EMC TEST REPORT

For

DELIXI HANGZHOU INVERTER CO.,LTD.

Adjustable speed electrical power drive systems

Test Model: G022

Additional Model No.: SPD Series a: G0R4, G0R75, G1R1, G1R5, G2R2, G3R7, G5R5, G7R5, G011, G015, G018.5

Prepared for	:	DELIXI HANGZHOU INVERTER CO.,LTD.
Address	:	No. 8, Economic Plot, Zhuantang Science and Technology Park, Zhuantang Street, Xihu District, Hangzhou, Zhejiang
Prepared by	:	Zhongshan LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	Oct 14, 2020
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	Oct 14, 2020 ~ Oct 21, 2020
Date of Report	:	Oct 21, 2020

CE

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EMC TEST REPORT

EN IEC 61800-3:2018

Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods

Report Reference No.	:	**LCS201010001DE**
Date of Issue.....	:	Oct 21, 2020
Testing Laboratory Name.....	:	**Zhongshan LCS Compliance Testing Laboratory Ltd.**
Address.....	:	23F, Building A, Zhongshan Harbor of iDEAS, No. 25 Gangyi Road, Torch Development Zone, Zhongshan, Guangdong, China
Testing Location/ Procedure....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	:	**DELIXI HANGZHOU INVERTER CO.,LTD.**
Address.....	:	No. 8, Economic Plot, Zhuantang Science and Technology Park, Zhuantang Street, Xihu District, Hangzhou, Zhejiang
Test Specification		
Standard.....	:	EN IEC 61800-3:2018 EN IEC 61000-3-2: 2019 EN 61000-3-3: 2013+A1:2019
Test Report Form No.....	:	LCSEMC-1.0
TRF Originator.....	:	Zhongshan LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2017-03

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Test Item Description.....	:	**Adjustable speed electrical power drive systems**
Trade Mark.....	:	DELIXI
Test Model.....	:	G022
Ratings.....	:	Please refer to page 9
Result	:	**PASS**

Compiled by:	Supervised by:	Approved by:
Mia Huang	JasonDeng	
Mia Huang/ File administrators	Jason Deng/ Technique principal	Gavin Liang/Manager

EMC -- TEST REPORT

Test Report No. : LCS201010001DE	Oct 21, 2020 Date of issue

Test Model.....	: G022
EUT.....	: Adjustable speed electrical power drive systems
Applicant.....	**: DELIXI HANGZHOU INVERTER CO.,LTD.**
Address.....	: No. 8, Economic Plot, Zhuantang Science and Technology Park, Zhuantang Street, Xihu District, Hangzhou, Zhejiang
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: DELIXI HANGZHOU INVERTER CO.,LTD.**
Address.....	: No. 8, Economic Plot, Zhuantang Science and Technology Park, Zhuantang Street, Xihu District, Hangzhou, Zhejiang
Telephone.....	: /
Fax.....	: /
Factory.....	**: DELIXI HANGZHOU INVERTER CO.,LTD.**
Address.....	: No. 8, Economic Plot, Zhuantang Science and Technology Park, Zhuantang Street, Xihu District, Hangzhou, Zhejiang
Telephone.....	: /
Fax.....	: /

Test Result	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	Oct 21, 2020	Initial Issue	Leo Lee

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1. TEST STANDARDS

The tests were performed according to following standards:

EN IEC 61800-3:2018 Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods

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2.SUMMARY OF STANDARDS AND RESULTS

2.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

Emission (EN IEC 61800-3:2018)			
Description of Test Item	**Standard**	**Limits**	**Results**
Conducted disturbance at mains terminals	EN IEC 61800-3:2018	C2	PASS
Radiated disturbance(30-1000MHz)	EN IEC 61800-3:2018	C2	PASS
Radiated disturbance(150kHz-30MHz)	EN IEC 61800-3:2018	C2	PASS
Harmonic current emissions	EN IEC 61000-3-2:2019	Class A	PASS
Voltage fluctuations & flicker	EN 61000-3-3: 2013+A1:2019	---------	PASS
Immunity (EN IEC 61800-3:2018)			
Description of Test Item	**Basic Standard**	**Performance Criteria**	**Results**
Electrostatic discharge (ESD)	EN 61000-4-2: 2009	B	PASS
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006+A2: 2010	A	PASS
Electrical fast transient (EFT)	EN 61000-4-4: 2012	B	PASS
Electrical fast transient (Power interfaces)	EN 61000-4-4: 2012	B	PASS
Electrical fast transient (Ports for process measurement control lines and signal interfaces)	EN 61000-4-4: 2012	B	PASS
Surge (Input a.c. power ports&DC power ports)	EN 61000-4-5: 2014+A1: 2017	B	PASS
Radio-frequency, Continuous conducted disturbance	EN 61000-4-6: 2014	A	PASS
***Note: N/A is an abbreviation for Not Applicable.			

Test mode:		
Mode 1	Normal operation	Record
***Note: All test modes were tested, but we only recorded the worst case in this report.		

2.2. Description of Performance Criteria

General Performance Criteria
Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following:
─ essential operational modes and states;
─ tests of all peripheral access (hard disks, floppy disks, printers, keyboard, mouse, etc.);
─ quality of software execution;
─ quality of data display and transmission;
─ quality of speech transmission.

2.2.1. Performance criterion A
The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacture when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deriver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

2.2.2. Performance criterion B
After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacture, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operation state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be deriver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

2.2.3. Performance criterion C
Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacture’s instructions.

Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be loss.

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3. GENERAL INFORMATION

3.1. Description of Device (EUT)

EUT	:	Adjustable speed electrical power drive systems
Trade Mark	:	DELIXI
Test Model	:	G022
Model List	:	SPD Series a: G0R4, G0R75, G1R1, G1R5, G2R2, G3R7, G5R5, G7R5, G011, G015, G018.5
Model declaration	:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Power Supply	:	Input :AC 380V, 50/60Hz, 46.5A DC 550V; Output: AC 380V, 45A

3.2. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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3.3. Measurement Uncertainty

Test	Parameters	Expanded uncertainty (U_{lab})	Expanded uncertainty (U_{cispr})
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 2.63 dB ± 2.35 dB	± 3.8 dB ± 3.4 dB
Power Disturbance	Level accuracy (30MHz to 300MHz)	± 2.90dB	± 4.5 dB
Electromagnetic Radiated Emission (3-loop)	Level accuracy (9kHz to 30MHz)	± 3.60 dB	± 3.3 dB
Radiated Emission	Level accuracy (9kHz to 30MHz)	± 3.68 dB	N/A
Radiated Emission	Level accuracy (30MHz to 1000MHz)	± 3.48 dB	± 5.3 dB
Radiated Emission	Level accuracy (above 1000MHz)	± 3.90 dB	± 5.2 dB
Mains Harmonic	Voltage	± 0.510%	N/A
Voltage Fluctuations & Flicker	Voltage	± 0.510%	N/A

1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.
2) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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4. MEASURING DEVICES AND TEST EQUIPMENT

Test Item: Conducted Disturbance

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Software	AUDIX	E3	/	N/A
2	EMI Test Receiver	R&S	ESPI	101840	2020-06-10
3	Artificial Mains	R&S	ENV216	101288	2020-06-10
4	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2020-06-10
5	Impedance Stabilization Network	TESEQ	ISN T800	45130	2019-11-15

Test Item: Radiated Disturbance (Electric Field)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Software	AUDIX	E3	/	N/A
2	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2020-06-10
3	Positioning Controller	MF	MF-7082	/	2020-06-10
4	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2020-06-10
5	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2020-06-10
6	EMI Test Receiver	R&S	ESR 7	101181	2020-06-10
7	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2019-11-15
8	Broadband Preamplifier	/	BP-01M18G	P190501	2020-06-10
9	RF Cable-R03m	Jye Bao	RG142	CB021	2020-06-10
10	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2020-06-10

Test Item: Harmonic Current

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Power Analyzer Test System	Voltech	PM6000	20000670053	2020-06-10

Test Item: Voltage fluctuation and Flicker

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Power Analyzer Test System	Voltech	PM6000	20000670053	2020-06-10

Test Item: Electrostatic Discharge

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ESD Simulator	SCHLODER	SESD 230	604035	2020-06-10

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Test Item: RF Field Strength Susceptibility

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	RS Test Software	Tonscend	/	/	N/A
2	ESG Vector Signal Generator	Agilent	E4438C	MY42081396	2019-11-15
3	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2020-06-10
4	RF POWER AMPLIFIER	OPHIR	5225R	1052	NCR
5	RF POWER AMPLIFIER	OPHIR	5273F	1019	NCR
6	Stacked Broadband Log Periodic Antenna	SCHWARZBECK	STLP 9128	9128ES-145	NCR
7	Stacked Mikrowellen Log.-Per Antenna	SCHWARZBECK	STLP 9149	9149-484	NCR
8	Electric field probe	Narda S.TS./PMM	EP601	611WX80208	2020-03-24
Note: NCR means no calibration requirement					

Test Item: Electrical Fast Transient/Burst

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Immunity Simulative Generator	EM TEST	UCS500 M4	0101-34	2020-06-10

Test Item: Surge

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Immunity Simulative Generator	EM TEST	UCS 500 M4	0101-34	2020-06-10

Test Item: Conducted Susceptibility

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Simulator	FRANKONIA	CIT-10/75	A126A1195	2020-06-10
2	CDN	FRANKONIA	CDN-M2+M3	A2210177	2020-06-10
3	6dB Attenuator	FRANKONIA	DAM25W	1172040	2020-06-10

Test Item: Power Frequency Magnetic Field Susceptibility

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Power frequency mag-field generator System	EVERFINE	EMS61000-8K	906003	2020-06-10

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Test Item: Voltage Dips					
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Voltage dips and up generator	3CTEST	VDG-1105G	EC0171014	2020-06-10

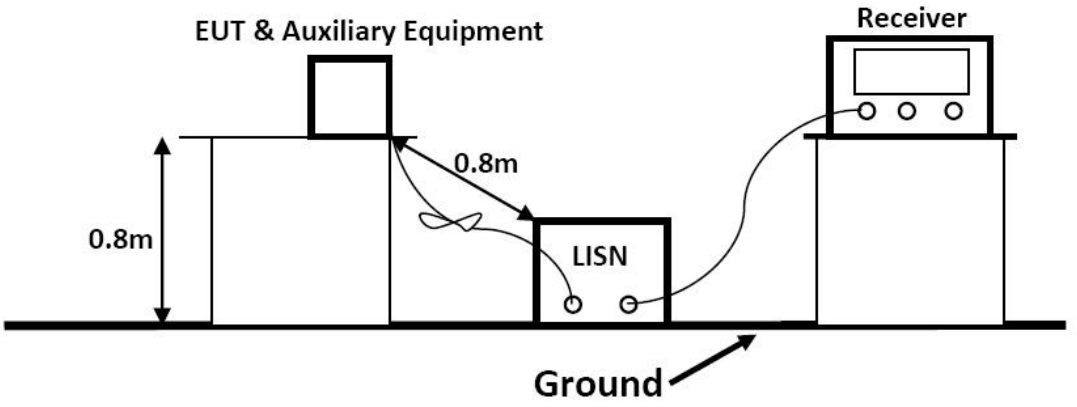
Test Item: Voltage Short Interruptions					
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Voltage dips and up generator	3CTEST	VDG-1105G	EC0171014	2020-06-10

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5. TEST RESULTS

5.1. POWER LINE CONDUCTED EMISSION MEASUREMENT

5.1.1. Block Diagram of Test Setup



5.1.2. Test Standard

EN IEC 61800-3:2018

Power Line Conducted Emission Limits (Category C1)		
Frequency (MHz)	Limit (dBμV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0
NOTE1-The lower limit shall apply at the transition frequencies. NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

Power Line Conducted Emission Limits (Category C2)		
Frequency (MHz)	Limit (dBμV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	79	66
0.50 ~ 5.00	73	60
5.00 ~ 30.00	73	60

5.1.3. EUT Configuration on Test

The following equipments are installed on Power Line Conducted Emission Measurement to meet the EN IEC 61800-3 requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

5.1.4. Operating Condition of EUT

5.1.4.1.Setup the EUT as shown on Section 5.1.1
5.1.4.2.Turn on the power of all equipments.
5.1.4.3.Let the EUT work in measuring mode(1) and measure it.

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5.1.5. Test Procedure

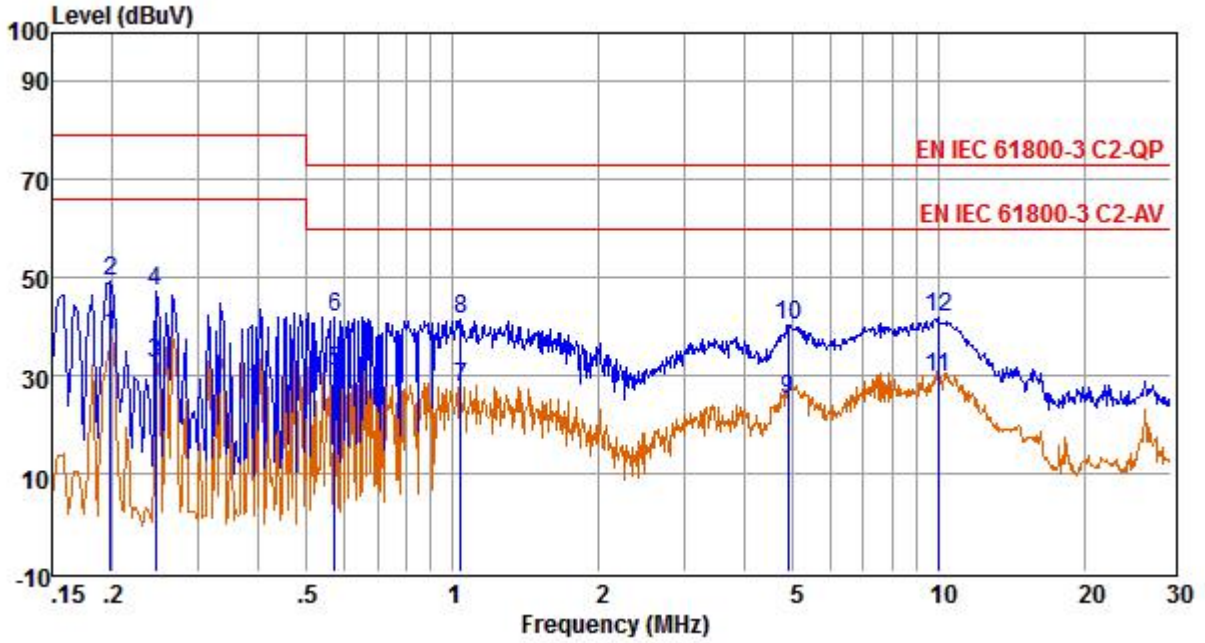
The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided 50-ohm coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the EN 55032 regulations during conducted emission measurement.
The bandwidth of the field strength meter is set at 9kHz in 150kHz~30MHz.
The frequency range from 150kHz to 30MHz is investigated.

5.1.6. Test Results

PASS.

The test result please refer to the next page.

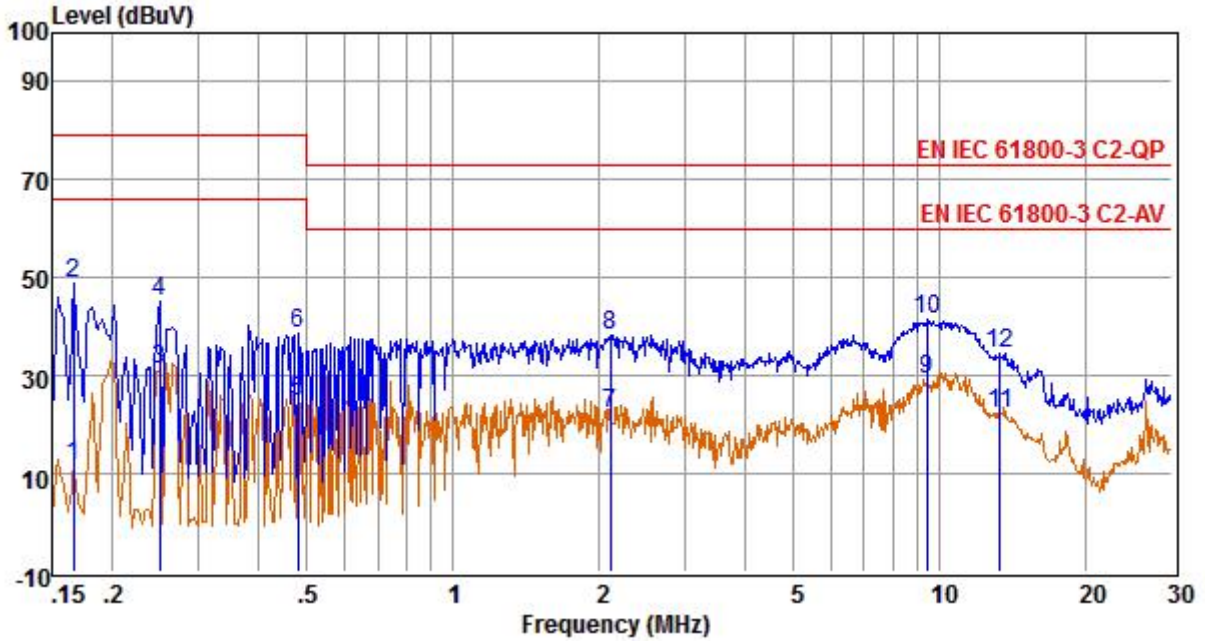
Test Model	G022	Test Mode	Mode 1
Environmental Conditions	20.3℃, 52% RH	Test Engineer	Feng liang
Pol.	Line	Test Voltage	AC 380V/50Hz



	Freq	Reading	LisnFac	CabLos	Measured	Limit	Over	Remark
	MHz	dBpW	dB	dB	dBpW	dBpW	dB	
1	0.20	28.70	9.58	0.13	38.41	66.00	-27.59	Average
2	0.20	39.70	9.58	0.13	49.41	79.00	-29.59	QP
3	0.25	22.67	9.58	0.12	32.37	66.00	-33.63	Average
4	0.25	37.67	9.58	0.12	47.37	79.00	-31.63	QP
5	0.57	21.24	9.58	0.10	30.92	60.00	-29.08	Average
6	0.57	32.24	9.58	0.10	41.92	73.00	-31.08	QP
7	1.04	17.80	9.59	0.12	27.51	60.00	-32.49	Average
8	1.04	31.80	9.59	0.12	41.51	73.00	-31.49	QP
9	4.90	15.60	9.64	0.11	25.35	60.00	-34.65	Average
10	4.90	30.60	9.64	0.11	40.35	73.00	-32.65	QP
11	9.97	19.91	9.74	0.12	29.77	60.00	-30.23	Average
12	9.97	31.91	9.74	0.12	41.77	73.00	-31.23	QP

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Test Model	G022	Test Mode	Mode 1
Environmental Conditions	20.3℃, 52% RH	Test Engineer	Feng liang
Pol.	Neutral	Test Voltage	AC 380V/50Hz



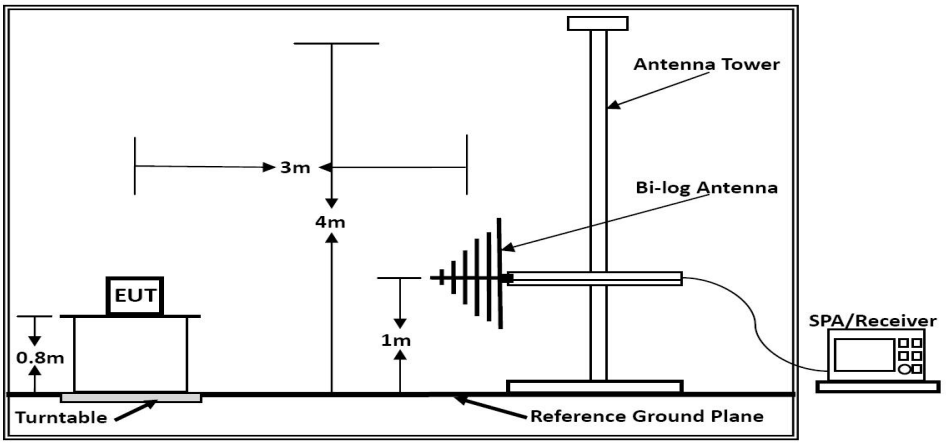
	Freq	Reading	LisnFac	CabLos	Measured	Limit	Over	Remark
	MHz	dBpW	dB	dB	dBpW	dBpW	dB	
1	0.17	2.06	9.59	0.12	11.77	66.00	-54.23	Average
2	0.17	39.06	9.59	0.12	48.77	79.00	-30.23	QP
3	0.25	21.61	9.58	0.12	31.31	66.00	-34.69	Average
4	0.25	35.61	9.58	0.12	45.31	79.00	-33.69	QP
5	0.48	15.03	9.57	0.10	24.70	66.00	-41.30	Average
6	0.48	29.03	9.57	0.10	38.70	79.00	-40.30	QP
7	2.11	12.59	9.59	0.13	22.31	60.00	-37.69	Average
8	2.11	28.59	9.59	0.13	38.31	73.00	-34.69	QP
9	9.40	19.50	9.72	0.12	29.34	60.00	-30.66	Average
10	9.40	31.50	9.72	0.12	41.34	73.00	-31.66	QP
11	13.34	12.26	10.05	0.15	22.46	60.00	-37.54	Average
12	13.34	24.26	10.05	0.15	34.46	73.00	-38.54	QP

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

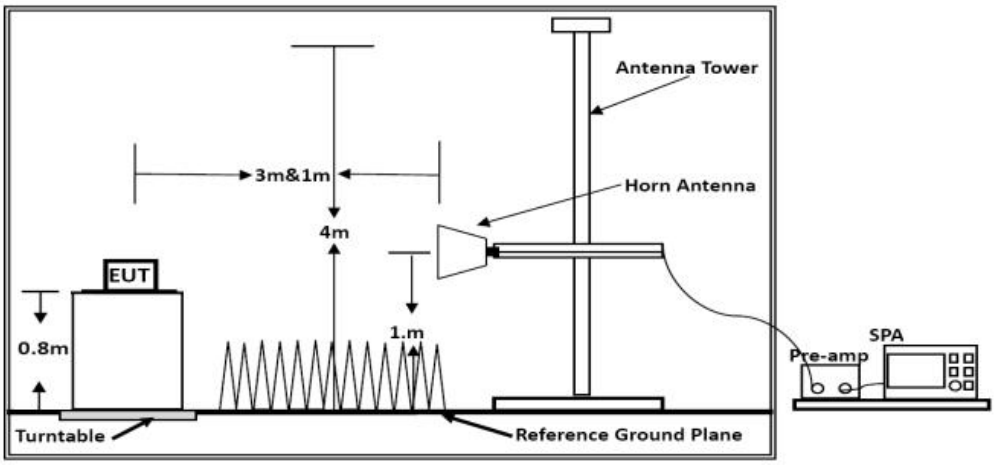
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5.2. RADIATED EMISSION MEASUREMENT

5.2.1. Block Diagram of Test Setup



Below 1GHz



Above 1GHz

5.2.2. Test Standard

EN IEC 61800-3:2018 Class B

All emanations from a C1 or C2 device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

Limits for Radiated Emission of C1		
Frequency (MHz)	Distance (Meters)	Field Strengths Limit (dBμV/m)
30 ~ 230	3	40
230 ~ 1000	3	47
***Note: (1) The smaller limit shall apply at the combination point between two frequency bands. (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.		
Limits for Radiated Emission of C2		
Frequency (MHz)	Distance (Meters)	Field Strengths Limit (dBμV/m)
30 ~ 230	3	50
230 ~ 1000	3	57
***Note: The lower limit applies at the transition frequency.		

5.2.3. EUT Configuration on Test

The EN 55032 regulations test method must be used to find the maximum emission during radiated emission measurement.

5.2.4. Operating Condition of EUT

5.2.4.1.Turn on the power.

5.2.4.2.Let the EUT work in the test mode(1) and measure it.

5.2.5. Test Procedure

The EUT is placed on a turntable, which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. By-log antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the EMI test receiver is set at RBW/VBW=120kHz/300kHz.

The frequency range from 30MHz to 1000MHz is checked.

The bandwidth of the Spectrum analyzer is set at RBW/VBW=1MHz/3MHz.

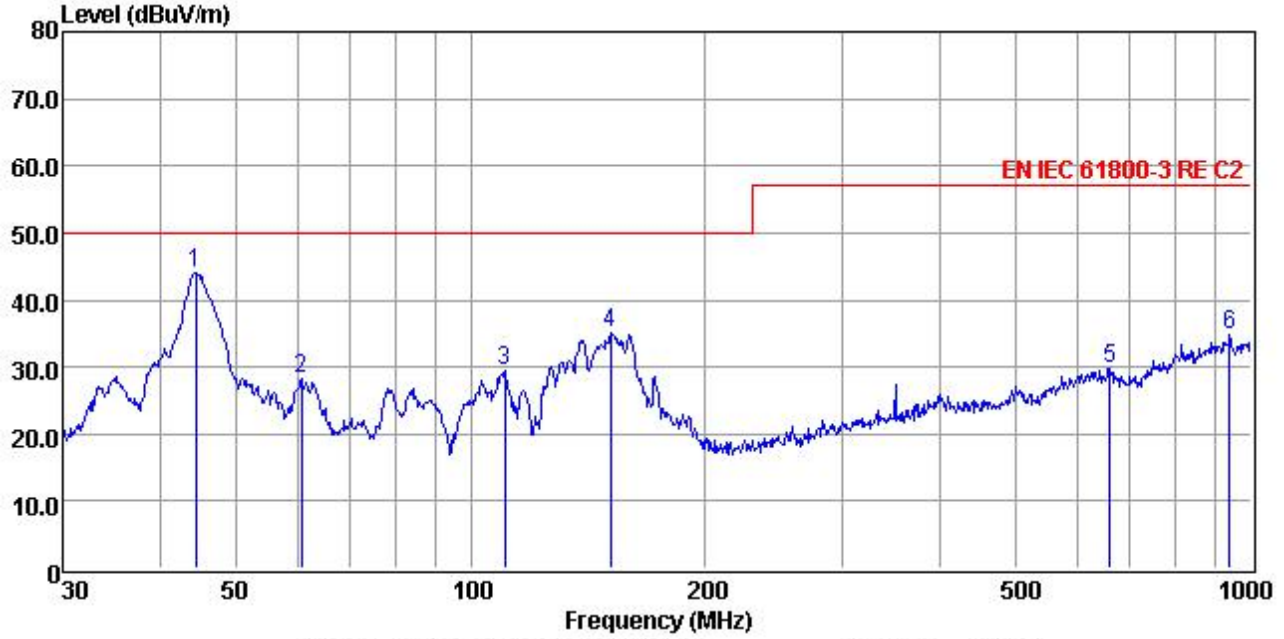
The frequency range from 1GHz to the frequency which about 5th carrier harmonic or 6GHz is checked.

5.2.6. Test Results

PASS.

The test result please refer to the next page.

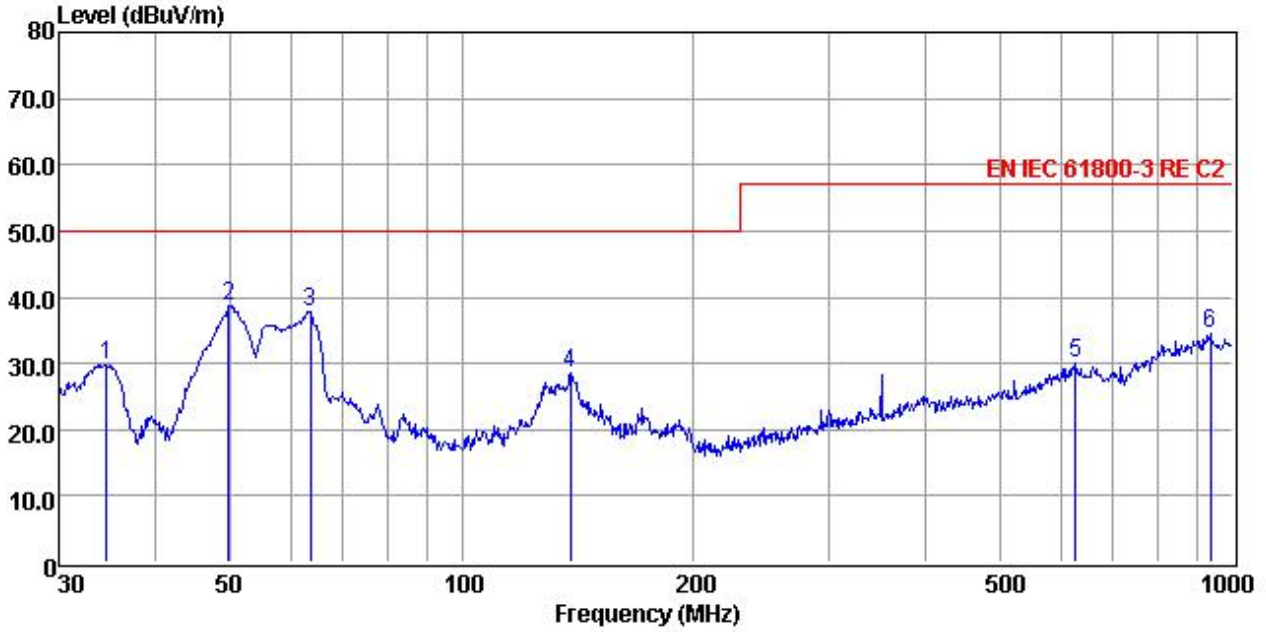
Test Model	G022	Test Mode	Mode 1
Environmental Conditions	24℃, 56% RH	Detector Function	Quasi-peak
Pol.	Vertical	Distance	3m
Test Engineer	Feng liang	Test Voltage	AC 380V/50Hz



	Freq	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	44.43	59.07	2.33	12.91	30.32	43.99	50.00	-6.01	QP
2	60.70	44.38	2.58	11.66	30.36	28.26	50.00	-21.74	QP
3	110.57	46.67	3.16	10.17	30.53	29.47	50.00	-20.53	QP
4	151.07	47.99	3.55	14.12	30.60	35.06	50.00	-14.94	QP
5	658.84	34.96	6.10	20.37	31.73	29.70	57.00	-27.30	QP
6	938.83	35.85	7.01	23.64	31.67	34.83	57.00	-22.17	QP

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Test Model	G022	Test Mode	Mode 1
Environmental Conditions	24℃, 56% RH	Detector Function	Quasi-peak
Pol.	Horizontal	Distance	3m
Test Engineer	Feng liang	Test Voltage	AC 380V/50Hz



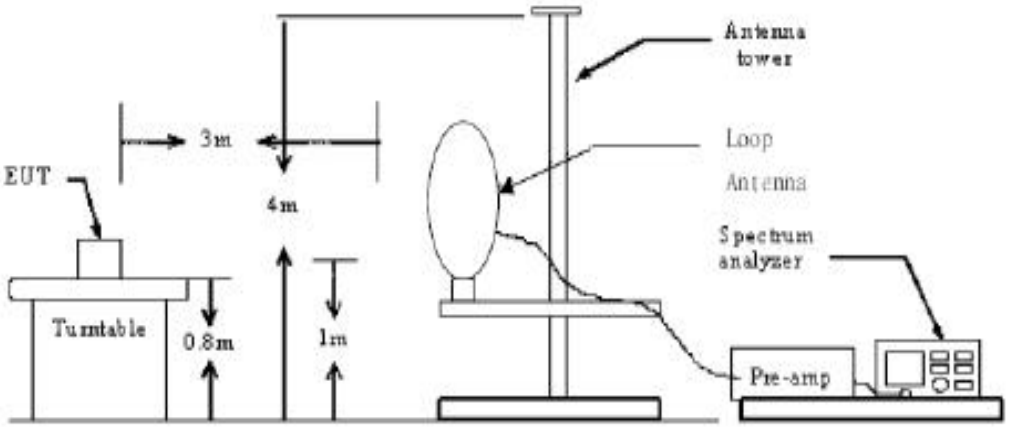
	Freq	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	34.64	47.62	2.17	10.38	30.32	29.85	50.00	-20.15	QP
2	49.88	53.10	2.41	13.47	30.32	38.66	50.00	-11.34	QP
3	63.54	53.70	2.62	11.88	30.37	37.83	50.00	-12.17	QP
4	138.39	43.17	3.43	12.63	30.58	28.65	50.00	-21.35	QP
5	625.08	35.27	5.95	20.37	31.68	29.91	57.00	-27.09	QP
6	935.55	35.56	7.01	23.48	31.67	34.38	57.00	-22.62	QP

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

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5.3. Rediation between 0.15MHz and 30MHz

5.3.1. Block Diagram of Test Setup



5.3.2. Test Procedure

In case of interference, the radiation shall be measured at a distance of 10m from the boundary of the installation, if interference occurs in the first enviroment or at a distance of 30m from the boundary of the installation , if interference occurs in the second environment ;

A magnetic loop antenna according to CISPR 16-1-4 shall be usde, The Values shall not exceed those given in next figure at the frequencies for which interference occurs.

Limits :

Frequency band (MHz)	Magnetic field Strengh component Quasi Peak dB(μ V/m)
0.15-0.49	75
0.49-3.95	65
3.95-20	50
20-30	40

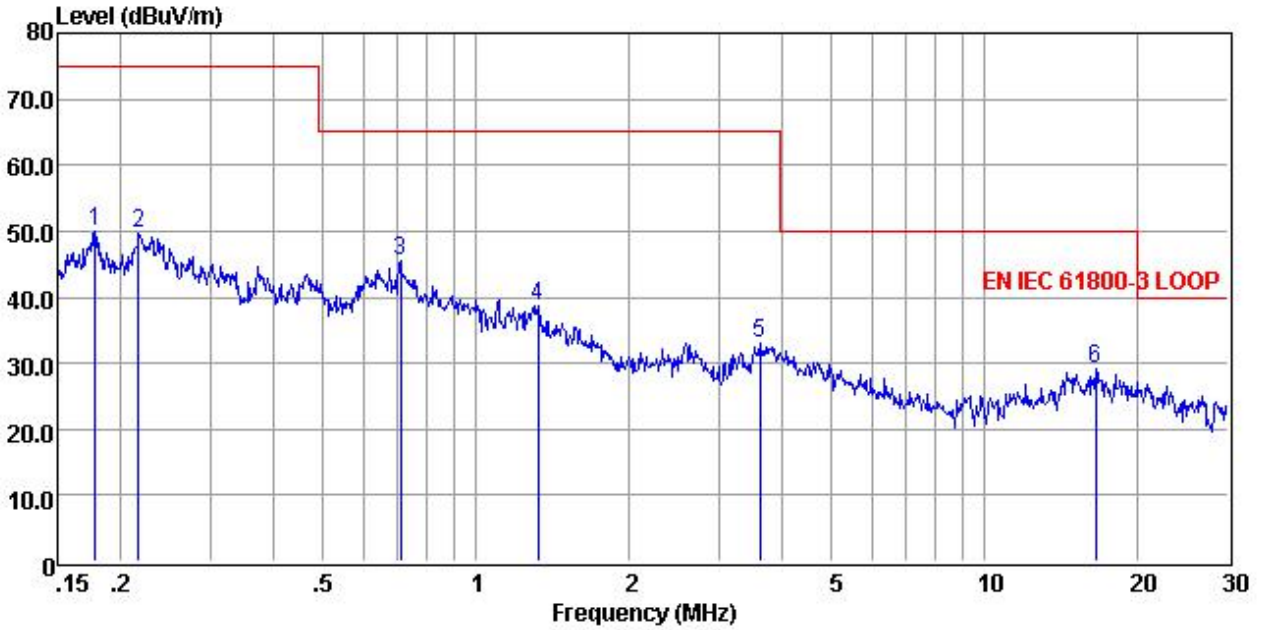
5.3.3 Test Results

PASS

The test result please refer to the next page.

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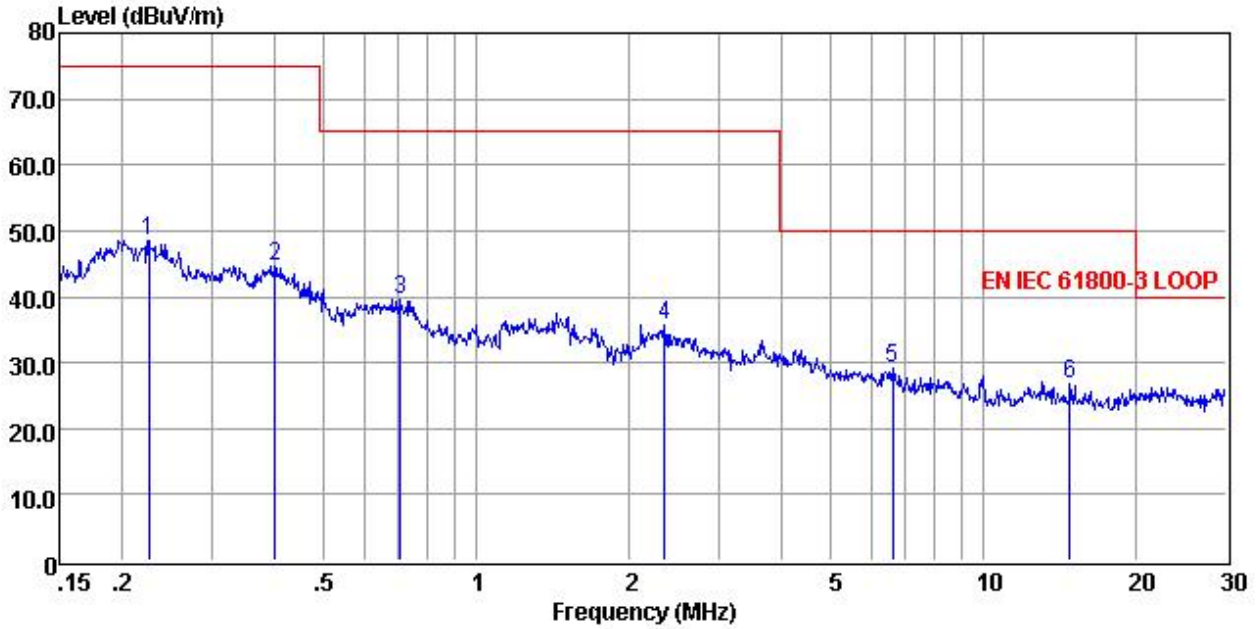
Test Model	G022	Test Mode	Mode 1
Environmental Conditions	24℃, 56% RH	Detector Function	Quasi-peak
Pol.	Vertical	Distance	3m
Test Engineer	Feng liang	Test Voltage	AC 380V/50Hz



	Freq	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	0.18	49.89	0.00	0.00	0.00	49.89	75.00	-25.11	QP
2	0.22	49.67	0.00	0.00	0.00	49.67	75.00	-25.33	QP
3	0.71	45.64	0.00	0.00	0.00	45.64	65.00	-19.36	QP
4	1.32	38.70	0.00	0.00	0.00	38.70	65.00	-26.30	QP
5	3.60	32.94	0.00	0.00	0.00	32.94	65.00	-32.06	QP
6	16.49	29.29	0.00	0.00	0.00	29.29	50.00	-20.71	QP

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Test Model	G022	Test Mode	Mode 1
Environmental Conditions	23.5℃, 53.3% RH	Detector Function	Quasi-peak
Pol.	Horizontal	Distance	3m
Test Engineer	Feng liang	Test Voltage	AC 380V/50Hz



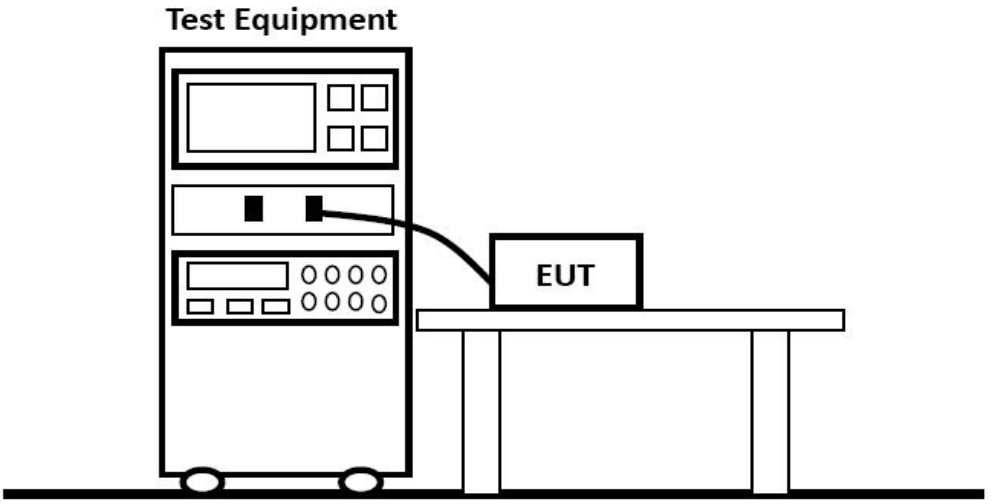
	Freq	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	0.23	48.58	0.00	0.00	0.00	48.58	75.00	-26.42	QP
2	0.40	44.69	0.00	0.00	0.00	44.69	75.00	-30.31	QP
3	0.70	39.68	0.00	0.00	0.00	39.68	65.00	-25.32	QP
4	2.35	35.55	0.00	0.00	0.00	35.55	65.00	-29.45	QP
5	6.59	29.26	0.00	0.00	0.00	29.26	50.00	-20.74	QP
6	14.75	26.83	0.00	0.00	0.00	26.83	50.00	-23.17	QP

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

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5.4. HARMONIC CURRENT EMISSION MEASUREMENT

5.4.1. Block Diagram of Test Setup



5.4.2. Test Standard

EN IEC 61000-3-2:2019

5.4.3. Operating Condition of EUT

Same as Section 5.2.4, except the test setup replaced as Section 5.4.1.

5.4.4. Test Results

PASS

Test Model	G022	Test Mode	Mode 1
Environmental Conditions	23.5℃, 53.3% RH	Detector Function	Quasi-peak
Test Engineer	Feng liang	Test Voltage	AC 380V/50Hz

Harmonic Number	Limit Current mA	Average (filtered) mA	% Limit	max. Value (Filtered) mA	% Limit	Assessment
Fundamental :		128.5				
2 :	2.6	0.1	3.8	0.12	4.6	Pass
3 :	36.7	15.9	43.3	16.00	43.6	Pass
4 :	-	0.1	-	0.08	-	-
5 :	13.0	5.5	42.3	5.57	42.8	Pass
6 :	-	0.1	-	0.06	-	-
7 :	9.1	3.0	33.0	3.04	33.4	Pass
8 :	-	0.0	-	0.05	-	-
9 :	6.5	3.1	47.7	3.14	48.3	Pass
10 :	-	0.0	-	0.05	-	-
11 :	3.9	2.7	69.2	2.77	71.0	Pass
12 :	-	0.1	-	0.06	-	-
13 :	3.9	2.0	51.3	2.11	54.1	Pass
14 :	-	0.0	-	0.05	-	-
15 :	3.9	1.5	38.5	1.60	41.0	Pass
16 :	-	0.0	-	0.05	-	-
17 :	3.9	1.5	38.5	1.52	39.0	Pass
18 :	-	0.1	-	0.05	-	-
19 :	3.9	1.7	43.6	1.71	43.8	Pass
20 :	-	0.0	-	0.05	-	-
21 :	3.9	1.8	46.2	1.86	47.7	Pass
22 :	-	0.1	-	0.06	-	-
23 :	3.9	1.6	41.0	1.62	41.5	Pass
24 :	-	0.1	-	0.06	-	-
25 :	3.9	1.3	33.3	1.29	33.1	Pass
26 :	-	0.1	-	0.06	-	-
27 :	3.9	1.1	28.2	1.16	29.7	Pass
28 :	-	0.1	-	0.05	-	-
29 :	3.9	1.1	28.2	1.13	29.0	Pass
30 :	-	0.1	-	0.05	-	-
31 :	3.9	1.0	25.6	1.00	25.6	Pass
32 :	-	0.1	-	0.06	-	-
33 :	3.9	0.9	23.1	0.94	24.1	Pass
34 :	-	0.1	-	0.07	-	-
35 :	3.9	0.9	23.1	0.97	24.9	Pass
36 :	-	0.1	-	0.05	-	-
37 :	3.9	0.8	20.5	0.89	22.8	Pass
38 :	-	0.1	-	0.06	-	-
39 :	3.9	0.6	15.4	0.65	16.7	Pass
40 :	-	0.1	-	0.05	-	-
21 - 39 :	12.3	3.7	30.1	3.73	30.3	-

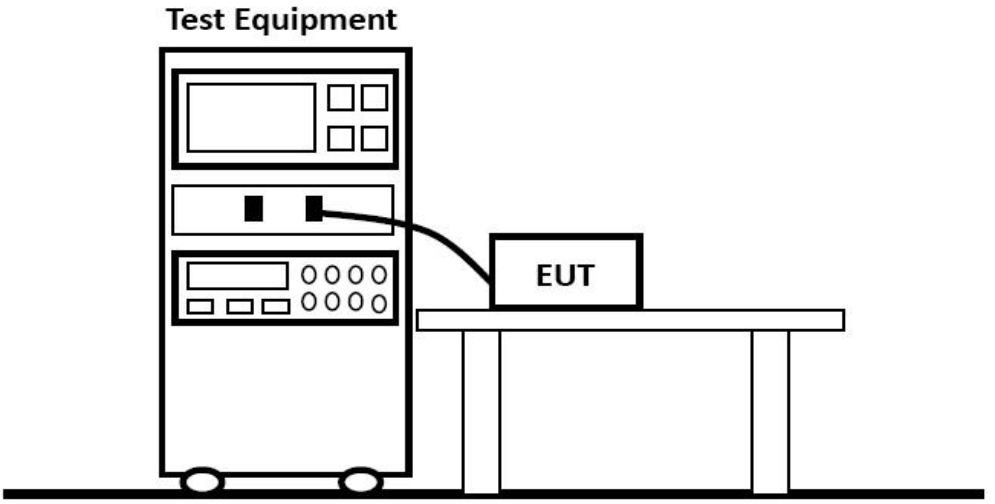
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Harmonic	Harmonic Voltage	Harmonic Ratio	Limit	Result
2	0.07	0.034	0.20	PASS
3	0.15	0.065	0.90	PASS
4	0.04	0.021	0.20	PASS
5	0.04	0.018	0.40	PASS
6	0.03	0.016	0.20	PASS
7	0.04	0.021	0.30	PASS
8	0.00	0.008	0.20	PASS
9	0.01	0.008	0.20	PASS
10	0.00	0.003	0.20	PASS
11	0.02	0.013	0.10	PASS
12	0.00	0.007	0.10	PASS
13	0.01	0.003	0.10	PASS
14	0.00	0.003	0.10	PASS
15	0.01	0.010	0.10	PASS
16	0.00	0.003	0.10	PASS
17	0.01	0.008	0.10	PASS
18	0.00	0.003	0.10	PASS
19	0.01	0.005	0.10	PASS
20	0.00	0.000	0.10	PASS
21	0.00	0.000	0.10	PASS
22	0.00	0.004	0.10	PASS
23	0.00	0.000	0.10	PASS
24	0.00	0.000	0.10	PASS
25	0.00	0.000	0.10	PASS
26	0.00	0.003	0.10	PASS
27	0.00	0.001	0.10	PASS
28	0.00	0.000	0.10	PASS
29	0.00	0.000	0.10	PASS
30	0.00	0.000	0.10	PASS
31	0.00	0.003	0.10	PASS
32	0.00	0.001	0.10	PASS
33	0.00	0.000	0.10	PASS
34	0.00	0.000	0.10	PASS
35	0.00	0.000	0.10	PASS
36	0.00	0.000	0.10	PASS
37	0.00	0.001	0.10	PASS
38	0.00	0.000	0.10	PASS
39	0.00	0.000	0.10	PASS
40	0.00	0.000	0.10	PASS

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5.5. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

5.5.1. Block Diagram of Test Setup



5.5.2. Test Standard

EN 61000-3-3: 2013+A1:2019

5.5.3. Operating Condition of EUT

Same as Section 5.2.4, except the test setup replaced as Section 5.5.1.

5.5.4. Test Results

PASS

Test Model	G022	Test Mode	Mode 1
Environmental Conditions	23.5℃, 53.3% RH	Detector Function	Quasi-peak
Test Engineer	Feng liang	Test Voltage	AC 380V/50Hz

Voltage Variations

Nominal Voltage:	380 Vrms		
Highest Half-cycle level:	-0.39%		
Lowest Half-cycle level:	-0.23%		
d(max):	0.00%	Limit: 4%	
t(max):	0.00seconds	Limit: 500ms	
Steady State definition:	>1000ms within +/- 0.2%		
Largest d(c) change down:	0.00%		
Largest d(c) change up:	+0.00%		
Largest d(c) change:	0.00%	Limit: 3.3%	PASS

Flicker

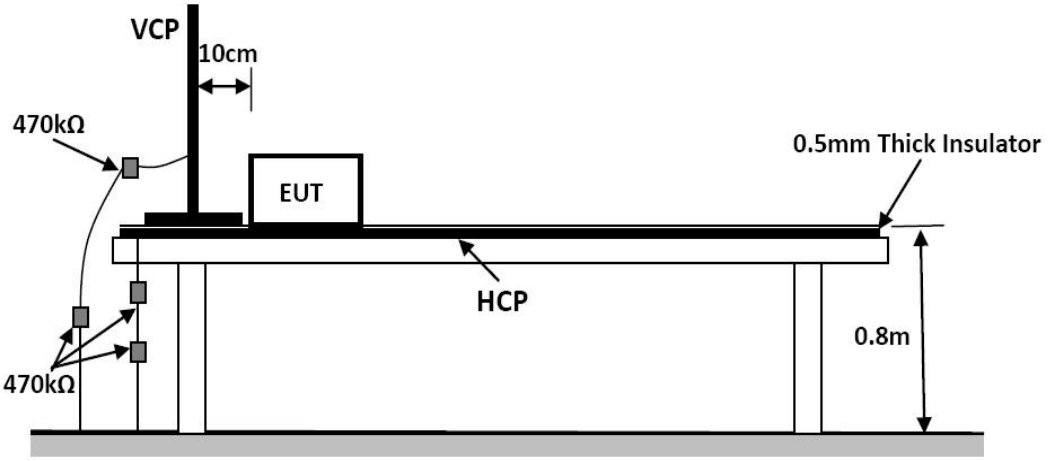
Short Term Flicker Pst:	0.00	Limit: 1.00	PASS

Pst Classifier		Plt Calculation	
Duration	Flicker	Interval	Pst
0.1%	0.00		
0.7%	0.00		
1.0%	0.00		
1.5%	0.00		
2.2%	0.00		
3%	0.00		
4%	0.00		
6%	0.00		
8%	0.00		
10%	0.00		
13%	0.00		
17%	0.00		
30%	0.00		
50%	0.00		
80%	0.00		

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5.6. ELECTROSTATIC DISCHARGE IMMUNITY TEST

5.6.1. Block Diagram of Test Setup



5.6.2. Test Standard

EN IEC 61800-3:2018 (EN 61000-4-2: 2009, Severity Level: 3 / Air Discharge: ±8KV, Level: 2 / Contact Discharge: ±4KV)

5.6.3. Severity Levels and Performance Criterion

5.6.3.1. Severity level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1	±2	±2
2	±4	±4
3	±6	±8
4	±8	±15
X	Special	Special

5.6.3.2. Performance Criterion
Performance Criterion: B

5.6.4. EUT Configuration on Test

The configuration of EUT is listed in Section 4.

5.6.5. Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 5.1.4. Except the test set up replaced by Section 5.6.1.

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Electrostatic Discharge Test Results

Standard	☐ IEC 61000-4-2 ☑ EN 61000-4-2		
Applicant	DELIXI HANGZHOU INVERTER CO.,LTD.		
EUT	Adjustable speed electrical power drive systems	**Temperature**	24.5℃
M/N	G022	**Humidity**	54.6％
Criterion	B	**Pressure**	1021mbar
Test Mode	Mode 1	**Test Engineer**	Feng liang

Air Discharge						
Test Points	**Test Levels**			**Results**		
	± 2kV	**± 4kV**	**± 8kV**	**Passed**	**Fail**	**Performance**

5.6.6. Test Procedure

5.6.6.1. Air Discharge

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

5.6.6.2. Contact Discharge

All the procedure shall be same as Section 5.6.1. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

5.6.6.3. Indirect Discharge For Horizontal Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

5.6.6.4. Indirect Discharge For Vertical Coupling Plane

At least 10 single discharge (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

5.6.7. Test Results

PASS.

The test result please refer to the next page.

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						Criterion
Front	☒	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☒	☐	☐A ☒B
Top	☒	☒	☒	☒	☐	☐A ☒B
Bottom	☒	☒	☒	☒	☐	☐A ☒B

Contact Discharge

Test Points	Test Levels		Results		
	± 2 kV	±4 kV	Passed	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B
Top	☒	☒	☒	☐	☐A ☒B
Bottom	☒	☒	☒	☐	☐A ☒B

Discharge To Horizontal Coupling Plane

Side of EUT	Test Levels		Results		
	± 2 kV	± 4 kV	Passed	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B

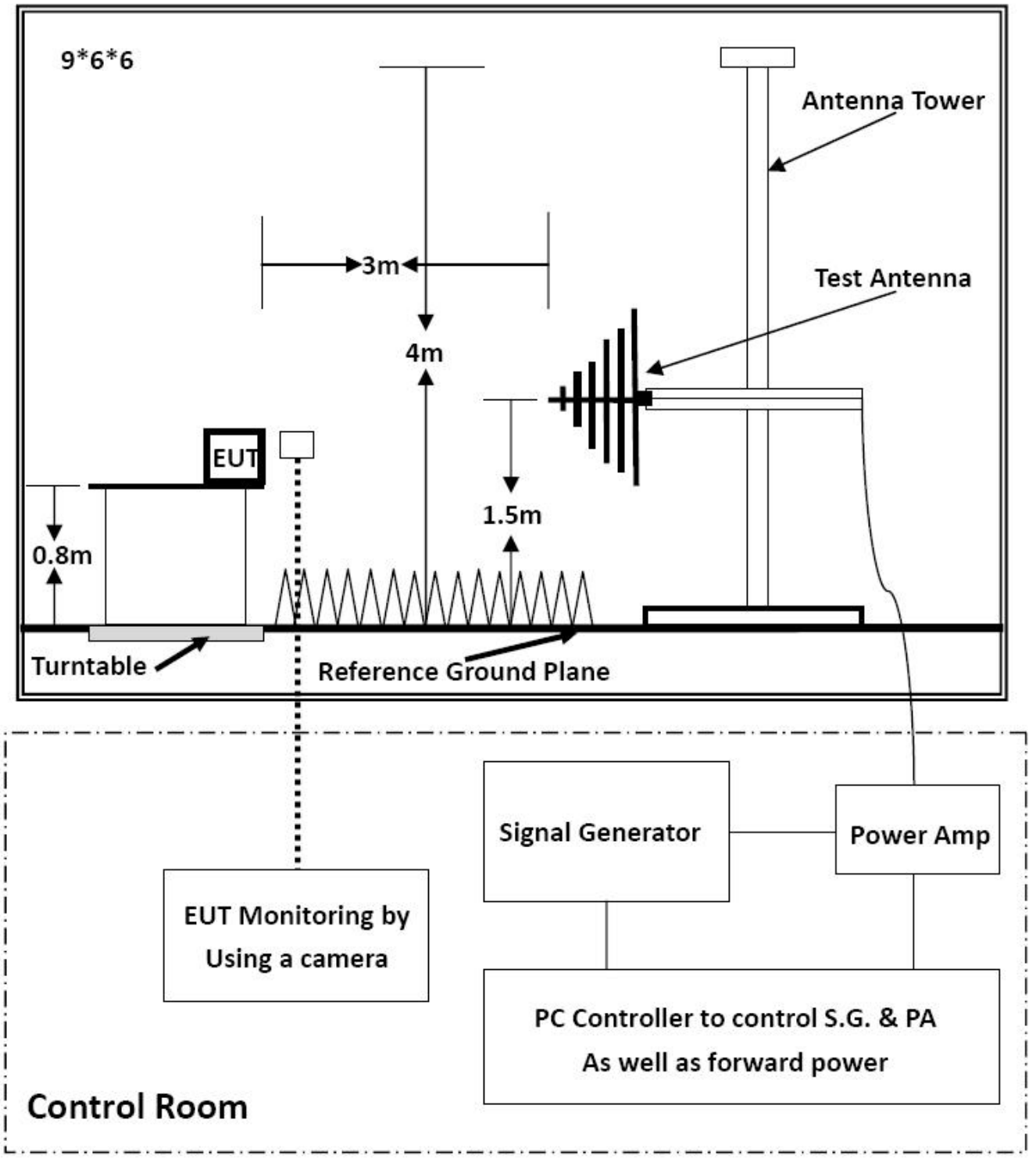
Discharge To Vertical Coupling Plane

Side of EUT	Test Levels		Results		
	± 2 kV	± 4 kV	Passed	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B

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5.7. RF FIELD STRENGTH SUSCEPTIBILITY TEST

5.7.1. Block Diagram of Test Setup



5.7.2. Test Standard

EN IEC 61800-3:2018 (EN 61000-4-3: 2006+A2: 2010 Severity Level: 2, 3V/m)

5.7.3. Severity Levels and Performance Criterion

5.7.3.1. Severity level

Level	Field Strength (V/m)
1	1
2	3
3	10
X	Special

5.7.3.2. Performance Criterion
Performance Criterion: A

5.7.4. EUT Configuration on Test

The configuration of EUT is listed in Section 4

5.7.5. Operating Condition of EUT

Same as radiated emission measurement, which is listed in Section 5.2.4, except the test setup replaced as Section 5.7.1.

5.7.6. Test Procedure

The EUT are placed on a table, which is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna, which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.
In order to judge the EUT performance, a CCD Recording is used to monitor its screen.
All the scanning conditions are as following:

Condition of Test	Remark
Fielded Strength	3 V/m (Severity Level 2)
Radiated Signal	Unmodulated
Test Frequency Range (swept test)	80-1000MHz
Test Frequency (spot test)	1000-2000MHz, 2000-2700MHz
Dwell time of radiated	0.0015 decade/s
Waiting Time	3 Sec.

5.7.7. Test Results

PASS.

The test result please refer to the next page.

RF Field Strength Susceptibility Test Results

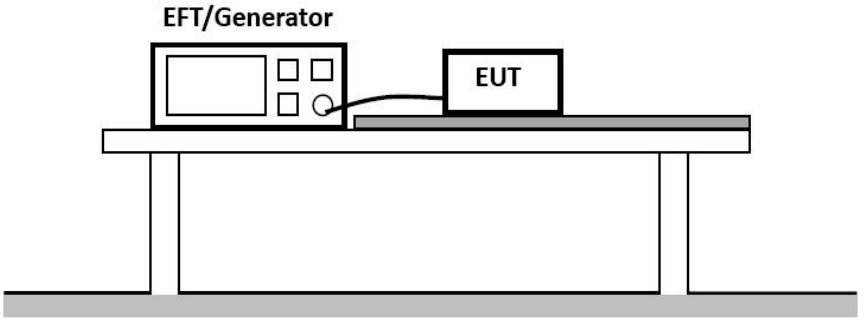
Standard	☐ IEC 61000-4-3 ☑ EN 61000-4-3		
Applicant	DELIXI HANGZHOU INVERTER CO.,LTD.		
EUT	Adjustable speed electrical power drive systems	**Temperature**	23.5℃
M/N	G022	**Humidity**	53.3％
Field Strength	3 V/m, 3V/m, 3V/m	**Criterion**	A
Test Mode	Mode 1	**Test Engineer**	Feng liang
Test Frequency	80MHz to 1000MHz (swept test) 1000MHz to 2000MHz 2000MHz to 2700MHz(Spot test)		
Modulation	☐None ☐ Pulse ☑AM 1KHz 80%		
Steps	1%		

	Horizontal	**Vertical**
Front	PASS	PASS
Right	PASS	PASS
Rear	PASS	PASS
Left	PASS	PASS

Note:

5.8. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

5.8.1. Block Diagram of Test Setup



5.8.2. Test Standard

EN IEC 61800-3:2018 (EN 61000-4-4: 2012, Severity Level, Level 2: 1KV)

5.8.3. Severity Levels and Performance Criterion

5.8.3.1. Severity level

Open Circuit Output Test Voltage ±10%		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 KV	0.25 KV
2	1 KV	0.5 KV
3	2 KV	1 KV
4	4 KV	2 KV
X	Special	Special

5.8.3.2. Performance Criterion

Performance Criterion: B

5.8.4. EUT Configuration on Test

The configuration of EUT is listed in Section 4

5.8.5. Operating Condition of EUT

5.8.5.1. Setup the EUT as shown in Section 5.8.1.

5.8.5.2. Turn on the power of all equipments.

5.8.5.3. Let the EUT work in test mode(1) and measure it.

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5.8.6. Test Procedure

The EUT is put on the table, which is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

5.8.6.1. For input and output AC power ports:
The EUT is connected to the power mains by using a coupling device, which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 1 mins.

5.8.6.2. For signal lines and control lines ports:
It's unnecessary to test.

5.8.6.3. For DC output line ports:
It's unnecessary to test.

5.8.7. Test Results

PASS.

The test result please refer to the next page.

Electrical Fast Transient/Burst Test Results

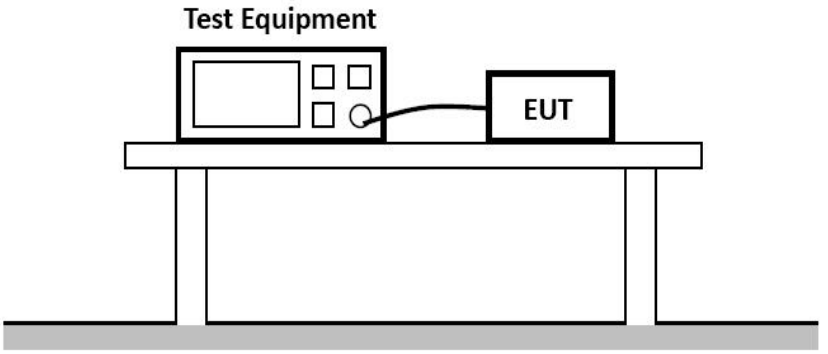
Standard	☐ IEC 61000-4-4 ☑ EN 61000-4-4		
Applicant	DELIXI HANGZHOU INVERTER CO.,LTD.		
EUT	Adjustable speed electrical power drive systems	**Temperature**	24.5℃
M/N	G022	**Humidity**	54.6%
Test Mode	Mode 1	**Criterion**	B
Test Engineer	Feng liang		

Line	Test Voltage	Result (+)	Result (-)
L	2KV	PASS	PASS
N	2KV	PASS	PASS
PE	2KV	PASS	PASS
L-N	2KV	PASS	PASS
L-PE	2KV	PASS	PASS
N-PE	2KV	PASS	PASS
L-N-PE	2KV	PASS	PASS
signal interfaces			
Control lines and power interfaces			

Note:

5.9. SURGE IMMUNITY TEST

5.9.1. Block Diagram of Test Setup



5.9.2. Test Standard

EN IEC 61800-3:2018 (EN 61000-4-5: 2014+A1: 2017, Severity Level: Line to Line: Level 2, 1.0KV, Line to Earth: Level 3, 2.0KV)

5.9.3. Severity Levels and Performance Criterion

5.9.3.1. Severity level

Severity Level	Open-Circuit Test Voltage (KV)
1	0.5
2	1.0
3	2.0
4	4.0
*	Special

5.9.3.2. Performance Criterion
Performance Criterion: B

5.9.4. EUT Configuration on Test

The configuration of EUT is listed in Section 4

5.9.5. Operating Condition of EUT

5.9.5.1.Setup the EUT as shown in Section 5.9.1.
5.9.5.1.Turn on the power of all equipments.
5.9.5.1.Let the EUT work in test mode (1) and measure it.

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5.9.6. Test Procedure

5.9.6.1. Set up the EUT and test generator as shown on Section 5.9.1.

5.9.6.2. For line to line coupling mode, provide a 2.0 KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

5.9.6.3. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

5.9.6.4. Different phase angles are done individually.

5.9.6.5. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

5.9.7. Test Results

PASS.

The test result please refer to the next page.

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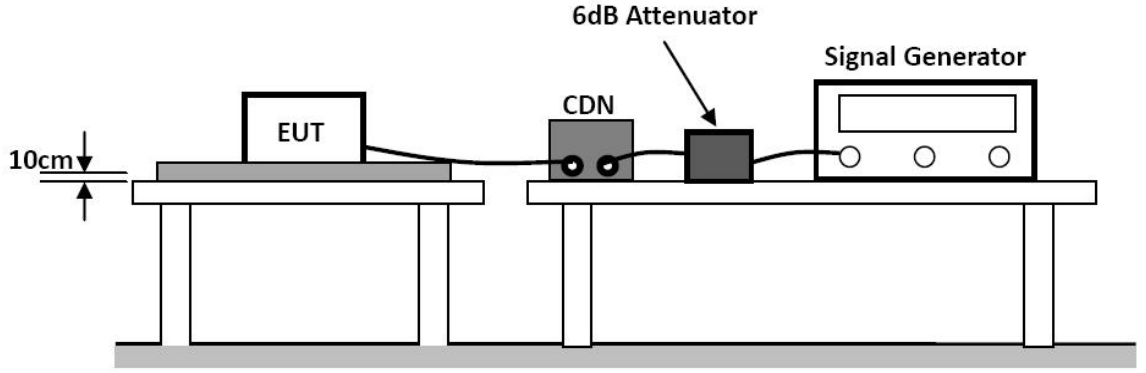
Surge Immunity Test Result

Standard	☐ IEC 61000-4-5 ☑ EN 61000-4-5		
Applicant	DELIXI HANGZHOU INVERTER CO.,LTD.		
EUT	Adjustable speed electrical power drive systems	**Temperature**	24.5℃
M/N	G022	**Humidity**	54.6%
Test Mode	Mode 1	**Criterion**	B
Test Engineer	Feng liang		

Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (KV)	Result
L&N	+	0º, 90º, 180º, 270º	5	1.0	PASS
	-	0º, 90º, 180º, 270º	5	1.0	PASS
L&PE	+	0º, 90º, 180º, 270º	5	2.0	PASS
	-	0º, 90º, 180º, 270º	5	2.0	PASS
N&PE	+	0º, 90º, 180º, 270º	5	2.0	PASS
	-	0º, 90º, 180º, 270º	5	2.0	PASS
Note	L=L1&L2&L3				

5.10. INJECTED CURRENTS SUSCEPTIBILITY TEST

5.10.1. Block Diagram of Test Setup



5.10.2. Test Standard

EN IEC 61800-3:2018(EN 61000-4-6: 2014, Severity Level: Level 2, (0.15MHz ~ 80MHz))

5.10.3. Severity Levels and Performance Criterion

5.10.3.1. Severity level

Level	Field Strength (V)
1	1
2	3
3	10
X	Special

5.10.3.2. Performance Criterion
Performance Criterion: A

5.10.4. EUT Configuration on Test

The configuration of EUT is listed in Section 4

5.10.5. Operating Condition of EUT

5.10.5.1.Setup the EUT as shown in Section 5.10.1.
5.10.5.2.Turn on the power of all equipments.
5.10.5.3.Let the EUT work in test mode(1) and measure it.

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5.10.6. Test Procedure

5.10.6.1. Set up the EUT, CDN and test generators as shown on Section 5.10.1.
5.10.6.2. Let the EUT work in test mode and measure it.
5.10.6.3. The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
5.10.6.4. The disturbance signal described below is injected to EUT through CDN.
5.10.6.5. The EUT operates within its operational mode(s) under intended climatic conditions after power on.
5.10.6.6. The frequency range is swept from 150kHz to 10MHz using 3V signal level,10MHz to 30MHz using 3V to 1V signal level,30MHz to 80MHz using 1V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.
5.10.6.7. The rate of sweep shall not exceed 1.5*10-3decades/s. where the frequency is swept incrementally; the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
5.10.6.8. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

5.10.7. Test Results

PASS.

The test result please refer to the next page.

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Injected Currents Susceptibility Test Results

Standard	☐ IEC 61000-4-6 ☑ EN 61000-4-6		
Applicant	DELIXI HANGZHOU INVERTER CO.,LTD.		
EUT	Adjustable speed electrical power drive systems	**Temperature**	23.8℃
M/N	G022	**Humidity**	54.6％
Test Mode	Mode 1	**Criterion**	A
Test Engineer	Feng liang		

Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
0.15 ~ 80	AC Mains	10V	A	PASS
0.15 ~80	Signal line and control line	10V	A	PASS

Remark:
1. Modulation Signal:1kHz 80% AM
2. Measurement Equipment :
Simulator: CIT-10 (FRANKONIA)
CDN : ☐CDN-M2 (FRANKONIA)
☑CDN-M3 (FRANKONIA)

Note:

6. PHOTOGRAPHS OF THE EUT



Fig. 1

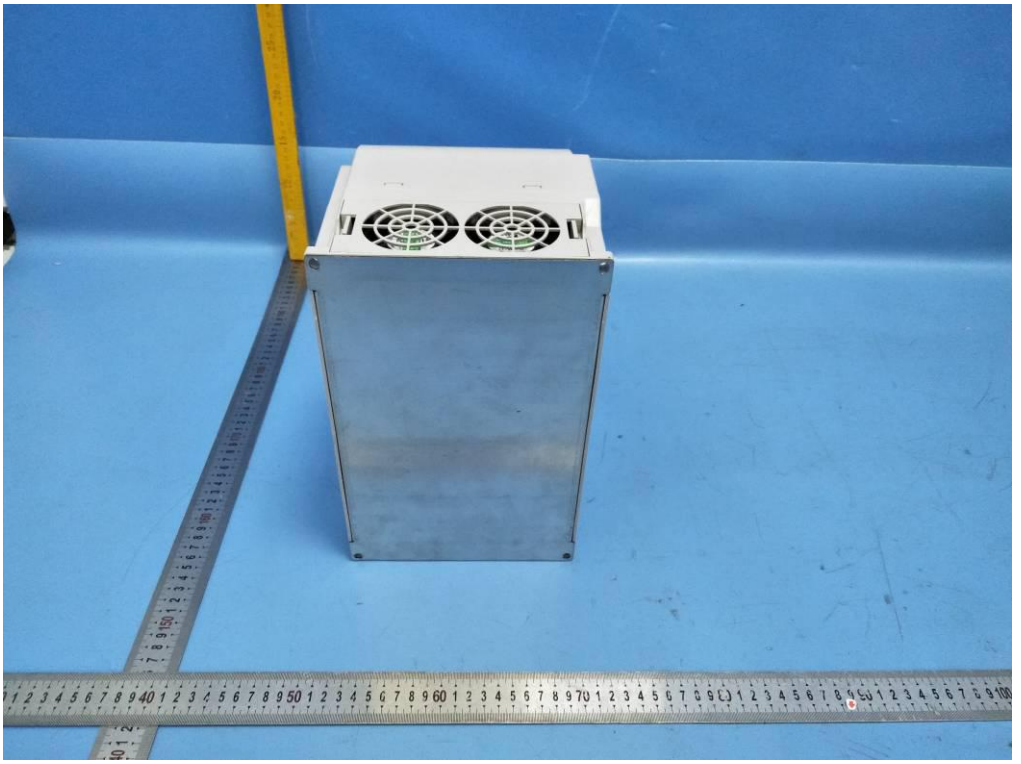


Fig. 2



Fig. 3



Fig. 4

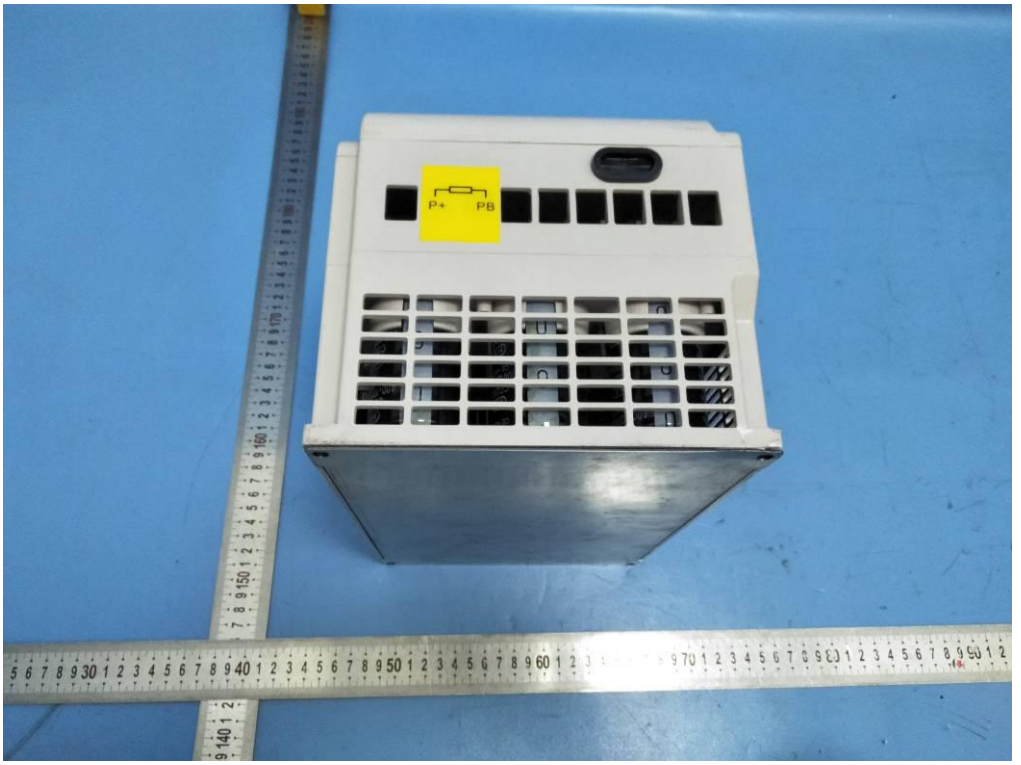


Fig. 5

---------- THE END OF TEST REPORT ----------