3185.000	40.74	3.35	44.09	80.00	-35.91	200	290	peak
5	4465.000	40.02	5.75	45.77	80.00	-34.23	100	349	peak
6	5775.000	38.47	7.67	46.14	80.00	-33.86	100	296	peak

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	CISPR 22	Test Distance:	3 m
Test Mode:	Mode 2 (1 GHz~6 GHz)	Power:	AC 230 V / 50 Hz
		Ant.Polar.:	Vertical
Description:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1805.000	43.42	-0.75	42.67	76.00	-33.33	200	281	peak
2	2475.000	42.56	2.31	44.87	76.00	-31.13	100	360	peak
3	3285.000	41.17	3.46	44.63	80.00	-35.37	100	237	peak
4	4565.000	39.94	5.90	45.84	80.00	-34.16	100	0	peak
5	5425.000	37.88	7.14	45.02	80.00	-34.98	200	50	peak
6	5915.000	36.29	7.87	44.16	80.00	-35.84	100	128	peak

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

5.3. Voltage Fluctuation and Flicker

■ **Limit**

The following limits apply:

-- the value of P_{st} shall not be greater than 1.0;

-- the value of P_{lt} shall not be greater than 0.65;

--T_{max}, the accumulated time value of d(t) with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms;

-- the relative steady-state voltage change, d_c, shall not exceed 3.3 %;

-- the maximum relative voltage change, d_{max}, shall not exceed;

a) 4 % without additional conditions;

b) 6 % for equipment which is:

-- switched manually, or

-- switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

Note: The cycling frequency will be further limited by the P_{st} and P_{1t} limit.

For example: a d_{max} of 6 %producing a rectangular voltage change characteristic twice per hour will give a P_{1t} of about 0.65.

c) 7 % for equipment which is:

-- attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or

-- switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

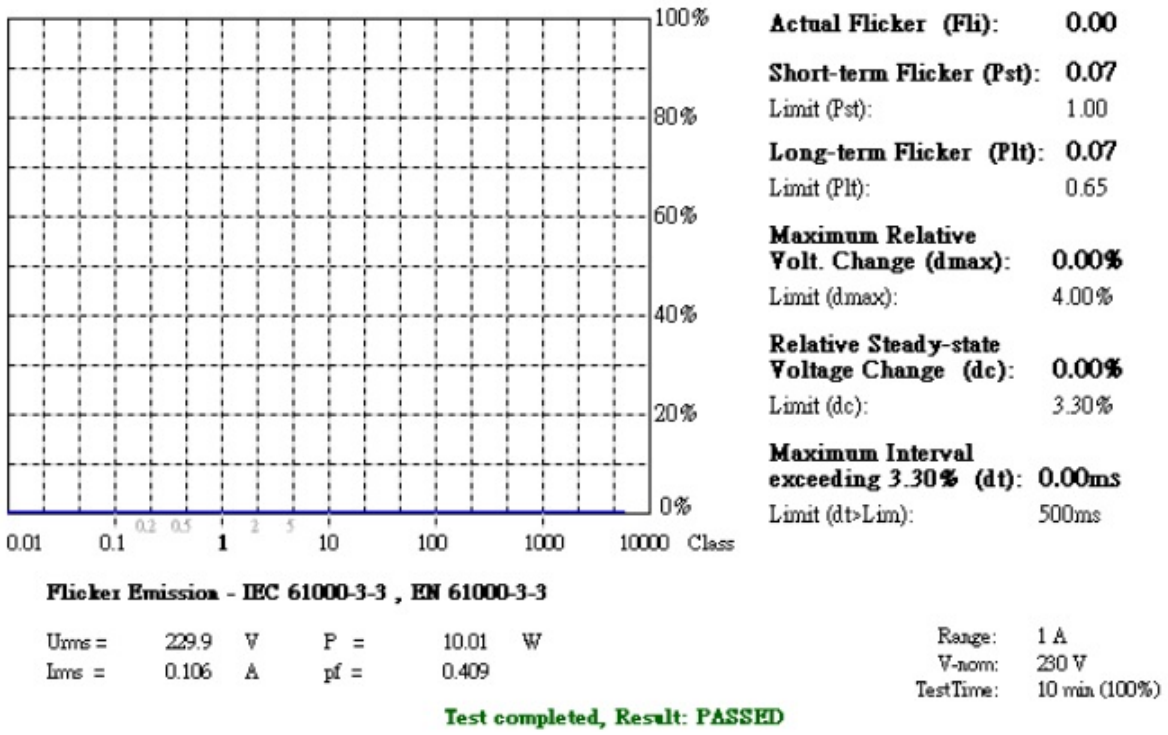
P_{st} and P_{1t} requirements shall not be applied to voltage changes caused by manual switching.

■ **Test Result**

Test Mode: Mode 2

Test Result: Pass Status: Test Completed

Plt and limit line



Urms =	229.9V	Freq =	49.987	Range:	1 A
Irms =	0.106A	Ipk =	0.449A	cf =	4.220
P =	10.01W	S =	24.47VA	pf =	0.409

Test - Time : 1 x 10min = 10min (100 %)

LIN (Line Impedance Network) : No LIN

Limits :	Plt :	0.65	Pst :	1.00
	dmax :	4.00 %	dc :	3.30 %
	dtLim:	3.30 %	dt>Lim:	500ms

Test completed, Result: PASSED

Note: T_{max}=(dt)=0.00 ms

5.4. Electrostatic Discharge (ESD)

■ **Test Specification**

EN 61000-4-2			
Environmental Phenomena	Units	Test Specification	Performance Criterion
Enclosure Port			
Standard requirement Electrostatic Discharge	kV (Charge Voltage)	±8 Air Discharge ±4 Contact Discharge	B

Polarity: Positive & Negative

Number of Discharge: Air Discharge: min. 10 times at single test point for each negative and positive polarity

Contact Discharge: min. 200 times in total

Discharge Mode: Single Discharge

1 second minimum

■ **Test Result**

Test Mode	Mode 2

Air Discharge												
Test Points	Test Levels									Results		
	± 2 kV	Performance Criterion		± 4 kV	Performance Criterion		± 8 kV	Performance Criterion		Pass	Fail	Observation
Case	☒	☒A	☐B	☒	☒A	☐B	☒	☒A	☐B	☒	☐	Note 1
USB Port	☒	☒A	☐B	☒	☒A	☐B	☒	☐A	☒B	☒	☐	Note 2
USB Type-B Port	☒	☒A	☐B	☒	☒A	☐B	☒	☐A	☒B	☒	☐	Note 2
COM1/ COM2 Port	☒	☒A	☐B	☒	☒A	☐B	☒	☒A	☐B	☒	☐	Note 1
Micro SD Card Port	☒	☒A	☐B	☒	☒A	☐B	☒	☒A	☐B	☒	☐	Note 1
Panel	☒	☒A	☐B	☒	☒A	☐B	☒	☒A	☐B	☒	☐	Note 1

Contact Discharge												
Test Points	Test Levels									Results		
	± 2 kV	Performance Criterion		± 4 kV	Performance Criterion		± 8 kV	Performance Criterion		Pass	Fail	Observation
LAN1 Port	☒	☒A	☐B	☒	☐A	☒B	☐	☐A	☐B	☒	☐	Note 2
LAN2 Port	☒	☒A	☐B	☒	☐A	☒B	☐	☐A	☐B	☒	☐	Note 2
DC Power Port	☒	☒A	☐B	☒	☐A	☒B	☐	☐A	☐B	☒	☐	Note 2
Screws	☒	☒A	☐B	☒	☒A	☐B	☐	☐A	☐B	☒	☐	Note 1

For the tested points to EUT, please refer to attached page.
(Blue arrow mark for Air Discharge and red arrow mark for Contact Discharge)

Discharge To Horizontal Coupling Plane									
Side of EUT	Test Levels				Results				
	± 2 kV	± 4 kV	± 6 kV	± 8 kV	Pass	Fail	Performance Criterion		Observation
Front	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1
Back	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1
Left	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1
Right	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1
Discharge To Vertical Coupling Plane									
Side of EUT	Test Levels				Results				
	± 2 kV	± 4 kV	± 6 kV	± 8 kV	Pass	Fail	Performance Criterion		Observation
Front	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1
Back	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1
Left	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1
Right	☒	☒	☐	☐	☒	☐	☒A	☐B	Note 1

Note 1: Criterion A: There was no change compared with initial operation during the test.

Note 2: Criterion A: There was no change compared with initial operation during the test.

Criterion B:The EUT's panel twinkles and can be self-recover.

5.5. Radiated Electromagnetic Field (RS)

■ **Test Specification**

EN 61000-4-3					
Environmental Phenomena	Units	Test Specification			Performance Criterion
Enclosure Port					
Test Frequency Range	MHz	80-1000	1400-2000	2000-2700	
RF Electromagnetic Field	V/m(Un-modulated, rms)	10	3	1	A
Amplitude Modulated	% AM (1kHz)	80	80	80	

EUT tested in accordance with the specifications given by the standard of IEC 61000-4-3.

■ **Test Result**

Test Mode	Mode 2					
Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Test Result	Observation
80 ~ 1000	H / V	0	10	☒A ☐B	PASS	---
80 ~ 1000	H / V	90	10	☒A ☐B	PASS	---
80 ~ 1000	H / V	180	10	☒A ☐B	PASS	---
80 ~ 1000	H / V	270	10	☒A ☐B	PASS	---
1400 ~ 2000	H / V	0	3	☒A ☐B	PASS	---
1400 ~ 2000	H / V	90	3	☒A ☐B	PASS	---
1400 ~ 2000	H / V	180	3	☒A ☐B	PASS	---
1400 ~ 2000	H / V	270	3	☒A ☐B	PASS	---
2000 ~ 2700	H / V	0	1	☒A ☐B	PASS	---
2000 ~ 2700	H / V	90	1	☒A ☐B	PASS	---
2000 ~ 2700	H / V	180	1	☒A ☐B	PASS	---
2000 ~ 2700	H / V	270	1	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

5.6. Electrical Fast Transient/Burst (EFT)

■ **Test Specification**

EN 61000-4-4				
Item	Environmental Phenomena	Units	Test Specification	Performance Criterion
Signal ports				
Fast Transients Common Mode		kV (Peak) Tr/Th ns Rep. Frequency kHz	±1 5/50 5	B
Input and output DC Power Ports				
Fast Transients Common Mode		kV (Peak) Tr/Th ns Rep. Frequency kHz	±2 5/50 5	B
Input and output AC Power Ports				
Fast Transients Common Mode		kV (Peak) Tr/Th ns Rep. Frequency kHz	±2 5/50 5	B

■ **Test Result**

Test Mode	Mode 2						
Test Point	Polarity	Test Level (kV)	Inject Time (Second)	Inject Method	Performance Criterion	Test Result	Observation
L	±	2	60	Direct	☒A ☐B	PASS	---
N	±	2	60	Direct	☒A ☐B	PASS	---
PE	±	2	60	Direct	☒A ☐B	PASS	---
L+N	±	2	60	Direct	☒A ☐B	PASS	---
L+PE	±	2	60	Direct	☒A ☐B	PASS	---
N+PE	±	2	60	Direct	☒A ☐B	PASS	---
L+N+PE	±	2	60	Direct	☒A ☐B	PASS	---
LAN1 Port	±	1	60	Clamp	☒A ☐B	PASS	---
LAN2 Port	±	1	60	Clamp	☒A ☐B	PASS	---
COM1/COM2 Port	±	1	60	Clamp	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

5.7. Surge

■ **Test Specification**

EN61000-4-5				
Item	Environmental Phenomena	Units	Test Specification	Performance Criterion
Signal ports				
	Surges Line to Earth	Tr/Th us kV	1.2/50 (8/20) ± 1	B
Input and output DC Power Ports				
	Surges Line to Line Line to Earth	Tr/Th us kV	1.2/50 (8/20) ± 0.5 ± 0.5	B
Input and output AC Power Ports				
	Surges Line to Line Line to Earth	Tr/Th us kV kV	1.2/50 (8/20) ± 1 ± 2	B

■ **Test Result**

Test Mode	Mode 2						
Angle	0, 90, 180, 270						
Inject Line	Polarity	Voltage (kV)	Time Interval (Second)	Inject Method	Performance Criterion	Test Result	Observation
L-N	±	1	60	Direct	☒A ☐B	PASS	---
L-PE	±	2	60	Direct	☒A ☐B	PASS	---
N-PE	±	2	60	Direct	☒A ☐B	PASS	---
LAN1 Port	±	1	60	Direct	☒A ☐B	PASS	---
LAN2 Port	±	1	60	Direct	☒A ☐B	PASS	---
COM1/COM2 Port	±	1	60	Direct	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

5.8. Conducted Susceptibility (CS)

■ **Test Specification**

EN 61000-4-6			
Environmental Phenomena	Units	Test Specification	Performance Criterion
Signal Ports			
Radio-Frequency Common mode	MHz	0.15-80	A
	V (rms, Un-modulated)	10	
	% AM (1kHz)	80	
Input and output DC Power Ports			
Radio-Frequency Common mode	MHz	0.15-80	A
	V (rms, Un-modulated)	10	
	% AM (1kHz)	80	
Input and output AC Power Ports			
Radio-Frequency Common mode	MHz	0.15-80	A
	V (rms, Un-modulated)	10	
	% AM (1kHz)	80	

EUT tested in accordance with the specifications given by the standard of IEC 61000-4-6.

■ **Test Result**

Test Mode	Mode 2					
Frequency Band (MHz)	Field Strength (Vrms)	Inject Port	Inject Method	Performance Criterion	Test Result	Observation
0.15 ~ 80	10	AC Mains	CDN-M3	☒A ☐B	PASS	---
0.15 ~ 80	10	LAN Port1	CDN-T8	☒A ☐B	PASS	---
0.15 ~ 80	10	LAN Port 2	CDN-T8	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

5.9. Power Frequency Magnetic Field (PMF)

■ Test Specification

EN 61000-4-8				
Item	Environmental Phenomena	Units	Test Specification	Performance Criterion
Enclosure Port				
Power-Frequency Magnetic Field		Hz A/m (r.m.s.)	50, 60 30	A

EUT tested in accordance with the specifications given by the standard of IEC 61000-4-8.

■ Test Result

Test Mode	Mode 2				
Polarization	Frequency (Hz)	Magnetic Strength (A/m)	Performance Criterion	Test Result	Observation
X Orientation	50	30	☒A ☐B	PASS	---
Y Orientation	50	30	☒A ☐B	PASS	---
Z Orientation	50	30	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

5.10. Voltage Dips and Interruption

■ **Test Specification**

EN 61000-4-11			
Environmental Phenomena	Units	Test Specification	Performance Criterion
Input AC Power Ports			
Voltage Dips	0	% Residual voltage	B
	1	Cycle	
	40	% Residual voltage	C
	10/12	Cycle	
	at 50/60	Hz	
	70	% Residual voltage	C
	25/30	Cycle	
	at 50/60	Hz	
Voltage Interruptions	0	% Residual voltage	C
	250/300	Cycle	
	at 50/60	Hz	

■ **Test Result**

Test Mode	Mode 1 / Mode 2				
Angle	0, 45, 90, 135, 180, 225, 270, 315				
Test Voltage (Vac)	Residual voltage (%)	Cycle	Performance Criterion	Test Result	Observation
230	0	1	☒A ☐B ☐C	PASS	Note1
	40	10	☒A ☐B ☐C	PASS	Note1
	70	25	☒A ☐B ☐C	PASS	Note1
	0	250	☐A ☒B ☐C	PASS	Note2
100	0	1	☒A ☐B ☐C	PASS	Note1
	40	10	☒A ☐B ☐C	PASS	Note1
	70	25	☒A ☐B ☐C	PASS	Note1
	0	250	☐A ☒B ☐C	PASS	Note2

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

Note 2: The power is temporary off and can be self-recoverable.

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